



DRAINAGE DESIGN MANAGEMENT SYSTEM FOR WINDOWS VERSION 6.0.5

TUTORIAL # 22 PIER INFLUENCE ZONE CALCULATION HEC-18 PROCEDURE



KVL Consultants, Inc.

**PIER INFLUENCE ZONE CALCULATION
[HEC-18 PROCEDURE]**

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PIER INFLUENCE ZONE CALCULATION

[HEC-18 PROCEDURE]

DATE UPDATED: APRIL 20, 2022

TUTORIAL TIME: 15 MINUTES

1.0 INTRODUCTION

A pier influence zone is the top width (W_T as shown in the figure below) of a pier local scour hole in cohesionless bed material. This tutorial computes the pier influence zone by using the procedure outlined in the Federal Highway Administration HEC-18 Manual (April 2012).

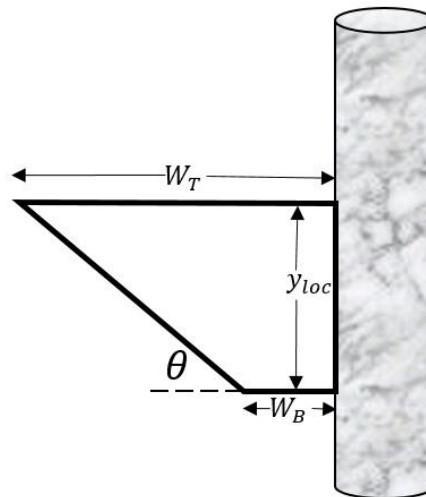


Figure 1: Top Width of Scour Hole Sketch Adapted from FHWA (2012)

2.0 REQUIRED DATA

For this tutorial on calculating pier influence zone, use the following conditions:

- Pier Scour Depth, Y_s (ft): 15.00
- Ratio of bottom width to depth of local pier scour, B : 1.0
- Angle of repose of the bed material in water, θ (degrees): 44.00
- Distance from outside edge of pier, X (ft): 10.00

3.0 STEP-BY-STEP PROCEDURE

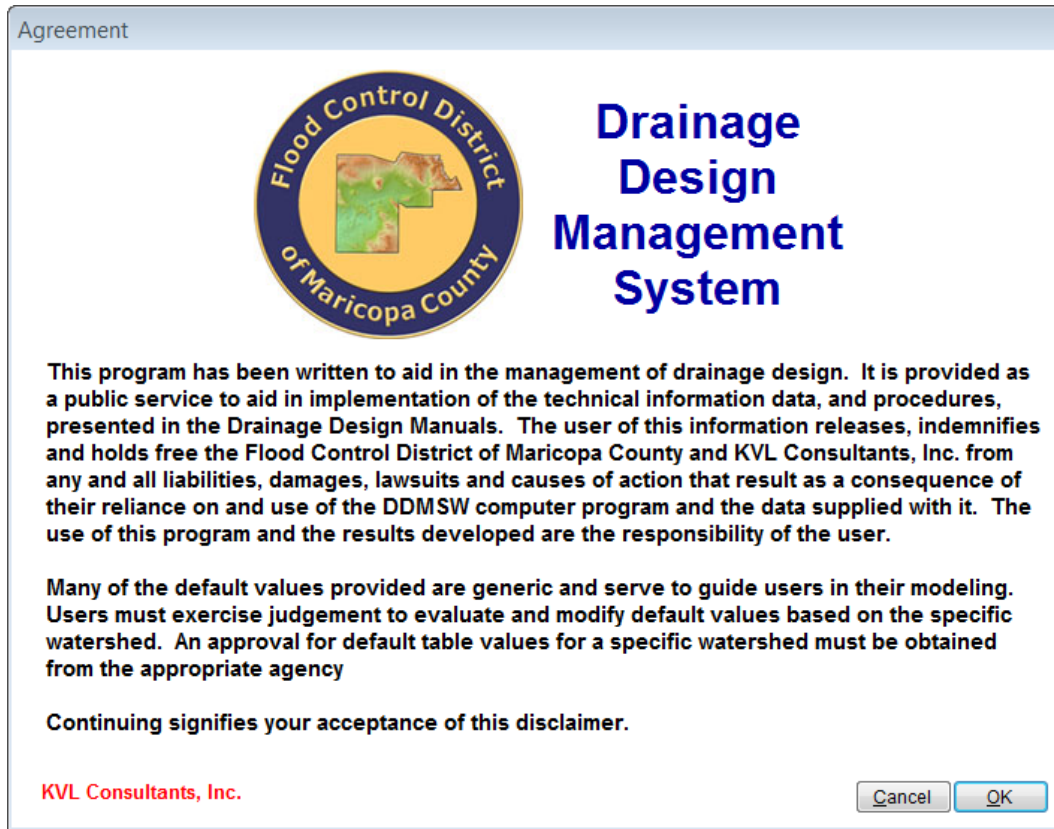
The step-by-step procedure for calculating pier influence zone is described as follows:

