DELAWARE RIVERKEEPER NETWORK

Enclosures:

Comments on the Draft Categorical Exclusion Evaluation, Princeton Hydro, January 9, 2017

Headquarters Road Bridge Rehabilitation Preliminary Plans, Bond, January 11, 2017

Draft Categorical Exclusion Evaluation, Meliora Design, January 12, 2017

Headquarters Road Bridge Rehab Analysis, McMullen and Associates, April 2, 2014

Headquarters Road Bridge – Coring Tests, *McMullan & Associates Report*, March 18, 2014

Letter dated March 25, 2003 to Tinicum Township from PennDOT

National Register Amendment, Ridge Valley Rural Historic District, May 5, 2005

US Department of Interior Determination of Eligibility of Headquarters Road Bridge to National Register of Historic Places, April 28, 2006

Letter Dated August 13, 2015 written by Maya van Rossum, the Delaware Riverkeeper, to Jon Crum, FHWA

Letter dated August 26, 2015 written by Jon Crum, FHWA, to Maya van Rossum, the Delaware Riverkeeper

Letter dated June 14, 2013 written by Robert Reynolds to Ed Rodgers, Delaware Riverkeeper Network

Letter dated December 15, 2016 written by Robert Reynolds to Maya van Rossum, the Delaware Riverkeeper

The Bridges of Tinicum Township, prepared for the Delaware Riverkeeper Network by Robert Reynolds, August 13, 2015

Determination of Effects Report, Pennsylvania Department of Transportation for PADEP, November 2015

Letter dated June 21, 2001 written by NPS to PennDOT regarding Geigel Hill Road Bridge

Letter dated July 7, 2016 written by Meliora Design to Maya van Rossum, the Delaware Riverkeeper

Expert Report on PennDOT Determination of Effects Report, Meliora Design, December 14, 2015

Report on potential stream impacts from Sheep Hole Road Bridge Replacement, Princeton Hydro, July 7, 2016

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Response to PennDOT Comments on Sheephole Bridge Replacement, Princeton Hydro, January 12, 2017

Natural Areas Inventory of Bucks County, Pennsylvania, Ann F. Rhoads and Timothy A. Block, Bucks County Commissioners, 1999

Impacts of new highways and subsequent landscape urbanization on stream habitat and biota, Reviews in fisheries science, 13(3), 141-164. A. P. Wheeler, P. L. Angermeier, & A. E. Rosenberger

Section 106 Mitigation and Minimization Memo, FHWA and PennDOT, November 15, 2016

PennDOT Public Hearing minutes, December 13, 2016

Design Manual Part 1B Post-tip NEPA procedures, Pennsylvania Department of Transportation, November 9, 2015, retrieved from https://www.dot.state.pa.us/public/PubsForms/publications/pub%2010/Pub10B_Cover.pdf

Comments on PennDOT DOE Report, Mark L. Stout Consulting, December 14, 2015

Supplement to Dec. 14, 2015 Comments on PennDOT DOE Report, Stout Consulting, January 18, 2016

Determination of Effects Report Comment Response Document, June 23, 2016

Preliminary Design for Intersection Improvements at Headquarters Road Bridge and Sheephole Road, Roberts Engineering for Mark L. Stout Consulting, June 21, 2016

Tinicum Twp. Board of Supervisors Meeting Minutes, October 20, 2015

Tinicum Township Bridge Controversy, Bo Koltnow, WFMZ News, August 19, 2016, retrieved from http://www.wfmz.com/news/news-regional-southeasternpa/tinicum-township-bridgecontroversy/41276656

Review of Headquarters Road Bridge Project- Determination of Effects Report, McMullan and Associates, December 7, 2015

Headquarters Road Bridge Over Tinicum Creek, PennDOT Response to DRN July 8 Comment, July 27, 2016

Existing Structure Condition Evaluation Report, Urban Engineers for PennDOT, August 18, 2006

Pennsylvania Department of Transportation Project Specific Agreement, March 23, 2005

PennDOT Purpose and Need Statement with Consulting Party Meeting Minutes, June 17, 2013

MEMORANDUM

VIA EMAIL

To: Maya van Rossum, Delaware Riverkeeper

From: Mary Paist-Goldman, P.E.

Subject: Comments on the
Draft Categorical Exclusion Evaluation for
S.R. 1012, Section BRC
Headquarters Road/Tinicum Creek
Tinicum Township, Bucks County, Pennsylvania
Princeton Hydro Project No. 1020.017

Date: January 9, 2017

Pursuant to your request, Princeton Hydro has completed a review of the Draft Categorical Exclusion Evaluation of S.R. 1012, Section BRC – Headquarters Road/Tinicum Creek as prepared by A.D. Marble and dated November 2016.

Our comments are as follows:

- On page 4, the document states, "Sediment deposition, coupled with the movement of the stream over time, has caused the stream channel to intersect with the westernmost abutment, creating a scour hazard."

  There is no evidence presented in the report to indicate that sediment deposition has created the problems described at the bridge. Sediment deposition is a natural stream function and the reach in the vicinity of the bridge is prone to sediment deposition as the stream travels around a bend approximately 400 feet upstream of the bridge. As streams slow down, the natural tendency is for sediment to deposit as is the case in the straighter stream stretch in the vicinity of the bridge. Just downstream of the bridge a riffle feature exists as a result of hydraulics changing as water moves through the bridge section.

- Page 4 of the document states, "To temporarily alleviate concerns of the substructure deterioriating further, grout bags were installed to address immediate scour concerns..."

The document does not provide the reasoning behind the selection of this type of temporary scour countermeasure and the timeline for its placement. PennDOT's guidance manual[1] for the selection of scour countermeasures identifies several disadvantages for the placement of grout bags. These are as follows:

- The potential of local scour is increased if the cross-section of the pier or abutment is increased.
- Cement washout from the grout fill material may cause pollution and diminish local biological habitats.

Local resident feedback provided during Princeton Hydro's assessment of the CE document included the following: "the grout bags choked down the through-bridge channel, causing the restricted stream to blast out the loose rock formerly covering the creek bed right down to bedrock, under and around the grout bags." According to the local resident, the grout bags have exacerbated the scour problems currently being experienced at the bridge. Prior to that point, the resident indicates that there were aggradation/degradation processes occurring at the bridge where the natural stream substrate was washing into and out of the bridge footprint and no obvious scour was occurring at the bridge piers or abutments.

- Page 6 of the document states, "The existing Tinicum Creek has meandered over the years. As the stream continues to meander the upstream banks have become unstable. The existing channel under the existing bridge exhibits evidence of contraction scour, which results from the meandering stream."

  The Tinicum Creek has a natural meander pattern, however, the meanders are generally linked to the bedrock outcrops which exist in the river valley and are not associated with upstream bank instabilities. Meander bends in the Tinicum Creek are constrained by the geologic features which exist and no significant change to the meander bend pattern has been noted by local residents or in available aerial maps of the project site. A shift in the stream thalweg has been noted upstream of the bridge within recent years, however, this is due to a tree which has fallen upstream of the existing bridge. The tree's placement is such that the thalweg of the stream shifts away from the left bank (where it hugs the existing bedrock outcrop) into the western bridge abutment.

  Current FHWA standards[2] include a definition for contraction scour which states, "Contraction scour, in a natural channel or at a bridge crossing, involves the removal of material from the bed and banks across all or most of the channel width. This component of scour results from a contraction of the flow area at the bridge which causes an increase in velocity and shear stress on the bed at the bridge. The contraction can be caused by the bridge or from a natural narrowing of the stream channel." There is no mention that

[1] August 3, 2012, PennDOT, Selection & Design of Scour Countermeasures for Pennsylvania Bridges - FINAL REPORT

[2] April 2012, Publication No. FHWA-HIF-12-003, Hydraulic Engineering Circular No. 18, Evaluating Scour at Bridges, Fifth Edition

meandering of streams leads to contraction scour in the FHWA definition and there is no evidence provided in the CE document that the Tinicum Creek meander patterns would result in contraction scour.

- Page 7 of the document states, "The normal stream depth upstream of the structure is approximately 6 inches deep. At its deepest point of the scour hole, the stream bed is nearly 5 feet deep."

  Princeton Hydro's hydraulic analysis of the Tinicum Creek indicates stream depth at bank forming flows of nearly three feet immediately upstream of the bridge. It is unclear the reason these depths are called out and what value this adds to the CE document. In typical streams of this type, pool and riffle features exist and there can expected to be variations in stream depth as water travels through the system.

- Page 7 of the document indicates compliance with a Chapter 105 regulation that "Bridge piers shall be kept to a minimum in number and cross-sectional area and shall be designed to offer the least obstruction to the passage of water and ice, consistent with safety."

  Although there are two existing bridge piers and the proposal by PennDOT will reduce the number of bridge piers, there are no existing issues with water and ice passage noted at the bridge and a rehabilitation of the existing bridge would not result in a change from the existing condition.

  It is worth noting that the draft CE makes no mention of a section of Chapter 105 which was not complied with. In particular, it is worth noting the following: § 105.171. Maintenance – "The owner or permittee of a culvert or bridge is responsible for maintaining the structure opening thereof in good repair and assuring that flood carrying capacity of the structure is maintained. The owner or permittee shall inspect the opening and approach of the culvert or bridge at regular intervals of not less than once each year…" The tree mentioned earlier in this report has been in the channel immediately upstream of the bridge for well in excess of a year and not been removed despite its obvious potential threat to the bridge piers and abutments. In addition, PennDOT cites deterioration of the bridge structure as a need for replacement, however, the structure opening was not being maintained in good repair as per the Chapter 105 regulations.

- Pages 7 and 8 states, "In-stream work would include temporary stream diversions and the dewatering of areas…" and "portions of the stream would need to be dewatered during construction for the removal of the piers, resulting in a temporary impact to the stream."

  The draft CE does not include details on the potential stream diversions or the planned dewatering of the stream channel. The timing for these dewatering activities is also not detailed. In order to ensure that there are no negative impacts to the EV stream, more detail is required. It is worth noting that the Tohickon Creek is connected to the Tinicum Creek in certain areas and the timing and duration of dewatering activities should be detailed. Impacts to groundwater as a result of planned dewatering activities should be evaluated as this interconnection with the Tohickon may impact critical groundwater areas.

- Page 8 states that “installation of rip-rap stone scour countermeasures. This scour countermeasure would be depressed to a depth of approximately 1 foot below the finished grade of the stream...”

  The report stated previously that the scour hole noted at the bridge had a depth of 5 feet. How would riprap placed to a depth of 1 foot address scour sufficiently given the depths noted in the report? In addition, no details are provided on the size of the riprap proposed.

- Page 18 of the CE states, “305 linear feet of Tinicum Creek will be permanently impacted from scour protection” and “the proposed project would temporarily impact 33 linear feet of Tinicum Creek.”

  The bridge footprint noted on page 10 of the CE shows a temporary construction easement which extends for a total stream length of approximately 60 feet, which is far less than the 305 feet mentioned in the report. The placement of the riprap scour countermeasures should be identified on a plan and detailed calculations provided. The temporary impacts noted are not detailed.

- Page 18 also indicates that “the reduction of potential scour would improve water quality by reducing the deposition of sediment in this EV stream.”

  The proposed project will not reduce the deposition of sediment in the EV stream overall. The natural stream processes will continue and sediment deposition is a normal stream function. If all sediment deposition was removed, the stream would be void of necessary ecological and biological functions essential to overall stream health. Reducing scour does not reduce sediment deposition; in fact, scour countermeasures reduce channel bed degradation in the vicinity of the bridge only as needed to protect the bridge infrastructure.

- Page 18 states, “this alternative would also improve the free-flowing nature of the creek through the removal of two piers and the repositioning of the western abutment outside of the stream channel.”

  Removal of piers does not improve “free-flow” of the creek as these features are not a barrier nor do they create ponding effects as a dam would. Further, it can be argued that overwidening the channel by repositioning the western abutment may in fact negatively impact the flow of the creek as the water depths are fairly shallow and would become more so with a wider overall channel bottom through the expanded bridge cross-section described in the CE document.

- Page 18 also states, “rip-rap extending along the stream bank immediately adjacent to the structure will be choked in with soil and seeded with a riparian seed mix in order to provide a more natural aesthetic.”

This is inconsistent with PennDOT's antidegradation policy[3] and the Act 167 stormwater management plan. PennDOT's antidegradation policy states that vegetative alternatives for slope and channel erosion protection should be considered. In addition, the antidegradation policy states that "advances in erosion control technologies in recent years has made it possible for vegetated lining to be used in channels that may experience moderate to high velocities and shear stresses. In fact, some products offer higher shear stress resistance than riprap lining. Vegetated channels also provide water quality benefits, such as filtering and adsorption of pollutants, which riprap channels do not." In addition, the use of riprap banks does not provide any environmental or ecological benefits to the EV stream such as tree canopy for temperature control.

- Page 22 of the CE states, "The project will have no significant floodplain encroachment…, since the project will not: 3. Have a significant adverse impact on natural or beneficial floodplain values."

  This is not supported by the narrative which follows this statement in the CE draft. Attempts by PennDOT in the past to address localized overtopping of the bridge during flood events have not been sufficient. Two small cross drains were installed in the 1970's to address resident complaints, however, these pipes were not sized properly and create pressurized flow conditions prior to overtopping of the road surface itself. In addition, the floodplain detailed on the effective FEMA Flood Insurance Rate Map for the project area depicts a narrowing of the overall floodplain at the bridge. The FIRM gives the appearance that the floodplain narrows in the vicinity of the bridge; however; this is not an accurate reflection of what occurs at the site and is not supported by past flood events. According to a local resident, the bridge itself has overtopped at six times since 1989 and has a history of frequent flooding. The overall flood extents stretch several hundred feet from the bridge crossing and have resulted in property damage and the roadway is frequently flooded out. The proposed bridge opening expansion and the elimination of one pier may have an adverse impact on the floodplain as the opening is increased. This will convey more water through the bridge opening, thereby reducing connection to the natural floodplain.

- Page 22 states, "There is moderate erosion of the left and right sides of the upstream banks." Later in the same paragraph, however, the report states "With the exception of the sloping trees on the downstream end, the banks upstream and downstream seem stable."

  This statements are confusing and misleading. Bank erosion exists upstream of the bridge as a result of the tree that fell and created a shift in the stream thalweg. The thalweg was redirected by the tree into the upstream western bank and abutment creating scour at this location and localized bank erosion. This can be addressed through the incorporation of

[3] 2015 Edition, PennDOT Pub 584 – Drainage Manual

natural channel design techniques such as j-hooks, single stone bendway weirs, and/or the use of large woody debris to redirect the stream away from the bank and the bridge abutment.

- Page 22 of the report states that the slope in front of the proposed abutment will be seeded with “a riparian seed mix that will be compatible with EV waters.”

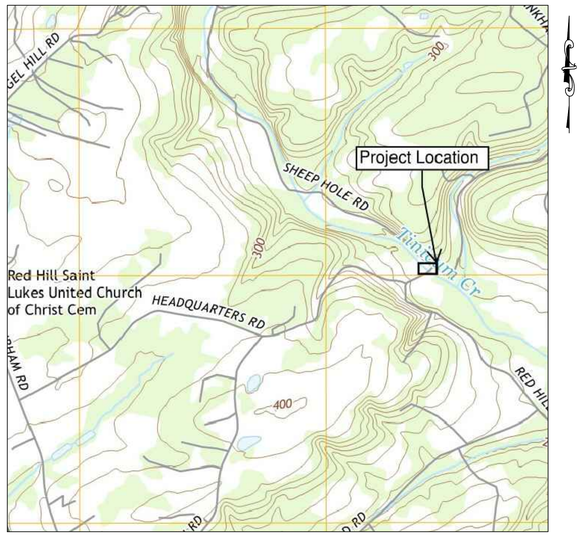
  No details are provided for this seed mix and it is unclear what this includes. It is presumed that this seed mix will include native species, however, the type of species and the value they will provide to the EV stream is unclear.

PROJECT NOTES

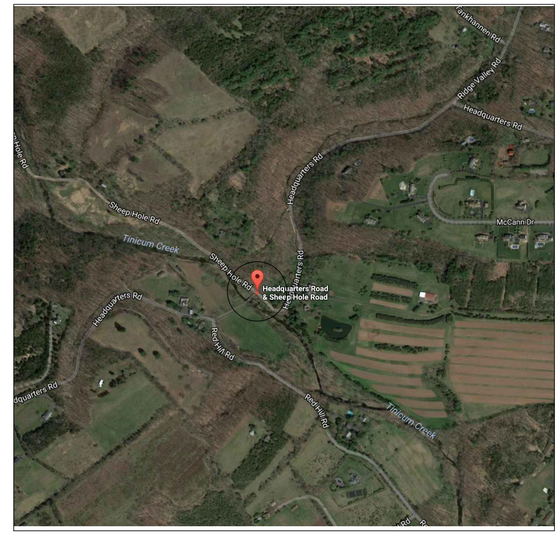
1. THESE PRELIMINARY PLANS FOR THE REHABILITATION OF HEADQUARTERS ROAD BRIDGE HAVE BEEN PREPARED FOR THE DELAWARE RIVER KEEPER NETWORK AND ARE NOT FOR CONSTRUCTION NOR HAVE THEY BEEN APPROVED BY THE PENNSYLVANIA DEPARTMENT OF TRANSPORTATION. THESE PLANS CALL FOR THE REHABILITATION OF THE EXISTING STONE MASONRY PIERS, ABUTMENTS AND WINGWALLS; AND, THE REMOVAL AND REPLACEMENT OF THE EXISTING SUPERSTRUCTURE.
2. DESIGN EXCEPTIONS TO THE PENNDOT STANDARDS ARE NEEDED PRIOR TO THE DEVELOPMENT OF THESE PRELIMINARY PLANS INTO CONSTRUCTION DOCUMENTS. THESE INCLUDE BUT ARE NOT LIMITED TO:
   A. THE REQUIREMENTS FOR ONE LANE BRIDGES AS SHOWN IN TABLE 1.11 COLLECTOR AND LOCAL ROAD FACILITIES, NEW AND RECONSTRUCTED BRIDGES (PAGE 1-36) AS MODIFIED BY "BRIDGE WIDTH NOTES" PAGE 1-37 ITEM (E), ONE-LANE BRIDGE, THIRD BULLET SHALL APPLY (SEE STRIKE OFF LETTER (SOL) 482-13-34 DATED DECEMBER 20, 2013 WHICH REVISES PUBLICATION 13M, DESIGN MANUAL PART 2.
   B. AN EXCEPTION IS REQUESTED FOR THE TRUCK TURNING MANEUVER TRAVELING SOUTHEAST ON SHEEPHOLE ROAD, TURNING RIGHT ONTO THE BRIDGE OVER TINICUM CREAK AND HEADQUARTERS ROAD.
3. ADDITIONAL INVESTIGATIONS OF EXISTING CONDITIONS ARE NEEDED FOR THE DEVELOPMENT OF CONSTRUCTION DOCUMENTS.
4. TINICUM TOWNSHIP SHALL HAVE THE RIGHT TO ACCESS AND OBSERVE ALL CONSTRUCTION.
5. ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH PENNDOT SPECIFICATIONS.
6. ALL WORK PERFORMED WITHIN THE RIGHT OF WAY SHALL BE IN ACCORDANCE WITH PENNDOT STANDARDS FOR ROADWAY CONSTRUCTION.

STATE ROUTE 1012 (HEADQUARTERS ROAD)
HEADQUARTERS ROAD BRIDGE REHABILITATION

PRELIMINARY PLANS
PREPARED FOR
THE DELAWARE RIVERKEEPER NETWORK



1 USGS TOPOGRAPHIC CONTOUR MAP
PORTION OF THE WEST CHESTER QUADRANGLE
WEST CHESTER, PENNSYLVANIA
SCALE: 1" = 2000'



2 ORTHOPHOTOGRAPHY - SITE LOCATION

INDEX OF DRAWINGS

SHEET NO.	DESCRIPTION
1	TITLE SHEET
2	GENERAL PLAN AND ELEVATION
3	EXISTING PLAN AND ELEVATION
4	EAST ABUTMENT DETAILS AND NOTES
5	WEST ABUTMENT DETAILS
6	EAST PIER DETAILS
7	WEST PIER DETAILS
8	MASONRY DETAILS
9	TRUCK TURNING PLAN
10	SECTIONS AND DETAILS
11	ROAD PROFILES
12	SCOUR COUNTERMEASURE PLAN

MARK	DESCRIPTION	BY	CHK'D	RECM'D	DATE

REVISIONS

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
DOUGLAS EDWARD BOND
ENGINEER No. PE079367
COMMONWEALTH OF PENNSYLVANIA

DATE

PREPARED BY:

McMULLAN & ASSOCIATES, INC.

CONSULTING STRUCTURAL ENGINEERS
1861 WIEHLE AVE, STE 125
RESTON, VA 20190
PH. 703-556-0651

DESCRIPTION	DWG. NO.	APP. DATE
THRIE-BEAM DETAILS	BC-703M	9/30/2016
BEARINGS	BC-755M	9/30/2016
REINFORCEMENT BAR DETAILS	BC-736M	9/30/2016
DOWEL AND DIAPHRAGM DETAILS	BD-651M	4/29/2016
PRESTRESSED BEAM DETAILS	BD-652M	4/29/2016
TYPICAL SPREAD BOX FRAMING DETAILS	BD-653M	4/29/2016
TYPICAL LONGITUDINAL SECTIONS	BD-656M	4/29/2016

SUPPLEMENTAL DRAWINGS

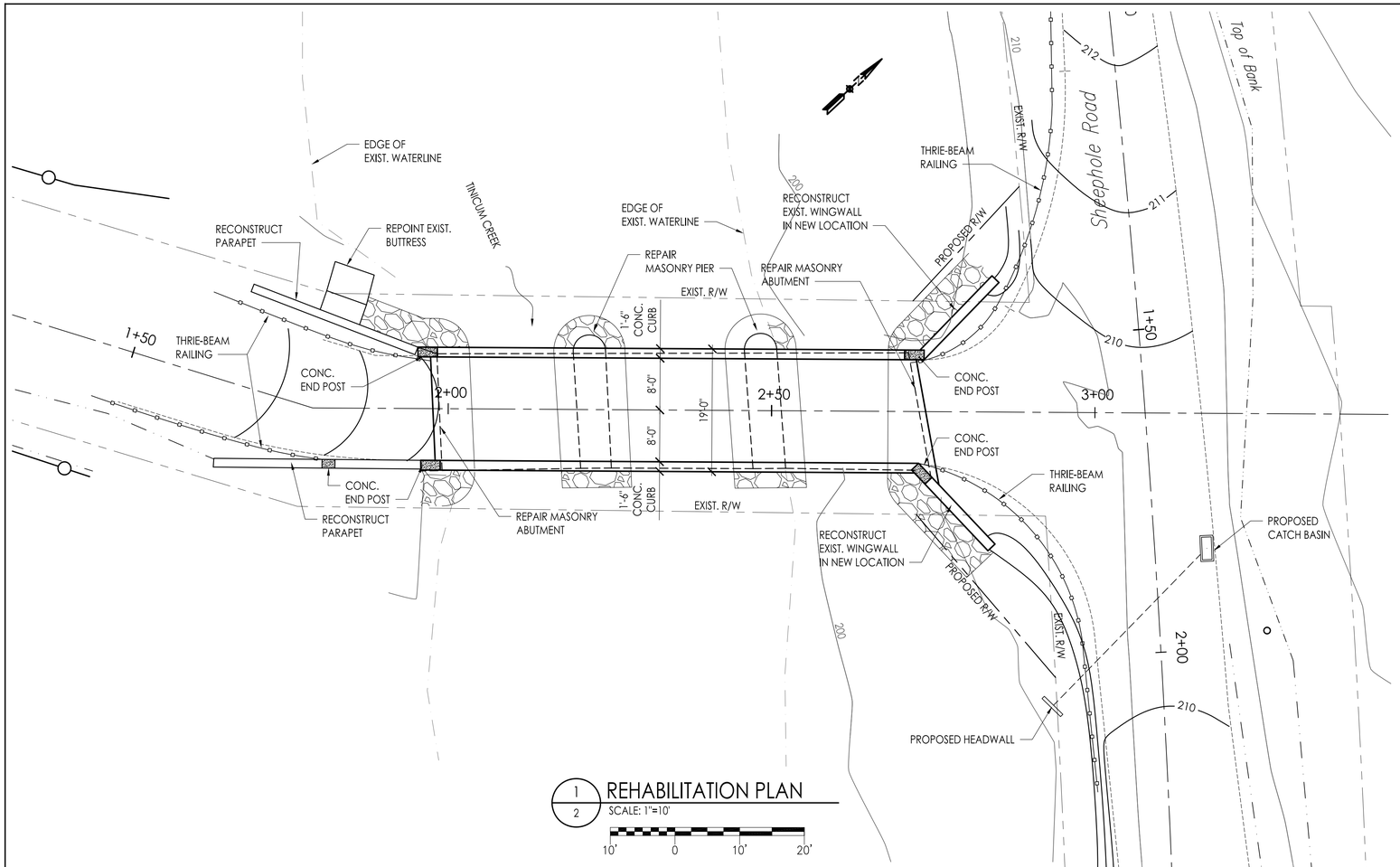
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUCKS COUNTY
STATE ROUTE 1012 (HEADQUARTERS ROAD)
HEADQUARTERS ROAD BRIDGE REHABILITATION

TITLE SHEET

RECOMMENDED _____

DISTRICT BRIDGE ENGINEER

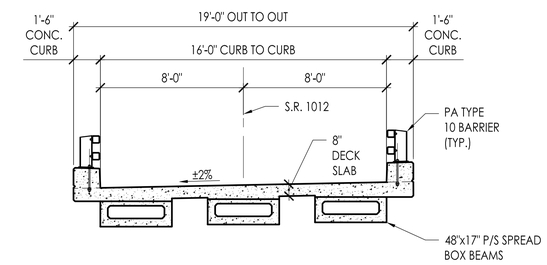
SHEET 1 OF 12
+ SUPPLEMENTAL DRAWINGS



1 / 2 REHABILITATION PLAN
SCALE: 1"=10'
10' 0 10' 20'

NOTES:

1. DESIGN SPECIFICATIONS: AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, 7TH EDITION 2014, AND AS SUPPLEMENTED BY DESIGN MANUAL PART 4, APRIL 2015.
   1.1. LIVE LOAD DISTRIBUTION TO GIRDERS IS BASED ON DM-4 DISTRIBUTION FACTORS
   1.2. DESIGN IS IN ACCORDANCE WITH THE LRFD METHOD
2. DESIGN LIVE LOAD: PHL-93
3. DEAD LOADS: INCLUDES A SURFACE AREA DENSITY OF 0.030 KSF FOR FUTURE WEARING SURFACE ON THE DECK SLAB
4. PROVIDE MATERIALS AND PERFORM WORK IN ACCORDANCE WITH SPECIFICATIONS PUBLICATION 408
5. COORDINATE, LOCATE, AND CONDUCT ALL WORK RELATED TO PUBLIC AND PRIVATE UTILITIES IN ACCORDANCE WITH PUBLICATION 408, SECTIONS 105.06 AND 107.12



3 / 2 TYPICAL SECTION - PROPOSED
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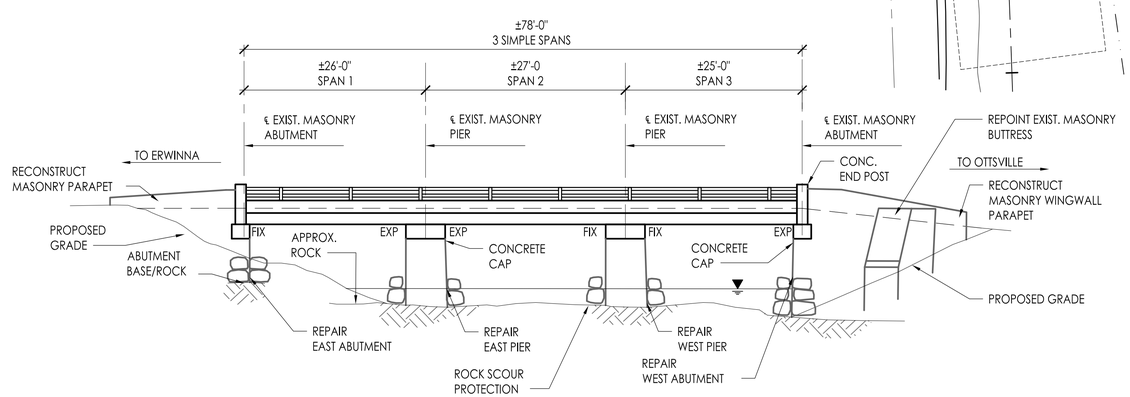


2 / 2 NORTH ELEVATION
SCALE: 1"=10'
10' 0 10' 20'

MARK	DESCRIPTION	BY	CHK'D	RECM'D	DATE

REVISIONS

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUCKS COUNTY
STATE ROUTE 1012 (HEADQUARTERS ROAD)
HEADQUARTERS ROAD BRIDGE REHABILITATION

GENERAL PLAN AND ELEVATION

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
DOUGLAS EDWARD BOND
ENGINEER
No. PE075087

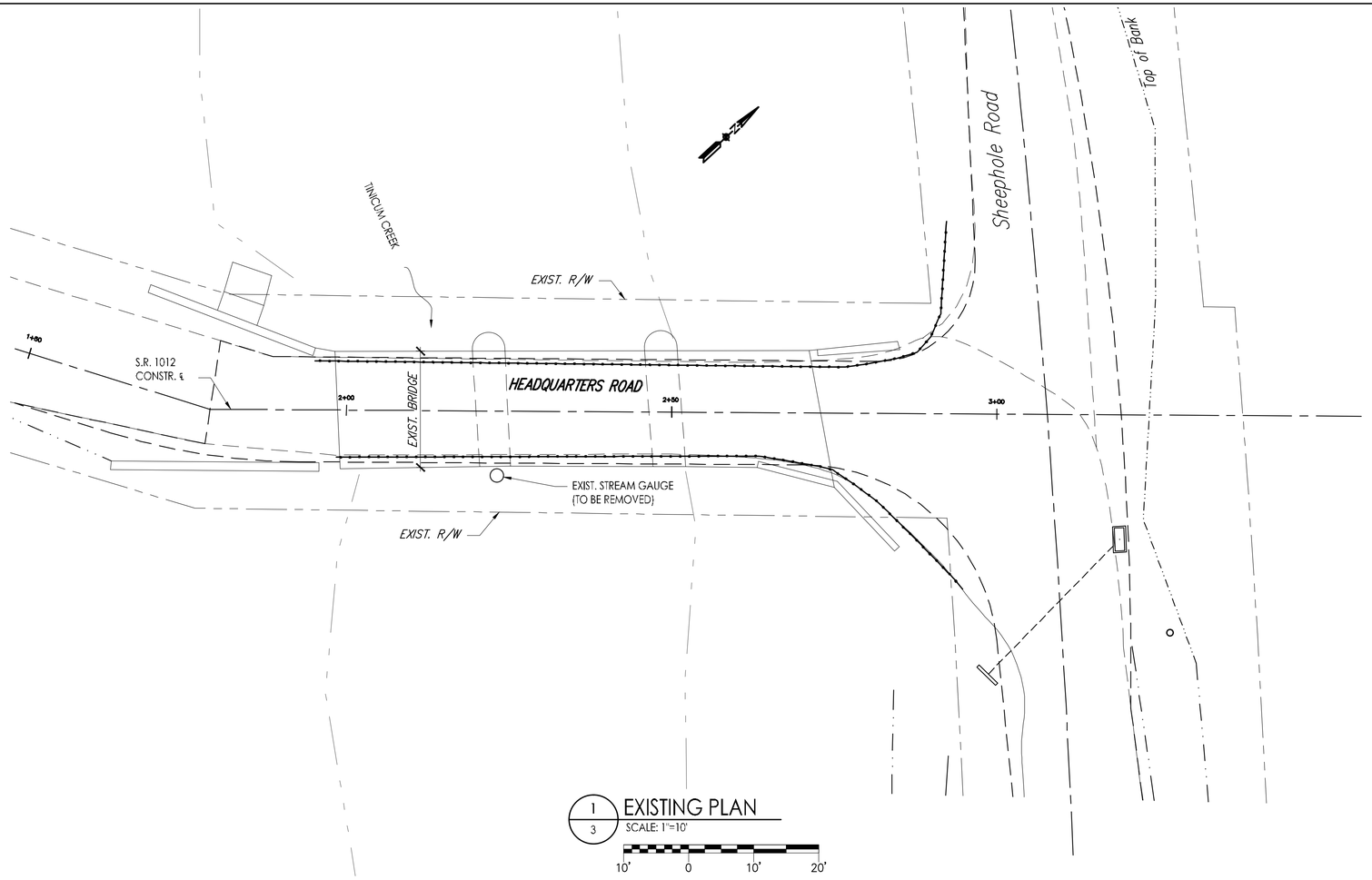
RECOMMENDED _____

SHEET 2 OF 12

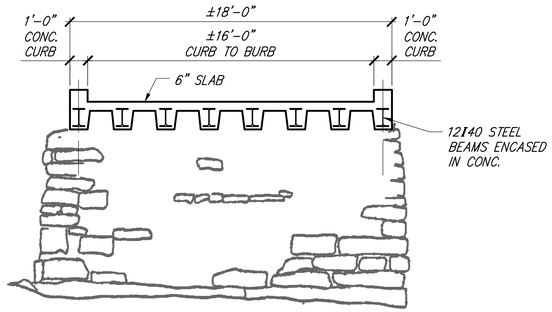
S-101

PRELIMINARY DRAWING

DES: GMG	DWG: AED/CNK	CKD: MPG/GMG



1/3 EXISTING PLAN
SCALE: 1"=10'
10' 0 10' 20'



3/3 EXISTING SECTION
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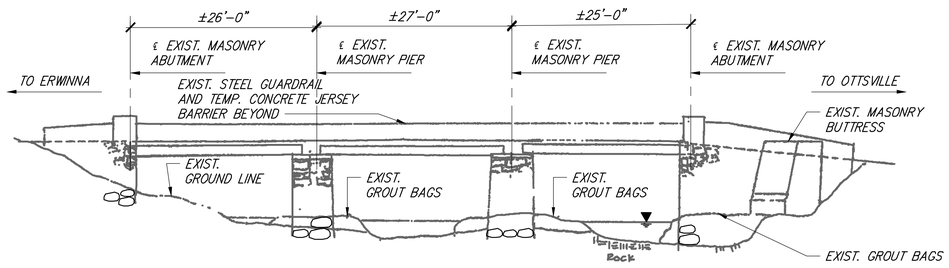


2/3 EXISTING
NORTH ELEVATION
SCALE: 1"=10'
10' 0 10' 20'

MARK	DESCRIPTION	BY	CHK'D	RECM'D	DATE

REVISIONS

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUCKS COUNTY
STATE ROUTE 1012 (HEADQUARTERS ROAD)
HEADQUARTERS ROAD BRIDGE REHABILITATION

EXISTING PLAN AND ELEVATION

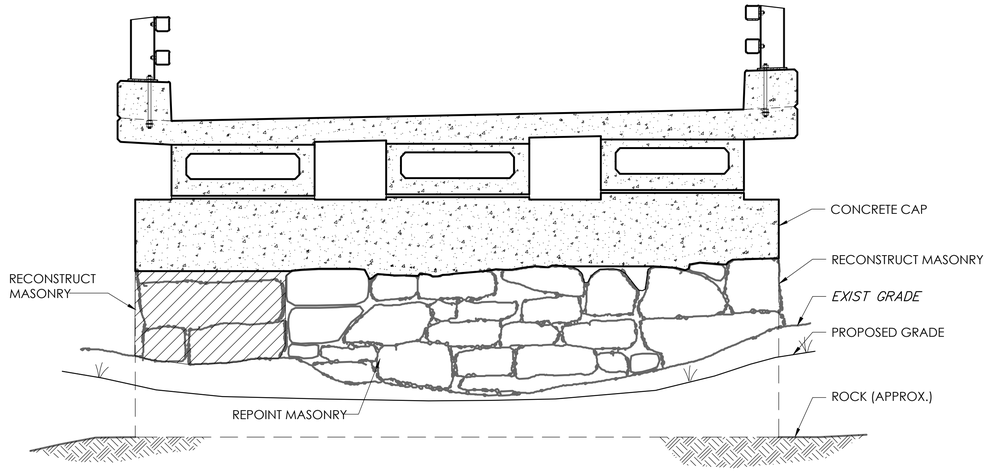
COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
DOUGLAS EDWARD BOND
ENGINEER
No. PE-070367

RECOMMENDED
_____

SHEET 3 OF 12
S-102

PRELIMINARY DRAWING

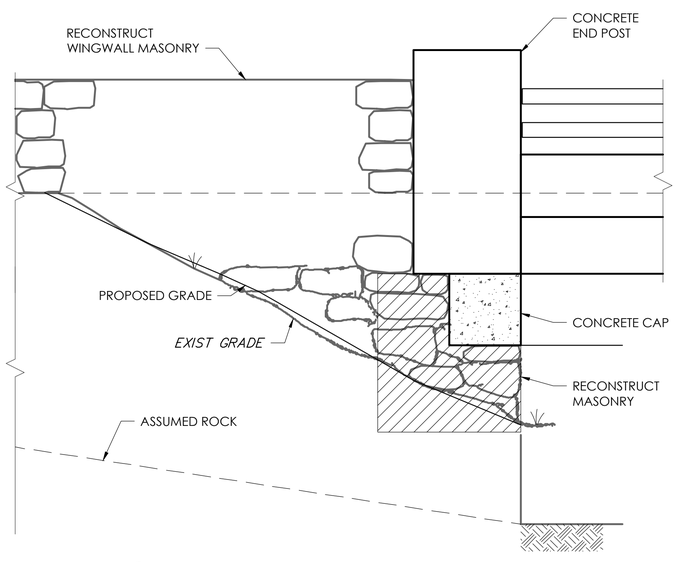
DES: GMG | DWG: AED/CNK | CKD: MPG/GMG



1/4 EAST ABUTMENT (EAST ELEVATION)

SCALE: ½"=1'-0"

2' 0 2' 4'



2/4 EAST ABUTMENT (NORTH ELEVATION)

SCALE: ½"=1'-0"

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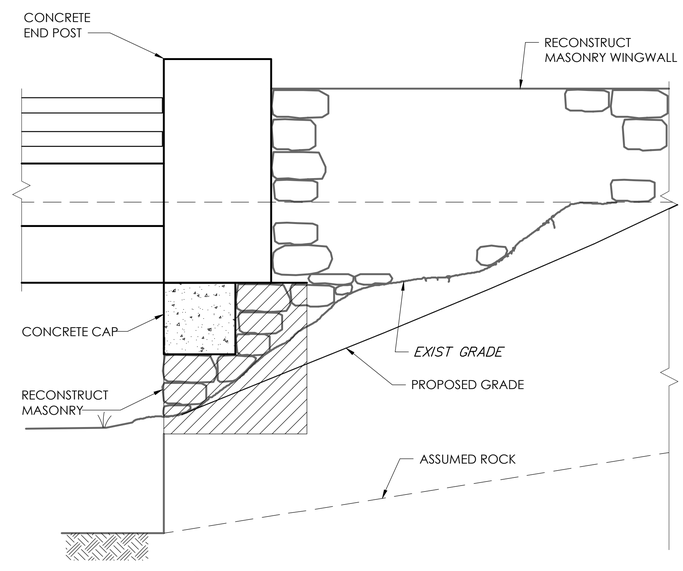


3/4 EAST ABUTMENT (SOUTH ELEVATION)

SCALE: ½"=1'-0"

2' 0 2' 4'

MASONRY NOTES

1. ALL MASONRY WORK SHALL BE ACCOMPLISHED BY QUALIFIED STONE MASONS THAT ARE APPROVED BY THE ENGINEER.
2. MASONRY RECONSTRUCTION SHALL UTILIZE EXISTING STONES FIRST AND THEN THE REMAINDER WITH NEW STONES AS NEEDED. PARTS OF WALLS THAT ARE RECONSTRUCTED SHALL MATCH THE CHARACTER OF THE COURSING IN ADJACENT PARTS OF THE WALL.
3. NEW STONES USED FOR RECONSTRUCTION SHALL MATCH THE EXISTING STONES IN TYPE, SIZE, COLOR, AND FINISH.
4. EXISTING MASONRY THAT IS TO BE RECONSTRUCTED SHALL FIRST BE DISMANTLED AND THE EXISTING STONES SALVAGED, CLEANED, AND TEMPORARILY STORED.
5. PRIOR TO THE PARTIAL RECONSTRUCTION OF MASONRY, IN AN AREA APPROVED BY THE ENGINEER, CONSTRUCT A SAMPLE OF RECONSTRUCTED MASONRY THAT IS AT LEAST 9 FEET SQUARE IN SURFACE AREA. ONCE APPROVED, ALL RECONSTRUCTED MASONRY SHALL MATCH THE CHARACTER OF THE SAMPLE AS DETERMINED BY THE ENGINEER.
6. MORTAR USED IN REPOINTED SHALL BE BASED ON NATURAL CEMENT ASTM C10 WITH A (PRELIMINARY DESIGN) PROPORTION OF 1 PART CEMENT TO 2 PARTS HYDRATED LIME. 28 DAY CURED SAMPLES OF MORTAR MIXES SHALL BE APPROVED BY THE ENGINEER PRIOR TO MASONRY REPOINTING OR RECONSTRUCTION.
7. EXTERIOR EXCESS MORTAR COATINGS ARE TO BE REMOVED USING HAND TOOLS AND SMALL PNEUMATIC POWERED CHIPPING HAMMERS WHEN APPROVED BY THE ENGINEER TO EXPOSE THE NATURAL STONE FACES. AVOID DAMAGING, LOOSENING, OR WORKING LOOSE THE UNDERLYING STONES. WHERE REMOVAL OF EXCESS MORTAR WOULD RESULT IN THE DAMAGE TO THE STONE, THE ENGINEER MAY APPROVE LEAVING THE EXISTING MORTAR COATING IN PLACE.
8. GROUTING OF EXISTING MASONRY SHALL BE ACCOMPLISHED USING A NATURAL CEMENT BASED GROUT. INSERT GROUT INJECTION AND EXIT PORT TUBES INTO MORTAR JOINTS. SEAL MASONRY JOINTS AND CRACKS PRIOR TO GROUTING. INJECT WATER INTO MASONRY TO BE GROUTED PRIOR TO GROUTING. GROUTING SHALL BE DONE IN LIFTS FROM THE LOWER INJECTION TUBE UNTIL IT EXITS THE UPPER TUBE. CAPTURE ALL WASTE GROUT.
9. REPOINT ALL DETERIORATED AND LOOSE MORTAR JOINTS. JOINTS THAT CONTAIN SOLID MORTAR ARE TO REMAIN. RAKE LOOSE MATERIAL IN JOINTS TO BE REPOINTED TO A MINIMUM DEPTH OF 2 TO 2.5 TIMES THE WIDTH OF THE JOINT USING HAND TOOLS, BRUSHES, AND LOW PRESSURE WATER (40-60 PSI). PLACE MORTAR BY HAND OR USING A PRESSURE GUN WHEN APPROVED BY THE ENGINEER.
10. CLEAN MASONRY IMMEDIATELY AFTER REPOINTING OR GROUTING WITH WATER AND NYLON BRUSHES TO REMOVE EXCESS MATERIAL AND PREVENT STAINING.
11. STONES SEPARATED INTO LARGE PIECES BY HAIRLINE CRACK TO REMAIN UNLESS OTHERWISE DIRECTED BY THE ENGINEER.
12. STONE FACE TREATMENT WILL BE CONSIDERED AT CONCRETE CAPS.

MARK	DESCRIPTION	BY	CHK'D	RECM'D	DATE

REVISIONS

COMMONWEALTH OF PENNSYLVANIA

DEPARTMENT OF TRANSPORTATION

BUCKS COUNTY

STATE ROUTE 1012 (HEADQUARTERS ROAD)

HEADQUARTERS ROAD BRIDGE REHABILITATION

EAST ABUTMENT DETAILS AND NOTES

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
DOUGLAS EDWARD BOND
ENGINEER
No. PE079067

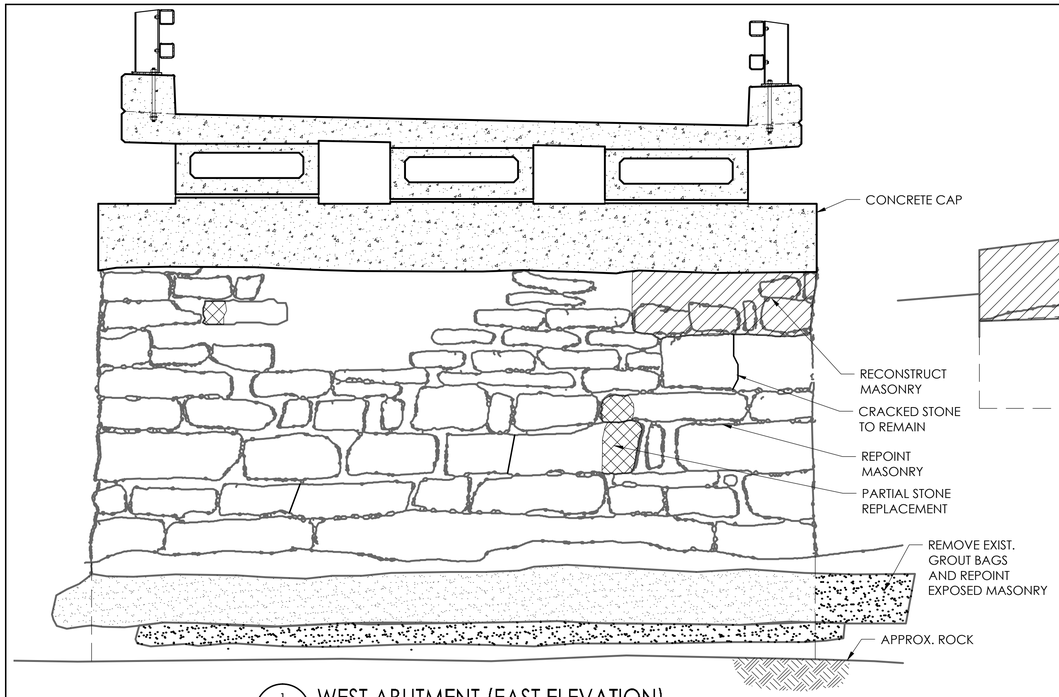
RECOMMENDED _____

SHEET 4 OF 12

S-401

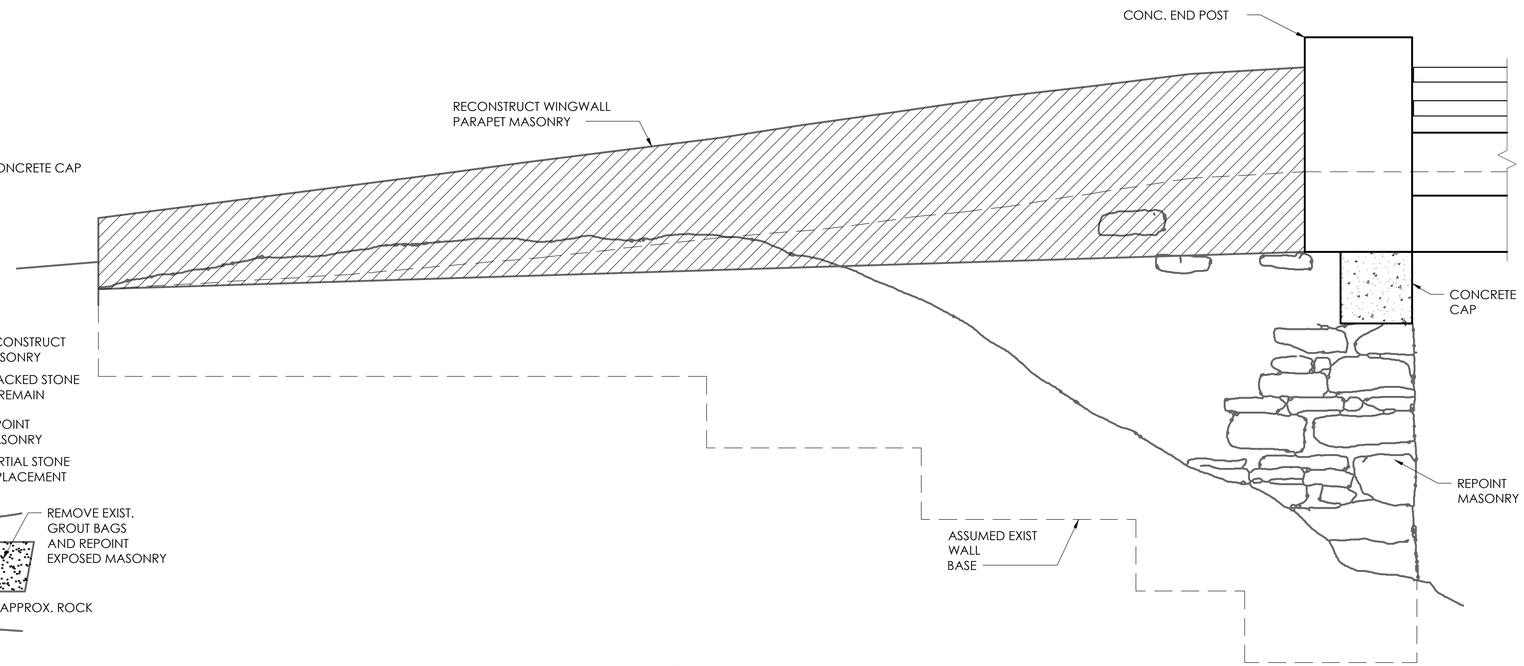
DES: GMG | DWG: AED/CNK | CKD: MPG/GMG

PRELIMINARY DRAWING



1/5 WEST ABUTMENT (EAST ELEVATION)
SCALE: 1/2"=1'-0"

2' 0 2' 4'



3/5 WEST ABUTMENT (SOUTH ELEVATION)
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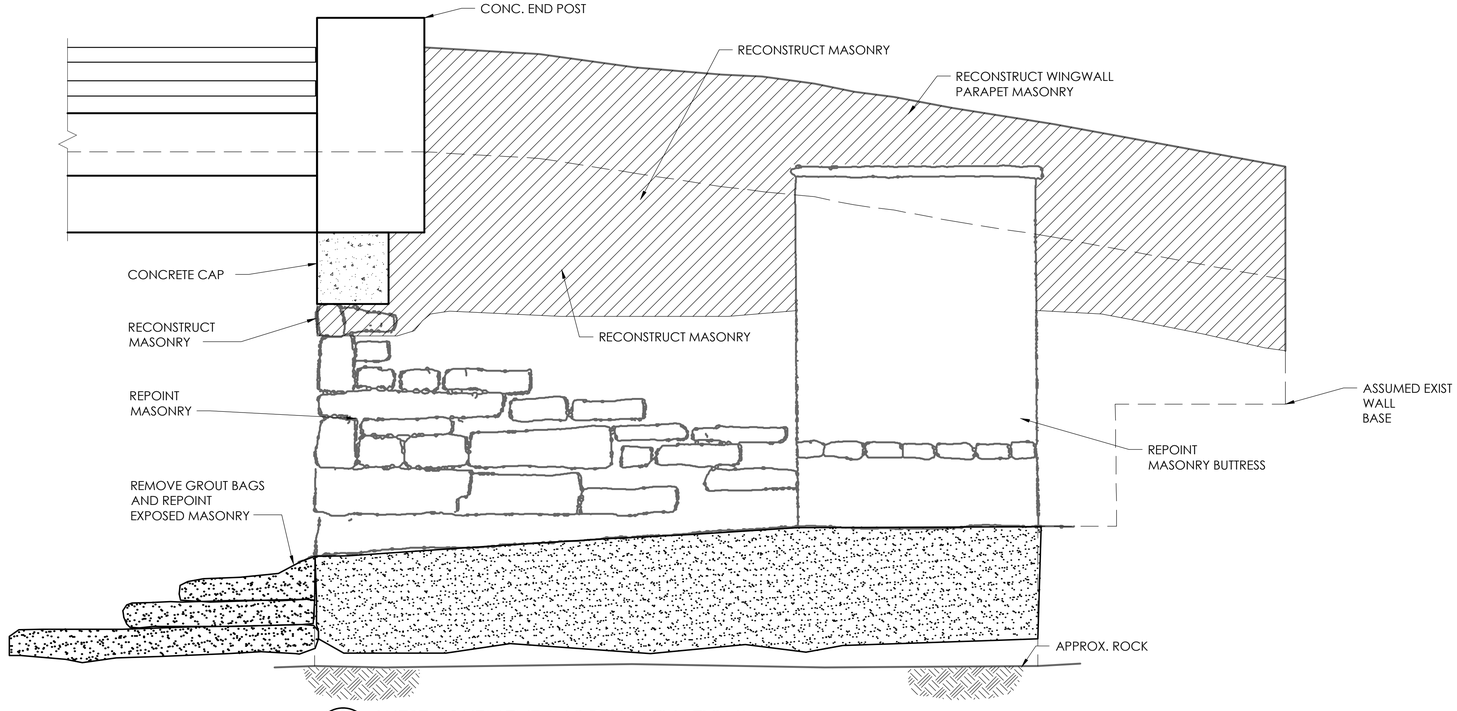


