

# BSDMS Summary Report

49 Pamunkey River at S.R. 614 near Hanover, VA

---

## Site Location:

---

**Site ID:** 49

**Site Name:** Pamunkey River at S.R. 614 near Hanover, VA

**County:** Hanover

**Nearest City:** Hanover

**State:** VA

**Latitude:** 374603

**Longitude:** 771957

**USGS Station ID:** 1673000

**Route Number:** 614

**Route Class:** State

**Service Level:** Mainline

**Route Direction:** NA

**Highway Mile Point:**

**Stream Name:** Pamunkey River

**River Mile:**

**Contact:**  
USGS  
3600 West Broad Street Suite 606  
Richmond, VA 23230  
(804) 771-2427

**Publication:**  
Hayes, Donald C., 1993, Site  
Selection and Collection of Bridge-  
Scour Data in Delaware, Maryland,  
and Virginia:  
U.S. Geological Survey  
Water-Resources Investigations  
Report 93-4017, 23 p.

## Site Description:

---

The site is located 2.0 mi east of Hanover, Virginia at the State Highway 614 bridge crossing the Pamunkey River. The bridge, 282 ft long, has three 3-ft-wide piers constructed on pile footings spaced 81 ft apart. The left end of the bridge is approximately 3 ft lower than the right end. The piers are aligned with the flow at most stages. There is a sand-bed channel at this location, and a sand bar is generally located on the left bank 50-200 ft upstream from the bridge. At high flows, the sand bed may shift, and the sand bar may flush through the bridge opening. The center pier tends to collect floating debris, and the largest local-scour values at this site were observed at the center pier. High flows generally last several days, and the flow generally peaks 1-2 days after the most intense period of rainfall. The streamflow-gaging station, located 100 ft downstream from the bridge on the right bank, has a loop rating curve. Normally, a good measurement can be made near the peak flow. The stage generally falls 4-5 ft per day after the peak. There is some regulation of flow by Lake Anna.

## Elevation Reference

---

**Datum:** Gage

**MSL (ft):** 14.72

# BSDMS Summary Report

49 Pamunkey River at S.R. 614 near Hanover, VA

---

## Description of Reference Elevation:

Wire-weight gage: 30.30 ft gage datum  
BM on top right bank, downstream abutment

## Stream Data

---

Drainage Area (sq mi):	1081	Floodplain Width:	Narrow
Slope in Vicinity(ft/ft):	0.00012	Natural Levees:	Little
Flow Impact:	Right	Apparent Incision:	None
Channel Evolution	Unknown	Channel Boundary:	Alluvial
Armoring:	None	Banks Tree Cover:	Medium
Debris Frequency:	Occasional	Sinuosity:	Meandering
Debris Effect:	Local	Braiding:	None
Stream Size:	Medium	Anabranching:	None
Flow Habit:	Perennial	Bars:	Narrow
Bed Material:	Sand	Stream Width Variability:	Equiwidth
Valley Setting:	Low		

## Roughness Data

---

### Manning's n Values

	Left Overbank	Channel	Right Overbank
High:	0.08	0.03	0.08
Typical		0.035	
Low:		0.035	

## Bed Material

---

Measurement Number	Yr	Mo	Dy	Sampler	D95 (mm)	D84 (mm)	D50 (mm)	D16 (mm)	SP	Shape	Cohesion
1	1991	5	31	BMH-53	2.8	1.6	0.7	0.32	2.65		Non-Cohesive

## Bed Material Comments

---

# BSDMS Summary Report

49 Pamunkey River at S.R. 614 near Hanover, VA

---

Measurement No: 1

## Bridge Data

---

Structure No: 6918  
Length(ft): 282  
Width(ft): 30  
Number of Spans: 4  
Vertical Configuration: Unknown  
Low Chord Elev (ft): 22.9  
Upper Chord Elev (ft): 24.7  
Overtopping Elev (ft): 29  
Skew (degrees): 30  
Guide Banks: None  
Waterway Classification: Main  
Year Built: 1967  
Avg Daily Traffic:  
Plans on File: Yes  
Parallel Bridges No  
Upstream/Downstream: Unknown  
Continuous Abutment: No  
Distance Between Centerlines:  
Distance Between Pier Faces:

### Bridge Description:

The bridge, 282 ft long, has three 3-ft-wide piers constructed on pile footings spaced 81 ft apart. The left end of the bridge is approximately 3 ft lower than the right end. The piers are aligned with the flow at most stages.

