Tutorial 5: Output: Reservoirs and QUAL Source Tracking

The purpose of this tutorial is to provide instruction on advanced output options. The first part involves modifications to the text input file, *hydro.inp*. We will add some outputs and also take a look at how data in hydro.inp is prioritized. The second part introduces the use of *groups* and source tracking.

1. **Add Output Paths to *hydro.inp*:**
   a. In Windows Explorer, navigate to the directory, \{*DSM2_home*}*tutorial**simple**t5_output*.
   b. Open the file *addin.inp* and note the new output paths for the channels and reservoir.
   c. Copy the entire file contents to the clipboard.
   d. Open the file *hydro.inp*.
   e. Navigate to the bottom of the file and paste the information. Note that the output bnd_1 is the same as one of the outputs in output_hydro_tutorial.inp, except that the distance has been changed from 0 to 1. The top-level input file (hydro.inp) overrides all the other layers.

2. **Add *Boundary* and *Source Groups*:**
   a. In the study directory, create a file called group_tutorial.inp.
   b. Add a group table. This is a simple table (it only exists so there is a parent table for overriding/layering) and we define two groups:

   ```
   GROUP
   NAME
   boundary
   sources
   END
   ```

   c. Now define the group members. Create the GROUP_MEMBER table below the GROUP table:

   ```
   GROUP_MEMBER
   GROUP_NAME  MEMBER_TYPE    PATTERN
   END
   ```

d. In the *Group Members table*:

   1) Enter a row with the following values in the appropriate fields:

      i) GROUP_NAME: *boundary*

      ii) MEMBER_TYPE: *stage*

      iii) PATTERN: *.*stream.**

      iv) Note that the dot-star in the above pattern is a "regular expression" wildcard. You can use any standard Perl-style regular expression in groups, but the html documentation describes most of the patterns you can put in a GROUP_MEMBER that are really useful.

   2) Enter another row with the following values in the appropriate fields:

      i) GROUP_NAME: *boundary*

      ii) MEMBER_TYPE: *flow_boundary*

      iii) PATTERN: *.*stream.**

   3) In the *Group Members table* insert another row with the following values in the appropriate fields:

      i) GROUP_NAME: *sources*

      ii) MEMBER_TYPE: *source_sink*

      iii) PATTERN: *source1*

e. In qual, create the GROUPS (note the plural) include block that will reference this file:

```
GROUPS
group_tutorial.inp
END
```

f. Save the current settings.

3. **Add *Group Output* for *Channel 5*:**

   a. Create a new file called *output_qual_sourcetrack.inp*.

   b. In this file, create an OUTPUT_CHANNEL table. Use your previous work as a template.

   c. In the *Channel Output* table create 3 rows:

1) For the first new row, enter the following values into the appropriate fields:
   i) Name: *ch5*
   ii) Channel: *5*
   iii) Distance: *5000*
   iv) Variable: *ec*
   v) Source Group: none (this will track ec from all sources)
   vi) Output File: *${QUALOUTDSSFILE}*
   vii) Time Interval: *15min*
   viii) Period Op: *inst*

2) For the second new row, enter the following values into the appropriate fields:
   i) Name: *ch5_bnd*
   ii) Channel: *5*
   iii) Distance: *5000*
   iv) Variable: *ec*
   v) Source Group: *boundary*
   vi) Output File: *${QUALOUTDSSFILE}*
   vii) Time Interval: *15min*
   viii) Period Op: *inst*

3) For the third new row, enter the following values into the appropriate fields:
   i) Name: *ch5_src*
   ii) Channel: *5*
   iii) Distance: *5000*
   iv) Variable: *ec*
   v) Source Group: *source*
   vi) Output File: *${QUALOUTDSSFILE}*
   vii) Time Interval: *15min*
   viii) Period Op: *inst*

d. Save the current settings.

4. Running HYDRO and QUAL

a. Open a command window for the *t5_output* directory.

b. In the command window, type: *hydro hydro.inp*.

c. In the command window, type: *qual qual.inp*.

d. Open the hydro echo file output_tutorial_hydro_echo.inp. Which version of bnd_1 got picked up by the model, the one in hydro.inp or the one in output_tutorial_hydro.inp.

e. Open the *output.dss* file in the *t5_output* directory, and examine the results. Do a little mass balance to make sure you believe the source tracking adds up.