2/5 WEST ABUTMENT (NORTH ELEVATION)
SCALE: 1/2"=1'-0"

2' 0 2' 4'

MARK	DESCRIPTION	BY	CHK'D	RECM'D	DATE

REVISIONS

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUCKS COUNTY
STATE ROUTE 1012 (HEADQUARTERS ROAD)
HEADQUARTERS ROAD BRIDGE REHABILITATION

WEST ABUTMENT DETAILS

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
DOUGLAS EDWARD BOND
ENGINEER
No. PE079367

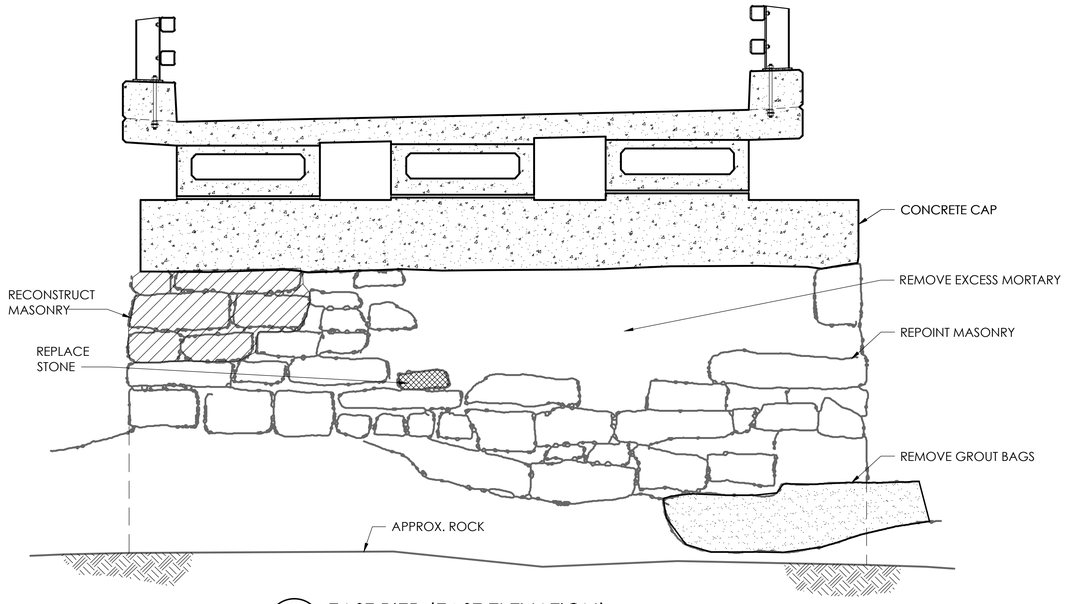
RECOMMENDED _____

SHEET 5 OF 12

S-402

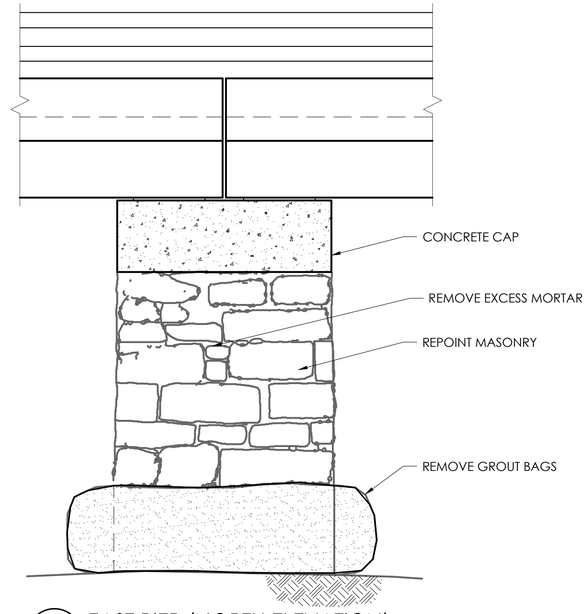
PRELIMINARY DRAWING

DES: GMG | DWG: AED/CNK | CKD: MPG/GMG



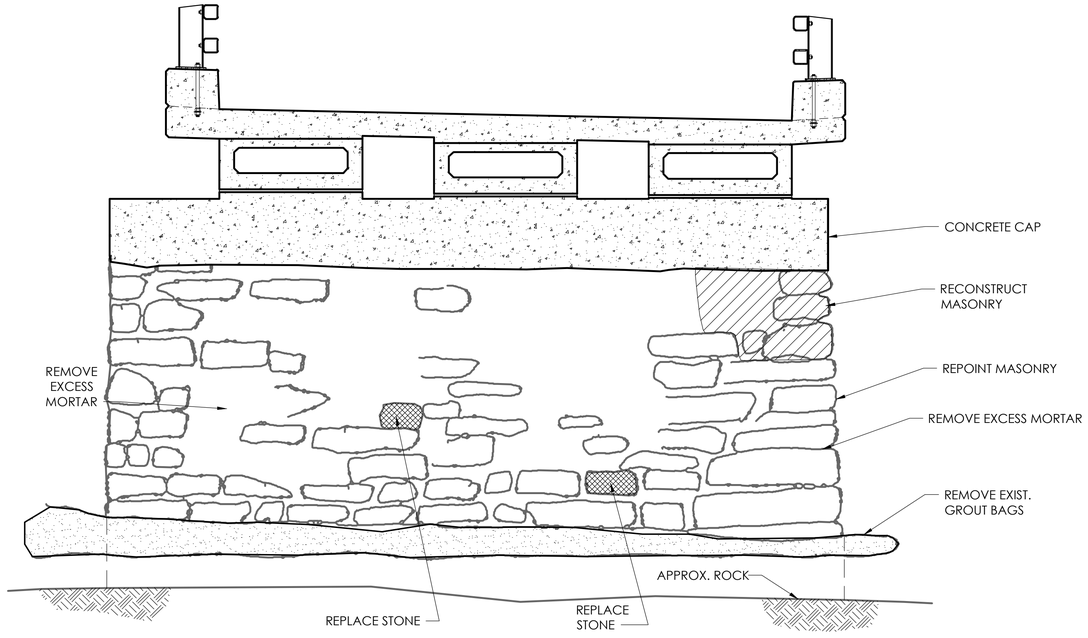
1/6 EAST PIER (EAST ELEVATION)
SCALE: 1/2"=1'-0"

2' 0 2' 4'



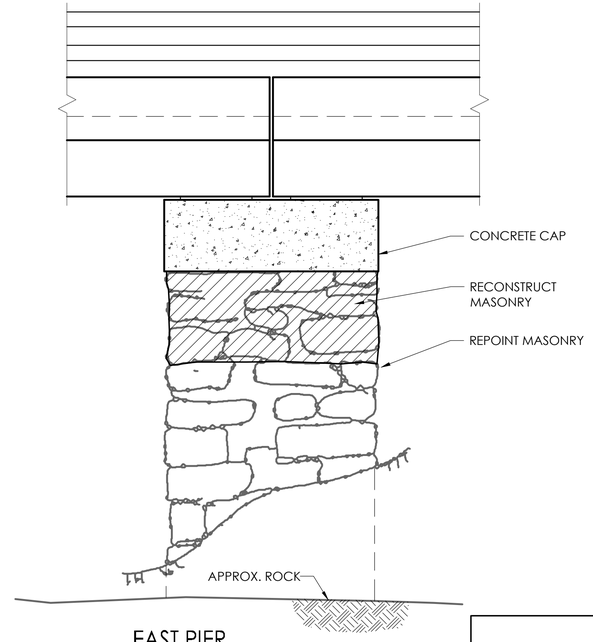
3/6 EAST PIER (NORTH ELEVATION)
SCALE: 1/2"=1'-0"

2' 0 2' 4'



2/6 EAST PIER (WEST ELEVATION)
SCALE: 1/2"=1'-0"

2' 0 2' 4'



4/6 EAST PIER (SOUTH ELEVATION)
SCALE: 1/2"=1'-0"

2' 0 2' 4'

MARK	DESCRIPTION	BY	CHK'D	RECM'D	DATE

REVISIONS

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUCKS COUNTY
STATE ROUTE 1012 (HEADQUARTERS ROAD)
HEADQUARTERS ROAD BRIDGE REHABILITATION

EAST PIER DETAILS

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
DOUGLAS EDWARD BOND
ENGINEER
No. PE075067

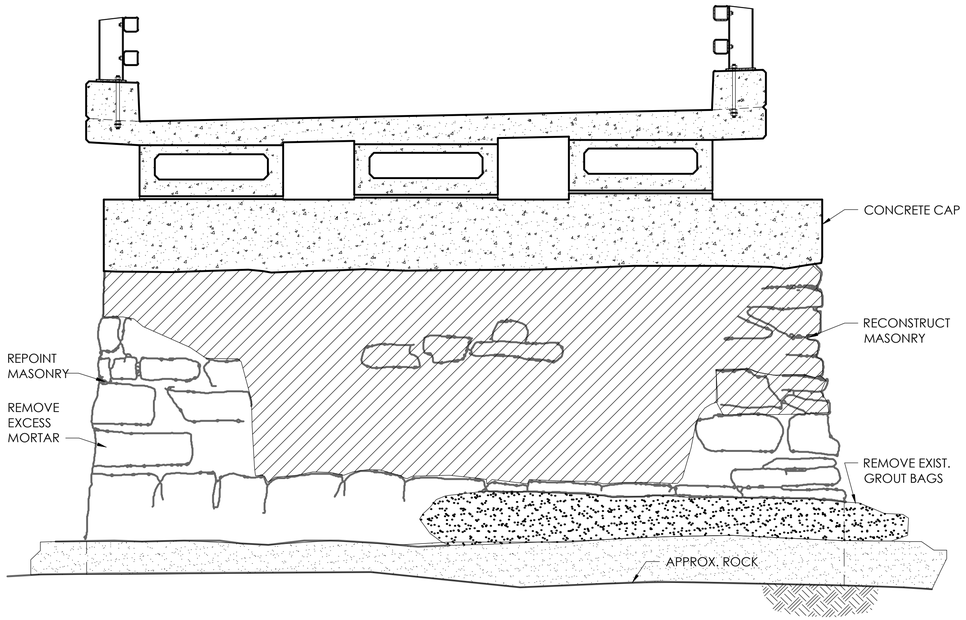
PRELIMINARY DRAWING

RECOMMENDED _____

SHEET 6 OF 12

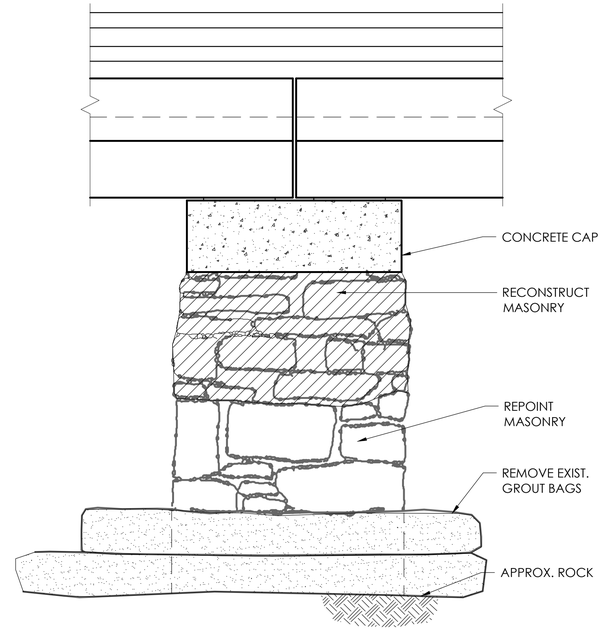
S-403

DES: GMG | DWG: AED/CNK | CKD: MPG/GMG



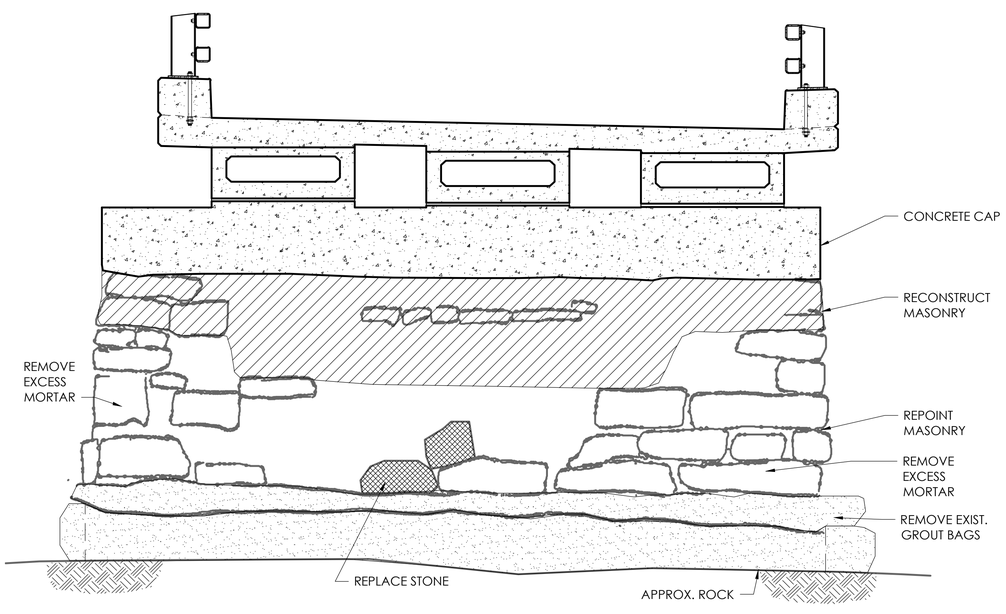
1/7 WEST PIER (EAST ELEVATION)
SCALE: 1/2"=1'-0"

2' 0 2' 4'



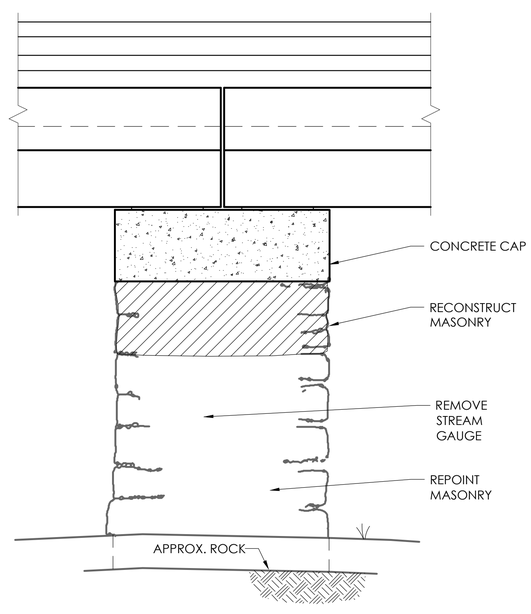
2/7 WEST PIER (NORTH ELEVATION)
SCALE: 1/2"=1'-0"

2' 0 2' 4'



3/7 WEST PIER (WEST ELEVATION)
SCALE: 1/2"=1'-0"

2' 0 2' 4'



4/7 WEST PIER (SOUTH ELEVATION)
SCALE: 1/2"=1'-0"

2' 0 2' 4'

PRELIMINARY DRAWING

MARK	DESCRIPTION	BY	CHK'D	RECM'D	DATE

REVISIONS

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUCKS COUNTY
STATE ROUTE 1012 (HEADQUARTERS ROAD)
HEADQUARTERS ROAD BRIDGE REHABILITATION

WEST PIER DETAILS

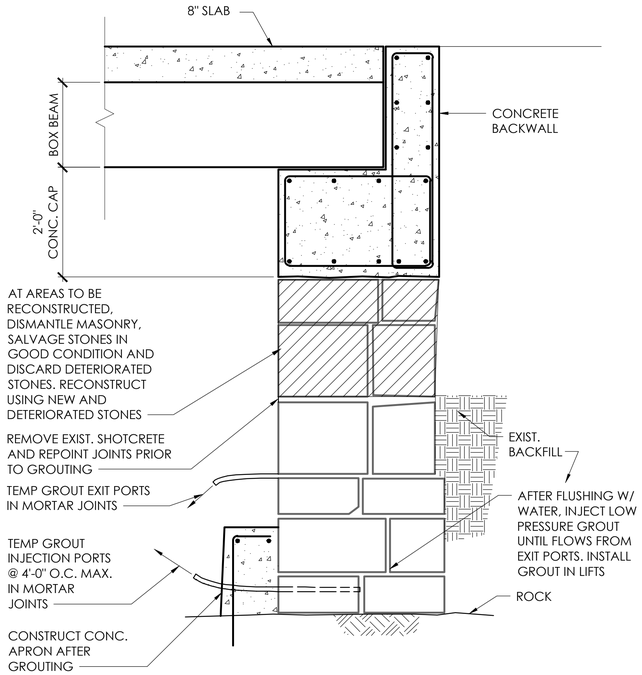
COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
DOUGLAS EDWARD BOND
ENGINEER
No. PE-070367

RECOMMENDED _____

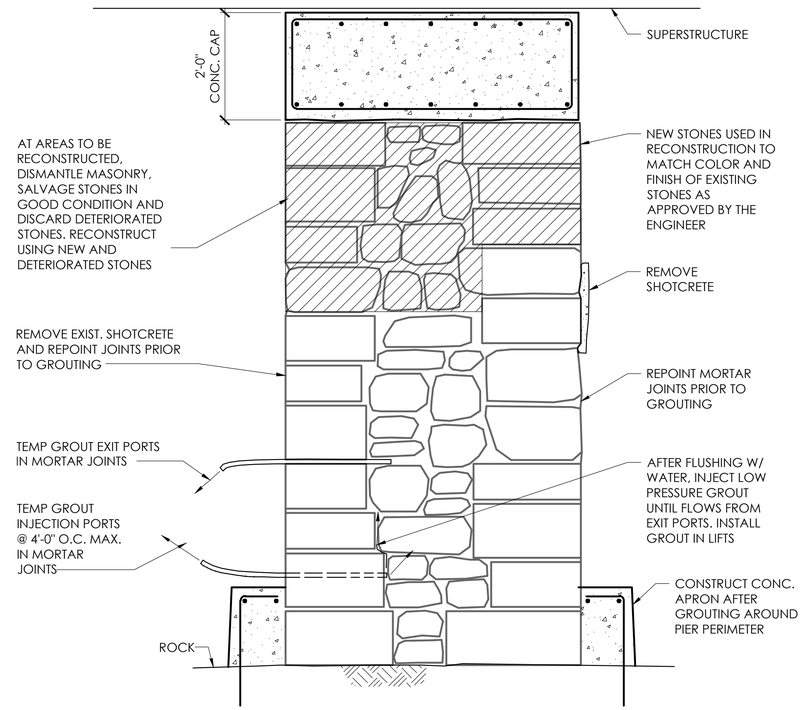
SHEET 7 OF 12

S-404

DES: GMG | DWG: AED/CNK | CKD: MPG/GMG



1 / 8 ABUTMENT REHABILITATION DETAIL
SCALE: ¾"=1'-0"
1' 0 1' 2' 3'



2 / 8 PIER REHABILITATION DETAIL
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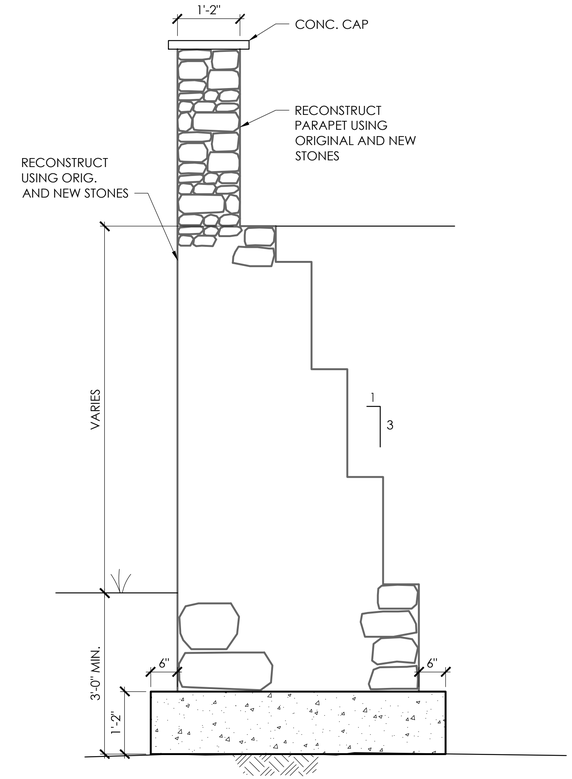
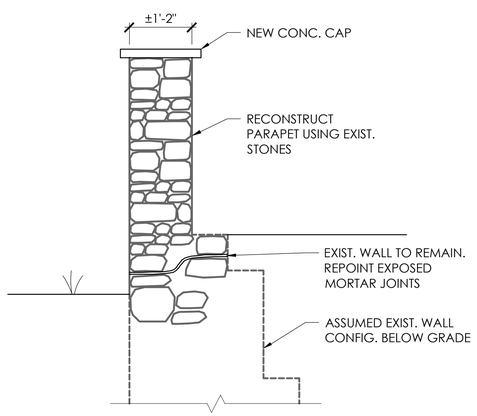
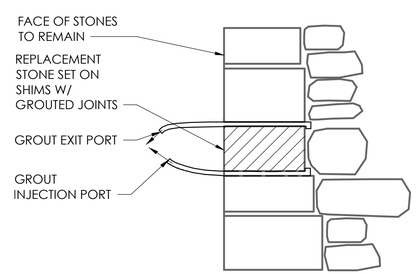


3 / 8 WINGWALL RECONSTRUCTION DETAIL
SCALE: ¾"=1'-0"
1' 0 1' 2' 3'



4 / 8 WINGWALL PARAPET RECONSTRUCTION
SCALE: ¾"=1'-0"
1' 0 1' 2' 3'



5 / 8 STONE REPLACEMENT DETAIL
SCALE: ¾"=1'-0"

MARK	DESCRIPTION	BY	CHK'D	REC'M'D	DATE

REVISIONS

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
BUCKS COUNTY
STATE ROUTE 1012 (HEADQUARTERS ROAD)
HEADQUARTERS ROAD BRIDGE REHABILITATION

MASONRY DETAILS

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
DOUGLAS EDWARD BOND
ENGINEER
No. PE079367

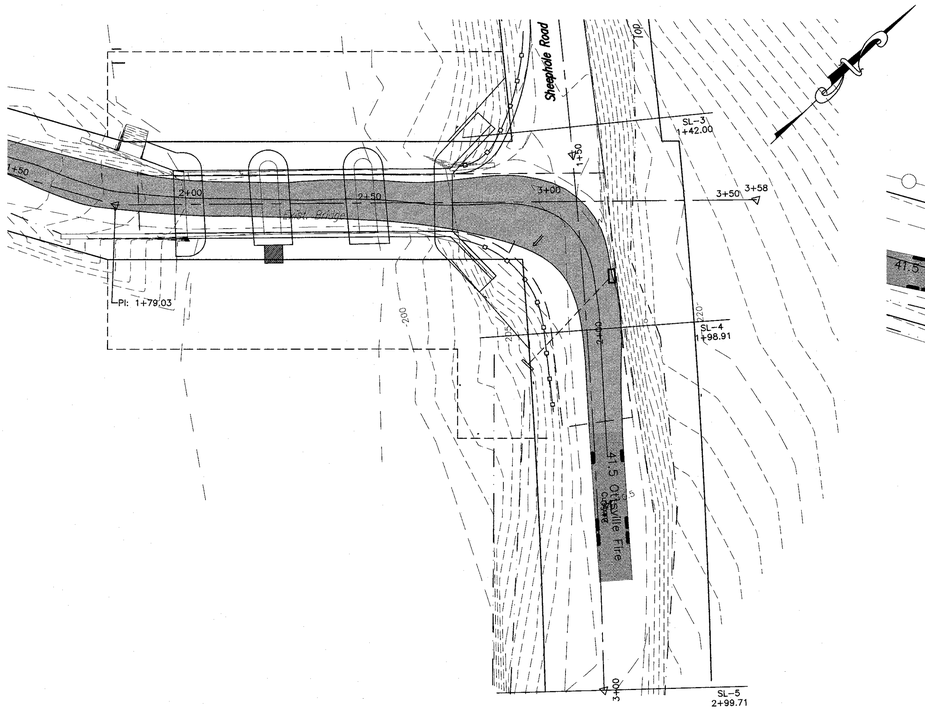
RECOMMENDED _____

SHEET 8 OF 12

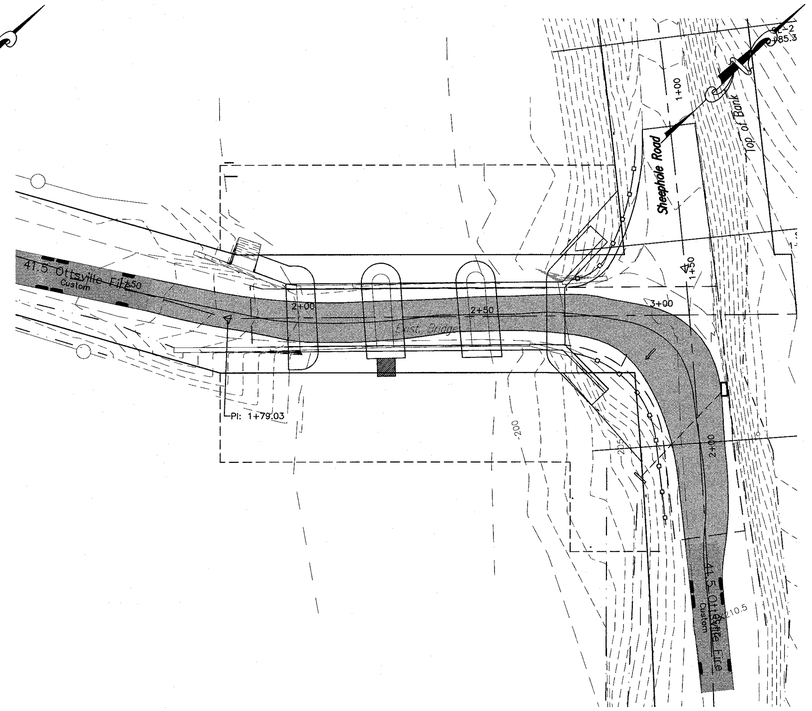
S-501

DES: GMG | DWG: AED/CNK | CKD: MPG/GMG

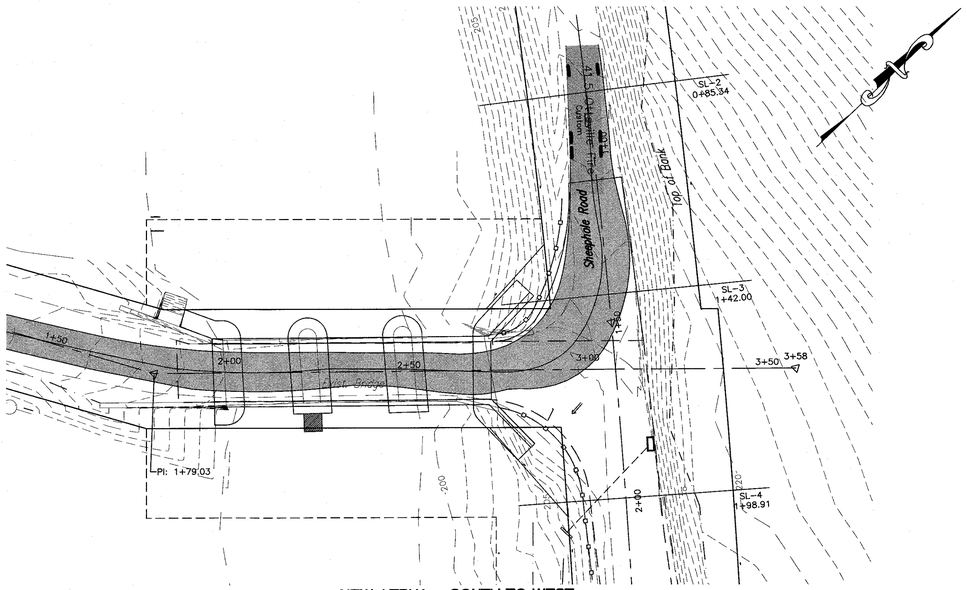
PRELIMINARY DRAWING



NEW AERIAL - EAST TO SOUTH
SCALE: 1"=20'



NEW AERIAL - SOUTH TO EAST
SCALE: 1"=20'



NEW AERIAL - SOUTH TO WEST
SCALE: 1"=20'

GRAPHIC SCALE

20 0 10 20 40 80

(IN FEET)
1 inch = 20 ft.

GENERAL NOTES:

1. THIS PLAN REFLECTS EXISTING SITE CONDITIONS AS THE RESULT OF AERIAL PHOTOS, TAX MAPS, AND A FIELD SURVEY PERFORMED BY ROBERTS ENGINEERING GROUP, LLC. DATED APRIL 21, 2016.
2. THIS PLAN IS NOT INTENDED TO GUARANTEE OWNERSHIP. DOCUMENTS OF RECORD WHICH MAY HAVE BEEN REVIEWED AND CONSIDERED AS PART OF THIS PLAN OF SURVEY ARE NOTED HERON AND HAVE BEEN OBTAINED BY ROBERTS ENGINEERING GROUP, LLC. THERE MAY EXIST OTHER DOCUMENTS OF RECORD WHICH WOULD AFFECT THIS PLAN.
3. THIS PLAN IS SUBJECT TO ANY EASEMENTS OR AGREEMENTS, WHICH MAY OR MAY NOT BE OF THE PUBLIC RECORD AND DISCLOSED AT THE TIME OF AN ABSTRACT OF TITLE OR TITLE SEARCH, WHICH MAY BE LOCATED BELOW THE SURFACE OF THE LANDS AND NOT VISIBLE AT THE TIME OF SURVEY. THE LOCATIONS OF UNDERGROUND UTILITIES AS SHOWN HEREON ARE BASED UPON ABOVE GROUND STRUCTURES VISIBLE AT THE TIME OF THE FIELD SURVEY AND RECORD OR AS-BUILT DRAWINGS PROVIDED TO ROBERTS ENGINEERING GROUP, LLC.
4. LOCATIONS OF UNDERGROUND UTILITIES/STRUCTURES MAY VARY FROM LOCATIONS SHOWN HEREON; WHEREAS ADDITIONAL BURIED UTILITIES/STRUCTURES MAY BE ENCOUNTERED. NO EXCAVATIONS WERE MADE DURING THE PREPARATION OF THIS SURVEY TO LOCATE BURIED UTILITIES OR STRUCTURES. BEFORE EXCAVATIONS ARE BEGUN, THE UNDERGROUND UTILITIES LOCATION SERVICE AT 1-800-242-1776 SHALL BE CONTACTED AT LEAST 72 HOURS PRIOR TO COMMENCEMENT OF ANY DEMOLITION OR EXCAVATION ACTIVITIES, IN APPLICABLE LAWS, RULES, AND REGULATIONS.
5. ALL BUILDINGS, SURFACE AND SUBSURFACE IMPROVEMENTS, ON OR ADJACENT TO THE SITE ARE NOT NECESSARILY SHOWN.
6. RIGHT-OF-WAY AND PROPERTY LINE INFORMATION ARE APPROXIMATE AND ARE BASED UPON TAX MAP INFORMATION AND LIMITED FIELD SURVEYING, AND HAS BEEN TAKEN FROM VARIOUS SOURCES AND IS NOT GUARANTEED FOR COMPLETENESS OR ACCURACY.
7. BOTH HORIZONTAL AND VERTICAL DATUM ARE ASSUMED SITE SPECIFIC.
8. TRUCK TURNING PLANS ARE BASED ON THE 41.5' FIRE TRUCK AS PER OTTSVILLE.

MARK	DESCRIPTION	BY	CHK'D	RECM'D	DATE

REVISIONS

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION

BUCKS COUNTY
HEADQUARTERS ROAD
AND SHEEPHOLE ROAD

TRUCK TURNING PLAN

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
Carmela Roberts
ENGINEER
No. PE078365

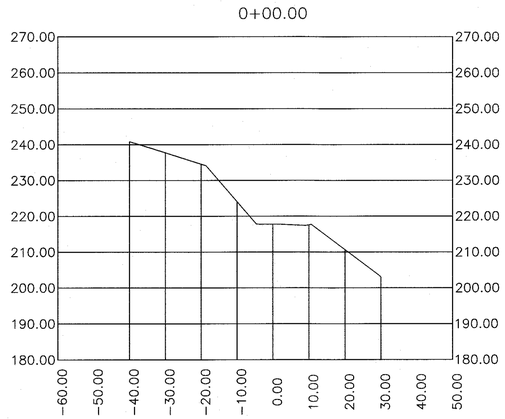
DATE

RECOMMENDED _____

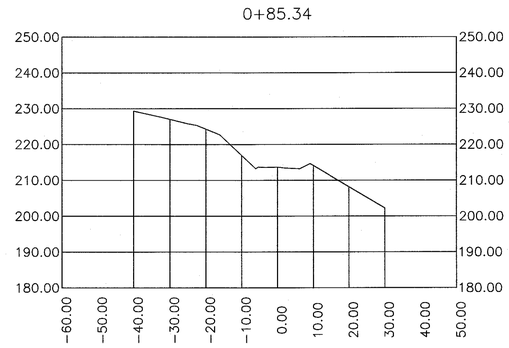
SHEET 9 OF 12

P1611

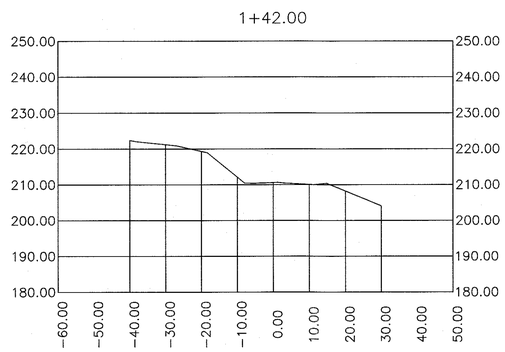
DES: GMG | DWG: AED/CNK | CKD: MPG/GMG



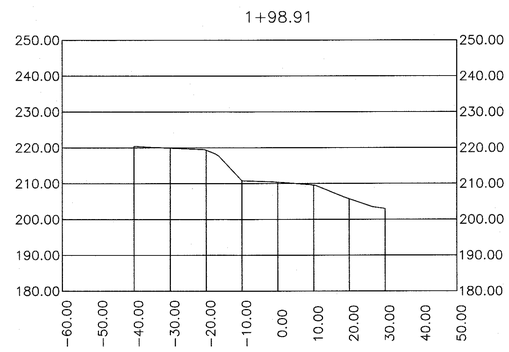
SECTION A-A
SCALE: 1"=20'



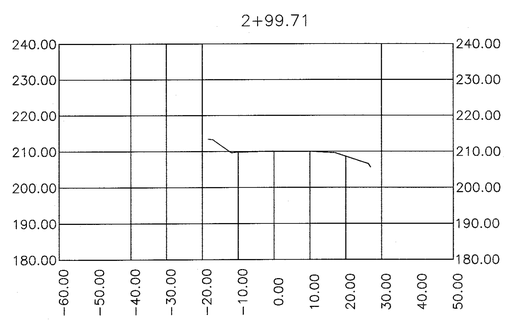
SECTION B-B
SCALE: 1"=20'



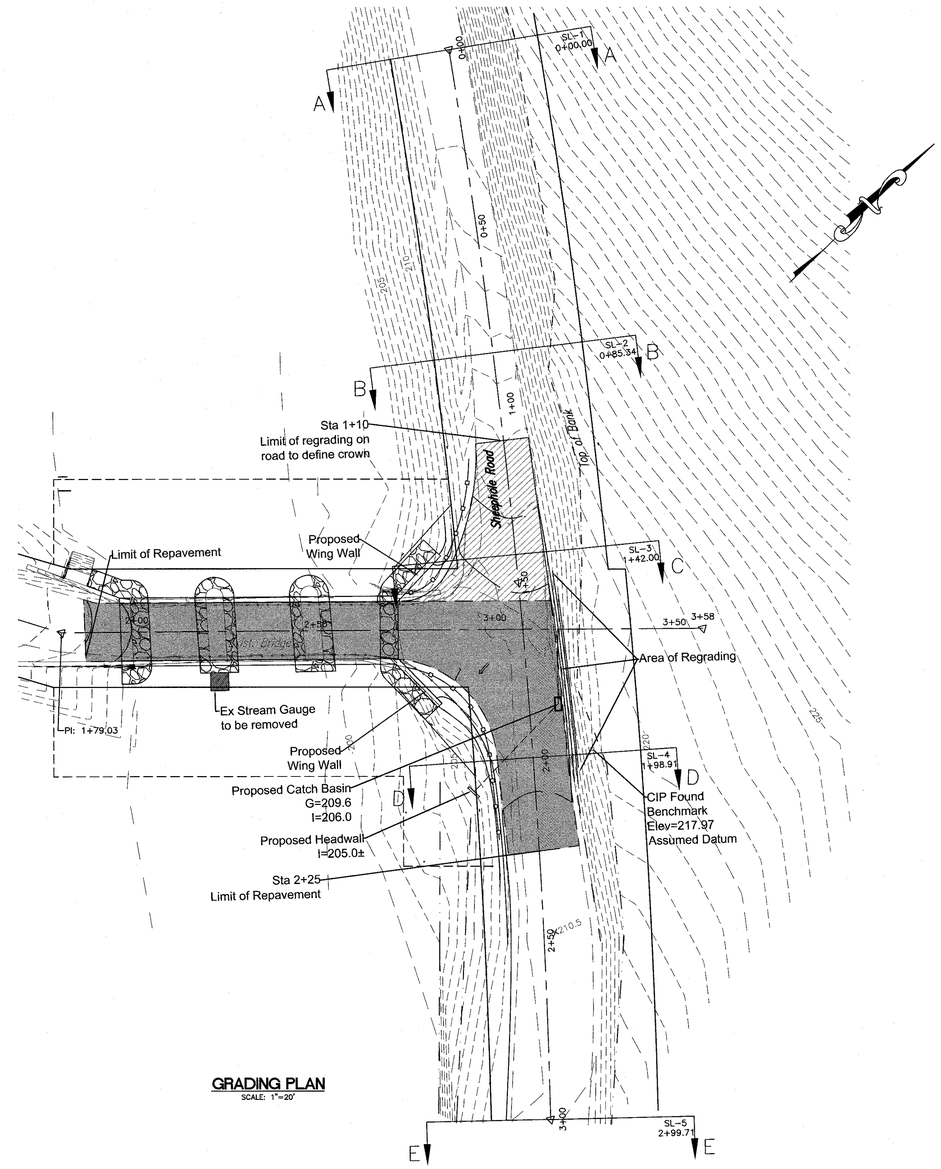
SECTION C-C
SCALE: 1"=20'



SECTION D-D
SCALE: 1"=20'



SECTION E-E
SCALE: 1"=20'



GRADING PLAN
SCALE: 1"=20'

GRAPHIC SCALE

20 0 10 20 40 80

(IN FEET)
1 inch = 20 ft.

DES: GMG	DWG: AED/CNK	CKD: MPG/GMG

MARK	DESCRIPTION	BY	CHK'D	RECM'D	DATE

REVISIONS

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
Carmela Roberts
ENGINEER
No. PE076365

DATE

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION

BUCKS COUNTY
HEADQUARTERS ROAD
AND SHEEPHOLE ROAD

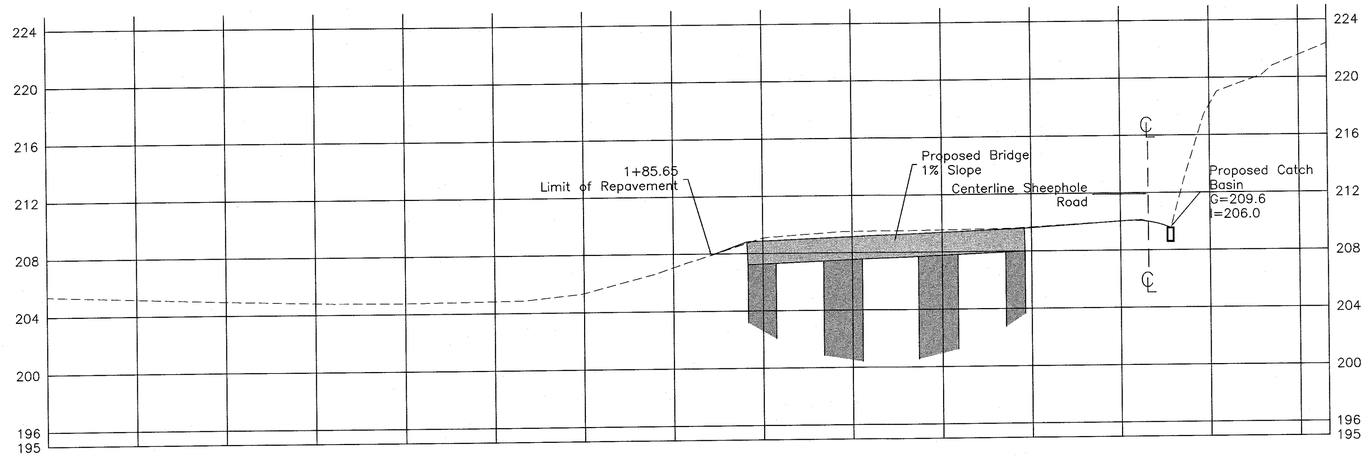
SECTIONS AND DETAILS

RECOMMENDED _____

SHEET 10 OF 12

P1611

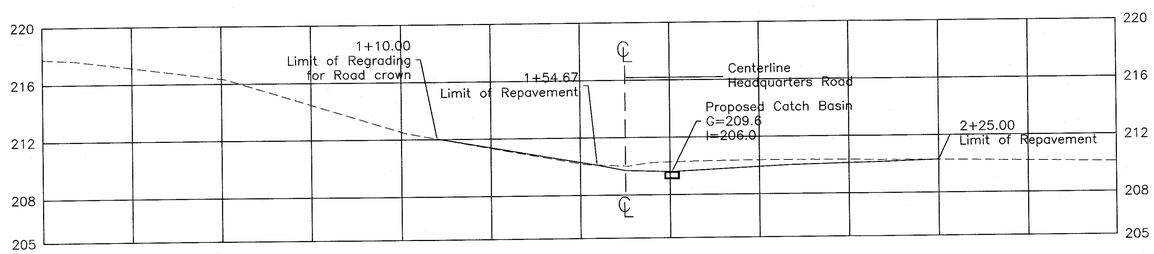
Profile View of Headquarters Bridge Road



Profile Data													
0+00.00	0+25.00 205.17	0+50.00 204.96	0+75.00 204.81	1+00.00 204.76	1+25.00 204.84	1+50.00 205.33	1+75.00 207.05 207.41	2+00.00 209.07	2+25.00 209.49	2+50.00 209.55	2+75.00 209.68	3+00.00 210.04	3+25.00 218.10	3+50.00 221.55	3+57.93 222.36

HEADQUARTERS ROAD PROFILE

SCALE HOR: 1"=20'
SCALE VERT: 1"=2'



Profile Data												
0+00.00 217.76	0+25.00 217.14	0+50.00 216.34	0+75.00 214.47	1+00.00 212.53	1+25.00 211.35	1+50.00 210.20	1+75.00 210.27	2+00.00 210.36	2+25.00 210.33	2+50.00 210.29	2+75.00 210.19	2+99.71 210.09

SHEEPHOLE ROAD PROFILE

SCALE HOR: 1"=20'
SCALE VERT: 1"=2'

GRAPHIC SCALE

20 0 10 20 40 80

(IN FEET)
1 inch = 20 ft.

MARK	DESCRIPTION	BY	CHK'D	RECM'D	DATE

REVISIONS

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
Carmela Roberts
ENGINEER
No. PE075085

DATE

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION

BUCKS COUNTY
HEADQUARTERS ROAD
AND SHEEPHOLE ROAD

ROAD PROFILES

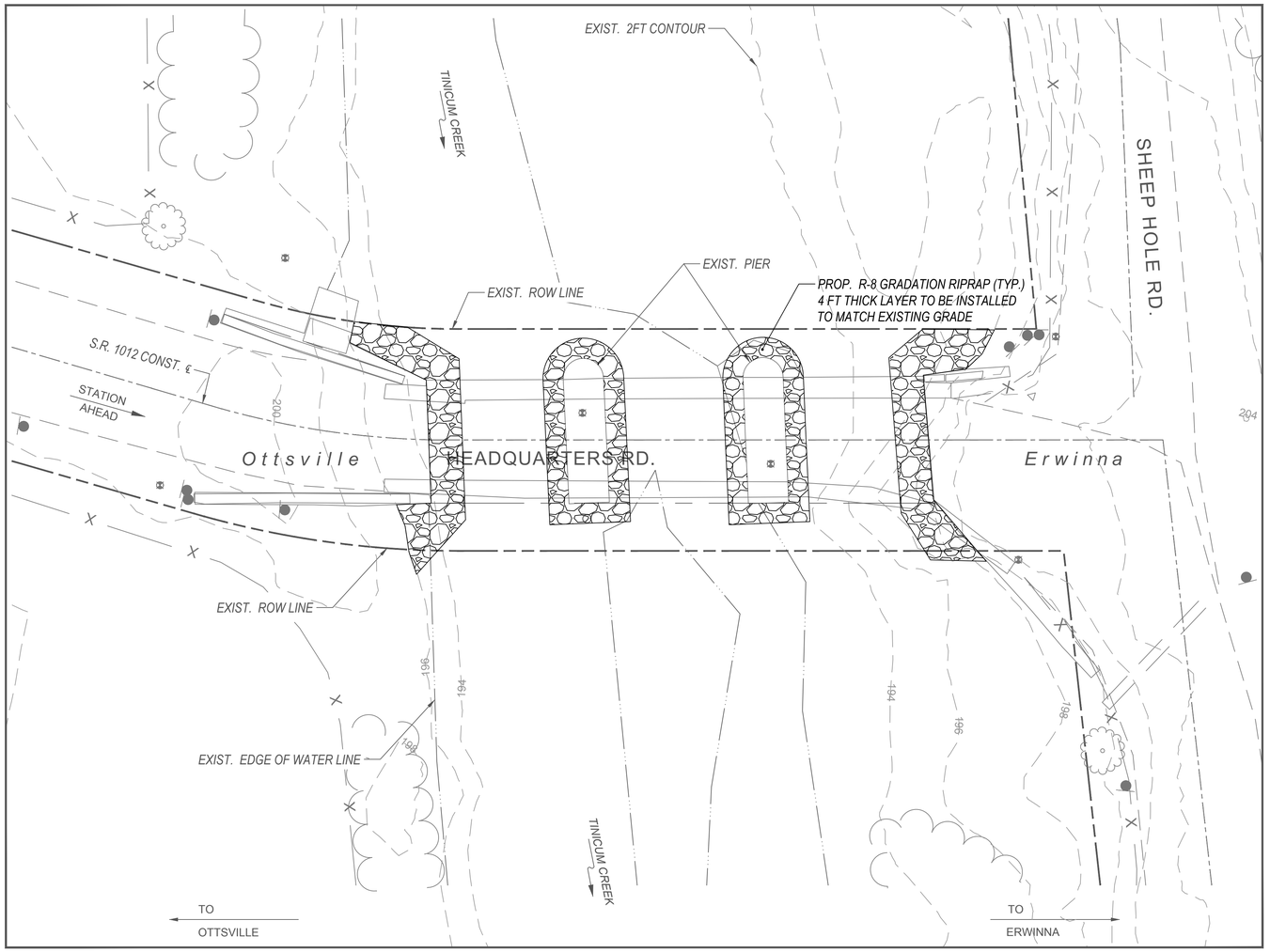
RECOMMENDED _____

SHEET 11 OF 12

P1611

DES: GMG	DWG: AED/CNK	CKD: MPG/GMG

Drawing name: P:\1020\Projects\1020017\CAD\SHEETS\01 PROPOSED.dwg Plotted on: Jan 11, 2017 - 3:12pm



SCOUR COUNTERMEASURE PLAN
SCALE: 1"=10'

LEGEND

- EXISTING 2FT CONTOUR
- EXISTING RIGHT-OF-WAY LINE
- EXISTING EDGE OF WATER LINE
- EXISTING TREELINE
- ROAD CENTERLINE
- EXISTING FENCE
- PROPOSED R-8 RIPRAP

GRAPHIC SCALE

0 2 4 6 8 10 20 30 40 FEET

SCALE: 1" = 10'

NOTES:

1. SCOUR COUNTERMEASURES AT BRIDGE OR DOWNSTREAM OF THE BRIDGE WILL BE DEVELOPED DURING FINAL DESIGN PLANS PREPARATION.
2. AS PART OF THE FINAL DESIGN, THE STREAM MAY BE REALIGNED USING NATURAL CHANNEL DESIGN FEATURES UPSTREAM OF THE BRIDGE.

RIPRAP GRADATION TABLE

CLASS SIZE NO. / ROCK SIZE (INCHES)	PERCENT PASSING (SQUARE OPENINGS) R-8
42	100
30	
24	15-50
18	
15	0-15
12	
9	
6	
4	
3	
2	

NOTE:
GRADATION OBTAINED FROM NCSA ROCK SIZE AND GRADATIONS INCLUDED IN SECTION 850 OF PENNSYLVANIA DEPARTMENT OF TRANSPORTATION PUBLICATION 408/2016; SPECIFICATIONS.

PREPARED BY:

PRINCETON HYDRO LLC.
SCIENTISTS AND ENGINEERS
1108 OLD YORK ROAD
SUITE 1, PO BOX 720
PHONE. 908.237.5660
FAX. 908.237.5666
WWW.PRINCETONHYDRO.COM

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
MARY L. PAIST-GOLDMAN
ENGINEER
PE-078834-E

MARK	DESCRIPTION	BY	CHK'D	RECM'D	DATE

REVISIONS

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION

BUCKS COUNTY
HEADQUARTERS ROAD
AND SHEEPHOLE ROAD

SCOUR COUNTERMEASURE PLAN

RECOMMENDED _____

SHEET 12 OF 12

P1611

DES: MPG	DWG: EPD	CKD: MPG

Meliora Design

January 12, 2017

Maya van Rossum
Delaware Riverkeeper Network
925 Canal Street, Suite 3701
Bristol, PA 19007

Re: Headquarters Road Over Tinicum Creek
S.R. 1012, Section BRC Headquarters Road / Tinicum – Draft Categorical Exclusion Evaluation, dated November, 2016

Dear Ms. van Rossum:

Meliora Design has reviewed the Draft Categorical Exclusion Evaluation prepared by A.D. Marble. It is our professional opinion there is not sufficient information to support a Categorical Exclusion for this bridge project based on the information provided in this draft evaluation and previous documents reviewed by Meliora Design. Categorical Exclusions are issued when there is sufficient information to determine that a project does not individually or cumulatively have a significant effect on the human environment.

This Draft Categorical Exclusion Evaluation makes two major assertions to support the issuance of a Categorical Exclusion for this bridge project:

1. 23 CFR 771.117(d) (13) supports a Level 2 Categorical Exclusion Evaluation

2. No unusual circumstances listed in 23 CFR 771.117(b) will result because of this proposed bridge project.

It is our professional opinion that the Draft Categorical Exclusion Evaluation does not support these to assertions for several reasons. First, the CEE is unclear as to which item under 23 CFR 771.117(d) this document refers to since there are only a total of 12 items listed under this section.

<u>Significant Environmental Impacts</u>

- No recent and up-to-date Hydrologic and Hydraulic Study has been performed on the proposed bridge design to demonstrate and support the assumption that altering bridge abutment locations, altering the number of bridge piers, and relocating the flow path of the stream underneath the bridge will not cause either individual or cumulative impacts to Tinicum Creek.
    - CEE suggests stream would become more “free flowing” and have “less deposition of sediment” which may or may not benefit Tinicum Creek, an exceptional value stream with a migratory fishery. More study needs to be provided which supports the assumptions that changing the hydraulic conditions at this bridge replacement will not negatively impact a valuable natural resource.
- 305 linear feet of Tinicum Creek are proposed to be regraded to include 2:1 side slopes and riprap armoring for scour protection.

- Previous PennDOT comments to Meliora's previous letter noted that this project is only focused on the immediate area of the bridge replacement and does not include upstream or downstream measures to alter Tinicum Creek. Project boundaries and project scope need to be defined in an up to date document so that impacts can be assessed and commented on. Changes to bank slope, alignment, cover material, and vegetation type alter the characteristics of the stream by impacting habitat, temperature, water quality, and flow.
- The project disturbance will require the removal of 13 mature trees in the area around Tinicum Creek. This indicates that the footprint of disturbance is being increased beyond the existing bridge. Typically, an existing bridge replacement would require very limited disturbance outside the footprint of the existing bridge, but because this bridge is doubling in size, that assumption does not apply to this project.

- Tinicum Creek is an Exceptional Value (EV) waterway.
- Tinicum Creek is classified by the National Park Service (NPS) as Federal scenic River within the Lower Delaware Wild and Scenic River.
- The Headquarters Road Bridge Over Tinicum Creek has been impacted by altered flow regimes from upstream development and the interactions with this changing hydrologic condition needs to be understood.
    - The role Headquarters Road Bridge plays in the Tinicum Creek ecology is only understood through study and analysis of environmental impacts, none of which will be known if a Categorical Exclusion is granted.

The above-listed points are an indication that the impacts of this project go far beyond that which would allow for a Categorical Exclusion to be issued. There are ample unquantified environmental impacts and controversy around the impacts of this project that require the due process of an Environmental Assessment at minimum as called for in in 23 CFR 771.115 that are not being given merit in this Draft CEE document. A Categorical Exclusion was not intended for circumstances similar to this project where there is the potential for significant environmental impacts or controversy on environmental grounds.

