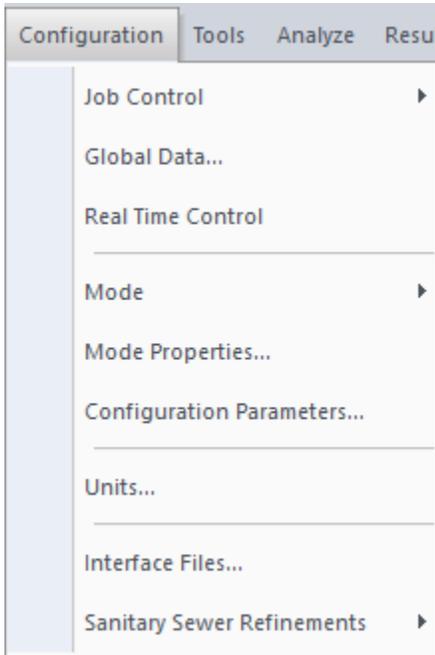# The Configuration Menu

The Configuration menu lists commands that are related to the overall modeling project. These include data that is global in nature (applying to many objects) and related to the control of the simulation such as time step, start and end times and which layers to solve.

Descriptions of the available configuration menu commands may be found below.

This page contains the following topics:

- Job Control
- Global Data
- Real Time Control
- Mode
- Mode Properties
- Configuration Parameters
- Units
- Interface Files
- Sanitary Sewer Refinements

Job Control

This item is used to define all of the job control data used by the Runoff, Sanitary, Hydraulics and 2D Settings.

The "Job Control" command allows the management of Control Data associated with the specific application. The data is global and not specific to any individual object.
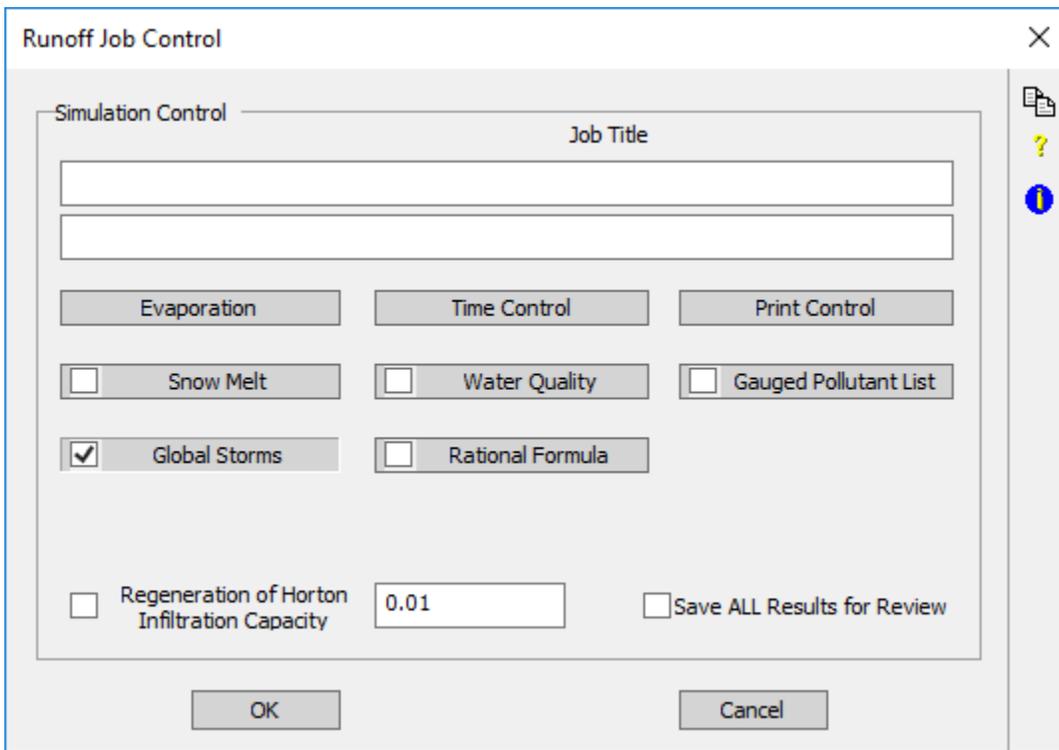
A full description of the parameters used by XPSWMM is provided in the Job Control page. A complete description of the solution technique is provided in SWMM Theory.

Global Data

Global databases are records of data which provide an environment for the whole network. They allow the editing of databases which are global to the network and which can be referenced from any objects within the network. This facility allows common data to be shared amongst many objects and thus reduces redundancy of data dramatically.

