
**HISTORIC AMERICAN ENGINEERING
RECORD (HAER)
BRIDGE 3-806 OVER DIAMOND POND
MILTON, SUSSEX COUNTY, DELAWARE**

Prepared for:

Delaware Department of Transportation

**State Project #21-046-01
Federal Aid No. ESTP-S319(1)**

Prepared by:

**Parsons
Fairfax, Virginia**

**FINAL
FEBRUARY 2005**

HISTORIC AMERICAN ENGINEERING RECORD

Bridge #3-806 over Diamond Pond
Route 319, Milton, Sussex County, Delaware
Cultural Resources Survey # S-9849

Location: Bridge #3-806 over Diamond Pond is located on State Route 319 in Sussex County, Delaware. Route 319 at Bridge #3-806 is a two-lane road leading into the town of Milton, Sussex County, Delaware.

Significance: Bridge #3-806, constructed ca. 1917, is the last remaining bridge and water control structure associated with the mills that once existed on Diamond Pond. The reinforced concrete box culvert is a typical design used throughout the State of Delaware, but the multi-arch parapet wall design is a unique ornamental element for such a modest structure. It is one of a handful of examples in the state of Delaware where this design is executed in the parapet wall.

The design of Bridge #3-806 has been attributed to the designer of Bridge #3-808, and the associated penstock bridge off of Wagamon Pond on Route 197 in Milton (demolished ca.1991). Bridge #3-806 and the penstock bridge off of Wagamon Pond were both multiple-cells, single span reinforced concrete box culverts with three arches in the parapet walls. The penstock bridge had a single parapet wall with functioning wood gates. Bridge #3-808 was a larger, multiple-cell, two-span, bridge and water flow control structure, measuring 23' in length with six arches in each parapet wall (P.A.C. Spero & Company 1991:136; Heite 1991:34). The demolition of the bridges at Wagamon Pond leaves Bridge #3-806 as the only extant example of this parapet wall design.

Description: Bridge #3-806 is a reinforced concrete box culvert that carries a two-lane road over the waterway of Diamond Pond. The dual function of the bridge includes carrying traffic over the waterway and water flow control. The ca. 1917 bridge is a single span, triple-cell, 14.31'-long, 22'-wide structure with two parapet walls each pierced by three arches. With the exception of the arches, the parapet walls are not architecturally embellished and are modest in design. The concrete parapet walls are approximately 3' from ground level and are approximately 8" thick. U-shaped concrete wingwalls extend from the parapet walls. The spillway of the multi-cell box culvert allows the water from the pond to spill into a stream. At the time of its construction, Bridge #3-806 water control functions included providing upstream water storage for the mills on Wagamon Pond less than a mile away (mills

demolished ca. 1991). The functional wood gates that controlled the amount of water moving through the spillway are no longer extant. These gates were in existence as recently as 1992 (DelDOT 1992).

Bridge #3-806 has undergone a certain degree of deterioration to the parapet walls, wingwalls, and apron corner as a result of age and uneven maintenance.

Date of Construction: Ca. 1917; written documentation and historic maps suggest a construction date of circa 1917. Physical evidence also suggests that this structure was constructed during the same time period as other water control structures associated with the pond prior to 1920.

History: *History of Milton.* The town of Milton developed at the head of the Broadkill Creek. The town became a grain shipping port and flour milling center in the nineteenth century, and evolved into a center for shipbuilding in the second half of the century (Journal 1957; Hancock 1976). By the turn of the century, the economic prosperity of the town was over, as the shipbuilding industry was no longer profitable. Canning and food processing became the dominant industry in the early twentieth century, supplemented by cottage industries including button making and holly wreath making.

Milton was founded in 1763 by a Mr. Forcus (Hancock and McCabe 1982). The town developed on both sides of Broadkill Creek, west of the swampy region that borders the creek and the Delaware Bay. A bridge was constructed on Union Street in 1793 joining the town lands north and south of Broadkill Creek.

The town of Milton was chartered in 1807. In 1814, eight grist mills and eight saw mills were located within four miles of the village of Milton (Heite 1991:12). However, three local citizens petitioned the General Assembly for permission to build a mill dam and bridge and a grist mill near the center of the village. Brothers William W. and John S. Conwell partnered with Dr. Joseph Maull on the undertaking. Despite some local opposition, the law authorizing the project was passed February 9, 1815 (Heite 1991:12). The Mill Pond was formed from Long Bridge Branch and the unnamed branch that flowed into the head of Broadkill Creek (Hancock and McCabe 1982:67). According to a survey, the mill pond would inundate 52.5 acres, which is similar to the size of the surviving pond, later known as Wagamons Mill Pond. The Conwells already owned much of the land to be flooded, as

their inheritance from their mother, Eunice Conwell, but the partners were required to buy the remainder (Heite 1991:12). The location where the mill dam was to be built already had a bridge over the head of navigation of the Broadkill River. Fergus' Bridge carried a major north-south road (later called Mulberry Street) over the marshland, and was built by 1794 (Heite 1991:10). A causeway south of the bridge crossed the bog south of the river. This area, at the northeast end of the pond later called Wagamons Pond, was known as the Lower Mills in the nineteenth century.

A tanyard was operating in Milton by 1816 under the management of Nathaniel Lofland (Atkins 1905 in Hancock and McCabe 1982:10), with a second opening in 1825. The tanyards were located near the top of the rise overlooking the north bank of the Broadkill River, and were active until 1860 (Henderson 1987:21). Hall and Hazzard Tannery in Milton was operating via horse power in the 1830s, with four employees and two horses (Hancock and McCabe 1982:129). They sold leather to customers up to 150 miles away.

