RDII Setup and Calibration

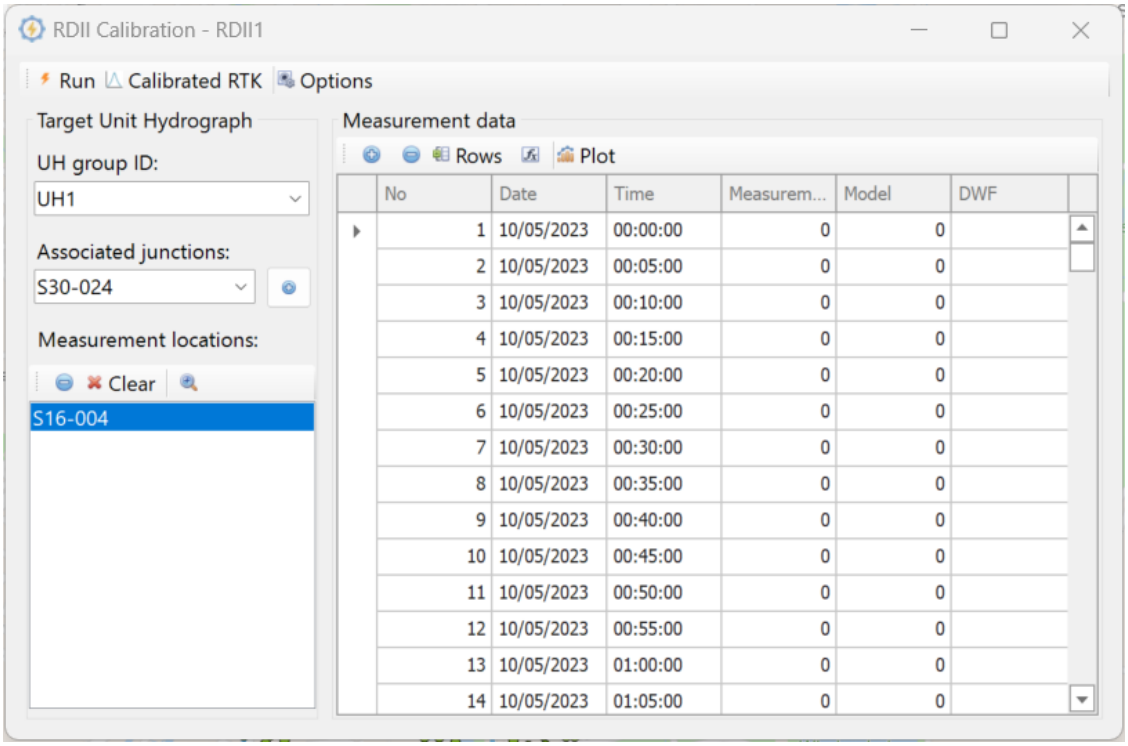

Figure 1: Example of the RDII calibration tool in AquaTwin Sewer.

Contents

Create Unit Hydrographs

Adding a new unit hydrograph

1. To start RDII analysis, the user needs to turn on *Digital Twin* > *General* > *Process Model* > *Include Rainfall/Runoff* and *Digital Twin* > *General* > *Process Model* > *Include RDII*.
2. A new Unit Hydrograph (UH) can be added from *Digital Twin* > *Hydrology* > *Unit Hydrograph*. Right click on the Unit Hydrograph and click on New to add a new UH.

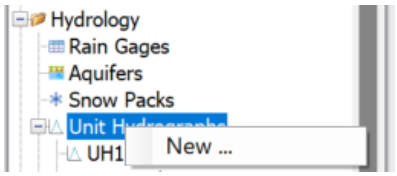

Figure 2: Unit Hydrograph button in the Digital Twin window.

3. After assigning an asset ID, a rain gauge must be associated with a UH. UHs estimate RDII into a sewer system. A UH set contains up to three such hydrographs, one for a short-term response, one for an intermediate-term response, and one for a long-term response. A UH group can have up to 12 UH sets, one for each month of the year. Each UH group is considered as a separate object by AquaTwin Sewer and is assigned its own unique name along with the name of the rain gage that supplies rainfall data to it.

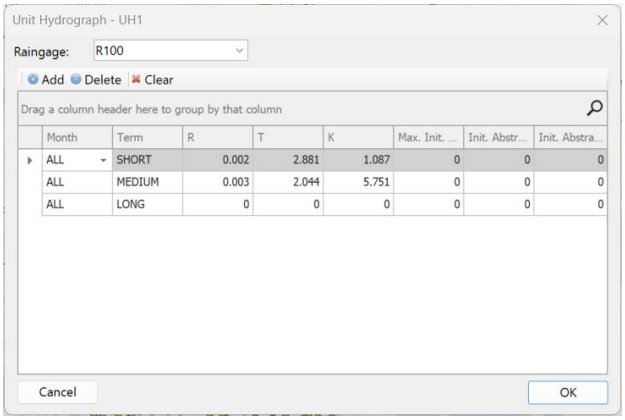

Figure 3: Unit Hydrograph editing window.