# BSDMS Summary Report

49 Pamunkey River at S.R. 614 near Hanover, VA

---

## Abutment Data

---

Left Station: 0  
Right Station: 283  
Left Skew (deg): 0  
Right Skew (deg) 0  
Left Abutment Length (ft): 35  
Right Abutment Length (ft) 35  
Left Abutment to Channel Bank (ft): 60  
Right Abutment to Channel Bank (ft): 55  
Left Abutment Protection:  
Right Abutment Protection  
Contracted Opening Type: III  
Embankment Skew (deg): 0  
Embankment Slope (ft/ft): 1.5  
Abutment Slope (ft/ft) 1.5  
Wingwalls: No  
Wingwall Angle (deg): 0

## Pier Data

---

Pier ID	Bridge Station(ft)	Alignment	Highway Station	PierType	# Of Piles	Pile Spacing(ft)
CNTR	141	30	133.61	Single	0	
LEFT	60	30	134.41	Single	0	
RT	222	30	132.81	Single	0	

  

Pier ID	Pier Width(ft)	Pier Shape	Shape Factor	Length(ft)	Protection	Foundation
CNTR	3	Round		35	None	Piles
LEFT	3	Round		35	None	Piles

# BSDMS Summary Report

49 Pamunkey River at S.R. 614 near Hanover, VA

---

RT	3	Round	35	None	Piles
Pier ID	Top Elevation(ft)	Bottom Elevation(ft)	Foot or Pile Cap Width(ft)	Cap Shape	File Tip Elevation(ft)
CNTR	-3.7	-6.7	6	Square	-42
LEFT	-4.8	-7.8	6	Square	-46
RT	-2.8	-5.8	6	Square	-44

## Pier Description

---

Pier ID CNTR

The three piers have the same dimensions (3 ft wide and 35 ft long), but are set at different elevations. Each pier has a solid web for its entire length. Each pier rests on 20 piles spaced at 3.7 ft (35-40 ft long) and a pile cap. The center pier is the only pier with the pile cap exposed.

Pier ID LEFT

See center pier.

Pier ID RT

See center pier.

## Pier Scour Data

---

Pier ID	Date	Time	USOrDS
CNTR	5/31/90	13:30	Upstream
CNTR	1/14/91	12:00	Upstream
CNTR	12/13/92	11:30	Upstream
CNTR	12/14/92	10:00	Upstream
CNTR	12/15/92	11:00	Upstream
CNTR	1/11/93	12:00	Upstream
CNTR	1/12/93	10:30	Upstream
CNTR	4/12/93	12:00	Upstream
CNTR	4/13/93	9:30	Upstream

# BSDMS Summary Report

49 Pamunkey River at S.R. 614 near Hanover, VA

CNTR	4/19/93	10:00	Upstream
LEFT	5/31/90	13:30	Upstream
LEFT	12/13/92	11:30	Upstream
LEFT	12/14/92	10:00	Upstream
LEFT	12/15/92	11:00	Upstream
LEFT	1/11/93	12:00	Upstream
LEFT	1/12/93	10:30	Upstream
LEFT	4/12/93	12:00	Upstream
LEFT	4/13/93	9:30	Upstream
LEFT	4/19/93	10:00	Upstream
RT	5/31/90	13:30	Upstream
RT	12/13/92	11:30	Upstream
RT	12/14/92	10:00	Upstream
RT	12/15/92	11:00	Upstream
RT	1/11/93	12:00	Upstream
RT	1/12/93	10:30	Upstream
RT	4/12/93	12:00	Upstream
RT	4/13/93	9:30	Upstream
RT	4/19/93	10:00	Upstream