Milling of tanning bark occurred at four mills in Milton in the nineteenth century (Henderson 1987:21). Much of the ground bark was exported, but the local tanyards also were supplied. Black oak (quercitron) bark was especially prized for tanning due to its high concentration of tannin. To tan a hide, roughly twice its weight in finely ground bark would be needed, or approximately 150 pounds for a steer-sized hide (Kellogg 1984:84). Bark was typically removed from the tree in the spring, when the sap was high and the bark was easiest to separate from the trunk (Prance and Prance 1993:91). Traditionally, a four-person barking crew usually consisted of a spudder, a fitter, and two bucklers. The team would strip off sections of bark roughly 4 feet long by 18 inches wide. The next step was to dry the bark. Dried bark could be stored indefinitely and wouldn't lose its tannin (Kellogg 1984:84). Once dried, the bark was cut in a grinding mill to the coarseness of cracked corn. In traditional methods for tanning, the tanners would layer the hides in vats or pits with the chopped bark in between the skin layers. Water was sometimes added, although the moisture in the hides was sometimes sufficient. The tannins would leach from the bark into the hides slowly. Every few weeks, the bark would need to be removed and replaced with a fresh batch of bark. The tanning process often took six to nine months to reach the desired level of leather quality and appearance. Tanning with vegetable matter usually dyed the skin brown, so was not preferred for preparing some types of fur (Kellogg 1984:87).

Milton was officially incorporated as a town in 1865, and was surveyed in 1867 by John C. Hazzard. A state directory in 1868 describes Milton as “laid out with great regularity and taste” (Delaware State Directory 1868). The landing was “on the creek being just below the town” in 1868. The principal business was mercantile, with “two or three shipyards, some fishing and commerce” and “quite a trade in lumber in the village and vicinity, and a flourishing Academy” (Delaware State Directory 1868 in Jackson 1976:137). The town had at least two hotels, four physicians, and eight merchants by 1868.

S. Martin and James Ponder operated shipyards in 1868 north of Front Street and south of Broadkill Creek. Ponder also owned a steam-powered bark and saw mill on Front Street, built around 1863. The saw mill mainly prepared timber for shipbuilding. The bark mill ground quercitron bark and could grind 3 tons per day (Welch 1935). The mills were destroyed by fire in 1877 and were not rebuilt.

The grist mill built ca. 1815 at the Lower Mills was located near the center of town in 1868 on town lot 77, at the intersection of Mulberry and Coulter Streets. The mill was still actively in use in 1878 (The Delawarean 1878). A bridge and dam along Mulberry Street formed the Mill Pond to the west, which drained into Broadkill Creek at the northeast end of the dam. Water flowed from the southeast end of the dam into a mill race leading to the grist mill and back into Broadkill Creek to the northeast.

A sawmill stood in the area of Sand Hill Road (Route 319) in 1868, just beyond the town limits. The mill was on the east side of the stream that flowed northward into the Mill Pond, and on the north side of Route 319. The sawmill and a residence on the west of the stream and north of Route 319, were both owned by J. Paynter. The residence was probably the miller’s house, since the mill operator usually lived in close proximity to his workplace. Caleb R. Paynter inherited the sawmill and residence in 1853 from Samuel R. Paynter, according to a plat filed in the Orphans Court Records (Sussex County Orphans Court Records 1853). The one-acre tract containing the residence also included a bark mill, on the northwest side of the historical bridge crossing the mill pond. This bridge appears to correspond to the present-day location of Route 319 in the project area, but is not Bridge 3-806. In 1878, Paynter’s sawmill was still in operation but the bark mill was a ruin (*The Delawarean* 1878 in Hancock and McCabe 1982). The property stayed in the Paynter family’s hands for the remainder of the nineteenth century. The grist and saw mill belonging to Sallie

Paynter's heirs were valued at only \$1,000.00 in 1901, before they were sold to Henry K. Wagamon (Broadkill Hundred Assessment 1901 - 1904).

By 1914, neither mill building is shown on a map of the area, and a single large pond (Mill Pond) still extends from west of the town of Milton southward. However, the residence building appears to still be standing in 1914 on the north side of Route 319. Physical and textual documentation suggests that Bridge #3-806 was constructed during the same time period as Bridge #3-808 and its associated penstock bridge in ca.1917. Bridge #3-808 was constructed by Sussex County (Levy Court of Sussex County 1917).

In 1933, the State of Delaware purchased the right of way from Henry and Emma Wagamon to construct a state highway for one dollar. As part of the agreement between the Wagamon's and the state, it was understood that "this conveyance shall not include the water rights...and that if in the future it shall be found necessary to widen the bridge across the runway of the pond the State Highway Department of the State of Delaware shall extend and rebuild the water gates of the flume" (DelDOT and Sussex County 1933). DelDOT records indicate the current bridge existed in 1933 and repairs were made throughout the remainder of the 20th century.

History of Reinforced Concrete Box Culverts. The use of reinforced concrete box culverts in Delaware and elsewhere in the United States was first introduced on highways during the early decades of the 20th century. Concrete slab bridges and reinforced concrete box culverts are similar both in design and early history as a result of the increasing popularity of concrete as a building material in the early 20th century. Concrete became the predominant type for highway bridges and short railroad spans in the early twentieth century as a result of improvements in concrete technology (P.A.C. Spero & Company 1991:122). Concrete was relatively economical to use and the simplicity of using the material made it a widely accepted choice for bridge construction in the United States and Delaware. A box culvert is similar in design to a slab bridge. A slab bridge concentrates reinforcing steel in the lower section of the slab and at the ends. The amount of steel and the depth of the slab are determined by its length and live-load capacity (Lichtenstein Consulting Engineers, Inc. 2000: 189). A box culvert differs with the exception of the slab being integral with the side walls and floor, or invert slab, constructed as part of the culvert. The box culverts can be single or multiple cell construction. They are excellent for areas where there are minor

streams and they have been primarily used for spans between 8' and 15' in length. This construction type presented an economical and efficient engineering solution. The technology of the reinforced concrete box culvert has remained relatively unchanged since the early half of the 20th century with the exception of an increasing use of pre-cast box sections instead of cast in-place sections during the last quarter of the 20th century (Lichtenstein Consulting Engineers, Inc. 2000: 224).

Current Project Information. The Delaware Department of Transportation (DelDOT) proposes to re-route traffic around Milton and effectively remove the traffic from the historic district of town. The Milton Truck Route will route vehicles around Milton from Delaware Route 5 onto Sussex 319, then to Delaware Route 30. The roadway improvements associated with the Milton Truck Route include the widening of turn lanes at the intersection of Delaware Route 5/Sussex 319, and reconstruction of Sussex 319 from Delaware Route 5 to Delaware Route 30. As a result, the demolition of Bridge #3-806 is required to accommodate the proposed improvements and a new bridge will be constructed in its place.