There is no acknowledgement that the relocation of the bridge abutments, construction of a new bridge pier, and the removal of two existing piers will cause additional disturbance and negatively alter the hydraulics in the area of the Headquarters Road Bridge. This major alteration of the bridge structure within Tinicum Creek will without a doubt create impacts that have not been evaluated or quantified. This work to evaluate impacts, both individually and cumulatively, needs to be completed. By allowing a Categorical Exclusion to the project, important analysis of this project will not be conducted from an environmental impact standpoint.

If you have any other questions or need additional information, I can be reached at
(610) 933-0123 or MarcH@melioradesign.com.

Sincerely yours,

Michele Adams, P.E., LEED AP
President

Marc Henderson, P.E.
Water Resources Engineer

Headquarters Road Bridge – Coring Tests

McMullan & Associates Report

March 18, 2014

Background

McMullan & Associates was retained to observe corings taken from the stone masonry piers and abutments at the Headquarters Road Bridge near Tinicum Pennsylvania. We visited the site on January 24, 2014, February 20, 2014, and March 27, 2014 in order to observe cores taken from the piers and abutments under the supervision of PennDOT consultant, Mike McAtee of Urban Engineering. This report contains a summary of McMullan's observations and findings.

Coring Procedures

Cores were taken with a rotary core barrel by Pennoni Associates under contract with PennDOT consultant, Urban Engineers. An electric rotary drill with a 2.75 inch diameter core barrel was used to horizontally core the East and West Piers and East Abutment. Core material was extracted and saved in a wooden box. A small amount of water was pumped into the barrel for cooling and lubrication. The core barrel extensions were 15 inches long. After drilling the length of one barrel, it was withdrawn and another 15 inch section added to extend the core length. The depth of the cores varied slightly up to about 40 inches. The core barrel machine was fastened to a stone at each location using an expansion type anchor placed into a hole drilled into the stone with a rotary hammer bit.

Figure 1 – North Elevation of the Bridge. The Arrow indicates the East Pier

Figure 2 – Core drill setup on the east face of the East Pier with the drill machine fastened to the stone

After measurements of the core hole were completed, the core holes were patched with high strength mortar flush to the surface of the stone.

Due to snowy weather and high water, a total of 3 days of coring were needed in order to core each of the piers and abutments. A core was not extracted from the face of the West Abutment due to high water, but a core was taken from the adjacent north side wing wall and this core is assumed to be representative of the conditions at the abutment face.

Coring Findings

The cores holes were observed using a flashlight and photographs were taken. Measurements of the widths of the face stone were taken. The widths of the stones beyond could not be accurately measured due to the small diameter of the hole and the angle of the tape. The material inside the core barrel was photographed each time after it was extracted.

Figure 3 - Core hole on the East Pier

Figure 4 – Extracted core material from the East Pier

The table below summarizes what was found at each core location.

Core #	Location	Observations
Core 1	East Pier, about mid height. 43 inches below the bottom of the concrete encasement around the steel beams	Large stone exterior course, 20 inches in width. Exterior course height 13 inches. Smaller stones in interior with apparent random coursing. Fragments of mortar attached to the extracted stone corings. Gap between stones observed at back of core hole. At the back of the 35 inch long hole, the coring bit cut 7 inches into a larger stone at the back of the hole, but not all the way through when coring was terminated.
Core 2	East Pier, near the bottom, 72 inches below the concrete encasement	Large stone exterior course, 17 to 19 inches in width. At the back of the 37 long inch hole, the coring bit cut into a large stone but did not go through the stone. Large stones have small gaps between.
Core 3	East Pier, near the top, 17 inches from the bottom of the concrete encasement	Core taken through smaller stones near the top of the pier. Exterior course of stone 9 inches in width. Grayish sandy mixture observed between stones. Core length 28 inches.
Core 4	West Pier, 60 inches below the cap, roughly mid-height	Core taken in smaller coursing height stones. Stone length was 19 inches. Grayish sand observed between the stones in the core. Smaller width stones near the back of the hole. Core length 36 inches.

Core 5	East pier, near the top, about 7 inches from the bottom of the beam.	Core taken in smaller height stone course. Exterior stone width is 4" wide. Many smaller stones seen throughout the length of the core. Core length 25".
Core 6	East Pier, near the top, 17 inches from bottom of beams.	Exterior stone course 18 inches in width. Total core length 36 inches.
Core 7	East Pier, near the top, 17 inches from the bottom of the beam.	Exterior Stone course 9 inches. Total core length 27 inches. At end of core, the barrel cut into a stone but did not go through it. Stones within the core appeared to be longer in length.
Core 8	East Abutment, about mid-height. 20 inches from the bottom of the beam.	Exterior Stone course 24 inches in width. Core length 36 inches, then into soil, likely clay.
Core 9	West Pier, 15 inches from the bottom of the beam	Width of face stone is about 5inch with a 9 inch stone behind it. Loose material was found from 18 inches onward towards the pier interior.
Core 10	West pier, 12 inches to the bottom of the beam	The width of the first stone was unclear. Small stones were found throughout the core depth of 26 inches.
Core 11	West Pier, north face of bull nose, about mid height	The face stone is about 14 inches in width. Behind the face stone there is loose material with some roots and clay visible.
Core 12	West Pier, about 5’-6” below the beams	The width of the face stone is about 12 inches wide and behind the stone there are voids and loose material.
Core 13	West Abutment, about 3’-9” to the bottom of the beams.	The width of the face stone is about 14 inches and there are smaller stones and loose material to where to the end of the core at about 22 inches.

In general, at the lower part of the piers, the face coursing of stone was found to be 14 to 20 inches wide. The interior of the pier at this location is between 20 to 24 inches wide, and appears to filled with larger stones and mortar.

Near the top of the pier, the width of the face coursing of stone is apparently smaller, and varies between 4 and 18 inches in width. Six of the eleven cores were taken near the top of the piers. The fill behind the face stones near the top is composed of smaller stone, sand, some clay, and remnants of mortar.

Mortar was observed attached to some of the pieces of stone that were extracted from the lower cores. These lower cores also contained a sandy material that could be deteriorated mortar.

Figure 5 - Piece of stone extracted from pier with arrow indicating mortar bonded to the stone

One core was taken in the East Abutment. The face stone is 24 inches thick and the total wall thickness was measured to be 36 inches.

One core was taken from the north wing wall near the West Abutment. The face stone is 14" wide.

Interpretation of Core Test Results

The stone piers are constructed with a Coursed Rubble type of masonry with larger squared stones near the bottom of the piers and smaller stones near the top. Coursed masonry and Squared-stone masonry typically have more compressive strength than Uncoursed or Random. See figure below for a graphic representation of the types of stone masonry.

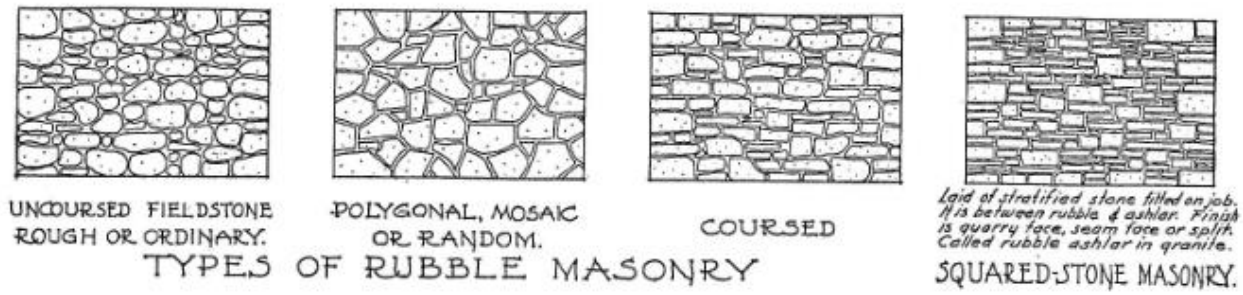


Figure 6 - Graphical representation of the types of rubble stone masonry (AGS, 1932)

The piers are constructed with larger coursed and squared stone near the base and smaller coursed stone near the top. The face stones were measured to be between 18 to 20 inches in width except near the top where they were measured between 4 and 18 inches. The 20 to 24 inch space between the face stones is filled with larger stone and mortar near the base of the piers and filled with smaller stone, deteriorated mortar, and soil near the top. It is unknown if the soil was part of the original fill or the result of creek sediment deposited during high water. A cross section of the pier is indicated below.

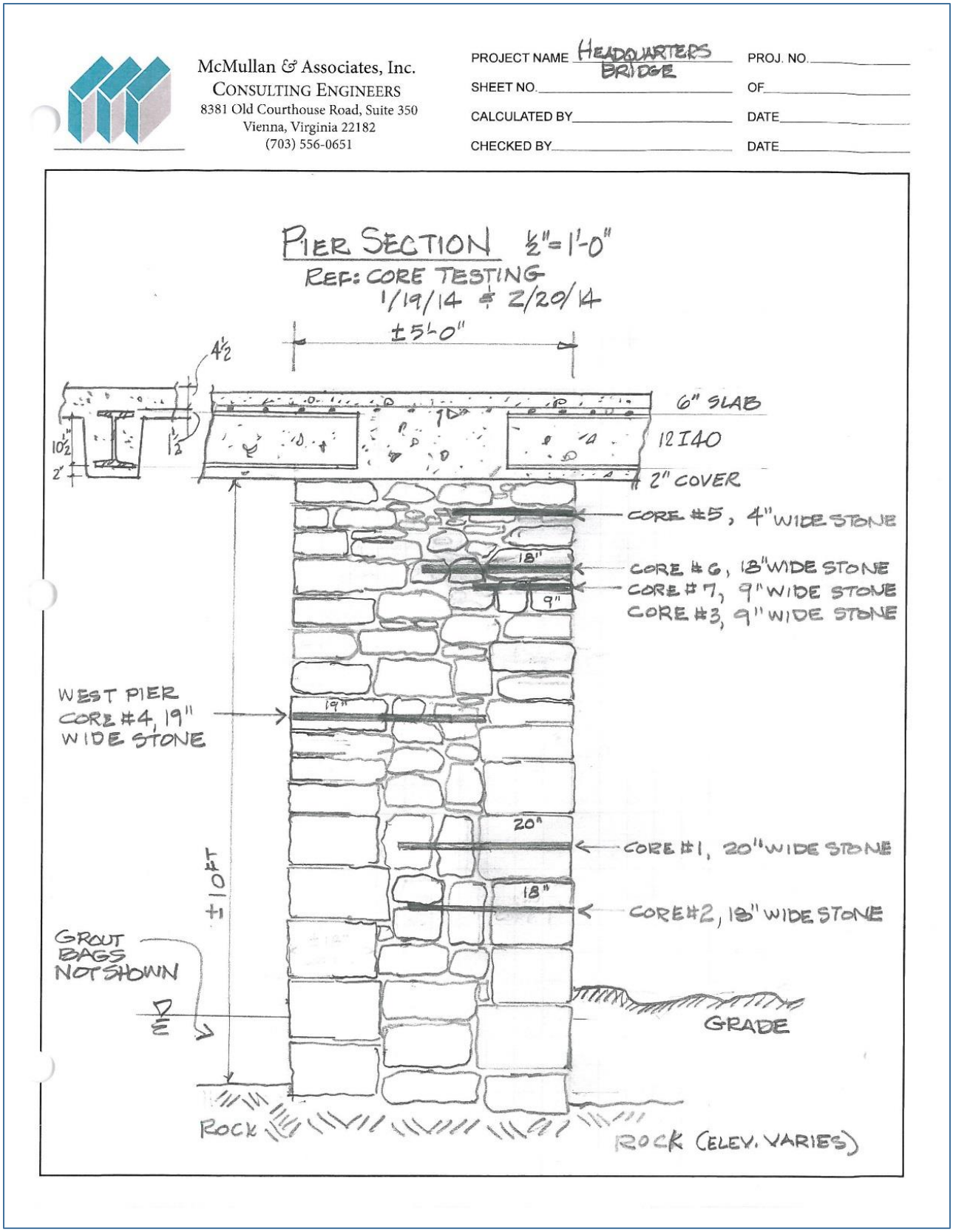


Figure 7 - Cross Section through the pier as interpreted from core results

This type of stone pier can be rehabilitated using stone restoration and repair techniques that have been successfully used on other historic stone projects. There many sources of information that contain descriptions of how stone structures can be rehabilitated such as the PennDOT Stone Arch Maintenance manual. This manual provides guidance on general stone structure repairs that would apply to the Headquarters Bridge as well as guidance specific to arch stone structures.

The abutments are constructed of coursed and squared stone masonry that was measured to be 36 inches in thickness. The abutments can also be rehabilitated using stone restoration and repair techniques similar to the piers.

Respectfully Submitted,

Douglas E. Bond, PE

Vice President

McMullan & Associates

1861 Wiehle Ave

Reston, VA 20190

Headquarters Bridge (S.R 1012) Rehabilitation

McMullan & Associates Consulting Engineers
for the Delaware River Keeper Network

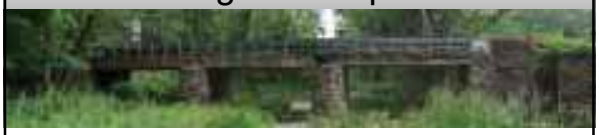
1

Stone Masonry Rehabilitation Projects

- Bridge of the C&O over Catoctin Creek NPS *built in1832; Rehabilitated 2010, Maryland*
- Bridge of the C&O over the Monocacy River *built in 1832; Rehabilitated 2001 NPS, Maryland*
- Snickersville Turnpike Hibbs Bridge *built circa 1850; Rehabilitated 2001, Virginia*
- Lock 2E of the Morris Canal *built in 1840; Rehabilitated 2011, New Jersey*
- Burnside Bridge; *built circa 1850, current, Maryland*
- Lock One of the M&E Canal *built 1845*; *rehabilitated 2013 OHS, Ohio*
- Bridge at Lock 19 over C&O canal *built 1831; rehabilitation planned for 2014 NPS*

2

Bridge Description



- Superstructure
  - 75 Feet Long
  - 16 feet clear roadway
  - Three Spans of about 25 feet each
  - Concrete Deck on Steel Stringers
- Substructure
  - 2 Stone Masonry Piers
  - 2 Stone Masonry Abutments with Wingwalls

3

Bridge History

- Constructed in 1812
  - Wood Deck and Timber Stringers
  - Stone Masonry Piers and Abutments
- Reconstructed 1919
  - Concrete Deck and Steel Stringers replaced wood
  - Stone Masonry Piers and Abutments remained
  - No major repairs to masonry indicated
- Stone masonry buttress West Side added after 1919

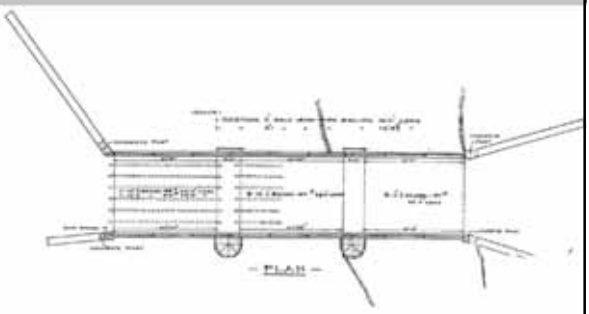
4

Bridge History – Last 15 years

- Determined to be a contributing property to the National Register for Historic Places for the Ridge Valley Rural Historic District – Rehabilitation must be considered
- Bridge width was reduced to 10 feet when Jersey barriers were added
- Bridge Load Rating 2004 -19 tons, 2010 -10 tons.
- Bridge Closed to Traffic 2011

5

Current Conditions vs 1919 Bridge Plans



6

Shotcrete Repairs

Shotcrete was applied prior to the 2004 NBIS inspection

Deterioration of pointing mortar, Date unknown

7

2004 NBIS vs Today

Photo from 2004 NBIS Inspection Report

2004 NBIS Report for the East Pier

"…several cracked stones; far face at beams 1 and 2 10 S.F. x1' outward movement, slight bulge with several crushed stones;….."

2004 Bridge Load Posting: 19 tons

Conclusion: Piers with cracked stones, bulges, and crushed stones can still carry significant load

8

Existing Concrete Apron at W. Abutment

[Prior to grout bag placement]

9

Grout Bags placed

10

Mortar remnants in West pier

11

Test Corings

12

Test Core Findings

- Near the Base
  - Face stones 17-20 wide
  - Lime mortar between the stones
  - Interior fill large stones
- Near the Top
  - Face stones 4-19 inches wide
  - Interior fill
  - Small stones, sand, clay and lime

13

Existing Pier Cross Section (from Corings)

14

Summary Current Conditions

- Superstructure
  - Beams and deck need replacement
- Substructure
  - Stone Masonry Piers and Abutments retain their original stones and shape but require repair
  - Wing-walls need to be partially or wholly reconstructed
  - Grout bags have been undermined and need to be repaired

15

Is Rehabilitation Possible? –YES!!

- Face stones carry majority of the load - Compressive stresses are low (about 60-70 psi)
- The stone masonry has lasted 200 years – Time proven material
- Can be repaired using conventional stone masonry repair techniques
  (ref: PennDOT Stone Arch Bridge Manual)

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Standards for Rehabilitation

- As a contributing resource to the Historic District, Headquarters Bridge should be rehabilitated using the Secretary's Standards for rehabilitation of historic structures
- Retain and preserve the key features of the existing Bridge that convey cultural or architectural values by repairing the stone masonry abutments and piers
- Maintain the appearance of the existing bridge by constructing a new superstructure using similar materials, spans, and width

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Stone Masonry Rehabilitation Techniques

- Stone Replacement Repairs (Dutchman)
- Stone Restoration mortars (Jahn material)
- Partial Disassemble and Reconstruct
- Pointing (Filling Mortar Joints)
- Grouting (low or high pressure)
- Pinning
- Cracked Stone Repair by Injection

18

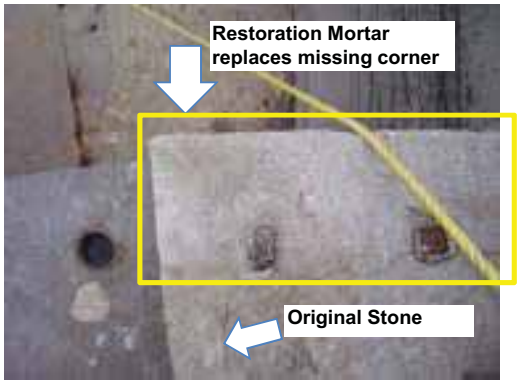
Dutchman Repairs

Preparation for Dutchman Repair of Wall Stone

Completed Dutchman Repair of Wall Stone

19

Stone Restoration Repair Mortar (Jahn)



20

Partially Disassemble and Reconstruct

Wing-wall prior to reconstruction

Wing-wall Rebuilt using original stones

21

Pointing of Stone Masonry Wall

22

Grout filling of Cavities and Holes

23

PennDOT Stone Masonry Resources

24

Headquarters Rehabilitation Work

- Substructure
  - Repair the Piers and Abutments by pointing, grouting, and partially reconstructing
  - Install new concrete distribution caps on top of each element
  - Upgrade the existing grout bag scour protection
  - Partially or wholly reconstruct all four stone masonry wing-walls using salvaged stones.

25

West Abutment

26

West Pier

27

East Pier

28

East Abutment

29

Wingwalls

30

Scour Protection

31

Scour Protection

- Work needed in either Rehabilitation or Replacement
- Consider Channel Protection
- Consider restoring flow through the middle span in an environmentally acceptable manner

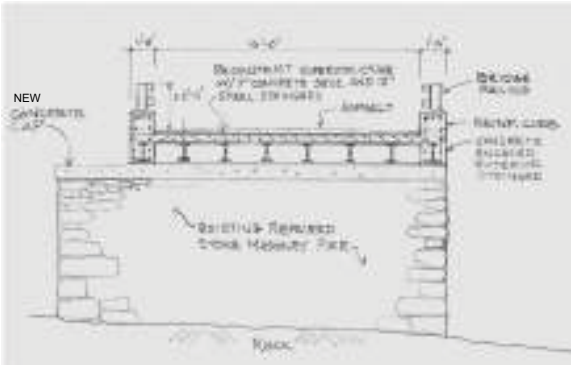
32

Rehabilitation Work Items cont'd

- Superstructure
  - Remove existing concrete deck and steel stringers
  - Construct new steel stringers to bear on the concrete pier cap
  - Construct a new reinforced concrete deck
  - Loading to be AASHTO HS-20 (72,000 lbs)
  - 1919 Bridge width to remain unchanged
  - Bridge railing to follow PennDOT Standards

33

Rehabilitated Cross Section



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Why Rehabilitate?

- A rehabilitated headquarters bridge will continue to protect the Historic Value of the District
- The time required to rehabilitate the headquarters bridge will be substantially less than a new structure.
- The cost of construction of the rehabilitated bridge is significantly less costly than Replacement
- Follows Secretary's Standards for Historic and PennDOT Stone Arch Bridge Manual
- Minimal impact to the Environment compared to Replacement Bridge

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Stone Masonry Maintenance

Before Construction
- Choosing the correct mortar for Rehabilitation
- Qualified Masonry Contractor for Rehabilitation

After Construction
- Clearing Vegetation
- Maintaining deck water resistance

36

Headquarters Bridge Rehabilitation

Rehabilitation of this Bridge can be accomplished without causing an adverse effect on its historic characteristics. It would restore a safe 200 year old crossing of Tinicum Creek for many years to come. A speedy resolution is needed to help the residents of Bucks County.

McMullan & Associates

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Tinicum Township and the Headquarters Road Bridge: Planning the Future

Mark L. Stout, PhD
Patricia A. Ott, PE
for the Delaware Riverkeeper
2 April 2014

STARTING POINT

PennDOT's Smart Transportation Guidebook

1. Tailor solutions to the context:

Roadways should respect the character of the community, and its current and planned land uses.

PennDOT's Smart Transportation Guidebook

3. Plan all projects in collaboration with the community:

The collaboration between state and community involves the integration of land use planning with transportation planning, and a focus on the overall transportation network rather than a single roadway.

PLANNING CONTEXT

Delaware Valley Regional Planning Commission 2040 plan

- Policy: limit suburban expansion into rural communities
- Tinicum: Rural Resource land, parts of 4 Conservation Focus Areas

Bucks County Comprehensive Plan

- 4 Conservation Landscapes partly in Tinicum
- Mostly Natural Resource/Conservation Area
- 7 Greenways in open space plan

Tinicum Twp Comprehensive Plan

Tinicum Township
Bucks County, Pa

- 1993 Plan: "Preserve and enhance the traditional character of Tinicum Township, particularly its heritage of buildings and landscapes with their natural beauty and rural quality."
- New plan under development……

Tinicum Twp Open Space Plan

"TO PRESERVE THE QUALITY OF LIFE ENJOYED BY CURRENT AND FUTURE TINICUM RESIDENTS, including irreplaceable natural resources, biolog diversity, clean, safe drinking water important agricultural soils, hi rural atmosphere, and a stable tax base, by maximizing permanent open space. These interconnected resources, once lost to development, can never be recovered"

Township policies discourage inappropriate growth

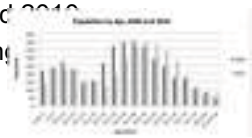
- Land use and zoning ordinances discourage growth in preservation areas, target growth for Ottsville and villages
- More than 1/3 of Tinicum already preserved as open space

Ridge Valley Rural Historic District

- The rural heart of Tinicum Township

No population increase expected

- Tinicum actually lost population between 2000 and
- Population is aging little in-migration
- One projection (DVRPC) shows growth – which we believe is incorrect – but even that is around Ottsville, with little impact east of Route 611



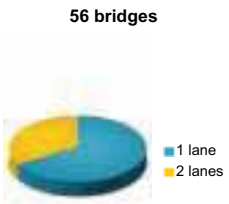
THE ROADWAY NETWORK

Country roads

- Narrow, winding roads

- Gravel roads (protected by ordinance)
- Fords

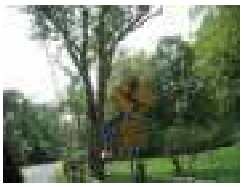
One-lane bridges



- Two-thirds of the 56 bridges in Tinicum Township are one-lane bridges
- Half of PennDOT's bridges (14 of 28) are one-lane bridges!

Winding, hilly roads

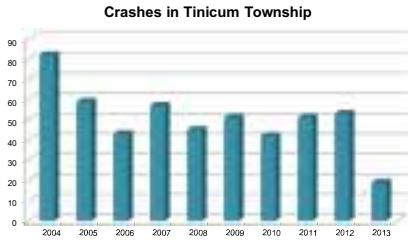
- Much of township has winding, hilly roads with limited "sight distance"
- Including approaches to Headquarters Rd Bridge (which won't be fixed by proposed project)



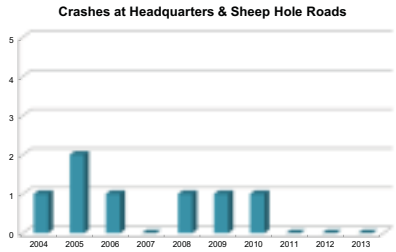
Low traffic counts

SAFETY

Crashes in Tinicum trending down



Crash history at bridge sparse



CONCLUSIONS

Tinicum Twp: A "Rural Conservation Zone"

A delineated "context area" characterized by:

- Very rural land use, with extensive open space and very limited development,
- High-value scenic, recreational, and rural historical and cultural resources,
- Assigned high priority for open space preservation and greenbelt-type functions in regional and local plans, and
- A rural roadway network unsuited to support extensive development.

Locally Preferred Alternative: One-lane bridge

A one-lane bridge on the current footprint is the alternative most consistent with the current and proposed roadway network serving the Tinicum Township Rural Conservation Zone and should be the Locally Preferred Alternative.

Planning the Future

Needed: Genuine collaborative state/local planning, integrating land use planning and transportation planning, for the future of the Tinicum Township Rural Conservation Zone

Concerned Citizen Comments: Increased Danger, Misleading PennDOT Plans

Joan Ramage Macdonald, Ph.D.
Headquarters Road concerned resident
Consulting party
Associate Professor, Lehigh University
Mother of 2 young children

Main Points

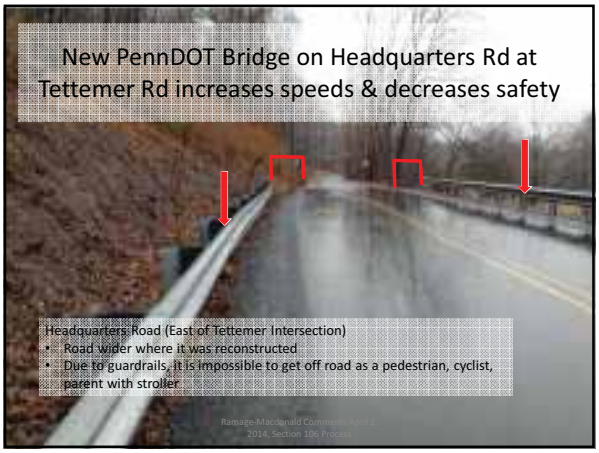
- Pedestrian danger increased at recent bridge replacements on Headquarters Rd.
- Emergency Vehicle Access Planning, Adequate communication with emergency responders necessary
- PennDOT needs to listen to community, follow regulations and restrictions, and if plans that respect the environment and community are shown/approved, they need to be followed (this has not been consistent in past)

Safety and Environment

- Two recent bridges were replaced on Headquarters Road, one at Cafferty Road and one at Tettemer Road.
  - New bridges caused the road to be straighter and wider
  - The traffic is faster
  - There is no place to get off the road due to walls and guardrails
  - Environmental guidelines to protect exceptional quality stream were not followed

Source: Google Maps View of Tettemer/Headquarters Intersection

20 feet



PennDOT Bridge on Headquarters Road at Tettemer Road does not promote access or efficiency for emergency vehicles

From Minutes of Tinicum Township Supervisors' Meeting July 16, 2012

"PennDOT agreed with the Township's position that a fire truck cannot make the right hand turn with the new realignment of the bridge"

New PennDOT Bridge on Headquarters Road at Tettemer Road does not promote access or efficiency for emergency vehicles

From Minutes of Tinicum Township Supervisors' Meeting July 16, 2012

"fire and delivery trucks could make the turn prior to the realignment and he (Pearson) did not understand why that was not considered in the new design."

"currently, a car could not make the right hand turn without drifting into the opposing lane."

Tinicum Supervisors' Meeting Minutes 09-04-12

Intersection Realignment proposed by PennDOT for Tettemer and Headquarters Road:

Fountain said that he had evaluated the intersection and determined that the intersection was not

"Fountain said that he had evaluated the intersection and determined that the intersection was not constructed as it had been designed."

Tinicum Supervisors' Meeting Minutes 09-04-12

Tinicum Supervisors' Meeting Minutes 09-04-12

Delaware Valley Volunteer Fire Chief, Chris Chevalier said that the fire trucks couldn't turn onto Tettemer and had to back up to make the turn. V. Dotti said that snow would decrease accessibility. Chevalier said that a truck coming from the Township Building will have a clear shot, but trucks coming

The Fire chief said that "his biggest concern was oncoming traffic and the safety of others. He said that drivers would see the big red truck and lights but speed still posed an issue."

back up to make the turn."

"… the turning radius was 10 feet on the plan but only 4 feet as built."

G. Pearson said that Tom Fountain would write a letter to PennDOT with his findings about the Tettemer Road intersection and that the Manager and Vince Dotti could add information on the overall issues with the Headquarters Road bridge projects.

PennDOT Bridge on Headquarters Road at Tettemer Road severely estricts access for emergency vehicles

Panoramic View from Cafferty Road Showing length of bridge construction on Headquarters

Note the **massive walls** on both sides of the road, decorated on the exteriors that almost nobody sees.

Safety issues hold here too – there is no way to get out of the way of a speeding car, and visibility is poor on the curve.

Bottom line: PennDOT built an unnecessarily massive structure was built that did not match designs presented to public, decreasing safety, impinging on the stream, and closing the road for a very long time.

Ramage-Macdonald Comments April 2, 2014, Section 106 Process

Source: Google Maps View of Cafferty/Headquarters Intersection

No way to evaluate impact of bridge replacement because we have no idea what this bridge replacement would really look like. The design they've shown is preliminary. The "proposed bridge" design in the Cafferty Road bridge case was preliminary too. At Sheephole Road, the actual conditions are at least as complex as they were at Cafferty.

The final Cafferty Road bridge unquestionably had a **massive and overwhelmingly negative effect** on the character of the road and the stream beside it. No one could have known this from the harmless "proposed bridge" design PennDot circulated for approvals. Everyone needs to remember that's what we're looking at now, another preliminary design.

Only in this case, there's a **significant national resource, the historic district and the wild and scenic rive at stake**. There is simply no way to know the impact of this proposal at this stage, but if we've learned

Ramage-Macdonald Comments April 2, 2014, Section 106 Process

How These Comments are Pertinent to the Headquarters Bridge over Tinicum Creek at Sheephole Road

- Widening the bridge will increase traffic speeds and therefore decrease safety on the road and bridge
- Widening the bridge may not increase access for emergency vehicles. There is prior evidence that emergency vehicle access has not been a PennDOT priority.
- Protections for exceptional value waterways (Tinicum Creek and tributaries) need to be respected
- Preliminary designs may not adquately portray ultimate bridge, so it is critical that the community remain involved. I strongly request that PennDOT keep the community needs in mind during all planning phases
- **Opening a single lane bridge that preserves and restores the historic bridge and neighborhood character is consistent with emergency vehicle access, public safety, and an environment conducive to cyclists, strollers, and pedestrians while not preventing vehicle access.**

Ramage-Macdonald Comments April 2, 2014, Section 106 Process

May 2, 2008

Post Office Box 39
Erwinna, PA 18920

Ms. Carol Lee, Chief
National Register Review
Bureau for Historic Preservation
Pennsylvania Historical & Museum Commission
Commonwealth Keystone Building, 2nd Floor
400 North Street
Harrisburg, PA 17120-0093

RE: RIDGE VALLEY RURAL HIST. DIST.
Tinicum Township, Bucks County, PA
National Register Amendment

Dear Carol,

I am pleased to include for your review an amendment to the above Ridge Valley Rural Historic District, placed in the National Register on July 24, 1992. A number of residents of the community expressed an interest in further clarifying the importance of the two fords and six bridges contained within the district, as well as the district's overall ability to convey transportation solutions for over 200 years.

You already have on file the initial nomination and associated maps and photographs. I am including herewith additional 35 photographs to supplement the subject matter. For your initial review I have included color photos. These will also be available on disc for final submission, as well as black & white prints.

Please feel free to call me with any questions, 610-294-8035. Thank you.

Sincerely,

Kathryn A. Auerbach

Kathryn Ann Auerbach
Preservation Consultant

NPS Form 10-900
(Rev. Aug. 2002)

OMB Approval No. 1024—0018
(Expires Jan. 2005)

United States Department of the Interior
National Park Service

National Register of Historic Places Registration Form

This form is for use in nominating or requesting determinations for individual properties and districts. See instructions in *How to Complete the National Register of Historic Places Registration Form* (National Register Bulletin 16A). Complete each item by marking "x" in the appropriate box or by entering the information requested. If an item does not apply to the property being documented, enter "N/A" for "not applicable." For functions, architectural classification, materials, and areas of significance, enter only categories and subcategories from the instructions. Place additional entries and narrative items on continuation sheets (NPS Form 10-900a). Use a typewriter, word processor, or computer, to complete all items.

1. Name of Property

historic name Ridge Valley Rural Historic District - Amendment

other names/site number N / A

2. Location

street & number Encompassing all of Sheep Hole Road, parts of Headquarters, Geigel Hill, Tabor, Red Hill and Bunker Hill Roads ☐ not for publication

city or town Ottsville ☒ vicinity

state Pennsylvania code PA county Bucks code 017 zip code 18942

3. State/Federal Agency Certification

As the designated authority under the National Historic Preservation Act, as amended, I hereby certify that this ☐ nomination ☐ request for determination of eligibility meets the documentation standards for registering properties in the National Register of Historic Places and meets the procedural and professional requirements set forth in 36 CFR Part 60. In my opinion, the property ☐ meets ☐ does not meet the National Register criteria. I recommend that this property be considered significant ☐ nationally ☐ statewide ☐ locally. (☐ See continuation sheet for additional comments.)

Signature of certifying official/Title Date

State or Federal Agency or Tribal government

In my opinion, the property ☐ meets ☐ does not meet the National Register criteria. (☐ See continuation sheet for additional comments.)

Signature of commenting official/Title Date

State or Federal agency and bureau

4. National Park Service Certification

I hereby certify that the property is:

Signature of the Keeper Date of Action

☐ entered in the National Register.
☐ See continuation sheet.

☐ determined eligible for the National Register
☐ See continuation sheet

☐ determined not eligible for the National Register.

☐ removed from the National Register.

☐ other (explain.)

Ridge Valley Rural Historic District
Name of Property

Bucks County, Pennsylvania
County and State

5. Classification

Ownership of Property
(Check as many boxes as apply)

- [x] private
- [ ] public-local
- [ ] public-State
- [ ] public-Federal

Category of Property
(Check only one box)

- [ ] building(s)
- [x] district
- [ ] site
- [ ] structure
- [ ] object

Number of Resources within Property
(Do not include previously listed resources in the count.)

Contributing	Noncontributing	
50	11	buildings
8	-	sites
9	-	structures
-	-	objects
67	11	Total

Name of related multiple property listing
(Enter "N/A" if property is not part of a multiple property listing.)

N / A

Number of contributing resources previously listed in the National Register

67

6. Function or Use

Historic Functions (Enter categories from instructions)	Current Functions (Enter categories from instructions)
Domestic	Single Dwelling
Agriculture	Agricultural Outbuilding
Agriculture	Storage
Agriculture	Agricultural Field
Transportation	Road related

7. Description

Architectural Classification
(Enter categories from instructions)

Other: Vernacular SE Pennsylvania
Other: Metal Truss
Other: Concrete Arch & Beam

Materials
(Enter categories from instructions)

foundation Stone
walls Stone
Clapboard
roof Slate
other Metal- steel
Concrete

Narrative Description
(Describe the historic and current condition of the property on one or more continuation sheets.)

Amendment to existing 3 page description,
see attached continuation sheets, 7 page description.

Ridge Valley Rural Historic District
Name of Property

Bucks County, Pennsylvania
County and State

8. Statement of Significance

Applicable National Register Criteria
(Mark "x" in one or more boxes for the criteria qualifying the property for National Register listing.)

- [x] **A** Property is associated with events that have made a significant contribution to the broad patterns of our history.
- [ ] **B** Property is associated with the lives of persons significant in our past.
- [x] **C** Property embodies the distinctive characteristics of a type, period, or method of construction or represents the work of a master, or possesses high artistic values, or represents a significant and distinguishable entity whose components lack individual distinction.
- [ ] **D** Property has yielded, or is likely to yield, information important in prehistory or history.

Criteria Considerations
(Mark "x" in all the boxes that apply.)

Property is:

- [ ] **A** owned by a religious institution or used for religious purposes.
- [ ] **B** removed from its original location.
- [ ] **C** a birthplace or grave.
- [ ] **D** a cemetery.
- [ ] **E** a reconstructed building, object, or structure.
- [ ] **F** a commemorative property.
- [ ] **G** less than 50 years of age or achieved significance within the past 50 years.

Areas of Significance
(Enter categories from instructions)

Other: Rural Development Pattern
Architecture
Agriculture
Engineering
Transportation

Period of Significance

1790-1940

Significant Dates

N / A

Significant Person
(Complete if Criterion B is marked above)

Cultural Affiliation

Architect/Builder

Martin, Adam Oscar
Nelson, Thomas
Buchanan, Andrew

Narrative Statement of Significance
(Explain the significance of the property on one or more continuation sheets.)

See attached amendment, 11 sheets

9. Major Bibliographical References

Bibliography
(Cite the books, articles, and other sources used in preparing this form on one or more continuation sheets.)

Previous documentation on file (NPS):

- [ ] preliminary determination of individual listing (36 CFR 67) has been requested
- [x] previously listed in the National Register
- [ ] previously determined eligible by the National Register
- [ ] designated a National Historic Landmark
- [ ] recorded by Historic American Buildings Survey #
- [ ] recorded by Historic American Engineering Record #

Primary location of additional data:

- [x] State Historic Preservation Office
- [ ] Other State agency
- [x] Federal agency
- [ ] Local government
- [ ] University
- [x] Other

Name of repository:

K. Auerbach, 16 Center Rd., Erwinna, PA

Ridge Valley Rural Historic District
Name of Property

BucksCounty, Pennsylvania
County and State

10. Geographical Data

Acreage of Property approximately 575 acres

UTM References
(Place additional UTM references on a continuation sheet.)

	Zone	Easting	Northing
1	18	487495	4482120
2	18	480100	4480880
3	18	486620	4470908
4	18	487910	4479595

See continuation sheet

Verbal Boundary Description
(Describe the boundaries of the property on a continuation sheet.)
See original nomination.

Boundary Justification
(Explain why the boundaries were selected on a continuation sheet.) See original nomination.

11. Form Prepared By

name/title Kathryn Ann Auerbach, Preservation Consultant

organization Institute of Community Preservation date May 2, 2008

street & number Post Office Box 39 telephone 610-294-8035

city or town Erwinna state PA zip code 18920

Additional Documentation
Submit the following items with the completed form:

Continuation Sheets Sect. 7 - 7 sheets, Sect. 8 - 11 sheets, Sect. 9 - 1 sheet, Photo Index - 2 sheets.

Maps Photo Location Map

A **USGS map** (7.5 or 15 minute series) indicating the property's location.

A **Sketch map** for historic districts and properties having large acreage or numerous resources.

Photographs 35 views

Representative **black and white photographs** of the property.

Additional Items
(Check with the SHPO or FPO for any additional items)

Property Owner
(Complete this item at the request of SHPO or FPO.)

name multiple

street & number _____ telephone _____

city or town _____ state _____ zip code _____

The Ridge Valley Rural Historic District contains a transportation network that presents a range of road types and stream crossings that demonstrate in physical reality the evolution of rural passage from the mid-18th century through the late 1930's. As the name implies, the district is comprised of a series of geologic prongs or ridges separated with narrow stream valleys incised through the rock, with intermittent broader respites of meadows and fields. Nearly 45% of the roads are dirt or unpaved pathways slightly more than one-lane wide that follow the dictates of the rugged topography. Another 22% are unmarked macadam of narrow two-lane width and the remaining 33% are paved two-lane wide rural collectors with standard centerline markings and minimal grassy shoulders. The roads are lined with trees or adjoin meadows or streams and follow the natural paths carved by the strong flowing creeks out of the surrounding shale rock and cliffs. Stream crossings are encountered eight times within the district, two crossings are natural fords, the remainder one-lane bridges dating from 1812 to 1936. The 1812 piers and abutments record the span capabilities of timber beam bridges of the earliest generation, three metal truss bridges contrast the Pratt pony truss design from its first period of popular use in rural areas in the 1880's (a Nelson & Buchanan bridge) to facilitating rural needs via the WPA programs of the 1930's. The early and quickly accepted use of reinforced concrete can be seen with the 1909 concrete arch, and then the concrete encasing of steel beams for a 1917 bi-span and the 1919 tri-span rebuild of the wooden beam bridge. The last three are also the work of prolific and talented county bridge engineer and local architect A. Oscar Martin. As a collection, the roads and bridges present a traveling experience closer akin to the past than the present. With roadside amenities such as stone walls, board and split rail fencing accenting fields, meadows, woods and historic houses and barns, the district maintains exceptional integrity and historic context.

There are seven public roads within the district boundaries covering a total length of approximately 4.5 miles. Over two miles, or nearly 45%, of the roads are unimproved packed dirt, namely Bunker Hill Road and Sheep Hole Road and a small portion of Tabor Road. These township public thoroughfares are graded paths averaging about 12 feet width, enough for cars to carefully pass. In dry seasons the dirt is a dusty red powder created from the red shale rock and naturally blends into the adjoining landscape. Bunker Hill and Tabor Roads are in the most remote northerly portion of the district where the geology quickly ascends to higher elevations caused by harder rock formations and swamps and as such are rugged, narrow paths indicative of their 18th century appearance.

Tabor Road is the shortest (approx. 900 feet in the district) and is presently closed to

automobile traffic. It enters the district from the northwest along the Rapp Creek and steep shale cliffs and joins Bunker Hill at the upper ford. Bunker Hill Road (with an approximate total distance in the district of 4,550 feet) follows along the township line north of the district, then turns southerly into Tinicum and down the geologic fault to the Rapp Creek. The ford often has the appearance of a still pond in the creek, as it is void of large boulders and has a flat rock bottom. Traffic over the years has also widened this portion of the creek. Bunker Hill Road simply disappears beneath the water and reappears on the other side. Rapp Creek bends to parallel the road on its east side against rock outcrops and within a short distance Bunker Hill Road again must cross the creek as the water makes an S-curve to then run on the westerly side of the road. The area near the upper ford is cleared for an old farmstead, but the balance of land along Bunker Hill is wooded with shale cliffs and outcrops. The road path in places is cut into the top surface of the ground from years of use. Natural woodland vegetation lines the road and adjoining landscape adding to the remote experience. As the road approaches Clay Ridge the landscape opens to the northeast to another farmstead and cleared meadows. One of the two concrete bridges on Clay Ridge is visible from the side, immediately to the west of the Bunker Hill intersection.

Sheep Hole Road is the longest road in the district, approximating one mile or 5,300 feet, as well as being unimproved dirt. It begins at the Geigel Hill Road Bridge, just below the confluence of Rapp Creek and Beaver Run into the Tinicum Creek. It follows south along the Tinicum Creek, generally favoring the meadow side of creek and providing views of the steep shale cliffs. A pair of Pratt Pony truss steel bridges from ca.1936 carry the road across the creek at approximately one-third and three-fifths distances along the length of the road. Mid-way between the bridges is a pull-off along the creek for a "watering hole" or more historically, the sheep dip. This still ponded portion of the creek is accessible even today. Views of broader sheep meadows, fields and historic farmsteads are characteristic of the landscape along this stretch. After the second bridge, traveling southeast, the road is to the east of the creek, but on the steeper side, as the meadow land was reserved for the mill pond and mill race to serve Christian Fretz's mill on Headquarters Road. As such the road passes directly in front of two historic farmsteads with the fieldstone houses and outbuildings oriented southerly to the road and meadows. Approaching Headquarters Road, Sheep Hole Road is nearly carved out of the shale bluffs and is less than ten feet wide in parts. It runs high to the creek bed immediately adjacent and terminates on the east abutment of the Headquarters Road Bridge, with views of the bridge on its approach.

The next type of road within the district is the paved enhancement of dirt roads. These are narrow, winding roads with barely two lanes passing and no shoulders or pavement markings. Two roads entering the area from the northease and south. Clay Ridge Road and Red Hill Road, are of this type with a total length of roughly 5,100 feet, just short of one mile (22% of district). Clay Ridge is among the oldest of the district roads, branching off of Geigel Hill Road as it travels east from Ottsville and the Durham Road, to cross first the Rapp Creek and then Beaver Run Creek before ascending out of the district to the clay uplands known historically as the "Swamps". It continues further to reconnect to Geigel Hill with a destination of the Delaware River and Frenchtown, NJ. Fifteen hundred feet of Clay Ridge is wholly in the district with the two creek crossings formerly forded until 1909 when the concrete arch bridge was built over Beaver Run and then in 1917 the two-span concrete encased steel beam bridge was built over Rapp Creek at Bunker Hill Road. The remaining 1,000 feet of Clay Ridge forms the northeast border of the district as it follows along Beaver Run. This corner of the district is a protected meadowland valley with farm buildings tucked against the geologic prongs away from the road. Clay Ridge Road winds along the run and curves around the nub of one of the shale ridges after crossing the arched bridge to extend westerly across the Rapp Creek to Geigel Hill. This latter area is the wetland and flood plain of the confluence of the two creeks and is partially wooded. Approaching the Rapp Creek bridge glimpses of Lewis Overpeck's Blacksmith Shop complex and the Geigel Hill Road Bridge are visible to the south.

Red Hill Road (roughly 2,600 feet) facilitates travel from the south into the valley of Christian Fretz's grist mill and was opened in 1812 in response to the construction of the Headquarters' Road Bridge. It is cut into the side of a shale cliff and traverses along the cliff roughly 40 feet above the meadowland. As such modern guiderail lines the outside (northeast) edge of the road until it approaches an historic farm complex on the south end of the district near Frankenfield Road. If one enters the district from the south along this road the heightened view into a broad flood plain meadow defined with white plank fencing, grazing animals, historic stone buildings and the Headquarters Road Bridge elicits pastoral serenity.

The remaining two roads in the district Headquarters Road and Geigel Hill Road comprise one-third of the road mileage (approx. 4,500' and 2,900' respectively). They are classified as PennDOT rural collectors and are paved, two lane cartways with standard centerline markings and minimal or no shoulders. Due to the challenging

topography these roads are often minimal width for two-lanes and have curves exceeding 90 degrees. While the roads above mentioned run mostly north-south and along portions of the Tinicum Creek, Headquarters and Geigel Hill Roads are principally east-west and provide the critical link historically and presently for points along the Delaware River and connections in New Jersey to the principal north-south arteries of the region, the Durham and Easton Roads (in places combined). The latter connects cities of Easton and Bethlehem to the north (and formerly the Durham Iron Furnace) with the county seat of Doylestown (and former 18th century seats of Newtown and Bristol) and major city of Philadelphia to the south. Both roads, while passing along runs or branches of the Tinicum Creek, must cross Tinicum Creek and thereby have the oldest bridges within the district (and among the oldest in the township).

Headquarters Road was established in the mid-18th century as an intercounty and interstate path crossing through the middle of Tinicum Township to the Delaware River ferry near Erwinna. The site on the west bank of the Tinicum Creek along this road was developed by the late 1760's by Christian Fretz as an important grist mill. The mill was set out of the low lying stream meadows near the western shale bluffs, now adjacent the Red Hill intersection. The combination of the meadows and a sizeable branch of the Tinicum (Headquarters Run) feeding in from the east allowed the early path of this road to be defined around the weathered shale prongs, a path still used today. Entering the district from the west the road circles northwardly around a shale bluff then turns eastward providing a panorama of the grassy meadows and historic buildings and descends down along the northeast side of the bluff between the stone house and barn and bends eastward between fenced pastures to the Headquarters Road Bridge. This right angle crossing of the Tinicum Creek ends in a "T" intersection with Sheep Hole Road entering from the north (left) and Headquarters Road continuing to the south (right) to follow around a weathered shale nob and an historic bank house then bending back (roughly 120 degrees) northeasterly between stone walls and Headquarters Run to pass another historic farmstead on the south before leaving the district. The experience traveling into the district from the east is similar with passage through wooded hillsides and watercourses then turning sharply to unfold the scene of fenced pastures and historic buildings near the bridge crossing. The road, while two-lanes and marked, is shoulderless for much of its course, traveling past natural creeks and runs, historic stone walls, shale outcrops and fenced pastures.

Geigel Hill Road also serves as a critical east-west connector from the Delaware River

(and former ferry) to the Ridge Road (portions Route 563) connecting to upper Montgomery County and conversely, a migration network for German populations settling Tinicum in the 18th century. From the west, the 18th century path broke from present day Geigel Hill onto Clay Ridge Road, joining Geigel Hill further east. In 1810 an alteration was made to create the present day path, with a ford crossing of the Tinicum Creek, just below its creation from Rapp and Beaver Run. Farmsteads were established flanking the creek and after the Civil War Lewis Overpeck established a blacksmith shop on the east side immediately by the side of the road. As with Headquarters Road, one enters the district from the west descending along a wooded hill with flanking ravine/water run, turning southeasterly past fenced pastures and a farmstead against a shale bluff to the Geigel Hill Road Bridge, a metal Pratt pony truss bridge set at right angles to the creek. Crossing the creek one passes the blacksmith, butcher shop and barn complex on the north and historic house on the south at Sheep Hole Road, then traveling up through a swale like cut in the shale bluffs, turning northward before arriving at the open, field like uplands. The deep ditch created by the strong run off that parallels the road on this eastern stretch up the hill has been replaced by a culvert and paved over, creating the only "shoulder" along any of the roads in the district. Aside from this one altered portion, the remainder of Geigel Hill Road is a simple two-lane, paved and marked roadway with minimal shoulders and surrounded by natural terrain and historical amenities.

Overall the integrity of the roads within the Ridge Valley Rural Historic District is very good in representing the character of roads and pathways as established in the 18th and early 19th century and used into the early period of automobile travel. The character of the dirt roads and fords is excellent from their inception to the present day. The secondary paved roads still follow their early or original paths and the 19th and early 20th century bridges hold to the period of significance of the district and fix the visual image to that of a pre-1940 era.

Following are descriptions of the eight stream crossings. mid-18th century through 1936.

Bunker Hill Road. Upper Rapp Creek Ford crossing adjacent TP#44-5-3-1, 10 & 21, dirt road with a straight alignment approaching the creek, crossing at right angles (approx. 50 feet) over smooth stone creek bottom, stream banks worn down at crossing give look of slightly wider creek without large boulders. Integrity & condition excellent.

Bunker Hill Road, lower Rapp Creek Ford crossing adjacent TP#44-5-3 & 20, dirt road that turns slightly and down a small embankment upon approach to creek from south, crossing roughly at right angles (approx. 70 feet) over smooth stone creek bottom, fewer boulders within ford area. Integrity & condition excellent.

Headquarters Road Bridge over Tinicum Creek adjacent TP#44-14-2, 3-1 & 8, 1812 stone piers (two). abutments and wingwalls to support open wooden beam bridge, 1919 reconstruction of wooden superstructure with concrete encased steel I-beams, concrete end and intermediate pylons to hold metal pipe railing, county bridge date placque on north pylon, newer macadam deck surface; pipe railing replaced with modern guiderail that has fallen off, now traffic guided by Jersey barriers lining both sides of cartway. Overall length 80 feet, spans between piers approximately 24 feet, original cartway 16 feet, estimated creek clearance of 10 feet. 1919 superstructure designed by A. Oscar Martin. Condition & integrity of superstructure poor due to inappropriate maintenance, condition & integrity of 1812 stone piers and abutments fair with ca. 1900 repointing and late 20th century cement pointing and gunnite applications. Additional stone buttress applied to west abutment to divert stream flow. No posted weight limit.

Geigel Hill Road Bridge over Tinicum Creek adjacent TP#44-5-6-1, 22, 33, 34, 1887-8 Pratt pony truss, metal pin-connected, single-span on stone abutments (covered with a concrete stucco). Stone wing walls on westerly approach, modern guide rail on eastern approach. Bridge designed by Nelson & Buchanan, bridge engineers, manufactured by Pittsburg Bridge Company (metal identification placques attached to trusses) and assembled by Henry Loux & John Swope, local contractors. Bridge span 58 feet, cartway 15 feet, 2 inches wide, upper chord is six feet above the road deck. Metal trusses hold four 12" beams via suspenders that carry eight 8" stringers. The deck, originally wooden planks, was replaced with wood 2x4's on end and currently has a top surface of asphalt. Simple metal curbs and U-channel guide rails served to guide traffic. A few of the pin connections were welded to provide greater stiffening ca.1940 at the increase of

automobile traffic. Bridge damaged in 2002 with vehicular impact on upstream truss bending the guiderail, one vertical with slight upper chord displacement. 2002 closed to vehicular traffic, 2008 closed to pedestrian traffic. Rusting members from extended neglect. Condition poor, integrity good. Formerly 8 tons. Replacement scheduled.

