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September 06, 2011

Mr. Gregory Sandusky, P.E., PLS
Mercer County Engineer
640 South Broad Street
Trenton, NJ 08650

Attn: Basit Muzaffar, PE

Re: ***Reconstruction of Bear Tavern Road***
Bridge Number 214.2 (1100-060)
Bear Tavern Road Bridge (CR579) over Jacobs Creek
Priority E Repair

Dear Mr. Sandusky:

As part of our on-going design services for the above referenced project, Parsons Brinckerhoff personnel were on site Wednesday, August 31, 2011 and our representatives observed significant erosion and structural damage to the Bear Tavern Road Bridge over Jacobs Creek caused by Hurricane Irene on the prior weekend. In response we dispatched a structural engineer (Edwin Skrobacz , P.E.) to the site the following day on Thursday, September 1, 2011 to perform a visual inspection of the Bridge. Based on our inspection, numerous Priority E deficiencies were noted primarily to the Bridge substructure (foundation). Significant erosion of the stream banks and scour around the substructure were also noted. A summary of our inspection findings and recommendations to mitigate these defects are described below along with a sketch and photos.

Floodwaters have caused numerous abutment stones to dislodge or loosen directly below all four truss bearing support points. In addition, it was evident that floodwaters overtopped both the bridge and approach roadway, as noted by the large amount of debris lodged in floor support members and on the top of the deck (See Photo 1), pavement failure and a large scour hole which has formed on the southwest quadrant of the bridge. The Bridge southwest wingwall fronting the scour hole has collapsed (See Photo 2).

Areas of Concern

Most of the pointing between abutment stones is missing under the truss bearings (See Photos 3,4,5, 6, 11 and 12). Capstones and supporting foundations below each bearing point show signs of settlement (east side) with voids forming below each support (west side). Significant areas of concern were noted at the northwest corner and east abutment corners which compromise the bridge's structural stability. At the northwest corner, masonry abutment stones have completely dislodged (See Photo 3) creating large voids below the capstone undermining more than 50% of the support area. Only one remaining stone supports the bridge at this bearing point (See Photo 4). Failure of this stone will likely result in a partial or complete collapse of the bridge superstructure. At the eastern abutment, both bearings have settled downwards and rotated (See Photos 5, 6, and 12). At the southeast corner, the top of the stone abutment breastwall is bowed slightly outwards (towards the west). Continued or future settlement / bowing of this abutment will result in complete failure of the easterly abutment and subsequent collapse of the bridge.

A significant portion of the existing southwest wingwall has collapsed and the existing roadbed has become undermined which likely occurred from the floodwater overtopping the roadway at this location (See Photos 2 and 7). Severe scouring has occurred at the Northeast, Southeast and Southwest embankments, as noted in the before and after photos in Photos 8 through 11.

In addition, a few lateral bracing members have become severed below deck and are hanging downwards into the riverbed (See Photo 13) which will reduce the structural stability of the superstructure.

Conclusion

Due to the instability of the sub-structure as noted above, it is our opinion that a partial or full structural collapse could occur at any time. Continued exposure to surface runoff and flooding events will further undermine and erode the structure, we are therefore recommending that the County take immediate action to address this situation for two primary reasons; first to protect public safety and secondly, to salvage the bridge which has been deemed Historically significant by the New Jersey Historic Preservation Office. The bridge has been determined eligible for listing on both State and National Register of Historic Places. It has also been deemed a contributing element to a potential Historic District currently under consideration by the State Historic Preservation Office (SHPO).

The existing bridge is a Pratt Truss that is a non-redundant structural system which makes it extremely vulnerable to failure of any of the bridge supports. Failure at any of the supports would likely be catastrophic, resulting in a complete loss of the bridge.

Failure of the bridge poses immediate public safety concerns. While the bridge and approach roadway are currently closed to vehicular traffic, the area is still accessible to pedestrians and cyclists. In addition should the bridge fail, it could restrict flow and pose safety concerns to downstream structures.

The County is currently in the process of designing a new bridge crossing for Bear Tavern Road over Jacobs Creek, as well as rehabilitating the existing Historic Truss that is currently in jeopardy. It is therefore Parsons Brinckehoff's recommendation that the County remove the superstructure, salvage and properly store historic elements of the superstructure for future use including the truss members and floor beams. Final salvaging requirements should be coordinated with SHPO. The existing standing and collapsed masonry abutment and wingwall stones shall be salvaged and stockpiled off site for future reuse. We are also recommending the County stabilize the eroded embankments and areas where the existing substructures are to be removed.

