

DRAINAGE DESIGN MANAGEMENT SYSTEM FOR WINDOWS VERSION 5.6.0

TUTORIAL # 14 LATERAL EROSION ANALYSIS



KVL Consultants, Inc.

LATERAL EROSION ANALYSIS

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RIPRAP SIZING ANALYSIS FOR BANK PROTECTION DATE UPDATED: MAY 1, 2018

1.0 PROBLEM STATEMENT

To estimate the lateral erosion corridor for a watercourse as a basis to protect the public from potential flood encroachments caused by unmitigated lateral bank migration.

The following data are provided for this tutorial:

- The Cross Section "LATEROS1"
 - Parameters for Hydraulics and Geometry:
 - Design Flow Rate (cfs): 3200
 - Channel Slope (ft/ft): 0.015
 - Design Manning's n for Main Channel: 0.035
 - Design Manning's n for LOB: 0.045
 - Design Manning's n for ROB: 0.050
 - > The geometric data (station and elevation) of the cross section:

Station (X)	Elevation (Y)	Notes
0	165.0	
200	164.9	
215	164.5	FEMA Floodway Left Station
275	164.3	
318	164.1	Left Bank Station
320	163.9	
321	163.85	
325	163.8	
340	163.6	
345	160.0	
350	159.9	
355	159.6	Thalweg Station
365	159.7	
370	160.0	
375	161.0	
380	163.0	Right Bank Station

Station (X)	Elevation (Y)	Notes
390	163.2	
420	164.0	FEMA Floodway Right Station
515	164.3	
600	164.6	
900	165.0	

- Data for Alternative Analyses
 - (a) Alternative Scenario #1: No Data Available
 - Channel Depth, D (ft): 4.5

(b) Alternative Scenario #2: Scour Data Available

- Channel Depth, D (ft): 4.5
- Scour Depth, Zt (ft): 12.0
- (c) Alternative Scenario #3: Scour and Historical Data are Available
 - Channel Depth, D (ft): 4.5
 - Scour Depth, Zt (ft): 12.0
 - Left Historical Lateral Erosion Distance, Lh (ft) 85.0
 - Right Historical Lateral Erosion Distance, Rh (ft) 85.0
- (d) Alternative Scenario #4: Scour, Historical Data and Cross Section Data are Available

•	Cross Section ID:	LATEROS1
•	Scour Depth, Zt (ft):	12.0

- Left Historical Lateral Erosion Distance, Lh (ft) 85.0
- Right Historical Lateral Erosion Distance, Rh (ft) 85.0
- FEMA Floodway Left Station 215.0
- FEMA Floodway Right Station 420.0
- Thalweg Station 355.0

2.0 STEP-BY-STEP PROCEDURES

- Step 1: Establish a New Project and Default Set-up
- Step 2: Prepare the Cross Section Geometry

- Step 3: Import Cross Section and Hydraulic Data
- Step 4: Calculate Lateral Erosion Distance
 - (a) Scenario #1 No Data Available
 - (b) Scenario #2 Scour Data Available
 - (c) Scenario #3 Scour and Historical Data Available
 - (d) Scenario #4 Scour, Historical and Cross Section Data Available
- Step 5: Report and Documentation of Results

2.1 STEP 1 - ESTABLISH A NEW PROJECT AND DEFAULTS SET-UP

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

20d control Dist	Drainage Design
	Management
Granicopa Count	System
	management of drainage design. It is provided as
presented in the Drainage Design Manuals and holds free the Flood Control District o any and all liabilities, damages, lawsuits an their reliance on and use of the DDMSW co	f the technical information data, and procedures, . The user of this information releases, indemnifies f Maricopa County and KVL Consultants, Inc. from d causes of action that result as a consequence of omputer program and the data supplied with it. The ped are the responsibility of the user.
presented in the Drainage Design Manuals and holds free the Flood Control District of any and all liabilities, damages, lawsuits an their reliance on and use of the DDMSW co use of this program and the results develo Many of the default values provided are ge Users must exercise judgement to evaluat watershed. An approval for default table v	The user of this information releases, indemnifies f Maricopa County and KVL Consultants, Inc. from d causes of action that result as a consequence of omputer program and the data supplied with it. The
presented in the Drainage Design Manuals and holds free the Flood Control District o any and all liabilities, damages, lawsuits an their reliance on and use of the DDMSW oc use of this program and the results develo Many of the default values provided are ge Users must exercise judgement to evaluat	The user of this information releases, indemnifies f Maricopa County and KVL Consultants, Inc. from d causes of action that result as a consequence of omputer program and the data supplied with it. The ped are the responsibility of the user. eneric and serve to guide users in their modeling. e and modify default values based on the specific alues for a specific watershed must be obtained

After the **DDMSW** is launched, the **Select Project** window is automatically opened as is shown in the following figure.

