Site-Specific Safety Issues at the Headquarters Road Bridge

A report prepared for the Delaware Riverkeeper Network by:

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"Safety" has been frequently invoked by PennDOT as part of its case for demolishing the Headquarters Road Bridge and replacing it with a larger structure. Our analysis shows that there are no persuasive safety arguments to support such a project.

In a very general sense, safety has been included in "purpose and need" statements, as in the Determination of Effects (DOE) report:

> The purpose of this project is to provide a crossing for Headquarters Road over Tinicum Creek, which is structurally sound and capable of **safely** and effectively handling the expected vehicular need of the public and emergency services of the surrounding area [emphasis added].[1]

More specific safety issues have been raised to support the assertion that there is a "site-specific safety problem" at the bridge. If the existence of a site-specific safety problem could be established it would not only support PennDOT's purpose and need statements, it would also provide a plausible reason for denying the agency's ability to apply flexible design standards there. As stated in the DOE report:

> AASHTO [the American Association of State Highway and Transportation Officials] states that existing bridges can remain in place without widening unless there is evidence of a site-specific safety problem related to the width of the bridge.[2]

PennDOT's rationale for concluding that there is a site-specific safety problem has changed over time. In the DOE report, the agency asserted that: "Given the existing design deficiencies and statistically high crash rates related to these deficiencies, there is a site-specific safety problem."[3]

The more recent Comment Response Document (CRD) puts forward two new rationales. First:

> Based on existing sight distance issues, sharp horizontal curvature along the eastern approach leading into the bridge, the inability of the Ottsville Ladder 49 truck to negotiate the turn from Sheephole

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[1] Determination of Effects Report (DOE), November 2015, 6.

[2] DOE, 15.

[3] DOE, 15.

> Road onto Headquarter (sic) Road Bridge in one complete turn, and evidence of repeated impacts to the bridge prior to a reduction in its width in 2000 and 2001, there is a site specific safety issue.[4]

And later:

> It is our professional engineering judgement given the intersection and bridge configuration and estimated traffic volumes, that the site specific safety problem is related to a one-lane bridge. We have received feedback from local residents about near head-on collisions from speeding drivers approaching the one-lane crossing. A two lane bridge would mitigate this hazard.[5]

These rather loose definitions of "site-specific safety problem" have been accompanied by a number of specific safety-related arguments, some of which have been abandoned, some of which of been added, and some of which have changed over time. The purpose of this paper is to summarize and analyze all of the shifting safety arguments that have been put forward by PennDOT. We believe that our analysis will demonstrate that there is no site-specific safety problem at the Headquarters Road Bridge.

We will refer to three PennDOT documents:

- The Determination of Effects report (DOE), November 2015, which sets out the basic arguments for the replacement project,
- The Comment Response Document (CRD), June 2016, which provides responses to comments (including ours) submitted to the DOE report, and
- The Bridge Width Evaluation report (BWE), April 2015, which was used as a source document for the DOE report.

Some of the analysis included in this report was included in previous reports made by Mark L. Stout Consulting to the Delaware Riverkeeper Network, all of which were submitted to the project record.

The following PennDOT arguments will be treated:

1. One-lane bridges are inherently less safe than two-lane bridges,
2. A statistical analysis shows a high accident rate at the Headquarters Road Bridge,
3. Analysis of the crash history supports the findings stated in 1 and 2 above,

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[4] Comment Response Document (CRD), June 2016, 10.

[5] CRD, 58.

4. A wider bridge is needed to accommodate emergency vehicles,
5. Sight distance and alignment are substandard on either side of the bridge,
6. A head-on collision was reported to be narrowly averted at the bridge,
7. There were reports of other collisions at the bridge, and
8. School buses have been reported to have had difficulties using the bridge.

1. Bridge width

PennDOT has noted that a one-lane bridge at this location does not conform to its current design manual and has implied that this raises a safety issue:

> Due to the existing structure's geometry and limited roadway width, it cannot safely and effectively accommodate current and future traffic needs.[6]

Specifically:

> PennDOT uses roadway classification and ADT estimates [traffic volumes] to assess [presumably using the PennDOT Design Manual] **safe** roadway and bridge widths [emphasis added].[7]

The implication – never directly stated – is that this "design deficiency" contributes to a site-specific safety problem. Although a design manual is a useful and important document for establishing standards, it is not a substitute for site-specific design and does not guarantee the "safest" outcome in a particular set of circumstances. In fact it is by no means certain that a two-lane bridge is safer than a one-lane bridge in all cases. A literature review was conducted to see if there was previous research regarding roadway safety at one-lane bridges or one-lane versus two-lane bridges. No applicable specific research was found on either subject. We would argue, in fact, that one-lane bridges can have a "traffic calming" effect by reducing traffic speeds.