A full description of the parameters used by XPSWMM is provided in Global Network Data.
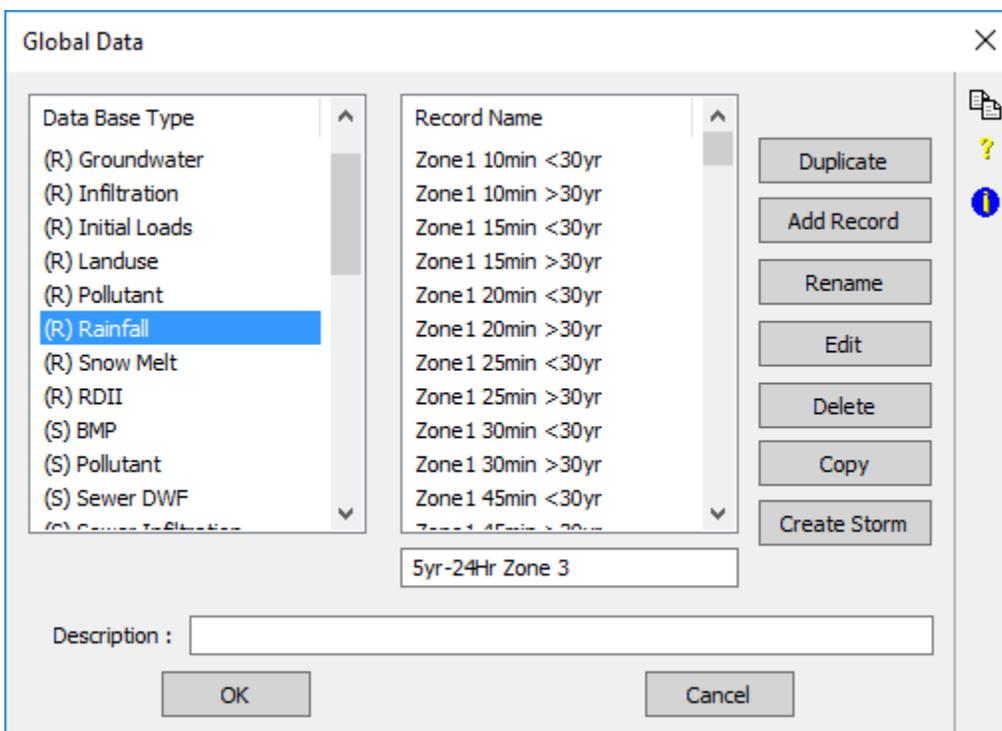
All records within the Global Database can be sorted, multiple selections can be made, and copies can be made. These functions can be initiated with typical commands. For instance, CNTRL-A (Select ALL), CNTRL-C (Copy), CNTRL-V (Paste) are all supported.

Real Time Control

Real Time Control (RTC) allows the user to simulate physical changes in the network structure. i.e. change speed of pumps, opening and closing of gates, etc. to both control the flows and water elevation throughout a distribution network. For example, this would allow for large wet weather events and either to redirect flows to an offline storage and/pr another less loaded portion of the network to prevent either floods or sewage overflow at specific points.

After the **Real Time Control** command is selected in the Configuration Menu, the following dialog box appears. Within the dialog is all data pertaining to both RTC control elements and their associated sensors.

The dialog box is made up of 3 main sections:

- A definition of RTC elements and their associated sensors (located in the top left hand corner)
- Properties of each RTC control element (bottom half of the dialog box)
- Properties of each sensor (top right section)

An RTC control element can consist of a conduit, node, pump, weir orifice or rating curve. Depending on the input RTC control properties these elements are controlled between minimum and maximum operating conditions. The change in operation over input ramp times is linear. Similarly, sensors can consist of either a conduit, node, pump, weir, orifice or time element.

Real-Time control consists of two components, the real-time control element and one or more sensors used to control this element. All control elements have an input rate of change between minimum and maximum operating values. When the combined sensors condition changes from false to true (on) the control will ramp from its current value towards the minimum value over the specified ramp time. When the combined sensor condition then changes from true to false (off) will ramp from the minimum value towards the maximum value. Each control element also has a time period over which the real-time control applies. This is between Time Start and Time End.

The Parameter may be subject to either the absolute minimum and/or maximum values or to a percentage of the input maximum value at the commencement of the simulation or the ongoing calculated maximum value, depending on the situation.

Order of Data

Data is usually input in the following order:

1. Enter the configuration of desired RTC elements and their associated sensors. The arrangement will be indicated in the resulting tree structures. When multiple sensors are used for any one RTC control element it is important to order them correctly. Section 2 indicates the operating algorithms and comparative methods that can be affected by sensor order.
2. Enter the data in the bottom half of the dialog to define the RTC control element types and their operating conditions. Highlight the respective RTC element in the tree diagram to show is respective data.
3. Enter in the top right hand corner the data that describes each sensor. Highlight the respective RTC element in the tree diagram to show its respective data.

⚠ There are also icon based tools to reorder and/or delete individual RTC control elements or sensors.

RTC Properties

The types of elements subject to RTC and the Parameters capable of being controlled are:

Element	Parameter
Conduit	Flow, Roughness, Diameter (or depth)
Node	Depth, Elevation
Pump	On Elevation, Off Elevation, Speed Factor, Pump Flow Rate, Well Volume Flow, Weir Crest Elevation, Weir Surcharge Elevation, Weir Length, Discharge Coefficient
Weir	Flow, Weir Crest Elevation, Weir Surcharge Elevation, Weir Length, Discharge Coefficient
Orifice	Area Discharge Coefficient
Rating Curve	Flow

Type

Select the type of element that will be subjected to real-time control. The available options are Conduit, Node, Pump, Weir, Orifice and Rating Curve.

Name

Once the type of element has been chosen, this list will display all the objects of this type available in the network. Select one of the objects.

Parameter

Once the type of element has been chosen, this list will display the types of parameters able to be controlled for this element. Select one of the parameters.

Use Percent

If this flag is enabled then the maximum and minimum values are entered as a percentage of the value calculated prior to application of real-time control.

Min Value

The absolute minimum value to be used while real-time control is active. The value is a percentage of the pre-RTC value if the use percent flag is active.