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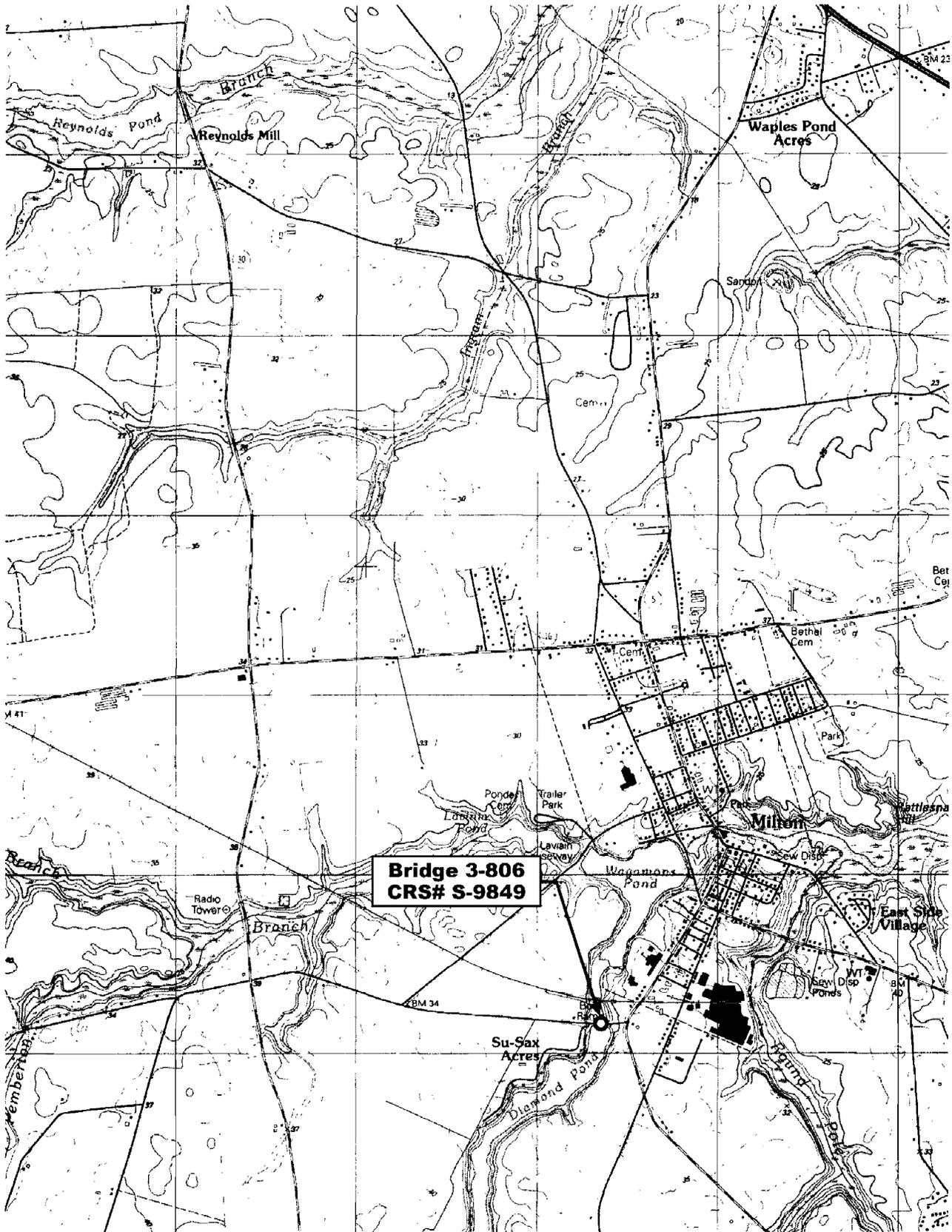
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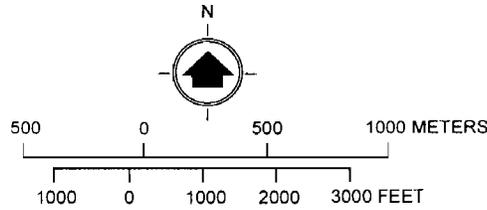
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Preparer: Simone Monteleone Moffett, Sr. Architectural Historian, Parsons,
April 2004.

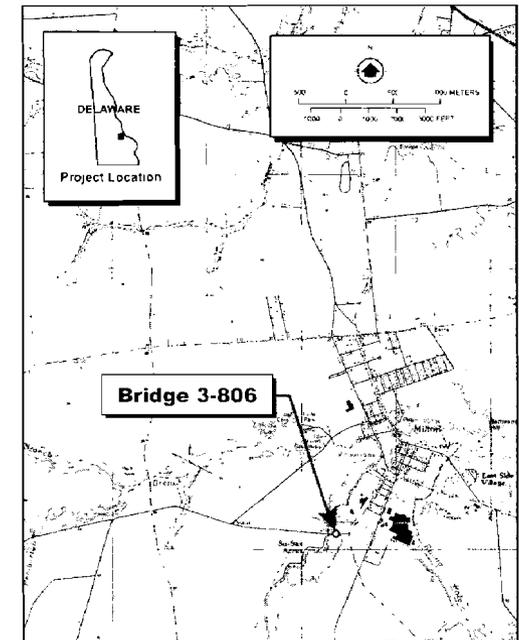
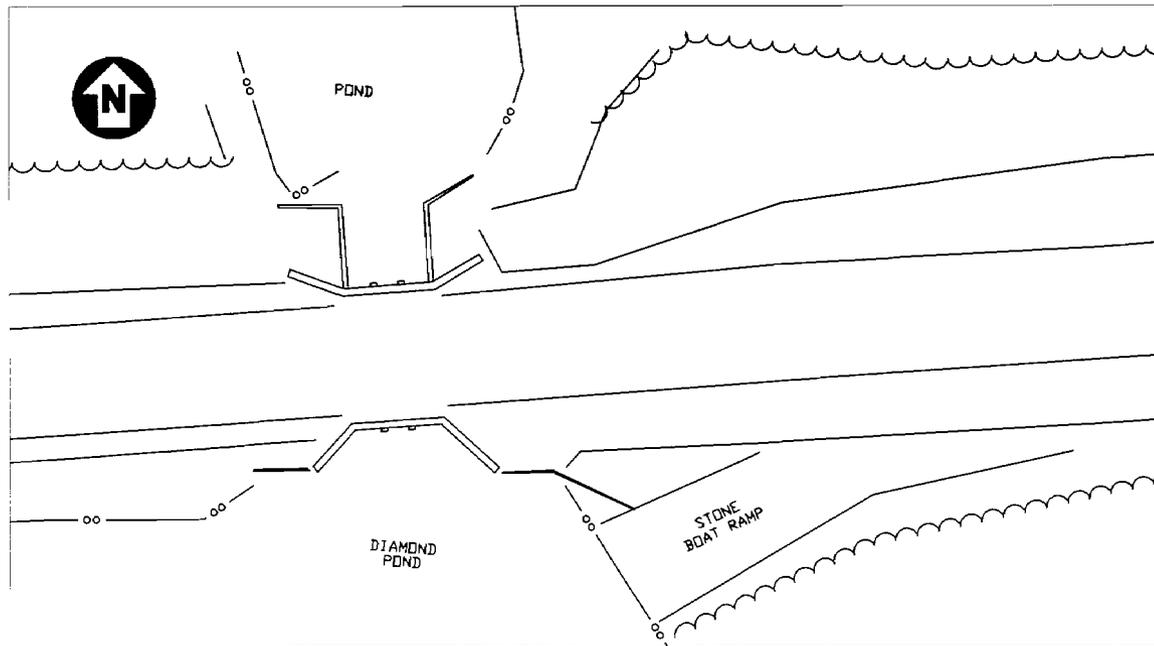