Clay Ridge Road Concrete Arch Bridge over Beaver Run, adjacent TP#44-5-20 & 24. 1909 with datestone "County Bridge 30". Single concrete arch span of 40 feet, 4 inches on a skewed alignment to the creek (arches offset 21', 4" to each other), 16 feet cartway, total width 18 feet to include one foot wide concrete parapet walls, 3 feet high. Arch supports concrete encased steel beams set at right angles to the traffic flow. Bridge designed by A. Oscar Martin. Condition and integrity very good. It is posted at 3 tons.

Clay Ridge Road Beam Bridge over Rapp Creek, adjacent TP#44-5-3 & 22. "County Bridge 1917" datestone. Two span concrete encased steel beam bridge with concrete abutments and mid-pier, total span 58 feet, 16 foot, 9 inch cartway, total width 18 feet, 6 inches including 10 ½ inch wide concrete pylons. Eight pylons hold seven sections of pipe railings and are 3 feet high and 34 1/2 inches long. Approach wing walls also have three sections of pipe railings. Two spans of eight 15 ½ inch high concrete encased beams. Bridge designed by A. Oscar Martin. Condition and integrity very good. Current posting 31 tons.

Sheep Hole Road Northern WPA Bridge over Tinicum Creek, adjacent TP#44-5-40 & 7. 1936 Works Progress Administration. Steel Pratt pony truss single-span bridge set on stone abutments with concrete cap and no wing walls. Skewed alignment (roughly 11 feet) over 60 foot span. Four 21 inch beams carry six 9 ½ inch stringers with concrete deck, 18 feet, 6 inches wide. Steel members much heavier than Geigel Hill Road Bridge and joined with metal plates. steel from "Phoenix USA". Very good condition, excellent integrity. No weight restrictions.

Sheep Hole Road Southern WPA Bridge over Tinicum Creek, adjacent TP#44-5-7, 8 & 39. 1936 Works Progress Administration. Steel Pratt pony truss single-span bridge set on stone abutments with concrete cap and no wing walls. Skewed alignment (roughly 12 feet) over 60 foot span. Four 21 inch beams carry six 9 ½ inch stringers with concrete deck. 18 feet, 6 inches wide. Steel members much heavier than Geigel Hill Road Bridge and joined with metal plates, steel from "Phoenix USA". Very good condition, excellent integrity. No weight restrictions.

The Ridge Valley Rural Historic District, initially listed in the National Register of Historic Places on July 24, 1998, is additionally eligible for the register under Criterion A in representing transportation patterns and stream crossing solutions spanning nearly two centuries from the mid-18th century through 1938. This network visually represents the 18th century pathways that enabled the movement of settlers into Tinicum township, the principal arteries and 19th century bridges that continued development of commerce and employment opportunities, and early 20th century adaptations of fords with one lane bridges to accommodate the automobile while preserving the quaint bucolic scenes that attracted exurbanites, celebrities and writers to continue to live in this historic landscape. The district is also eligible under Criterion C in demonstrating the evolution of stream crossing engineering and rural bridge technology with active stream fords, beam bridges from 1812, metal single span pin-connected Pratt pony truss bridge from 1888 and comparative steel pony trusses from 1936 as well as early 20th century concrete construction with 1909 arch and 1917 and 1919 concrete encased steel beam bridges. Additionally, four of the bridges are representative examples of well-known bridge engineers, the 1888 metal truss bridge that of Nelson & Buchanan and the Pittsburg Bridge Company and the early 20th century concrete bridges leading edge technology of county bridge engineer and recognized architect A. Oscar Martin. All of these stream crossings are increasingly rare and unprotected resources and combined within this one district provide unique insight into rural transportation from its most basic dirt roads and stream fords of the 18th century to the delicate, yet mass produced metal Pratt pony trusses of the 19th century, to innovative concrete technology of the 20th century, all used to provide the most efficient, least intrusive and least expensive solutions for economically challenged rural communities. Little change to the roads and bridges since the mid-20th century, combined with the preserved landscape and historic buildings principally from the 19th century maintains a full context for viewing and understanding the role of rural roads and bridges in the history of this area.

Criterion C: Evolution of Bridge Engineering & Technology: Works of Masters:
Active stream fords carrying one-lane dirt roads through natural streams and rural landscapes are nearly extinct in the 21st century within the metropolitan region between New York and Philadelphia. Within Tinicum Township, Bucks County there are four fords, two of which are in this district. These are the only known active fords within Bucks County. They are rare survivors within a physical and historical context that remains intact from the early-19th century, with usage extending further back into the

mid-18th century. Their value is increased by the fact that they can still be used and experienced and also that once a crossing is bridged, and the bridge then closed or removed, a ford is not reinstated as a method of passage. The two fords in this district are additionally representative of the earliest method of passage through a creek as the creek bottom is still the natural stone, not improved with a slab of concrete, as is seen with a ford in the Delaware River crossing from Tinicum to Pennington Island (New Life Island).

The next simplest form of rural stream crossing was the open wooden beam bridge Supported by stone abutments built into the stream bank, spans were limited to the capability of the wooden beams. Intermediate stone piers were used to supplement the length of longer spans. This type of bridge was less expensive to build than the stone arch, or the covered Burr and later Town truss spans emerging as technology after the Revolution. Major stream crossings for primary interstate transportation routes, such as the Old York Road or the Durham-Easton Road, were principally stone arch and funded by the county from the mid-18th century and particularly at the turn of the 19th century (Eight-Arch Bridge, ca.1804, Warwick Township, NR; Nockamixon Arch Bridge, 1804, Nockamixon Township, NR eligible). Delaware River bridge crossings were built by private subscription companies and funded by tolls. These were covered bridges principally of the Burr Truss design built on stone piers and abutments (such as the 1804 Morrisville Bridge to Trenton, NJ, replaced). Local rural bridges were too expensive for municipalities to construct, necessitating county funding and design and in less important areas often resorted to open wooden structures with support beams spanning pier to pier.

Such was the case with the Headquarters Road Bridge. Petitions for a bridge were offered to the county in 1805, but not approved until 1812 (BC Bridge File #83, session docket 2, ps. 4, 85; BC Bridge File #104, session docket 2, ps. 294-307, File #112, docket 2, ps. 360 & 364). This may be because the site was viewed in August, perhaps during a dry spell when the Tinicum Creek was low and easily forded. Additional arguments given in 1812 stressed the importance of Headquarters Road as extending from Sumneytown (in upper Montgomery County) to the Delaware River ferry at Erwinna. Specifications given were for a bridge of "about 85 foot that it would require a bridge of ten feet high to be above the highest freshet in said creek…". The stone piers and abutments in place today for the Headquarters Road Bridge date from 1812 and the stonework is representative of character of Federal era masonry style combining rubble and locally quarried stone with cut piers and corners. The placement of the piers also

documents the span capability of approximately 25 feet for three spans each (plus the additional pier width) accomplishing the 80 foot length required at this site. Turn of the 20th century county records identify this bridge, called "Burnt Mills Bridge" due to the ruins of the burned Fretz mill nearby, as an "open wooden bridge". One other open wooden bridge exists on the border of Tinicum and Plumstead Townships over the Tohickon Creek (NR eligible). This, however, is a Howe truss bridge and the combined use of wooden trusses reinforced with wrought iron components allows for a much greater span of 90 feet with one intermediate pier for an overall length of 180 feet. The trusses are not as high as on a covered bridge and are enclosed on each side of the open wooden cartway. On the Headquarters Road Bridge the subsequent replacement of the deck with concrete encased steel beams simply replicates the initial engineering in a new material, using the original stone piers and abutments for support, thus maintaining the span capability information and basic design.

From stream fords throughout the entire district in the 18th century, to one bridge in 1812, no other bridges existed in the district until 1888 when the Geigel Hill Road bridge was completed. Aside from two ca.1832 covered bridges serving the canal towns of Erwinna and Uhlerstown, one ca.1872 covered bridge on a principal road from Erwinna to Philadelphia, and one ca.1877 Pratt pony truss over the Delaware Canal in Point Pleasant, (all serving the eastern and southeastern part of the township) as well as the 1812 Headquarters Road Bridge, there were no substantial creek spans within the township, especially in this western quadrant until the Geigel Hill truss of 1887-1888. This bridge was important as a link for much of the interior populations of upper Tinicum to the Easton Road at Ottsville and access by stage and then trolley to larger towns and cities.

After the Civil War through the early-20th century much of Tinicum Township suffered economic decline due to poor soils and thus inability to shift to larger dairy operations popular at the time, followed by a general decline in agricultural prosperity at the turn of the century. The county, in response to petitions, and perhaps in an effort to offer greater opportunities to rural populations, commissioned in 1887 seven Pratt single-span pony truss bridges throughout the county, principally upper Bucks. In August 1887 "four of the contracts (for the iron superstructures) were let to Nelson & Buchanan, and the other three were let to the Wrought Iron Bridge Company of Canton, Ohio." (PHMC Historic Resource Survey Form, Courtney Clark, CHRS, March, 2003)

"County Bridge Docket records reveal that the Commissioners had been favoring iron bridges over wooden and stone spans for at least a decade. The majority of Bucks County bridges constructed between 1876 and 1893 were iron truss structures." (Clark, PHMC form 2003) Iron and steel bridges of the 1870 through 1880's (a time when there was a combination of both materials and a transition to more use of steel) exhibit an extraordinary delicacy of design and use of materials, perhaps in part as a celebration of the strength vs. mass capabilities in contrast to wood. They were manufactured by iron companies, in this case Pittsburg Bridge Company, and assembled on site through the use of pin-connections, the work being performed by local contractors. Set on stone abutments, these bridges were an inexpensive and efficient answer to bridging difficult stream crossings and were once familiar elements of the rural landscape. Bridges of this type are exceedingly rare (as few remain in Bucks County as covered bridges- 12, 2002 PennDOT statistics) and are being quickly replaced. As a documented example of the work of Nelson & Buchanan bridge designers of Chambersburg, PA and the Pittsburg Bridge Company, the Geigel Hill Road Bridge is an important representation of the engineering and iron and steel industries of Pennsylvania and their easy outreach to rural communities.

"Thomas Nelson and Andrew Buchanan had begun working as partners and agents for the Pittsburg Bridge Company in 1883, five years after the company was organized (Walsh 1984: n.p.; Miller 1992: n.p.). Headquartered in Chambersburg, Pennsylvania, Nelson and Buchanan traveled throughout Pennsylvania, New York, and Virginia selling and constructing iron bridges on behalf of the Pittsburg Bridge Company (Spero and Yearby 1987: n.p.) Nelson would eventually serve as president of the Pittsburg Bridge Company from 1896 until 1900, at which time the firm was purchased by the American Bridge Company (Darnell 1984: 67)." (Clark, PHMC form 2003) Nelson & Buchanan were "masters that were well-known representatives of the Pratt, pony truss bridge type…their workmanship was well-respected and well-known throughout Pennsylvania…and additionally known and valued throughout a number of the states including Virginia, West Virginia and Ohio." (Clark, ibid) The Old Mill Road Bridge over Owens Creek in Rocky Ridge, MD, 1882 is a National Register recognized example of a Pittsburg Co. Pratt through truss. The Geigel Hill Road Bridge is one of two known remaining bridges (the other on Gayman Road, Plumstead Township) in Bucks County from this time and the only Nelson & Buchanan, pin-connected, Pratt pony truss single span bridge from the 19th century in the state of Pennsylvania to remain within a National Register historic district, and thus within its original context and historical setting.

As technology evolved at the turn of the 20th century toward the use of reinforced concrete in bridge construction, as seen with the Clay Ridge concrete arch 1909 and concrete encased bridges 1917 and 1919 (redecking of the Headquarters Road bridge) all designed by A. Oscar Martin, steel pony trusses were not as common. Their reoccurance in the district with the pair of ca.1936 Pratt pony trusses on Sheep Hole Road illustrates how these bridges, due to their ease of manufacture and efficient assembly, were adopted by the Works Progress Administration, again to aid declining rural areas. Built 50 years after the Geigel Hill Road Bridge, the Sheep Hole Bridges provide a unique compare and contrast in technology of the time, given nearly the identical design parameters. Heavy steel members (Phoenix USA) and welded plate connections are the principal variations to the light metal and pin-connections of the late-19th century. For example, the Geigel Hill Road Bridge has 12" floor beams and 8" stringers, whereas the Sheep Hole Road bridges have 21"beams and 9 ½" stringers. As welding was the acceptable practice for assembling the 1930's bridges, it was applied in places on the Geigel Hill Road Bridge in 1932 as a common repair and strengthening technique, in part due to increased usage by automobiles and trucks. Within the period of significance for the district, the welding applications are a part of the evolution of metal bridge engineering. The sturdiness of metal truss bridge designs is attested to by both the Geigel Hill and Sheep Hole Bridges. The Geigel Hill Road Bridge functioned at 8 tons (carrying additional (non-original) 15 tons asphalt roadbed dead weight) until an accident (not structural failure) resulted in closing in 2002 (a total of 114 years of operation). The Sheep Hole Road Bridges have received timely maintenance and painting (unlike Geigel Hill) and continue to serve at full load capacity over seventy years after construction.

Mass production of individual members coupled with local assembly allowed these metal trusses to be inexpensive solutions in rural areas. The Geigel Hill Road Bridge superstructure was priced at $1,049 with local contractors John Swope and Henry Loux completing the substructure and masonry at approximately $400 (bill of $800 for two bridges, Geigel Hill and Gayman) (Clark, PHMC form, March 2003). A WPA grant matched by funds from Tinicum Township provided the means for the two 1936 pony trusses to be assembled along Sheep Hole Road. Again, all local labor was used in this effort not only to provide bridges, but also income (at the rate of $.40 per hour) to the rural residents of Tinicum. Each of the Sheep Hole Bridges cost $5,000 total, according to John Wexley, screenwriter and local resident who was instrumental in acquiring the WPA grants (Wexley, John, "A Tale of Two Bridges", *Tinicum Bulletin*, 1984, Tinicum Civic Association).

In between the construction of the Geigel Hill Road Bridge and the Sheep Hole metal bridges, reinforced concrete began to be used for bridge construction. Also referred early on as "steel concrete", the idea of adding strength to concrete started in France in 1868. The ability to mold concrete into complex forms coupled with its compressive strength was combined with the greater shearing and tensile qualities of iron, then steel, imbedded as rods, expanded metal or I-beams into the concrete. Experiments and patents both with the steel and Portland cement (against failures in 1887 caused by elements and saltwater) yielded a new era of construction and engineering (*Encyclopedia Britannica*, University Press, Cambridge, England, 1910, p. 837-840). By the end of the 19th century enough confidence in the material was gained that government projects were engaged using reinforced concrete (Fort Wadsworth Endicott Era Batteries, Staten Island, 1895-1902, complex forms and load bearing spans). A. Oscar Martin (1873-1942), a distinguished Bucks County architect and engineer, whose active career began in the early 1890's, appears to have first designed a "concrete steel arch" bridge over Swamp Creek near Campbell Mill in Milford Township in 1906 ("What Makes a Bridge Great?", *Better Roads*, February 2005- one of six featured outstanding examples nationwide). Previous bridgework involved repairs to covered bridges and the construction of a stone arch bridge in Wycombe in 1905. Known for his appealing conservative designs that drew strongly on Colonial Revival, with some Prairie and Arts and Crafts motifs and occasionaly Spanish Mission, Martin's engineering work in reinforced concrete gave him a "modern" creative outlet, contemporary with the pioneering work of nearby Henry Chapman Mercer (Fonthill, Tile Works and Mercer Museum, NHL).

While maintaining his private practice in the Hart Building in Doylestown, Martin became "county engineer", principally in charge of repairing or building new bridges in the county system. The county commissioners apparently were interested in exploring the capability of reinforced concrete in bridge construction and commissioned Martin. Concurrent with repairs to stone arch and covered bridges, during the period of 1906-1919 records indicate Martin designed 44 concrete bridges, only five of them identified as arched, not counting bridge repairs (and those drawings not a part of this collection) ("Philadelphia Architects and Buildings", www.philadelphiabuildings.org). Such a phenomenon in Bucks County was worthy of note in the *Trenton Evening Times*, August 19, 1914 "CONCRETE BRIDGES ARE ERECTED IN BUCKS" "Bucks County's reinforced concrete bridges are justifying the faith of the County Commissioners, who first introduced the plan of substituting them for old-fashioned iron and wooden bridges.

The assurance is given by County- Engineer A. Oscar Martin, of Doylestown, who designed all of them."

The Clay Ridge Concrete Arch Bridge over the Beaver Run was designed by A. Oscar Martin as a part of this ambitious county bridge program. Following soon after his first bridge, Campbell's Mill, 1906 (scheduled for demolition 2005, documented by Bucknell University) featuring an open spandrel concrete encased steel arch, Martin designed a reinforced concrete arch bridge on the Tinicum border over the Tohickon Creek the same year (Dark Hollow Road, demolished ca. 2001). In 1908 he designed a concrete arch bridge over the Cabin Run in nearby Bedminster Township before the Beaver Run Bridge in 1909 (note Beaver Run not listed in Martin's inventory as an arch bridge, others he designed may also be misidentified). While the previous arch bridges are for principal two-lane highways, the Beaver Run Bridge on Clay Ridge Road was a seemingly remote narrow one-plus lane country road. Martin's unique sensitivity to historical architecture and context led him to design a bridge, that while modern, continued the 16 foot road width and alignment and was surface treated to blend with the surroundings (with a rough, pebbly concrete texture). The Beaver Run Bridge on Clay Ridge Road is now one of the earliest of Oscar Martin's concrete arch bridges to remain in very good integrity and condition and within an excellent context from its first construction.

This sensitivity to historical and natural setting allowed Martin to continue to design new and rebuilt bridges throughout the county with minimal impact on existing resources. He scaled the bridges to match the roadway cartway width without excessive shoulders. He used existing stone abutments and piers, as well as wing walls and other amenities. He opted for open pipe horizontal railings, not unlike wooden split rails or boards used previously, for the beam, or through-girder bridges (the concrete arch bridges often had a solid 3 foot high parapet like their predecessors the stone arch bridge, later with open arched railings). The success of Martin's bridge building career may be due in part to his efficient, uncomplicated and thrifty approach to building or repairing bridges, using existing alignments, stonewalls and abutments and proper scale to maintain low cost and local appeal.

The second Clay Ridge Road Bridge over the Rapp Creek in 1917 demonstrates another of Martin's early concrete bridge designs, that of a beam or through-girder bridge. Based in form on the wooden beam bridges used for well over a century (and an example of which was just downstream at Headquarters) these bridges hold a concrete deck with a

series of concrete encased steel I-beams running parallel to the line of traffic and set on concrete abutments and piers. The 58 foot overall span has a mid-stream pier support and the I-beams therefore span roughly 26 feet each section. Concrete pylons roughly three feet square hold round pipe railings that allow for a great visibility of the creek, and conversely avoid too solid of interference in the natural setting. With the completeion of this bridge Martin could then undertake the repair of a number of county bridges, short and long spans, including the Headquarters Road Bridge. In 1919 he replaced its wooden components with concrete encased steel I-beams of 24 foot span and pipe railings, while retaining the original stone abutments, piers, wing walls, width and alignment of the 1812 bridge. Subsequent hostile repairs by PennDOT has compromised Martin's work, although it is still identifiable, both by the bridge placque and remnants of the railings. As an example of Martin's ability at adaptive reuse and recognition and retention of the bridge's important 1812 qualities, the Headquarter's Road Bridge is valuable in its own right as a chronicle of bridge crossings at this location and also as a comparative study to the Rapp Creek 1917 bridge just upstream.

Criterion A: Representing Transportation Patterns & Rural Stream Crossing Solutions: The Ridge Valley Rural District encapsulates over two centuries of stream crossing solutions within its boundaries, with each crossing set in the natural and historic context little changed from its initial construction. The remote character, prevailing natural setting, dirt roads and location of one modest historic farmstead within sight distance of the Bunker Hill Road fords reinforces the experience of the 18th century traveler into this western portion of Tinicum Township. As travel difficulties pervade the township along all of its borders as well as the interior, this section of the district reinforces Tinicum's somewhat remoteness and late organization compared to other townships in Bucks County. Braving the challenges and preferring the isolation, early settlers and squatters on tracts owned by the Pennsylvania Land Company of London were the Scotch-Irish. Their first church location was on Clay Ridge Road just outside of the district, near unwanted boulder land, perhaps in an effort to hide from real property owners. After actual land purchases were made by the occupants the church moved ca. 1760's to a more visible location along the Durham Road in Ottsville, with the "inland" settlers now moving along these roads to communicate with church and businesses. Tabor Road and Geigel Hill Road were also paths of migration for the next and more permanent settlement group, German Lutheran and Reformed from portions of upper Montgomery County and northwestern upper Bucks County. These were mostly second and third generation from early German immigrant families and followed early colonial paths

along ridges from Salford, Franconia, Rockhill, Bedminster and Haycock townships. The Red Hill Hotel at Ridge and Durham Road above Ottsville, by which they would pass, was owned by Philip Nice, whose family also owned the farmstead at Bunker Hill and Tabor Roads, suggesting again a close communication into the Ridge Valley area in the 18th century from principal roads such as the Durham and Ridge Roads. Throughout the 18th century and until 1812 paths were cut along and around the shale rock outcrops and prongs dealing with elevation changes from roughly 210 feet to 400 feet within short distances and using stream fords when weather permitted.

With the improvement of farmsteads after the Revolution, the interest in wheat production and the economic savy of the German population, demand for a bridge along Headquarters Road, a road previously established to Erwin's Ferry along the Delaware, was initiated to access Christian Fretz's mill. Requests were concurrent with numerous bridge construction projects within the county, 1804-5, however, not approved until 1812, perhaps again due to the area's perceived remoteness compared to other parts of the county. This was the first "internal" bridge in the township and continued (with the exception only of bridges near the Delaware Canal) to be the only bridge for the next 60 years. As a wooden beam bridge, Headquarters Road Bridge was not as sophisticated or expensive as contemporary stone arch or covered bridges, but served adequately as an "open wooden bridge" well into the 20th century. Additional roads, such as Red Hill and Sheep Hole, were laid out to the mill, which continued with good business until the late 19th century when it burned. (*Doylestown Democrat*, September 25, 1883)

The remoteness of this portion of the township continued until the 1880's when metal truss bridges were made available by the county to rural areas. The inexpensive, easy to assemble bridges offered practical solutions for areas of troubled travel. The flash like torrent of the Tinicum Creek after rain and snow melts made the fords impassible on a regular basis. The post Civil War economy, coupled with growing need for marketing farm goods, such as eggs, poultry and meat products, and a need for off farm occupations demanded a reliable bridge crossing. The Geigel Hill Road Bridge located by Lewis Overpeck's blacksmith shop and later also butcher shop aided local businesses and transport of farm goods. With dependable connection to the Philadelphia-Easton trolley operating by the late 19th century, greater work opportunities could be offered to the impoverished rural population.

The residents of this area again took advantage of a spurt in bridge construction by the county with the introduction of concrete bridges by A. Oscar Martin. The petition states that "there is not now and has not been any bridge located at this point. The bed of the stream at this point is at least forty-five feet wide and at certain times in the year is impassable, due to the ice in winter and at other times when there are heavy rains the stream is so swollen that travelers cannot cross, and the safety of the traveling public as well as their necessity requires the erection of a bridge at this point, and the erection of such bridge would be burdensome upon the inhabitants and tax-payers of said township and more than is reasonable that they should bear and that said township is poor, at present indebted and cannot afford the construction of a bridge..." (Bridge Book D, p. 390, #532). With the greater use of automobiles, and the diminution of self-sufficiency on the farms, travel to stores in Revere and Frenchtown increased in importance. With the county now having a "county engineer" available, and with the proficiency of the new steel concrete technology, bridges could be built to meet these rural needs. Within the span of 1906 to 1919 Martin designed at least 44 bridges. Both Clay Ridge Road bridges from 1909 and 1917, as well as the 1919 rebuild of Headquarters Road Bridge represent the application of this program in remote rural areas. Likewise they represent two common and efficient designs, the concrete arch and through girder spans, that met the local needs.

That agriculture continued in a traditional way, with horses and on small operations, is outlined in the article "The Tale of Two Bridges" by famous screenwriter and local resident John Wexley (*Tinicum Bulletin*, 1988). He recalls in the 1930's that no farmer was using a tractor, only horses to plow and tend the fields. This may help to explain the lack of vehicle bridges on Sheep Hole Road until this time (he does mention the existence of unstable foot bridges to cross the creeks). His further description of the trials of the Great Depression illustrate the incredible value to rural areas such as Ridge Valley of the WPA program. He describes the idea of himself and several local farmers to make application for a WPA grant, to be matched by the township, for the construction of the bridges. Again, the simple mass production and ease of assembly by local contractors (in this case the local farmers and residents) of metal Pratt pony truss bridges allowed for the construction of the two Sheep Hole Bridges in 1936. The residents benefited both by having additional income from labor, as well as quality finished products of bridges. That the motivation was offered by Wexley, whose wife disliked crossing the foot bridges and whose car could not always pass through the high water of the stream fords on his way from New York to his farm on Sheep Hole Road, only adds to the importance

of these bridges in illustrating the transition in the first half of the 20th century of the township from a rural farm community to a respite for writers, celebrities and exurbanites.

Due to the remote character and less affluent character of Tinicum Township throughout its history the construction of bridges, as illustrated within the Ridge Valley Rural Historic District, was dependant upon bridge building spurts at the county level. These "spurts" were enhanced by simplified bridge technology that allowed inexpensive, efficient bridges to be constructed, such as the wooden beam, metal Pratt pony truss and concrete bridges. The six bridges and two fords within the district have adequately served the needs of this rural area, even into the 21sst century. They are representative of technology over two hundred years and are placed within an historical setting and context that has seen little change since the 1940's. Thus all of the bridges and fords serve as significant contributing resources to the historic district, as well as to the history of bridge building, not only within the township, but at a county and state level as well. While once common types serving rural communities throughout the state, these bridges are now rare survivors of early bridge engineering, and the two fords represent a nearly extinct resource. Coupled with associations with significant bridge engineers Nelson & Buchanan (Geigel Hill Road Bridge) and A. Oscar Martin (two Clay Ridge Road Bridges and the Headquarters Road Bridge), the district is exceptional in retaining excellent representative examples of their work in their original settings and context.

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NPS Form 10-900-a
(8-86)

OMB Approval No. 1024-0018

United States Department of the Interior
National Park Service

National Register of Historic Places
Continuation Sheet

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Photo date 4/15/2008. Negatives filed: K. Auerbach, 16 Center Road, Erwinna, PA.

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NPS Form 10-900
(Rev. 8-86)

OMB No. 1024-0018

United States Department of the Interior
National Park Service

National Register of Historic Places Registration Form

This form is for use in nominating or requesting determinations of eligibility for individual properties or districts. See instructions in *Guidelines for Completing National Register Forms* (National Register Bulletin 16). Complete each item by marking "x" in the appropriate box or by entering the requested information. If an item does not apply to the property being documented, enter "N/A" for "not applicable." For functions, styles, materials, and areas of significance, enter only the categories and subcategories listed in the instructions. For additional space use continuation sheets (Form 10-900a). Type all entries.

1. Name of Property

historic name Ridge Valley Rural Historic District

other names/site number Sheep Hole Road and Vicinity

2. Location

street & number Encompassing all of Sheep Hole Road and parts of Headquarters, Geigel Hill, Red Hill, Tabor and Bunker Hill Roads. ☐ not for publication N/A

city, town Ottsville (Tinicum Township) ☐ vicinity N/A

state Pennsylvania code PA county Bucks code 017 zip code 18942

3. Classification

Ownership of Property
- [X] private
- [ ] public-local
- [ ] public-State
- [ ] public-Federal

Category of Property
- [ ] building(s)
- [X] district
- [ ] site
- [ ] structure
- [ ] object

Number of Resources within Property

Contributing	Noncontributing	
44	9	buildings
7	-	sites
15	1	structures
1	--	objects
67	10	Total

Name of related multiple property listing: N/A

Number of contributing resources previously listed in the National Register 0

4. State/Federal Agency Certification

As the designated authority under the National Historic Preservation Act of 1966, as amended, I hereby certify that this ☐ nomination ☐ request for determination of eligibility meets the documentation standards for registering properties in the National Register of Historic Places and meets the procedural and professional requirements set forth in 36 CFR Part 60. In my opinion, the property ☐ meets ☐ does not meet the National Register criteria. ☐ See continuation sheet.

Signature of certifying official — Date

State or Federal agency and bureau

In my opinion, the property ☐ meets ☐ does not meet the National Register criteria. ☐ See continuation sheet.

Signature of commenting or other official — Date

State or Federal agency and bureau

5. National Park Service Certification

I, hereby, certify that this property is:

- ☐ entered in the National Register.
  ☐ See continuation sheet.
- ☐ determined eligible for the National Register. ☐ See continuation sheet.
- ☐ determined not eligible for the National Register.
- ☐ removed from the National Register.
- ☐ other, (explain:) _____

Signature of the Keeper — Date of Action

6. Function or Use

Historic Functions (enter categories from instructions)	Current Functions (enter categories from instructions)
Domestic / Single Dwelling	Domestic / Single Dwelling
Agriculture / Agricultural Outbuilding	Agriculture / Agricultural Outbuilding
Agriculture / Storage	Agriculture / Storage
Agriculture / Agricultural Field	Agriculture / Agricultural Field

7. Description

Architectural Classification (enter categories from instructions)	Materials (enter categories from instructions)
Other: Vernacular Southeast Pennsylvania	foundation Stone
	walls Stone
	Weatherboard
	roof Slate
	other

Describe present and historic physical appearance.

The Ridge Valley Rural Historic District contains approximately 575 acres of land in Tinicum Township. The setting of this district in a valley is visually interesting. The name "Ridge Valley" is descriptive. Exposed shale, steep slopes, creeks, winding roads, open fields, woods, and historic resources combine to create this area's sense of place. The name for this historic district comes from the 1891 Atlas, in which this area was labeled Ridge Valley School District.

The Ridge Valley Rural Historic District contains a total of 77 resources. Sixty-seven resources are contributing and ten resources are non-contributing. Of the contributing resources there are forty-four buildings, seven sites, fifteen structures, and one object. Of the forty-four buidlings, there are fourteen houses, twelve barns, eighteen agricultural or residential out-buildings. Of the seven sites, there are one archaeological farm site, one blacksmith shop site, one barn ruin, one privy foundation, and two fords and one hay barn ell site. Of the fifteen structures there are six bridges, four corn cribs, four chicken coops, and one twentieth century pottery kiln. The object is a kerosene pump.

Of the non-contributing buildings there are three houses, two garages, four buildings associated with horses, and one non-contributing structure, a swimming pool. Not a single noncontributing house is visible from a public right of way. Access to all three noncontributing houses was down long lanes that were posted against trespassing. No other information about these houses was available. Since they are not visible, they have no negative impact on the district's integrity. The two garages are modest frame structures that fit in scale and material with the buildings on those properties. Three horse related buildings, which are only ten to twenty years old, are built of wood in a simple design. They also contribute to the context because they shelter horses, whose presence is an attribute of this area. The other horse related building is a large stable that is an intrusion on the district. On the property that has the swimming pool, the pool and the house are far enough apart that the integrity is not badly compromised.

The historic district consists mostly of farmsteads. The standard Ridge Valley farmhouse is built of red shale, stands 2 1/2 stories, is between two and five bays wide, and is vernacular in style. Most farms retain their bank barns, and

[X] See continuation sheet

several farms have fine collections of agricultural outbuildings including wagon houses, pig pens, milk houses, and chicken coops. Another important element of this district is the fine collection of six bridges.

The Ridge Valley Rural Historic District is made up of a group of farms united by Tinicum Creek and three of its tributaries which, due to topography, form a region visually and physically distinct from the surrounding landscape. Approximately a mile from the district in most directions the land is gently rolling and sections of road frontage have been recently developed. As the district is approached on Geigel Hill Road, Headquarters Road, and Tabor Road, the topography changes. Suddenly these roads begin to drop downhill at a sharp angle. The roads generally follow streams and much of the scenery is made up of exposed stone ledges and rocks. Beyond this area is densely wooded and until recently, little development had occurred. Near the Tinicum Creek, the land becomes flat again and forms the center of the district. This topography helped define which land could be farmed. All the properties within the proposed district are oriented to the south off roads that parallel the waterways.

The Ridge Valley Historic District began to be settled in the fourth quarter of the eighteenth century. The 1798 Federal Direct Tax documents the late eighteenth century appearance of this area. Nearly every house and barn recorded in the tax list was built of log, with the exception of Christian Fretz's stone house. Mr Fretz owned a grist mill located near his house. The mill, which no longer remains, was a major enticement that lured other Scotch-Irish and German farmers to settle here and develop their properties. By the 1830s most log houses and log barns had been replaced by stone houses and stone or stone and frame barns. Today, no log buildings survive. Subsequent changes and additions to buildings in the district, most of which are over fifty years old, have been sympathetic in material and scale with a low impact to architectural integrity.

The resources on Sheep Hole Road retain the highest degree of architectural integrity of the whole district. The road is named for the pool in the creek where farmers used to herd their sheep to wash them before shearing. Historic resources along Sheep Hole Road and resources radiating out around the industrial areas are contained within the district boundary. Although the buildings in this district represents a modest level of prosperity, people who appreciated the seclusion and beauty of this area began to buy up the farms in the 1920s and 1930s as farmers were selling out. Many of these new people were instilled with a strong preservation ethic which has gone far to maintain a high degree of architectural integrity here.

The district has one remaining industrial area where roads and creeks converge. This site contains a blacksmith shop ruin (burned in 1988), the site of a bank barn ruin, and a long stone building of undetermined use (44-5-33). The stone building was probably powered by water. It is located at the junction of two creeks providing an excellent source for water power. In the twentieth century the stone building was used as an ice house, and later as a slaughter house.

The majority of the buildings in this district were constructed to serve the needs of agriculturalists. Most houses are simple vernacular structures with little or no ornamentation. The integrity is generally good, but a few houses have had substantial additions made in the twentieth century that are reflective of the increased wealth of recent owners. Overall, in the context of this rural setting, the alterations to the buildings are minor. They do not disrupt the historic development pattern.

There are thirteen stone houses and one frame house in the district. Three farmhouses consist of an early nineteenth century main block with an attached rear stone kitchen (44-5-10, 44-5-20 and 44-5-38). One stone bank house, which appears to date to the nineteenth century, was documented (44-14-3-1). The north side of the building stands 2 1/2 stories high. On the south side the basement is fully exposed which makes the house appear to be 3 1/2 stories. Access through a central door leads to a basement kitchen. A majority of the farmhouses are three bay design with a central door and were constructed in the first quarter of the nineteenth century. In the mid-nineteenth century three stone, four bay wide houses were constructed (44-5-6-1, 44-5-34 and 44-14-9). These houses all featured twin front doors. During the period that these houses were being built, a frame addition to one of the earlier stone farmhouses was built which also featured twin front doors (44-11-21-1). A subsequent addition to one of the stone twin front door houses was built in the Victorian style (44-5-6-1).

A majority of the resources in this district are outbuildings. All twelve barns are bank barns. Five barns are built entirely of stone and six barns have stone stabling with frame upper levels above (one of which has been converted into

residential use). One barn is built of stone with frame gables while the remaining two barns are ruins. Remaining agricultural or residential outbuildings include: one early twentieth century garage, one milk house, one root cellar, one carriage houses, two piggeries, two sheds, two smoke houses, two wagon houses, four chicken coops, four corn cribs, and four privies.

The presence of several creeks in this district strongly influenced the road network. In the northern portion of the district the Rapp Creek and Beaver Creek come together to form the Tinicum Creek which flows through the center of the district to its southern boundary. In the southern part of the district Headquarters Run flows west into Tinicum Creek. This network of creeks is paralleled by a road network. Tabor Road and Clay Ridge Road parallel Rapp Creek and Beaver Creek. Sheep Hole Road and Red Hill Road parallel the Tinicum Creek. Headquarters Road follows the Headquarters Run. With the exception of Red Hill Road which is paved, all north-south roads are dirt, while all east-west roads are paved. There are eight places in the district where a creek intersects with a road. Six areas currently have bridges while two crossings are still forded.

On Geigel Hill Road, at the confluence of Rapp and Beaver Creeks where Tinicum Creek is formed, there exists a late nineteenth century deck bridge with stone abutments and concrete walled approaches (adjoins 44-5-33). On Headquarters Road, near the point where the Tinicum Creek and Headquarters Run meet, is the second early bridge site (adjoins 44-14-8). The current bridge bears a 1919 datestone and appears to be built on earlier, nineteenth century, bridge supports. Judging from the design of the the stone supports, the older bridge may have been a wooden covered bridge. Geigel Hill Road and Headquarters Road were the primary main roads through the district.

Until the early twentieth century all six remaining crossings were forded. The change from horse drawn transportation to the automobile resulted in the improvement of roads and the construction of bridges. During the period between 1909 to 1936, four bridges were built at previously forded crossings. There are two bridges on Clay Ridge Road. The oldest is built of reinforced cement and is a single arch with a 1909 datestone (adjoins 44-5-20). The second bridge (adjoins 44-5-22) was engineered by A. Oscar Martin, a noted Bucks County architect. Martin who served as county engineer for twenty-five years, was responsible for designing county owned bridges. This bridge bears a 1917 datestone and is constructed of cement with a pipe railing and one mid span support. The remaining two bridges are built of welded steel with concrete decks and were completed in 1936 with WPA funding (adjoins 44-5-7 and adjoins 44-5-8). The two

surviving fords are located on Tabor Road approximately a quarter mile apart (adjoins 44-5-3 and 44-5-3-1).

The area to the west of Rapp Creek includes a historic archaeological site (44-5-3-1) and a potential site (44-5-3). Both properties had houses, and presumably farm outbuildings, according to the 1891 Bucks County Atlas. On one of the parcels stands the ruin of one of the stone farmhouses. All other above ground traces of these two farms are gone. Other sites not already discussed include a privy foundation, and a hay barn ell.

The Ridge Valley Rural Historic District contains scenic waterways paralleled by man made roads that lead to historic buildings. Individual houses and small farmsteads, obscured from each other by the topography and foliage, are situated between folds in the land. The district is an unusually well preserved example of modest farmsteads that retains outstanding integrity.

RIDGE VALLEY RURAL HISTORIC DISTRICT
PROPERTY INVENTORY

44-5-3 (ADJ)

1 C. Site
Bunker Hill Road

This ford remains unchanged since new.

44-5-3-1

1 C. Site
Bunker Hill Road

The 1876 Scott Atlas and the 1891 Noll Atlas of Tinicum indicates the existence of buildings on this property. Along an overgrown abandoned farm lane stands the ruins of the nineteenth century farmhouse. Other historic resources on this site are archaeological.

44-5-3-1 ADJ

1 C. Site
Bunker Hill Road

This ford exhibits excellent integrity. After heavy rain fall portions of the ford are deep enough to submerge the exhaust system of automobiles which causes the vehicle to stall out. Care should be taken to know where the shallowest route through the ford is located to ensure safe passage.

44-5-6-1
44-5-22

2 C. Buildings & 1 C. Structure

Geigel Hill Road

The farmhouse was built in two sections. The earlier circa 1845 section is built of plastered stone. It stands 2 1/2 stories and is four bays wide. A circa 1885 frame addition was added to the primary elevation of the first section. Built in the Victorian style, this addition has decoratively cut shingles on the front gable and porches extends along three elevations. The bank barn has stone stabling with frame upper levels. The barn was extended on both gable ends with frame additions built on stone foundations. A small early twentieth century chicken coop faces south across the lane from the barn.

44-5-6-1 (ADJ)

1 C. Structure
Geigel Hill Road

This deck bridge is made of steel and it carries Geigel Hill Road over Tinicum Creek. This bridge is threatened with replacement.

44-5-7

4 C. Buildings
2 C. Structures
Sheephole Road

The farmhouse is built of stone and it has been pointed. Standing 2 1/2 stories, this four bay house has 9/6 first floor windows and 6/6 second floor windows. A porch extends along the entire primary elevation. A kitchen added to the southerly elevation in the mid twentieth century was constructed of native red shale which matches the existing main block. The large bank barn is built of stone. Front and rear eaves wall frame extensions were added to the barn. Although the barn has been adapted to a new use, the integrity of the structure remains good. Other related agricultural outbuildings include a frame wagon house, a frame milk house, and two corn cribs.

44-5-7 ADJ

1 C. Structure
Sheephole Road

This steel truss deck bridge was built by the WPA in 1938. It is in good condition and it exhibits excellent integrity.

44-5-8 ADJ

1 C. Structure
Sheep Hole Road

This steel truss deck bridge was built by the WPA in 1938. It is in good condition and it exhibits excellent integrity.

44-5-10

3 C. Buildings
1 N.C. Building
1 N.C. Structure
Bunker Hill Road

This modest sized farm house remains in good condition and it exhibits good integrity. The original house consists of a 2 1/2 story two bay main block with a rear 1 story kitchen ell. An 1807 datestone is located in the east gable. Additions built of native red shale blend with the original portions of the house. A bank barn ruin was rebuilt as a residence. A frame nineteenth century privy is located on the property. Two resources, a built in swimming pool and a horse stable do not contribute to the historic district.

44-5-12

3 C. Buildings
Bunker Hill Road

This farmstead is in good condition and it exhibits good integrity. The plastered stone house is 2 1/2 stories tall and three bays wide and was constructed circa 1840. In the 1930s a 2 1/2 story frame addition was made to the rear of the main block. The bank barn has stone stabling with frame upper levels. The original vertical wood siding was covered in the 1940s with asbestos shingle siding. A well preserved frame privy retains its slate gable roof.

44-5-20

4 C. Buildings
1 C. Structure
1 N.C. Building

44-5-20-1

Clay Ridge Road

This 2 1/2 story plastered stone farmhouse was built circa 1825. In the mid-nineteenth century stone additions were made that are sympathetic to the main block. Outbuildings include a bank barn, pig pen, garage and a root cellar

44-5-20 ADJ

1 C. Structure
Clay Ridge Road

The early example of a concrete arch bridge bears a datestone which reads "County Bridge 30 1909." This bridge has an appearance extremely similar to the stone arch bridges which have been constructed in southeastern Pennsylvania since the seventeenth century. The use of concrete as a building material allowed for the continuation of the construction of arched bridges into the twentieth century.

44-5-21

1 N.C. Building
Bunker Hill Road

This house is non-contributing due to age.

44-5-22 ADJ

1 C. Structure
Clay Ridge Road

This concrete deck bridge bears a datestone that reads "County Bridge 1917." The bridge is supported mid-span by a concrete piling. The side railing are constructed of pipes. According to other information on the datestone, A. Oscar Martin, a local architect of note, served as engineer for this project.

44-5-24

2 C. Buildings
Clay Ridge Road

This farmstead is in good condition and it exhibits fair integrity. The farmhouse is built of wood. It stands 2 1/2 stories tall and is three bays wide. A frame addition extends from the north gable. The bank barn has stone stabling with frame above.

44-5-33

2 C. Sites
1 C. Building
Geigel Hill Road

The ruin of a large blacksmith shop that was recently burned by an arsonist stands astride Geigel Hill Road. Discussion with the owner and on site investigation revealed that this building was designed as a two story shop. The first floor was entered on the street side, while a bank in the rear allowed entry to the second floor. It is possible that in addition to basic blacksmith work, repair or construction of wagons and carriages may have taken place here. Adjoining the ruin is the foundation remains of a bank barn. A mid nineteenth century plastered stone building stands on the bank where the Rapp Creek and Beaver Creek join to form the Tinicum Creek. Historic research did not reveal the original use of this building. It is assumed that based on its location, the building probably utilized the water as a source of power.

44-5-34

4 C. Buildings
1 C. Object
Geigel Hill Road

This property is historically associated with parcel 44-5-33 which stands across the street. The house is built of plastered stone and dates to circa 1850. The double front doors and corinthian porch post capitals subtly reflect a classical influence. A porch extends along the primary elevation and a dormer appears to date to the 1910s. The side porch has been enclosed with window sash. A banked stone smoke house is located behind the house. A one bay early twentieth century garage has been sided with asbestos shingles. A small frame shed and a kerosene pump dating from the first quarter of the twentieth century reflect the change from horse power to gas engine power and the fall of blacksmiths and the rise of mechanics.

44-5-38

5 C. Buildings
1 C. Site
1 C. Structure

44-5-9

Sheep Hole Road

The circa 1800 stone house is a rare example of a five bay house in this region. The 2 1/2 story building is a remarkably well preserved example of a vernacular farmhouse. A 1 1/2 story stone kitchen extends from the rear of the main block, and according to the current owner, may pre-date the larger five bay section. Inside the house early nineteenth century wallpaper and original paint colors remain intact. The house was purchased in the 1920s by Charles and Lorraine Rudy who reluctantly added modern conveniences in a conservative manner. After living in the house for thirty years an indoor bathroom was installed on the second floor of the kitchen. Mr. Rudy, a well known sculptor, converted the second floor of the large bank barn into a studio and placed a kiln within the foundation remains of a demolished hay barn ell. Other buildings on the property include a carriage house, privy, and a shed.

44-5-39

2 C. Buildings
1 N.C. Building

44-5-8

Sheephole Road

This 2 1/2 story three bay stone house bears a datestone which reads "J & M Rufe 1856." A circa 1940 addition was added to the original section of the house. The main block retains many original features including window sash, first floor shutters, flooring, moldings, and doors. The first floor was originally divided into two rooms, but the partition between the kitchen and parlor was removed. A frame chicken coop and a non-contributing frame garage are located on this property.

44-5-40
44-5-6-2

4 C. Buildings

Sheephole Road

The original portion of the John Wexley house is a 2 1/2 story three bay stone farmhouse. During the 1930s Wexley added a large addition to the house that doubled the square footage. The new addition was constructed of native red shale and many of the details reflect local building traditions. A small smokehouse stands in front of the house. The bank barn is built of stone with a frame forebay. A one story frame ell with a stone foundation extends from a gable wall of the barn. A frame chicken coop is sited in a pasture several hundred feet from the main house.

44-14-1
44-14-2

1 C. Building
1 C. Building
2 N.C. Buildings
Headquarters Road

This property was built by Christian Fretz. Although the house bears a 1740 datestone, it does not seem likely that the house was constructed until the last quarter of the eighteenth century. Mr. Fretz ran the grist mill that was located across the road from this site (the mill no longer stands). In the 1930s the building was added to in a sympathetic manner utilizing native stone with the detailing consistent with local building traditions. In addition to the house and mill site, a stone bank barn (44-14-2) stands across Headquarters Road. The barn is built of stone and has been sympathetically converted into a residence. A non-contributing horse stable and horse shelter is located on this parcel.

44-14-3

1 N.C. Building
Headquarters Road

This house is non-contributing due to age.

44-14-3-1

2 C. Buildings
2 C. Structure
1 C. Site
Headquarters Road

This stone house is built of plastered stone and is the only example of a banked house in the district. The building is 2 1/2 stories on one elevation and 3 1/2 stories on the opposing elevation. The house was constructed circa 1790 and the interior features a significant amount of surviving historic fabric. Of note are several fireplace mantels with gouge carving and drill work. Local tradition suggests that an itinerant carver wondered through this area and exchanged these mantels for lodging and food. A bank barn with stone stabling and frame upper levels is sited down from the house along Headquarters Road. The barn was covered with asphalt shingles in the 1930s. Other agricultural outbuildings include a single corn crib and a chicken coop. The concrete foundation of a privy is located near the house.

44 - 14 - 8

1 N.C. Building
Headquarters Road

A non-contributing horse shed is located on this parcel.

44-14-8 (ADJ)

1 C. Structure
Headquarters Rd.

This bridge carries Headquarters Road over Tinicum Creek. The deck of the bridge is made of concrete and the side railings were made from pipe. A datestone in one of the terminal post supports reads "No. 286 Rebuilt 1919." The massive stone bridge approaches and middle support suggest that the earlier bridge may have been a wooden covered bridge.

44-14-9

2 C. Buildings
Headquarters Road

The stone farmhouse dates to circa 1850 and features double front doors. A porch extends along the primary elevation. Recently, the stucco was removed from the outside of the house and the red shale was pointed. The bank barn is built of stone and has been adapted into living space. No other outbuildings survive.

44-14-21-1

5 C. Buildings
1 C. Structure

44-11-43-1

Red Hill Road

The farmhouse consists of a five bay 2 1/2 story stone section that dates to circa 1835 with a wood frame three bay addition that dates to circa 1855. The first floor door openings on the stone section appear to have been changed from the original design, but the window sash, porches, and slate roofs have all survived in good condition. The outbuildings are a good collection of nineteenth century farm buildings. The bank barn is built entirely of stone and it retains an exterior stucco finish. Other outbuildings include a double drive through corn crib, a wagon house, a privy and a piggery that was converted into an apartment.

44-11-43-2

1 N.C. Building
Red Hill Road

This house is non-contributing due to age.

8. Statement of Significance

Certifying official has considered the significance of this property in relation to other properties:

☐ nationally ☐ statewide ☒ locally

Applicable National Register Criteria ☒ A ☐ B ☒ C ☐ D

Criteria Considerations (Exceptions) ☐ A ☐ B ☐ C ☐ D ☐ E ☐ F ☐ G

Areas of Significance (enter categories from instructions)
Architecture
Agriculture

Period of Significance
1790-1940

Significant Dates
N/A

Cultural Affiliation
N/A

Significant Person
N/A

Architect/Builder
Unknown

State significance of property, and justify criteria, criteria considerations, and areas and periods of significance noted above.

The proposed Ridge Valley Rural Historic District, located in Tinicum Township, Bucks County is locally significant under Criterion A in the area of Agriculture as an example of farming in small stream valleys in the county. This type of farm forms a distinctive subset of traditional Bucks County agricultural development. It is also eligible under Criterion C for its architecture which is representative of southeast Pennsylvania rural vernacular architecture from the late 18th to the early 20th century. Throughout the Ridge Valley Historic District winding dirt roads, stone farmsteads and outbuildings, fields and meadows are found in visual harmony with the intact and undisturbed wetlands and woodlands. These features provide an outstanding context for the district's architecture. The period of significance is circa 1790 to circa 1940.

Architecturally, the Ridge Valley Rural Historic District contains representative examples of late eighteenth and early nineteenth century vernacular architecture of the region. These represent second generation buildings. No houses from the original settlement period have survived. The earliest houses were small one story log structures which were later replaced by the current stone ones. The 1798 Federal Direct Tax bears this out indicating that many of the original houses and barns in the district were log. After the log houses of the settlement period, stone became the predominant building material and remained so well into the mid nineteenth century. This was probably more due to the availability of easily quarried and easily worked shale than the relative wealth of the builders. Like much of the region, houses in Ridge Valley built in the second quarter of the nineteenth century were usually three bays wide. By the 1850s stone houses with twin front door became common. Post Civil War outbuildings and additions to houses were built of wood frame. The progression from small log houses in the settlement period to stone houses built after the farm was better established, to frame construction after the Civil War is representative of the vernacular Bucks County building tradition.

☒ See continuation sheet

The generally small size of houses and their lack of ornamentation suggests a more modest income level for this valley's farmers. Although most barns are of typical size, most stone farm houses are two or three bays (for example TMP 44-5-10 and 44-5-40). But a few larger houses were built. The largest house in the district (TMP #44-5-38) is a full five bay vernacular house. [A second five bay house (TMP#44-11-21-1) appears to have been built in two sections]. The only other large house within the district was constructed by Christian Fretz (TMP #44-14-1). Fretz' substantial house seems directly related to his wealth as the area's saw and grist mill owner. This house was considerably enlarged in 1932.

Agricultural outbuildings also contribute to this district's architectural significance. Several properties have well preserved farmsteads consisting of a range of outbuildings in addition to the house and barn (TMP 44-5-20, 44-5-40, 44-5-38, 44-5-7, 44-14-3-1, and 44-14-21-1). The presence of corn cribs, wagon houses, chicken coops, pig pens and privies creates a strong vernacular farmscape in several areas of the district. On a few farms lesser outbuildings that have not been maintained have been taken down.

The topography of the land in this area limited the economic viability of many of these farms in the twentieth century. Farming was successfully pursued in the entire area when the source of power for basic farm machinery was the horse. But as farming became more dependent on machines and less labor intensive, the hillier farms could not successfully compete. The transition to dairy farming and the widespread adoption of the tractor after World War II limited successful farming in this district to those farms with the least hilly ground. The fact that steep slopes were more difficult to cultivate by machinery than flat or gently rolling farm land made these farms less successful.

Evidence of this decline in the number of operating farms takes several forms. In the most hilly parts of the districts are two farms that were abandoned and only remain as archaeological sites and much of the formerly cultivated hilly farm land has grown back into woodlands. During the first quarter of the twentieth century while many Bucks County farms specialized in dairy farming, the bank barns on the moderately hilly farms within the district show no sign of being adapted to milk production. There is no evidence of cow stanchions or the stabling level of bank barns having been whitewashed for sanitary reasons. Unlike much of central Bucks County, these farms lack twentieth century dairying outbuildings such as milk houses attached to the barns or silos.