Max Value

The absolute maximum value to be used while real-time control is active. The value is a percentage of the pre-RTC value if the use percent flag is active.

Time to Ramp On

The time (in minutes) over which the real-time control turns on.

Time to Ramp Off

The time (in minutes) over which the real-time control turns off.

Sensor Properties

Every RTC element in the network can be controlled by any or all of the other elements in the network. There is no limit to the number of controlling elements (sensors).

The type of sensors available for RTC and the Parameters capable of being controlled are:

Sensor	Parameter
Conduit	Flow, Velocity
Node	Water depth, Water Elevation
Pump	Pump flow rate
Weir	Flow Rate
Orifice	Flow rate, Velocity
Time	Simulation Time (HH:MM), Time of Day (HH:MM), Month (JAN-DEC), Weekday (MON-SUN), Even/Odd day

Object

Once the type of sensor has been chosen, this list will display all the objects of this type available in the network. Select one of the objects.

Parameter

Once the type of sensor has been chosen, this list will display the types of parameters able to be used to control the RTC element. Select one of the parameters.

Condition

The control parameter is compared with a user-defined value, or the value of another sensor, using a relational condition. The available operators are:

Operator	Relationship
<	Less than
<=	Less than or equal to
=	Equal to
/=	Not equal to
>	Greater than
>=	Greater than or equal to

The relational expression consists of the sensor value compared to either a constant value or another sensor to determine whether the relationship stated by the relational operator is satisfied. The result of the relational expression is **True** if the relation specified by the operator is satisfied; the result is **False** if the relation specified by the operator is not satisfied.

Sequential expressions are compared using Additive Operators.

Additive Operators

Multiple sensors are compared using logical expressions consisting of one or more logical operators and logical, numeric, or relational operands. The following are logical operators:

Operator /Example	Meaning
AND (A AND B)	Logical conjunction: the expression is true if both A and B are true.
OR (A OR B)	Logical disjunction (inclusive OR): the expression is true if either A, B, or both, are true.
NEQV (A NEQV B)	Logical inequivalence (exclusive OR): the expression is true if either A or B is true, but false if both are true.
XOR (A XOR B)	Same as NEQV.
EQV (A EQV B)	Logical equivalence: the expression is true if both A and B are true, or both are false.
NOT (NOT A)	Logical negation: the expression is true if A is false and false if A is true.

⚠ NOT is a unary operator.

⚠️

Multiple sensors are evaluated from top to bottom in the list.

Value

The sensor can be compared to a constant value or to the value of another sensor.

Sensor (comparative)

The comparative sensors available for RTC and the Parameters capable of being controlled are the same as for the primary sensor:

Sensor	Parameter
Conduit	Flow, Velocity,
Node	Water depth, Water elevation
Pump	Pump flow rate
Weir	Flow rate
Orifice	Flow rate, Velocity

Object (comparative)

Once the type of comparative sensor has been chosen, this list will display all the objects of this type available in the network. Select one of the objects.

Parameter (comparative)

Once the type of comparative sensor has been chosen, this list will display the types of parameters able to be used to control the RTC element. Select one of the parameters.

Operator (comparative)

The value of the sensor parameter may be mathematically modified by a constant value using one of the following operators:

Operator	Relationship
+	Add
-	Subtract
*	Multiply
/	Divide

Constant (comparative)

The value of the sensor parameter may be mathematically modified by using the comparative operator above combined with this constant value.

View examples of Real Time Controls.

Mode

This command defines the current mode for editing and the mode or modes to solve for.

XPSWMM can operate in different modes: **Runoff**, **Sanitary,** and **Hydraulics**. The modes are controlled via the "Modes" command under the Configuration menu. The three modes are provided to segment the model into logical parts and thus reduce the complexity of the user interface.

The three modes have the following functions:

Runoff: Rainfall/Runoff/Water Quality generation, simple hydraulics.

Sanitary: Sewer loading, sewer treatment, retarding basin/BMP design, kinematic wave hydraulics.

Hydraulics: Dynamic flow routing, complex hydraulics.

The mode can be set 3 ways:

1. selecting the Rnf, San or Hdr icons from the toolstrip in the main window
2. selecting Mode Properties form the Configuration Menu. In the SWMM Mode of Operation dialog, select the Runoff, Sanitary or Hydraulics radio button from the Current Mode Group.
3. selecting Mode from the Configuration menu and then selecting Runoff, Sanitary or Hydraulics.

The ability to define different modes has several advantages. It allows sub-branches of the network to be defined in Runoff mode, for instance, and the main branch in EXTRAN Mode. Thus the complex hydraulic analysis is done on a smaller, more hydraulically sensitive network with significantly shorter run durations.

> ⚠️ When generating flows from a Runoff file containing a number of discrete un-connected nodes XPSWMM will, by default, only solve for one network, ie. one set of connected nodes and links. To enable all nodes to be solved within the one network, connect the nodes together in any order and delete the links from the runoff mode. The network will then appear to be contiguous but will behave as a series of discrete, unconnected elements.