- Step 1: Establish a New Project and Set-up the Defaults
- Step 2: Prepare the Data

- Step 3: Calculate the Pier Influence Zone Width
- Step 4: Reporting and Documentation of Results

3.1 Step 1 - Establish a New Project and Set-up the Defaults

- (a) Click the **DDMSW** icon on the Desktop or Program menu to launch the **DDMSW**. Click the **OK** button to accept the software disclaimer as shown in the following figure.




After the **DDMSW** is launched, the **SELECT PROJECT** form is automatically opened as shown in the following figure.


Select Project

List Details

Look for

Reference ^	Date	ID	Title
BANKPROTECTIONFCD	01/01/2012	00049	River Mechanics Example - Bank Protection
BRIDGEPIERFCD	01/01/2012	00011	River Mechanics Example - Bridge Pier
EXAMPLE1	01/01/2010	00001	Clark, Green Ampt, Single, 6 Hour
EXAMPLE2	01/01/2010	00002	S-Graph, Green-Ampt, Single, 24 Hour
EXAMPLE3	01/01/2010	00003	S-Graph, Green-Ampt, Multiple, 6 Hour
EXAMPLE4	01/01/2010	00004	Clark, Init and Uniform, Single, 6 Hour
KVLEXAMPLE1	01/01/2011	00005	Example 1 HEC-1 tutorial project
KVLEXAMPLE10	01/10/2014	00025	HEC-1 Tutorial - Import HEC-1 File
KVLEXAMPLE11	01/10/2014	00029	FCDMC Hydraulics Manual Design Example 4.6
KVLEXAMPLE12	01/10/2014	00030	Street Drainage Example
KVLEXAMPLE2	01/01/2011	00021	Example 2 using Shape files and NOAA 14
KVLEXAMPLE3	01/01/2011	00024	Example 3 Rational Method tutorial project
KVLEXAMPLE5	01/01/2011	00017	HEC-1 Tutorial - Clark Unit Hydrograph
KVLEXAMPLE6	01/01/2011	00018	HEC-1 Tutorial - S-Graph Unit Hydrograph
KVLEXAMPLE7	01/01/2011	00019	Rational Method Tutorial
KVLEXAMPLE8	01/01/2011	00020	Street Drainage Examples

Modification Date 



- (b) Click the **Add** button on the **SELECT PROJECT** form to start a new project (Alternatively, **File** → **New Project** → **Add**).
- (c) On the **NEW PROJECT OPTIONS** dialog box, select the **River Mechanics** checkbox, then click the **OK** button to close / exit the form.
- (d) On the **SELECT PROJECT** form (**Details** tab), enter “*V605_PIER_INFLUENCE*” into the **Reference** textbox. This is the name of the new project. Users can choose any name for the **Reference** textbox as long as it does not exist already in the current **DDMSW** project database.
- (e) Type into the **Title** textbox a brief descriptive title for this project. (Optional) (e.g., ‘*Pier Influence Zone Calculation using HEC-18 Procedure*’).
- (f) Type into the **Location** textbox the location of this project. (Optional) (e.g., ‘*Maricopa County, Arizona*’)
- (g) Type into the **Agency** textbox the agency or company name. (Optional) (e.g., ‘*Flood Control District of Maricopa County*’).
- (h) Check the **River Mechanics Only** checkbox.
- (i) Type a detailed description of this project into the comment area under the **Project Reference** frame. (Optional) (e.g., ‘*This is a tutorial project for calculating Pier Influence Zone Width using HEC-18 Procedure*’).
- (j) Set the **Modification Date** using today’s date by clicking on the Calendar icon.