TASK1112_LRIPRAP 02/29/2016 00091 Assignment No. 4 - Task 1.1.12_Launchable TASK1112_RIPRAP 02/29/2016 00092 Assignment No. 4 - Task 1.1.12_Launchable TASK1112_SCOUR 02/29/2016 00092 Assignment No. 4 - Task 1.1.12_Import Ripray TASK1112_SCOUR 02/29/2016 00093 Assignment No. 4 - Task 1.1.12_Import Ripray TASK1113_RIPRAP 02/29/2016 00099 River Mechanics Example - Riprap Sizing TASK1113_SCOUR 02/29/2016 00097 Assignment No. 4 - Task 1.1.13_Import Ripray TASK1114_SYIELD 02/29/2016 00100 Assignment No. 4 - Task 1.1.4_Add Comment TASK1115_SYIELD 02/29/2016 00101 Assignment No. 4 - Task 1.1.4_Add Comment	
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	Box to the Was
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- (b) Click the Add button on the Select Project window to start a new project (or you can start a new project by File → New Project).
- (c) On the **New Project Options** form, select **River Mechanics** checkbox and click the **OK** button to close the form.
- (d) Type "LATEROSION1" into the Reference textbox. This is the name of this newly created project. The users can choose the name as long as it does not exist in the DDMSW database.
- (e) Type into the Title textbox a brief descriptive title of this project. (Optional)
- (f) Type into the Location textbox the location of this project. (Optional)
- (g) Type into the Agency textbox the agency or company name. (Optional)
- (h) Check River Mechanics Only checkbox for this project.
- (i) Type a detailed description of this project into the **Comment Box** under the **Project Reference** frame. *(Optional)*
- (j) Click the **Save** button to save the entered data.
- (k) Click the OK button on the SELECT PROJECT window, and then click OK on the pop-up message box. The following figure shows what the window looks like.

Select Proje	ct						
	<u>L</u> ist			De <u>t</u> ai	ls		
	Reference			Project Defaults			
Project ID	00175 Refe	rence LATEROSION1					
Title	Lateral Erosion Analy	sis Tutorial		Soils	FCDMC	\sim	
Location	Maricopa County			Land Use	FCDMC	\sim	
Agency	Flood Control District	of Maricopa County					
	River Mechanics Only						
	al is set up to give a ste perform lateral erosio	p-by-step instruction on ho n analysis.	w to use				
Modificatio	n Date 02/18/2016		<mark>.</mark> €§_info	P <u>r</u> int <u>D</u> el	ete <u>A</u> dd	<u>о</u> к	

Note: the **Project ID** 00175 in the above figure is the database records unique read-only identifier of the project, which is automatically generated by the program when a new project is created. When the users create a new project, the **Project ID** of this new project will not be the same as the **Project ID** shown in the above figure.

2.2 STEP **2** – PREPARE THE CROSS SECTION AND HYDRAULICS DATA

To develop the cross section and hydraulic data to be used for this project, the *"LATEROS1"* dataset will be used which will be imported from another project.

(a)From the menu bar of main application window, click **River Mechanics** → Import Cross Sections from Another Project to open the IMPORT CROSS SECTIONS FROM ANOTHER PROJECT form.

