

WHOM MAY I CONTACT FOR MORE INFORMATION?

For questions concerning the Bridge Scour Program, contact:
District Chief
Pennsylvania District
U. S. Geological Survey, Water Resources Division
840 Market Street
Lemoyne, PA 17043

For questions concerning all other aspects of Pennsylvania
bridges, contact:

Chief Bridge Engineer
Department of Transportation
Forum Place, 7th Floor
555 Walnut Street
Harrisburg, PA 17101-1900

For additional information about USGS programs and activities
in Pennsylvania, please visit our web site at:
<http://www.pdnh2o.er.usgs.gov/>

The mission of the U. S. Geological Survey is to
provide geologic, topographic, and hydrologic
information that contributes to the management
of the Nation's natural resources and that promotes
the health, safety, and well-being of the people. The
Water Resources Division of the U. S. Geological
Survey identifies potential water-related hazards and
their causes and character and provides information
used by Federal and State agencies to assess the
effects of these hazards.



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U. S. GEOLOGICAL SURVEY
in cooperation with the
PENNSYLVANIA DEPARTMENT
OF TRANSPORTATION

SCOUR AT BRIDGES

What's it all about?

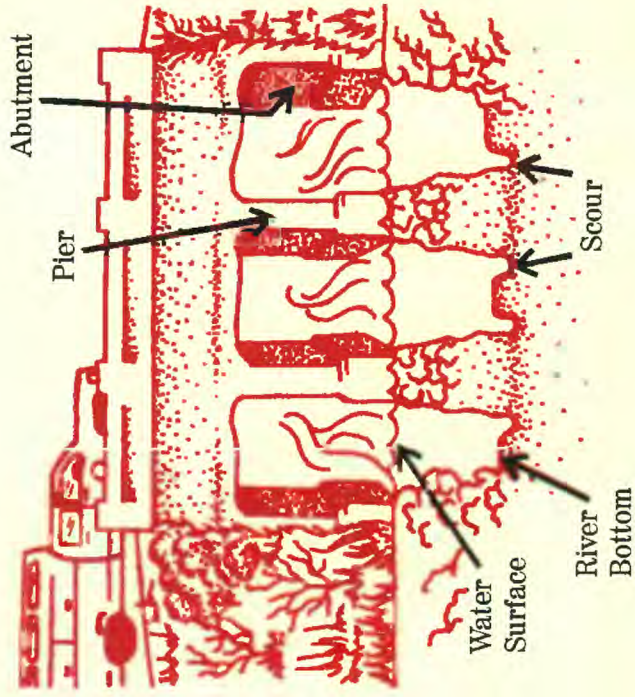
Stream Stability and Scour Assessment
at Bridges in Pennsylvania

A Brief Description of the U. S. Geological
Survey Project

Open-File Report 96-497

WHAT IS SCOUR?

Scour is the removal of sediment (soil and rocks) from streambeds and streambanks caused by moving water. Although scour may occur at any time, it is usually more significant during high flows, when the water is swift and deep. Swiftly moving water has more energy (turbulence and velocity) to lift and transport sediment than slowly moving water.



Three areas at bridges are affected by scour:

- 1 At pier and abutment foundations. (Piers are pillars supporting a bridge. Abutments are the supports at each end of a bridge.) Commonly, the water flows faster around piers and abutments making them susceptible to local scour.
- 2 Across a bridge opening. Contraction scour occurs when water accelerates as it flows through a bridge opening that is narrower than the channel and floodplain upstream from the bridge.
- 3 Throughout a large section of stream, both upstream and downstream from a bridge. This degradation in a stream is usually a long-term process that results in lowering the streambed.

WHY BE CONCERNED ABOUT SCOUR?

If too much sediment supporting bridge piers and abutments is scoured by a stream, then the bridge could fail or become unsafe for travel. Many bridge failures have been caused by scour, some of which resulted in deaths. In 1987, the Interstate 90 bridge over Schoharie Creek in New York failed because of scour, and 10 people lost their lives. On March 10, 1995, the Interstate 5 bridge over Arroyo Pasajero in California collapsed, and seven people died. After the Schoharie Creek failure, the Federal Highway Administration mandated every state to assess bridges for existing scour and to identify sites where scour may become a problem. Identification of existing and potential scour-susceptible bridges will assist the Pennsylvania Department of Transportation (PennDOT) in monitoring and correcting problems before bridges fail or become unsafe.

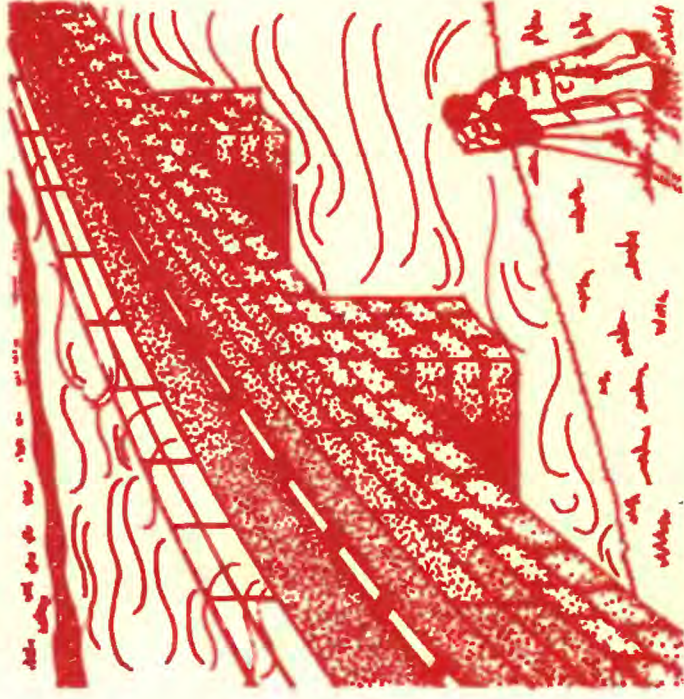
WHAT'S BEING DONE ABOUT SCOUR AT BRIDGES?

In response to that mandate, the PennDOT and the U.S. Geological Survey (USGS) initiated a cooperative study to examine approximately 16,000 bridges throughout the Commonwealth of Pennsylvania, which are greater than 20 feet in length and over water.

The PennDOT manages the bridge-scour evaluation program for all State- and locally owned bridges over water. Through review of their Bridge Management System database and consultation with their District Offices, the PennDOT identified approximately 2,200 bridges scattered around the state as having potential for scour. These bridges are the first group of sites that are being evaluated by the USGS.



A scour assessment by the USGS begins in the PennDOT District Office responsible for maintaining the bridge being assessed. Bridge plans, historical inspections, and available maintenance records are reviewed.



A field team then visits the site and collects the following information:

- ◆ Site characteristics including the location and appearance of stream bends (meanders), amounts of woody vegetation stabilizing the streambanks, type of sediment in the streambed and streambanks, and any evidence of scour.
- ◆ Survey of the bridge features and the channel upstream and downstream of the site.
- ◆ Precise bridge location using Global Positioning Satellite (GPS) data.
- ◆ Video of the bridge and channel to document existing site conditions.

The information gathered during the scour assessments is transferred to a computerized database and used to identify a bridge's potential for scour. The PennDOT then uses these USGS results, in concert with information gathered by the PennDOT personnel, to prioritize remediation as needed.