The region's lack of twentieth century agricultural methods had two distinctive consequences. These farms, without large equipment sheds, modern silos, grain bins, milk houses, pole barns and large dairy additions retain a more

nineteenth century appearance than the farms in other parts of upper Bucks County that remained in operation through the 1960s. Secondly, few farms weathered the Great Depression, making them ripe for purchase by members of the New York artistic community. The influx of this group, who fell in love of with the rugged beauty of the area, is a major factor in how well preserved the Ridge Valley area is today.

In the late 1920s artist Charles Rudy purchased a farm on Sheep Hole Road. (TMP 44-5-38) Several years later he was joined by screenwriter John Wexley who bought a neighboring farm on Sheep Hole Road (44-5-40). Much of Bucks County attracted artists and entertainment personalities during this period. Tinicum boasted actress Miriam Hopkins, song writer Jerome Kern, humorist Dorothy Parker, and playwright S. J. Pearlman.

Rudy converted the bank barn of his farm into a studio. Light for his second floor workspace came from a large slanted dormer he built. During the warm weather he worked under the forebay, when it turned cold he went into the barn. A large hay barn in poor condition was removed and the foundation served as walls for Rudy's kiln. Wexley added a substantial stone addition to his farmhouse circa 1940. The stone matched the existing house, and the addition was faithful to traditional Bucks County architecture. While the individual significance of Rudy and Wexley is not being claimed because most of their accomplishments occurred within the last fifty years, they are representative of a trend in the region's development.

The Ridge Valley Rural Historic District compares well to other Bucks County Rural Historic Districts in terms of integrity and its ability to convey its period of significance. Bucks County has two other rural historic districts: The Upper Aquetong Valley Historic District (which includes portions of the Honey Hollow National Historic Landmark; a rural historic landmark designated prior to the "Rural Historic District" concept) in Solebury Township, and the Gardenville - North Branch Rural Historic District in Plumstead Township.

The Ridge Valley Rural Historic District is an impressive illustration of nineteenth century agricultural growth, and serves as an excellent example of farming in small stream valleys in Bucks County. Ridge Valley represents a more modest level of rural life than that seen in other National Register rural areas in Bucks County. The poorer soils had strong bearing on the built environment.

Comparison of this district to designated districts in Solebury, Plumstead and Tinicum Townships reveals three areas of rural development with strong differences and shows how better soils yielded more prosperous farmers who

were able to build more substantial farm houses. The General Soil Map of Bucks and Philadelphia Counties compiled by the U. S. Department of Agriculture Soil Conservation Service notes that the soils in Solebury are nearly level to sloping and moderately well drained. In Gardenville the soils are nearly level and gently sloping, poorly to moderately well drained. In Ridge Valley the soils range from nearly level to moderately steep, poorly drained to well drained soils on uplands. Comparatively, the Solebury soils are excellent, in Gardenvile they are good, and in Ridge Valley they are fair. The prosperity of the farms correlates to the size and ornamentation of buildings and undoubtedly influenced the period of settlement. The best lands were settled early. The value of the land for farming was the single most important factor in how these areas developed. Better soils produced higher yields which translated into more profit which allowed for construction of more substantial buildings. The better lands remain as viable farm land to the present day. In the Aquetong Valley a majority of traditionally farmed fields remain in cultivation. In Gardenville there is some continuance of farming, but much formerly cultivated ground has been subdivided from the farmsteads for suburban housing or remains untended. In Ridge Valley there is very little farming. Growing hay and cutting fields to stop reforestation is the major agricultural pursuit.

The Upper Aquetong Valley Historic District and the Honey Hollow National Historic Landmark overlap. Both are both located in Solebury Township, in central Bucks County. The Honey Hollow Landmark's period of significance is the late 1930s. It represents the first small upland watershed to be brought totally under water, soil, and wildlife conservation practices in the United States. The Upper Aquetong Valley, and the historic resources of Honey Hollow, show the mid eighteenth to late nineteenth century Quaker settlement pattern spanning a period of significance of 1750 to 1900.

Solebury was originally settled by English Quakers in the mid eighteenth century. The Ridge Valley area was settled by Scotch-Irish Presbyterians in the eighteenth century with a strong influx of Germans at the turn of the nineteenth century. Unlike the Ridge Valley area, the majority of farmsteads in the Solebury districts were large, 100 to 200 acres, and the farmsteads tended to be centered on the property down a lane from the main road. In Ridge Valley the acreage of farms average between 60 and 80 acres and nearly all the farms were near the main road. The Solebury farms were initially developed fifty to seventy five years earlier than the farms in Ridge Valley. The better lands in Solebury created more prosperous farmers than those of Ridge Valley. Aided by the advantages of the limestone belt which passes under the soil in that region, the more prosperous

farmers built substantial farm houses that were larger and more formal than those in Ridge Valley. In the late 1930s, when many Ridge Valley farmers were selling out their farms to newcomers, farmers in Solebury were pursuing means to enhance and preserve their rich soils.

The Gardenville - North Branch Rural Historic District in Plumstead Township is significant as an example of the convergence of the English and German settlement patterns in Central Bucks County. Despite significant infill and loss of working farms, the district provides insight into nineteenth century agricultural land use. While the Gardenville and Ridge Valley areas share common German ethnicity, the differences in soils and topography has resulted in a level of prosperity higher in Gardenville than Ridge Valley. The prosperity of Solebury was highest of all. The higher level of prosperity resulted in more substantial farm buildings. Unlike Ridge Valley, the gently sloping Gardenville area farms made the transformation into large scale dairy farming in the first half of the twentieth century.

There are few areas in Bucks County that directly compare to Ridge Valley. The Deep Run area along Deep Run Creek in Bedminster Township is an example of a more prosperous group of farms located in a valley along a creek. This area was settled in the mid-eighteenth century by Scotch-Irish. Later, Germans moved in. The farms have substantial stone houses that strongly reflect the Federal style. A grist mill and stone quarry served as local industry. The prosperity here was better than in Ridge Valley. Unlike the Ridge Valley area, this area made the transition into dairy farming and it continues to remain strongly agricultural.

The Cabin Run area of Plumstead and Bedminster developed in a similar pattern. The area was initially settled in the same period. The first owners were English, and the land was tenanted. Dwellings were mostly log cabins which gave the stream its name. By the early nineteenth century, the area had undergone growth and development by a large number of German immigrants. The valley is broader than the Ridge Valley area and consequently the farms were larger and more prosperous.

Since Bucks County remained very strongly agricultural until the mid twentieth century, it is very difficult to find other similar regions. West Rockhill Township, particularly along Tower Road, where most of the land is covered with rocks. Farmable areas are sites where a stream came through and pushed the stones off of a piece of ground large enough to farm. The houses are modest vernacular homes including a stone end log house and several small stone houses. There is no evidence that these farms made it to dairy farming. These

types of areas have mostly been subdivided and developed, making the Ridge Valley Rural Historic District's preservation more significant.

The Ridge Valley Historic District is a fine collection of historic resources that are important for their architecture and as a well preserved example of farming in small stream valleys.

9. Major Bibliographical References

County of Bucks, Recorder of Deeds Office. Bucks County Deed Books.

Federal Direct Tax of 1798. Microfilm copies available at the Spruance Library, Bucks County Historical Society.

MacReynolds, George. Place Names in Bucks County, Pennsylvania. Easton, PA: John S. Correll Publishing Company. 1942.

Noll, E.P. Atlas of Bucks County, Pennsylvania. Philadelphia, PA: E.P. Noll & Company, 1891.

Scott, J.D. Combination Atlas Map of Bucks County, Pennsylvania. Thomas Hunter, Printer, 1876.

U.S. Department of Agriculture Soil Conservation Service. Soil Survey of Bucks and Philadelphia Counties. 1975.

☐ See continuation sheet

Previous documentation on file (NPS):

- [X] preliminary determination of individual listing (36 CFR 67) has been requested
- [ ] previously listed in the National Register
- [ ] previously determined eligible by the National Register
- [ ] designated a National Historic Landmark
- [ ] recorded by Historic American Buildings Survey # _____
- [ ] recorded by Historic American Engineering Record # _____

Primary location of additional data:

- [ ] State historic preservation office
- [ ] Other State agency
- [ ] Federal agency
- [ ] Local government
- [ ] University
- [X] Other

Specify repository: Bucks County Conservancy

10. Geographical Data

Acreage of property Approximately 575 acres.

UTM References

	Zone	Easting	Northing
A	18	487495	4482120
B	18	488010	4480880
C	18	488620	4479080
D	18	487910	4479595

☐ See continuation sheet

Verbal Boundary Description

[X] See continuation sheet

Boundary Justification

[X] See continuation sheet

11. Form Prepared By

name/title Robert W. Reynolds / Architectural Historian

organization Bucks County Conservancy date March 10, 1992

street & number Bucks County Conservancy 85 Old Dublin Pike telephone (215) 345-7020

city or town Doylestown state PA zip code 18901

VERBAL BOUNDARY DESCRIPTION

The following verbal boundary description is based on current Bucks County Tax Parcel Maps and is for reference use only. Courses and distances are approximate.

BEGINNING at a point in the NE corner of the intersection of Red Hill Road (Route LR 09139) and Frankenfield Road (T427);
Thence along the southerly line of parcel 44-11-43-1 westerly 550' to a corner of parcel 44-11-43;
Thence along the easterly side of parcel 44-11-43 northerly 900' to a corner
Thence by same westerly 600' to a corner;
Thence by parcel 44-11-44 the three following courses and distances N 600', NE 175', N 550';
Thence by parcel 44-11-42 and 44-11-42-1 600' to a corner of parcel 44-11-42-1 and the SE side of Headquarters Road (SR 1012) NW 450'
Thence by 44-1-45-5 and along the SE side of Headquarters Road, NE 500' to a corner;
Thence crossing Headquarters Road and by parcel 44-1-45-1, and 44-1-45-4 NW 800' to a corner
Thence by 44-1-45-4 W 500';
Thence by 44-1-45-4 and 44-1-45 NW 1300' to 44-1-43;
Thence by same NE 350' to a corner;
Thence by same NW 900' to a corner in 44-1-41-10;
Thence by parcels 44-1-41-10, 44-5-5 and 44-5-6 NE 1225';
Thence by parcel 44-5-6 N 500';
Thence by same and 44-5-6-3 and crossing Geigel Hill Road (SR 09138) NE 1100';
Thence along N side of Geigel Hill Road W 200' to 44-5-4-2;
Thence by same in a line curving to the west approximately 800' to 44-5-4-1;
Thence by same N 200' to 44-5-3-2;
Thence by same E 400' to a point where the easterly line of 44-5-3-1, if extended southerly would strike parcel 44-5-3;
Thence by said line if extended to parcel 44-5-3-1 and crossing Tabor Road (T 447) 1400' to a point on the N side of said road;
Thence along same W 250' to parcel 44-5-10-2;
Thence along same N approximately 1000' to 44-5-10-1;
Thence along same the following three courses and distances: E 350', S 500' and E 350';

Thence along same, 44-5-11-1 and along the SE side of Bunker Hill Road (T 441) NE 1800' and along 44-5-12-2 E 500';
Thence by 44-5-13-1 and 44-5-13 SE 1150' to a corner;
Thence by 44-5-13 NE 300';
Thence by 44-5-19-1 SE 400';
Thence by 44-5-19-1 and 44-5-12-1 S 400';
Thence by 44-5-12-1 NW 200';
Thence by same and crossing Beaver Creek SW 700';
Thence by same SE 300' to the W side of Clay Ridge Road;
Thence along same SW 1200' to a point where the N line of parcel 44-5-24-2 if extended would cross said road;
Thence along said line if extended and 44-5-24-2 SE 450' to 44-5-32-2 ;
Thence along same S 600';
Thence by 44-5-33-2 SW 400',
Thence by same SE 150';
Thence by 44-5-33-1 SW 450' to S side of Geigel Hill Road E 1300 ' to 44-5-32;
Thence crossing Geigel Hill Road and by 44-5-37 1050' to a corner;
Thence by 44-5-37, 44-14-5-2 and 44-14-5-3 crossing Headquarters Run and crossing Headquarters Road SE 2550';
Thence along N side of Headquarters Road SW 800' to a point on the S line of 44-14-10; if extended across Headquarters Road
Thence along the line between 44-14-10 and 44-14-9 by various courses approximately 3200' to 44-14-11;
Thence by 44-14-11, 44-14-12, 44-14-9-1 SW 800';
Thence by 44-14-9-1 NW 150';
Thence by same SW 700' to 44-14-19;
Thence by same SW 1200' to a corner;
Thence by same along Tinicum Creek 450' to a corner;
Thence by same SW 600' to the POINT OF BEGINNING.

Total area is approximately 575 acres.

BOUNDARY JUSTIFICATION

The core of the Ridge Valley Rural Historic District is the valley cut by the Tinicum Creek through which Sheep Hole Road travels. All farmsteads, bridges and significant sites on properties adjoining this road are in the district with their legal property lines serving as the district boundary. The farmland gently rolls from the creek up to the horizon on the east and west sides forming a strong sense of rural seclusion.

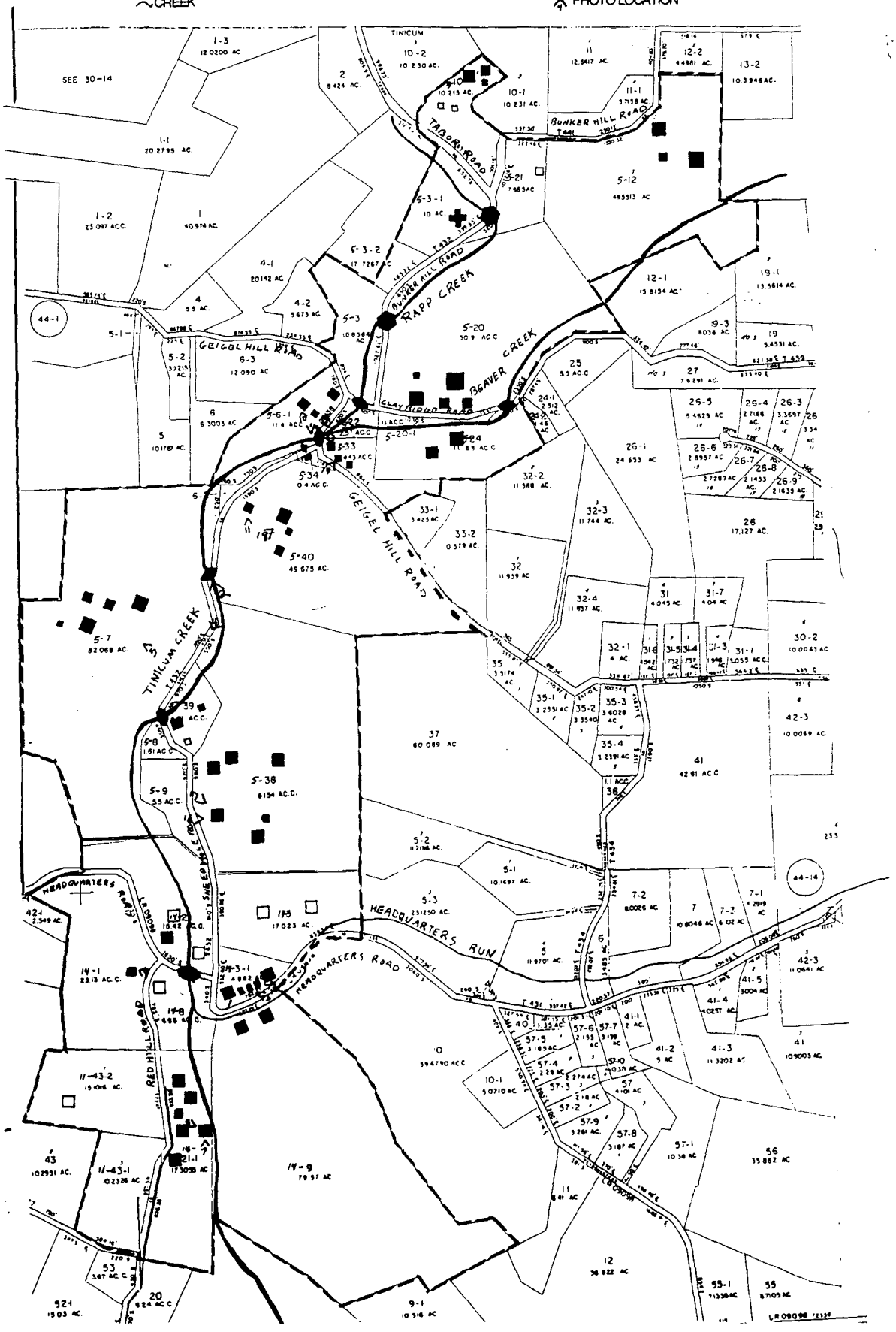
South of Sheep Hole Road Headquarters Road begin to climb out of the valley to the east and west. The farmsteads included in this area are located within the valley. Along Red Hill Road one farmstead was included because it forms a strong entry point and because it forms a significant portion of the Tinicum Creek viewshed.

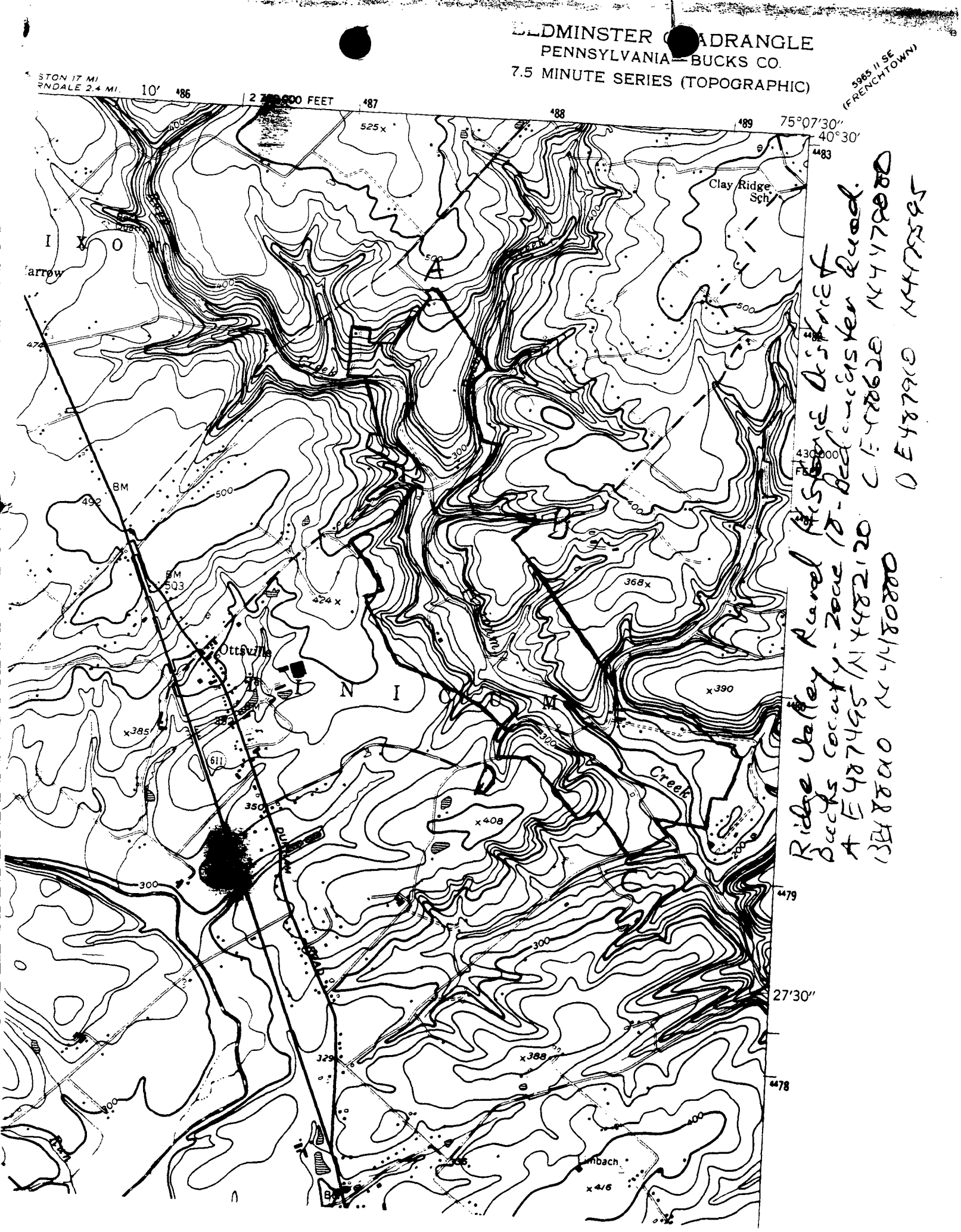
North of Sheep Hole Road Rapp Creek and Beaver Creek combine to form the Tinicum Creek. Rapp Creek is followed by Bunker Hill Road. After passing through two fords Rapp Creek turns west and flows outside the district while Bunker Hill Road climbs out of the valley.

On Clay Ridge Road and Red Hill Road the boundary was drawn to cut the district off from development that was not fifty years or older.

RIDGE VALLEY RURAL HISTORIC DISTRICT
TINICUM TOWNSHIP
BUCKS COUNTY, PENNSYLVANIA

- DISTRICT BOUNDARY
- SIGNIFICANT OR CONTRIBUTING RESOURCE
- NON-CONTRIBUTING RESOURCE
- CREEK
- BRIDGE
- FORD
- ARCHEOLOGICAL SITE
- PHOTO LOCATION




DOYLESTOWN QUADRANGLE
PENNSYLVANIA—BUCKS CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)
5965 II SE (FRENCHTOWN)
10'
2 000 000 FEET
75°07'30"
40°30'
27'30"
Clay Ridge Sch
Ottsville
Limbach
Creek
BM
430 000 FEET
Ridge Valley Road Bridge Disaster
Bucks County - Zone 18 - Bedminster Quad.
A E 487482.20 C E 472612 N 4411788.00
B E 487410 N 4411805.00
D E 487410 N 4411755

United States Department of the Interior

NATIONAL PARK SERVICE
1849 C Street, N.W.
Washington, D.C. 20240

IN REPLY REFER TO:

DETERMINATION OF ELIGIBILITY NOTIFICATION

National Register of Historic Places
National Park Service

Name of Property: Headquarters Road Bridge (AKA Burnt Mill Bridge)

Location: Bucks County **State:** Pennsylvania

The Headquarters Road Bridge was listed in the National Register of Historic Places on July 24, 1992, as a contributing property in the Ridge Valley Rural Historic District, Bucks County, Pennsylvania. The bridge consists of early 19th century stone abutments and piers carrying an early 20th century replacement concrete deck supported on concrete-encased steel I beams. Both its original construction and alteration occurred within the historic district's defined Period of Significance (1790-1940). The bridge is historically significant in the context of the development of the township, regional transportation, and the operation of local mills, and is of engineering significance both for its early 19th century construction and its sensitive modernization in 1919. Although the concrete deck shows signs of considerable deterioration and the deck has been altered with the removal of the 1919 railings, the bridge retains sufficient historic integrity to continue to contribute to the Ridge Valley Rural Historic District.

Patrick Andrus
Historian
National Register of Historic Places
4/28/2006

VIA EMAIL

August 13, 2015

Jon Crum
Environmental Protection Specialist
Federal Highway Administration / Pennsylvania Division
PH: (717) 221-3735
Email: jonathan.crum@dot.gov

Re: *Headquarters Road Bridge – Headquarters Road Bridge as a 4(f) Property*

Dear Mr. Crum:

The Delaware Riverkeeper Network ("DRN") submits the following comment regarding the Headquarters Road Bridge project. In previous letters DRN has made clear its position that Tinicum Creek is a 4(f) resource, and thereby entitled to any associated protections. It is also DRN's position that Headquarters Road Bridge itself is a 4(f) property. DRN submitted a similar comment to PA DOT in July of 2013. *See* Attachment 1.

In deciding whether Headquarters Road Bridge requires § 4(f) status, the Federal Highway Administration must determine whether the bridge is on or eligible for the National Historic Register. *See* 23 C.F.R. § 771.135(e). To be considered for the National Register a property or site must meet the regulatory requirements promulgated pursuant to the National Historic Preservation Act ("NHPA"). 16 U.S.C.A. § 470a. The criteria for evaluation under NHPA are set forth in 36 C.F.R. § 60.4, which provides, in pertinent part:

> The quality of significance in American history, architecture, archeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association and
>
> > (a) that are associated with events that have made a significant contribution to the broad patterns of our history; or
> > (b) that are associated with the lives of persons significant in our past; or
> > (c) that embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of amaster, or that possess high

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> artistic values, or that represent a significant and distinguishable entity wh ose componentsmay lack individual distinction; or
> (d) that have yielded, or may likely yield, information important in prehistory or history.

36 C.F.R. § 60.4.

Headquarters Road Bridge meets at least the criteria identified in subsection (a) and (c); as such, the bridge requires 4(f) protection pursuant to any review under the National Environmental Policy Act. *See also Benton Franklin Riverfront Trailway an Bridge Committee v. Lewis*, 701 F.2d 784 (9th Cir. 1983) (finding that a historic bridge met criteria (a) and (c) of 36 C.F.R. § 60.4 and thus was afforded 4(f) protection).

In support of Headquarters Road Bridge qualifying pursuant to these criteria, attached is an expert report titled, "The Bridges of Tinicum Township." *See* Attachment 2. The report explains that "[t]he Bridges of Tinicum Township, when viewed as a collection, warrant greater consideration for preservation," and that as part of this collection, Headquarters Road Bridge represents "the oldest surviving pier-to-pier bridge left in Pennsylvania." *See* Attachment 2, at 2, 3, 13. Therefore, the modification or loss of this bridge, or its unique historical components, would render the collection of historic bridges in Tinicum Township incomplete, thereby reducing their historical value. *See* Attachment 2, at 2, 3, 13. Additionally, Attachments 3-5 provide in-depth evaluation of the historical significance of the bridge, and come to the ultimate conclusion that "the bridge is individually eligible for the National Register." *See* Attachment 5, at 1. Considered together, the expert evidence attached to this letter provides sufficient proof that Headquarters Road Bridge meets the conditions identified in 36 C.F.R. § 60.4 to qualify for 4(f) protection.

To the extent a 4(f) determination has already been made with regard to whether Headquarters Road Bridge itself qualifies pursuant to 36 C.F.R. § 60.4, DRN requests notification and documentation of the decision.

Thank you for your time and consideration.

Regards,

Maya K. van Rossum
the Delaware Riverkeeper

Attachment 1

CULTURAL HERITAGE PARTNERS, PLLC
innovation for preservation

July 30, 2013

Ryan M. Whittington, E.I.T.
Consultant Project Management (HNTB)
PA Department of Transportation
Engineering District 6-0
7000 Geerdes Boulevard
King of Prussia, PA 19406

VIA EMAIL: c-rwhittin@pa.gov

Re: *Headquarters Road Bridge*

Dear Mr. Whittington:

Cultural Heritage Partners, PLLC is counsel to the Delaware Riverkeeper Network regarding the Headquarters Road Bridge. The Headquarters Road Bridge project requires regulatory review under the National Environmental Policy Act (NEPA), Section 106 of the National Historic Preservation Act (Section 106), and Section 4(f) of the Department of Transportation Act (Section 4(f)). Each of these statutes applies different criteria to project reviews. NEPA requires agencies to consider the environmental impacts of their proposed actions and assess reasonable alternatives to those actions. Section 106 requires agencies to consider the adverse effects of their undertakings on historic resources. Section 4(f) requires agencies to reasonably consider all prudent and feasible alternatives and engage in all possible planning to minimize harm to historic properties. Agencies are strongly encouraged to coordinate these three reviews to achieve better protection for impacted resources, more informed public participation, and a more streamlined process. We write to inquire about PennDOT's progress in carrying out these three regulatory reviews, and to ensure that the consulting parties participating in the Section 106 process are fully aware of the requirements of each statute and of opportunities to inform the agency's progress.

The Headquarters Road Bridge is Subject to NEPA Review

Documents prepared early in the review process suggest that PennDOT may be attempting to classify the Headquarters Road Bridge project as a categorical exclusion and thereby exempt the project from NEPA review. Due to the significance of the Bridge as a contributing resource in the Ridge Valley Rural Historic District and the potential for significant impacts to the Bridge and other cultural, natural, and recreational resources, this project should not be exempted from NEPA review.

Federal Highway Administration (FHWA) regulations provide a list of actions that may be categorically excluded only after FHWA approval at the Division level. 23 C.F.R. § 771.117(d) (2013). Examples of actions include but are not limited to "[b]ridge rehabilitation, reconstruction or replacement." *Id*. § 771.117(d)(3). However, the regulations also specify that

actions may only be classified as categorical exclusions if they "do not have a significant impact on any natural, cultural, recreational, historic or other resources" or "do not involve significant air, noise, or water quality impacts." *Id*. § 771.117(a). Furthermore, projects that are normally classified as categorical exclusions must be reviewed by the FHWA if they involve unusual circumstances, such as "[s]ignificant environmental impacts" or "[s]ignificant impacts on properties protected by section 4(f) of the DOT Act or section 106 of the [NHPA]." *Id*. § 771.117(b).

The Headquarters Road Bridge is a contributing resource to the Ridge Valley Rural Historic District, and Tinicum Creek has received Federal Wild and Scenic and State Exceptional Value Waters designations. Consulting parties in the Section 106 process have indicated that the Bridge replacement will have significant impacts to these resources.

PennDOT Should Coordinate NEPA and Section 106 Reviews

PennDOT should coordinate the NEPA and Section 106 reviews in order to encourage public participation in the Section 106 process and successfully assess the impacts to all cultural and natural resources.

NEPA review ensures that agencies consider the natural, cultural, and historic environment in Federal project planning. Section 106 and NEPA reviews are most effective when agencies coordinate the processes and begin them simultaneously. That way, each process will fully inform the other, and public involvement can satisfy the requirements of both NEPA and Section 106. The Section 106 implementing regulations strongly encourage this coordination (36 C.F.R. § 800.8(a)(1)), and the Advisory Council on Historic Preservation and the Council on Environmental Quality have published a handbook on NEPA and Section 106 integration.[1]

The regulations state, "Agencies should consider their section 106 responsibilities as early as possible in the NEPA process, and plan their public participation, analysis, and review in such a way that they can meet the purposes and requirements of both statutes in a timely and efficient manner." 36 C.F.R. § 800.8(a)(1) (2013). Furthermore, consulting parties should be included early in the NEPA process when the "widest possible range of alternatives are under consideration." *Id*. § 800.8(a)(2).

Because agencies consider a proposed action's effects to historic properties under NEPA review, they may be able to inform the NEPA process through close coordination with Section 106. Resources identified under Section 106 then can be evaluated under NEPA. Additionally, an agency's determination and resolution of adverse effects to historic properties under Section 106 may be considered in determining whether there are any potentially significant effects that require the preparation of an Environmental Impact Statement (EIS) under NEPA.

[1] *See* COUNCIL ON ENVTL. QUALITY & ADVISORY COUNCIL ON HISTORIC PRES., NEPA AND NHPA: A HANDBOOK FOR INTEGRATING NEPA AND SECTION 106 (2013), http://www.achp.gov/docs/NEPA_NHPA_Section_106_Handbook_Mar2013.pdf.

An agency must prepare an EIS "if it is proposing a major Federal action significantly affecting the quality of the human environment." 40 C.F.R. § 1508.5 (2012). During the process of preparing the EIS, the agency must solicit and consider public comment and conduct further analysis as necessary based on the public feedback. The agency should begin coordinating the EIS with Section 106 review early in the process when the agency begins developing the project's purpose and need statement and identifying parties for consultation. Similarly, the processes should be coordinated when the agency engages in the "scoping process," seeking out interested parties and members of the public with whom the agency can consult and solicit comments. Scoping can help fulfill the Section 106 public notification and consultation requirements, and the information obtained from the Section 106 process can help define the project's purpose and needs.[2]

Most importantly, the consultation and public participation components of NEPA and Section 106 should be closely aligned to avoid overlap and to ensure that the agency is considering the full range of potential impacts to historic resources and possible resolutions for those impacts.[3]

PennDOT Should Coordinate Section 4(f) and Section 106 Reviews

PennDOT should coordinate the Section 106 review with the Section 4(f) review, because the Section 4(f) review process provides an added layer of protection to the historic resources considered under Section 106.

Section 4(f) of the Department of Transportation Act requires agencies to reasonably consider all prudent and feasible alternatives and mitigate any potential adverse effects to historic resources. Unlike Section 106, which only mandates a process, Section 4(f) requires agencies to engage in *all possible planning to minimize harm to historic properties*. 23 C.F.R. § 774.3 (2013). As such, Section 4(f) provides an added layer of protection to historic properties assessed under Section 106 review. Agencies should closely coordinate these two processes because the Section 4(f) process can greatly affect the outcome of the Section 106 process.[4] The agency should familiarize participants in the Section 106 process with the mandates of Section 4(f) so that all project participants will understand how 4(f) will influence the project decisions.

Identifying Historic Resources

Section 4(f) resources should be identified as early in the process as practicable. *Id.* § 774.9(a). Historic resources typically will be identified during the Section 106 process. Accordingly, the Section 106 process should be initiated and resources listed or eligible for

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[2] *Id*.
[3] *Id*.
[4] *See* AM. ASS'N OF STATE HIGHWAY TRANSP. OFFICIALS, PRACTITIONER'S HANDBOOK: CONSULTING UNDER SECTION 106 OF THE NATIONAL HISTORIC PRESERVATION ACT (2006), http://environment.transportation.org/pdf/PG06.pdf.

listing in the National Register of Historic Places identified early enough in the project planning to determine whether Section 4(f) applies so that avoidance alternatives can be developed and assessed.[5]

Assessing Use of Section 4(f) Properties

Once the Section 4(f) properties have been identified in the study area, the agency can then determine if any of the properties will be "used." *Id.* § 774.17. The most common type of use in 4(f) projects is when land is permanently incorporated into a transportation facility. *Id.* § 774.17(1). A historic bridge will be used when the action will impair the historic integrity of the bridge either through rehabilitation or demolition. However, agencies must also consider constructive use, which involves no *actual* use but considers proximity impacts from the proposed project. A constructive use occurs when "the project's proximity impacts are so severe that the protected activities, features, or attributes that qualify the property for protection under Section 4(f) are substantially impaired." *Id.* § 774.15(a). Like the indirect effects defined under the Section 106 process, constructive use often results in increased noise, vibrations, and aesthetic impacts to historic resources. *Id.* § 774.15(e).

Obtaining Project Approval

To obtain project approval, PennDOT must find either that: (1) there is no feasible and prudent alternative that completely avoids the use of the Section 4(f) property; and (2) the project includes all possible planning to minimize harm to the Section 4(f) property. *Id.* § 774.3(a).

The agency can use information obtained through the Section 106 process to guide the Section 4(f) analysis of alternatives under the "prudent and feasible" standard and plan for mitigation when avoidance of the 4(f) resources is not possible. The first step in determining whether a feasible and prudent avoidance alternative exists is to identify a reasonable range of project alternatives including those that avoid using the Section 4(f) property.[6]

Once the agency identifies each potential avoidance alternative, it must determine whether the options are feasible or prudent. A feasible and prudent avoidance alternative is one that avoids using Section 4(f) property and does not cause other severe problems of a magnitude that substantially outweigh the importance of protecting the Section 4(f) property. A potential avoidance alternative is not feasible if it cannot be built as a matter of sound engineering judgment. *Id.* § 774.17(2).

An avoidance option is not prudent if: (1) it compromises the project to a degree that it is unreasonable to proceed in light of the project's stated purpose and need; (2) it results in unacceptable safety or operational problems; (3) after reasonable mitigation, it still causes

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[5] *See* U.S. DEP'T OF TRANSP. FED. HIGHWAY ADMIN., SECTION 4(F) POLICY PAPER (2012), http://environment.fhwa.dot.gov/4f/4fpolicy.pdf.
[6] *Id*.

severe social, economic, or environmental impacts; severe disruption to established communities; severe or disproportionate impacts to minority or low-income populations; or severe impacts to environmental resources protected under other Federal statutes; (4) it results in additional construction, maintenance, or operational costs of extraordinary magnitude; (5) it causes other unique problems or unusual factors; or (6) it involves multiple factors as outlined above that, while individually minor, cumulatively cause unique problems or impacts of extraordinary magnitude. *Id.* § 774.17(3). The prudence determination requires an analysis of these six factors and documentation that describes the agency's efforts in this regard.[7]

The agency can use information obtained through the Section 106 process to guide the Section 4(f) analysis of alternatives under the "prudent and feasible" standard and plan for mitigation when avoidance of the 4(f) resources is not possible. The September 19, 2012 Section 106 Agency Coordination Meeting Minutes suggest that the alternatives were analyzed before the adverse effects were fully assessed under Section 106. Without a full understanding of the significance of the resources and how the alternatives will impact those resources, the agency cannot reasonably select the best possible outcome. The process of assessing alternatives and selecting the best possible outcome must involve input from the consulting parties.

Purpose and Need Statement

PennDOT should involve the public in drafting the purpose and need statement. Both NEPA and Section 4(f) require a purpose and need statement, which analyzes the proposed alternatives. Based upon information from consulting parties within the Section 106 process, it appears that PennDOT has not involved the public in drafting the purpose and need statement for the Headquarters Road Bridge, as required under both NEPA and Section 4(f), and has developed a statement that drives the analysis of alternatives toward PennDOT's preferred outcome.

The Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) provides additional standards for environmental review of federally funded transportation projects. 23 U.S.C. §§ 101–170 (2012). SAFETEA-LU requires public participation in defining a project's purpose and need, stating that "[a]s early as practicable during the environmental review process, the lead agency shall provide an opportunity for involvement by participating agencies and the public in defining the purpose and need for a project." *Id.* § 139(f)(1). PennDOT presented its purpose and need statement at the June 17, 2013 Section 106 Consulting Party Meeting and focused on objectives already established in the statement.

If the June 17 meeting is merely a continuation of the previous Section 106 meetings that occurred in 2006, the previous Section 106 process should be re-evaluated because

[7] *Id.*

additional consulting parties are now involved and new information is available that may help shape the project's purpose and need.

The purpose and need statement shapes the process of considering, analyzing, and selecting project alternatives. Under Section 4(f), the purpose and need statement is critical in assessing whether or not an alternative is feasible and prudent. Specifically, "[a]n alternative is not prudent if: (i) it compromises the project to a degree that it is unreasonable to proceed with the project in light of its stated purpose and need." 23 C.F.R. § 774.17(3). Furthermore, if the agency determines that there is no feasible and prudent avoidance alternative, it may seek approval for one of the remaining alternatives that causes the least overall harm to Section 4(f) resources. The least overall harm is determined by balancing several factors, one of which is "[t]he degree to which each alternative meets the purpose and need for the project." *Id.* § 774.3(c)(1).

Because the purpose and need statement drives the process of considering, analyzing, and selecting project alternatives, it should be defined broadly enough so that it includes a discussion of a range of reasonable alternatives.[8] PennDOT's purpose and need statement presents a well-defined purpose, but the statements of need indicate that PennDOT assessed the reasonable alternatives and pre-selected its preferred alternative before drafting the statement. For example, the statement that the bridge is "functionally obsolete" ("Purpose and Need, Headquarters Road (SR 1012) over Tinicum Creek") strongly suggests that rehabilitation is not a viable alternative and that replacement is the only option.

PennDOT Should Conduct the Section 106 Process in Good Faith

The Delaware Riverkeeper Network is concerned that PennDOT has not conducted its Section 106 consultation process in good faith. By restarting a process that began in 2006, the current consulting parties have not had the opportunity to participate in decisions that were made during the initial phase; consequently, decisions made during that phase were not in accordance with the law.

Section 106 requires agencies to consider the adverse effects of their undertakings on historic resources. More specifically, Section 106 requires that an agency establish that an undertaking exists, identify historic properties that may be affected by the proposed undertaking, assess the adverse effects of the undertaking on the historic properties, and consult with interested parties in an effort to resolve the adverse effects, a process that results in a Memorandum of Agreement that evidences the agency's compliance with Section 106.[9]

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[8] *See* AM. ASS'N OF STATE HIGHWAY TRANSP. OFFICIALS, PRACTITIONER'S HANDBOOK: DEFINING THE PURPOSE AND NEED AND DETERMINING THE RANGE OF ALTERNATIVES FOR TRANSPORTATION PROJECTS (2007), http://environment.transportation.org/pdf/PG07.pdf.

[9] *See Section 106 Regulations Flow Chart and Explanatory Material*, ADVISORY COUNCIL ON HISTORIC PRES., http://www.achp.gov/flowexplain.html (last visited July 29, 2013).

Area of Potential Effects

The Area of Potential Effects (APE) is defined in the Section 106 implementing regulations as "the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist." 36 C.F.R. § 800.16(d). Determining the APE is one of the most critical steps in the Section 106 process and should not be confined to the project area. The APE may be much larger than the project area if the undertaking has the potential to directly or indirectly affect properties located outside this immediate area. In addition to direct physical effects on properties, an agency must also consider the full range of indirect visual and audial effects that may impact these properties. Indirect effects may occur at a later date and may be cumulative. In road or bridge projects, these future or cumulative effects may manifest in increased traffic that causes noise or vibrations to nearby properties.[10]

Identifying Historic Properties and Assessing Adverse Effects

An agency is required to make a "reasonable and good faith effort" to identify historic properties within the APE that may be affected by the proposed undertaking. *Id.* § 800.4(b)(1). An agency makes a reasonable and good faith effort to identify historic properties by reviewing existing information on historic properties within the APE and seeking other information from individuals or organizations that have knowledge of properties within the area. *Id.* § 800.4(a). Section 106 regulations specify that a reasonable and good faith effort may consist of or include "background research, consultation, oral history interviews, sample field investigation, and field survey." *Id.* § 800.4(b)(1). Once the agency has identified historic properties that may be affected by the proposed undertaking, the agency must consult with the State Historic Preservation Officer (SHPO) or Tribal Historic Preservation Officer (THPO) to assess the adverse effects the undertaking may have on the properties.[11] *Id.* § 800.4(b).

Public Participation

Once the agency has determined that its undertaking will have adverse effects on historic properties, the agency must consult with the SHPO, THPO and other interested parties to resolve those effects. Public involvement is essential to successful Section 106 consultation, and the views of the public should be solicited and considered throughout the process. *Id.* § 800.2(d). At a minimum, an agency must provide an opportunity for the public to examine the results of the agency's efforts to identify historic properties, evaluate the properties' significance, and assess the undertaking's effects on the properties.[12] When an agency finds that the undertaking will have adverse effects on historic properties, it must make that information

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[10] *See* VA. DEP'T OF HISTORIC RES., DEFINING YOUR AREA OF POTENTIAL EFFECTS (2011), www.dhr.virginia.gov/pdf_files/Defining_Your_APE.pdf.

[11] *See* ADVISORY COUNCIL ON HISTORIC PRES., MEETING THE "REASONABLE AND GOOD FAITH" IDENTIFICATION STANDARD IN SECTION 106 REVIEW (2013), www.achp.gov/docs/reasonable_good_faith_identification.pdf.

[12] *See Section 106 Regulations Section-by-Section Questions and Answers*, ADVISORY COUNCIL ON HISTORIC PRES., http://www.achp.gov/106q&a.html (last visited July 29, 2013).

available to the public and provide the public an opportunity to express its views on resolving the adverse effects. As stated in the implementing regulations, "The agency official shall provide an opportunity for members of the public to express their views on resolving adverse effects of the undertaking… and *ensure that the public's views are considered in the consultation*." *Id.* § 800.6(a)(4) (emphasis added). Furthermore, parties who have officially applied and been approved for "consulting party" status have the right to share their views, receive and review pertinent information, offer ideas, and consider possible solutions.[13]

Although Section 106 is a process that does not mandate resolution of all adverse effects, an agency must make a reasonable and good faith effort to consider the public's views. Additionally, the agency must justify its findings to the public so that the public has an opportunity to comment and suggest alternative solutions to any possible adverse effects. If PennDOT fails to consider public input, it will undermine this important component of the Section 106 process.

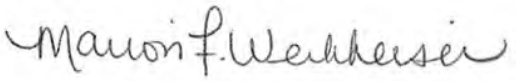
[continued]

[13] *See* ADVISORY COUNCIL ON HISTORIC PRES., PROTECTING HISTORIC PROPERTIES: A CITIZEN'S GUIDE TO SECTION 106 REVIEW (2013), www.achp.gov/docs/CitizenGuide.pdf.

Conclusion

In sum, we write on behalf of the Delaware Riverkeeper Network to inquire about PennDOT's progress in carrying out its obligations under NEPA, Section 106 and Section 4(f). We recommend that PennDOT add to the next meeting agenda an informational session on the intersection of NEPA, Section 106 and Section 4(f), and a discussion regarding how the agency intends to carry out the three reviews. We wish to work with you to ensure that consulting parties and the general public have the opportunity to participate fully in each of these processes.

Sincerely,



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Attachment 2

The Bridges of Tinicum Township

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About the Delaware Riverkeeper Network

The Delaware Riverkeeper Network champions the rights of our communities to a Delaware River and tributary streams that are free-flowing, clean, healthy and abundant with a diversity of life.

The Delaware Riverkeeper Network gives voice, strength and protection to the communities and waterways of the Delaware River. Through independent advocacy, and the use of accurate facts, science and law, DRN works to ensure the rich and healthy future that can only exist with a clean, healthy and free flowing river system.

The Delaware Riverkeeper Network is unique in that it is founded upon the expectation of personal and community responsibility for river protection, as personified by the Delaware Riverkeeper. DRN is the only grassroots advocacy organization that operates watershed-wide and empowers communities with the engaged interaction and information needed to succeed in protecting our River and region now and into the future.

About the Author: Robert W. Reynolds

The principal focus for Robert Reynolds is the documentation and preservation of cultural and historical places and landscapes. The experiences of visits to family in rural Vermont, college alongside the Gettysburg Battlefield, growing up during the summer at a lake resort in a region once known as the Jersey Adirondacks, and setting up homes first in Bucks then in Berks Counties, all occurred in landscapes of historic significance that inspired inquiry, study, photography, and preservation efforts.

Rob lived twice along the watershed of the Tohickon. After joining the Heritage Conservancy in 1989 he and his wife rented a portion of an eighteenth century tavern in Keelersville along Lake Nockamixon. Two years later they bought an 1891 Victorian home in Quakertown. Behind the house ran a tributary that led to the Tohickon and occasionally flooded the alley two feet deep with water up into the back yard. While living in Quakertown Rob led the effort to save the train station and photographed 27,000 historic buildings in Bucks County, including all of Tinicum. While earning a doctorate at Lehigh, he helped grow and establish the Historic Preservation Certificate Program at Bucks County Community College.

At Kutztown University Rob specializes in Pennsylvania History and teaches courses on Local History, Pennsylvania Dutch Culture, and Environmental History. As the Residential Curator for the David Hottenstein Mansion, owned by the Preservation Trust of Berks County, he maintains and preserves a 1783 Georgian house, which some scholars consider the finest Pennsylvania German farmhouse of its era. The woodwork from the master chamber was relocated to the Winterthur Museum in the early 1950s and today serves as the Fractur Room. Periodically, Rob, his wife Jennette, and daughter Reanna live along the east shore of Beaver Lake, New Jersey in a 1909 bungalow still retaining original furnishings and a view that inspires the drive to preserve cultural and historic landscapes that retain uncompromising integrity.

The Bridges of Tinicum Township

Tinicum Township is the home to a unique, complete, and irreplaceable collection of historic bridges. This collection includes a variety of designs on the brink of being destroyed.

The bridges of Tinicum Township may well be the most significant collection of bridges in a single municipality in the State of Pennsylvania. Much of the Tinicum terrain tilts toward the Delaware River serving as a drainage with over three percent of the township made up of flowing water. The interplay of roadways and streams, the Delaware River, large and small bridges, fords and the canal, forest and farmland speckled with farmsteads, and neatly packed villages all retaining remarkable integrity, continue to evoke past eras in the development of the Delaware Valley, which are both locally and nationally significant. The Bridges of Tinicum, as a collection, call to mind a range of historical themes as artifacts of other eras and as contributors to assemblages of significant vernacular architecture and scenic landscapes, that are emblematic of the historical development of the Delaware Valley including settlement by the Scotch–Irish, English, and Pennsylvania Dutch, the development of transportation routes by road and canal to exploit natural resources, deliver the bounty of a productive agricultural area to market, and bring in the finished goods made elsewhere needed as the area prospered. As the age of wood gave way to the age of iron after the Civil War the bridges change from wood to iron, first wrought and then steel, with concrete becoming a new early twentieth century bridge material that now dominates all new bridge projects.

The purpose of this report is to argue for a comprehensive management plan for the Bridges of Tinicum Township that details a strategy for historic bridges with improved maintenance and preservation. The following discussion will place a selection of important bridges into a broader historic context, discuss the excellent bridge preservation efforts already accomplished in Tinicum by the State, note the immediate Tinicum bridge crisis, and advance understanding about why the preservation and attention to historic bridges in Tinicum should become even more commonplace and collaborative.

Bridge Types and their Historic Context in Tinicum Township

Tinicum Township encompasses 17,177 acres in upper Bucks County. The lands offer rolling hills, flats along the Delaware River, and a distinctive ledge rising 75–150 feet above the river paralleling a portion of the Delaware. The Tohickon, Tinicum, and Mill Creeks and their tributaries drain through the area. William Penn knew of the Tohickon area as an Indian Township with rich lands much cleared by the Indians. The lands that would become Tinicum Township in 1738 featured two large tracts combined with other lands. The Pennsylvania Land Company of London bought a 7,500 acre portion of the Manor of the Highlands in 1699 featuring five miles of Delaware River shoreline. The Streeper Tract of 4,448 acres was first surveyed in 1703, but when Johaness Streeper died an alien, having not been naturalized, his heirs could not sell the land. James Logan accepted the surrender of the Streeper Tract in exchange for a like quantity of land near the Durham Iron works allowing the Streeper Tract to be used to supply wood and timber for the furnace. In 1738, the same year Tinicum is organized as a township, the old Streeper Tract lots began to be surveyed to sell to settlers.

The Tohickon Creek attracted the earliest settlers into what would become Tinicum Township. The Creek name is said to mean the stream we cross on driftwood. The Delaware King Teedyuscung stated that the Tohickon was meant to be the northern limit of the white man's country, and that the land to the north of it had been taken from them fraudulently. That deceit was the 1737 Walking Purchase that is considered one of the most notorious land frauds committed in the colonial era. Based on a circumspect deed the Penn heirs laid claim to the greater Lehigh Valley dispossessing several native communities living in the Lehigh and Delaware valleys. Tinicum continued to be the home of a remnant of the Delaware Tribe of Indians for upwards of twenty-five years after it was surveyed, but those natives who stayed usually lost their property and were forced either to settle on poor land or to endure a meager existence working for colonists as farm laborers or servants.

The year following the infamous walking purchase led to the organization of Tinicum Township, but people were already living in the Tohickon Valley. The Scotch–Irish, Lowland Scots that emigrated to Ulster, Ireland in the seventeenth century, faced economic, political, and religious persecution leading them to decide in large clusters to move on to Pennsylvania with a group entering the Tohickon area through the nearby Deep Run settlement in Bedminster Township in the first quarter of the eighteenth century. Other early settlers were English immigrants. German speaking settlers came later with German names rare in the early to mid-eighteenth century public documents.

The first major road project was in 1741 when the road was laid out from the mouth of Tinicum creek, near Erwinna, then known as "London's ferry," to the mouth of Indian cabin run, where it crosses the Tohickon and meets the Durham road, near Hinkletown, in Plumstead Township. This road likely linked the Tinicum Scots–Irish to the Scotch–Irish settlement in the Deep Run. The Tinicum Scotch–Irish settlement was part of a larger cluster of nearby Bucks County settlements that started about 1720 and was particularly strong from 1730–1740 with lands taken up in Tinicum, Bedminster and in Deep Run, Plumstead, and New Britain Townships.

The road to Durham was opened through Tinicum in 1745. About 1750 the inhabitants of Tinicum built, by subscription, a wooden bridge over Indian creek, near its mouth at the river. In 1768 the inhabitants of Tinicum, Nockamixon, Bedminster and Plumstead asked permission of the court to build a stone bridge at their own expense, in place of the wooden one, but it was not granted. This location may be in the vicinity of a 1922 concrete arch bridge on River Road in Point Pleasant. This structure is also known as the Burnt Mill Bridge or the Sheep Hole bridge. The first name was adopted because of a fire that occurred at a mill on a property adjacent to the bridge. The second name refers to a local roadway that intersects with Headquarters Road at the bridge.

A few miles south of the village of Red Hill (Ottsville) travelers crossed the Tohickon Creek at John Orr's Ford. In 1763 residents petitioned for a bridge, raising as much of the funds as they were able with the remainder funded by the County Commissioners. The bridge over the Tohickon, on the Durham road, was built in 1765, at an expense of £283, of which the inhabitants contributed £101 and the balance was taken from the public funds. A large multiple stone arch bridge stood at this location until the mid-twentieth century when the road was widened and the old stone arch bridge replaced by the state. This was the largest stone arch bridge built in Tinicum Township and it has been gone for sixty years. The stone arch bridge as a bridge type, was used for major stream crossings in the 18th century on the most significant major roads often with multiple arches depending upon length, but was also found with frequency in smaller single arch designs on more local roads over smaller stream crossings.