4. Each unit hydrograph, as shown in **Figure 4**, is defined by three parameters:
   - R: the fraction of rainfall volume that enters the sewer system
   - T: the time from the onset of rainfall to the peak of the UH in hours
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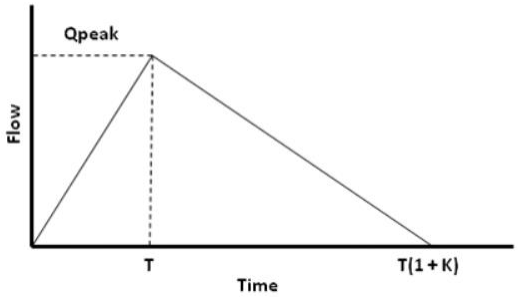

Figure 4: RTK parameters of a UH.

A unit hydrograph can also have a set of Initial Abstraction (IA) parameters associated with it. These determine how much rainfall is lost to interception and depression storage before any excess rainfall is generated and transformed into RDII flow by the hydrograph. The IA parameters consist of:

- a maximum possible depth of IA (inches or mm),
- a recovery rate (inches/day or mm/day) at which stored IA is depleted during dry periods,
- an initial depth of stored IA (inches or mm).

Identify Nodes with UH groups

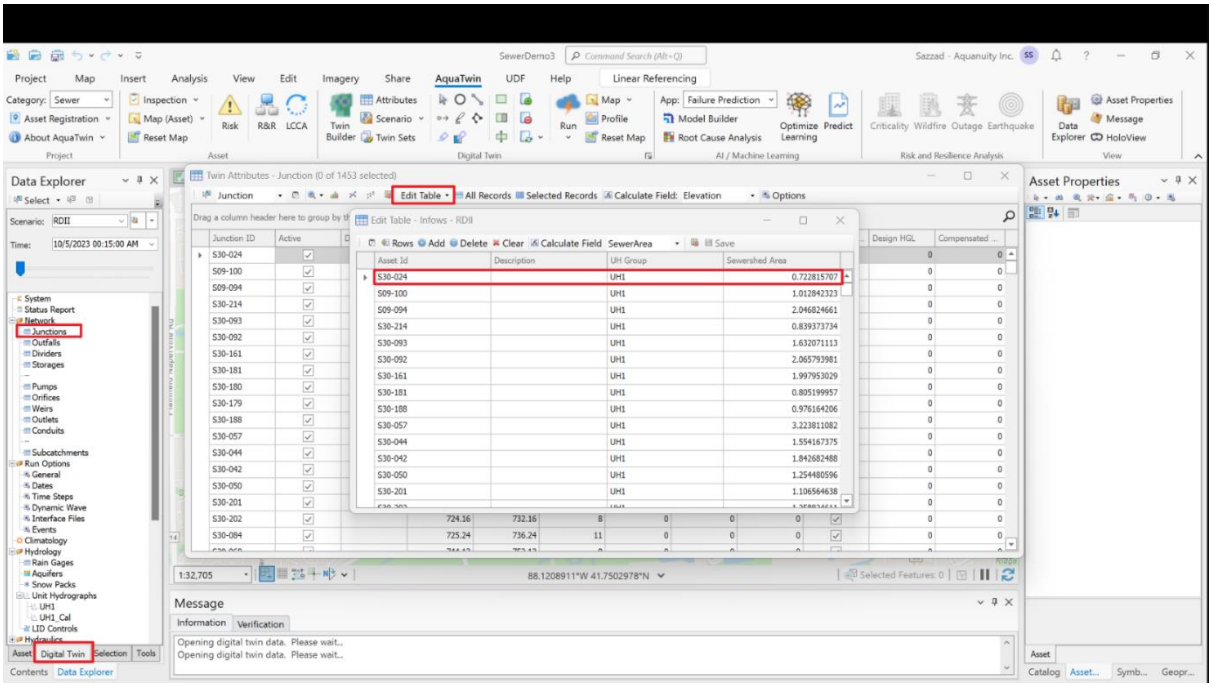

Figure 5: Adding a UH group to nodes through inflow property.

