

Appendix 104-2: Hydraulic Survey Form

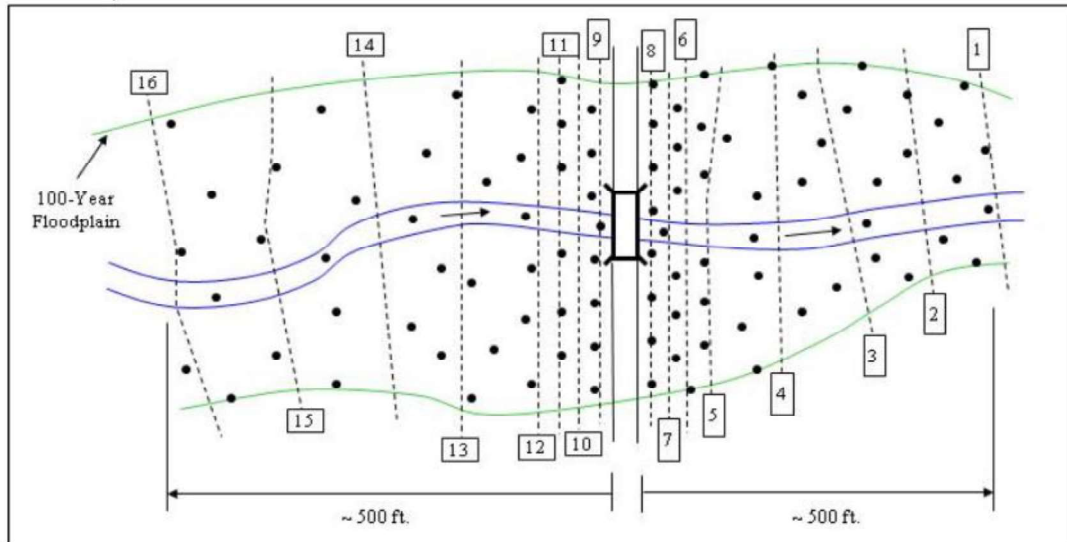
HYDRAULIC SURVEY FORM			
Project:	_____		
Stream Name:	_____	Date:	_____
County:	_____	Job Number:	_____

Obtaining complete and accurate stream and structure survey data is a critical step in the development of a hydraulic model. It is important for the engineer tasked with the hydraulic modeling to be involved in the selection of hydraulic cross section locations. This form is to be used by the engineer to communicate survey needs to the surveyor.

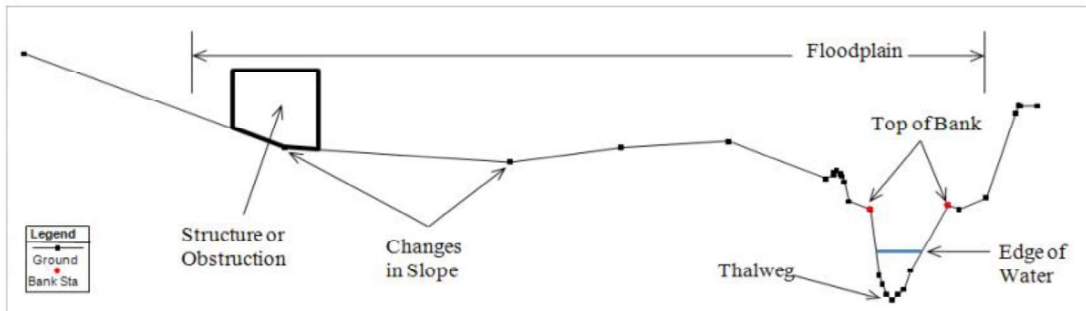
PART 1 - BASIC STREAM AND FLOODPLAIN SURVEY

The figure below depicts a typical hydraulic survey scenario. The survey must extend upstream and downstream of the structure, as required by the DeIDOT Bridge Design Manual Section 104.1.5.

For most culvert and small bridge projects, a topographic survey sufficient to create a surface within the limits of the study is recommended.



In general, elevations should be obtained at the top and bottom of stream banks, edge of water, the thalweg, and breaks in slope in the overbanks (floodplain) area. A typical stream cross section is shown below.