Mode Properties

A set of objects is defined for each mode. Any object can belong to any, none or all modes. In this manual, sub-networks can be defined for any mode. For example, it is possible to use the runoff layer to generate flows for all nodes and then use the hydraulics layer to perform sophisticated hydraulic analysis on all or only some of the conduits.
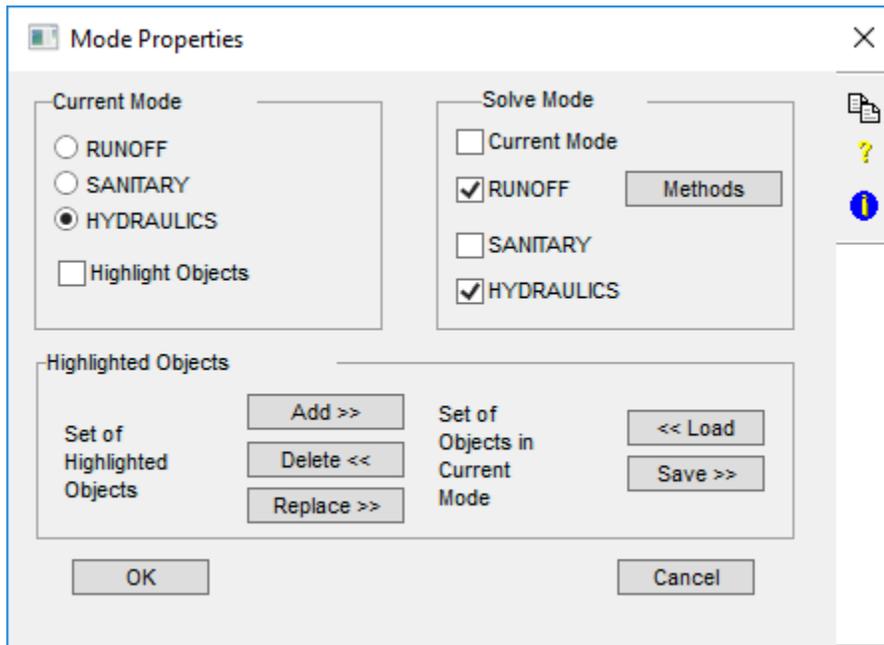
This dialog handles the interaction of the three layers (modes) of the program - Runoff, Sanitary and Hydraulics. The 3 modes are provided to segment the model into logical parts and thus reduce the complexity of the user interface. Each network object may belong to none, any or all of the modes.

Use this dialog to set the Current Mode (which defines the subset of Dialogs that will appear when editing), the Mode to be solved for (this need not be the same as the Current Mode), and to define which objects belong to which modes. When the Current Mode is defined, those network objects not belonging to the Current Mode appear dashed or hidden in the network window. However, their data may still be edited.

Current Mode

The current mode is used to control the editing of node and link data. Only data appropriate to the current mode is displayed for nodes, links and Job Control.

Runoff Mode

This option sets the currently active mode to the Runoff mode. The Runoff module deals with hydrology and water quality generation and with simple network hydraulics. When editing a node or link, only the relevant Runoff data will be visible.

Sanitary Mode

This option sets the currently active mode to the Sanitary mode. Transport handles sewer loading and treatment, with kinematic wave hydraulics. When editing a node or link, only the relevant Transport data will be visible.

Hydraulics Mode

This option sets the currently active mode to the Hydraulics mode. Extran handles complex dynamic network flow routing. When editing a node or link, only the relevant Hydraulics data will be visible.

Highlight Objects

If this flag is selected all objects that are members of the Current Mode will be highlighted when the OK button is hit. Only these objects will be highlighted.

See Also Node Data and Link Data.

Solve Mode

A solve may be performed for the Current Mode or any combination of modes. When the 'Current Mode' flag is ON the other flags are made inactive and will be ignored. At least one of the four flags must be selected.

 Note that there may be multiple disconnected networks defined within the one XP file. In this case the network to which the first highlighted object belongs will be the network solved.

Solve for Current Mode

This flag controls the mode of data solved for. When this flag is ON, only objects belonging to the Current Mode and belonging to the network being solved will be analyzed. When this flag is OFF, then the modes to be solved for are selected manually with the flags below, which will become activated. The latter option also allows for more than one mode to be solved for in one analysis.

Solve for Runoff Mode

This flag controls whether Runoff mode will be solved for. This flag will only be active if the 'Solve for Current Mode' flag is OFF. When multiple modes are solved for, Runoff is the first in the sequence that is analyzed.

Solve for Sanitary Mode

This flag controls whether the Sanitary mode will be solved for. This flag will only be active if the 'Solve for Current Mode' flag is OFF. When multiple modes are solved for, Sanitary follows Runoff and precedes Hydraulics in the sequence of analysis.

Solve for Hydraulics Mode

This flag controls whether Extran mode will be solved for. This flag will only be active if the 'Solve for Current Mode' flag is OFF. When multiple modes are solved for, Hydraulics follows Sanitary in the sequence of analysis.

Methods

This dialog allows the user to specify alternal computational methods.
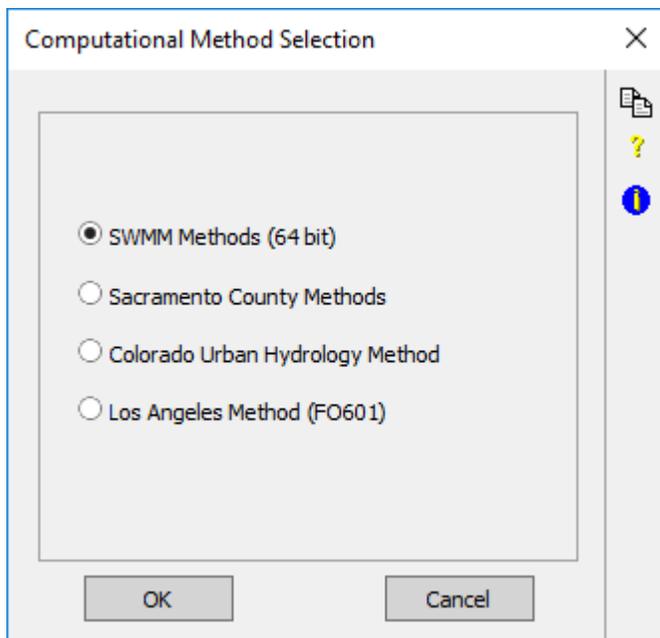
The following methods are included:

Computational Methods:

SWMM Methods (64 bit)

This is the 64 bit native xp computational engine which will allow increased computing capacity, over the 32 bit native engine, if used. This computational engine may be advantageous to use for models which take longer to solve as it may decrease simulation time by upwards of about 30%. For smaller models this is not very significant but for very large 1D or 2D models where run times are over a few hours in length this may make the model run times more manageable. This option also allows for much larger 2D models to be solved than can be done with the 32 bit engine, in particular models over 2 million grid cells in size should use the 64 bit engine.

Hydrology methods:

The Sub-Catchment dialog will vary based on which Hydrology Methods are specified. In an xp runoff model. Sub-catchments may have different routing methods as long as they are in the same Hydrology Methods group. The hydrologic routing methods are grouped as:

SWMM Methods

- Runoff
- Kinematic Wave
- Laurenson
- SCS Hydrology
- Unit Hydrograph
- Rational Formula

SWMM methods can now be used with either 32 bit or 64 bit engines.

Sacramento Method

Method developed for Sacramento County, California USA

Colorado Urban Hydrology Method

Procedure

Theory

Los Angeles County Method

Procedure

Highlighted Objects

This section allows manipulation of the set of objects that belong to the current mode. There are three sets of objects that exist; one for each mode. There is a Runoff set, a Sanitary set, and an Hydraulics set. Each network object (node/link) may be a member of any, none or all of these object sets. Note that only those objects which are members of a particular mode set can be solved for in that mode.

Set of Highlighted Objects

These are the currently selected (highlighted) objects in the network window.

Set of Objects in Current Mode

These are the set of network objects which are members of the Current Mode.

Add to Current Mode Objects

This button adds all the currently highlighted objects into the set of objects belonging to the Current Mode. If a selected network object is not already a member of the set, it will be added to that set. If a selected object is already a member of that set, no action is taken. Subsequently, these network objects will be not 'hidden'. An object or group of objects can also be added to the current set by typing CTRL-A.

Delete From Current Mode Objects

This button removes all the currently highlighted objects from the set of objects belonging to the Current Mode. If a selected network object is already a member of the set, it will be removed from that set. If a selected object is not already a member of that set, no action is taken. These network objects will subsequently be 'hidden'. An object or group of objects can also be deleteted from the current set by typing CTRL-D.

Replace Current Mode Objects

This button replaces all objects in the Current Mode set with those network objects currently highlighted. This action effectively first clears or removes all members from the Current Mode Set, and then adds all currently highlighted objects to the same set.

Load Object Modes

This button loads the sets of network objects belonging to each mode from a disk file previously saved with the "Save >>" button. The Load/Save button combination allows different mode sets to be stored and recalled.

Save Object Modes

This button will allow the set of network objects in all Mode Sets to be permanently saved to a disk file allowing different sets to be defined and stored.

Configuration Parameters

These are special command line arguments for advanced users that can be used to fine-tune the way in which the analysis engine works.

Configuration parameters are global. There is no means of setting a configuration parameter to apply to only one link or node. e.g. if you set USE_ORF_EQN to force the use of the orifice equation instead of creating an equivalent pipe then ALL orifices must use the orifice equation.

You can set default configuration parameters in the [Engine] section of the SWMXP.INI file. These parameters will then be used for all files unless overwritten by values set in the shown below dialog.
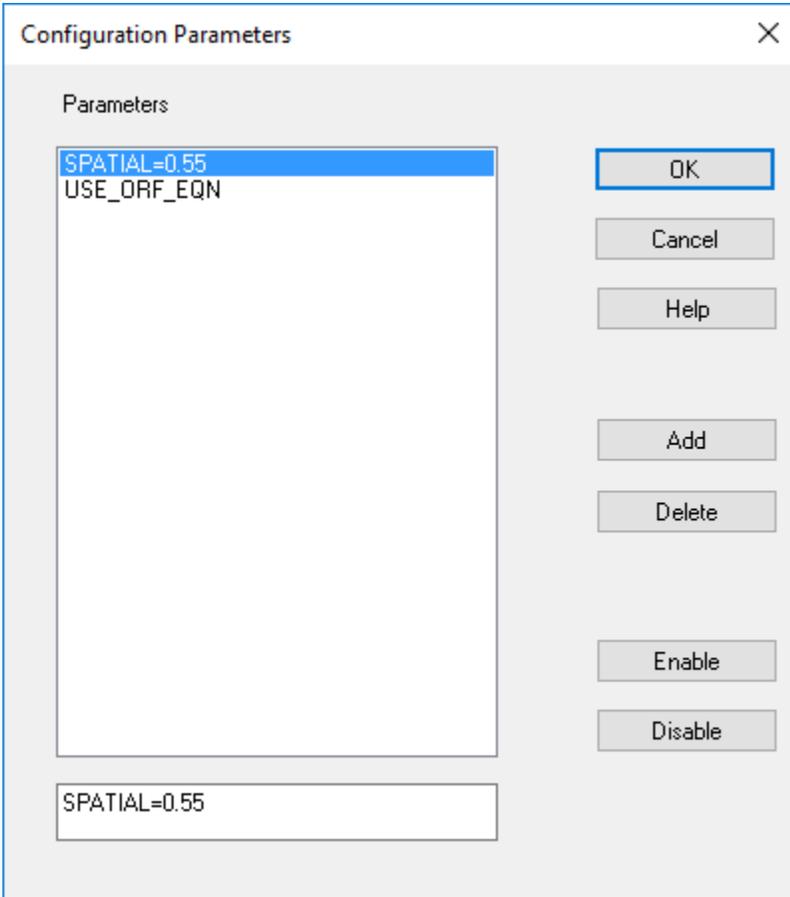
A configuration parameter is edited or added to the current list using the Edit field beneath the list of parameters.