**Bridge 3-806
CRS# S-9849**

Source:
1992 USGS Map
1:24,000 Scale
Milton, DEL



Bridge 3-806, Milton, Sussex County, Delaware (CRS# S-9848)



MILTON BRIDGE

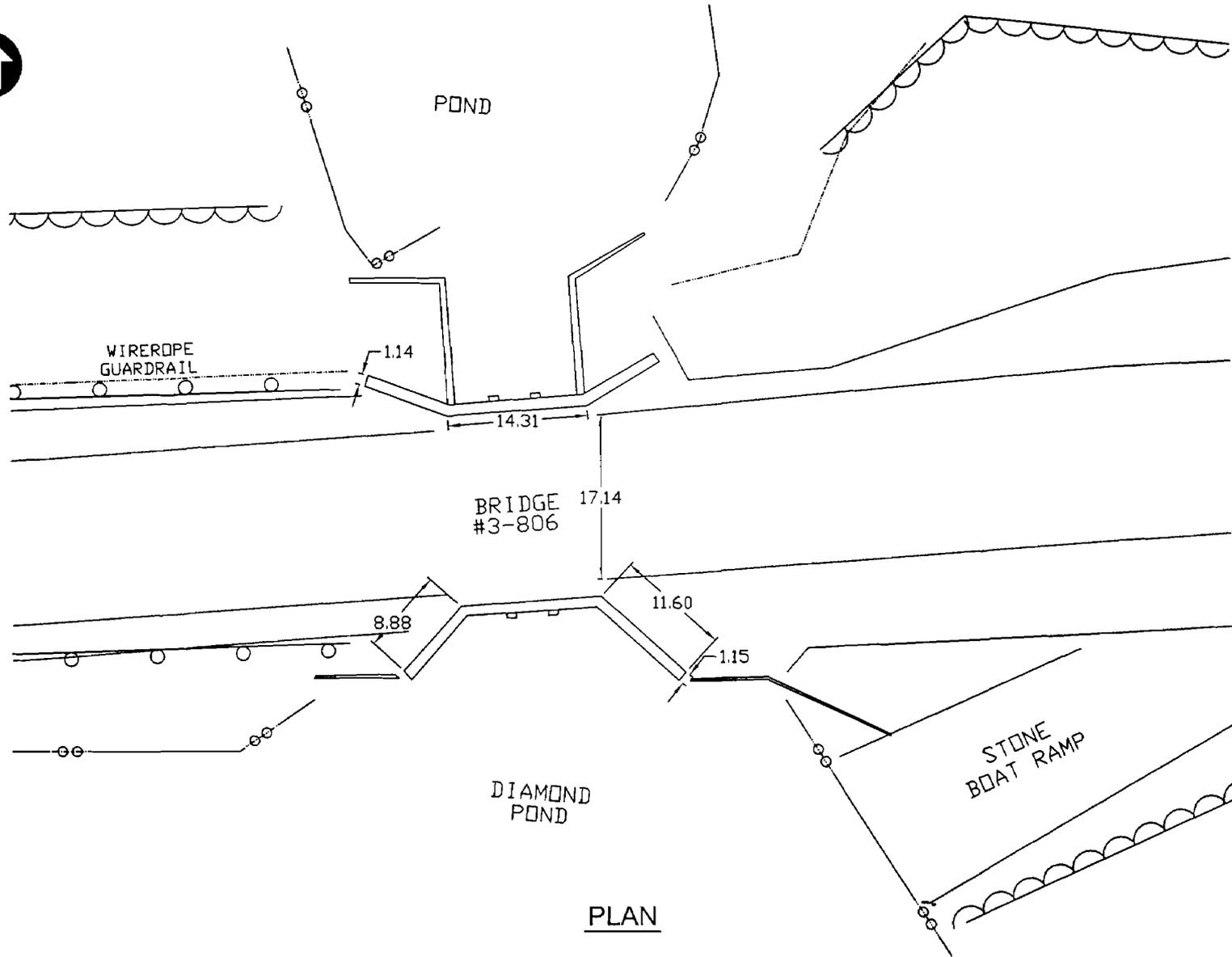
MILTON, DE

The Delaware Department of Transportation (DelDOT) proposes to establish a bypass that would re-route traffic around Milton and effectively remove the traffic from the historic district of town. The Milton Truck Route will route vehicles around Milton from Delaware Route 5 onto Sussex 319, then to Delaware Route 30. The roadway improvements associated with the Milton Truck Route include the widening of turn lanes at the intersection of Delaware Route 5/Sussex 319, and reconstruction of Sussex 319 from Delaware Route 5 to Delaware Route 30. As a result, the demolition of Bridge #3-806 is required to accommodate the proposed improvements and a new bridge will be constructed in its place. Bridge #3-806, constructed in ca. 1917, is located over Diamond Pond on Route 319 in Sussex County. In order to mitigate the demolition of Bridge #3-806, recordation of the structure to HAER standards was required by the Delaware State Historic Preservation Office.

