



DRAINAGE DESIGN MANAGEMENT SYSTEM FOR WINDOWS VERSION 5.6.0

TUTORIAL # 4 UPDATING NSTPS VALUES FOR CHANNEL ROUTING



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UPDATING NSTPS VALUES FOR CHANNEL ROUTING

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1.0 INTRODUCTION

This tutorial document is developed to guide users in evaluating the NSTPS parameter (HEC-1 RS card's first field) for channel flow routing in HEC-1 using DDMSW. The input data file is an existing HEC-1 input file where normal-depth storage routing methodology is used. The implemented tool within the DDMSW program creates an updated HEC-1 input file that includes a refined set of NSTPS values updated from two successive model runs.

NSTPS is normally evaluated from flow and reach characteristics of the project area. It is usually estimated by the following relation (HEC, 1998).

$$NSTPS = [Channel\ Reach\ Length / Average\ Flow\ Velocity] / Time\ Interval \dots (1)$$

It can also be estimated by:

$$NSTPS = [Difference\ in\ Time-to-Peak\ between\ Channel\ Inflow\ and\ Outflow\ Hydrographs\ for\ Routed\ Flows] / Time\ Interval \dots (2)$$

Normally, the determination of the refined values of NSTPS can be made from several runs of the HEC-1 model, until the values converge. There are rare occasions, however, when NSTPS do not converge (i.e., values swing back and forth between iterations). In these cases, the modeler should look into the matter and use engineering judgment to select appropriate values of NSTPS adequate for his/her modeling purposes. One possible solution is to manually use Manning's equation to estimate the channel flow velocity and then estimate NSTPS by Equation (1) above. The manually estimated NSTPS can then be entered into an HEC-1 input file for the channel routings whose NSTPS values do not converge. To detect if there are any channel routings whose NSTPS values do not converge, users can execute the tool within DDMSW twice (i.e., three (3) model iterative runs in each execution). Here, the second-time model execution (i.e., three more iterative model runs) provides refined NSTPS values for the HEC-1 input file. This process of executing the model twice will shed light if there is any instability in the NSTPS values.

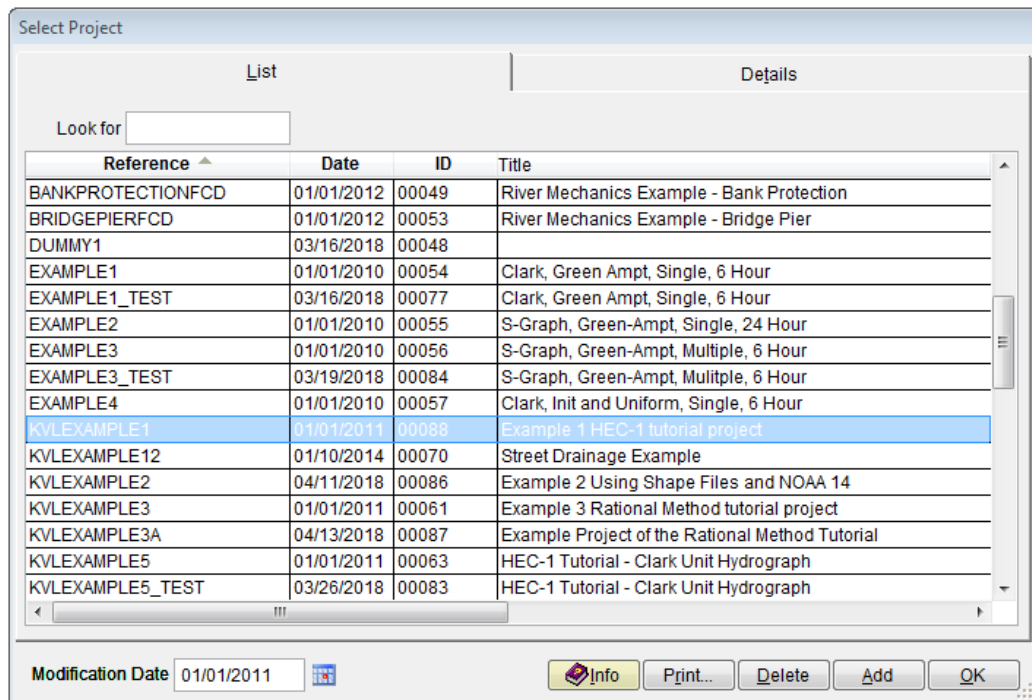
The program is based on two assumptions. The first assumption is that normal-depth channel routings are defined by RS cards with FLOW as a keyword in Field 2. It should be mentioned that there might be some exceptions to this assumption due to many combinations of routing parameters though this assumption is valid for most cases. Users should check to make sure that the intended channel routings are defined by RS card with FLOW as a keyword in Field 2. The second assumption is that all ID's in KK cards are unique. Users should check to make sure