1. To generate RDII into a drainage system node, the node must identify (through its Inflows property) the UH group and the area of the surrounding sewershed that contributes RDII flow. The UH group can be added to individual/multiple nodes through *Digital Twin* > *Junction* > *Edit Table* > *Inflow – RDII button.*

2. Additionally, the RDII builder tool allows for the global assignment of sewershed areas and unit hydrograph (UH) groups based on feature or table GIS layers. This too can be found in *Tools* > *RDII Builder*.

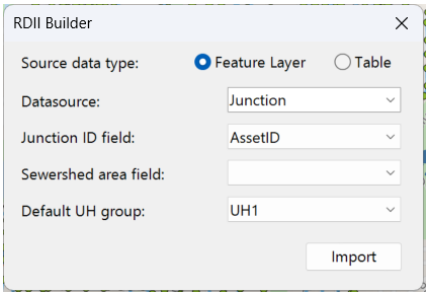

Figure 6: Adding a UH group to nodes through RDII Builder tool.

RDII Calibration

Creating a New RDII Calibration File

1. The RDII Calibration folder can be found in *Digital Twin* > *RDII Calibration*.
2. A new RDII calibration file can be created by right clicking on the *RDII Calibration* folder and selecting *New* as shown in Figure **7.**

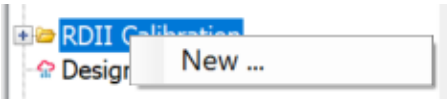

Figure 7: Creating a new RDII calibration file.

Adding Measurement Data

1. All the junctions associated with the UH group are shown in the *Associated junctions* dropdown menu (**Figure 8**).
2. The *Add Measurement Location* button is just on the right-hand side of the *Associated junctions* dropdown menu. This button will add the metering locations in the RDII calibration file.
3. Measurement data can be directly copied into the empty table on the right. The *Plot* button will plot the copied measurement data.

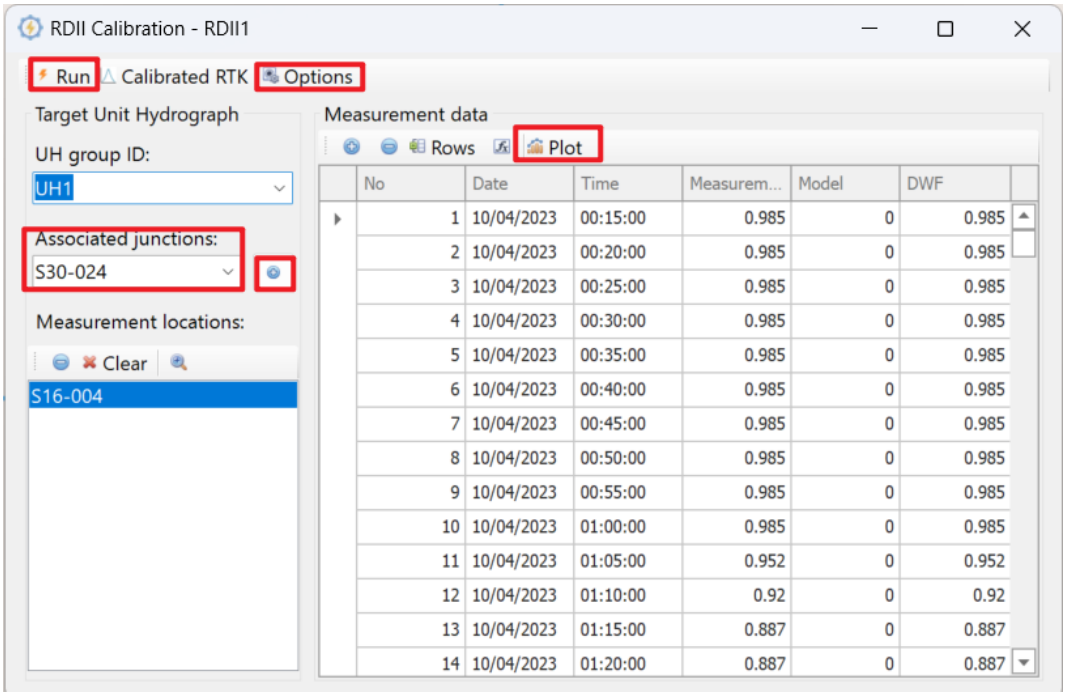

Figure 8: RDII calibration menu.

4. The measurement data can be a single event or continuous monitoring data (shown in the next section)

RDII Calibration

1. The *Run* button (**Figure 8**) will run and calibrate by using the genetic algorithm to match the UH RTK parameters to the measured data.
2. After running the calibration, the model and DWF column will get populated. The tool calculates the DWF from the user defined DWF at that junction and a minimum rainfall cutoff. The minimum rainfall

cutoff setting can be found under the *Options* button and this cutoff value must be greater than zero to extract DWF. The calibration tool subtracts the calculated DWF from the measured data to get the true wet weather flow. Then the RDII is calibrated to the newly calculated wet weather flow.