	Flo	ood C	Control District of Maricopa County - LATEROSION	1 - Network
	File	Edit	River Mechanics Help	
	A		Scour	
	ō		Riprap	
I	Ō		Launchable Riprap	
	8		Lateral Erosion	
			Sediment Yield	
			Cross Section Hydraulics	
1			Cross Section <u>G</u> eometry	
	S.		Import Cross Sections from Another Project	
1	ĥ.			_

- (b) On the IMPORT CROSS SECTIONS FROM ANOTHER PROJECT form, select the following settings:
 - Import Project Reference: PROJECTXSECTIONS
 - Option:

•

Import Cross Section ID:

PROJECTXSECTIONS Specific Cross Section LATEROS1

1	
Import Cross Sections From Another Project	ct
Import Project Reference	PROJECTXSECTIONS
Option	Specific Cross Section
Import Cross Section ID	LATEROS1
	Import OK

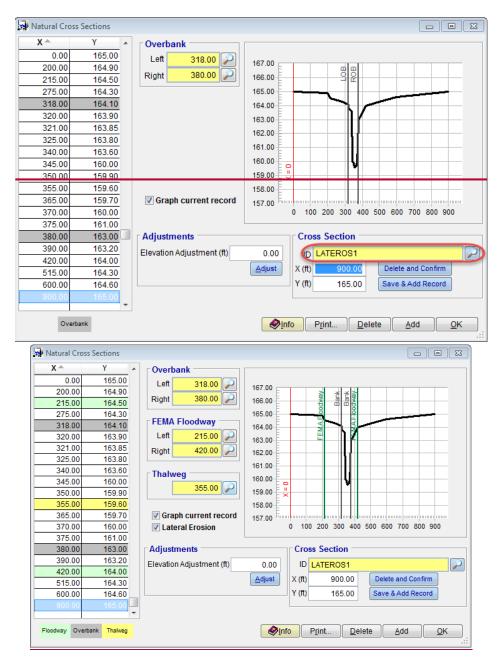
(c) Once the specified data have been selected, click the **Import** button. Select **Yes** to proceed, and hit **OK** to close the **IMPORT CROSS SECTION FROM ANOTHER PROJECT** form.

Quest	ion		×
	?)	This will import Cross Section BRIDGECROSSSECTION from PROJECTXSECTIONS to the current project. - Data with the same ID will be overwritten.	
		Do you want to continue?	
		Yes No	
	Que	stion	
		This will import Cross Section LATEROS1 from PROJECTXSECTIONS to the current project. - Data with the same ID will be overwritten. Do you want to continue?	
		Yes No	

(d) To check if the lateral erosion cross section data has been successfully imported, open the NATURAL CROSS SECTIONS form (River Mechanics → Cross Section Geometry).

FI 🛃	Flood Control District of Maricopa County - LATEROSION1 - Network					
File	Edit	River Mechanics Help				
۲	-	Scour				
0		<u>R</u> iprap				
Ō		Launchable Riprap				
٨		La <u>t</u> eral Erosion				
12		Sediment Yield				
		Cross Section Hydraulics				
2		Cross Section <u>G</u> eometry				
X		Import Cross Sections from Another Project				

(e) On the form, select *"LATEROS1"* for the **Cross Section ID** by clicking the Selector button at the right side of the **ID** textbox.



Compare the geometric data on the **NATURAL CROSS SECTIONS** form against the tabulated data listed below. Make necessary data edits or adjustments on the form, if necessary. Click **OK** to close the form.

Station (X)	Elevation (Y)	Notes
0	165.0	
200	164.9	
215	164.5	FEMA Floodway Left Station

Station (X)	Elevation (Y)	Notes
275	164.3	
318	164.1	Left Bank Station
320	163.9	
321	163.85	
325	163.8	
340	163.6	
345	160.0	
350	159.9	
355	159.6	Thalweg Station
365	159.7	
370	160.0	
375	161.0	
380	163.0	Right Bank Station
390	163.2	
420	164.0	FEMA Floodway Right Station
515	164.3	
600	164.6	
900	165.0	

- (f) Edit the cross section geometry, if necessary, and click *Save* to save all changes and revisions. Click *OK* to close and exit the **NATURAL CROSS SECTION** form.
- (g) To view the cross-section hydraulic data for this cross-section, open the CROSS SECTION HYDRAULICS form (River Mechanics → Cross Section Hydraulics) and on the form select "LATEROS1" from the Cross Section ID listing.