Pier ID	Scour Depth	Accuracy (ft)	Side Slope (ft/ft)	TopWidth (ft)	Apprch Vel (ft/s)	Apprch Depth(ft)	Effective Pier Width	Skew to Flow(deg)
CNTR	5	1	7.5	75	4.56	28.7	3	0
CNTR	2.5	1	7	35	3.16	24	3	0
CNTR	4.5	1	4	34	3.18	16.2	3	0
CNTR	3.5	1	3.5	24	3.31	22.8	3	0
CNTR	4.5	1	4	35	3.01	22	3	0
CNTR	5.1	1	3.5	37	2.84	21.3	3	0
CNTR	4.2	1	3	25	3.08	21.7	3	0
CNTR	4	1	4	30	3.34	24.6	3	0
CNTR	3.5	1	3.5	23	3.22	24.4	3	0
CNTR	3.6	1	3.5	25	3.26	24.8	3	0
LEFT	3.2	1	3.5	23	1.73	21.2	3	0
LEFT	1.6	1	10	34	1.21	16.5	3	0
LEFT	3	1	5.5	33	1.3	17.5	3	0
LEFT	2	1	6	23	1.02	16.9	3	0
LEFT	1.8	1	6	22	0.95	15.6	3	0
LEFT	3	1	4	24	1.01	16.4	3	0
LEFT	1.6	1	6	19	1.56	18.1	3	0
LEFT	2	1	7.5	30	1.35	18.4	3	0

# BSDMS Summary Report

49 Pamunkey River at S.R. 614 near Hanover, VA

LEFT	2.3	1	6	28	1.7	18.9	3	0
RT	3	1	3.5	20	1.87	26.3	3	0
RT	1.5	1	10	30	1.25	19.5	3	0
RT	2	1	7	27	1.2	20	3	0
RT	1.2	1	8.5	20	0.82	18.8	3	0
RT	1.5	1	2	6	1.07	18.5	3	0
RT	1.3	1	2.5	6	0.95	19.3	3	0
RT	1.5	1	2.5	7	1.16	20.8	3	0
RT	1.5	1	3.5	10	1.08	21	3	0
RT	3	1	1.5	9	1.08	23.4	3	0

PierID	Sediment Transport	Bed Material	BedForm	Trough (ft)	Crest (ft)	Sigma	Debris Effects
CNTR	Unknown	Unknown	Unknown			2.24	Unknown
CNTR	Unknown	Unknown	Unknown			2.24	Unknown
CNTR	Unknown	Unknown	Unknown			2.24	Unknown
CNTR	Unknown	Unknown	Unknown			2.24	Unknown
CNTR	Unknown	Unknown	Unknown			2.24	Unknown
CNTR	Unknown	Unknown	Unknown			2.24	Unknown
CNTR	Unknown	Unknown	Unknown			2.24	Unknown
CNTR	Unknown	Unknown	Unknown			2.24	Unknown
CNTR	Unknown	Unknown	Unknown			2.24	Unknown
CNTR	Unknown	Unknown	Unknown			2.24	Unknown
LEFT	Unknown	Unknown	Unknown			2.24	Unknown
LEFT	Unknown	Unknown	Unknown			2.24	Unknown
LEFT	Unknown	Unknown	Unknown			2.24	Unknown
LEFT	Unknown	Unknown	Unknown			2.24	Unknown
LEFT	Unknown	Unknown	Unknown			2.24	Unknown
LEFT	Unknown	Unknown	Unknown			2.24	Unknown
LEFT	Unknown	Unknown	Unknown			2.24	Unknown
LEFT	Unknown	Unknown	Unknown			2.24	Unknown
LEFT	Unknown	Unknown	Unknown			2.24	Unknown
LEFT	Unknown	Unknown	Unknown			2.24	Unknown

# BSDMS Summary Report

49 Pamunkey River at S.R. 614 near Hanover, VA

---

RT	Unknown	Unknown	Unknown	2.24	Unknown
RT	Unknown	Unknown	Unknown	2.24	Unknown
RT	Unknown	Unknown	Unknown	2.24	Unknown
RT	Unknown	Unknown	Unknown	2.24	Unknown
RT	Unknown	Unknown	Unknown	2.24	Unknown
RT	Unknown	Unknown	Unknown	2.24	Unknown
RT	Unknown	Unknown	Unknown	2.24	Unknown
RT	Unknown	Unknown	Unknown	2.24	Unknown
RT	Unknown	Unknown	Unknown	2.24	Unknown