Below is a summary a list of alternatives considered in formulating our proposed recommendation:

Mitigation Alternatives

Do Nothing - This option is not recommended as the Historic bridge will eventually collapse into Jacobs Creek which poses public safety concerns at the bridge site and downstream of the crossing, and will result in a complete loss of the bridge, prohibiting future re-use.

Shore up the Structure – This option proposes to temporarily shore the existing bridge superstructure. This will also require a complete replacement of the bridge abutments and wingwalls since the existing abutments and wingwalls are severely compromised and not fit for re-use. This option would also require the stabilization of the stream and road embankments. Existing masonry stone will be stockpiled for future re-use as part of a complete replacement or rehabilitation of the bridge. This option is not recommended for the following reasons: 1) it would require constructing supports and foundations in the river that will restrict water flow; 2) is extremely costly; 3) poses maintenance issues; and 4) shoring up the truss at the bearing locations will be difficult since the bottom chord is comprised of eyebars that cannot be shored against.

Dismantle Structure – This option proposes the dismantling of the existing historic truss and storing reusable historic elements for future rehabilitation and erection. This structure will need to be removed by a qualified contractor in a carefully planned manner with the greatest care practical as not to damage the existing truss components. Existing components will need to be braced as required during demolition to prevent buckling or damage during salvaging operations. The bracing will need to be designed by the Contractor as part of his/ her means and methods and reviewed by a Structural Engineer. Existing abutment & wingwall stones shall be removed and stockpiled for future use and the stream bed and banks stabilized.

We understand that the County could be performing this work on an emergency basis very soon. Prior to execution of the emergency work consultation with the State Historic Preservation Office is recommended.
Should you need more information please call me at 609-512-3564.

Very truly yours,

PARSONS BRINCKERHOFF, INC.

Michael Troncone, P.E.
Project Manager

Enclosures

cc: Str.

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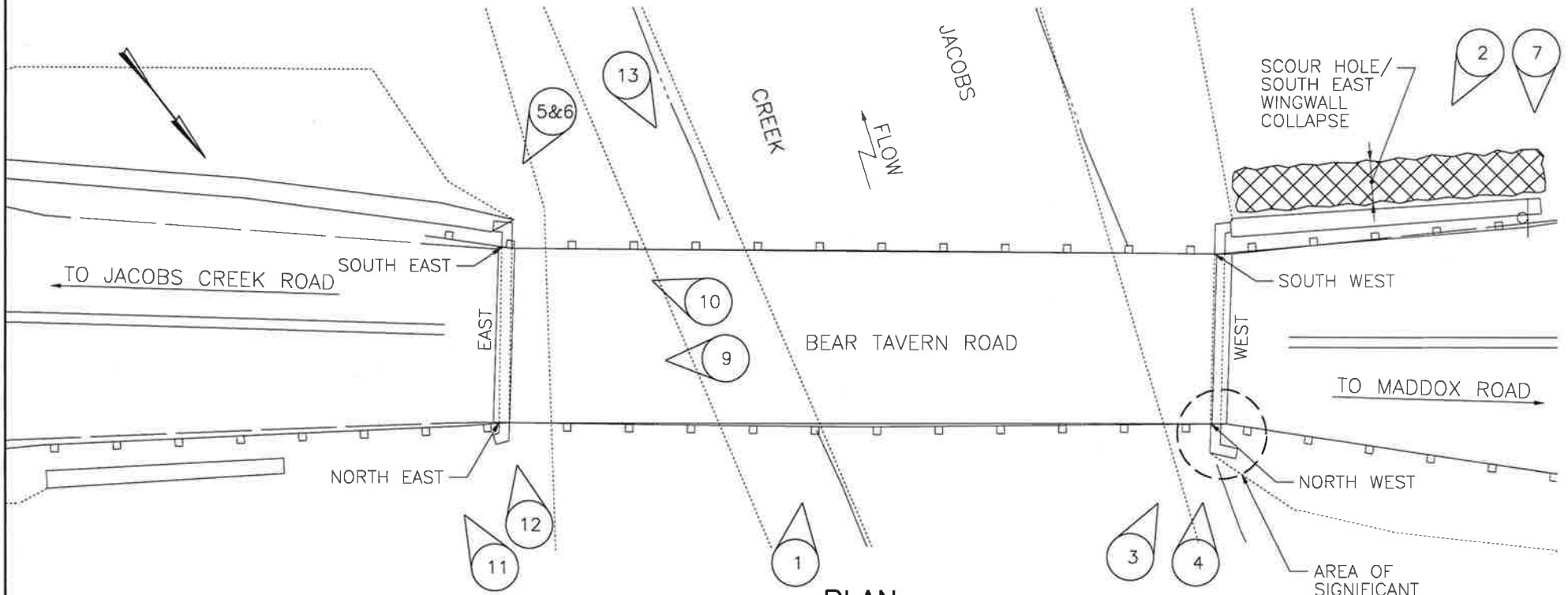