r.			······································	
	FI 🛃	ood (Control District of Maricopa County - LATEROSION1 -	Network
	File	Edit	River Mechanics Help	
			Scour	
	ō		<u>R</u> iprap	
			Launchable Riprap	
	8		La <u>t</u> eral Erosion	
			Sediment Yield	
	12)			
			Cross Section Hydraulics	
	ر م		Cross Section Geometry	
	×		Import Cross Sections from Another Project	
11	100			

River Mechanics - Cross Section Hydrau	lics		
Section ID	Entire Cross Section		
LATEROSXSECTION	Source Calculate Data 💌	🔽 Design	🗖 Dominant
	Total Scour Flow Rate (cfs)	3200	
Cross Section ID	Slope (ft/ft)	0.015000	
LATEROSASECTION	Manning's n Channel	0.035	Man's n
	Manning's n LOB	0.045	
	Manning's n ROB	0.050	
	Flow Area (sq ft)	557.04	
	Wetted Perimeter (ft)	901.70	
	Average Width (ft)	102.90	
	Top Width (ft)	900.00	
I	Hydraulic Depth (ft)	0.62	
	Normal or Max Depth (ft)	5.41	
	Velocity (ft/sec)	5.74	
Lateral erosion first cross section			
T			
Print Cop	y <u>D</u> elete <u>A</u> dd <u>Graph X</u> S	ection <u>D</u> etai	I <u>Update O</u> K

(h) On the CROSS SECTION HYDRAULICS form, ensure that the Source is set to "Calculate Data". Check to ensure that the imported data values for Flow Rate (cfs), Slope (ft/ft), and Manning's n (Channel, LOB, and ROB) are the project values specified for this project, otherwise, edit and modify them.

The project data are provided below:

•	Design Flow Rate (cfs):	3200
---	-------------------------	------

- Channel Slope (ft/ft): 0.015
- Design Manning's n for Main Channel: 0.035
- Design Manning's n for LOB: 0.045
- Design Manning's n for ROB: 0.050

(i) Click *Save* to save the edits, if you have made any.

- (j) To recalculate or update the hydraulic analysis on this form, click **Update**.
- (k) Select "This Record" from the SELECT OPTION form. Click OK to close the form.

Sele	ect Option
	Option 🔺
	This Record
	This Major Basin
	All
	-
	OK <u>C</u> ancel

(I) Click Yes on the UPDATE CROSS SECTION HYDRAULICS form to continue.

(m) Click **OK** to close the form.

2.3 STEP 3 - CALCULATE LATERAL EROSION DISTANCE

Four (4) analysis scenarios will be presented in this tutorial. These different scenarios are dependent on availability of data for analysis. These scenarios include: (a) no data; (b) with scour data; (c) with scour and historical data; and (d) with scour, historical, and cross section data.

2.3.1 Scenario #1 - No Data

- (a) On the RIVER MECHANICS LATERAL EROSION form (River Mechanics → Lateral Erosion → Details tab), make sure that all the check boxes in the Available Data frame are unchecked.
- (b) Click Add to enter a new data and type in "LOCID" on the Location ID textbox.
- (c) Type in "4.5" into the **Channel Depth, D (ft)** textbox. This information is assumed to be the field estimate made on the channel depth.

River Mechanics - Lateral Erosion -	Edit						
List	Available Data S Historical F Cross Se Vepth, D (ft)	Scour 🗖 Photo 🗖	Ţ		Deţails		
Comments		×					
	<u>S</u> ave	<u>C</u> ancel	Pgint	<u>D</u> elete	∆dd	<u>U</u> pdate	<u>o</u> k

- (d) Click *Save* to save the data entered.
- (e) To calculate the Lateral Erosion Distance, L (ft), click the *Update* button and select "*This Record*" from the SELECT OPTION form. Click *OK* to close the form.

Sele	ct Option	
	Option	
	This Record	1
	This Major Basin	
	All	
	•	
	OK <u>C</u> ancel	
		ii

(f) Click **Yes** when the **CALCULATE LATERAL EROSION** form opens.

The following screen capture below shows the results of the analysis. The only data used was a field estimate of the **Channel Depth**, **D** (ft) at the location of interest.