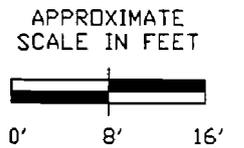
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NAME AND LOCATION OF STRUCTURE	
MILTON BRIDGE (BRIDGE 3-806)	
MILTON DELAWARE (OVER DIAMOND POND, ROUTE 319)	
SUSSEX COUNTY, DE CRS NUMBER (S-9849)	

CULVERT CONDITION PRIOR TO OCTOBER 2004



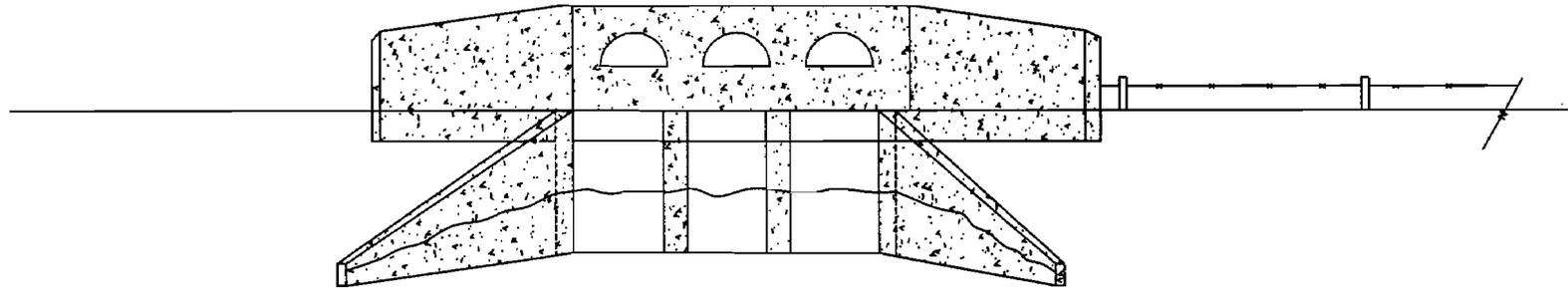
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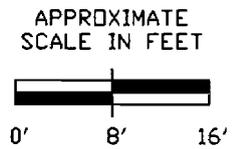
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 MILTON DELAWARE (OVER DIAMOND POND, ROUTE 319)
 SUSSEX COUNTY, DE CRS NUMBER (S-9849)

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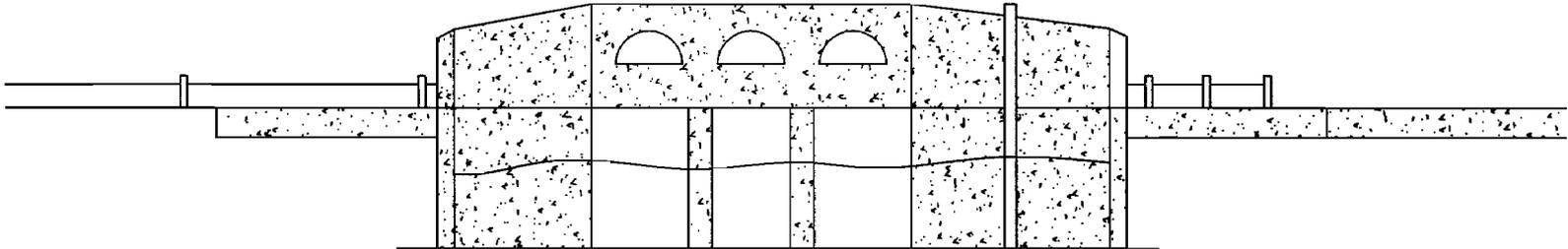
N. ELEVATION



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MILTON DELAWARE (OVER DIAMOND POND, ROUTE 319)
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CULVERT CONDITION PRIOR TO OCTOBER 2004