PLAN
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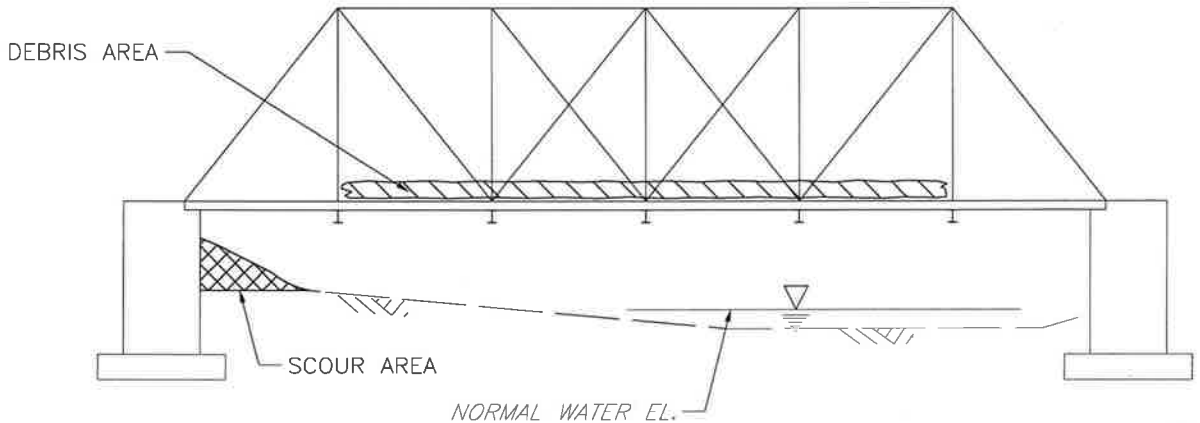

ELEVATION
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LEGEND:

X PHOTO LOCATION

PARSONS BRINCKERHOFF

JACOBS CREEK BRIDGE PLAN AND ELEVATION SKETCH

COUNTY BRIDGE #1100-060
COUNTY ROUTE 579 OVER JACOBS CREEK
HOPEWELL TOWNSHIP, MERCER COUNTY

Photo 1: General view showing large amount of flood debris lodged between the lower chord of the truss and the bridge mounted guide rail. Photo taken on the north side of the bridge looking south-west.

Photo 2: Complete failure of the stone wing wall on the southwest quadrant of the bridge due to large scour hole in front of the wall. Looking Northeast

Photo 3: Area of significant concern at the northwest corner of the structure. A large void has developed below the capstone undermining more than 50% of the support area.

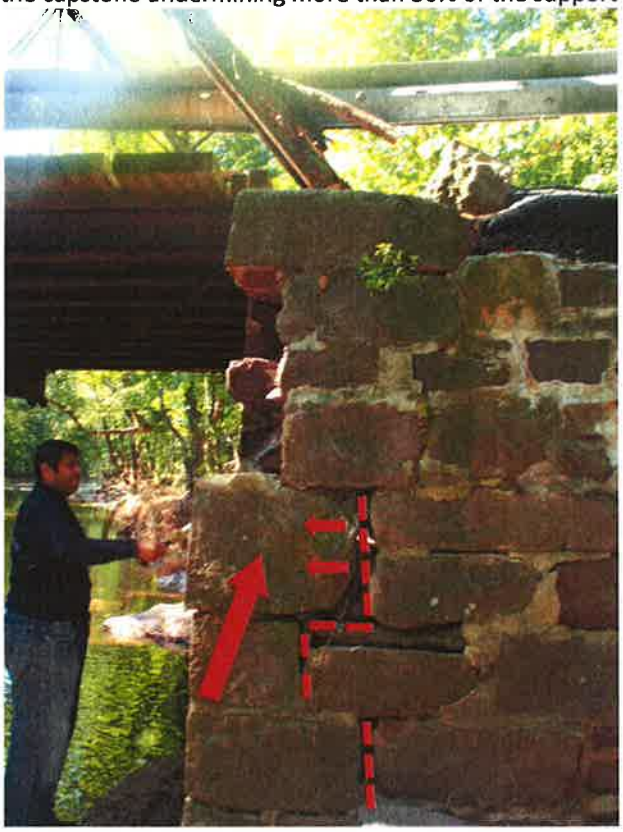

Photo 4: Note if one large stone becomes dislodged then a collapse or partial collapse of the superstructure is likely. Looking Southwest