River Mechanics - Lateral Erosion	1					_ 🗆 ×
List				De <u>t</u> ails		
Location ID LOCID	Available Data Scour F Historical Photo F Cross Section F					
Lateral Erosion						
Channe	I Depth, D (ft) 4.50					
Lateral Erosion D	iistance, L (ft) 81.0					
Comments	× V					
	Help 🔗 Info	P <u>r</u> int	<u>D</u> elete	<u>A</u> dd	[Update]	<u>о</u> к

2.3.2 Scenario #2 – Scour Data Available

- (a) On the **RIVER MECHANICS** LATERAL EROSION form (**River Mechanics** → Lateral Erosion), check the Scour checkbox and leave the other two checkboxes unchecked.
- (b) Type in "12.00" into the Scour Depth, Zt (ft) textbox, while keeping the value of the Channel Depth, D (ft) at "4.50". Click Save.

🙀 River Mechanics - Lateral Eros	ion						<u>_ 0 ×</u>
<u>L</u> ist					De <u>t</u> ails		
Location ID LOCID	Available Data Historical I Cross Se	Scour 🔽 Photo 🗖					
Sc	nel Depth, D (ft)	4.50					
		T					
		@ <u>I</u> nfo	P <u>r</u> int	<u>D</u> elete	Add	<u>U</u> pdate	<u>о</u> к

(c) To calculate the Lateral Erosion Distance, L (ft) for the manually entered data, click the *Update* button and select "*This Record*" from the **SELECT OPTION**

form. Click **Yes** to continue. Note that the estimated **Lateral Erosion Distance, L (ft)** is **99** *ft*.

(d) As an alternative to the manual entries made, **DDMSW** has the capability to import the value from a scour analysis project. To use this import feature, click the magnifying glass across the **Scour Depth, Zt (ft)** textbox.

(e)On the IMPORT TOTAL SCOUR FROM A PROJECT form, use the following data:

- Import Project Reference: BANKPROTECTION1
- Import ID:

AZRIVER

Automatically Update Scour Depth (Zt) to
 Total scour Checkbox
 Check

Import Total Scour From a Project	
Import Project Reference	BANKPROTECTION1
Import ID	AZRIVER
Total Scour (ft)	16.12
Automatically Update Scour Depth (Zt) to Total Scour	V
	<u>Info</u> <u>Cancel</u> <u>O</u> K

Click **OK** to close the form. [Note that the **Scour Depth, Zt (ft)** value has changed from "12.00" to "16.12"].

💀 River Mech	anics - Lateral Erosion		
	<u>L</u> ist		Details
Location ID		Available Data Scour 🗸 Historical Photo 🗍 Cross Section 🗍	
Lateral E	rosion		
		el Depth, D (ft) 4.90 nr Depth, Zt (ft) 16.12	
Comments		^	
		Help @Info	Print Delete Add Update OK

(f) To calculate the Lateral Erosion Distance, L (ft), click the *Update* button and select "*This Record*" from the SELECT OPTION form. Click *OK* to close the form.

Sele	ect Option
	Option 🔺
	This Record
	This Major Basin
	All
	_
	<u>O</u> K <u>C</u> ancel

(g) Click Yes when the CALCULATE LATERAL EROSION form opens.

Calculate	Lateral Erosion	X
Ì	This will calculate the Lateral Erosion for the current record. Scour Depth (Zt) will be updated from Total Scour Analysis if "Automatically Update Scour Depth (Zt) to Total Scour" is Checked. Do you want to continue?	
	Yes No	

The screen capture below shows the results of the lateral erosion analysis where scour data is available, in addition to the field estimate of **Channel Depth**, **D (ft)** at *"4.50"* ft.

River Mechanics - Lateral Erosion		
List		Details
Location ID LOCID	Available Data Scour 🗹 Historical Photo 📄 Cross Section 🕅	
Scor		
Comments	۲ ۲	
	Help ØInfo	P <u>r</u> int <u>D</u> elete <u>A</u> dd <u>Update O</u> K

2.3.3 Scenario #3 – Scour and Historical Data Available

(a) On the RIVER MECHANICS – LATERAL EROSION form (River Mechanics → Lateral Erosion), make sure that the Scour and Historical Photo checkboxes are checked. Leave the Cross Section checkbox unchecked.