that there are no duplicate (ID's in) KK cards. It is the users' responsibility to check and accept the final results.

For purposes of illustration, this tutorial will use KVLEXAMPLE1.DAT. After completing the tutorial, the user should test the tool using his or her project data.

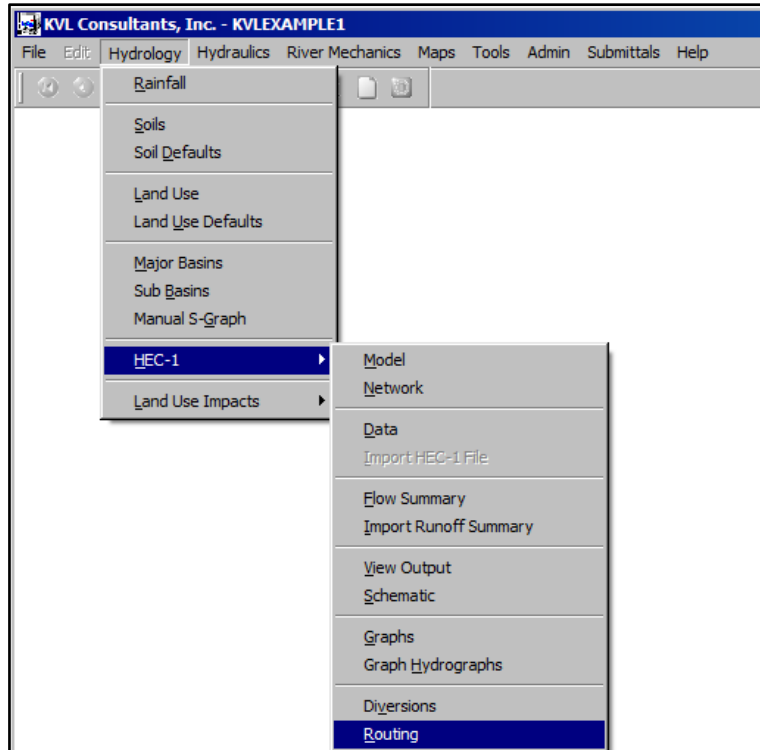
2.0 OPEN THE PROJECT

After launching the DDMSW program, open an existing project (**'File => Select Project'**). Select **KVLEXAMPLE1** from the project list. Press **'OK'** to close the **SELECT PROJECT** form. **[Note:** Please use the DDMSW project file **'KVLEExample1.zip'** that is bundled along with the tutorial document for this tutorial. To use the attached project data, delete first the **'KVLEExample1'** project in DDMSW and once it is deleted, to import the **'KVLEExample1.zip'** into DDMSW (**File → Project Management → Import**].



3.0 ENTER INITIAL NSTPS VALUES

Go to the Routing Menu (**'Hydrology → HEC-1 → Routing'**).



On the **HEC-1 ROUTING DATA** form, check the custom check boxes to the right of the **'Steps'** field for all the return periods. This allows you to enter an initial step value into the current routing card. Enter initial step values into the **'Steps'** field. Now, uncheck the custom check boxes and press **'Save'**. Repeat for every routing card or record. When finished, press **'OK'** to close the **HEC-1 ROUTING DATA** form.