PierID	D95 (mm)	D84 (mm)	D50 (mm)	D16 (mm)
CNTR	2.8	1.6	0.7	0.32
CNTR	2.8	1.6	0.7	0.32
CNTR	2.8	1.6	0.7	0.32
CNTR	2.8	1.6	0.7	0.32
CNTR	2.8	1.6	0.7	0.32
CNTR	2.8	1.6	0.7	0.32
CNTR	2.8	1.6	0.7	0.32
CNTR	2.8	1.6	0.7	0.32
CNTR	2.8	1.6	0.7	0.32
CNTR	2.8	1.6	0.7	0.32
LEFT	2.8	1.6	0.7	0.32
LEFT	2.8	1.6	0.7	0.32
LEFT	2.8	1.6	0.7	0.32
LEFT	2.8	1.6	0.7	0.32
LEFT	2.8	1.6	0.7	0.32
LEFT	2.8	1.6	0.7	0.32
LEFT	2.8	1.6	0.7	0.32
LEFT	2.8	1.6	0.7	0.32
LEFT	2.8	1.6	0.7	0.32

# BSDMS Summary Report

49 Pamunkey River at S.R. 614 near Hanover, VA

---

LEFT	2.8	1.6	0.7	0.32
RT	2.8	1.6	0.7	0.32
RT	2.8	1.6	0.7	0.32
RT	2.8	1.6	0.7	0.32
RT	2.8	1.6	0.7	0.32
RT	2.8	1.6	0.7	0.32
RT	2.8	1.6	0.7	0.32
RT	2.8	1.6	0.7	0.32
RT	2.8	1.6	0.7	0.32
RT	2.8	1.6	0.7	0.32

## Pier Scour Comments

---

**Pier ID** CNTR                      **Time:** 13:30                      **US/DS:** Upstream

Accuracy of local scour measurement is probably 1 foot. Estimate of local scour is for this cross section only and may not represent maximum local scour at the pier.

**Pier ID** CNTR                      **Time:** 12:00                      **US/DS:** Upstream

**Pier ID** CNTR                      **Time:** 11:30                      **US/DS:** Upstream

**Pier ID** CNTR                      **Time:** 10:00                      **US/DS:** Upstream

**Pier ID** CNTR                      **Time:** 11:00                      **US/DS:** Upstream

**Pier ID** CNTR                      **Time:** 12:00                      **US/DS:** Upstream

**Pier ID** CNTR                      **Time:** 10:30                      **US/DS:** Upstream

# BSDMS Summary Report

49 Pamunkey River at S.R. 614 near Hanover, VA

---

Pier ID	CNTR	Time:	12:00	US/DS:	Upstream
Pier ID	CNTR	Time:	9:30	US/DS:	Upstream
Pier ID	CNTR	Time:	10:00	US/DS:	Upstream
Pier ID	LEFT	Time:	13:30	US/DS:	Upstream
Pier ID	LEFT	Time:	11:30	US/DS:	Upstream
Pier ID	LEFT	Time:	10:00	US/DS:	Upstream
Pier ID	LEFT	Time:	11:00	US/DS:	Upstream
Pier ID	LEFT	Time:	12:00	US/DS:	Upstream
Pier ID	LEFT	Time:	10:30	US/DS:	Upstream
Pier ID	LEFT	Time:	12:00	US/DS:	Upstream
Pier ID	LEFT	Time:	9:30	US/DS:	Upstream
Pier ID	LEFT	Time:	10:00	US/DS:	Upstream
Pier ID	RT	Time:	13:30	US/DS:	Upstream

# BSDMS Summary Report

49 Pamunkey River at S.R. 614 near Hanover, VA

---

Pier ID	RT	Time:	11:30	US/DS:	Upstream
Pier ID	RT	Time:	10:00	US/DS:	Upstream
Pier ID	RT	Time:	11:00	US/DS:	Upstream
Pier ID	RT	Time:	12:00	US/DS:	Upstream
Pier ID	RT	Time:	10:30	US/DS:	Upstream
Pier ID	RT	Time:	12:00	US/DS:	Upstream
Pier ID	RT	Time:	9:30	US/DS:	Upstream
Pier ID	RT	Time:	10:00	US/DS:	Upstream

## Abutment Scour

---

## Contraction Scour

---

# BSDMS Summary Report

49 Pamunkey River at S.R. 614 near Hanover, VA

---

## Stage and Discharge Data

---

Peak Discharge					Flow	Peak Stage					Stage	Water	Return	
year	mo	dy	hr	mi	(cfs)	Qacc	year	mo	dy	hr	mi	(ft)	Temp (C)	Period(yr)

## Hydrograph

---

Hydrograph							Discharge	
Number	Year	Month	Day	Hr	Min	Sec	Stage(ft)	(cfs)

## Supporting Files

---