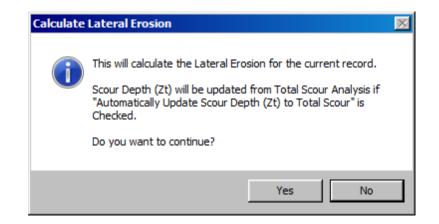
River Mechanics - Lateral Erosion	I	
List		Dețails
	Distance, Lh (ft) 85.0 Distance, LI (ft)	
Comments	×	
	Help ØInfo	Print Delete Add Update OK

(b) Type in "85.0" into the Left Historical Lateral Erosion Distance, Lh (ft) and the Right Historical Lateral Erosion distance, Lh (ft) textboxes. Leave the Channel Depth, D (ft) value at "4.50" and the Scour Depth, Zt (ft) at "16.1209" unchanged. Click Save to save the data. (c) To calculate the Lateral Erosion Distance, L (ft), click the *Update* button and select "*This Record*" from the SELECT OPTION form. Click *OK* to close the form.

River Mechanics - Lateral Erosion			
List		De	tails
Location ID LOCID	Available Data Scour V Historical Photo V		
□ Lateral Erosion □	Cross Section 🔲		
	el Depth, D (ft) 4.90 r Depth, Zt (ft) 16.12 2 stance, Lh (ft) 85.0		
Right Historical Lateral Erosion Di Left Lateral Erosion D			
Right Lateral Erosion D	istance, Lr (ft)		
Comments	۵ ۲		
	Help Ølnfo	P <u>r</u> int <u>D</u> elete	Add Update OK

Sele	ct Option	
	Option 🔺	
	This Record	
	This Major Basin	
	All	
	•	
	OK Cancel	

(d) Click Yes when the CALCULATE LATERAL EROSION form opens.



The screen capture below shows the results of the lateral erosion analysis where scour and historical data are available, in addition to the field estimate of **Channel Depth, D (ft)** at *"4.50"* ft.

River Mechanics - Lateral Erosion		
List		Details
ID Location ID LOCID	Available Data Scour V Historical Photo V Cross Section	
	Distance, Lh (ft) 85.0 Distance, Ll (ft) 148.1	
L	Help ØInfo	P <u>r</u> int <u>D</u> elete <u>A</u> dd <u>Update</u> <u>O</u> K

2.3.4 Scenario #4 – Scour, Historical and Cross Section Data Available

(a) On the RIVER MECHANICS – LATERAL EROSION form (River Mechanics → Lateral Erosion), make sure that all the checkboxes (i.e., Scour, Historical Photo, and Cross Section) are checked.

River Mechanics - Lateral Erosion		l ×
List	Details	
ID Location ID LOCID Scour Historical Photo Cross Section	Cross Section Section ID LATEROSXSECTION	
Lateral Erosion	Cross Section Data	
Channel Depth, D (ft) 4.90	Overbank Station (ft) Elevation (ft)	
Scour Depth, Zt (ft) 16.09 🔑	Left 318.0 164.10	
Left Historical Lateral Erosion Distance, Lh (ft) 85.0	Right 380.0 163.00	
Right Historical Lateral Erosion Distance, Lh (ft) 85.0	FEMA Floodway	
Left Lateral Erosion Distance, LI (ft)	Left 215.0 164.50	
Right Lateral Erosion Distance, Lr (ft)	Right 420.0 164.00	
Left Lateral Erosion Station (ft)	Thalweg	
Right Lateral Erosion Station (ft)	355.0 159.60	
	Opposite Side	
Comments	571.7 164.50	
Help ØInfo	P <u>r</u> int <u>D</u> elete <u>A</u> dd <u>U</u> pdate <u>O</u> K	

(b) To access the Cross Section Data for this project, click the Selector button (Magnifying glass) to the right of the Section ID textbox. On the SELECT CROSS SECTION ID form, select the "LATEROS1" from the list.

Lateral Eros	ion Cross Section IDs		x
Look for			
ID 📥	Description	*	
LATEROS1	Lateral erosion first cross section		
		_	
		-	
		-	
		-	
		= =	
		-	
		-	
		-	
4	4 11		
Cross Secti			
Section ID			
		- I	
Description	Lateral erosion first cross section		
	-		
L			
		te OK).:

(c) Click OK to close the SELECT CROSS SECTION ID form.