The screenshot shows the 'HEC-1 Routing Data - MB: 01' form. The 'Route' section is configured with Major Basin ID '01', Route ID '010105', and Type 'NORMAL DEPTH'. The 'Normal Depth' section contains a table with the following data:

		Station	Elevation
LOB N	0.035	1. 510.0	99.70
Chan N	0.038	2. 1510.0	94.10
ROB N	0.035	LB 1585.0	93.60
Length	4224.0	4. 1596.0	92.20
Slope	0.0012	5. 1600.0	92.20
Max Elev	99.70	RB 1612.0	93.60
		7. 1662.0	94.90
		8. 2262.0	99.70

The 'NSTPS' section shows the following configuration:

Model	NSTPS	Custom
2 Year	<input checked="" type="checkbox"/>	<input type="checkbox"/>
5 Year	<input checked="" type="checkbox"/>	<input type="checkbox"/>
10 Year	<input checked="" type="checkbox"/>	<input type="checkbox"/>
25 Year	<input checked="" type="checkbox"/>	<input type="checkbox"/>
50 Year	<input checked="" type="checkbox"/>	<input type="checkbox"/>
100 Year	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Custom	<input type="checkbox"/>	<input type="checkbox"/>

The 'Custom' column for all return periods contains the value '1'. The 'Update NSTPS from HEC-1' button is visible at the bottom right of the form.

4.0 UPDATE THE MODEL

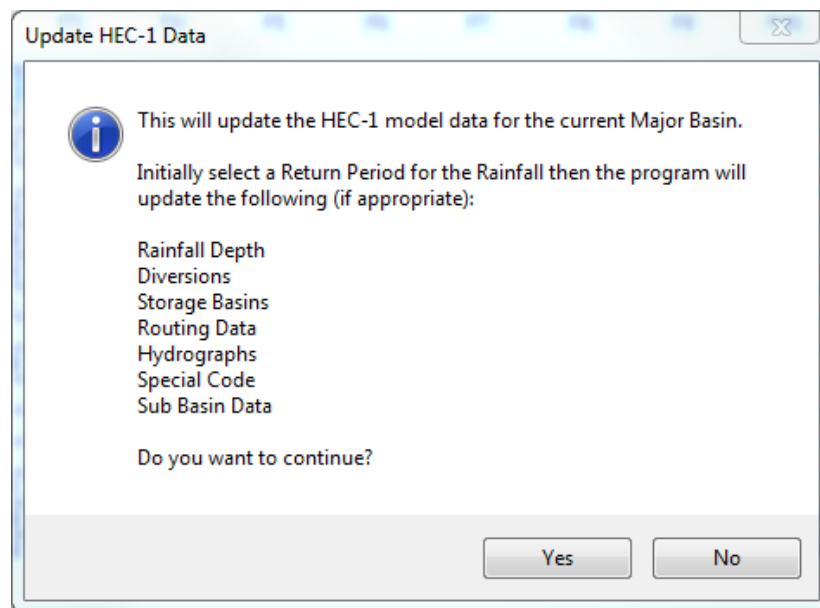
On the **HEC-1 DATA** form (*'Hydrology → HEC-1 → Data'*), press the **'Update'** button.

The screenshot shows a window titled "HEC-1 Data - MB: 01" with a "List" tab selected. The window contains a table with columns labeled F0 through F10, a "Sort" column, and a "Special Code ID" column. The table data is as follows:

ID	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	Sort	Special Code ID
		KVL Cons	ultants	Inc								10
ID		VLEXAMP	LE1 - Ex	ample 1	HEC-1 tu	torial p	roject					20
ID		100 YEAR										30
ID		6 Hour	Storm									40
ID		Unit Hyd	rograph:	Clark								50
ID		Storm: M	ultiple									60
ID		08/31/20	13									70
ID		This is	the HEC-	1 tutori	al program	examp	le.					80
*D	IAGRAM											90
IT	5	1JAN99	0	2000								100
IO	5											110
IN	15											120
*												130
JD	3.250	0.0001										140
PC	0.000	0.008	0.016	0.025	0.033	0.041	0.050	0.058	0.066	0.074		150
PC	0.087	0.099	0.118	0.138	0.216	0.377	0.834	0.911	0.931	0.950		160