2. Statistical accident analysis

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[6] DOE, 7.

[7] DOE, 15.

The DOE report, as previously noted, refers to "statistically high crash rates" related to design deficiencies.[8] As we pointed out in a previous report, which was submitted as a comment to PennDOT, this statement is apparently based on the safety discussion in the Bridge Width Evaluation report.[9] The BWE report provides a summary of crash data and argues that both the accident rate and crash intensity rates are "well above the statewide average." It is important to note that this analysis is based on a total of 10 crashes reported over 10-year period. It seems excessive to base significant conclusions on such a small sample. Indeed, even the BWE report states that no "crash clusters" could be identified because the small numbers could not meet the minimum threshold for that status. And although the statistics cited by PennDOT provide a minimal control for the overall level of development (rural) and traffic counts, these do not account for the local terrain (steep slopes and winding valleys) or the status of the roadway network (shifting bridge closures and attendant detours). A statistical analysis, in fact, provides only a general look at an area and should be subordinate to an analysis of the actual crashes at the location.

While PennDOT appeared to lay great store in this statistical analysis in the DOE and BWE reports, in the CRD report they have conceded that statistical analysis was merely a "starting point."[10] They attempt to retain some credibility for their statistical analysis by noting out that in the BWE report "the crash rate was calculated for 3 crashes in the most recent 5 year period," which, when compared with the low traffic volume in the area, results in "a crash rate that is significantly higher than the statewide average."[11] It is not clear which three crashes PennDOT is alluding to, but given that only three crashes in the list of ten that they analyzed for a ten-year period were even located at the bridge – and none of them apparently related to the geometry of the bridge – this is a very slender reed to base a statistical analysis on. As we shall see, the "starting point" that this analysis supposedly provided leads nowhere when the actual crash history is examined.

3. Crash history

[8] DOE, 15.

[9] Bridge Width Evaluation (BWE) report, April 2015, 6.

[10] CRD, 13.

[11] CRD, 13.

PennDOT's assertions regarding the crash history in the vicinity of the Headquarters Road Bridge were only presented in summary form in the Bridge Width Evaluation and Determination of Effects reports and as a result prevented any ability to understand or assess the accuracy of PennDOT's determinations regarding the implications of the accident for its claim of unsafe conditions due to the Headquarters Road Bridge. It required a Freedom of Information Act process for the Delaware Riverkeeper Network to obtain the actual list of crashes upon which PennDOT's conclusions were based.

Of the 10 crashes on PennDOT's list, only 3 occurred on or at the Headquarters Road Bridge. Of the 7 PennDOT reported crashes which were not at or near the bridge, 5 were located to the west of the bridge (4 of these west of the intersection with Red Hill Road) and 2 were located east of the bridge. **None of these 7 crashes has any relation to Headquarters Road Bridge.**

We were able to analyze the 3 crashes at or near the bridge using police records. Our analysis showed the following:

1. 24 October 2003. A vehicle driving westbound on Headquarters Road attempted a left turn onto the bridge and slid on an icy road surface on the bridge, resulting in contact with the bridge wall. This crash occurred at the bridge but was not caused by the geometry of the bridge. There is nothing in the CDART Crash Resume Data report, obtained from PennDOT using the Freedom of Information Act, to contradict this assessment.
2. 7 May 2006. A motorcyclist reported losing control of his eastbound motorcycle on loose gravel as he entered the bridge. This crash occurred at the bridge but was not caused by the geometry of the bridge. There is nothing in the CDART Crash Resume Data report to contradict this assessment.
3. 6 July 2007. A vehicle driving westbound was reported as having made contact with a fence or wall near the bridge. Based on the limited description and the police sketch, the vehicle probably made contact with the fence on the western end of the bridge. PennDOT evidently considers this crash to be at the bridge. We believe it occurred at some point west of the bridge, not at the bridge. The location data provided by PennDOT is ambiguous, but the police narrative, sketch, and coding ("hit fence or wall," as distinguished from other possible choices, such as "hit bridge pier or abutment," "hit parapet end," "hit bridge rail," or "hit concrete or longitudinal barrier") all suggest contact with the fence west of the

bridge. In any event, in any event, the crash was not caused by the geometry of the bridge. There is nothing in the CDART Crash Resume Data report to contradict this assessment.