<u>L</u> ist		De <u>t</u> ails
ID Available Data Location ID LOCID Scour IV Historical Photo IV Cross Section IV		Cross Section Section ID LATEROSXSECTION X Section IDs Graph
Si Left Historical Lateral Erosion Right Historical Lateral Erosion Left Lateral Erosion Right Lateral Erosion Left Lateral Er	n Distance, Lh (ft) 85.0 n Distance, Ll (ft)	Cross Section Data Overbank Station (ff) Elevation (ff) Left 318.0 164.10 Right 380.0 163.00 FEMA Floodway Left 21.0 164.50 Right 420.0 164.00 Thalweg 35:0 159.60 Opposite Side 571.7 164.50

Note that by using the Cross Section Data, the **"Channel Depth, D (ft)"** textbox becomes "inactive" and a new value of the Channel Depth had replaced the manual data entered. This new value of the Channel Depth is the difference between the **FEMA Floodway Elevation** and the **Thalweg Elevation** (i.e., 164.50 - 159.60 = 4.90 ft).

(d) On the RIVER MECHANICS – LATERAL EROSION form, click on the X Section Data button to view the LATERAL EROSION CROSS SECTION form that shows the cross section data and plot identifying the location of the banks and the FEMA Floodway limits.

🙀 Lateral Erc	sion Cross Sectio	n	
X 📥	Y 🔺	Overbank	
0.00	165.00	Left 318.00 🔎	107.00
200.00	164.90		167.00 공 공 공 공
215.00	164.50	Right 380.00	
275.00	164.30		165.00
318.00	164.10	FEMA Floodway	166.00 165.00 164.00 164.00 164.00 162.00 163.00 163.00 164.00 164.00 164.00 165.00
320.00	163.90	Left 215.00 🔎	163.00
321.00	163.85	Right 420.00 🔎	162.00
325.00	163.80		161.00
340.00	163.60	Thalweg	
345.00	160.00	355.00 🔎	160.00
350.00	159.90	333.00	159.00
355.00	159.60		158.00
365.00	159.70	Graph current record	157.00 5
370.00	160.00		0 100 200 300 400 500 600 700 800 900
375.00	161.00		
380.00	163.00	Adjustments	Cross Section
390.00	163.20	Elevation Adjustment (ft)	0.00 ID LATEROS1
420.00	164.00	-	Adjust X (ft) 420.00 Delete and Confirm
515.00	164.30		
600.00	164.60		Y (ft) 164.00 Save & Add Record
900.00	165.00		
L			
Floodway Ov	erbank Thalweg		

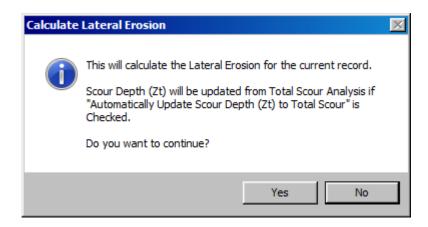
- (e) Click **OK** to close the **LATERAL EROSION CROSS SECTION** form.
- (f) To calculate the Left Lateral Erosion Distance Ll (ft), and the Right Lateral Erosion Distance, Lr (ft), click the *Update* button.

River Mech	anics - Lateral Erosion						
List			De	tails			
_ ID		Available D)ata —		Cross Section		
Location ID			Scour [- 1	Section ID LATEROS1		\sim
			al Photo 🛛	_	X Section Data X	Section IDs	<u>G</u> raph
Lateral E	rosion				Cross Section Data		
	Channe	I Depth, D (ft)	4.9	90	Overbank	Station (ft)	Elevation (ft)
	Scou	r Depth, Zt (ft)	16.12	$\left \right\rangle$	Left	318.0	164.10
Left Histor	rical Lateral Erosion Di	stance, Lh (ft)	85	.0	Right	380.0	163.00
Right Histor	rical Lateral Erosion Di	stance, Lh (ft)	85	.0	FEMA Floodway		
	Left Lateral Erosion D	istance, LI (ft)	148	.1	Left	215.0	164.50
F	Right Lateral Erosion Di	istance, Lr (ft)	148	.1	Right	420.0	164.00
	Left Lateral Erosi	on Station (ft)	66	.9	Thalweg		
	Right Lateral Erosi	on Station (ft)	719	.8		355.0	159.60
				Opposite Side			
Comments				*		571.7	164.50
				-			
		Hel	p 🔗 In	fo	P <u>r</u> int <u>D</u> elete	Add Up	date OK

(g) When the **SELECT OPTION** form appears, highlight "*This Record*" and click **OK** to close the form.