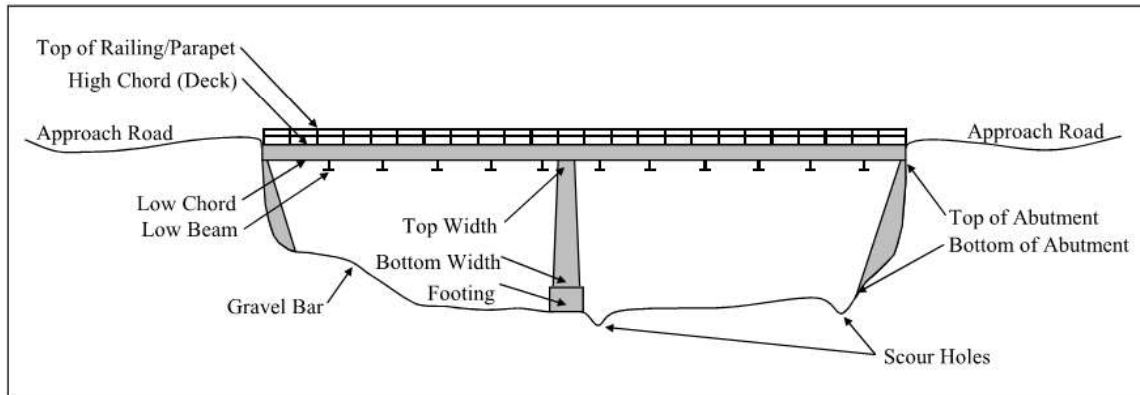
HYDRAULIC SURVEY FORM

Project: _____
 Stream Name: _____ Date: _____
 County: _____ Job Number: _____

In addition to the stream channel and floodplain, the survey should include all of the applicable items listed in Parts 1A and 1B.

1A - STRUCTURE AND ROADWAY FEATURES

- Approach roads (centerline, edge of pavement or shoulder)
- Bridge centerline and edge of deck (if superelevated) elevations
- Low chord elevations of superstructure (US and DS, L and R)
- Low beam elevations (if applicable) (US and DS, L and R)
- Top of railing and parapet
- Abutments (top and bottom corners, clear distance between abutments, US and DS, L and R)
- Piers (footings, shape, width)
- Scour holes (location, approximate width and depth)
- Gravel bars, beaver dams, etc. (location, approximate width and height)
- Other _____



1B - OTHER FEATURES

- | | |
|--|---|
| • Other structures/obstructions (within survey limits) | • High water marks |
| • Changes in terrain/channel shape | • Stream gage locations |
| • Gravel bars | • Culverts (size, type, invert elevation) |
| • Meanders (sharp bends) | • Bank protection |
| • Tributaries (section US/DS of intersection) | • Levees, walls |
| • Dams, spillways (top and bottom elevations) | • Other _____ |

HYDRAULIC SURVEY FORM

Project: _____
Stream Name: _____ Date: _____
County: _____ Job Number: _____

PART 2 - SPECIAL REQUIREMENTS

Some projects require channel/floodplain data for some distance upstream and downstream of the site. Examples of scenarios that may require more than outlined in Part 1 include:

- Most "rivers"
- Streams with very mild longitudinal grades
- Projects located in a detailed FEMA study area (Zone AE)
- Tidal areas

Check the items below that apply to the project.

- Additional cross sections (outside of the area in Part 1) are needed.
→ See the instructions in Part 3.
- LiDAR data is available in this area to complement floodplain data.
→ Note that the survey must be tied to the State Plane Coordinate System.
LiDAR data can be downloaded from the Delaware Geological Survey website:
<http://www.dgs.udel.edu/category/misc-keywords/lidar>

2A - EXTENDED CROSS SECTION SURVEY

Sketch or insert a figure below depicting the locations of all hydraulic cross sections required that are located outside of the 500-foot offsets from the site. An annotated aerial photograph, USGS map, or FEMA FIRM (if applicable) is preferred.



HYDRAULIC SURVEY FORM

Project: _____
Stream Name: _____ Date: _____
County: _____ Job Number: _____

2B - GENERAL GUIDELINES FOR OBTAINING EXTENDED SURVEY

- The surveyed area should extend just beyond the 100-year floodplain, unless LiDAR is available.
- Cross sections should be perpendicular to the direction of flow. The direction of flow in the channel may be different than the direction of flow in the overbanks.
- Cross sections should not overlap.
- Cross sections should be perpendicular to the low flow channel and the direction of flow in the floodplain. Where the channel meanders through the floodplain, broken or dog-legged sections be necessary. See the following sketch.
- Survey all of the applicable features listed in Parts 1A and 1B.