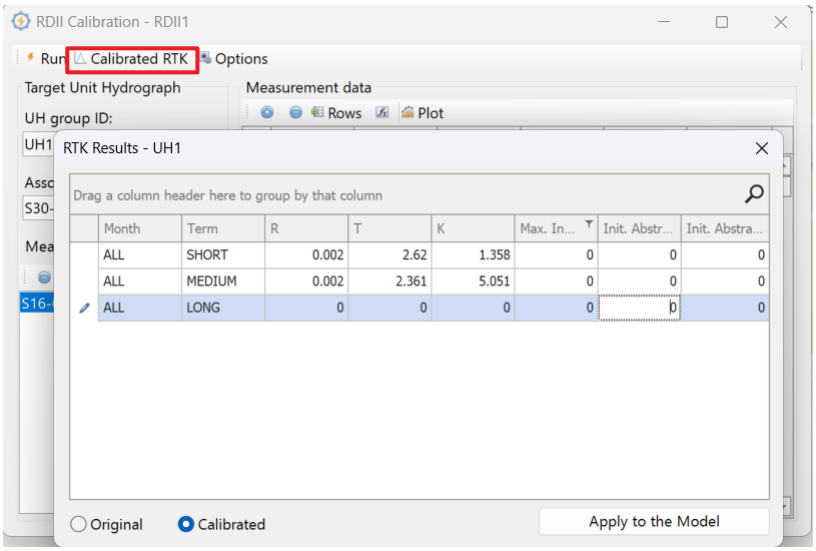

Figure 9: The newly calibrated RTK parameters.

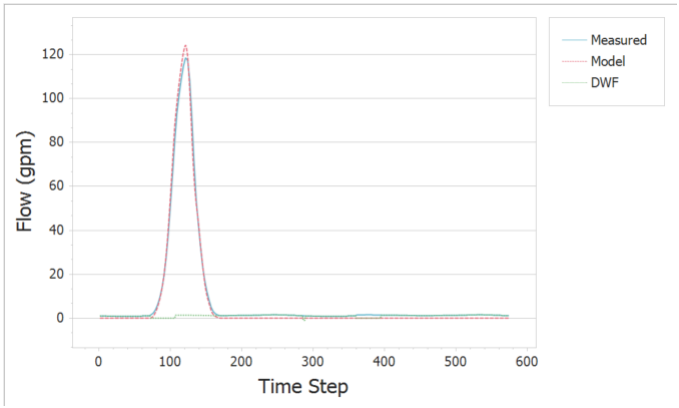

Figure 10: Measured vs Model results after RDII Calibration.

3. The *Calibrated RTK* button will show the newly calibrated RTK parameters using the genetic algorithm. *Apply to the Model* button will use these parameters in the model (**Figure 9**).
4. After running the calibration and the model, the *Plot* button will plot both the measure and calibrated results (**Figure 10**).

Special Case: RDII Calibration to Total inflow

1. To calibrate continuous total inflow into a node from multiple sewershed, we recommend creating a dummy node with a dummy link connecting to an outfall (**Figure 11**).
2. Identify the dummy node with the UH group that is going to be calibrated.
3. The summation of all the sewershed areas of that UH group must be used as the sewershed area of the dummy node.
4. Then the rest of the calibration process is the same as mentioned earlier.

Figure 11: Dummy node creation.

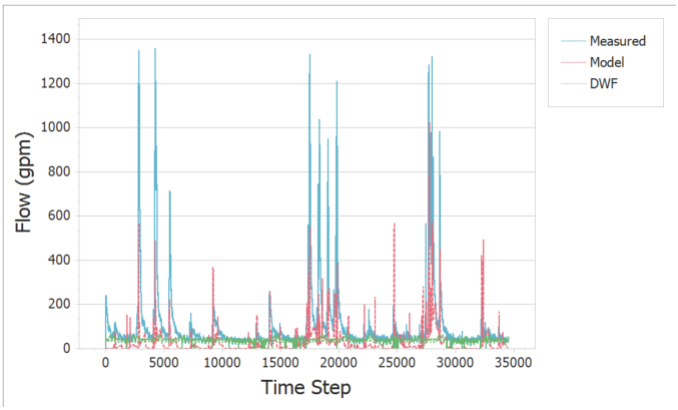

Figure 12: Calibration to continuous data