S. ELEVATION

APPROXIMATE
SCALE IN FEET

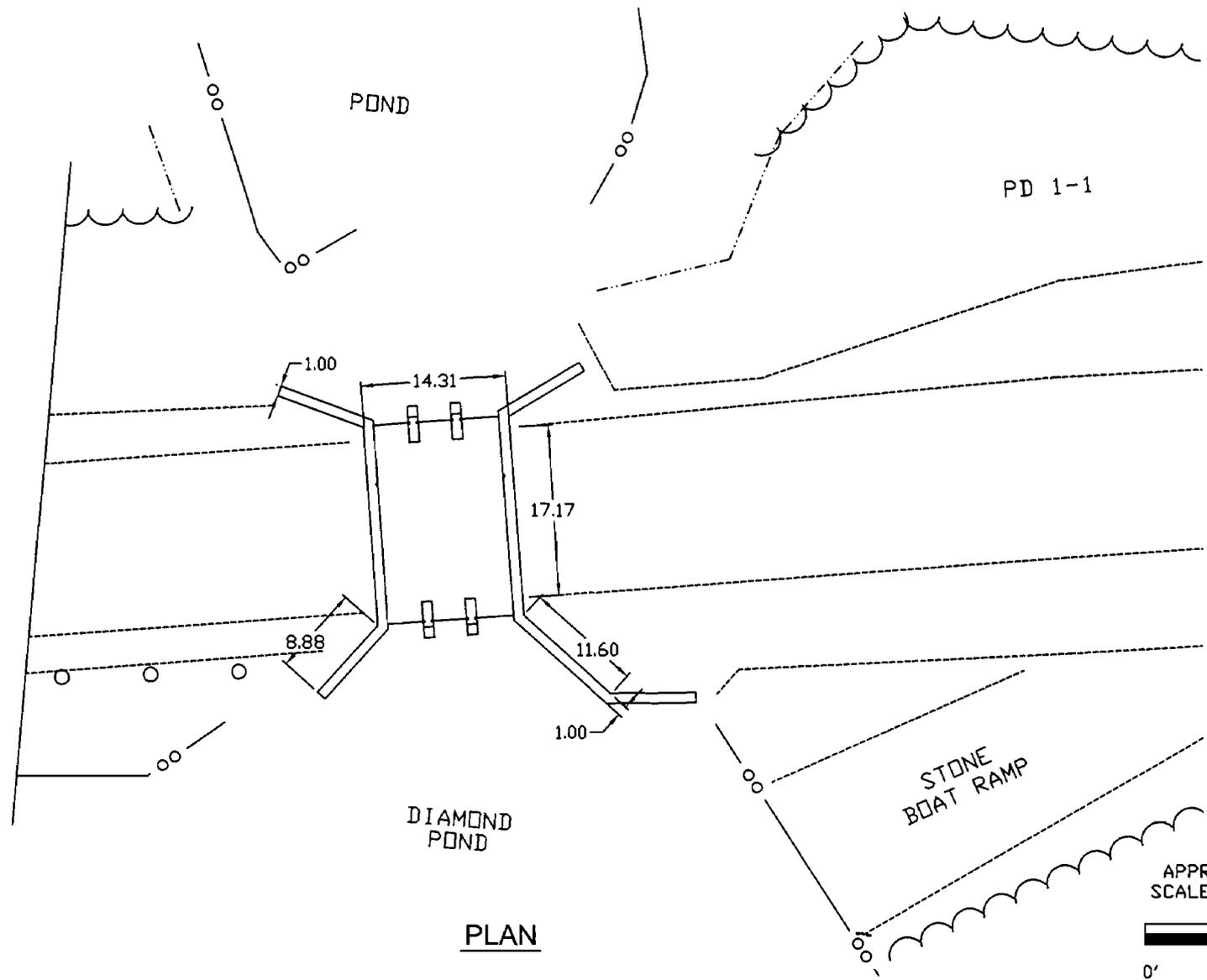


0' 8' 16'

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MILTON DELAWARE (OVER DIAMOND POND, ROUTE 319)
SUSSEX COUNTY, DE CRS NUMBER (#S-9849)

CULVERT CONDITION SHOWING REMOVED DECK



PLAN

APPROXIMATE
SCALE IN FEET

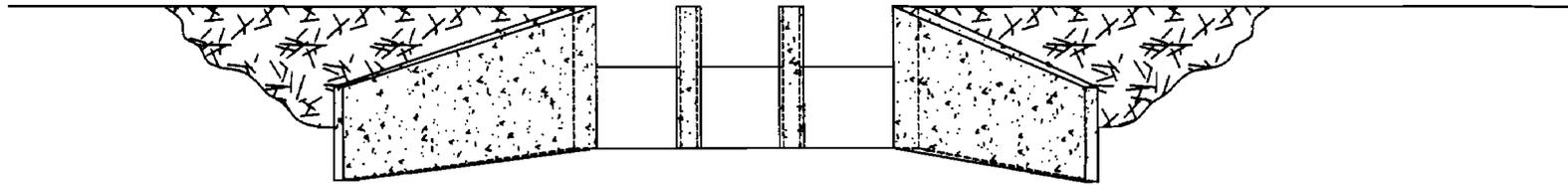


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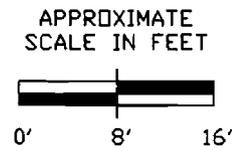
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CULVERT CONDITION SHOWING REMOVED DECK



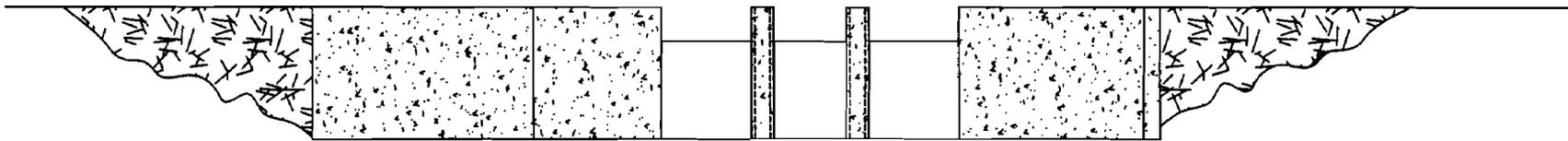
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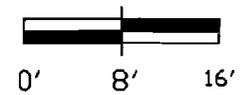
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CULVERT CONDITION SHOWING REMOVED DECK