In its most recent document, PennDOT has now conceded that "upon a more detailed investigation" (presumably following our detailed investigation) that "the police do not report that the accidents were directly caused by the bridge."[12] PennDOT does hold open the possibility that the 3 crashes at the bridge may have some value for their case, however: "Even though the width of the bridge may not have been the direct cause of the crashes on the bridge, it is not possible to rule out that there could be geometry and/or drainage issues (i.e., wide turns coming off the single lane bridge; icy roadways and debris indicate drainage issues that can form a site-specific safety concern and should be addressed)."[13] A review of the description of the three accidents cited above will reveal that none of these conjectures has any basis in the police reports.

4. Emergency vehicle access

PennDOT has continually expressed concern about the ability of the Headquarters Road Bridge, assuming a curb-to-curb width of 16 feet, to accommodate emergency vehicles. Although sometimes stated in broad terms, the specific issue always raised is the ability of the Ottsville Fire Company's longest vehicle, Ladder 49, to make (1) a left-hand turn from the bridge onto Sheephole Road in one continuous move and (2) a left-hand turn from Headquarters Road onto the bridge.

Our research showed that the bridge did in fact accommodate the largest vehicles available to the Ottsville company, even when at a reduced 10-foot width, although not all turns could be done in one move. With the bridge closed, of course, no emergency vehicles at all can cross it. The fire chief has stated repeatedly that his highest priority is not to secure a wider bridge but to have the bridge reopened as quickly as possible.

However, we have suggested in the past that if accommodating Ladder 49 is the highest priority, that can be accomplished by making minor improvements to the intersection of Headquarters Road and Sheephole

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[12] CRD, 10.

[13] CRD, 15.

Road, without altering the footprint of the bridge. An engineering study by Roberts Engineering, which will be presented for the record, has been done to establish that point.

5. Sight distance and alignment

The roadway network of Tinicum Township is characterized by narrow, winding, hilly roads which traverse a very rural, heavily wooded landscape. PennDOT has periodically called attention to sight distance and alignment issues in the vicinity of the bridge. For instance, the "sight distance and horizontal curve radius of the western approach…does not meet PennDOT safety criteria"[14] and the "sharp horizontal curvature along the eastern approach"[15] is also a concern. None of these identified approach roadway issues is asserted to be actually at the bridge or related in any way to traffic traversing it.

PennDOT concedes that sight distance and alignment will continue to be "substandard" for every alternative considered and that any effort to address these would substantially increase project size, cost, and impact. Therefore, "correcting the alignment and sight distance are not part of the project need but are part of the overall determination as to whether a site specific safety issue is present when considering design exceptions for other design criteria."[16]

We are left to conclude that PennDOT justifies demolishing the Headquarters Road Bridge and replacing it with a bigger structure at least in part because they have identified sight distance and alignment issues on the approach roads which (a) are typical of roads in Tinicum Township, (b) unrelated to the bridge itself, and (c) will not be addressed by the proposed bridge project.

6. Reported near head-on collision

In the Comment and Response document, PennDOT notes a comment by Marilyn Herd, a local resident, that she was "almost killed" by a speeding

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[14] DOE, 7.

[15] CRD, 10.

[16] CRD, 5.

motorist who failed to stop at the STOP sign at the western end of the bridge. They respond that "Incidents such as these which go unreported to police are important to consider in evaluating whether there is a site-specific safety issue."[17] Ms. Herd's comment is elsewhere cited as corroborating "an issue with vehicles negotiating turns onto the bridge,"[18] which it does not in fact appear to do. At another place, PennDOT uses "the feedback from local residents who have experienced near head-on collisions on the bridge"[19] to challenge the idea that a one-lane bridge can be safe here.

Are there other local residents in addition to Ms. Herd who have recounted these events? If not, this one reported incident is given far great significance than it should, especially since the immediate cause of the incident was a motorist's failure to comply with an authorized traffic control device (STOP sign), and there is in fact no information whatsoever to substantiate when, where, and if this incident happened as later recounted.

