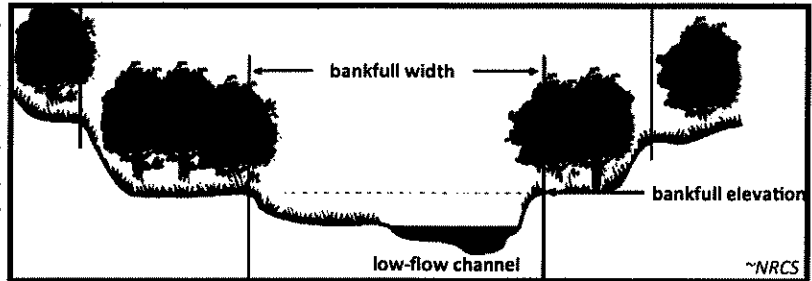


# Guidance in Determining Bankfull Stream Width in Pennsylvania

**Bankfull Flow:** This flow stage is determined by the elevation point of incipient flooding, indicated by deposits of sand or silt at the active scour mark, break in stream bank slope, perennial vegetation limit, rock discoloration, and root hair exposure. It is typically called the "channel-forming flow", with roughly a 1.5-2 year recurrence interval, and is where a stream will typically begin to access its floodplain.



**Bankfull Width** – The width of the channel at the bankfull elevation.

## **Finding a "Reference Reach" of a Stream:**

Because streams vary widely in composition, slope, and manmade impacts, it is impossible to create a set of "instructions" for determining bankfull that will work on every channel. The goal when determining bankfull flow is to find a "Reference Reach" of the stream that is the most representative of the natural channel. This sometimes means moving further upstream or down, or skipping sections of stream that are unnaturally widened or constricted. **Be flexible in choosing your bankfull measurement locations in order to find a section of stream that is the most representative of the natural channel.**

## **Procedure for Determining Bankfull Width Near a Road / Stream Crossing Structure:**

**Location:** Start at a location away from the influence of any culvert or bridge, since they often impact width. To do this, roughly estimate bankfull channel width, then go at least 5 times that distance away from the structure. Looking upstream is preferred, but downstream reaches can be used if necessary (*see locations to avoid below*).

**Determine Bankfull:** Using the indicators below, find the elevation that matches the most bankfull criteria, using both sides of the channel. Start on the side with the best indicators. Begin at the stream and move up the bank to a point you are sure is above bankfull. Then start moving back down the bank looking for indicators to determine where the bankfull elevation is. Try to match that elevation with indicators on the opposite bank. Stretch a measuring tape across the stream at your bankfull mark(s), noting that the tape should be level, to measure the bankfull channel width. Continue moving upstream or downstream, taking successive measurements that are at least 1/2 bankfull width apart (for example, if the first bankfull measurement is 16 feet, move at least 8 feet away before taking another measurement). Attempt to get at least 5 measurements, and average them together.

## **Field Indicators of Bankfull Flow:** (*listed in order from most to least reliable indicators*)

**Change in Bank Slope:** Bankfull flows are often associated with "benches" or the top of the stream bank, unless the stream is entrenched or has been altered in the past.

**Depositional Features:** The top of features such as point bars and mid-channel bars are often indicators of the bankfull flow elevation. Use these elevations to look for additional clues on each bank at the same elevation.

**Changes in Particle Size:** Streams drop sediment when they start accessing their floodplain. A change in particle size along a stream bank (from gravelly, to silty or sandy) often indicates bankfull elevation.