Photo 5: Southeast truss bearing exhibits settlement and rotation due to movements of the substructure. Note the loose supporting stone and lack of mortar between stones directly below the bearing. Looking north

Photo 6: Loose bowed stone below the Southeast truss bearing. Looking south

Photo 7: Undermining of the west approach roadway on the south side due to overtopping floodwaters. Looking North

Photo 8: South Elevation of the bridge taken in February 2011. Note the location of the easterly riverbank. Looking North.

Photo 9: Location of embankment in front of the easterly abutment looking east. Photo taken on 4-27-11.

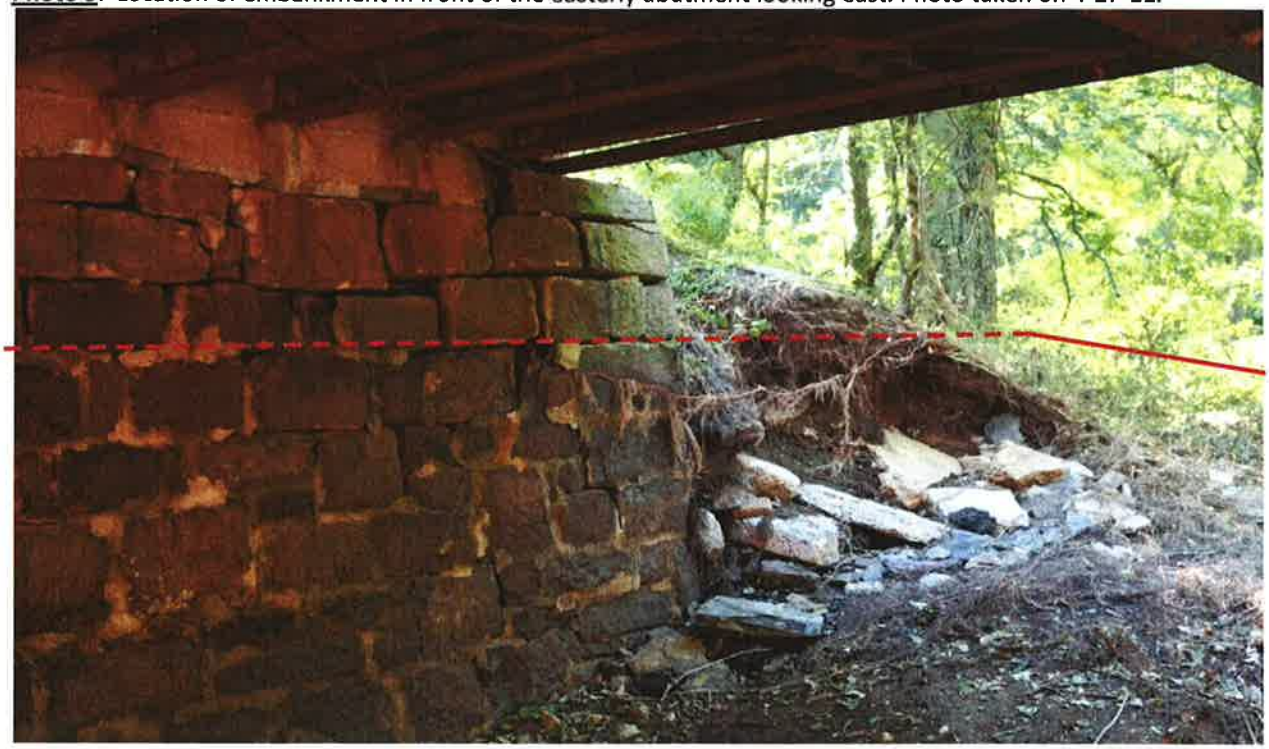

Photo 10: Location of embankment in front of the easterly abutment. Note the significant erosion in front of the stone abutment wall as compared with photo 9 and large scour hole on the southeast corner. Photo is looking southeast.

Photo 11: Large scour hole on the northeast corner of the bridge. Also note loose un-pointed stones below the truss bearing. Photo is looking southeast.

Photo 12: Rotated bearing and settled/bowed abutment.

Photo 13: Loose underdeck lateral bracing members hanging down off the superstructure. Looking North