7. Reported 2001 collisions

PennDOT also makes reference in the Comment and Response document to (1) collision damage documented in 2000 and 2001 inspection reports and (2) a 2001 collision "which resulted in guiderail dislodging from the bridge and falling into the creek, and the subsequent placement of concrete barriers."[20] Without any further documentation it is impossible to assess whether these reports are at all useful in evaluating what has happened or may happen in the future at the bridge.

8. School buses

PennDOT has also made reference, in the Comment and Response document, to reported school bus problems. Although not included in their summary criteria for site-specific safety problems, the related

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[17] CRD, 49.

[18] CRD, 10.

[19] CRD, 19.

[20] CRD, 10.

discussion includes a reference to a comment by consulting party Tim Cashman in 2013 that school buses had "impacted the bridge when it was still open to traffic."[21] Again, without any further documentation it is impossible to assess whether this report is at all useful in evaluating what has happened or may happen in the future at the bridge.

Mark L. Stout Consulting team qualifications

Mark Stout is an independent transportation consultant and is principal of Mark L. Stout Consulting. His consulting practice addresses a wide range of transportation policy issues, including state and federal funding challenges, climate change, organizational transformation, and Smart Growth planning. His clients include state transportation departments, national and state nonprofit and advocacy groups, and metropolitan planning organizations. His recent work includes providing strategic planning advice to a state DOT; directing a regional multimodal strategic land development plan for a local government; coaching a medium-sized MPO in setting up a Smart Growth transportation program; providing policy support for a national transportation reform group, including making recommendations for supporting state DOT transformation in reauthorization legislation; helping state DOTs to collaborate with environment and energy agencies on a regional basis in addressing transportation and climate change issues; and coaching several state advocacy groups in the skills needed to engage state DOTs in project selection and capital programming.

Mark Stout's experience in Pennsylvania has included work with 10,000 Friends of Pennsylvania, the Lancaster County MPO, the Delaware River Joint Toll Bridge Commission, and extensive collaboration with PennDOT and DVRPC. He was co-manager of the development of the joint

[21] CRD, 10.

PennDOT/NJDOT Smart Transportation Guidebook: Planning and Designing Highways and Streets that Support Sustainable and Livable Communities.

Dr. Stout previously served more than 25 years with the New Jersey Department of Transportation. As Assistant Commissioner for Planning and Development he was responsible for the divisions of planning, capital programming, project development, local aid, freight services, aeronautics, and environmental resources. His accomplishments included leading the development of new Smart Growth planning tools, developing and implementing a performance-based capital planning and programming system, leading organizational transformation, leading the Department's response to climate change and energy policy challenges, managing major legislative initiatives, and developing a new statewide long-range transportation plan. He was previously Director of Capital Investment Planning and Development, where he managed the development of the Department's $1.5 billion annual capital program for transportation, as well as managing the flow of federal and state funding for projects. He has also served as a legislative assistant in the U.S. Congress.

Dr. Stout is a nationally recognized expert in transportation and land use planning, transportation and climate change, and transportation policy and legislation. He has published and spoken widely on transportation issues and produces his own "Smart Transportation Blog" (at www.mlstoutconsulting.com). He holds a BA in political science from Washington University in St. Louis and a PhD in political science from the London School of Economics.

William E. Anderson is a traffic engineer who had a 31-year career at the New Jersey Department of Transportation involving traffic engineering and traffic safety. He managed statewide highway safety programs and led a multi-disciplinary team responsible for reviewing high-profile crash locations. He served as Manager of the Bureau of Traffic Engineering and Safety Programs from 1993 to 2001, responsible for approval of all traffic control devices on state, county, and municipal roadways.

At Stantec Consulting he was the project supervisor for NJDOT planning and for operational review of task order assignments. He developed Traffic Impact Statements and Access Permits for private developer projects in New Jersey, Pennsylvania, and Virginia. He also conducted analyses of road-off-road crashes for the New Jersey Turnpike Authority on the Turnpike and Garden state Parkway.

He has been a member of the Adjunct Faculty of the Rutgers University School of Government Services, where he developed and taught two courses: Traffic Engineering for Police Officers and Advanced Traffic Engineering for Police Officers. These courses provided training in the application of the Manual on Uniform Traffic Control Devices and the identification and analysis of traffic safety problems.

He is currently a member of the National Committee on Uniform Traffic Control Devices and the New Jersey Governor's Highway Traffic Safety Policy Advisory Committee.