S. ELEVATION

APPROXIMATE
SCALE IN FEET



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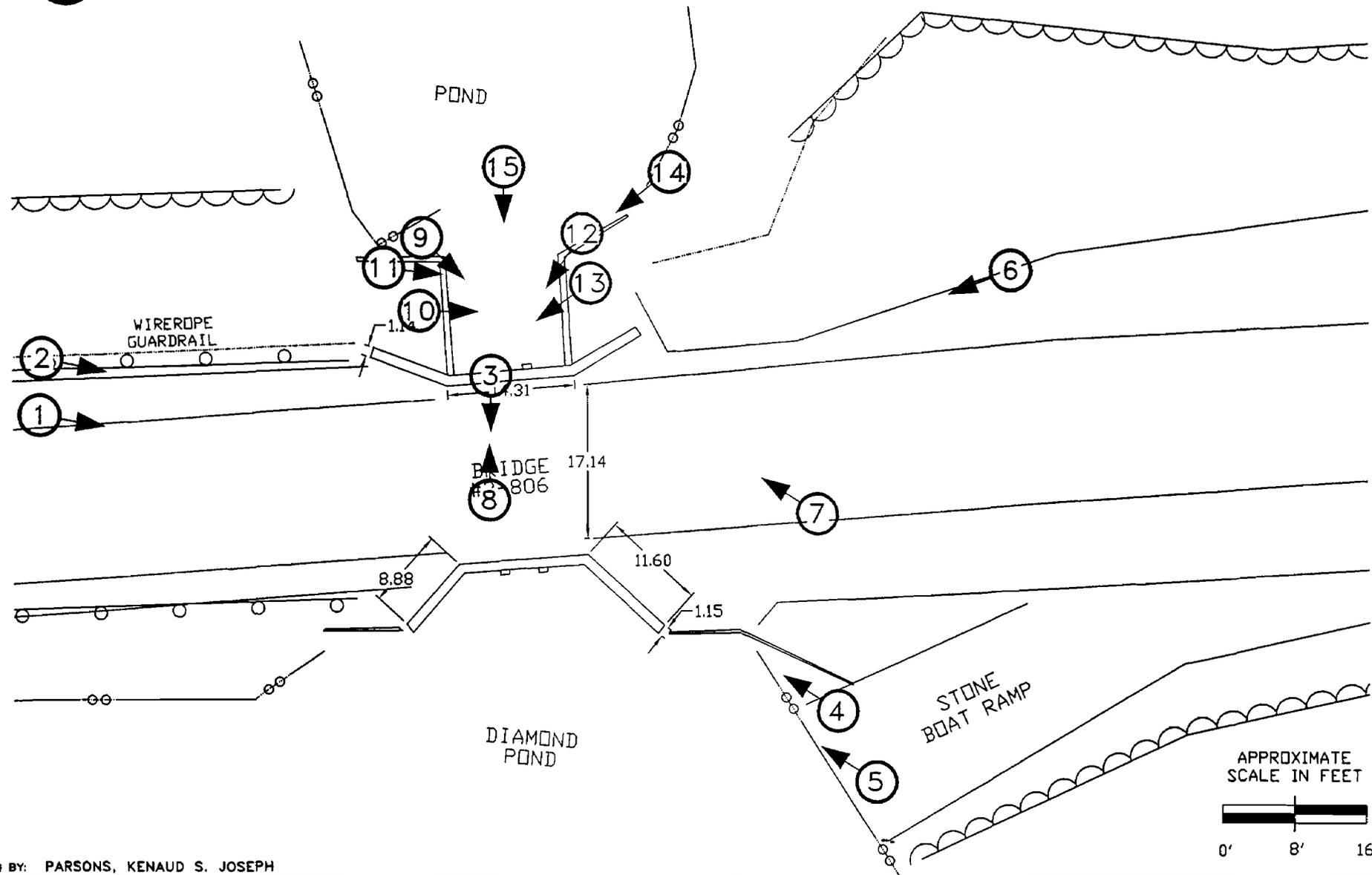
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Route 319, Milton, Sussex County, Delaware
Cultural Resources Survey # S-9849
#1-13, Laurie Paonessa, December 2003
#14-15, Kenuad Joseph, October 2004**

Number	Description	View
1	West Approach to Bridge along Route 319	Southeast
2	Southwest Wing Wall	Southeast
3	Detail of South Parapet Wall	South
4	South Elevation of Bridge	Northwest
5	South Elevation of Bridge	Northwest
6	East Approach to Bridge along Route 319	Southwest
7	Northeast Wing Wall	Northwest
8	North Parapet Wall	North
9	Detail of North Elevation	Southeast
10	Detail of North Elevation and Channel	East
11	View of Abutment on Northeast End of Bridge	East
12	Detail of Channel Below Bridge	Southwest
13	Detail of Channel and North Elevation	Southwest
14	SE View of Bridge Showing Removed Deck	Southeast
15	South View of Bridge Showing Removed Deck	South

Key To Photographs
 Bridge #3-806 over Diamond Pond
 Route 319, Milton, Sussex County, Delaware



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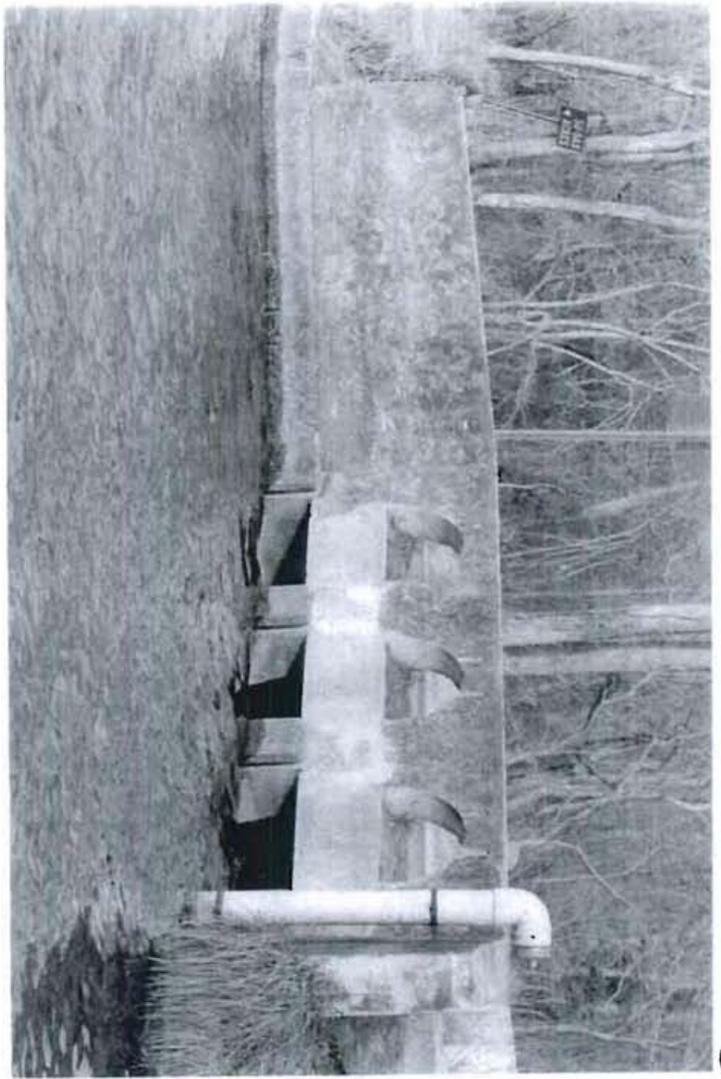
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SUSSEX COUNTY, DE CRS NUMBER (S-9849)				