Later eighteenth century roadways include a road laid out from Erwinna to John Wilson's tavern in 1767, about half-way to the Brick church, and in 1774, one from Abraham Johnson's blacksmith shop, on the Durham road, to the Presbyterian burying-ground. In 1786 the River road was extended up the river from Kugler's mill, below Lumberville, to the mouth of Durham creek, where it met the road already laid out from Erwinna down to that crossing. The road from Erwin's mills to the Durham road was opened in 1790. Whenever possible, the perimeter boundaries of the patents and grants became the location of local connecting roads. In this manner, the private properties would be minimally impacted.

Very few bridges existed as Tinicum Township initially attracted frontier settlers. Fords and ferries offered passage through and over waterways providing the most primitive form of creek or river crossings. Today, two fords can still be taken to cross onto Delaware River islands, and three creek fords, located on interior dirt roads retaining a narrow width, serve as clear surviving segments of the eighteenth century roads of the area that would have been known by the pioneer Scotch–Irish and English settlers. In several locations where fords were replaced by bridges, the earlier ford remains intact and the worn cartways that led in and out of the ford remain to be seen although long abandoned. Tinicum Township featured two Delaware River ferry crossings at the London or Erwin Ferry and in Point Pleasant, known earlier as Lower Black Eddy. The former ferry was replaced by a covered bridge and now features a 1930s iron truss bridge.

As settlers shifted from the first phase of initial settlement and survival to a focus on market agriculture, demand for more secure roads and stream crossings increased. Bridges of the eighteenth and early nineteenth century were often wooden beam bridges built on large masonry piers with stone abutments. These bridges were far less expensive than stone arch bridges, but the deck timbers had to be periodically replaced as they rotted. During the auto era, the wooden decks were phased out and replaced by I-beams and concrete decks, but the superstructure of masonry piers and abutments continued in place from the original bridges. Only two bridges remain in Bucks County with the original stone pier substructure for multi-span wooden beam design, both located in Tinicum Township dating 1812 and 1835. Based on an examination of PennDot's statewide bridge survey in 2003, there were only eight working bridges in Pennsylvania built before 1812. All were of the more common stone arch construction design. Based upon this data, the Headquarters Road Bridge is the oldest surviving pier-to-pier bridge left in Pennsylvania. This structure is also known as the Burnt Mill Bridge because of a fire that occurred at a mill on an adjacent property.

Three covered bridges offer travelers a momentary glimpse of the wooden lattice truss that hold up the roadway above the water of creeks and the canal, and that are wrapped in the wooden covering of siding and roofing that give these early American engineering innovations their name. These covered bridges have Town Trusses designed to be built quickly, out of readily available materials with local, relatively unskilled workers. A fourth wooden truss bridge with the trusses covered in siding, but not encased with walls and a roof, stands in Ralph Stover Park. The truss type of this unique bridge is unknown due to the siding covering the wooden trusses. It is not hard to imagine some of the German speaking residents helping to build these wooden truss bridges as they took up the rolling farmland up above the Delaware after migrating into Bucks County from the northwest by traveling up the Schuylkill from Philadelphia to the Perkiomen Creek watershed along branches like the Unami into Bucks County to the Tohickon watershed, overtaking and buying out many of the earlier arriving Scotch–Irish.

Ithiel Town's truss was patented on January 28, 1820. His wooden truss bridge, also known as Town's Lattice Truss, was inspired by the wooden arch truss patent design of Theodore Burr. Town's innovative lattice design provided a new more efficient method of load distribution, which could be achieved with lighter-weight planks of pine or spruce connected with wooden pins. The resulting structure was much lighter and considerably less expensive to build than a Burr arch truss bridge. The light, almost insubstantial, appearance of Town's bridges prompted comparisons to the common trellis found in every flower garden. The lattice truss bridge became so widely used across the eastern states in the 19th century that Town, who received royalties of $1 to $2 dollars per foot for use of his patented design, became a wealthy man. Ithiel Town's lattice truss became common across Bucks County.

While Durham boats carried iron down the Delaware River in the spring when the water ran fast and high, it was the Delaware Division of the Pennsylvania Canal that provided a means to overcome the navigation challenges of the Delaware. In Tinicum Township one can walk the canal towpath for several miles following the trail formed by mules over 180 years ago. In several locations camel back bridges convey vehicles over the canal as they have since 1832.

The canal linked the main Bucks County port at Bristol to Easton where a canal along the Lehigh River provided connection to the rich anthracite coal areas further north in Pennsylvania. The canal in Tinicum Township was operating in 1832 offering a means to move bulk items such as lime and coal, but many new manufactured items could now be cheaply transported distances such as cast iron stoves. Michael Uhler saw the opportunities brought by the canal and set up a series of businesses including a canal boat yard, lime kilns, a hay press, a general store, and a furniture factory as well as worker housing, a hotel, and a mansion overlooking this village all along the canal inland from the Frenchtown-Erwinna Ferry crossing.

A number of the road bridges crossing the canal were replaced in 1932 with through girder or box beam bridges and decorative wood truss side rails. The camelback open wooden truss bridges with wrought iron tie bar components were designed for crossings of the Delaware Division of the Pennsylvania Canal. The design evolved to solve the height requirements needed to allow the mules and bargemen to pass underneath along the towpath with proper head clearance. Commercial canal operations ceased in 1931, when the Lehigh Navigation Company sold the land to the Commonwealth of Pennsylvania to become Roosevelt State Park. A National Historic Landmark, the 60-mile canal that passes through Tinicum Township is among the last fully watered tow-path canals remaining in the United States.

After the Civil War cast iron bridges signaled America's technological shift from the age of wood to the age of iron. During the early twentieth century iron bridges and concrete bridges vied for dominance with concrete wining out. There may be as few as twenty-six metal truss bridges remaining in Bucks County, with at least seven of those closed or out of service. As the rural economy diversified with small scale cigar making, clothing factories, creameries, and shipment of milk, eggs, and vegetables to markets the iron bridges eliminated more fords and minimized wooden deck maintenance on the older wooden beam deck bridges experiencing greater daily traffic as the resident population of Tinicum continued to grow through the 1870s.

The principal time frame for metal truss bridges, particularly those built by medium-sized iron and steel bridge manufacturers from Pennsylvania and Ohio was from the era 1876–1900. The earlier iron bridges, might be through or pony trusses, and were constructed utilizing light-sized components, and generally assembled with pin connections. A second wave of metal trusses occurred during the New Deal of the Great Depression in the 1930s. These pony trusses utilize much beefier steel components, connected with welded plates. During the depression John Wexley, a Hollywood screen writer, directed the application and construction with local residents of two circa 1935 iron truss bridges that still stand in the Ridge Valley Historic District on Sheep Hole Road.

Tinicum Township features a grouping of early twentieth century bridges designed by Bucks County Engineer A. Oscar Martin. Martin designed or improved over 100 bridges in Bucks County through circa 1923. His work is important to the Tinicum collection for he improved older bridges by adding decks using concrete and steel while still preserving and maintaining the superstructure and abutments that were historic. Martin's imprint on the bridge collection of Tinicum is significant and impressive.

Trained as both an architect and engineer at Drexel Institute, A. Oscar Martin offered cost effective modern rehabilitations of existing bridges using new materials, and he created new designs that often utilized the colonial era arch shape only with concrete instead of coursed stone as the construction material. The cement industry was pioneered in the vicinity of Tinicum at locations in Lehigh and Northampton Counties, making the new concrete easily available for Martin's bridge designs. On primary roads and with long spans Martin offered innovative and agile open and closed spandrel arch designs. For short spans he worked with a variety of reinforced concrete deck solutions, many utilizing encased I-beams to replace former wooden beams and retaining the existing stone substructure, or in some new designs, entirely reinforced abutments, deck or reinforced beams. He is also credited with several plate-girder designs over the Delaware Division of the Pennsylvania Canal, a strategy developed to resolve approach heights as well as the under-clearance headroom for passing bargemen. His bridge projects were simple, direct, practical and easily affordable by the county, and transformed the vocabulary of county bridges to the new combinations of concrete and steel.

During the 1930s, the Pennsylvania Department of Highways created a more standardized approach to bridge design. Bridges on major roads were more likely to be replaced than bridges on less traveled roads, and by the 1950s larger scale bridges became common on the major through roads. The largest bridge in Tinicum is the 1931 steel Warren Truss bridge that features six spans measuring 951 feet to link Frenchtown, New Jersey to Uhlerstown, Pennsylvania. The stone piers and abutments once supported a massive covered bridge.

The Uhlerstown- Frenchtown bridge crosses the Delaware River and is considered National Register eligible.

These above mentioned bridges are among the upper tier of the township's fifty-two bridges listed on the Tinicum website. The Lichtenstein study for Tinicum enumerates twenty-eight bridges of interest, but the database software is no longer supported by Microsoft making the online database useless, there are no photos of the bridges accessible through the database, and text boxes with meaty entries cannot be fully read. In 1997 the Lichtenstein Study found ten bridges eligible and one potentially eligible for the National Register. The lack of a fully functional comprehensive inventory means that a comprehensive bridge survey must be made in order to speak definitively about the full collection in Tinicum Township. No doubt, there are more stellar bridges awaiting recognition on the roadways of Tinicum, and challenges to be made to some determinations of eligibility.

Preservation of the Bridges of Tinicum Township

When the historic resources of Tinicum Township were documented by the Heritage Conservancy from 1989-1990, nearly every bridge was historic. Over the past quarter century, some bridges have been preserved, but others have been demolished, are slated for replacement, or are threatened. Nationwide, a precipitous loss of historic bridges has occurred with an estimated decline of twenty-five percent of America's historic bridges in just two decades. In Tinicum Township, this national trend has been challenged with several protracted clashes occurring over the fate of historic bridges. A grass-roots effort to preserve the bridges of Tinicum Township has received tremendous local attention and support in the community and from non-profit organizations. Federal historic designations for bridges and districts, in concert with designations protecting streams, as well as the protection inherent in establishing the Delaware Canal Heritage Corridor, and the setting aside of natural areas for public parks, may well represent the most spirited effort in the Commonwealth to advocate for historic bridge retention and bridge restoration projects instead of bridge replacements.

Tinicum Township is a place where historic bridges stand as vital experiences within landscapes and viewsheds that still tell the story of how America was transformed from a wilderness to a pastoral landscape that epitomizes the draw of Bucks County's rural beauty to residents and visitors alike. The Bucks County countryside has attracted renown since the turn of the twentieth century, but today that heritage is at risk with large expanses of rural Bucks County countryside with minimal or limited new development rapidly diminishing, and worthy of more proactive and innovative bridge management. Tinicum Township is at risk to lose rare surviving examples of bridge types that are nearly extinct state-wide despite the efforts of residents to plead for bridge conservation rather than replacement. With no up-to-date functional database or publicly available systematic management plan, the State is not able to place deteriorated historic bridges into a context that truly evaluates rarity and significance, and unfortunately, bridge battles usually entrench both sides. Successful oversight of the historic bridges of Tinicum Township calls for a new type of management approach that gives voice to historical significance and repair options earlier in the bridge project analysis process, and bridge repair needs to become an acceptable means to manage historic bridges by the State of Pennsylvania. Before turning to a few key bridge preservation challenges, it will prove useful to look at several excellent bridge preservation outcomes in Tinicum Township.

It is absolutely clear that the State of Pennsylvania can repair certain historic bridges quite well. There are several excellent bridge preservation success stories in Tinicum Township. Three Town Truss covered bridges remain in service today, the Frankenfield, Erwinna, and Uhlerstown bridges, thanks to deck replacements that made the bridges safe, and a regular program of maintenance for this specific bridge type. Most residents would agree that the covered bridges are the most significant bridges in the area as they certainly evoke the horse-drawn transportation of the nineteenth century. This bridge type has benefited from popular public support resulting in a special state-wide covered bridge program that has saved most of the 219 surviving Pennsylvania covered bridges. Bucks County once had thirty-six covered bridges, but two-thirds have been lost leaving twelve, of which three remain in Tinicum.

In Ralph Stover Park an open wooden truss bridge survives as the last bridge of its type in Pennsylvania. The bridge is actually a covered bridge without the walls or roof, in other words there are wooden trusses, but they have been sided and protected from the weather but the deck is open to the weather. This last of its kind bridge in Pennsylvania has been closed to traffic for decades and is in poor condition and at risk of continued deterioration.

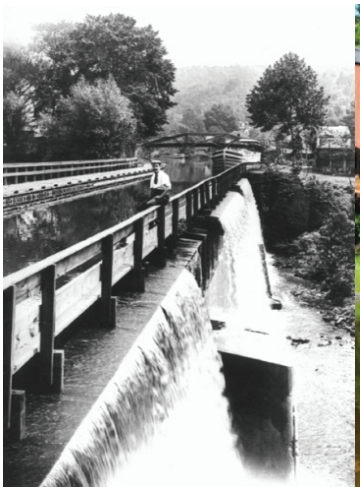
The Frankenfield Covered Bridge.

Bridges crossing the canal have also fared well and the basic design of the bridge sidewalls has been preserved over time. The Delaware and Lehigh Canal National Heritage Corridor features a common camel-back bridge design for road crossings over the canal that despite repairs and rebuilding, have retained their character defining sides forming the camelback profile. In looking at all of the camelback canal bridges along the sixty mile canal, only six fully original camelback bridges still exist. Most are newer beam bridges that replicate the wooden trusses as the side railings. One bridge is of the camelback design, but made entirely of metal pipe. Another replicates the engineering features, with wood and metal components, but is much heavier in appearance, being designed for heavy modern loads. Other types of crossings include metal Pratt pony truss, concrete arch, I-beam, box beam and concrete, pipe and pre-stressed arch culverts.

Pony Truss 1877 bridge crossing the canal—restored.

A representative example of a camel-back canal bridge.

The 1877 Pratt Pony Truss bridge over the canal recently underwent disassembly, repair, and restoration. The bridge was cast by the Murray Dougal and Company in Milton, Pennsylvania. The 1948 concrete canal aqueduct in Point Pleasant was replaced recently with a more authentic wooden structure that ensures that the canal flows over the Tohickon Creek.



While not a true reconstruction, the new canal aqueduct over the Tohickon Creek is a remarkable renewal of a key linkage in the canal system.

An 1887 pony truss bridge at Geigel Hill and Sheephole Roads was struck by a truck, closed, and its replacement was held up by public pressure because the Geigel Hill Road Bridge was the only bridge made by Nelson & Buchanan and/or the Pittsburgh Bridge Company that was located within a potential or listed historic district in Pennsylvania, that district being the Ridge Valley Rural Historic district.

The covered bridges, the canal bridges, and the restoration of the iron canal bridge and the compromise on the iron Geigel Hill Road bridge prove that in particular situations, the State of Pennsylvania has taken the path of preserving and enhancing the historic bridges of Tinicum Township or rebuilding, under historic bridge size constraints with the reuse of character defining features, in a manner that has complemented the settings in which those bridges operate.

There are three bridges currently at risk in Tinicum Township that do not appear to be receiving the consideration their historic significance would seem to dictate. Currently in Tinicum Township, a 1922 concrete arch bridge in Point Pleasant designed by county engineer A. Oscar Martin, which contributes to a historic district, is about to be demolished, and the last two multi-span stone supported beam bridges in Bucks County have replacement studies underway. The 1812 Burnt Mill (Sheephole) Bridge on Headquarters Road is the eleventh oldest bridge remaining in Pennsylvania and contributes to a historic district while the 1835 Creamery Road Bridge contributes to a Lower Tohickon Creek Historic District for which a determination of eligibility is being pursued.

Although the 1887 bridge was demolished, the one lane width, trusses, abutments and the right of way remained virtually unchanged.

The 1933 concrete arch bridge in the Point Pleasant Historic District was demolished this spring.

The Point Pleasant bridge replacement is underway with a temporary crossing being put in place to allow for the demolition of the historic bridge. The removal of this bridge is a significant loss as it is a central feature in the Point Pleasant Historic District. With the powerful Tohickon Creek flowing under its concrete arch, this bridge is a focal point especially from the second floor porch of the Point Pleasant Hotel, a location attracting visitors that came to the area for the quaint architecture and natural beauty seen at this bridge location. That this bridge is not being repaired calls into question the historic designations of the Point Pleasant Historic District and the National Landmark canal designation and how the State honors historic designations. Are these designations not designed to preserve the historic resources of an area? It is especially discouraging for the State to use tax-payer funds to demolish a structure that contributes to a historic district in the most significant part of Tinicum Township.

The significance of A. Oscar Martin as a county bridge engineer has been debated but not resolved making it impossible to determine how significant this particular bridge in Point Pleasant may be in the measure of his large body of early twentieth century bridge projects. Martin pioneered the use of concrete in bridge designs and this bridge is a significant example of his work that recalls the older tradition of stone arch bridge building in this region, yet by utilizing a new material that presented cost savings over stone masonry a traditional arch form could be formed to allow the passing through of the Tohickon Creek, a major tributary of the Delaware River. As the number of A. Oscar Martin bridges is diminished piecemeal, how many more of his projects will be lost before his contributions are competently and finally evaluated?

The 1812 Burnt Mill Bridge (above) and the 1835 Creamery Road Bridge (below) are the last two multi-span stone supported beam bridges left in Bucks County.

The 1812 Burnt Mill Bridge and the 1835 Creamery Road Bridge are the last two bridges of their type remaining in Bucks County. Is that fact not a reason to repair rather than replace the spans? It is the superstructure of the original bridges that remains since the decks were both originally wooden planks that had to be replaced periodically. The significance of both remains challenged by twentieth century auto era improvements that left both bridges one lane wide with the superstructure intact. Both are monumental with the earlier bridge spanning two supports and the latter stretching 199 feet across seven piers. In the auto age both bridges received concrete decks and pipe railings. The early auto era renovations extended the life of both bridges and are reflective of an older approach of repairing rather than replacing bridges in Pennsylvania. The Burnt Mill Bridge forms a squirrelly intersection with Sheephole Road and Headquarters Road that will likely force a bridge realignment if a new two lane bridge is mandated. A new span will have a significant negative effect on the Ridge Valley Historic District.

The Creamery Road Bridge forms the context for the Harpel Farmhouse that stands nearby in site of the bridge. The Harpel Farm was examined for National Register eligibility and denied, yet the researcher never gained entry to the property to evaluate the interiors. The farmhouse may well have one of the most intact interiors of any stone farmhouse in all of Tinicum Township. The house was abandoned during the depression, and after thirty-five years of being vacant a family purchased the farm and built a very sensitive addition leaving the original house interiors vacant and largely untouched since the 1930s. The second floor chamber that overlooks the Creamery Road Bridge features all of its original woodwork, plaster, hardware, and paint colors from the eighteenth century. The interiors of the farmhouse and the Creamery Road bridge have traveled through time together and as of today both still exist complementing each other. Will all three of these currently threatened bridges be lost? If so, what exactly is being lost if new bridges go in and the context of the bridge sites is altered?

Historic bridges, remaining in service, offer those traveling on the road an experience of crossing a stream or creek on an engineered structure that has remained unchanged for generations. Bridges offer users a brief moment to experience the crossing of a body of water. That experience can often be one of natural beauty as seen over the railing looking up or down stream at the views. The stream, creek, or canal below often only momentarily comes into view before the crossing is completed. Where the lands abutting the crossing are wooded the span offers a momentary rush of light, and when the lands are open the views can provide brief but distant images of scenery and buildings that have been part of that view since the bridge first opened. Historic bridges make those crossings a significant historical experience that enriches the traveling experience of residents and visitors alike. Historic bridges are living history serving as direct physical connections to a period in the past.

The bridges of Tinicum Township are a remarkable collection of structures that offer a rare and unusual variety of bridge designs meeting a variety of transportation needs over a broad sweep of time. The bridges are significant due to their design, but even more so for their context and the manner in which those brief moments of experiencing the crossing of the bridge connect the residents and visitors of Tinicum to the rhythms of the past. The historic bridges in Tinicum lay within surroundings that are natural, architectural, archeological, or a combination of all three that evoke the broader Delaware Valley story of settlement and pastoral development in a single municipality.

With immediately threatened bridges and no publicly available management plan for the bridges of Tinicum Township, it is not possible to know what the fate will be for the remainder of the municipality's historic bridges. Modern spans fail to equal the beauty and context sensitivity of historic bridges. Replacement bridges meeting modern standards often cause the redesign of the bridge location changing the appearance of adjacent intersections and requiring right of way acquisitions that negatively affect historic resources. When historic bridges are lost the impact of a new span is nearly always far greater than the loss of the bridge itself. The materials, size, design, alignment and impact to frontage can greatly undermine the historic integrity that once existed. "What is lost in the calculated costs of replacing or rehabilitating a historic bridge is the intrinsic value of the bridge itself," argues the Historic Bridge Foundation, "Somehow we must elevate the importance of our historic bridges in the stories that identify the communities of our nation and say "this bridge is part of who we are and it must be saved."

In researching professional responses to the nationwide issue of significant losses of historic bridges a workshop held twelve years ago in Washington, D.C. offers important lessons that have yet to become standard operating procedure in bridge replacement discussions. The workshop was sponsored by Eric DeLony, of the Historic American Engineering Record, and Terry Klein, of the SRI Foundation. A noble effort was made to address the loss of historic bridges in America by bringing together transportation professionals from across America to develop a fresh strategy for bridge preservation. Several of their findings are helpful in this discussion of preserving a rich and significant grouping of historic bridges in Tinicum Township. The stated goal of the workshop was to "articulate and define efficient and economical strategies for historic bridge preservation and management." A questionnaire was sent out to all fifty state DOTs, selected State Historic Preservation Officers (SHPOs), several consulting engineers experienced in historic bridge rehabilitation, a couple of civil engineering educators interested in the subject, and several non-engineering preservationists and historic bridge scholars. Thirty-seven DOTs responded, including the District of Columbia.

The number one recommendation was to mandate historic bridge management plans. The group recommended that every attempt should be made to identify those bridges where rehabilitation and/or preservation is appropriate and feasible, and to develop specific treatments for these bridges. Such efforts would result from bridge inventories. Two other topics have bearing on our topic. One question asked "Speaking with individuals in state DOTs, there is concern of a "disconnect" between environmental and engineering interests and disciplines. Could you characterize the relationship between these two disciplines in your agency? This is a touchy issue confirmed by many equivocal responses from the state DOTs. Though many states indicated that relationships were improving, eight states responded that there was a "disconnect." In some states, environmental and preservation interests were still perceived as "scapegoats," something extra and not necessary. Other respondents cited different value systems between the two disciplines as one of the reasons for this disconnect. Despite the prevalence of engineering interests and the lack of interest to pursue alternative or non-traditional methods, many respondents said that relationships were improving because of better understanding of the respective disciplines. Some of the reasons for improvement included the intervention or mediation by the FHWA division office, change of leadership within the agency, the attitude of individual project managers, context sensitive design, and the integration of environmental and engineering disciplines within the same office. Vermont claimed that its historic bridge program helped instill a measure of pride among the engineers on staff."

The other question asked "What has been the fundamental reason(s) that historic bridges have been saved? By far, community interest was the primary factor, noted by thirty-one (31) of the states. Thirteen (13) cited flexible design standards and three mentioned adopt-a-bridge programs. Nine (9) states cited their historic bridge management plans as the reason bridges were saved. Many states cited the Section 106 compliance process. One reason cited for successful rehabilitation involved someone on the DOT staff or a focused, passionate citizen or citizen's group willing to make a conscience effort to save a bridge. Other reasons mentioned included SHPO interest, the availability of transportation enhancement funding, and the obvious cost effectiveness of rehabilitation."

The last perspective to offer in this report is evidence of a changing attitude among professional engineers about applying their expertise to preservation and rehabilitation efforts with historic bridges rather than continually asserting that every deteriorated older bridge must be replaced. The American Society of Civil Engineers developed a policy in support of the rehabilitation of historic bridges that shows professional recognition of the viability of repairing rather than replacing historic bridges that reads "The American Society of Civil Engineers (ASCE) supports the maintenance, repair and rehabilitation of historic bridges preferably in continued vehicular use, and when that is not possible, some alternative transportation means such as a pedestrian or bike bridge." In their rationale the ASCE offers "Historic bridges are important links to our past, serve as safe and vital transportation routes in the present, and can represent significant resources for the future. Rehabilitation maintains these important engineering structures in service and can represent significant cost savings." There is professional pride to be found in saving bridges, "bridges are the single most visible icon of the civil engineer's art. By demonstrating interest in the rehabilitation and reuse of historic bridges, the civil engineering profession acknowledges concern with these resources and an awareness of the historic built environment." By planning to maintain historic bridges with management plans, "Many historic bridges can still serve the nation's transportation needs given appropriate repair, maintenance and flexibility in interpreting transportation standards as suggested by national transportation policy. Due to perceived functional obsolescence, lack of cyclical maintenance, and any funding priority, historic bridges are a heritage at risk."

The ASCE places the loss of historic bridges at a much higher rate than seen in other sources stating "Over half the historic bridges of the United States have been destroyed during the last twenty years—a startling and alarming statistic." In considering how this high rate of historic bridge loss might affect the ASCE's view of the threatened bridges in Tinicum Township consider, "Certainly no one can argue that outstanding and representative examples of the nation's historic bridges shouldn't be preserved. The ASCE policy calls on engineers to play a leadership role in bridge preservation, "Citizens groups throughout the country are working to save historic bridges. We, as civil engineers, need to help lead and support these efforts. Bridges are engineered resources thus requiring the skills of engineers. There is little chance that the historic bridges of the United States can be saved without the interest and skills of engineers, until they become part of everyday transportation policy, receive the support of transportation officials at all levels, and the continued interests of citizen groups."

In conclusion, the Bridges of Tinicum Township, when viewed as a collection, warrant greater consideration for preservation. The bridge collection in Tinicum tells a remarkable story of Scotch-Irish, English and Germanic settlement and economic development. A Tinicum Township management plan with input from the local community that forecasts the options for future treatment of all township bridges would be of great benefit to all of the various entities seeking to conserve and preserve Tinicum's historical and natural environments in which bridges play a highly visible role in how residents and visitors experience the nationally significant layers of Delaware Valley history still evident in the environs of the Bridges of Tinicum Township.

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Attachment 3

BURNT MILL BRIDGE HAER DOCUMENTATION SUMMARY
Prepared by Kathryn Ann Auerbach, Preservation Consultant and Instructor for Bucks County Community College Historic Preservation Certificate Program. @ 2012

Overview:

The Burnt Mill Bridge, aka Hockman's Bridge, aka Headquarters Road Bridge near Sheephole Road in Tinicum Township, Bucks County, PA carries Headquarters Road (LR 1012, section BRC) over the Tinicum Creek. The creek is designated as Exceptional Value under the Pennsylvania system and also is included in the Federal Wild & Scenic listing for the Delaware River. The resource is within and contributes to the Ridge Valley Rural Historic District listed in the National Register of Historic Places on July 24, 1992. The bridge's individual register status was further confirmed by letter from Patrick Andrus, Keeper of the National Register on April 28, 2006.

The bridge maintains two components of interest, first, the stone substructure that retains integrity and engineering features from its initial construction in 1812. The PennDOT Lichtenstein survey of historic bridges lists this as 4th oldest in Bucks County and 11th oldest in Pennsylvania. Second is the 1919 superstructure replacement of the original three-span wooden beam and plank deck with the documented "repairs" of steel I-beams and concrete deck designed by celebrated county bridge engineer A. Oscar Martin.

The one-lane (16 foot inside curb) bridge has served the township for nearly 200 years, only recently (March 2011) being closed to vehicular traffic due to deferred maintenance concerns. A large stone buttress was placed against the northerly side of the west wing wall ca. 1930-40 by the county or Pennsylvania Department of Highways to counter the prevailing action of the stream during flood stage. The bridge retained its 1919 pipe railing until ca. 1990 when the Pennsylvania Department of Transportation removed the pipe and installed modern galvanized W-type rail, drilling into the concrete curbs to set the posts. This introduction of holes and cracks into the concrete surface exacerbated freeze-thaw and spalling action that has caused the railing to become dislodged and to fall off. In the last decade moveable concrete "Jersey" barriers have been placed on the deck inside of the railing, diminishing the traveling lane from 16 feet to less than 11 feet.

Other work that has been in place over ten years include a concrete flange, or angled addition to the eastern downstream deck above the abutment to ease the turning radius as well as the placement of metal plates at several locations on the deck near the east and west abutments to cover erosion holes in the deck surface. Overall deferred maintenance, improper masonry techniques and failure to address water drainage has caused deterioration of the concrete deck. The stone abutments and piers were repointed, most comprehensively ca. 1919, and in the last several years concrete "cushions" or pillows were poured at the base to attempt stream scour remedy around the foundations of these features. Up until the last six years there was no weight restriction placed on the bridge. Since 2002 PennDOT has been exploring plans for full replacement of the bridge.

 continued…

Historical Background & Context:
Headquarters Road is an early path that lead travelers through Tinicum township from the major road to Philadelphia and the Durham Furnace to the crucial Delaware River crossing at London's or Erwin's Ferry. It also was placed through this section to provide access for local farmers to the Christian Fretz (first Henry Myers) grist mill, the earliest and most successful of the "internal" gristmills within the large rural township of Tinicum. The immediate path of the road leading to and crossing the creek at the present bridge location has been confirmed as the original course verified by the county courts in 1747. (Bucks County Road Book A, Return #80, p.35, 38, microfilm, Spruance Library, BCHS). The narrow two-lane Headquarters Road follows a winding path along streams and geologic outcrops that define the character of the township and meets the easterly end of the bridge at the terminus of Sheephole Road. The bridge wing walls are noted as property corners in land surveys from the 1823 (BC Orphans' Court Survey, BCHS). The westerly approach from Ottsville passes the 18th century stone farmhouse of Christian Fretz, the associated stone barn and the site of the pre-1747 grist mill at Red Hill Road (opened 1812) then passes through level meadows with flanking fencing to lead up to the bridge. The mill suffered a fire in the late 19th century, at a time when outside commercial forces were challenging the economic viability of local grist mills and was never rebuilt. The bridge in county records assumed first the appellation of "Burnt Mill Bridge" due to the visible presence of the local landmark in ruin, then that of the adjoining owner "Hockman" at the time of its reconstruction by Adam Oscar Martin in 1919. (BC Bridge Records, microfilm & Martin Bridge Collection, Spruance, BCHS).

Substructure Background:
The substructure of the bridge, i.e. the stone abutments and piers which date from 1812, exhibit character defining features of the Federal period, as well as subtle engineering features that have proven sound over the bridge's 200 year history. Account books of William Erwin, son of Col. Arthur Erwin and landholder of substance along the river in Erwinna, document his work to oversee the "Building of a bridge at the mouth of the Tinicum Creek" (Erwin, William, *Account Book, 1799 & 1800 (-1804), with Bucks County Commissioners*… MSC. 193, Fol. 3, 1 v., Spruance Library, Bucks County Historical Society, Doylestown, PA). This bridge, along the Delaware River, was the only other bridge crossing of the Tinicum Creek, a large, strong stream that cuts through a major portion of the township. It carried the first road leading from Philadelphia to London's Ferry, replacing a stream ford crossing in place since before 1740. The majority of the abutments and pier, as well as the deck, of this bridge were completely replaced in the 1970's, only remnants of the stone wing walls remain.

Erwin's account book documents the local participation in the construction of a county bridge, namely the supervision by local resident William Erwin and the listing of "mechanics" or skilled carpenters and masons. The following names are included: Masons: John Neice (also listed as mason on a deed), George Neice, Moses Lauder, John

Helwick and Mark Wismore, and carpenters: Joshua Opdyke, Charles Thompson, John Vancamper, Thomas Curtis, Thomas Lott and Barnet Hillpot (documented carpenter in other records) (Ibid.). John Neice and Barnet Hillpot were known property owners in Tinicum at the turn of the 19th century. (Adams, Harry, Federal Direct Tax of 1798, *Tinicum Township*. Bedminster, PA: Adams Apple Press. 1994, pp. 225, 228)

There would be a strong likelihood that some of these artisans participated in the construction of the Burnt Mill bridge a decade later under supervision of the Fretz family. The Early Republic aka Federal period witnessed an interest by township residents for public and private improvements, including William Erwin's brother Joseph investigating with the DuPont's of Delaware the potential to harness the power of the Delaware River for milling and manufacturing purposes. (Fackenthal, B. F. Collection, 1801-1939, Fol. 80, Erwin. Joseph, *Letter to Geo. Wall of Solebury, Erwinna, Sept. 10, 1801*. ALS 2pp., Spruance Library, Bucks County Historical Society). (Note: above materials found in unpublished report: Steffe, Michael J., Historical Research Report Erwin-Stover House, prepared for Bucks County Parks & Recreation Department, December 31, 2004).

Refined stonework technique mirrored the maturation of Bucks County communities settled for nearly a century, benefitting from established economic base and second or third generation stability. The "building boom" of the post Revolutionary era was primarily an upgrade of established farms, transportation networks and crossroads communities with larger houses, barns and public buildings celebrating the autonomy and prosperity through solid, permanent stone construction. New county buildings, first at Newtown, then at the new county-seat of Doylestown in 1812, as well as the large county almshouse coupled with the county's sponsorship of bridges to improve transportation all featured stone construction primarily of cut and fitted ashlar technique. Houses and barns demonstrated dramatic cut corner quoins and jack arches to achieve an artistic strength, while wall ranges were skillful rubble ensembles in horizontal bed lines.

Bridges of county construction on principal interstate roads featured dramatic stone arches inspired by renewed interest in Roman government and building achievements. Only a handful of these remain today in Bensalem (Philadelphia Road) 18th century, Newtown (Center Street) 1794, Nockamixon (Old Easton Road) 1804, Springfield (Old Bethlehem Road) and in Warwick (Old York Road) 1808. Road improvements of the mid-20th century, such as along Easton Road (Route 611) eliminated several significant stone arch bridges, including one of nine-arches entering Tinicum Township across the Tohickon Creek. For important roads within townships, bridge improvements came after numerous petitions and, as noted, often with the help of local work force and supervision. Thus the construction engineering preferences and technique were a reflection of local capabilities of skill, materials and economic support. For rural and somewhat remote communities such as Tinicum, wooden beam bridges on stone substructures were acceptable and serviceable solutions. Coupled with enhanced knowledge of and belief in

wooden construction mastered by the local German heritage populations (the above John Neice & Barnet Hillpot), wooden beam bridges were achieved with ease and competency.

Several petitions were submitted to the county from 1805-1811 for the construction of a bridge by Fretz's mill, approved in 1812. (BC Bridge File #83, docket 2, ps. 4, 85; File #104, docket 2 ps. 294-307; File #112, docket 2, ps 360, 364) In 1805 the committee to view the site for a bridge described "that the width of the said Creek at the place where the bridge is wanted is about eighty-five feet that it would require a Bridge of ten feet High to be above the Highest Freshet in said Creek…" (Ibid.) County budgets printed in the *PA Correspondent & Farmers' Advertiser* 2/28/1814 and 1/30/1815 list George Snyder (local resident) as overseeing the construction of a "bridge over Tinicum Creek" and 1815 bridge account book shows Christian Fretz paid $21.75 for 175 bushels of sand. (BM B-20, p.8, Spruance Library) An undated county bridge index (ca.1887–1919) lists "Burnt Mill" bridge "spans Tinicum Creek on road from Red Hill to Erwinna, 80 ft. long and 16 ft. wide, open wooden structure." (BC Bridge records, microfilm, Spruance Lib.).

Further information on the appearance of the open wooden beam bridge design is found in the Oscar Martin bridge drawings collection (Spruance Library, BCHS) for a span over the Contrary Creek in Rockhill Township. This is the only multiple span wooden beam bridge within the Martin collection of over 100 bridge drawings. Only one other open wooden bridge, in Milford Township, is documented in the Martin drawings, but this has covered sides and long spans, and would be similar to the open wood Pony truss bridge over the Tohickon in Ralph Stover Park. The Rockhill township untrussed bridge has a deck width of 16 feet carried by six - one foot square wooden beams upon which 2 ½ inch thick wooden planks are set. The wooden railings are held with 4" x 4" wooden posts, spaced at approximately five foot intervals and anchored into the wooden beams with wrought iron spikes. The top rail is also 4" x 4" and one side plank 1" x 9" is placed at midway of the 3'3" height above the 3"x 6" toe curb. This bridge had four total spans with stone piers appearing of similar dimension to Burnt Mill, i.e. nearly five feet wide with rounded upstream noseings. The water flow favored under one of the spans close to one abutment. Martin's repairs included stonework repairs, as well as a change in the deck grade. While no other specific information is available about this bridge, it appears to be in the vicinity of State Road and the Route 309 bypass, thus no longer in existence.

It would be over sixty years before another bridge crossed the Tinicum Creek in the township, the Frankenfield Covered Bridge (carrying the combined Hollow Horn & Cafferty Roads), underscoring the importance of and the proven capability of the Erwin River Road Bridge and the Burnt Mill Bridge to serve the needs of Tinicum travelers. In contrast to other "repairs" undertaken by A. Oscar Martin during his twenty-four year service as county bridge engineer, he did not call out any specific repairs to the existing 1812 stone work of the Burnt Mill ("Hockman's") Bridge in 1919. He did order concrete caps to the abutments and piers to receive the new I-beams and integrate with the new concrete deck, as well as new coping on the stone wing walls. (*A. Oscar Martin*

Collection of Drawings, Bridge folders (3), drawer G, Spruance Library, Bucks County Historical Society, Doylestown, PA). This stands in contrast to other bridges he repaired, where he specified pointing repairs, or complete concrete "jackets" to cover and seal existing abutments.

Not only was the stone substructure sound 107 years after its initial construction and has continued to support a functioning bridge for nearly 200 years, but, of the long span (over 70 feet) bridges in the county, this is the oldest and best preserved example of stone abutment and pier substructure to serve a open wooden bridge. The size of the stones, the "batter" or splay of the wall and angled or concave facades demonstrate knowledge of stone engineering and performance. In particular the placement and arrangement of the very large cut rough ashlar stones are largest in the lower third of the stone features, diminishing in height & precision with increase in elevation. The west abutment, the area that requires the most strength against the prevailing stream flow, contains the largest stones, some measuring four feet by two feet and two feet deep. These stones are neatly fitted in horizontal bed lines, the largest favoring the north corner, most susceptible to downstream water flow. In addition, these large corner "quoins" are cut in a trapezoid plan, to follow the angled northerly façade of the abutment, serving to deflect high water.

The mass and shape of the piers, featuring rounded upstream noseings, served as a prototype for the Creamery-Fretz Valley Road (Harpel's) wooden beam bridge of 200 foot span over the Tohickon Creek built twenty years later. With the advent of wooden truss technology in the 19th century, however, difficult streams could be spanned without multiple piers, thus the covered bridge eclipsed the open wooden beam bridge as the popular travel solution. By the late 19th century metal truss, followed by concrete and I-beam technology offered engineering solutions that could meet the spans with materials less susceptible to weather elements and continuous maintenance supervision. The few early wood beam spans were replaced, not only the superstructure, but commonly the substructure as well, leaving Burnt Mill Bridge as perhaps the oldest remaining example of the stone substructure for multiple-span wooden beam bridges in the county and state.

Within the Ridge Valley Rural Historic District the Burnt Mill Bridge is a significant contribution to the understanding of the evolution of transportation and stream crossings, echoes and compliments the surrounding natural stone outcrops, as well as the character, craftsmanship, feeling and association with the neighboring rural historical buildings. It documents the earliest road path through the district and the earliest constructed stream crossing within the district (there are still two natural stream fords in the district). The importance of the stone substructure as an educational document has been elevated since the destruction and removal of the historical stone abutments of the upstream Geigel Hill Road Bridge (1887) within the district. The superstructure 1919 Adam Oscar Martin "repair" is a valuable compare and contrast to the upstream 1917 crossing by Martin over the Rapp Creek within the district. The organic and historical character of the bridge,

coupled with its high visibility within the district, is an important landscape feature that demonstrates a successful union of historical engineering and dramatic natural and historical features each serving to enhance the other. The bridge provides continuity of the historical experience, critical to the value of the rural historic district.

Superstructure Background:

The early 20th century saw a change in bridge maintenance policy by the County of Bucks with the installation of Adam Oscar Martin as county engineer by 1902. This newly created position came at the advent of new engineering technology as well, that of the use of steel I-beams and reinforced concrete for load bearing construction. Martin (1873-1942), a Bucks County native, trained in architecture and engineering from Drexel Institute, and benefitting from architecture experience in Buffalo as well as Philadelphia, embraced the opportunity to establish a practice in his home county by ca. 1897. By 1900 he offered designs for two stone arch bridges to the county, ironically possibly serving as county commissioner as well (an Adam Martin is listed as commissioner on bridge placques from 1900-1902). As the county's first bridge engineer, serving from 1900 – ca. 1923, Martin directed the repair and new construction of over 100 bridges throughout the entire county. A collection of Martin's bridge drawings (as well as many of his other architectural designs) is held at the Bucks County Historical Society's Spruance Library. This collection provides unique insight into the emerging technologies of the early 20th century, Martin's practical and sensitive approach to design, and a record of bridges and bridge types that no longer exist.

Martin's Pennsylvania German background guided him in a conservative and practical solution to design challenges. His architectural training and personal aesthetic combined many philosophies of the Arts and Crafts, Colonial and Spanish Revivals with a keen knowledge and sensitivity to scale, patterns and settings of Bucks County's building traditions. As a result, his pleasing designs consistently won favor with clients throughout the county. This attentiveness to scale and setting, surface textures and affinity for the heritage of local wood and stone craftsmanship comes through in Martin's collective body of bridge work. Nearly one half of the bridges documented in the BCHS collection were "repairs", incorporating elements of existing bridges, maintaining road alignments and widths, using existing stone abutments and piers and repairing or replacing the superstructure. Martin rehabilitated open wooden beam and truss bridges, covered wooden truss bridges, metal truss and stone arch bridges.

Martin's new designs for either deck replacement or entire new construction included metal plate girder bridges, reinforced concrete deck, concrete encased I-beam and concrete deck, reinforced concrete beam and deck, concrete arch and stone arch constructions. Many of his "repairs" were simply replacing wooden beam and deck components in I-beam and concrete, while maintaining the footprint and profile

elevations of the existing bridge. Concrete decks were macadamized to blend with the approach roads and open wooden railings were replaced with open pipe rail. Martin designed well over fifty concrete bridges of various types from 1906-ca.1923. This "modern" phenomenon was worthy of note at the time, as seen in the *Trenton Evening Times*, August 19, 1914 "Concrete Bridges are Erected in Bucks" "Bucks County's reinforced concrete bridges are justifying the faith of the County Commissioners, who first introduced the plan of substituting them for old-fashioned iron and wooden bridges. The assurance is given by County-Engineer A. Oscar Martin, of Doylestown, who designed all of them."

Martin's work with concrete and steel beams appears first in 1906 with designs for a single arched span at Auchey's Mill in Milford Township. He had designed a stone arch approach to the mill, but changed to concrete and steel with success. That same year he designed two longer spans, the first with two arches on Dark Hollow Road at Stover's Mill over the Tohickon Creek from Bedminster into Tinicum Township and the second with a single 72-foot span on Allentown Road at Campbell's Mill over the Unami Creek in Milford Township. (Both latter bridges recently destroyed, Campbell's Mill featured in an article "What Makes a Bridge Great?", Stidger, Ruth W., ed. *Better Roads*, 2/2005). Martin continued to design closed and open spandrel arch spans, although not as prolific, into the 1920's, the large two-span bridge in Point Pleasant being among his last in1921.

Martin developed a concrete substitute for wooden bridge decks by ca. 1908. These were primarily encased steel I-beams replicating the wooden beam spans of approximately 25 feet. He used eight I-beams for a 16 foot wide deck (wooden beams used only six), the standard bridge width, and used a raised square concrete curb and end concrete pylons to receive the 2" or 2 ½" pipe railing. Occasionally he raised the approach and deck slightly to increase the hydraulic opening. Quite often he made repairs to the existing stonework, even to entire encasement in concrete "jackets". Concrete "caps" or diaphragm seats for the I-beams were placed on top of the stone features, and concrete coping was used on the wing walls. Date stones (generally marble) were nearly always incorporated to commend the county's interest in its bridges. Martin also built some bridges with full reinforcements, either an integrated deck, or with reinforced concrete beams (four for 16' width) depending on the span and circumstance.

The majority of I-beam bridges through the 1920's were replacements of mostly wood beam bridges, labeled as "repairs" with 16' wide deck of 8-beams averaging 15" high & 25' in length (29'-30' spans used 18" I-beams). These I-beam bridges were mostly shorter, of one or two spans to about 50+ feet. While some beam bridges used new abutments and a single pier of concrete, Martin commonly used existing stone piers, abutments and wing walls, although often with repairs, concrete refacing and coping on the top surface. The new concrete deck was always covered with macadam or stone grit with a center crown. The concrete itself contained rough, pebbly aggregate and was a

medium-tan color that eased its harshness. Martin attempted to maintain historical features, existing path, stone walls, arches and setting and took a conservative approach to utilize what was there and make minimal overall changes.

Burnt Mill Bridge appears to be among the longest of the "Repairs" (another over the Mill Creek in Rushland was nearly identical, age unknown and since replaced) with three spans approaching 75 feet. There is no notation on repairs to the stonework, just to add a concrete cap to receive the new beams and seal into the deck. Occasionally Martin corrected the creek channel to better align under the bridge, and changed the approach over the creek to skewed (especially with new concrete arched bridges) to achieve the design and connect the road path. This is not the case at Burnt Mill. Martin's "repairs" to rural bridges were nearly exclusive to 16-foot width and replaced the wooden decks of shorter span bridges. Longer spans were either repairs to covered bridges (120-180' spans) or repairs and widening of stone arch bridges. Spans of 50 to 75 feet were often new concrete arch spans, the retention of the stone substructure of Burnt Mill further demonstrates it was sound and capable of reuse. The use of galvanized pipe railing of 2" to 2 ½" diameter was common with Martin's beam bridges. The marble date stone was often placed slightly recessed in the bridge pylon or at the inside face of solid parapet walls at crown of arch. Burnt Mill's 1919 date placque is in the north pylon.

Thus Burnt Mill Bridge demonstrates the quality and engineering of the 1812 stone substructure and its minimal alteration in 1919 to accommodate the new concrete deck of A. Oscar Martin. The superstructure not only illustrates Martin's engineering formula for the replacement of wooden beam spans, but his stylistic treatments as well. This formula became a prototype copied by subsequent county engineer John S. Roberts and into the mid-1930's with early Pennsylvania Department of Transportation bridge improvements. Perhaps most importantly, through Martin's documentation drawings, the suitability of the stone substructure is verified, not only by virtue that he called out no repairs to the stone, but also in that his choice to "repair" the deck, rather than to place a new concrete arch span at this location, answers to the quality of the existing stone.

Historical Background & Context Summary:

- 1812 substructure
  - 4th oldest bridge in Bucks County, 11th oldest in PA
  - oldest documented stone supports for multi-span open wooden beam bridge in PA
  - demonstrates characteristics of Federal era stonework, local craft and engineering
  - only remaining of its type within a rural historic district in Bucks County.
- 1919 superstructure
  - work of pioneering master county engineer A. Oscar Martin
  - design decisions & preservation of substructure verified by Martin's drawings
  - demonstrates prototype for "repair" of wooden beam bridges with I-beams & concrete deck, copied by subsequent bridge projects over the next 30 years.

Kathryn Ann Auerbach/2012

Documentation Project:

In order to document this very early surviving example of the substructure of a wooden beam bridge of multiple spans and to provide a greater understanding of the character of the 1812 stonework as well as the sensitive repair treatments of A. Oscar Martin, the Historic Preservation Department of the Bucks County Community College undertook Historic American Engineering Record (HAER) level field documentation of the bridge during 2009-2011. The HAER field study used standard HABS/HAER measuring techniques to measure and draw to scale the Burnt Mill Bridge with principal focus on the 1812 substructure of the bridge and the 1919 deck construction characteristics. Field datums included a horizontal level line established across the entire length of the bridge from abutment to abutment at approximately 4.5 feet below the I-beams of the deck, and vertical plumb datums at corners. Approximately 1/3 of the stones were measured, primarily those on corners and lower portions of the substructure that are demonstrative and consciously fashioned. The beams under the deck were measured for height and placement. The deck surface was measured from a second datum (7', 10" above 1st datum) stretched the length & beyond onto the approach path. Wing walls and the buttress were plotted. The 1919 concrete pylons, datestone, curbs, evidence of pipe railing and location of ca. 1990 guiderail were documented. Diagonals were used between piers to confirm the lateral geometric placement of the bridge on the landscape. Documentation was conducted around the bridge while the bridge was open to traffic. In spite of very large trash and PennDOT line-painting trucks crossing overhead, no evidence of stress was exhibited by the bridge or any of its components.

Draft pencil drawings made to scale (elevations ½" – 1') were produced by the students. These were reviewed by the project director Kathryn Ann Auerbach against the extensive field notes and photos and a draft pencil on velum organization set was prepared with hand written notations and dimensions to facilitate further study and evalulation of the bridge and assist with the section 106 process. This documentation project was not undertaken with any contract, it was an educational offering by the Bucks Historic Preservation Certificate Program under the Historic American Building Survey Workshop. Previous workshops lead by instructor Auerbach have garnered the Bucks program national recognition with 1st, 3rd, 4th and Honorable Mention awards in the prestigious Charles Peterson Prize competition among national universities, sponsored by the National Park Service-Historic American Building Survey, the Athenaeum of Philadelphia and the American Institute of Architects.

N.B. To commemorate the 200th birthday of Burnt Mill Bridge, the Bucks County Community College assisted with the production of a poster featuring scanned images of the HAER drawings, as well as elements of Oscar Martin's drawings. This poster is not to exact scale, nor a final HAER product and was produced solely to celebrate the engineering and quality stonework characteristics of this unique bridge.

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Substructure Observations:

The high quality of the cut stones is evident in the lower ½ of the abutments and piers, and is most visible on the east face of the west abutment. The stones may be deep bed Brunswick and Lackatong shale, primarily of a dark brown color, and having strength qualities approximating red argillite quarried today from Blooming Glen quarries in Hilltown Township (less than 10 miles distance). They echo the stone piers built during the same period (ca. 1812) to carry subscription toll bridges over the Delaware River, specifically at New Hope (1814) and Centre Bridge (1813). (MacReynolds, George, Place Names in Bucks County. Doylestown, PA: Bucks County Historical Society, 2nd ed. 1955. pp. 74, 273). The principal bed stones approximate four feet in length, two feet high and two feet deep and are laid in horizontal courses with diminishing size at increasing vertical height. Due to elevation changes from the east side to the west, the size, character and design of the abutments vary.

Abutments:
East Abutment:
The east abutment is barely five feet in height with cut stones at the corners and along the west face, with more random, rubble masonry blending directly into the wing walls that retire quickly into the hill behind. The west face of the abutment has a width of 18', 2" to the corners. Nearly centered in this façade is a large stone that appears round due to extensive applications of pointing and surface gunnite, but may actually be almost 2 feet square. Its conscious placement suggests a function greater than decoration, perhaps intended as a date stone, although there is no evidence of incised numbers. The corner blocks or quoins are large, some four feet in length, and fairly consistent in height, averaging one foot high.

The downstream corner blocks are of an obtuse angle in plan to begin the extended wing wall that carries 24 feet along the shoulder of the road. The first 12 feet of the wing wall have been dismantled above grade to accommodate the angled cantilevered concrete deck flare that runs on top of the wing wall. A survey post was noted 20 feet to the east of the end of the actual bridge deck. Portions of the north wing wall by the Sheephole Road intersection have been broken down as well. The marble datestone placque from 1919 is placed in the concrete pylon on the north corner directly above the corner of the abutment/ wing wall. It is obscured by application of the W-guiderail directly in front of and on the pylon. The south pylon was removed as a part of the deck flare enhancement, although the footprint of the 1919 curb is visible in the deck in this area.

A natural spring in the hillside on the east side of Headquarters Road, immediately east of the abutment tends to overflow onto the road and then onto the bridge, due to the blockage of adjacent drains and gutters. This additional water, coupled with inadequate deck drainage caused by the placement of the Jersey barriers, appears to have contributed

to the hole in the deck near the face of the abutment. Water was observed traveling down the surface of the wall, as well as some water infiltrating through a masonry crack below the hole. This is approximately four feet from the north corner.

The vertical plumb of the north corner appears to cantilever out past the base stone by two inches. This appearance is partly due to the build-up of applications of gunnite closer to the deck. The variation is exacerbated by the evidence of erosion wear and spalling from surface water running against the abutment onto the corner of the base stone, thus diminishing the width of the west face at the very base datum to 18 feet. Stones behind the face stone are sound with no evidence of displacement. With the exception of a loss-of-mortar crack beneath the deck hole, there is minimal evidence of any other associated cracks or stress elements in the masonry, although heavy gunnite applications conceal the stone and mortar edges. The standard "batter" of approximately 2" splay to a wider base is preserved and evident on the downstream south corner.

All of the deck beams are at nearly the same height above the datum, averaging 4'- 4", with variation of about one inch due to original or resurfaced concrete encasing, or exposed iron. The southernmost beam is slightly higher than the others, possibly due to its incorporation into the newer deck flange construction. Important to note is that the primary west façade of this east abutment is slightly concave in plan, curving in towards the center and out towards the corners (average 2 ½" difference from the corners to the center). The consistency of this subtle curve suggests this is an intentional original construction to further provide strength of the abutment against the earthen hillside.