- (k) Click the **Save** button to save the entered data. The following figure shows what the current form looks like.

The screenshot shows the 'Select Project' dialog box with the following fields and options:

- Project Reference:**
 - Project ID: 00147
 - Reference: V605_PIER_INFLUENCE
 - Title: Pier Influence Zone Calculation using HEC-18 Procedure
 - Location: Maricopa County, Arizona
 - Agency: Flood Control District of Maricopa County
 - Hydrology and Hydraulics Only
 - River Mechanics Only
- Project Defaults:**
 - Soils: FCDMC
 - Land Use: FCDMC
- Text Area:** This is a tutorial project for calculating Pier Influence Zone Width using HEC-18 Procedure.
- Buttons:** Modification Date (04/05/2022), Update Project Defaults, Info, Print..., Delete, Add, OK.

- (l) Click the **OK** button to exit the **SELECT PROJECT** form.

Note: The **Project ID** "00147" in the above figure is the unique database record identifier for the project, which is automatically generated by the program. Each time a new project is created, a **Project ID** is assigned by the program. The **Project ID** assigned to your project will not necessarily be the same as the **Project ID** shown in the above figure.

3.2 Step 2 - Prepare the Data

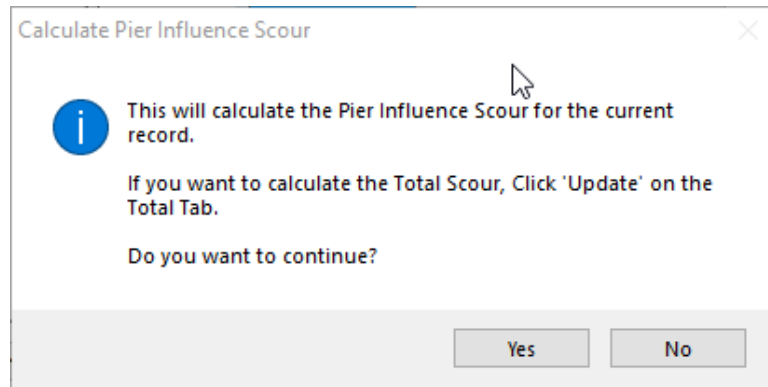
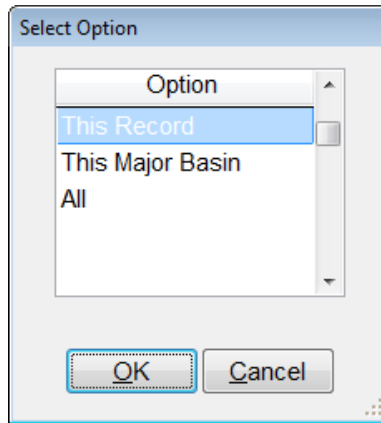
- (a) From the menu bar of the main application window, click **River Mechanics** → **Scour**, to open the **TOTAL SCOUR** form.

- (e) Click the **Save** button to save the entered data. The **TOTAL SCOUR** form should look like following figure.