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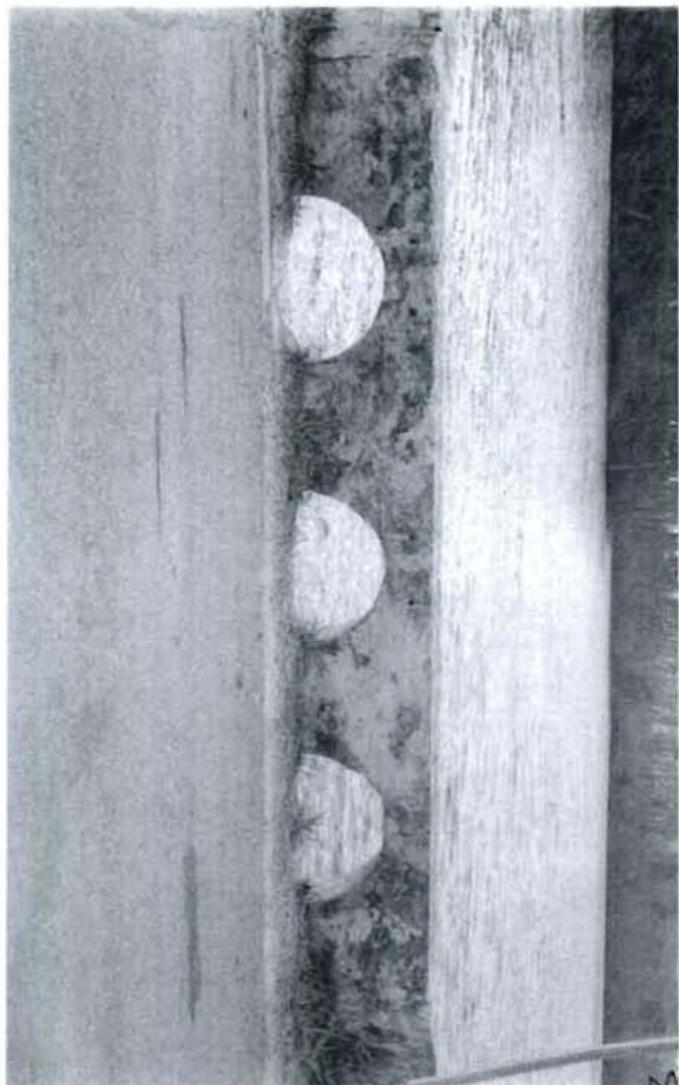


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UNION BRIDGE



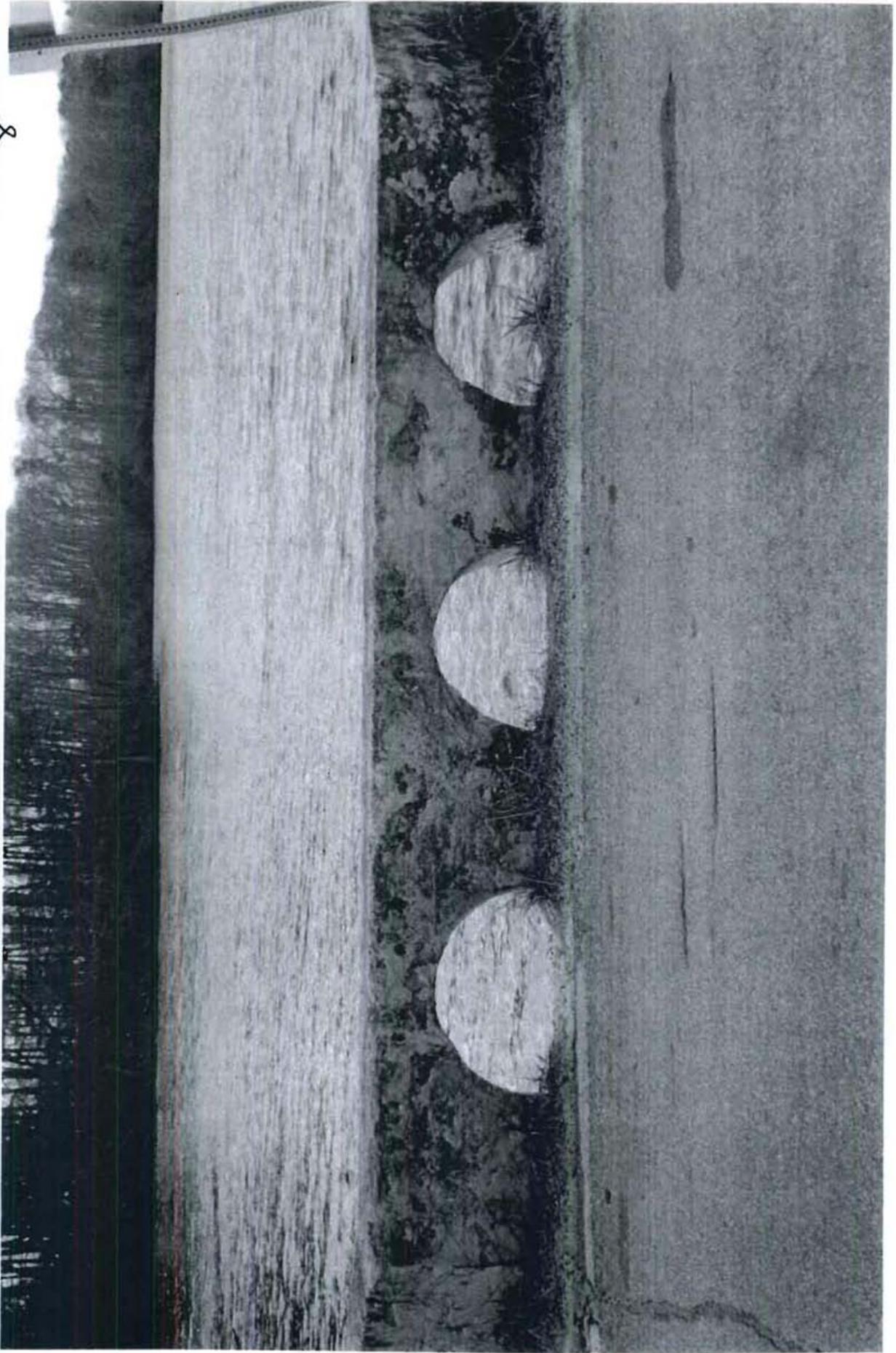
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