Summary of Features of East Abutment:

- -consistent and gentle concave west façade as originally built, no evidence of movement
- -consistent beam heights, variation due to spalling concrete encasement of I-beams
- -large stones in horizontal bed lines, largest at base
- -typical vertical wall batter on south corner
- -nearly intact north pylon with 1919 marble date placque
- -early or original stone wing walls, intact at ground level & below, broken or rebuilt in portions of both upstream & downstream walls above ground.
- -survey stake adjacent downstream wingwall, wall as survey point noted ca.1823 deed.
- -mid-late 20th century concrete cantilevered deck flange added on downstream side, original deck curb, pylon and wingwall location evident in deck surface.
- -poor drainage of surface and adjacent spring water causing deck deterioration and unattended water infiltration issues.
- -original 1812 stone and massing intact

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West Abutment:
The west abutment is the most remarkable, by size, stonework and sophistication. It stands roughly ten feet above the stream bed, although the main channel of the stream runs close to this abutment, creating a deeper channel within several feet of the east face. Very large rectangular stones are laid in conscious horizontal courses, the lower two courses exhibiting stones of four feet long, two feet high and two feet deep. The vertical face of the walls exhibit a slight "batter" or taper to greater width at the base, with about a 2"-3" variation from base to top. Again there is a very slight concave plan to the east face along its 19'2" length. A distinct stone footer or "water table" was noted, slightly beneath prevailing water heights during the fall season. Although the top edge of the footer had evidence of broken edges, thus no longer of an even height, it has a consistent projection of 6 ½" along the entire face, verifying the intact condition of the wall mass.

The south façade retires quickly into the earthen bank behind, similar to the east abutment, with random rubble stone in horizontal courses making up the south wall as it blends into the wing wall. At approximately 10 feet west of the abutment face the stonework is above the road surface and is made up of smaller, more rubble stone, possibly with portions of the wall rebuilt. There is a thin concrete cap applied on the top of the wall (not the several inch squared coping called for in 1919). The 1919 concrete pylon at the east terminus of this wall is relatively intact but with top corners broken off.

The approach road from the west has a distinct upward slope as it nears the bridge within this wall area. There are no scuppers evident for road drainage. The length of the south wing wall is nearly 36 feet, with the adjoining earth crowned to the deck height, then dropping quickly down in the easterly direction to below water level within 10 feet of the east façade and the creek edge. A measuring gauge is fixed to the wall near this southeast face corner. A galvanized pipe is also attached here, likely as a hand hold for anyone reading the gauge or working on the bridge on this side.

The north façade contains some of the most interesting features of the bridge, including the largest stones, masterfully angled at the northeast corner to match the trapezoid plan and a unique large stone buttress set at an angle against the western bank of the land and wing wall. The prevailing channel and main force of the stream favor this north corner, evident even in the 1919 Martin drawings. The stonework on both the north and east sides of this northeast corner of the west abutment is the best cut and fitted on the bridge, designed in 1812 for maximum strength against the stream. The large corner quoins are cut at an obtuse angle to incorporate the angled approach of the road from the west, and perhaps to help divert any flood waters more easterly back to the stream. The two stones at the base, one 4 feet the other 3.5 feet, appear locked with lap joint, with a very fine mortar space in-between. While this may have been an installation crack of the once nearly 8 foot long stone, its tight fit indicates virtually no movement of the base stones over 200 years and essentially integrates the stones together.

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As with the east façade, large stones in horizontal courses characterize the lower half of the north façade and on the corner roughly five feet above the base. The upper portion of the wall (another 4.5 feet) contains roughly rectangular stones that decrease in size to blend into the rubble wing wall that stands at an 8 foot height above the datum. Evidence of mortar and stonework repairs that appear in this upper portion tends to follow at an angle just below the road surface, suggesting infiltration from surface drainage water, again without scuppers. The concrete pylon at the east terminus of the wing wall has been diminished in height by at least one foot and the north exterior face of the concrete broken off, exposing the reinforcing rebar. Built-up applications of gunnite cover and alter the stone surfaces under the pylon to compensate for added exposure resulting from the loss of the pylon face. Additional gunnite, deflection and cracks in this top NE corner demonstrate water damage from the surface deck hole directly above (note, some damage noted also on east façade, approx. 5' square area in top NE corner). From the east abutment face the wing wall extends westerly about 22 feet, being substantially broken down at the last several feet at the road surface just above and west of the buttress.

A large stone buttress is built against this wing wall into the earthen bank starting 13 feet from the east face of the abutment and extending west for six feet. The buttress is nearly 10 feet high and begins six feet to the north of the abutment wing wall, with an angled face diminishing back to 3.5 foot projection at the top. This is made up of much smaller stones, although matching mortar repairs allow the feature to blend with the 20th century repointing to the original 1812 stone construction. At the base of the buttress and along the north face of the abutment is a recently poured (within the last five years) concrete cushion or pillow with a slightly convex top surface, at nearly water level. Three additional cushions are poured in staggering projections and lower depths eastward of the east façade of the abutment, within the prevailing stream channel. While the original, 6.5" projecting stone footer measures approximately five feet below the datum line, the stream channel may exceed seven feet below the datum near mid-span of the western bay, just east of these cushions.

Summary of Features of West Abutment:

- -largest and best fitted stones, especially near the NE corner
- -slight concave east façade plan and typical "batter" to vertical profile verifies built-in strength features of 1812 construction for solid, secure wall.
- -original stone work in-situ below road & surface grade
- -consistent stone footer projection across entire east face of wall shows no movement
- -consistent height of I-beams
- -portions of 1919 concrete pylons and attendant stone wing walls in-situ
- -large stone buttress, ca. 1930-40, on north façade for strength reinforcement
- -concrete cushions/pillows poured at base to protect abutment foundation from scour
- -measuring gauge and handrail fixed on south façade
- -over ¾ of stonework and overall massing of very good integrity from 1812

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Stone Piers:
The two stone piers are significant, not only as an integral part of the current engineering, but in clearly demonstrating the type of bridge built here in 1812. They demonstrate the accepted capability of an untrussed wooden span, namely approximately 25 feet, and the accepted width of a solid stone pier of about five feet. Rounded upstream noseings extend two feet beyond the rectangular footprint of the load bearing portion of the pier, the curve to deflect the stream flow. They are also a character defining feature of the Federal era bridge, being easier to construct than a sharp pointed nose used with late-19th and early-20th century bridges. They provide verifiable comparison to the nearby Creamery Road Bridge attributed to an associated Fretz family member.

Both upstream and downstream facades of the piers contain large cut stones, the upstream stones cut on a curve to echo the pier's footprint profile. The south façades are square, with demonstrative stone corner quoins. The nearly ten foot high walls are again battered with a roughly 2 to 4 inch splay although the taper accelerates inward at the top foot of the pier on the ends. Horizontal I-beam placement varies slightly from the east pier to the west pier, due to the angled path of the roadway across the creek over the bridge. Thus the I-beam on the south end of the east pier is nearly flush with the south façade, the corresponding beam on the west pier is set in several inches. Again, vertical I-beam heights are relatively consistent as seated on the piers, height variations generally from separating and spalling surface concrete applications to the beams themselves. A medium size tree is growing out of the creek bed close to the south end of the east pier, but without any evidence of impact to the stonework. The USGS stream measuring gauge, a metal cylinder with protective square observation hood on the top, is fixed with metal bars to the south façade of the west pier, blocking visibility of some stones.

Poured concrete cushions surround the upstream noseings and run along the east and west facades of the piers, again to deflect scour waters. Where the cushion ends on the east pier east façade, a backwash action is occurring, with slight erosion along on several base stones. Nothing else is showing cracking or deflection suggesting that simple repairs and cushion extension can remedy this. A variety of pointing, patch pointing repairs and gunnite applications are evident throughout both piers, in particular on the north rounded noseings. For measuring purposes this treatment obscured surfaces of the stones, although some of the original stones could be discerned through these less-than- artful applications. The piers are capped with concrete to receive the I-beams, as well as a protective feature on the top surface of the rounded north ends, although the latter has broken off in portions over the years.

The piers in their overall massing appear remarkably secure and consistent in height, vertical splay and façade evenness. One stone at the base of the west pier on the west face, roughly in the middle appears set out slightly (3-4") from its neighbors. While this may indicate a former slippage from overhead deck water leakage, there are no

indications of recent movement. The adjacent downstream stone appears slightly weathered, actually enhancing the appearance of the projection, and thereby minimizing the veracity of this slight bulge. Likewise, stones on the noseings, especially the west pier, that became dislodged or lost mortar over the years, may have not been reset properly, giving these profiles an irregular appearance. I-beam heights, however, run very consistently, confirming overall firmness of the piers under deck and load bearing weight strains.

Pier Summary:
- -character defining round noseing upstream profile
- -number and placement of piers of engineering significance
- -vertical splay and smooth running facades demonstrate soundness over 200 years
- -dressed square and rounded stones on ends and larger squared stones in lower half character defining of construction technique, time period and engineering
- -I-beam placement of consistent height, no movement
- -cushion treatment may be enhancing scour where missing
- -variety of pointing, including scored ribbon pointing and broad surface application of gunnite
- -minimal evidence of modern stress or cracking

Superstructure Observations:

Deck:
A horizontal datum was extended the length of the bridge beginning near the east pylon and extending past the west abutment with vertical measurements down to the deck surface taken roughly every 12 feet. The readings demonstrated a deck that is remarkably even, basically level but with a consistently graduated descent to the west approach. The concrete deck surface was covered with macadam as per Oscar Martin's specifications in 1919, although macadam reapplication was likely done within the last 40 years. Lateral cracks in macadam parallel with the stream flow were noticed over the expansion joint areas, namely the area of approx. 18" between the I-beams atop of the piers and at the deck termini over the abutments. No other significant cracks were noticed, just wear and weatherizing effects on the surface.

Several holes in deck surface were found near the abutments and have the appearance of being in existence for a long time. These holes are nearly one foot in rough diameter and were simply "repaired" or covered with application of heavy metal plate over top. The resultant water seepage has infiltrated concrete encasement of beams, adjacent deck areas, as well as stonework beneath, although the holes themselves occur over spaces between the floor beams and had minimal direct structural impact. One hole is at the deck terminus on Erwinna side near northeast pylon. It is between the 2nd & 3rd beams from the side and is allowing water to filter down onto the east abutment. The two holes on

Ottsville side likewise are found where deck meets abutment, both again between the 2nd & 3rd beams from each side, the northwest hole again causing water infiltration onto the abutment. These locations appear to have become susceptible from the thin deck surface above the ends of the I-beams coupled with traffic friction. Associated damage to the deck and stone mortar appears to have been ongoing for a long time, with gunnite repairs applied more than once over the affected areas.

The 1919 pipe railing installed with the Oscar Martin repairs was removed ca. 1990 and modern W-guiderail applied to the bridge. This application has caused significant damage to the deck along the curb sides. The posts for the railing were mounted with bolts drilled into the concrete curb, thus allowing fracture and water seepage. The concrete curbs spalled at the bolt lines causing most of the curbs and railings to fall off of the bridge (significant debris was noticed on the ground around the bridge). This exposed the interior aggregate of the concrete, as well as the end I-beams. Heavy concrete "Jersey barriers" have been placed along the sides of the roadway for remedial protection. The barriers have restricted water drainage on the deck, snow removal and have caused collection of debris. Modern guiderail has been affixed to the barriers, as well as over the flange and retaining wall remnants on the Erwinna side. The earlier W-rail was applied over the marble datestone on the northeastern pylon, obscuring the date information and again damaging the pylon. The location of the original concrete curb is imbedded and visible in the road deck of the newer flange on the south east corner toward Erwinna.

Deck Summary:

- the deck horizontal profile is exceptional in its consistent evenness and graduated descent toward the lower Ottsville approach. There is no obvious displacement
- large holes occur at the deck terminus on both ends, in place for a long time & covered with metal plate
- remnants of the concrete curb, pylons, pipe railing from 1919 are still visible
- Northeast pylon most intact and holds the marble date placque from 1919
- application of modern W-guiderail has significantly damaged the curb, side surfaces of the deck and I-beams and end pylons

"jersey barrier" placement has restricted water drainage, snow removal &c

- these barriers have introduced significant "dead weight" to the deck, perhaps 30 tons, Although no strain exhibited on the deck or substructure
- surface treatment is macadam, as per 1919 specifications, deck underneath is reinforced concrete that integrates with concrete casings around I-beams beneath
- expansion joint lateral cracks predictably occur above piers and at abutments
- concrete exposed on sides of deck show large pebble aggregate.

Landscape Conditions

The prevailing landscape surrounding the bridge is natural, stream banks lined with trees, adjoining fenced pastures to the west and the rugged impression of shale cliffs to the north. Road and bridge features are minimal and blend completely into the rural setting, reinforcing the visual expression of the logical progression of this site from 18th century stream ford to bridged crossing of the Federal period and easy transition to motor vehicle traffic of the modern era. The stone substructure echoes the stone outcrops on Sheep Hole Road, as well as the masonry technique demonstrated in many of the Federal era farm buildings in the historic district. It represents the most basic of principles of vernacular architecture that characterizes the area, namely to utilize the materials at hand and incorporate the skills and traditions of the resident population to provide a solution to transportation. Jersey barriers and modern guiderail installed on the deck of the bridge and the approach from the east detract from the historic presentation of the bridge with open railings and stone parapet wing walls. The stone substructure still retains its integrity of form, material, craftsmanship and connection to the earth, creek and surrounding landscape.

Generally 18th and 19th century bridge alignments were perpendicular in relation to the watercourse they were crossing. This allowed for the shortest span at the crossing location and allowed for abutments and piers to be in line with the flow of the water. Placement on a slight skew to the creek was far less common. The Burnt Mill Bridge is somewhat unusual in demonstrating this feature in use in the early 19th century. Thus placement and width of the abutments and piers at a slight skew is significant in the understanding of evolving bridge engineering and construction of the early Federal period. The west abutment is roughly 19 feet wide, the two piers are over 20 feet and the east abutment is slightly over 18 feet, all to accommodate a deck of 16 feet plus curbs and railings.

The strong land rise to the east of the bridge defines the sharp curve path of Headquarters Road as it leaves the bridge towards Erwinna. It is partially wooded and grassy yard with a stone wall and historical home positioned with an easterly view. Banks of this property have natural vegetation and seasonal flowers. While not obviously noticeable, a small spring filters out of this bluff very near to the east approach of the bridge. Historically a small drain allowed this water to flow under the road toward the creek, but at times is blocked, causing water to cross the road and run onto the bridge deck. This may have exacerbated the deck hole and erosion conditions adjacent the north side of the east abutment.

The Tinicum Creek has a broad presentation at this location, and exhibits the character of its early ford function. Collections and islands of stream cobble tend to order the course of the water flow. Such build up over time has increased from the Sheep Hole side, in

part due to falling trees from the steep banks that subsequently gathered stones and encouraged water to flow around. As such the stream has migrated away from the Sheep Hole side toward the pasture side. At the bridge the cobble island build-up has created a stronger flow towards the west abutment. While this prevailing channel was shown in the 1919 Martin drawings, it may have increased since then. Likewise, build-up downstream from the bridge is causing an eddy effect, and is now sending water back to the bridge and around the west pier in a broad S-curve path. Natural stream bank vegetation, including trees, brush and grasses, is serving well to protect the adjoining pasture and road landscapes while absorbing water flows.

While outside the basic scope of actual measurement documentation, observations made in the field of conditions that may be remedied to increase the longevity of a structure are of value to the preservation of the resource. Simply maintaining a clear drain for the spring water to flow under the road can greatly resolve water issues on the east side of the bridge. Likewise, a redistribution of the stream cobble that sits atop the stream bed, in order to redirect the stream flow under the spans of the bridge, as well as to ease the damming effect downstream of the bridge, would greatly diminish erosion and scour effects. Removal of the jersey barriers and reinstallation of the 1919 deck railings would eliminate substantial dead load, as well as improve snow placement, surface drainage and debris removal. An open railing would also bring the resource closer to its historical appearance and allow the beauty of the landscape to prevail over the structure. Inclusion of scuppers in new curbing would enhance removal of standing water from the deck surface. Of course, deteriorated conditions of the deck itself would suggest an in-kind replacement of the beam and concrete features to best maintain the historical appearance.

Summary of History and Documentation:

-bridge substructure dates to 1812 and is among the oldest resources in the historic District, the first bridged crossing within the district and contributed to the enhancement of the economy and lifestyles of the residents within the district.

-bridge as a verification of the 1812 engineering is significant as the oldest documented stone supports for a multi-span wooden beam bridge in PA

-Stone substructure represents the efforts and craftsmanship of local citizens, no bridge companies or known bridge builders or the region were involved. Nearby residents of Christian Fretz and Barnet Snyder are recorded participants in the construction- descendants of these families still reside in the area today.

-stone substructure represents engineering with splayed or battered walls, consistent water table footer on the west abutment, rounded upstream noseings on the piers.

-abutments constructed with a concave face towards the stream to offer strongest resistance to the earthen bank behind.

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-stone sizes are relative to strength requirements of the features, largest and most dressed stones on the lower portions of the bridge, and at the corners, smaller, less fashioned stones in the upper 1/3 of the walls and in the interior ranges. Stones, while not strictly ashlar in size and construction, are placed in horizontal bed lines and are of similar heights in respective ranges

-bridge placement in landscape, namely on a slight skew, adds to the understanding of bridge construction of the time

-bridge contributes to the understanding of stream crossings within Tinicum township, namely it was the first of the major interior bridged crossings in the township and continued as the only bridge for another 60 years. It contributed to intercounty and interstate travel in upper Bucks County, as well as to facilitate the local population's ability to access a dependable grist mill.

-bridge contributes to the rural landscape presentation of this section of the Ridge Valley Rural Historic District, a section that is the most visible and frequently traveled of the areas within the district.

-bridge demonstrates the qualities of vernacular architecture, namely the blending of local materials and engineering knowledge and craft into a structure of substance and duration.

-as a product of its own time, the substructure clearly offers insight into bridge and stone construction of the Federal period in Bucks County. The superstructure represents the unique approach of A. Oscar Martin, county bridge engineer, to respecting historical stone craft and engineering, earlier bridge types and landscape amenities even with a new deck replacement in "modern" materials of 1919. The concrete pylons, pipe railings and marble placque are character defining features of the 1919 changes.

-the consistent measurements and solid evenness of the stone substructure attest to its continued strength. No major displacement was observed.

-the consistent measurements and evenness of the deck surface likewise attests to the soundness of the overall bridge. No major displacement was observed.

-damage to the concrete deck due to inappropriate guiderail applications, water drainage & neglected repairs are noted. Water damage to I-beams and concrete encasements will require remedy or replacement.

-issues of water drainage are noted. While potentially damaging in the long term, these issues can be effectively corrected at this stage.

-integrity of the surrounding landscape is significant to the overall presentation of the historic district as well as the bridge, the experience of travelers through the district, as well as to the understanding of this early 18th century creek crossing site. Diligent maintenance of this delicate environment will continue to offer the future such understanding and appreciation of the history encapsulated in this valley.

Kathryn Ann Auerbach/2012

Ed Rodgers
Delaware Riverkeeper Network
925 Canal Street, Suite 3701
Bristol, PA 19007

June 14, 2013

Dear Mr. Rodgers,

The following letter is written in response to your request to review the potential impact of replacing the Headquarters Road Bridge as well as the effects of rehabilitating the existing span, historically known as the Burnt Mill Bridge, in Tinicum Township, Bucks County, Pennsylvania. The Delaware Riverkeeper Network is a consulting party in the Section 106 process for PennDOT's proposal to replace the historic Headquarters Road Bridge and this correspondence is written in support of those efforts. As the researcher and preparer of the Ridge Valley Historic District nomination some twenty years ago my remarks and observations are offered here with the hope that a fair and reasonable outcome can be reached by all parties that maintains the historic integrity of this rare and significant historic resource, and that has no adverse impact on the Ridge Valley Historic District or the exceptional value of the Tinicum Creek.

In preparing this letter, a review was made of several documents that were provided. In 2006 the Army Corp of Engineers sought a determination of National Register Eligibility for the Bridge on Headquarters Road. Although the bridge was already listed as a contributing structure to a listed National Register Historic District, the State Historic Preservation Officer determined the bridge to be not eligible. This finding appears contrary to fact and no explanation is given as to how the SHPO could determine a National Register listed historic resource not eligible. However, the determination of eligibility also went to the Secretary of Interior who indeed determined the bridge eligible under criterion A for architecture and criterion C for agriculture. It is my opinion that the determination of eligibility should be sent back to the State Historic Preservation Officer with a letter outlining the importance of this bridge to review again, with the hope that reconsideration might yield a supportive determination.

In a document written to call for support in preserving the bridge, the rarity of the pier-to-pier design of the Headquarters Road Bridge was made clear. Based on an examination of PennDOT's statewide bridge survey in 2003, there were only eight working bridges in Pennsylvania built before 1812. All were of the more common stone arch construction design. Based upon this data, the Headquarters Road Bridge is the oldest surviving pier-to-pier bridge left in Pennsylvania. This bridge was modernized in 1919 during the early automobile era with a new concrete deck with railings, designed by noted engineer and architect Oscar Martin, replacing the earlier wooden deck that once spanned the piers. While this was an open bridge and not a covered bridge, the design of the surviving 1812 abutments and piers mirrors the designs used on covered bridges particularly the numerous Delaware River crossings between Pennsylvania and New Jersey. In 1992 when the Ridge Valley district was first placed on the National Register it was not known that this bridge was of such an early date. If those facts were known, more significance would have been given to the bridge in the nomination.

The Headquarters Road Bridge is the point of convergence for one major portion of the district. The bridge ties together four roadways that follow creeks and drop down in elevation to a relatively flat plain where Christian Fretz built his grist mill in the eighteenth century. A bird's eye view of the road pattern converging at the bridge looks like two back to back parentheses)(. Two of the legs are Headquarters Road, one is Red Hill Road, and the fourth is Sheep Hole Road, which is the most significant roadway in the district because of its dirt surface. Approaching the bridge from any of these roads is dramatic. The loud sounds of water flowing down the Tinicum Creek and its tributaries, combined with a sense of dropping down to the lower elevation of the bridge and mill site, creates a sense of place, a feeling of arrival, and with the convergence of four roadways the bridge, in its current alignment and one lane configuration, provides the visitor with a bridge experience little changed in over 200 years.

Removing the Headquarters Road Bridge and building a modern two lane bridge would cause significant damage to the historic integrity of this portion of the Ridge Valley Historic District. One of the key themes of the Ridge Valley Historic District was the interplay of man-made roadways and natural waterways. The district is mostly a series of narrow, twisting, rising and falling roads following creeks. There were six bridges and two fords in the district. The Headquarters Road Bridge is the oldest in the district as all nearly all the other bridges were built in the auto era to replace fords. In terms of significance, the Headquarters Road Bridge is the most significant in the district due to its age, design, and rarity. The ninety degree turns onto Sheep Hole Road and Headquarters Road on the one side of the bridge would likely lead to a change in bridge alignment that could impact the archeological remains of Fretz's Mill. Changes in bridge alignment would also ruin the relationship of the bridge to the mill site and the road network that has remained intact for over two centuries. The intrusion of a modern two lane replacement bridge would significantly diminish the integrity and the feeling of the Fretz Mill portion of the Ridge Valley Historic District. The existence of this bridge in a listed historic district provides good cause to sensitively renew this span with a new deck as detailed in the engineering report submitted in 2011 by McMullan & Associates.

The Headquarters Road Bridge brought farmers to Fretz's mill from four directions and the house and bridge are sited in view of each other. As a miller, Christian Fretz was a significant man in the local farming community and he accrued some wealth as seen in the Georgian architecture of his fine home. Fretz's standing in the community and his status are apparent in the way that his stone house, the bridge, and the mill site serve as a central axis to the roads that converge at this rural agricultural industrial site. Christian Fretz's stone farmhouse stands at the junction of Headquarters and Red Hill Road which combine briefly in a straight approach to the bridge and then split after the bridge with ninety degree turns onto Sheep Hole and Headquarters Road.

The bridge plays a critical role in defining the central axis of this part of the historic district and the bridge alignment, use of red shale for abutments and piers, and one lane scale tie the bridge into the landscape and are in sync with the winding, narrow, and scenic roadways that meet at the bridge. Perhaps the most interesting travel leg in this area is the approach made on Sheep Hole Road, a narrow dirt road barely two lanes wide that follows the Tinicum Creek to the bridge. Traveling down this road along the creek under a dense tree canopy and at the end glimpsing the red shale lozenge shaped bridge piers that date back to 1812 is truly a journey that

engenders a sense of traveling back in time into the nineteenth century. Such remnant surviving road landscapes in Pennsylvania are extremely rare, and to imagine the change that would come from finding a realigned modern concrete span at the end of the dirt Sheep Hole Road seems an avoidable tragedy in the management of the Commonwealth's historic resources and National Register listed rural landscapes.

The Tinicum Creek is a federally listed Wild and Scenic River and a state listed Exceptional Value watershed. To my knowledge, no written discussion has occurred about the potential impact of a bridge replacement and/or realignment on the exceptional value of the Tinicum Creek. The Wild and Scenic Rivers Act (WSRA) requires the National Park Service to evaluate whether a "water resources project," which includes bridge replacement projects, will have an adverse effect on a wild and scenic river or tributary. The requirement is found at 16 U.S.C. section 1278(a) and is referred to section 7 of the WSRA. In addition, The WSRA contains several provisions designed to protect designated rivers and their environments. Foremost among these is Section 7 which provides that "no department or agency of the United States shall assist by loan, grant, license, or otherwise in the construction of any water resources project that would have a direct and adverse effect on the values for which such river was established, as determined by the Secretary charged with its administration." When a water resources project, which includes bridge construction projects, is found to have a "direct and adverse effect" on a wild and scenic river, the project cannot be authorized or funded absent congressional intervention. The most significant historic resource associated with the Tinicum Creek is the Headquarters Road Bridge.

I would argue the this district is nationally significant for it encapsulates the rise of upper Bucks County from a farming region with distinctive English and Quaker vernacular architecture into a region colonized by artists and celebrities in the 1930s. The Ridge Valley district featured sculptor Charles Rudy and screenwriter John Wexley. Tinicum Township was also home to actress Miriam Hopkins, song writer Jerome Kern, humorist Dorothy Parker, playwright S.J. Pearlman, and writer James Michener. All were attracted to the rustic rural landscapes of this region. Beyond Tinicum there were artists colonies in Solebury Township at Philips Mill and the small town of New Hope became an artistic sanctuary of international renown. Wexley and Rudy lived on Sheephole Road near the Headquarters Bridge and along the Tinicum Creek. In an interview with Charles Rudy's widow the rural beauty and simple living at a modest price was the main impetus for buying their farm and moving out of New York City. Lorraine Rudy spoke about how the rural countryside of the Ridge Valley Historic District allowed a lifestyle that informed and made possible her husband's creative endeavors.

Bucks County has a national reputation as a sanctuary for artists and the Ridge Valley Historic District is the single best example of a surviving remnant landscape that continues to look and feel like the Bucks County landscape of nearly one hundred years ago that attracted creative people to settle on the back roads of a rural area rich in stone vernacular architecture and a landscape of fields and forests and streams and roadways. The Headquarters Road bridge with its associated roadways and the motorist experience that can still be had traveling through that portion of the Historic District still retains the integrity needed to reveal the power of place that much more of Bucks County was once known for. Take out that one lane bridge that has stood since 1812 and the historic associations of water and roadways would be irreparably damaged.

The Geigel Hill Road Bridge, which also resides within the Ridge Valley Historic District, witnessed many years of effort to achieve a replacement design that all parties could accept. The character defining pony trusses were preserved and integrated into a new one lane design and red shale was integrated into the abutments. The character defining features of the Headquarters Bridge are the abutments and lozenge shaped piers as well as the alignment. Maintaining those features, keeping the bridge one lane and replacing the deck would result in a new bridge that continues to contribute to the historic district. Keeping the alignment and maintaining the scale of the existing bridge would surely have less impact on the wild and scenic Tinicum Creek than a realigned larger two lane span would have.

Thanks for the opportunity to provide this information to you and it is my hope that a sympathetic outcome results from the Section 106 process. Please contact me if there is anything more I am able to do to help in this matter.

Sincerely,

Robert W. Reynolds

Robert W. Reynolds

Attachment 5

June 18, 2013

Post Office Box 39
Erwinna, PA 18920

Maya K. van Rossum, the Delaware Riverkeeper
Delaware Riverkeeper Network
925 Canal Street, Suite 3701
Bristol, PA 19007

RE: BURNT MILL BRIDGE, aka Headquarters Road
Bridge @ Sheephole Road over Tinicum Creek
SR 1012, Section BRC, Tinicum Township, Bucks Co.

Dear Ms. van Rossum,

I am enclosing as an attachment an Assessment of the Historical Significance of the above Burnt Mill Bridge. While the bridge has been affirmed by the Keeper of the National Register to be a contributing resource to the Ridge Valley Rural Historic District (NR- 1992), it is my professional opinion that the bridge is individually eligible for the National Register.

Under Criterion A the Burnt Mill Bridge is important for its critical role in the early development and economy of Tinicum Township as the only internal bridge crossing for 60 years and for its strategic place in the early 20th century image and travel-facilitation which attracted a significant influx of nationally known artists, writers and celebrities.

Under Criterion C Burnt Mill Bridge holds a critical place in the national bridge inventory for its ability to represent a very rare historic bridge type, a multi-span timber beam bridge on substantial stone supports and for the engineered design of the 1812 abutments and free-standing pillars. The bridge served as a prototypical design for medium and large stream crossings utilized by the founding German heritage families, whose members carried cultural, architectural and engineering ideas through migrations throughout the United States and Canada. It is significant to demonstrate the cultural preference and acceptance of open timber bridges on stone supports by the local German heritage builders as a permanent and durable bridge accomplishment. The 1919 deck replacement by renown engineer A. Oscar Martin likewise demonstrates the prototypical "repair" utilized thereafter by counties and even the Pennsylvania Department of Highways decades later. Martin's engineering drawings, both of the deck repair of this bridge and the measured recorded design of a similar timber beam bridge (now gone), provide verifiable period evidence of early stringer engineering, both timber and concrete encased steel I-beam.

 continued…

Burnt Mill Bridge and its later companion Harpel's Bridge serve as the only known examples of stone supports for multi-span timber beam crossings in upper Bucks County and, with Burnt Mill, the earliest example in the Commonwealth of Pennsylvania. Both are critical components of several rural bridge collections of national importance for engineering: the Tinicum Township wooden bridge collection and Tinicum Township rural historic bridge collection. Both collections contain a very broad spectrum of historic bridge technology that contributed to the building of the nation, including rare, earliest, prototypical and one-of-a-kind historic bridge types.

That Burnt Mill Bridge is located in a nearly pure historical context of setting and historical association within the National Landmark potential Tinicum Township and the National Register listed Ridge Valley Rural Historic District, coupled with its placement over a PA designated Exceptional Value Stream, demonstrates its crucial role in the Federal designation of the Lower Delaware in the Federal Wild and Scenic Rivers program.

Any significant alteration or destruction of the Burnt Mill Bridge would significantly impact the nation's body of knowledge on rural bridge technology and quality of life.

Sincerely,

Kathryn Ann Auerbach
Historic Preservation Consultant
610-294-8035
kauerbach@frontiernet.net

attachment

BURNT MILL BRIDGE aka HEADQUARTERS ROAD BRIDGE
OVER TINICUM CREEK, TINICUM TOWNSHIP, BUCKS COUNTY, PA

Historical Assessment Summary

Prepared by Kathryn Ann Auerbach, Historic Preservation Consultant, June 2013

Resource: Multi-span, rural highway, beam bridge spans 80' over medium sized stream.
Stone sub-structure: **Built 1812**, stone buttress reinforcement west wing wall ca. 1935.
Super-structure: Timber stringer, wooden deck, wooden plank rails 1812 – 1919.
Concrete encased steel I-beams, concrete deck & pylons, pipe rail **1919**.
W-guiderail replaced pipe rail ca. 1990.
Jersey barrier replaced W-guide rail ca. 2001.

Designations: -Ridge Valley Rural Historic, contributing resource listed in the **National Register of Historic Places-** applied 1990, listed 1992.
-Lower Delaware **Wild & Scenic River**, contributing resource, 2000.
-Tinicum Creek, PA **Exceptional Value Stream** Designation

Affirmation: Keeper of the National Register's letter of April 26, 2006 states:
"Both its (Burnt Mill Bridge) original construction and alteration occurred within the historic district's defined Period of Significance (1790-1940). The bridge is **historically significant** in the context of the development of the township, regional transportation, and the operation of local mills, and IS OF **ENGINEERING SIGNIFICANCE** BOTH FOR ITS EARLY 19TH CENTURY CONSTRUCTION AND ITS SENSITIVE MODERNIZATION IN 1919. Although the concrete deck shows signs of considerable deterioration and the deck has been altered with the removal of the 1919 railings, the bridge **RETAINS SUFFICIENT HISTORIC INTEGRITY** TO CONTINUE TO CONTRIBUTE TO THE RIDGE VALLEY RURAL HISTORIC DISTRICT."

PA Historic Bridges: Based on the PA Historic Bridge Inventory conducted in 1993 by Lichtenstein & Associates, Burnt Mill Bridge is the
- **4th oldest bridge in Bucks County** and the
- **11th oldest bridge in Pennsylvania**.

Stone Arch bridges are the only older bridge type.

Bridge Type: Stone supports for a multi-span timber stringer wooden bridge.
- **Burnt Mill Bridge is the oldest documented stone supports for a Multi-span timber-stringer bridge in Pennsylvania.**

While once a fairly common rural bridge type in some areas, timber stringer and deck bridges of the 18th & 19th centuries have nearly disappeared from the entire inventory of historic bridges and often do not even appear as a bridge type. Only one other multi-span stone supported beam bridge is currently known in Bucks County, that of ca. 1835 Harpel's or Creamery Road Bridge over the Tohickon.

Additional Historical Context Categories:
NATIONAL: *Tinicum Township Writer & Artist Enclave of early to mid-20th century*

The majority of Tinicum Township is currently being evaluated for eligibility as a **National Historic Landmark**. Initiated with correspondence with the National Landmark office in 2008, studies are underway to document the area's **unique role as a home to many writers, artists and notables of national caliber during the early to mid-20th century**. **Tinicum Township retains the integrity of historical landscape and buildings and structures** that were in place during the first half of the 20th century.

Bordering the Delaware River, Tinicum is characterized by a rugged natural beauty secured with historical roots extending back nearly 300 years and evidenced through the handiwork of substantial structures created by the founding families. Building on the framework of ancient roads and buildings of the early Scot-Irish and German families, the agriculturally poor township transitioned into an area of resort and respite by the late 19th century.

The advent of the automobile encouraged writers and artists to settle within the hills and valleys and seek inspiration and quiet renewal, and in some cases to live the thrill of the pioneer lifestyle. With leading names such as S. J. Perelman, Nathaniel West, Dorothy Parker, John Wexley, Artie Shaw, Josephine Herbst and later James Michener, Tinicum became host to a unique blend of generational residents, serious artists and New York sophisticates. The resultant preserved landscape and collection of historical resources is a demonstration of the economic symbiosis between cultures and universal appeal and respect for the natural and historic settings that Tinicum offers. The uniqueness of Tinicum is that the handmade local quality and connection to heritage was retained and sustained, even as artists, notables and sophisticates were added to the demographic.

Headquarters Road is a principal avenue through the township to view and experience this district, and was the visual image that captured the desire of this nationally significant collection of artists to settle here. It retains many of the character defining features of this image, such as winding narrow roads and one-lane bridges.

Burnt Mill Bridge is a critical element of the ability of the township to convey this early 20th century image. It demonstrates both the heritage building traditions and natural stone materials that blended this resource to the landscape, as well as the modest yet effective upgrades in steel and concrete by recognized architect/ engineer A. Oscar Martin to carry modern motorized traffic. It retains evidence of the 1919 appearance wiat was in place upon the arrival of this bohemian trend. Burnt Mill Bridge joins with nearly ten other bridge upgrades (several recently destroyed) Martin executed during this era of renewed prosperity for the township and reinforces the complete physical picture of the 20th century phenomenon.

KAA/2013

Additional Historical Context:
NATIONAL: *Architecture & Engineering: Cultural Preferences, Earliest Example*

Burnt Mill Bridge represents a **cultural preference** acceptance of **timber super-structure and stone masonry substructure as a permanent and valid bridge** engineering type by the **predominant German** founding families of Tinicum and upper Bucks County. As a source region for significant westward migrations by the descendants of immigrant first settlers, southeastern Pennsylvania became the trying ground for pure cultural expression, as well as the first cultural blends to both other groups and local landscape offerings of geology and climate. Designs that evolved and design choices made often reflected cultural preferences that ultimately **contributed to the national fabric of construction heritage and practice**. Early examples of building and bridge engineering methods and designs are highly significant to the understanding of the national vocabulary that followed as the 19th century progressed.

Burnt Mill Bridge represents **character defining features of stone masonry supports** that saw principal sourcing and refinement in the early Republic period. Referred to as "pillar bridges" the stone features include large, rough ashlar stone blocks on horizontal courses, diminishing to random stones in height, battered walls to provide the most stable "Pylon" or Pillar, rounded pier noseings to deflect water flows, slightly concave inside facades of abutments to deflect the earthen force of the approach ramps, water tables or a stepped foundation feature. Abutments and piers were placed at roughly 25 foot intervals to support the untrussed wooden timber spans. The Burnt Mill bridge stone supports exhibit these character defining features of this formative period of engineering for these free standing stone support structures.

Burnt Mill Bridge provides **information on the combination of stone and wood** to provide a lasting bridge crossing for over one hundred years until the deck replacement in 1919. Burnt Mill Bridge 1812 provides **the earliest documented evidence of bridges that became commonplace throughout the nation**, design ideas and preferences carried by the very family members of German founding families of this source region. While beam bridges are seemingly "un-engineered", Burnt Mill demonstrates engineering in the stone supports and the understanding of the design capabilities of wooden beams, thus an **engineered choice with regard to span and placement of piers and abutments.** That this design is repeated in greater scale within 20 years with Harpel's (Creamery Road) Bridge reinforces both the bridge type and its acceptance as a valid and permanent method of stream crossing. Wooden beam bridges on solid stone supports appear to have been built with more frequency in areas of Bucks County/ southeastern Pennsylvania that contained higher density of German immigrants and their successive generations, areas that sustained a relatively pure cultural imprint even into the 20th century, thereby showing cultural preference in bridge type.

KAA/2013

Additional Historical Context:
NATIONAL: *Architecture & Engineering: Cultural Preferences,continued…*

Southeastern Pennsylvania retains pockets of intact settlement areas that represent the variety of cultural groups who arrived to settle under William Penn's Holy Experiment. This event, perhaps the first in the history of civilization that peoples from around the world were invited to live together under a loose Frame of Government, resulted in **successful permanent communities of different cultures** with different architectural and building traditions existing side-by-side.

German migration into Tinicum, to join earlier arrivals of Dutch and Scot-Irish, is verified by requests **in 1738 to form a township**. First and second generation immigrants brought a solid tradition of heavy timber construction and faith in wood as a material of substance and strength. Equally skilled in stone masonry, Germans in Tinicum and other upper Bucks communities accepted timber superstructure bridges on quality, permanent stone supports. This is in contrast to English preferences in southeastern Pennsylvania for full stone, thus the frequency of stone arch bridges in landscapes to the south and southeast, or on major interstate routes. Local artisans John Niece and Barnet Hillpot likely joined with **documented Barnet Snider and Christian Fretz in the construction of Burnt Mill Bridge, adding a true signature of cultural handiwork to the physical bridge**. Local stone and wood artists continued to contribute during technology changes that brought wooden truss covered bridges by the third decade of the 19th century.

While seemingly of local or regional importance, it is these **first permanent expressions of building art and engineering that established the nation's building traditions as well as provided the physical underpinnings of the creation and growth of the nation**. Only one other stone supported multi-span timber-beam bridge (again with ca. 1935 concrete deck) known to exist in upper Bucks County is the nearby 200 foot Harpel's aka Creamery – Fretz Valley Road Bridge. This bridge shares regional, cultural, engineering and familial associations with Burnt Mill Bridge. To view period historic bridges side-by-side with the stone homes of these founding families (in this case the Fretz's, Christian & Abraham and the Harples) gives a rare and unique glimpse of the very basic foundation of our nation.

A national bridge assessment study "A Context for Common Historic Bridge Types" prepared in 2005 (Parsons Brinckerhoff and Engineering and Industrial Heritage, National Cooperative Highway Research Program &c), while well-written and very comprehensive on truss types, provides minimal information on the timber stringer with stone supports, generally focusing on timber bridges with timber pylon supports and 20th century picturesque park-type timber bridges (representative examples given are of the latter). It does acknowledge the commonality and frequency of the type, especially for short, single spans, and the duration of use into the 20th century.
KAA/2013

Additional Historical Context:
NATIONAL: *Architecture & Engineering: Cultural Preferences,continued…*

The report notes that **timber bridges were among the earliest**, as "stone bridges were expensive and time-consuming". It infers that these "bridges were all of a temporary nature". This misunderstanding comes perhaps from a lack of information about these very early bridges, due in part to their rarity today, as well as a lack of understanding of the significance of the stone supports to verify the existence of a wooden structure and the local achievement to build a bridge. The report does qualify the limitations of its study and the need to gather more information on timber bridges.

The Burnt Mill Bridge, as the oldest documented bridge of its type in Pennsylvania, along with Harpel's Bridge demonstrate sophisticated design of the stone supports, application for county assisted funds to construct the stonework, and acceptance of a timber beam deck as a permanent bridge by the locally dominant German population. The study does state that "very old (pre-twentieth century) examples would possess significance as an early representative example of the type if they retain integrity. In the case of Burnt Mill, the stone substructure retains very good integrity from its original engineered design, and clearly demonstrates the span capability of the wooden beam, namely 25 feet. Even without the original timber beams, the number and spacing of the stone supports provides clear evidence of the design and span. Documentation drawings rendered by A. Oscar Martin in the early 20th century (collection @ Bucks County Historical Society) for a similar bridge, now destroyed, provide measured specifications for the wooden super structure, including the wooden beams, board deck, wood railing and wrought iron nails to attach the railing. These drawings "complete the picture" of the design of the wooden superstructure assuming similarities within the same county, geographic setting and cultural group. **Thus Burnt Mill Bridge stands as a significant verification of a forgotten bridge type, and by age and size, may have provided a prototype for migrating cultural groups from Bucks County to repeat as settlement moved across North America.**

NATIONAL: *Engineering: Wooden Bridge Technology*
Burnt Mill Bridge contributes to a unique collection of wooden bridges in Tinicum Township that is exemplary on a national scale in representing some of the **oldest and most diverse variety of bridge types.** Burnt Mill 1812 and Harpel's Bridge ca. 1835 verify wooden beam technology, there is one ca. 1835 Queen Truss pony bridge over the NHL Delaware Canal, one ca. 1867 Howe open pony wooden truss of multi-span, three ca. 1850-1880 covered Town or lattice trusses and one ca. 2005 Burr truss replication of the original 1832 Delaware Canal aqueduct over the Tohickon Creek. The majority of these bridges are located either in National Register Historic Districts, over National Landmark designated canal or within State Park boundaries, designations which help to reinforce the physical context for understanding the choice of wooden bridges.
KAA/2013

Additional Historical Context:
NATIONAL: *Engineering: Collection of Rural Bridge Types*

Tinicum Township's collection of bridges (including those crossing the Tohickon into other townships) is one of **the most comprehensive in the state** and **represents all major rural bridge types**. Included are natural stream fords (three active), supports for wooden beam spans (two active), stone arch (one active), covered wooden Town truss bridges (three active), open wooden Howe truss (one), open wooden Queen post pony (NHL-one pedestrian), metal truss (one active King Iron Company bow string, four active Pratt pony), concrete deck girder arch- 1909 (one active), early concrete encased I-beam (five active), early solid concrete deck (at least three active), early concrete barrel arch long span- 1922 (one active), ca.1930 balustraded concrete T-beam long span (one active), ca. 1930 paneled parapet concrete T-beam single span (two active), mid-20th century early park-era crossings of the Delaware Canal (NHL) (four active). Additionally of interest is the reconstructed timber Burr truss aqueduct for the canal over the Tohickon Creek. This collection has rare wrought iron, one-of a kind open wooden truss designs, as well as some of the earliest examples of concrete technology. Burnt Mill is critical by both age and type to complete the full picture of rural bridge technology that this remarkable collection represents.

Unfortunately, a significant steel plate girder bridge- 1921 over the Delaware Canal, was recently completely destroyed and replaced. Likewise several early 20th cent., single span, one-lane concrete and I-beam spans were inappropriately replaced with intrusive modern bridges that altered stream characteristics, natural setting and serenity and historic road paths and degraded NR historic districts. In spite of these recent mistakes, this collection of nearly 34 historic bridges of all types (except plate girder) provides perhaps the most comprehensive representation of rural bridge solutions in preserved visual and historical context in the country. **The Burnt Mill Bridge is a critical component as the oldest bridge and representing the oldest type (save natural ford) of engineered crossing in this collection.**

REGIONAL AND LOCAL: *Patterns of History, Development & Transportation*:

Burnt Mill Bridge verifies by its placement the original path of the ca. 1747 Headquarters Road as a critical path to the only internal mill in the township, first Henry Myers' then Christian Fretz', as well as the regional path for travelers coming across from the Perkiomen (Goshenhoppen) Region to the Erwin's ferry crossing to New Jersey on the Delaware. Once the bridge was build in 1812, connecting roads, Red Hill and Sheep Hole were confirmed to facilitate this critical transportation artery.
KAA/ 2013

Additional Historical Context:

REGIONAL: *Community Development: Bucks County in the Early Republic*

Burnt Mill Bridge represents the significant growth and maturity of the County of Bucks during the Early Republic period, namely the capability of the young government to fund major construction projects including inter-state bridges, the county almshouse and a new set of county buildings built in conjunction with the relocation of the county seat from Newtown to Doylestown 1812. By its remote location 12 miles from the county seat in Doylestown Burnt Mill Bridge represents the effective outreach of the county system to meet the needs of its rural populations. It also represents the ascension of cultural groups that had been in the political minority, but now who were playing strong roles in the growth of the county, including the Stovers and the Fretz families, both very instrumental in the county court house and almshouse building projects.

REGIONAL: *Community Development: Local Craftsmen to carry out Public Projects*

Burnt Mill Bridge represents the southeastern PA approach to bridge building projects, namely that bridges were built by the local population of artisan and property owners, with an account of funding placed in charge of a neighbor to the chosen bridge site. Thus Bridges take on a hand-made quality with distinctive characteristics of the stone masons and carpenters who also constructed the houses and barns in the community.

NATIONAL/ REGIONAL: Architecture/ Engineering, significant AOM

(detailed discussions)

NATIONAL- *Architecture & Engineering: Cultural Preferences*.
Southeastern Pennsylvania retains pockets of intact settlement areas that represent the variety of cultural groups who arrived to settle under William Penn's Holy Experiment. This event, perhaps the first in the history of civilization that peoples from around the world were invited to live together under a loose Frame of Government, resulted in successful permanent communities of different cultures with different architectural and building traditions existing side-by-side. German migration into Tinicum, to join earlier arrivals of Dutch and Scot-Irish, is verified by requests in 1738 to form a township. First and second generation immigrants brought a solid tradition of heavy timber construction and faith in wood as a material of substance and strength. Equally skilled in stone masonry, Germans in Tinicum and other upper Bucks communities accepted timber superstructure bridges on quality, permanent stone supports. This is in contrast to English preferences in southeastern Pennsylvania for full stone, thus the frequency of stone arch bridges in landscapes to the south and southeast, or on major interstate routes. Local artisans John Niece and Barnet Hillpot likely joined with documented Barnet Snider and Christian Fretz in the construction of Burnt Mill Bridge, adding a true signature of cultural handiwork to the physical bridge. Local stone and wood artists continued to contribute during technology changes that brought wooden truss covered bridges by the third decade of the 19th century.

While seemingly of local or regional importance, it is these first permanent expressions of building art and engineering that established the nation's building traditions as well as provided the physical underpinnings of the creation and growth of the nation. Only one other stone supported multi-span timber-beam bridge (again with ca. 1935 concrete deck) known to exist in upper Bucks County is the nearby 200 foot Harpel's aka Creamery – Fretz Valley Road Bridge. This bridge shares regional, cultural, engineering and familial associations with Burnt Mill Bridge. To view period historic bridges side-by-side with the stone homes of these founding families (in this case the Fretz's, Christian & Abraham and the Harples) gives a rare and unique glimpse of the very basic foundation of our nation.

A national bridge assessment study "A Context for Common Historic Bridge Types" prepared in 2005 (Parsons Brinckerhoff and Engineering and Industrial Heritage, National Cooperative Highway Research Program &c), while well-written and very comprehensive on truss types, provides minimal information on the timber stringer with stone supports, generally focusing on timber bridges with timber pylon supports and 20th century picturesque park-type timber bridges (representative examples given are of the latter). It does acknowledge the commonality and frequency of the type, especially for short, single spans, and the duration of use into the 20th century. The report notes that timber bridges were among the earliest, as "stone bridges were expensive and time-consuming". It infers that these "bridges were all of a temporary nature". This misunderstanding comes perhaps from a lack of information about these very early bridges, due in part to their rarity today, as well as a lack of understanding of the

significance of the stone supports to verify the existence of a wooden structure and the local achievement to build a bridge. The report does qualify the limitations of its study and the need to gather more information on timber bridges.

The Burnt Mill Bridge, as the oldest documented bridge of its type in Pennsylvania, along with Harpel's Bridge demonstrate sophisticated design of the stone supports, application for county assisted funds to construct the stonework, and acceptance of a timber beam deck as a permanent bridge by the locally dominant German population. The study does state that "very old (pre-twentieth century) examples would possess significance as an early representative example of the type if they retain integrity. In the case of Burnt Mill, the stone substructure retains very good integrity from its original engineered design, and clearly demonstrates the span capability of the wooden beam, namely 25 feet. Even without the original timber beams, the number and spacing of the stone supports provides clear evidence of the design and span. Documentation drawings rendered by A. Oscar Martin in the early 20th century (collection @ Bucks County Historical Society) for a similar bridge, now destroyed, provide measured specifications for the wooden super structure, including the wooden beams, board deck, wood railing and wrought iron nails to attach the railing. These drawings "complete the picture" of the design of the wooden superstructure assuming similarities within the same county, geographic setting and cultural group. Thus Burnt Mill Bridge stands as a significant verification of a forgotten bridge type, and by age and size, may have provided a prototype for migrating cultural groups from Bucks County to repeat as settlement moved across North America.

NATIONAL: *Tinicum Township 20th century Writers' & Artists' Enclave, National Historic Landmark*

Bordering the Delaware River, Tinicum is characterized by a rugged natural beauty secured with historical roots extending back nearly 300 years and evidenced through the handiwork of substantial structures created by the founding families. Building on the framework of ancient roads and buildings of the early Scot-Irish and German families, the agriculturally poor township transitioned into an area of resort and respite by the late 19th century. The advent of the automobile encouraged writers and artists to settle among the hills and valleys to seek inspiration and quiet renewal, and in some cases to live the thrill of the pioneer lifestyle. With leading names such as S. J. Perelman, Nathaniel West, Dorothy Parker, John Wexley, Artie Shaw, Josephine Herbst and later James Michener, Tinicum became host to a unique blend of generational residents, serious artists and New York sophisticates. The resultant preserved landscape and historical resources is a demonstration of the economic symbiosis between cultures and universal appeal and respect for the natural and historic settings that Tinicum offers.

Headquarters Road is a principal avenue through the township to view and experience this district, and was the visual image that captured the desire of this nationally significant collection of artists to settle here. It retains many of the character defining features of this image, such as winding narrow roads and one-lane bridges.

Burnt Mill Bridge is a critical element of the ability of the township to convey this early 20th century image. It demonstrates both the heritage building traditions and natural stone materials that blended this resource to the landscape, as well as the modest yet effective upgrades in steel and concrete by recognized architect/ engineer A. Oscar Martin to carry modern motorized traffic. Burnt Mill Bridge joins with nearly ten other bridge upgrades (several recently destroyed) Martin executed during this era of renewed prosperity for the township and reinforces the complete physical picture of the 20th century phenomenon.

U. S. DEPARTMENT
OF TRANSPORTATION

**Federal Highway
Administration**

Pennsylvania Division

228 Walnut Street, Room 508
Harrisburg, PA 17101-1720

AUG 24 2015

RECEIVED
AUG 26 2015

In reply refer to:
HPD-PA

Bucks County, Pennsylvania
S.R. 1012, Section BRC
Headquarters Road Bridge over Tinicum Creek
Headquarters Road Bridge as a 4(f) Property

Maya K. van Rossum
Delaware Riverkeeper
Delaware Riverkeeper Network
925 Canal Street, Suite 3701
Bristol, Pennsylvania 19007

Dear Ms. van Rossum:

The Federal Highway Administration Pennsylvania Division (FHWA) is in receipt of your letter dated August 13, 2015 regarding the Delaware Riverkeeper Network's (DRN's) position that the Headquarters Road Bridge over Tinicum Creek is a Section 4(f) resource. Your letter also provides cited justification primarily relating to the DRN's opinion that the bridge is individually eligible for the National Register of Historic Places.