Add: Adds a parameter to the list and sorts the list alphabetically.

Insert: Inserts a note before the currently highlighted note.

Enable: Enable a previously disabled parameter in the list.

Disable: Disable a parameter in the list. This allows a parameter to be turned off without removing it from the list. A parameter is disabled by inserting a # character before the parameter name.

Configuration parameters used in the calculation are reported in the output file. Names beginning with $ are default parameters. The 2nd column indicates the value of the argument (if applicable, otherwise 0.0000). The 3rd and 4th columns are internal values and counters. Below is an excerpt from an output file showing some parameters:

    $spatial = 0.90 0.9000 5 124

    $weirlen = 50 50.0000 1 153

    HDR_EVAP 0.0000 1 244

    $new_nl_97 0.0000 2 290

    USE_ORF_EQN 0.0000 1 304

    $q_tol = 0.01 0.0001 1 316

    $new_storage 0.0000 1 322

```
$old_iteration 0.0000 1 333

MINLEN=10 10.0000 1 346

$min_ts = 0.5 0.5000 1 407

$design_restart = on 0.0000 1 412
```

View the full Configuration Keywords.

Units

The **Units** functionality allows you to set the units you will use in your project in **Stormwater** or **Wastewater/Sanitary** mode. You can access this dialog from **Configuration > Units**. When a new database is created, the software will prompt you to define the units that will be used. If units are changed after a database is created, then data conversions are not done.

It is important to set the units expected to be used at the time a database is created.

Units for Stormwater Mode

The **Units** dialog for **Stormwater** mode allows you to select between **Metric** and **U.S. Customary** units.

Units for Wastewater/Sanitary Mode

By default, cubic feet per second (cfs) is selected for **Wastewater/Sanitary** mode. You may choose the other available units in the dialog.
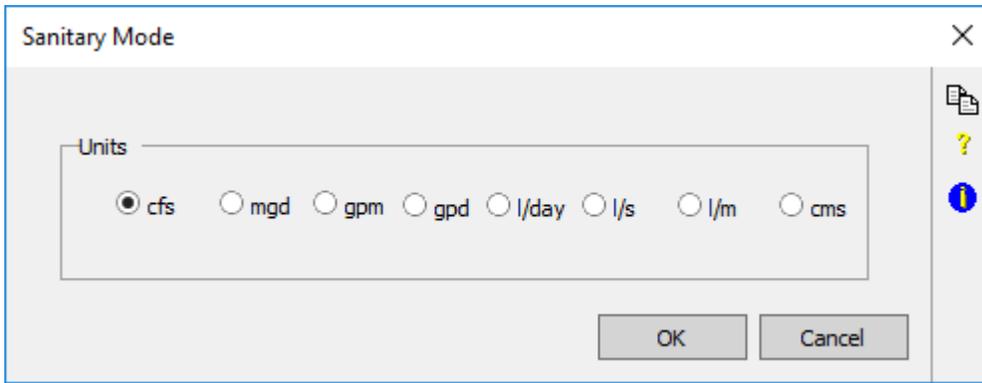
mgd – million gallons per day