Sele	ect Option	
	Option 🔺	
	This Record	
	This Major Basin	
	All	
	_	
	OK <u>C</u> ancel	н.

(h) Click Yes when the CALCULATE LATERAL EROSION form opens.



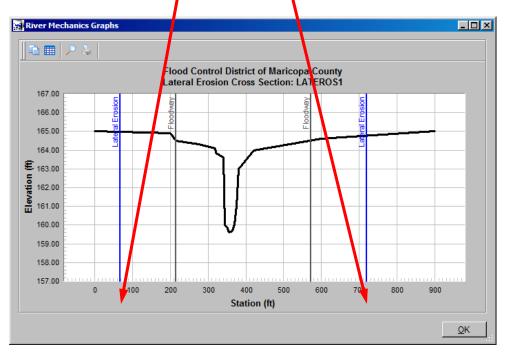
The screen capture provided below shows the results of the lateral erosion analysis where scour depth, historical data, and cross-section data are available. The summary of the results are:

•	Left Lateral Erosion Distance, Ll (ft):	148.0
•	Right Lateral Erosion Distance, Lr (ft):	148.0
•	Left lateral Erosion Station (ft):	67.0

• Right Lateral Erosion Station (ft): 719.7

River Mechanics - Lateral Erosio	n					_0
ist				De <u>t</u>	ails	
Location ID LOCID	Available Data S Historical P Cross Sec	icour 🔽 Thoto 🔽			ECTION	<u>G</u> raph
Lateral Erosion	Cross Se	ection Data —				
Channe	el Depth, D (ft)	4.90		Overbank	Station (ft)	Elevation (ft)
Scour Depth, Zt (ft) 16.09 🔎				Left	318.0	164.10
Left Historical Lateral Erosion Distance, Lh (ft) 85.0				Right	380.0	163.00
Right Historical Lateral Erosion Distance, Lh (ft) 85.0			FEN	IA Floodway		
Left Lateral Erosion Distance, LI (ft) 1				Left	215.0	164.50
Right Lateral Erosion D	istance, Lr (ft)	148.0		Right	420.0	164.00
Left Lateral Eros	ion Station (ft)	67.0		Thalweg		
Right Lateral Eros	ion Station (ft)	719.7)		355.0	159.60
			0	pposite Side		
Comments		<u>+</u>			571.7	164.50
	<mark>.</mark> Ø⊦elp	.⊘ Info	P <u>r</u> int	<u>D</u> elete	Add Upo	late <u>O</u> K

(i) To view the plot of the Lateral Erosion analysis results, click the **Graph** button. As shown on the results plot, the extent of lateral erosion on the left bank is at Station 67.0 ft and the lateral erosion on the right bank is at Station 719.7 ft. To exit the **RIVER MECHANICS GRAPHS** form, click the OK button.



2.4 STEP 4 - REPORT AND DOCUMENTATION OF RESULTS

In this step, the instruction will be given on how to view, print, and export the calculation results of the lateral erosion analysis.

(a) To view the Lateral Erosion report, click the **Print** ... button on the **River MECHANICS** – LATERAL EROSION form.

Page 1		Drainage De: RIVER MECHA	District of Maricopa (sign Management Sy NICS - LATERAL EF ference: LATERO SIO	stem ROSION				2/19/2016
ID Cross Section ID	Channel Depth (ft)	Scour Depth (ft)	Historical Lateral Left (ft)	<u>Erosion Length</u> Right (ft)	Lateral Eros Left (ft)	<u>sion Length</u> Right (ft)	Lateral En Left (ft)	o <u>sion Station</u> Right (ft)
LOCID LATEROS1	4,90	16,09	85.0	85.0	148.0	148.0	67,0	719,7

- (b) To print the report, click the printer symbol (B) at the top of the form.
- (c) To export the report to a PDF file or other file formats, click the export symbol (2) at the top of the form.

This concludes the tutorial for the Lateral erosion Analysis.