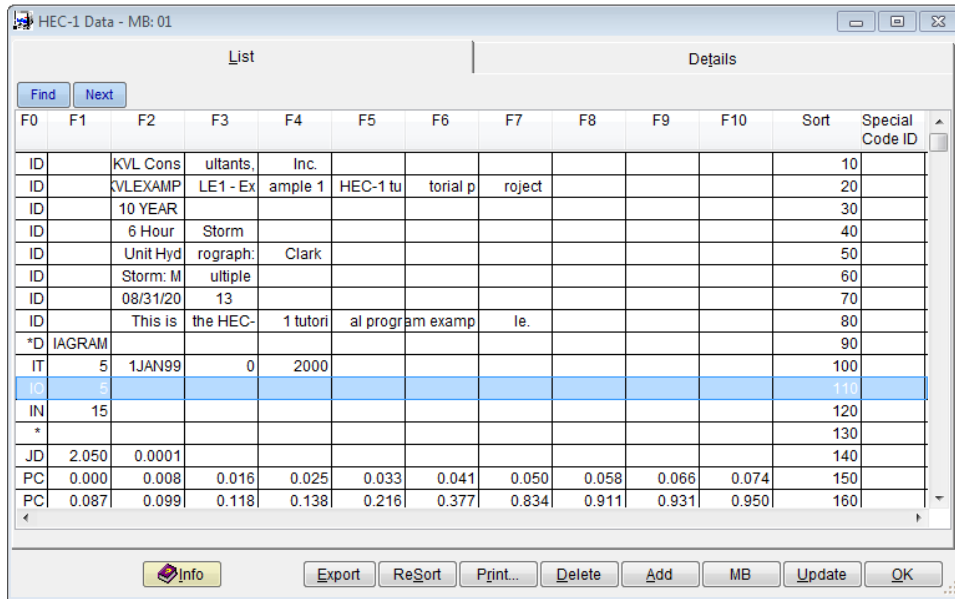
At the bottom of the window, there are several buttons: Info, Export, ReSort, Print..., Delete, Add, MB, Update (highlighted), and OK.

On the **UPDATE HEC-1 DATA** form, press **'Yes'** to continue.



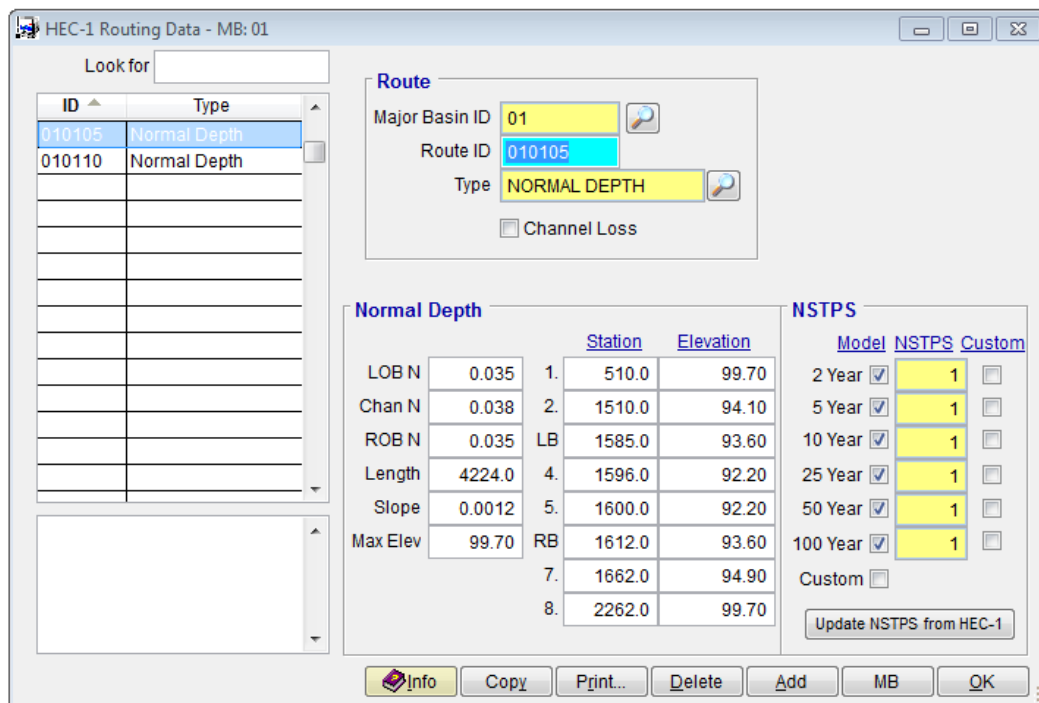
Select a return period. Press the **'OK'** button for DDMSW to update the HEC-1

model with the latest parameters from the data entry menus, including the initial routing NSTPS values. Press **‘OK’** to close the **HEC-1 DATA** form.