gpm – gallons per minute

gpd – gallons per day

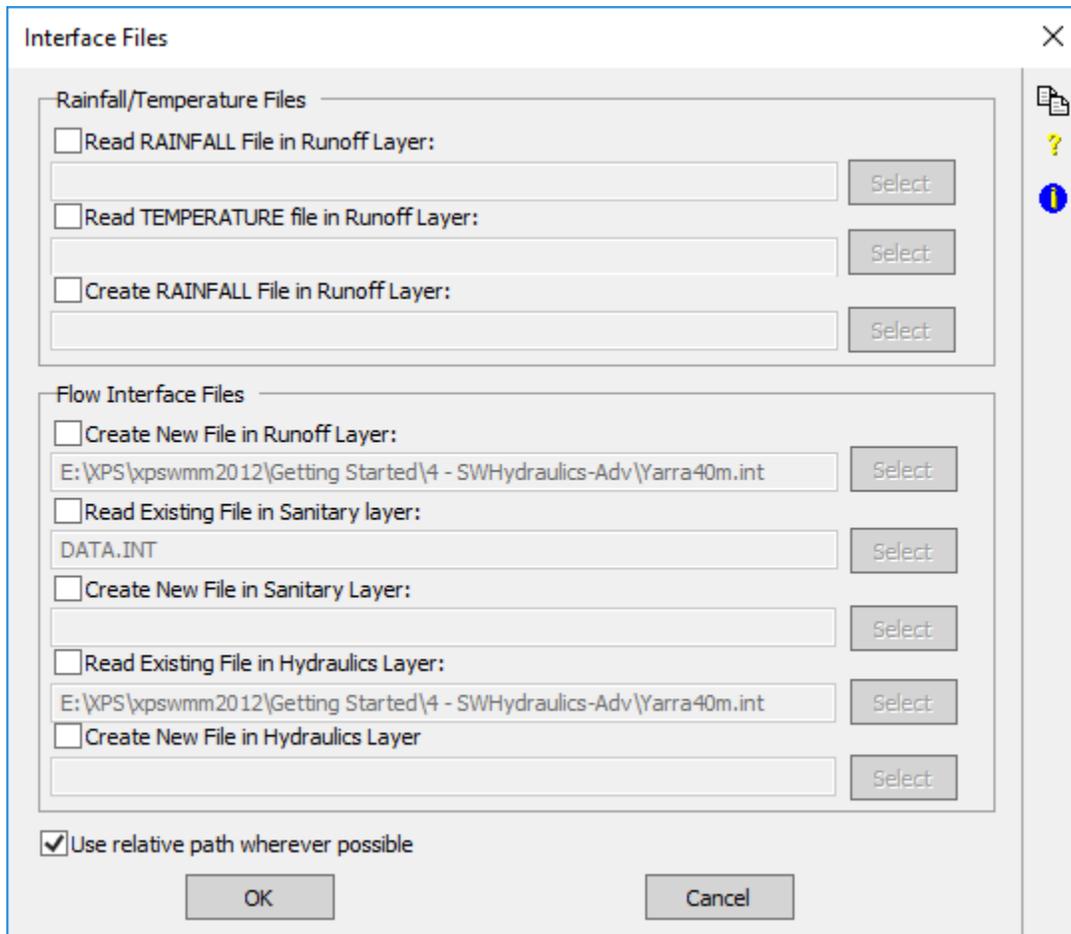**l/day** – liters per day

l/s – liters per second

l/m – liters per minute

cms – cubic meters per second

Interface Files

Interface files are used for exchanging rainfall, temperature, flow, and water quality data between the Runoff, Sanitary or Hydraulics modes, or with another program, XPRafts for example.

xp interface files may contain the following information:

    a. Descriptive titles
    b. The simulation starting date and time
    c. The name of the module generating the interface file
    d. The total catchment or service area
    e. The number of hydrograph locations
    f. The number of pollutants
    g. The location identifiers for transferred flow and pollutant data
    h. The pollutant and unit names
    i. The type of pollutant concentration units
    j. Flow conversion factor
    k. Flow and pollutant data for each time step for each location

The dialog is used to define the interface files read or created by XPSWMM.

In this example, flows to a combined sewer are generated in both the Runoff and Sanitary modes. In the Runoff Mode, the file Run.int is created. This file is read in the Sanitary mode and the file Run+San.int containing both runoff and sanitary flows is created. Run+San.int is read by the Hydraulics mode.

> ⚠
> - The Runoff interface file is not created if Run Hydrology/Hydraulics Simultaneously is checked in the Hydraulics Job Control Dialog.
> - Sanitary outflows are including in the Sanitary interface file only if Save Outflows to SWMM Interface file is checked in the Sanitary Node Data dialog.
> - Files created in either the Sanitary or Hydraulics modes must be different from the ones that are read.

Hydraulics Mode Interface Files

The Hydraulics layer provides the facility to create and/or use one type of interface file. An interface file is used or created if a name exists in the filename field. To prevent the use or creation of an interface file disable the appropriate check box. Several Configuration Parameters can be used to control the format of the Interface File and in particular which nodes are included to the Interface File.

EXPORTALL (or EXPORT_ALL) causes all of the nodes of Hydraulics Layer to be saved to the interface file created from Hydraulics layer. The sum of the flow into the node will be saved to the interface file.

EXPORTUS (or EXPORT_US) causes only the most upstream nodes of Hydraulics Layer to be saved to the interface file created from Hydraulics layer. The sum of the flow into the node will be saved to the interface file.

EXPORTJPRT (or EXPORT_JPRT) causes only the nodes with **Detailed Printout Flag** enabled in the Hydraulics Layer to be saved to the interface file created from Hydraulics layer. The sum of the flow into the node will be saved to the interface file.

By default only the nodes at the extremities of the network will be saved to the interface file. i.e. the outfall nodes and the most upstream nodes in the network.

Runoff Mode Interface Files

The Runoff module is capable of both creating and using Rainfall interface files plus using a Temperature interface file created by the Utilities module and creating an Interface file for use by other SWMM modules.

Sanitary Mode Interface Files

The Sanitary layer provides the facility to create and/or use one type of interface file. An interface file is used or created if the check box is enabled and a name exists in the filename field. To prevent the use or creation of an interface file, disable the appropriate check box.

See Also SWMM Interface File Format.

Sanitary Sewer Refinements

Sanitary Sewer Refinements allows you to select whether to display **Stormwater** or **Wastewater/Sanitary** options in the **Layers Control Panel**.

Selecting **Stormwater** displays all possible options you can use in XPSWMM, while selecting the **Wastewater/Sanitary** hides some of these options in the **Layers Control Panel** and displays only the ones relevant for your modelling.