**Vegetation Changes:** Although not as reliable, changes in vegetation can indicate bankfull elevation.

**Scour Features:** Erosion and scour lines can be used if other features cannot be located.

## **Locations to Avoid in Determining Bankfull Flow:** (*if possible*)

**Logjams:** These structures tend to increase the bankfull width temporarily in their immediate vicinity.

**Manmade Impacts:** Avoid locations with wall, weirs, dams, rip-rap, pipes, etc.

**Bedrock Outcroppings:** Bedrock can hide indicators of bankfull flow and alter channel width.

**Braided Channels:** Measure upstream or downstream of any braided channels if at all possible.

**Tributaries/Springs:** Measure bankfull between road crossing and any incoming flows that may increase width.

**Hard Meander bends:** Hard bends make it difficult to find good indicators since the stream is moving laterally.

## **Additional Bankfull Determination Tips:**

- Bankfull flows will be level across the channel, so make sure your tape is level when measuring bankfull widths.
- When looking for bankfull indicators, think logically about a 1.5-2 year recurrence interval. Does it make sense that the points you are measuring as bankfull will see flow with that frequency?
- On entrenched streams, or streams with historically high sediment impacts (legacy sediments), bankfull elevation is often below the elevation of the "top of stream bank" due to many years of man-made impacts.
- Note that tree roots and other vegetation can exist below the bankfull elevation, especially in dry years.
- Measuring bankfull is often easier during Spring and Fall when vegetation is dormant.
- **Be flexible in your measurement locations to find the best "Reference Reach" of a natural channel.**

# PA Dirt Gravel and Low Volume Road Program—Stream Crossing Evaluation Form




## Reviewer Information: Site Information




Date: \_\_\_\_\_

Reviewer: \_\_\_\_\_

Entity: \_\_\_\_\_

**Existing Structure (circle):**

 round
  oval
  bottomless arch

 box culvert
  footers & bridge
  multiple openings

Other :  
(describe/draw)

County \_\_\_\_\_ Township \_\_\_\_\_  
 Road Owning Entity \_\_\_\_\_  
 Structure Owning Entity \_\_\_\_\_  
 Road Name \_\_\_\_\_  
 Stream Name <sup>"UNT" for unnamed tributary to</sup> \_\_\_\_\_  
 Latitude \_\_\_\_\_ N Longitude \_\_\_\_\_ W  
 Site notes: \_\_\_\_\_

## Existing Conditions: quantitative assessment

required

**Measuring Bankfull Channel Width:** Since stream conditions vary, these guidelines are flexible, and the goal is to determine bankfull width of an unaltered "reference reach" of the stream. Look upstream if possible, trying to find an undisturbed "reference reach" of stream free from influences that may impact cross section (such as debris jams, floodplain obstructions, bedrock outcrops, etc.). In order to get out of the "area of influence" from the structure, roughly estimate the bankfull channel width, then go at least 5 times that distance away from the structure to begin taking bankfull measurements. Additional bankfull widths should be measured so that at least three (with 5 preferred) are collected. Subsequent bankfull width measurement should be collected at least 1/2 bankfull width away from the first measurement, taking care to avoid channel obstructions and bends. Additional bankfull determination guidance on reverse.

Bankfull width measurements: 1) \_\_\_\_\_ ft 2) \_\_\_\_\_ ft 3) \_\_\_\_\_ ft 4) \_\_\_\_\_ ft 5) \_\_\_\_\_ ft

A. Avg. Reference bankfull width \_\_\_\_\_ ft If it is impossible to obtain reference bankfull widths upstream of the structure, downstream widths can be used if they are taken out of the structure influence area.

B. Existing structure width \_\_\_\_\_ ft Width of structure at narrowest point.

C. Structure / Bankfull ratio \_\_\_\_\_ % Structure width divided by average bankfull width. (Line B divided by line A)

## Existing Conditions: qualitative assessment

D. Stream Bank Erosion	upstream	none	slight	moderate	high	severe
	downstream	none	slight	moderate	high	severe
E. Stream Bed Erosion	upstream	none	slight	moderate	high	severe
	downstream	none	slight	moderate	high	severe
F. Stream Bed Deposition	upstream	none	slight	moderate	high	severe
	downstream	none	slight	moderate	high	severe
G. Bank Armoring		unknown	none	intact	failing	

## Eligibility for Crossing Structural Replacement with Program Funds

Is the existing structure opening equal to or less than 13 square feet (equivalent to a 48" diameter round pipe): **NO-see below** **YES-Eligible**  
 Note that multiple-pipes are automatically eligible for replacement, but must be replaced with a single bankfull-width structure.

For larger structures, **all three** criteria below must be met in order to be eligible for replacement with Program funds:

Existing structure to bankfull width ratio of 75% or less. What is the existing structure to bankfull ratio (line C above): \_\_\_\_\_ %

Show signs of streambank erosion. Is stream bank erosion present (line D above): **YES** **NO**

Show signs of streambed erosion/aggradation. Is streambed erosion/aggradation present (line H&J above): **YES** **NO**

Is this stream crossing eligible for replacement with Program funds? **YES** **NO**

Note that ALL new structures paid for with Program funds are required to span the bankfull channel with a single opening.