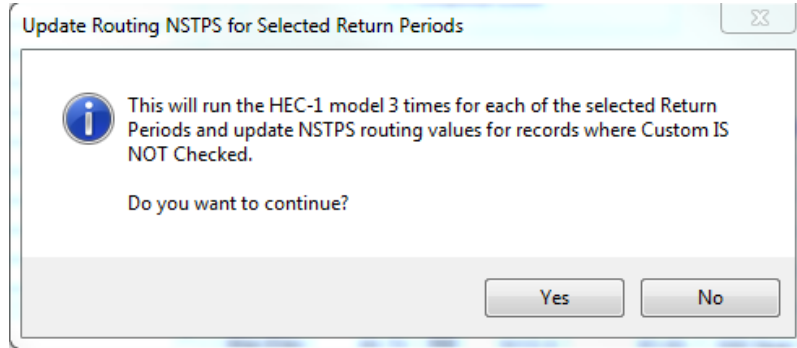


5.0 EXECUTE PROGRAM TO EVALUATE NSTPS VALUES

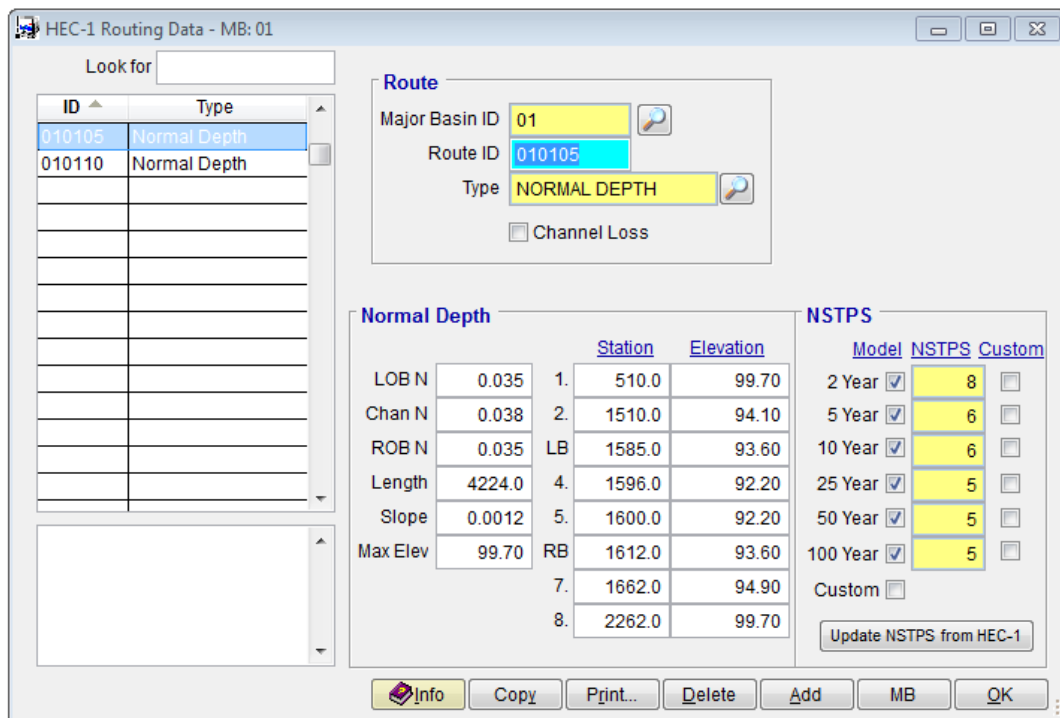
On the **HEC-1 ROUTING DATA** form (*‘Hydrology → HEC-1 → Routing’*), click the **‘Update Steps from HEC-1’** button.