Moreover, **Wastewater/Sanitary** makes some Object Creation tools inactive and renders them grey. For example, the River icon is locked down in this mode.

The following options are available in **Stormwater**:
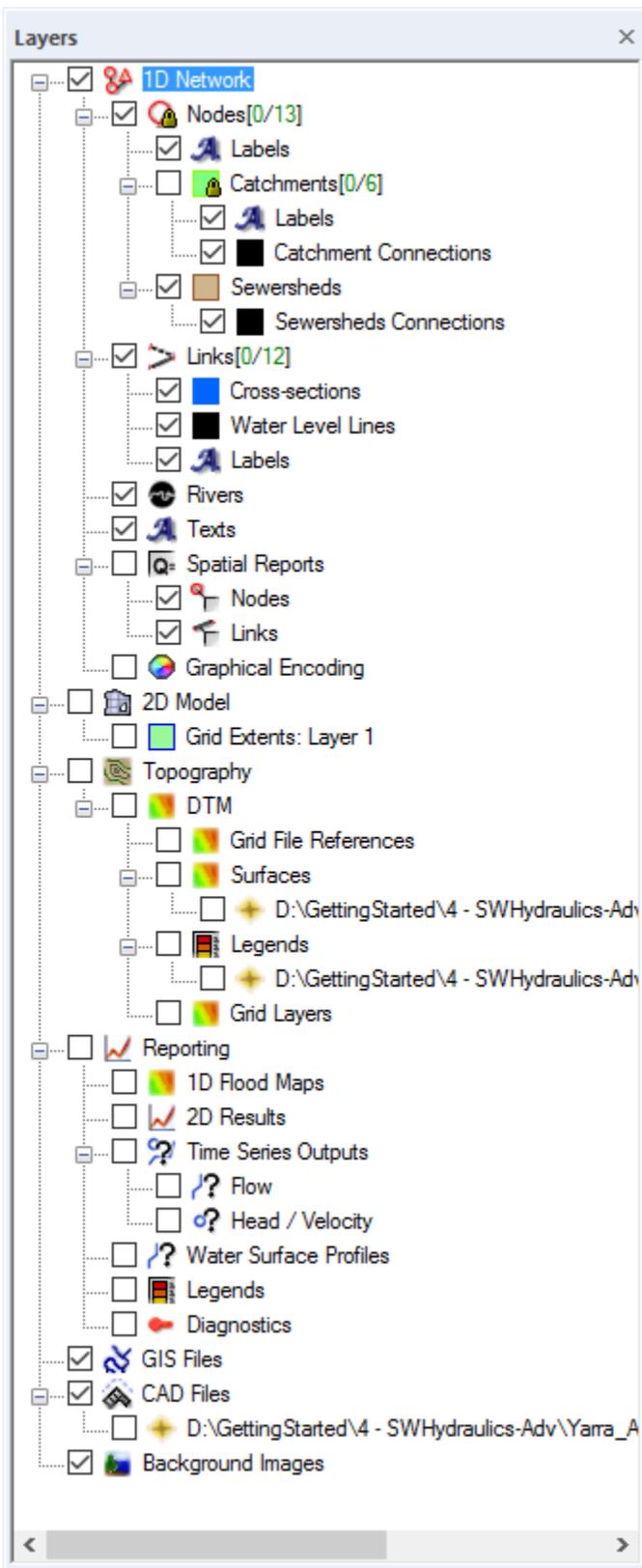
The following options are available in **Wastewater/Sanitary**:
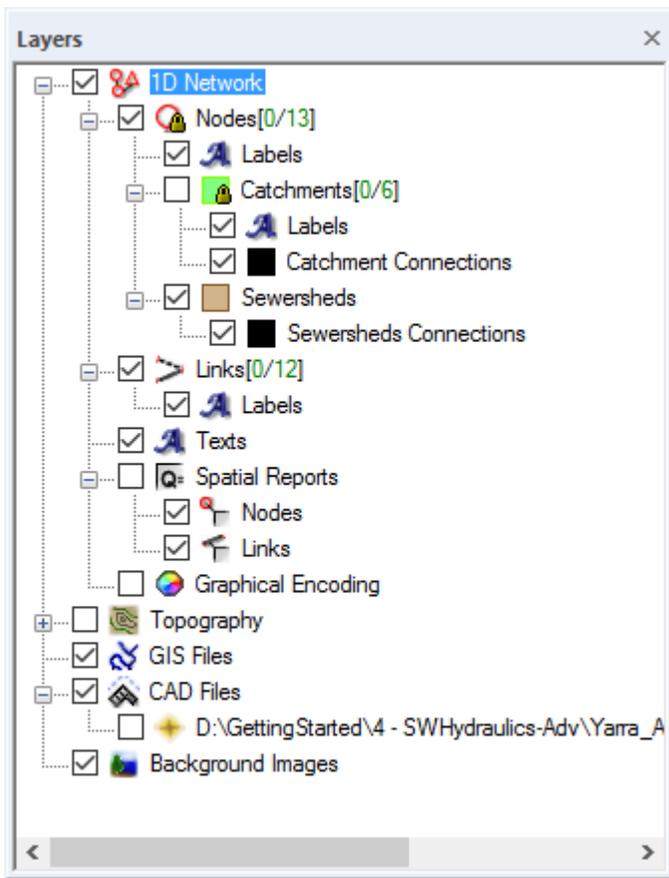
For more information about the different options in the **Layers Control Panel**, refer to Layer Control Panel.