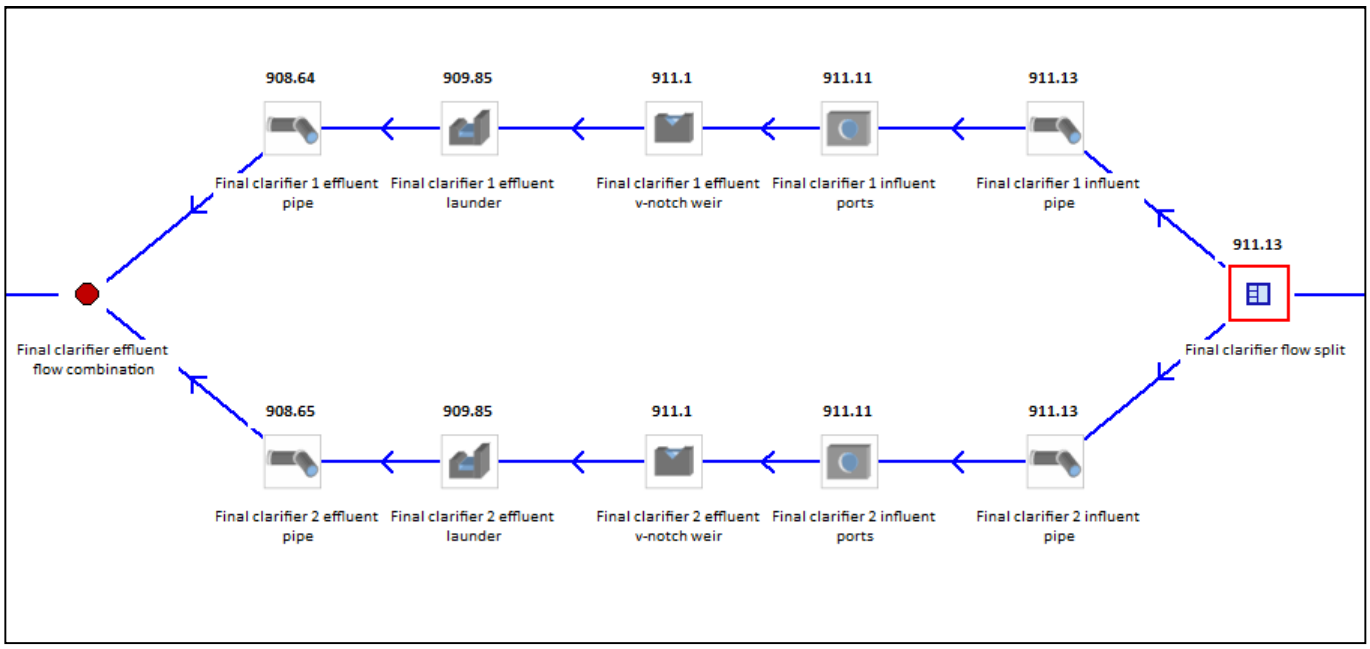
Visual Hydraulics Example IV – Managing Flow Paths - Units off-line and on-line

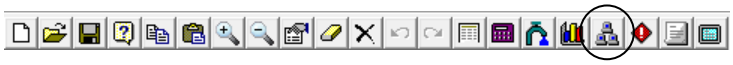
Most treatment plants have redundancy when it comes to treatment units, meaning two or more units accepting the flow through that particular section of the treatment process. Additionally, some treatment trains may operate in parallel but have completely different hydraulic characteristics. Visual Hydraulics provides the option of taking any treatment train off-line at any time. This is not uncommon at treatment plants, as trains are kept off-line due to low flows, optimizing operations, or maintenance. Treatment trains are taken off-line at the flow split element where they are split into multiple trains.

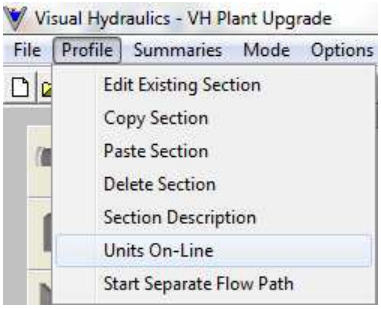
Problem: A treatment plant has flow that is split equally through its secondary process. The client is looking to make significant repairs to one of the final clarifiers, and wishes to remove that treatment train from operation until the repairs can be made. This will only leave one treatment train in operation. The plant is subjected to high variations in flow during wet weather events, and the client needs to know how the hydraulics will be affected for varying flow conditions with one of the secondary process trains out of service.