A pop-up message will appear stating that HEC-1 will run 3 times for each of the selected return periods. This will update the NSTPS routing values, only if the custom checkbox is unchecked. Press **'Yes'** to continue.



After the last HEC-1 run is completed, the NSTPS values for the routing cards will be updated. Press **'OK'** to close the **HEC-1 ROUTING DATA** form.

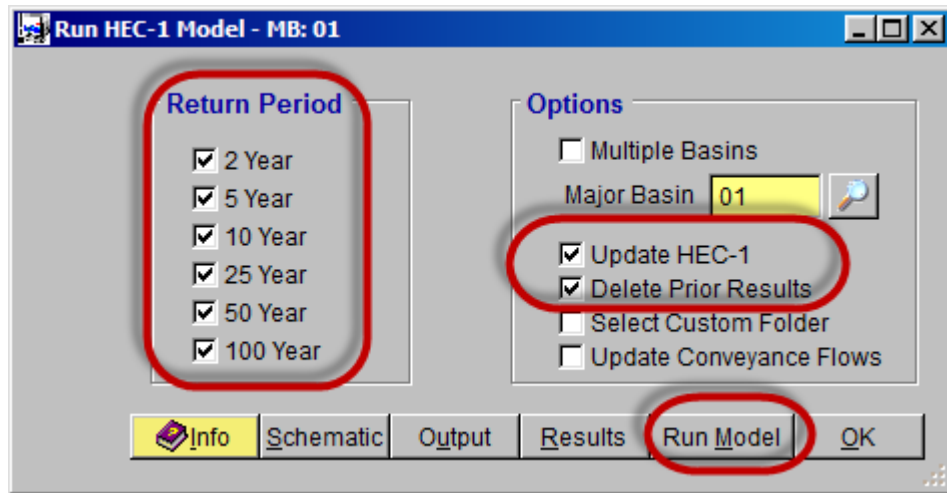


6.0 RUN THE MODEL

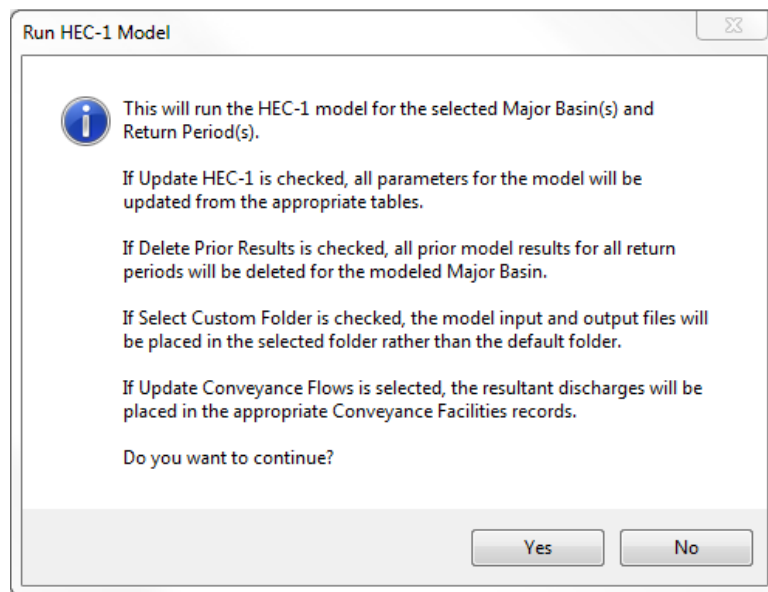
After all the NSTPS values have been determined and accepted, you can run the HEC-1 model to obtain your model results.

To run the model, open the **RUN HEC-1 MODEL** form (**'Hydrology → HEC-1 → Model'**) and check the following checkboxes: All the events in the **'Return**

Period', the **'Update HEC-1'** checkbox, and the **'Delete Prior Results'** checkbox. Finally, click the **'Run Model'** button to execute the program.



Click **'Yes'** twice to continue.



Afterwards, you can view the model results by clicking the **'Results'** button on the **RUN HEC-1 MODEL** form. Alternatively, you can also view the results from **'Hydrology → HEC-1 → Flow Summary'**.