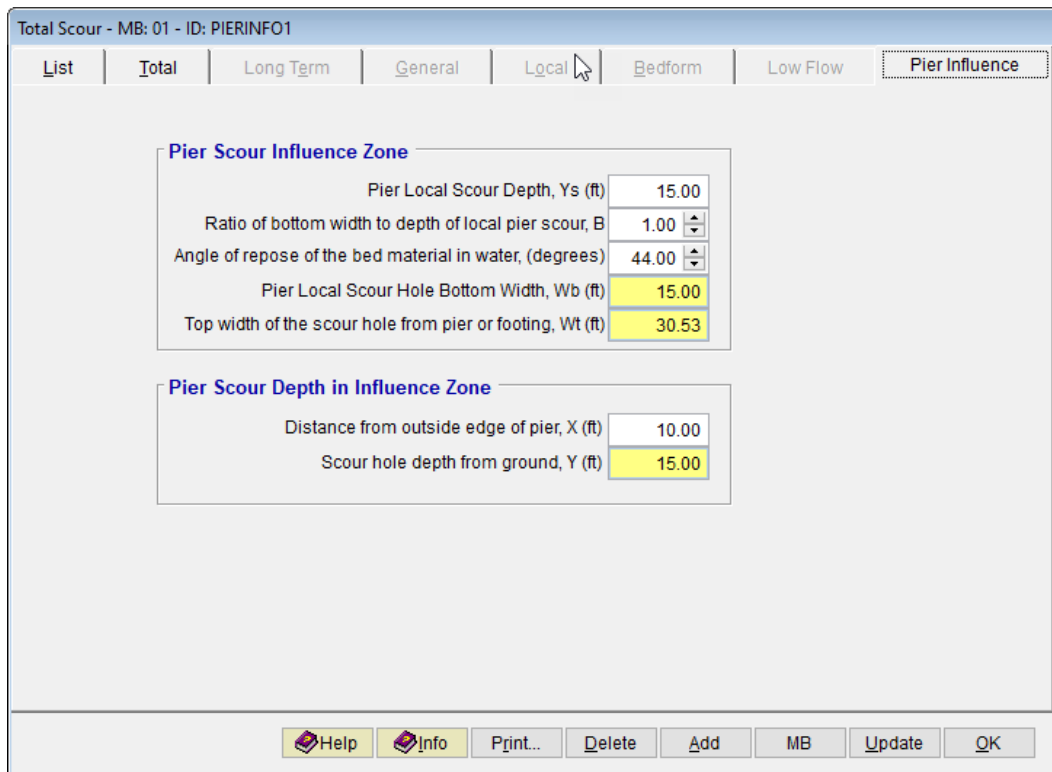
The screenshot shows the 'Total Scour' software interface. The title bar reads 'Total Scour - MB: 01 - ID: PIERINF01'. The interface has several tabs: 'List', 'Total' (selected), 'Long Term', 'General', 'Local', 'Bedform', 'Low Flow', and 'Pier Influence'. Under the 'ID' section, 'Major Basin ID' is set to '01' and 'ID' is set to 'PIERINF01'. The 'Scour Depth' section has a table with columns 'Include', 'Calc', 'FS', 'Value', 'Custom Calc', and 'Method'. The 'Pier Influence' row is checked and has a value of '1.3'. The 'Total (ft)' field is empty. The bottom toolbar contains buttons for 'Help', 'Info', 'Print...', 'Delete', 'Add', 'MB', 'Update', and 'OK'.

3.3 Step 3 – Calculate the Pier Influence Zone Width

- (a) On the **TOTAL SCOUR** form, select the **Pier Influence** Tab
- (b) Enter “15” into the **Pier Scour Depth, Y_s (ft)** textbox.
- (c) Enter “1.0” into the **Ratio of bottom width to depth of local pier scour, B** textbox.
- (d) Enter “44” into the **Angle of repose of the bed material in water, (degrees)** textbox.
- (e) Enter “10” into the **Distance from outside edge of pier, X (ft)** textbox.
- (f) Click the **Save** button to save the entered data.
- (g) Click the **Update** button to update or perform the analysis.
- (h) Select “*This Record*” from the **SELECTION OPTION** dialog box, then click **Yes** on the **CALCULATE PIER INFLUENCE SCOUR** dialog box to continue.





(i) After the update, the form should look like the figure below.



3.4 Step 4 - Reporting and Documentation of Results

- (a) To view the results on the screen, click the **Print ...** button on the **Local** tab of the **TOTAL SCOUR – MB: 01 – ID: PIERINF01** form. A report will be generated as shown.



- (b) To print a hard copy of the results, click the printer symbol ().
- (c) To export the results to a PDF file or to other file formats, click the export symbol ()

This concludes the tutorial for pier influence zone calculation.