The hydraulic profile for the treatment plant has been created in Visual Hydraulics. A screenshot of the secondary process portion of the treatment plant is show as follows:

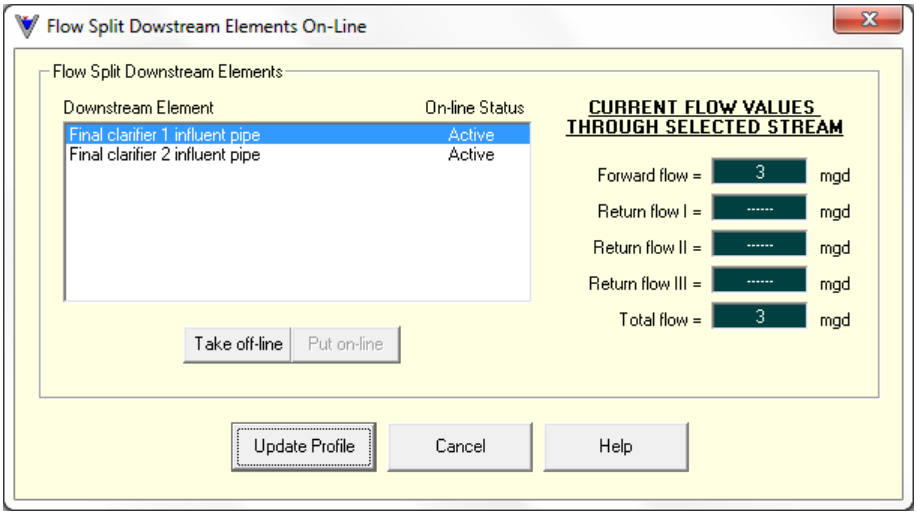


As can be seen from the hydraulic profile, the flow is split equally between the two trains, and the hydraulic elements are identical for both trains. As was summarized in the problem statement, the client wishes to take a secondary clarifier out of service, which would affect all of the hydraulic elements in one of the trains. Visual Hydraulics has a feature that allows the user to take a treatment train off-line. This option can be accessed from the main toolbar or from the drop down menus:

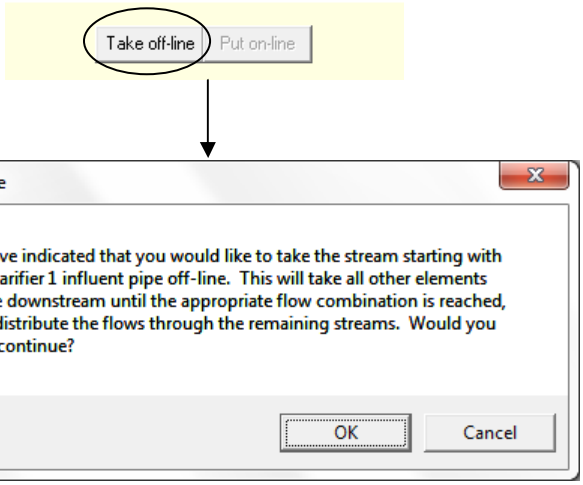




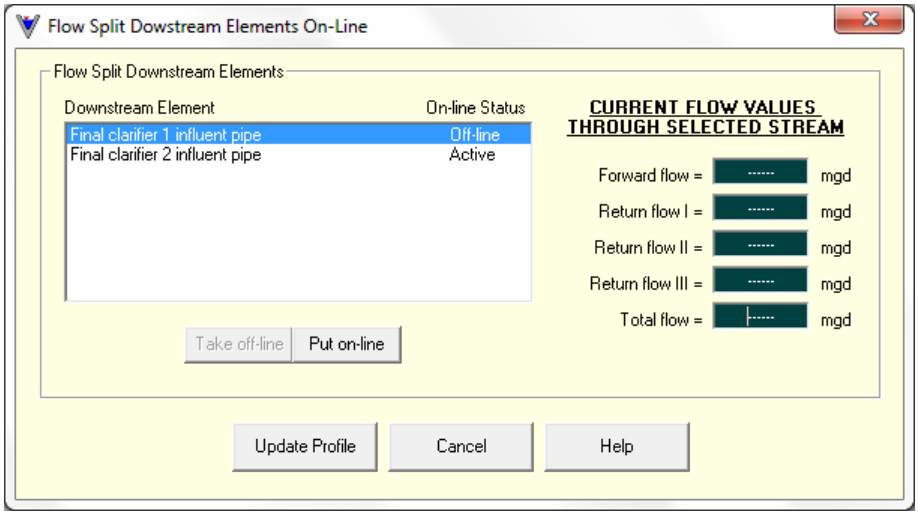
When the "Units On-Line" option is selected, the following summary form is displayed. Note that the user can only access the units on-line form when a flow split element is active. In this example, the form appears as follows:



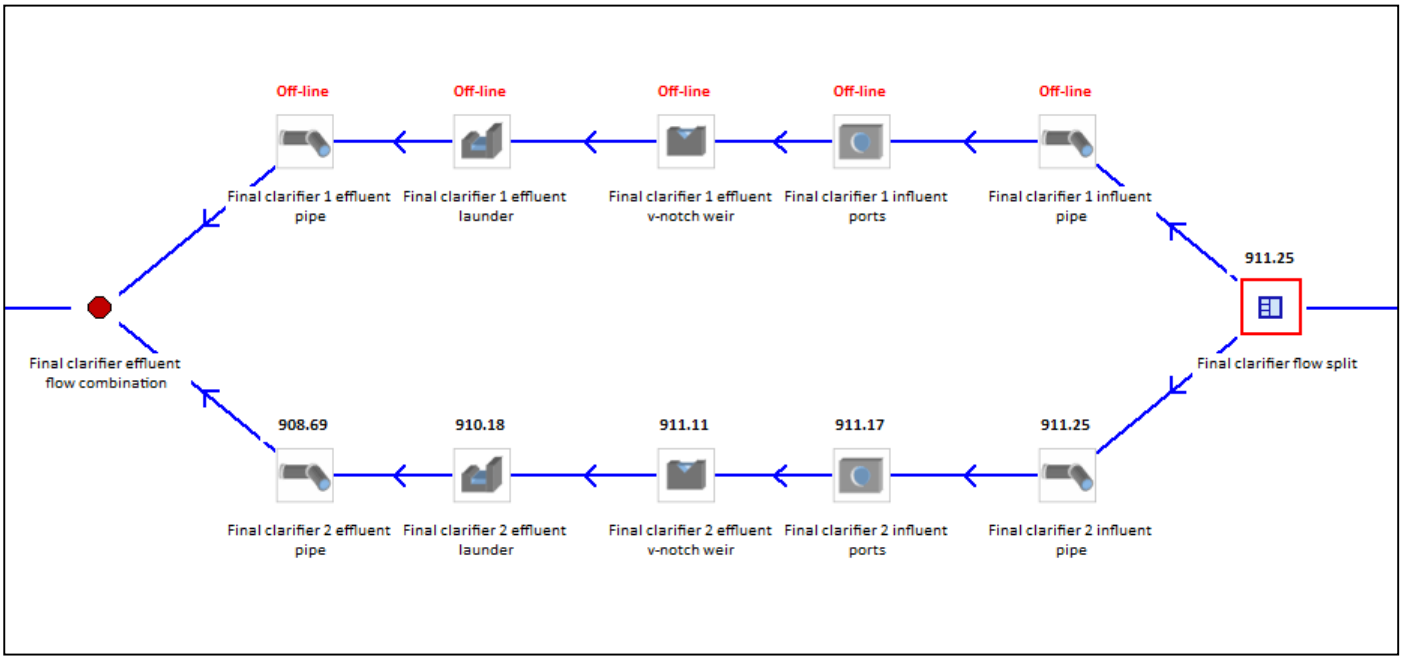
Looking back at the hydraulic profile being analyzed, the units on-line form was accessed while the flow split element ("Final clarifier flow split") was active. The form shows both flow paths, with the hydraulic element just downstream of the flow split being displayed as the starting point for each flow path connected to the flow split element. So if the user wishes to take one of the flow paths off line, the "Take off-line" option should be selected, and a message will be provided confirming the selection:



This instructs the software to take the flow path downstream of the final clarifier flow split (starting with element “Final clarifier 1 influent pipe” off-line, all the way to the flow combination, and to re-distribute the flows through the remaining on-line path. The units on-line form is then redisplayed, showing the election to take the one flow path off-line:

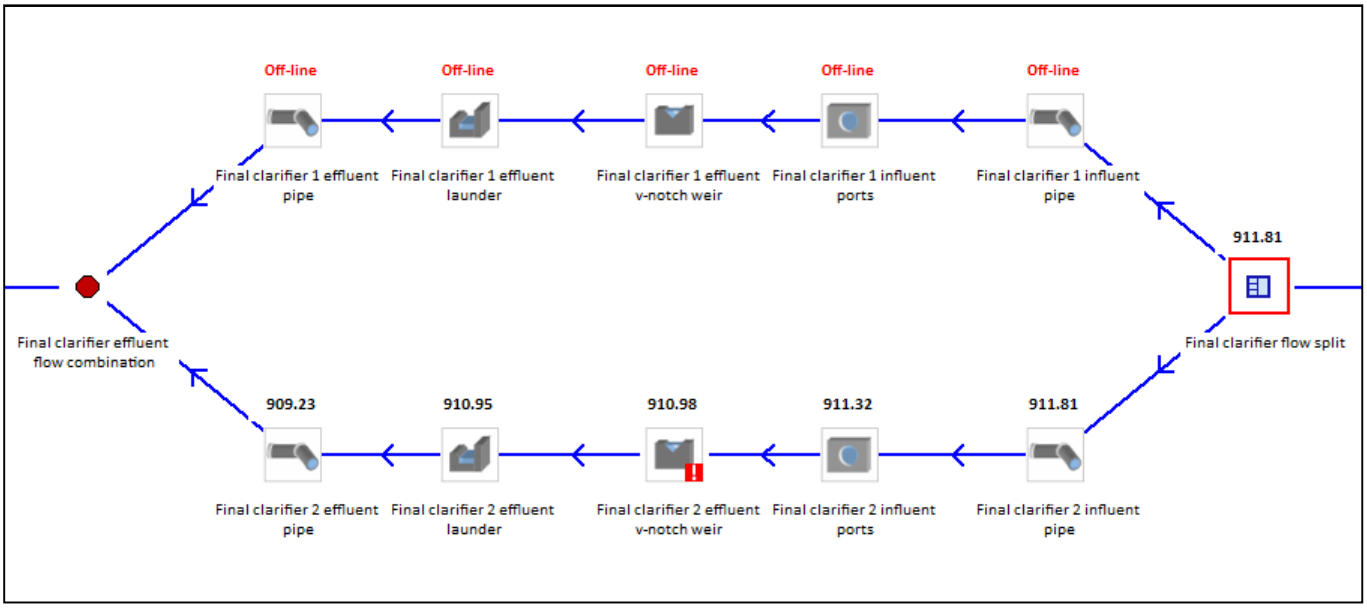


In order to complete the operation, the user simply needs to select the “Update Profile” button, and the hydraulic profile will be recalculated with the one path off-line:



All of the flow has been re-routed through the on-line path, in this case the flow increases from 3 MGD to 6 MGD. In looking at the water elevations, the hydraulic change is not overly significant. This is at a low to

average flow, however. If we look at a scenario where the flows represent wet weather flows, let's say 15 MGD, the effect of taking a flow path off-line is much more pronounced:



In this case, the water levels are raised significantly, and the element titled "Final clarifier 2 effluent v-notch weir" is actually submerged.

This is how the units on-line/off-line flow path management tool can be utilized to examine the hydraulic effects of taking flow paths off-line or placing them back on-line.