Your letter references 23 CFR 771.135(e) which states that historic resources (those on or eligible for the National Register of Historic Places) are subject to the requirements of Section 4(f). You are correct in this assertion. However, the regulation now codified at 23 CFR 774.11(e), is further addressed in the FHWA's *Section 4(f) Policy Paper* (July 2012), which states that…

> *Within a NR listed or eligible historic district, FHWA's longstanding policy is that Section 4(f) applies to those properties that are considered contributing to the eligibility of the historic district, as well as any individually eligible properties within the district.* (See Answer 2B)

The Headquarters Road Bridge over Tinicum Creek is a contributing resource to the Ridge Valley Rural Historic District. Accordingly, it is subject to the requirements of Section 4(f). The individual eligibility of the bridge would not influence how the FHWA or the Pennsylvania Department of Transportation (PennDOT) is complying with the related requirements.

Thank you for your continued interest in the Headquarters Road Bridge over Tinicum Creek project. Should you have any questions or need additional information, please contact me at (717) 221-3735 or Jonathan.Crum@dot.gov.

Sincerely,

Jon Crum
Environmental Protection Specialist

ec: Keith Highlands, P.E., PENNDOT
Ryan Whittington, E.I.T., PENNDOT 6-0
Bob Eppley, PENNDOT 6-0

Ed Rodgers
Delaware Riverkeeper Network
925 Canal Street, Suite 3701
Bristol, PA 19007

June 14, 2013

Dear Mr. Rodgers,

The following letter is written in response to your request to review the potential impact of replacing the Headquarters Road Bridge as well as the effects of rehabilitating the existing span, historically known as the Burnt Mill Bridge, in Tinicum Township, Bucks County, Pennsylvania. The Delaware Riverkeeper Network is a consulting party in the Section 106 process for PennDOT's proposal to replace the historic Headquarters Road Bridge and this correspondence is written in support of those efforts. As the researcher and preparer of the Ridge Valley Historic District nomination some twenty years ago my remarks and observations are offered here with the hope that a fair and reasonable outcome can be reached by all parties that maintains the historic integrity of this rare and significant historic resource, and that has no adverse impact on the Ridge Valley Historic District or the exceptional value of the Tinicum Creek.

In preparing this letter, a review was made of several documents that were provided. In 2006 the Army Corp of Engineers sought a determination of National Register Eligibility for the Bridge on Headquarters Road. Although the bridge was already listed as a contributing structure to a listed National Register Historic District, the State Historic Preservation Officer determined the bridge to be not eligible. This finding appears contrary to fact and no explanation is given as to how the SHPO could determine a National Register listed historic resource not eligible. However, the determination of eligibility also went to the Secretary of Interior who indeed determined the bridge eligible under criterion A for architecture and criterion C for agriculture. It is my opinion that the determination of eligibility should be sent back to the State Historic Preservation Officer with a letter outlining the importance of this bridge to review again, with the hope that reconsideration might yield a supportive determination.

In a document written to call for support in preserving the bridge, the rarity of the pier-to-pier design of the Headquarters Road Bridge was made clear. Based on an examination of PennDOT's statewide bridge survey in 2003, there were only eight working bridges in Pennsylvania built before 1812. All were of the more common stone arch construction design. Based upon this data, the Headquarters Road Bridge is the oldest surviving pier-to-pier bridge left in Pennsylvania. This bridge was modernized in 1919 during the early automobile era with a new concrete deck with railings, designed by noted engineer and architect Oscar Martin, replacing the earlier wooden deck that once spanned the piers. While this was an open bridge and not a covered bridge, the design of the surviving 1812 abutments and piers mirrors the designs used on covered bridges particularly the numerous Delaware River crossings between Pennsylvania and New Jersey. In 1992 when the Ridge Valley district was first placed on the National Register it was not known that this bridge was of such an early date. If those facts were known, more significance would have been given to the bridge in the nomination.

The Headquarters Road Bridge is the point of convergence for one major portion of the district. The bridge ties together four roadways that follow creeks and drop down in elevation to a relatively flat plain where Christian Fretz built his grist mill in the eighteenth century. A bird's eye view of the road pattern converging at the bridge looks like two back to back parentheses)(. Two of the legs are Headquarters Road, one is Red Hill Road, and the fourth is Sheep Hole Road, which is the most significant roadway in the district because of its dirt surface. Approaching the bridge from any of these roads is dramatic. The loud sounds of water flowing down the Tinicum Creek and its tributaries, combined with a sense of dropping down to the lower elevation of the bridge and mill site, creates a sense of place, a feeling of arrival, and with the convergence of four roadways the bridge, in its current alignment and one lane configuration, provides the visitor with a bridge experience little changed in over 200 years.

Removing the Headquarters Road Bridge and building a modern two lane bridge would cause significant damage to the historic integrity of this portion of the Ridge Valley Historic District. One of the key themes of the Ridge Valley Historic District was the interplay of man-made roadways and natural waterways. The district is mostly a series of narrow, twisting, rising and falling roads following creeks. There were six bridges and two fords in the district. The Headquarters Road Bridge is the oldest in the district as all nearly all the other bridges were built in the auto era to replace fords. In terms of significance, the Headquarters Road Bridge is the most significant in the district due to its age, design, and rarity. The ninety degree turns onto Sheep Hole Road and Headquarters Road on the one side of the bridge would likely lead to a change in bridge alignment that could impact the archeological remains of Fretz's Mill. Changes in bridge alignment would also ruin the relationship of the bridge to the mill site and the road network that has remained intact for over two centuries. The intrusion of a modern two lane replacement bridge would significantly diminish the integrity and the feeling of the Fretz Mill portion of the Ridge Valley Historic District. The existence of this bridge in a listed historic district provides good cause to sensitively renew this span with a new deck as detailed in the engineering report submitted in 2011 by McMullan & Associates.

The Headquarters Road Bridge brought farmers to Fretz's mill from four directions and the house and bridge are sited in view of each other. As a miller, Christian Fretz was a significant man in the local farming community and he accrued some wealth as seen in the Georgian architecture of his fine home. Fretz's standing in the community and his status are apparent in the way that his stone house, the bridge, and the mill site serve as a central axis to the roads that converge at this rural agricultural industrial site. Christian Fretz's stone farmhouse stands at the junction of Headquarters and Red Hill Road which combine briefly in a straight approach to the bridge and then split after the bridge with ninety degree turns onto Sheep Hole and Headquarters Road.

The bridge plays a critical role in defining the central axis of this part of the historic district and the bridge alignment, use of red shale for abutments and piers, and one lane scale tie the bridge into the landscape and are in sync with the winding, narrow, and scenic roadways that meet at the bridge. Perhaps the most interesting travel leg in this area is the approach made on Sheep Hole Road, a narrow dirt road barely two lanes wide that follows the Tinicum Creek to the bridge. Traveling down this road along the creek under a dense tree canopy and at the end glimpsing the red shale lozenge shaped bridge piers that date back to 1812 is truly a journey that

engenders a sense of traveling back in time into the nineteenth century. Such remnant surviving road landscapes in Pennsylvania are extremely rare, and to imagine the change that would come from finding a realigned modern concrete span at the end of the dirt Sheep Hole Road seems an avoidable tragedy in the management of the Commonwealth's historic resources and National Register listed rural landscapes.

The Tinicum Creek is a federally listed Wild and Scenic River and a state listed Exceptional Value watershed. To my knowledge, no written discussion has occurred about the potential impact of a bridge replacement and/or realignment on the exceptional value of the Tinicum Creek. The Wild and Scenic Rivers Act (WSRA) requires the National Park Service to evaluate whether a "water resources project," which includes bridge replacement projects, will have an adverse effect on a wild and scenic river or tributary. The requirement is found at 16 U.S.C. section 1278(a) and is referred to section 7 of the WSRA. In addition, The WSRA contains several provisions designed to protect designated rivers and their environments. Foremost among these is Section 7 which provides that "no department or agency of the United States shall assist by loan, grant, license, or otherwise in the construction of any water resources project that would have a direct and adverse effect on the values for which such river was established, as determined by the Secretary charged with its administration." When a water resources project, which includes bridge construction projects, is found to have a "direct and adverse effect" on a wild and scenic river, the project cannot be authorized or funded absent congressional intervention. The most significant historic resource associated with the Tinicum Creek is the Headquarters Road Bridge.

I would argue the this district is nationally significant for it encapsulates the rise of upper Bucks County from a farming region with distinctive English and Quaker vernacular architecture into a region colonized by artists and celebrities in the 1930s. The Ridge Valley district featured sculptor Charles Rudy and screenwriter John Wexley. Tinicum Township was also home to actress Miriam Hopkins, song writer Jerome Kern, humorist Dorothy Parker, playwright S.J. Pearlman, and writer James Michener. All were attracted to the rustic rural landscapes of this region. Beyond Tinicum there were artists colonies in Solebury Township at Philips Mill and the small town of New Hope became an artistic sanctuary of international renown. Wexley and Rudy lived on Sheephole Road near the Headquarters Bridge and along the Tinicum Creek. In an interview with Charles Rudy's widow the rural beauty and simple living at a modest price was the main impetus for buying their farm and moving out of New York City. Lorraine Rudy spoke about how the rural countryside of the Ridge Valley Historic District allowed a lifestyle that informed and made possible her husband's creative endeavors.

Bucks County has a national reputation as a sanctuary for artists and the Ridge Valley Historic District is the single best example of a surviving remnant landscape that continues to look and feel like the Bucks County landscape of nearly one hundred years ago that attracted creative people to settle on the back roads of a rural area rich in stone vernacular architecture and a landscape of fields and forests and streams and roadways. The Headquarters Road bridge with its associated roadways and the motorist experience that can still be had traveling through that portion of the Historic District still retains the integrity needed to reveal the power of place that much more of Bucks County was once known for. Take out that one lane bridge that has stood since 1812 and the historic associations of water and roadways would be irreparably damaged.

The Geigel Hill Road Bridge, which also resides within the Ridge Valley Historic District, witnessed many years of effort to achieve a replacement design that all parties could accept. The character defining pony trusses were preserved and integrated into a new one lane design and red shale was integrated into the abutments. The character defining features of the Headquarters Bridge are the abutments and lozenge shaped piers as well as the alignment. Maintaining those features, keeping the bridge one lane and replacing the deck would result in a new bridge that continues to contribute to the historic district. Keeping the alignment and maintaining the scale of the existing bridge would surely have less impact on the wild and scenic Tinicum Creek than a realigned larger two lane span would have.

Thanks for the opportunity to provide this information to you and it is my hope that a sympathetic outcome results from the Section 106 process. Please contact me if there is anything more I am able to do to help in this matter.

Sincerely,

Robert W. Reynolds

Robert W. Reynolds

Maya Rossum
Delaware Riverkeeper Network
925 Canal Street, Suite 3701
Bristol, PA 19007

December 15, 2016

Dear Maya-

After reviewing the Section 106 Mitigation and Minimization report sent to the Headquarters Road Bridge consulting parties I offer the following analysis and discussion.

The Pennsylvania Department of Transportation offers to preserve two aspects of the original National Register listed oldest pier-to-pier bridge in the commonwealth. The 1919 dedication plaque from the early auto era concrete deck will be salvaged from the historic bridge and affixed in some manner to be determined later to the new bridge. Some of the stone from the intact piers of the eighth oldest span in Pennsylvania will survive in a decorative veneer to a new modern span, covering the concrete abutments, wingwalls, and approach roadway barriers. To ensure consulting party support for the manner in which the salvaged stone is laid out and pointed, a masonry sample panel will be reviewed by a nine member Design Advisory Committee (DAC). The committee will also be given the authority to review the design for a replacement bridge.

The Design Advisory Committee will play a minor role in influencing the final bridge design. The DAC will be able to look at the masonry sample panel and comment on how the stone on the sample panel compares historically to the original bridge, although that bridge will be demolished at the time this determination is made. They can make suggestions about the orientation and layout of the stone. Care will be taken to follow the vernacular tradition of the historic bridge stonework where larger cut stones are found at the bottom, with rubble courses of smaller stones further up as the masonry wall rises. At the 30% and 90% phases the DAC will be able to participate in reviewing the project plans and specifications and provide feedback on aesthetic elements. However, the DAC will serve only an advisory role, as PennDot remains the final arbiter agreeing to incorporate DAC recommendations "as practicable."

If a new bridge rises from the banks of the Tinicum Creek the PennDot offered compromises will fail to meaningfully replace the value of the current Headquarters Road Bridge. Stone veneering and a plaque lacking any meaningful context combined with limited input that may or may not affect any minor aesthetic decisions is woefully inadequate a trade for the extant historic creek crossing. What will the public learn about the oldest pier-to-pier bridge extant in Pennsylvania if the replacement span is built under this mitigation plan: the answer is nothing.

The mitigation and minimization report irreparably compromises the Ridge Valley Rural Historic District and fails to resolve the adverse effect. The Headquarters Road Bridge has both historic and engineering significance as verified by the Keeper of the National Register. Efforts by PennDot to demean the significance of the bridge by claiming it is not individually eligible for the National Register are not true. The engineering significance would allow for a case to be

made for individual eligibility, but that will never happen as the bridge is already listed on the National Register as a contributing structure in a listed Historic District. In 2006 Patrick Andrus, Historian of the National Register of Historic Places wrote a summary of this bridge's significance in support of the Secretary of Interior's finding that the bridge was listed on the National Register of Historic Places that read, "the bridge is historically significant in the context of the development of the township, regional transportation, and the operation of local mills, and is of engineering significance both for its early 19th century construction and its sensitive modernization in 1919." PennDot has yet to acknowledge the engineering significance for the pier to pier superstructure or the early reinforced concrete auto-era deck, and that failure echoes through their unacceptable mitigation plan. How do stone veneering and a relocated plaque compensate the public for the loss of one of the oldest extant bridges in America that the Secretary of the Interior confirms has both historical and engineering significance? It does not.

The use of stones from the 1812 bridge piers is a token nod to a historic span. The new bridge supports and abutments have not been specified to echo the shapes and massing of the original bridge. The stone will not be structural, so the authenticity of the stone work as a structural material will be reduced to a façade decoration attempting to hide the inappropriate new materials that make up the Alternative 6 bridge. While the use of a skilled mason to adhere these stones to the modern concrete is called for, perhaps someone more familiar with brick face and stucco work will be better suited to accomplish the veneer work. A real traditional mason builds stone walls that are load bearing, not decorative.

The plaque from 1919 seems like an artifact that could be easily saved, but how will it be utilized? Simply placing it on the new bridge is a false representation of history as the 1919 concrete deck would be in a landfill somewhere. The use of the plaque only make sense if a more complete narrative of the history of the Headquarters Road bridge was presented alongside the plaque. The mitigation and minimization plan fails to place the plaque in a proper context and utilizes the salvaged stone non-structurally in a manner that mimics older bridges ineffectively. The 1812 superstructure that has engineering and historic significance disappears from public understanding in this mitigation proposal.

The mitigation proposal fails to chart a path that will protect the Ridge Valley Historic District from being undermined by similar controversial and unwanted modern spans in the future. In fact, the mitigation plan is a template for the destruction of all creek crossings in the Ridge Valley Historic District. The realization of this mitigation plan is a threat to every historic creek crossing and the entire viability of the long term preservation of the historic district. Acceptance of this mitigation plan results in the fords, iron truss and concrete spans remaining in the Ridge Valley Historic District to become equally threatened with modernization that will ruin and destroy the Ridge Valley Historic District, creek crossing by creek crossing. The Headquarters Road fight will occur over and over and over again, crossing by crossing, with one crossing replacement after another. If the mitigation for the Headquarters Road Bridge becomes fact, then what we have here is a death sentence for the Ridge Valley Historic District.

Should PennDot continue to move forward over the next fifty or more years replacing every single historic crossing with an inappropriate modern bridge in the Ridge Valley Historic District, the entire district will lose all integrity and no long hold together as a cohesive place. The majority of the consulting parties realize this and thus they will continue to challenge and

fight the replacement of the Headquarters Road Bridge. The mitigation plan creates a tipping point after which the remaining Ridge Valley creek crossings will all be threatened and the district will be incrementally compromised and ruined. The mitigation plan fails in that its accomplishment creates a template that ensures the destruction of all historic creek crossings in the Ridge Valley Historic District, as well as all other bridges in the other township historic districts.

The Headquarters Road bridge project has gained significant community involvement and generated strong opposition partly because the fate of all historic bridges in Tinicum Township located in historic districts will be determined by the outcome. If this mitigation plan is acted upon there will be a time in the future when the Ridge Valley Historic District will no longer have any historic bridges. With the bridges gone, the district will no longer convey the interplay of roads and creek crossings that are the single most significant element binding together the listed historic resources. The mitigation plan yields an outcome that will destroy the integrity of the entire Ridge Valley Historic District over time as future bridge replacement projects in the district follow this rationale for removing contributing structures and replacing them with non-contributing modern bridges.

A great disparity exists between the solutions PennDot has endorsed and the wishes of the various consulting parties. While a small minority of participants in the Section 106 process do indeed desire a new bridge now at any cost, the vast majority are not accepting or endorsing this mitigation process, although that is not acknowledged in the mitigation report. Instead, to deal with this opposition PennDot dismisses most of the opposition's positions as a part of the mitigation. For example, the vast majority of respondents voted as a priority with their green stickers to rehabilitate the 1812 bridge (29) or to build a temporary bridge to buy more time in pursuing the rehabilitation of the old bridge (16). Out of 25 ideas listed in tables 2-6, nearly half the respondents gave their green stickers to the ideas of preserving the old bridge where it now stands. Of course this was not discussed in the mitigation letter. Instead the position of repairing the historic bridge was dismissed as the mitigation report is based on Alternative 6, a solution that remains unacceptable to the advocates of maintaining the integrity of the Ridge Valley Historic District. Substantial controversy continues about the environmental and historic impact of the plan to replace the Headquarters Road Bridge.

If the Ridge Valley Rural Historic District was nominated to the National Register after the creation of the proposed new bridge, the portion of the district in that viewshed would not likely be eligible. The mitigation and minimization plan fails to mention the trees that will be removed, the changes made in the location of a new wider span, or the accommodations made at the intersection with Sheep Hole Road. Bank hardening for 300' downstream of the bridge on the west bank is part of the proposal and yet is not mentioned in the mitigation and minimization report. The bank hardening is intended to force the creek back into its historic path but it will be under constant assault in all flows if the replacement bridge gets built. How long before the creek simply rips across the adjoining fields decimating historic elements and the field itself?

Any requirement for archeology is dismissed with the argument that the flood plain is "too young" to have experienced any Native American cultural impact, however evidence for this dismissal is lacking. No evidence has been presented that established any disturbances to the area in view of the bridge so how can the flood plain be too young to yield historic or prehistoric

artifacts? There may well be archeology that would shed light on the area's settlement in the eighteenth century that will be destroyed. The mill race, mill site, and the remains of a dwelling have been identified as potential archeological sites but the mitigation utilizes an impact boundary that excludes these areas that might have been studied and incorporated into a more creative mitigation approach. Yet the new bridge size and alignment may well change the course of the Tinicum Creek and threaten this historic archeology.

Other recent PennDot projects in Tinicum have had severe unforeseen consequences with creeks undermining roads and eroding stream bank. The mill elements and the fields adjacent to the current bridge warrant an archeological study as part of any mitigation agreement. The mill race came off at the north edge of the field on the north side of Headquarters Road and the tail race returned to the stream below the south field, the location of both remains obvious. The mill must have been between them and probably on the slope, just out of the flood plain. The area of potential effect (APE) of the project must be expanded to allow for the study of the already identified historic archeology that may well be threatened by unforeseen creek flow changes brought on by a modern bridge replacement. The mitigation plan fails to protect or study these historic archeological resources despite the fact that other recent PennDot bridge replacement projects in Tinicum have had effect far beyond the bridge right-of-way, the APE chosen for the Headquarters Road Bridge.

Despite the consulting party's preference of maintaining the one lane width in the original alignment across the Tinicum Creek, Alternative 6 calls for a two lane wide bridge constructed as narrowly as possible within the same approximate, but clearly not the same, footprint as the existing bridge. This intentionally opaque design standard, alters the actual orientation of the new bridge compared to the existing historic bridge, and fails to address the impacts of adding a new superstructure and removing the 200 year old superstructure from the Tinicum Creek may have on the flow of the waters.

Careful examination of the Tinicum Creek and the precise current orientation of the bridge indicate that it is highly plausible that when the Headquarters Bridge was constructed in 1812 the skewed placement was intentional and with purpose in how it helped maintain the flow of the waters of the creek. The west bridge abutment is built far tougher than any other part of the bridge. That abutment has always been taking the brunt of the flow from the creek. The adjacent topography features tall stone cliffs and at the location of the west abutment the cliffs turn away from the stream. The bridge was designed to preserve the existing creek location and eliminate any possibility of the creek migrating west into the floodplain, and that's exactly what it has done. That western abutment is massive and the huge buttress is there to help maintain the creek course that existed when the bridge was constructed. The creek is being blocked by the abutment on purpose - it is defining the landscape. Building the 1812 bridge askew, instead of centering it on the stream as called for in Alternative 6, deflected the stream east along its present course. This alignment offered protection to the miller's floodplain fields and mill race.

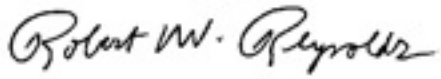
It would have been in the interest of the miller that arranged for the 1812 bridge to want the bridge located askew to the creek in order to channel the water flow away from his mill allowing the mill race to function at a better efficiency, and to keep the creek from cutting a channel through the fields that flood between the mill and the creek, thus preserving a portion of his landholding. Utilizing the west bridge abutment of the bridge to absorb the velocity of flood

waters, maximizes the size and capacity of the floodplain and minimizes the velocity of floodwaters as they cross it, which is good for better protecting the soil and crops. From this analysis it becomes clear the siting of the 1812 bridge was quite intentional and was purposefully constructed yielding a bridge to creek relationship that is a key part of the significance of the Ridge Valley Historic District and part of the engineering significance. The mitigation plan fails to maintain this precise alignment of the bridge to the creek, erasing another crucial aspect of this portion of the agricultural and industrial landscape of the Ridge Valley Historic District. The mitigation plan fails to address the full impact of the new bridge on the original location of the 1812 bridge.

The clearest message radiating from the mitigation and minimization proposal is that the majority of the consulting parties want the 1812 bridge rehabilitated and preserved, and PennDot refuses to act on this alternative. Despite Herculean efforts to counter the engineering, safety, historical, and environmental concerns raised in the Section 106 process, no real compromises have occurred and the presented arguments to rehabilitate the old bridge are not included in the various reports leading up to this mitigation proposal. The result of the proposed mitigation is a complete failure. The 1812 bridge superstructure will be destroyed and no one experiencing the new bridge will ever understand the significance or enjoy the aesthetics of crossing the old span. The Ridge Valley Historic District will be driven to destruction as the mitigation plan becomes the template utilized incrementally to replace all the creek crossings in the Ridge Valley Historic District over the next decades.

There is something wrong with this process. The community will not be getting "final structure plans and specifications [that] reflect the vision of the community" as promised in the mitigation proposal, rather the community vision of rehabilitating the 1812 superstructure with a new one lane deck has been consistently avoided. While PennDot has dutifully gone through a process, they have failed to rise to the spirit of compromise intended in these hearings and reviews in any meaningful way. There appears to be no check on PennDot's power and authority to not preserve bridges in National Register Historic Districts in Pennsylvania. This mitigation and minimization proposal is insulting and a complete failure to all consulting parties that have spent many years working diligently to maintain the 1812 Headquarters Road Bridge superstructure for future generations.

Respectfully submitted,



Robert W. Reynolds
Architectural Historian
Associate Professor of History, Kutztown University

The Bridges of Tinicum Township

Delaware Riverkeeper Network
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215-369-1188 | drn@delawareriverkeeper.org
www.delawareriverkeeper.org

About the Delaware Riverkeeper Network

The Delaware Riverkeeper Network champions the rights of our communities to a Delaware River and tributary streams that are free-flowing, clean, healthy and abundant with a diversity of life.

The Delaware Riverkeeper Network gives voice, strength and protection to the communities and waterways of the Delaware River. Through independent advocacy, and the use of accurate facts, science and law, DRN works to ensure the rich and healthy future that can only exist with a clean, healthy and free flowing river system.

The Delaware Riverkeeper Network is unique in that it is founded upon the expectation of personal and community responsibility for river protection, as personified by the Delaware Riverkeeper. DRN is the only grassroots advocacy organization that operates watershed-wide and empowers communities with the engaged interaction and information needed to succeed in protecting our River and region now and into the future.

About the Author: Robert W. Reynolds

The principal focus for Robert Reynolds is the documentation and preservation of cultural and historical places and landscapes. The experiences of visits to family in rural Vermont, college alongside the Gettysburg Battlefield, growing up during the summer at a lake resort in a region once known as the Jersey Adirondacks, and setting up homes first in Bucks then in Berks Counties, all occurred in landscapes of historic significance that inspired inquiry, study, photography, and preservation efforts.

Rob lived twice along the watershed of the Tohickon. After joining the Heritage Conservancy in 1989 he and his wife rented a portion of an eighteenth century tavern in Keelersville along Lake Nockamixon. Two years later they bought an 1891 Victorian home in Quakertown. Behind the house ran a tributary that led to the Tohickon and occasionally flooded the alley two feet deep with water up into the back yard. While living in Quakertown Rob led the effort to save the train station and photographed 27,000 historic buildings in Bucks County, including all of Tinicum. While earning a doctorate at Lehigh, he helped grow and establish the Historic Preservation Certificate Program at Bucks County Community College.

At Kutztown University Rob specializes in Pennsylvania History and teaches courses on Local History, Pennsylvania Dutch Culture, and Environmental History. As the Residential Curator for the David Hottenstein Mansion, owned by the Preservation Trust of Berks County, he maintains and preserves a 1783 Georgian house, which some scholars consider the finest Pennsylvania German farmhouse of its era. The woodwork from the master chamber was relocated to the Winterthur Museum in the early 1950s and today serves as the Fractur Room. Periodically, Rob, his wife Jennette, and daughter Reanna live along the east shore of Beaver Lake, New Jersey in a 1909 bungalow still retaining original furnishings and a view that inspires the drive to preserve cultural and historic landscapes that retain uncompromising integrity.

The Bridges of Tinicum Township

Tinicum Township is the home to a unique, complete, and irreplaceable collection of historic bridges. This collection includes a variety of designs on the brink of being destroyed.

The bridges of Tinicum Township may well be the most significant collection of bridges in a single municipality in the State of Pennsylvania. Much of the Tinicum terrain tilts toward the Delaware River serving as a drainage with over three percent of the township made up of flowing water. The interplay of roadways and streams, the Delaware River, large and small bridges, fords and the canal, forest and farmland speckled with farmsteads, and neatly packed villages all retaining remarkable integrity, continue to evoke past eras in the development of the Delaware Valley, which are both locally and nationally significant. The Bridges of Tinicum, as a collection, call to mind a range of historical themes as artifacts of other eras and as contributors to assemblages of significant vernacular architecture and scenic landscapes, that are emblematic of the historical development of the Delaware Valley including settlement by the Scotch–Irish, English, and Pennsylvania Dutch, the development of transportation routes by road and canal to exploit natural resources, deliver the bounty of a productive agricultural area to market, and bring in the finished goods made elsewhere needed as the area prospered. As the age of wood gave way to the age of iron after the Civil War the bridges change from wood to iron, first wrought and then steel, with concrete becoming a new early twentieth century bridge material that now dominates all new bridge projects.

The purpose of this report is to argue for a comprehensive management plan for the Bridges of Tinicum Township that details a strategy for historic bridges with improved maintenance and preservation. The following discussion will place a selection of important bridges into a broader historic context, discuss the excellent bridge preservation efforts already accomplished in Tinicum by the State, note the immediate Tinicum bridge crisis, and advance understanding about why the preservation and attention to historic bridges in Tinicum should become even more commonplace and collaborative.

Bridge Types and their Historic Context in Tinicum Township

Tinicum Township encompasses 17,177 acres in upper Bucks County. The lands offer rolling hills, flats along the Delaware River, and a distinctive ledge rising 75–150 feet above the river paralleling a portion of the Delaware. The Tohickon, Tinicum, and Mill Creeks and their tributaries drain through the area. William Penn knew of the Tohickon area as an Indian Township with rich lands much cleared by the Indians. The lands that would become Tinicum Township in 1738 featured two large tracts combined with other lands. The Pennsylvania Land Company of London bought a 7,500 acre portion of the Manor of the Highlands in 1699 featuring five miles of Delaware River shoreline. The Streeper Tract of 4,448 acres was first surveyed in 1703, but when Johaness Streeper died an alien, having not been naturalized, his heirs could not sell the land. James Logan accepted the surrender of the Streeper Tract in exchange for a like quantity of land near the Durham Iron works allowing the Streeper Tract to be used to supply wood and timber for the furnace. In 1738, the same year Tinicum is organized as a township, the old Streeper Tract lots began to be surveyed to sell to settlers.

The Tohickon Creek attracted the earliest settlers into what would become Tinicum Township. The Creek name is said to mean the stream we cross on driftwood. The Delaware King Teedyuscung stated that the Tohickon was meant to be the northern limit of the white man's country, and that the land to the north of it had been taken from them fraudulently. That deceit was the 1737 Walking Purchase that is considered one of the most notorious land frauds committed in the colonial era. Based on a circumspect deed the Penn heirs laid claim to the greater Lehigh Valley dispossessing several native communities living in the Lehigh and Delaware valleys. Tinicum continued to be the home of a remnant of the Delaware Tribe of Indians for upwards of twenty-five years after it was surveyed, but those natives who stayed usually lost their property and were forced either to settle on poor land or to endure a meager existence working for colonists as farm laborers or servants.

The year following the infamous walking purchase led to the organization of Tinicum Township, but people were already living in the Tohickon Valley. The Scotch–Irish, Lowland Scots that emigrated to Ulster, Ireland in the seventeenth century, faced economic, political, and religious persecution leading them to decide in large clusters to move on to Pennsylvania with a group entering the Tohickon area through the nearby Deep Run settlement in Bedminster Township in the first quarter of the eighteenth century. Other early settlers were English immigrants. German speaking settlers came later with German names rare in the early to mid-eighteenth century public documents.

The first major road project was in 1741 when the road was laid out from the mouth of Tinicum creek, near Erwinna, then known as "London's ferry," to the mouth of Indian cabin run, where it crosses the Tohickon and meets the Durham road, near Hinkletown, in Plumstead Township. This road likely linked the Tinicum Scots–Irish to the Scotch–Irish settlement in the Deep Run. The Tinicum Scotch–Irish settlement was part of a larger cluster of nearby Bucks County settlements that started about 1720 and was particularly strong from 1730–1740 with lands taken up in Tinicum, Bedminster and in Deep Run, Plumstead, and New Britain Townships.

The road to Durham was opened through Tinicum in 1745. About 1750 the inhabitants of Tinicum built, by subscription, a wooden bridge over Indian creek, near its mouth at the river. In 1768 the inhabitants of Tinicum, Nockamixon, Bedminster and Plumstead asked permission of the court to build a stone bridge at their own expense, in place of the wooden one, but it was not granted. This location may be in the vicinity of a 1922 concrete arch bridge on River Road in Point Pleasant. This structure is also known as the Burnt Mill Bridge or the Sheep Hole bridge. The first name was adopted because of a fire that occurred at a mill on a property adjacent to the bridge. The second name refers to a local roadway that intersects with Headquarters Road at the bridge.

A few miles south of the village of Red Hill (Ottsville) travelers crossed the Tohickon Creek at John Orr's Ford. In 1763 residents petitioned for a bridge, raising as much of the funds as they were able with the remainder funded by the County Commissioners. The bridge over the Tohickon, on the Durham road, was built in 1765, at an expense of £283, of which the inhabitants contributed £101 and the balance was taken from the public funds. A large multiple stone arch bridge stood at this location until the mid-twentieth century when the road was widened and the old stone arch bridge replaced by the state. This was the largest stone arch bridge built in Tinicum Township and it has been gone for sixty years. The stone arch bridge as a bridge type, was used for major stream crossings in the 18th century on the most significant major roads often with multiple arches depending upon length, but was also found with frequency in smaller single arch designs on more local roads over smaller stream crossings.

Later eighteenth century roadways include a road laid out from Erwinna to John Wilson's tavern in 1767, about half-way to the Brick church, and in 1774, one from Abraham Johnson's blacksmith shop, on the Durham road, to the Presbyterian burying-ground. In 1786 the River road was extended up the river from Kugler's mill, below Lumberville, to the mouth of Durham creek, where it met the road already laid out from Erwinna down to that crossing. The road from Erwin's mills to the Durham road was opened in 1790. Whenever possible, the perimeter boundaries of the patents and grants became the location of local connecting roads. In this manner, the private properties would be minimally impacted.

Very few bridges existed as Tinicum Township initially attracted frontier settlers. Fords and ferries offered passage through and over waterways providing the most primitive form of creek or river crossings. Today, two fords can still be taken to cross onto Delaware River islands, and three creek fords, located on interior dirt roads retaining a narrow width, serve as clear surviving segments of the eighteenth century roads of the area that would have been known by the pioneer Scotch–Irish and English settlers. In several locations where fords were replaced by bridges, the earlier ford remains intact and the worn cartways that led in and out of the ford remain to be seen although long abandoned. Tinicum Township featured two Delaware River ferry crossings at the London or Erwin Ferry and in Point Pleasant, known earlier as Lower Black Eddy. The former ferry was replaced by a covered bridge and now features a 1930s iron truss bridge.

As settlers shifted from the first phase of initial settlement and survival to a focus on market agriculture, demand for more secure roads and stream crossings increased. Bridges of the eighteenth and early nineteenth century were often wooden beam bridges built on large masonry piers with stone abutments. These bridges were far less expensive than stone arch bridges, but the deck timbers had to be periodically replaced as they rotted. During the auto era, the wooden decks were phased out and replaced by I-beams and concrete decks, but the superstructure of masonry piers and abutments continued in place from the original bridges. Only two bridges remain in Bucks County with the original stone pier substructure for multi-span wooden beam design, both located in Tinicum Township dating 1812 and 1835. Based on an examination of PennDot's statewide bridge survey in 2003, there were only eight working bridges in Pennsylvania built before 1812. All were of the more common stone arch construction design. Based upon this data, the Headquarters Road Bridge is the oldest surviving pier-to-pier bridge left in Pennsylvania. This structure is also known as the Burnt Mill Bridge because of a fire that occurred at a mill on an adjacent property.

Three covered bridges offer travelers a momentary glimpse of the wooden lattice truss that hold up the roadway above the water of creeks and the canal, and that are wrapped in the wooden covering of siding and roofing that give these early American engineering innovations their name. These covered bridges have Town Trusses designed to be built quickly, out of readily available materials with local, relatively unskilled workers. A fourth wooden truss bridge with the trusses covered in siding, but not encased with walls and a roof, stands in Ralph Stover Park. The truss type of this unique bridge is unknown due to the siding covering the wooden trusses. It is not hard to imagine some of the German speaking residents helping to build these wooden truss bridges as they took up the rolling farmland up above the Delaware after migrating into Bucks County from the northwest by traveling up the Schuylkill from Philadelphia to the Perkiomen Creek watershed along branches like the Unami into Bucks County to the Tohickon watershed, overtaking and buying out many of the earlier arriving Scotch–Irish.

Ithiel Town's truss was patented on January 28, 1820. His wooden truss bridge, also known as Town's Lattice Truss, was inspired by the wooden arch truss patent design of Theodore Burr. Town's innovative lattice design provided a new more efficient method of load distribution, which could be achieved with lighter-weight planks of pine or spruce connected with wooden pins. The resulting structure was much lighter and considerably less expensive to build than a Burr arch truss bridge. The light, almost insubstantial, appearance of Town's bridges prompted comparisons to the common trellis found in every flower garden. The lattice truss bridge became so widely used across the eastern states in the 19th century that Town, who received royalties of $1 to $2 dollars per foot for use of his patented design, became a wealthy man. Ithiel Town's lattice truss became common across Bucks County.

While Durham boats carried iron down the Delaware River in the spring when the water ran fast and high, it was the Delaware Division of the Pennsylvania Canal that provided a means to overcome the navigation challenges of the Delaware. In Tinicum Township one can walk the canal towpath for several miles following the trail formed by mules over 180 years ago. In several locations camel back bridges convey vehicles over the canal as they have since 1832.

The canal linked the main Bucks County port at Bristol to Easton where a canal along the Lehigh River provided connection to the rich anthracite coal areas further north in Pennsylvania. The canal in Tinicum Township was operating in 1832 offering a means to move bulk items such as lime and coal, but many new manufactured items could now be cheaply transported distances such as cast iron stoves. Michael Uhler saw the opportunities brought by the canal and set up a series of businesses including a canal boat yard, lime kilns, a hay press, a general store, and a furniture factory as well as worker housing, a hotel, and a mansion overlooking this village all along the canal inland from the Frenchtown-Erwinna Ferry crossing.

A number of the road bridges crossing the canal were replaced in 1932 with through girder or box beam bridges and decorative wood truss side rails. The camelback open wooden truss bridges with wrought iron tie bar components were designed for crossings of the Delaware Division of the Pennsylvania Canal. The design evolved to solve the height requirements needed to allow the mules and bargemen to pass underneath along the towpath with proper head clearance. Commercial canal operations ceased in 1931, when the Lehigh Navigation Company sold the land to the Commonwealth of Pennsylvania to become Roosevelt State Park. A National Historic Landmark, the 60-mile canal that passes through Tinicum Township is among the last fully watered tow-path canals remaining in the United States.

After the Civil War cast iron bridges signaled America's technological shift from the age of wood to the age of iron. During the early twentieth century iron bridges and concrete bridges vied for dominance with concrete wining out. There may be as few as twenty-six metal truss bridges remaining in Bucks County, with at least seven of those closed or out of service. As the rural economy diversified with small scale cigar making, clothing factories, creameries, and shipment of milk, eggs, and vegetables to markets the iron bridges eliminated more fords and minimized wooden deck maintenance on the older wooden beam deck bridges experiencing greater daily traffic as the resident population of Tinicum continued to grow through the 1870s.

The principal time frame for metal truss bridges, particularly those built by medium-sized iron and steel bridge manufacturers from Pennsylvania and Ohio was from the era 1876–1900. The earlier iron bridges, might be through or pony trusses, and were constructed utilizing light-sized components, and generally assembled with pin connections. A second wave of metal trusses occurred during the New Deal of the Great Depression in the 1930s. These pony trusses utilize much beefier steel components, connected with welded plates. During the depression John Wexley, a Hollywood screen writer, directed the application and construction with local residents of two circa 1935 iron truss bridges that still stand in the Ridge Valley Historic District on Sheep Hole Road.

Tinicum Township features a grouping of early twentieth century bridges designed by Bucks County Engineer A. Oscar Martin. Martin designed or improved over 100 bridges in Bucks County through circa 1923. His work is important to the Tinicum collection for he improved older bridges by adding decks using concrete and steel while still preserving and maintaining the superstructure and abutments that were historic. Martin's imprint on the bridge collection of Tinicum is significant and impressive.

Trained as both an architect and engineer at Drexel Institute, A. Oscar Martin offered cost effective modern rehabilitations of existing bridges using new materials, and he created new designs that often utilized the colonial era arch shape only with concrete instead of coursed stone as the construction material. The cement industry was pioneered in the vicinity of Tinicum at locations in Lehigh and Northampton Counties, making the new concrete easily available for Martin's bridge designs. On primary roads and with long spans Martin offered innovative and agile open and closed spandrel arch designs. For short spans he worked with a variety of reinforced concrete deck solutions, many utilizing encased I-beams to replace former wooden beams and retaining the existing stone substructure, or in some new designs, entirely reinforced abutments, deck or reinforced beams. He is also credited with several plate-girder designs over the Delaware Division of the Pennsylvania Canal, a strategy developed to resolve approach heights as well as the under-clearance headroom for passing bargemen. His bridge projects were simple, direct, practical and easily affordable by the county, and transformed the vocabulary of county bridges to the new combinations of concrete and steel.

During the 1930s, the Pennsylvania Department of Highways created a more standardized approach to bridge design. Bridges on major roads were more likely to be replaced than bridges on less traveled roads, and by the 1950s larger scale bridges became common on the major through roads. The largest bridge in Tinicum is the 1931 steel Warren Truss bridge that features six spans measuring 951 feet to link Frenchtown, New Jersey to Uhlerstown, Pennsylvania. The stone piers and abutments once supported a massive covered bridge.

The Uhlerstown- Frenchtown bridge crosses the Delaware River and is considered National Register eligible.

These above mentioned bridges are among the upper tier of the township's fifty-two bridges listed on the Tinicum website. The Lichtenstein study for Tinicum enumerates twenty-eight bridges of interest, but the database software is no longer supported by Microsoft making the online database useless, there are no photos of the bridges accessible through the database, and text boxes with meaty entries cannot be fully read. In 1997 the Lichtenstein Study found ten bridges eligible and one potentially eligible for the National Register. The lack of a fully functional comprehensive inventory means that a comprehensive bridge survey must be made in order to speak definitively about the full collection in Tinicum Township. No doubt, there are more stellar bridges awaiting recognition on the roadways of Tinicum, and challenges to be made to some determinations of eligibility.

Preservation of the Bridges of Tinicum Township

When the historic resources of Tinicum Township were documented by the Heritage Conservancy from 1989-1990, nearly every bridge was historic. Over the past quarter century, some bridges have been preserved, but others have been demolished, are slated for replacement, or are threatened. Nationwide, a precipitous loss of historic bridges has occurred with an estimated decline of twenty-five percent of America's historic bridges in just two decades. In Tinicum Township, this national trend has been challenged with several protracted clashes occurring over the fate of historic bridges. A grass-roots effort to preserve the bridges of Tinicum Township has received tremendous local attention and support in the community and from non-profit organizations. Federal historic designations for bridges and districts, in concert with designations protecting streams, as well as the protection inherent in establishing the Delaware Canal Heritage Corridor, and the setting aside of natural areas for public parks, may well represent the most spirited effort in the Commonwealth to advocate for historic bridge retention and bridge restoration projects instead of bridge replacements.

Tinicum Township is a place where historic bridges stand as vital experiences within landscapes and viewsheds that still tell the story of how America was transformed from a wilderness to a pastoral landscape that epitomizes the draw of Bucks County's rural beauty to residents and visitors alike. The Bucks County countryside has attracted renown since the turn of the twentieth century, but today that heritage is at risk with large expanses of rural Bucks County countryside with minimal or limited new development rapidly diminishing, and worthy of more proactive and innovative bridge management. Tinicum Township is at risk to lose rare surviving examples of bridge types that are nearly extinct state-wide despite the efforts of residents to plead for bridge conservation rather than replacement. With no up-to-date functional database or publicly available systematic management plan, the State is not able to place deteriorated historic bridges into a context that truly evaluates rarity and significance, and unfortunately, bridge battles usually entrench both sides. Successful oversight of the historic bridges of Tinicum Township calls for a new type of management approach that gives voice to historical significance and repair options earlier in the bridge project analysis process, and bridge repair needs to become an acceptable means to manage historic bridges by the State of Pennsylvania. Before turning to a few key bridge preservation challenges, it will prove useful to look at several excellent bridge preservation outcomes in Tinicum Township.

It is absolutely clear that the State of Pennsylvania can repair certain historic bridges quite well. There are several excellent bridge preservation success stories in Tinicum Township. Three Town Truss covered bridges remain in service today, the Frankenfield, Erwinna, and Uhlerstown bridges, thanks to deck replacements that made the bridges safe, and a regular program of maintenance for this specific bridge type. Most residents would agree that the covered bridges are the most significant bridges in the area as they certainly evoke the horse-drawn transportation of the nineteenth century. This bridge type has benefited from popular public support resulting in a special state-wide covered bridge program that has saved most of the 219 surviving Pennsylvania covered bridges. Bucks County once had thirty-six covered bridges, but two-thirds have been lost leaving twelve, of which three remain in Tinicum.

In Ralph Stover Park an open wooden truss bridge survives as the last bridge of its type in Pennsylvania. The bridge is actually a covered bridge without the walls or roof, in other words there are wooden trusses, but they have been sided and protected from the weather but the deck is open to the weather. This last of its kind bridge in Pennsylvania has been closed to traffic for decades and is in poor condition and at risk of continued deterioration.

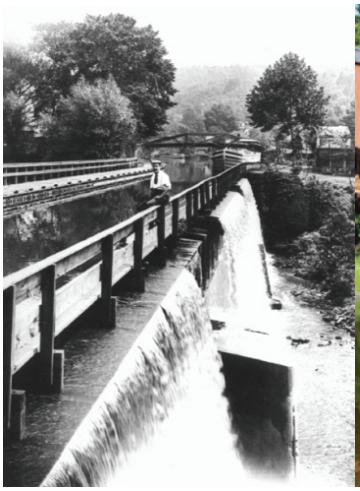
The Frankenfield Covered Bridge.

Bridges crossing the canal have also fared well and the basic design of the bridge sidewalls has been preserved over time. The Delaware and Lehigh Canal National Heritage Corridor features a common camel-back bridge design for road crossings over the canal that despite repairs and rebuilding, have retained their character defining sides forming the camelback profile. In looking at all of the camelback canal bridges along the sixty mile canal, only six fully original camelback bridges still exist. Most are newer beam bridges that replicate the wooden trusses as the side railings. One bridge is of the camelback design, but made entirely of metal pipe. Another replicates the engineering features, with wood and metal components, but is much heavier in appearance, being designed for heavy modern loads. Other types of crossings include metal Pratt pony truss, concrete arch, I-beam, box beam and concrete, pipe and pre-stressed arch culverts.

Pony Truss 1877 bridge crossing the canal—restored.

A representative example of a camel-back canal bridge.

The 1877 Pratt Pony Truss bridge over the canal recently underwent disassembly, repair, and restoration. The bridge was cast by the Murray Dougal and Company in Milton, Pennsylvania. The 1948 concrete canal aqueduct in Point Pleasant was replaced recently with a more authentic wooden structure that ensures that the canal flows over the Tohickon Creek.



While not a true reconstruction, the new canal aqueduct over the Tohickon Creek is a remarkable renewal of a key linkage in the canal system.

An 1887 pony truss bridge at Geigel Hill and Sheephole Roads was struck by a truck, closed, and its replacement was held up by public pressure because the Geigel Hill Road Bridge was the only bridge made by Nelson & Buchanan and/or the Pittsburgh Bridge Company that was located within a potential or listed historic district in Pennsylvania, that district being the Ridge Valley Rural Historic district.

The covered bridges, the canal bridges, and the restoration of the iron canal bridge and the compromise on the iron Geigel Hill Road bridge prove that in particular situations, the State of Pennsylvania has taken the path of preserving and enhancing the historic bridges of Tinicum Township or rebuilding, under historic bridge size constraints with the reuse of character defining features, in a manner that has complemented the settings in which those bridges operate.

There are three bridges currently at risk in Tinicum Township that do not appear to be receiving the consideration their historic significance would seem to dictate. Currently in Tinicum Township, a 1922 concrete arch bridge in Point Pleasant designed by county engineer A. Oscar Martin, which contributes to a historic district, is about to be demolished, and the last two multi-span stone supported beam bridges in Bucks County have replacement studies underway. The 1812 Burnt Mill (Sheephole) Bridge on Headquarters Road is the eleventh oldest bridge remaining in Pennsylvania and contributes to a historic district while the 1835 Creamery Road Bridge contributes to a Lower Tohickon Creek Historic District for which a determination of eligibility is being pursued.

Although the 1887 bridge was demolished, the one lane width, trusses, abutments and the right of way remained virtually unchanged.

The 1933 concrete arch bridge in the Point Pleasant Historic District was demolished this spring.

The Point Pleasant bridge replacement is underway with a temporary crossing being put in place to allow for the demolition of the historic bridge. The removal of this bridge is a significant loss as it is a central feature in the Point Pleasant Historic District. With the powerful Tohickon Creek flowing under its concrete arch, this bridge is a focal point especially from the second floor porch of the Point Pleasant Hotel, a location attracting visitors that came to the area for the quaint architecture and natural beauty seen at this bridge location. That this bridge is not being repaired calls into question the historic designations of the Point Pleasant Historic District and the National Landmark canal designation and how the State honors historic designations. Are these designations not designed to preserve the historic resources of an area? It is especially discouraging for the State to use tax-payer funds to demolish a structure that contributes to a historic district in the most significant part of Tinicum Township.

The significance of A. Oscar Martin as a county bridge engineer has been debated but not resolved making it impossible to determine how significant this particular bridge in Point Pleasant may be in the measure of his large body of early twentieth century bridge projects. Martin pioneered the use of concrete in bridge designs and this bridge is a significant example of his work that recalls the older tradition of stone arch bridge building in this region, yet by utilizing a new material that presented cost savings over stone masonry a traditional arch form could be formed to allow the passing through of the Tohickon Creek, a major tributary of the Delaware River. As the number of A. Oscar Martin bridges is diminished piecemeal, how many more of his projects will be lost before his contributions are competently and finally evaluated?

The 1812 Burnt Mill Bridge (above) and the 1835 Creamery Road Bridge (below) are the last two multi-span stone supported beam bridges left in Bucks County.

The 1812 Burnt Mill Bridge and the 1835 Creamery Road Bridge are the last two bridges of their type remaining in Bucks County. Is that fact not a reason to repair rather than replace the spans? It is the superstructure of the original bridges that remains since the decks were both originally wooden planks that had to be replaced periodically. The significance of both remains challenged by twentieth century auto era improvements that left both bridges one lane wide with the superstructure intact. Both are monumental with the earlier bridge spanning two supports and the latter stretching 199 feet across seven piers. In the auto age both bridges received concrete decks and pipe railings. The early auto era renovations extended the life of both bridges and are reflective of an older approach of repairing rather than replacing bridges in Pennsylvania. The Burnt Mill Bridge forms a squirrelly intersection with Sheephole Road and Headquarters Road that will likely force a bridge realignment if a new two lane bridge is mandated. A new span will have a significant negative effect on the Ridge Valley Historic District.

The Creamery Road Bridge forms the context for the Harpel Farmhouse that stands nearby in site of the bridge. The Harpel Farm was examined for National Register eligibility and denied, yet the researcher never gained entry to the property to evaluate the interiors. The farmhouse may well have one of the most intact interiors of any stone farmhouse in all of Tinicum Township. The house was abandoned during the depression, and after thirty-five years of being vacant a family purchased the farm and built a very sensitive addition leaving the original house interiors vacant and largely untouched since the 1930s. The second floor chamber that overlooks the Creamery Road Bridge features all of its original woodwork, plaster, hardware, and paint colors from the eighteenth century. The interiors of the farmhouse and the Creamery Road bridge have traveled through time together and as of today both still exist complementing each other. Will all three of these currently threatened bridges be lost? If so, what exactly is being lost if new bridges go in and the context of the bridge sites is altered?

Historic bridges, remaining in service, offer those traveling on the road an experience of crossing a stream or creek on an engineered structure that has remained unchanged for generations. Bridges offer users a brief moment to experience the crossing of a body of water. That experience can often be one of natural beauty as seen over the railing looking up or down stream at the views. The stream, creek, or canal below often only momentarily comes into view before the crossing is completed. Where the lands abutting the crossing are wooded the span offers a momentary rush of light, and when the lands are open the views can provide brief but distant images of scenery and buildings that have been part of that view since the bridge first opened. Historic bridges make those crossings a significant historical experience that enriches the traveling experience of residents and visitors alike. Historic bridges are living history serving as direct physical connections to a period in the past.

The bridges of Tinicum Township are a remarkable collection of structures that offer a rare and unusual variety of bridge designs meeting a variety of transportation needs over a broad sweep of time. The bridges are significant due to their design, but even more so for their context and the manner in which those brief moments of experiencing the crossing of the bridge connect the residents and visitors of Tinicum to the rhythms of the past. The historic bridges in Tinicum lay within surroundings that are natural, architectural, archeological, or a combination of all three that evoke the broader Delaware Valley story of settlement and pastoral development in a single municipality.

With immediately threatened bridges and no publicly available management plan for the bridges of Tinicum Township, it is not possible to know what the fate will be for the remainder of the municipality's historic bridges. Modern spans fail to equal the beauty and context sensitivity of historic bridges. Replacement bridges meeting modern standards often cause the redesign of the bridge location changing the appearance of adjacent intersections and requiring right of way acquisitions that negatively affect historic resources. When historic bridges are lost the impact of a new span is nearly always far greater than the loss of the bridge itself. The materials, size, design, alignment and impact to frontage can greatly undermine the historic integrity that once existed. "What is lost in the calculated costs of replacing or rehabilitating a historic bridge is the intrinsic value of the bridge itself," argues the Historic Bridge Foundation, "Somehow we must elevate the importance of our historic bridges in the stories that identify the communities of our nation and say "this bridge is part of who we are and it must be saved."

In researching professional responses to the nationwide issue of significant losses of historic bridges a workshop held twelve years ago in Washington, D.C. offers important lessons that have yet to become standard operating procedure in bridge replacement discussions. The workshop was sponsored by Eric DeLony, of the Historic American Engineering Record, and Terry Klein, of the SRI Foundation. A noble effort was made to address the loss of historic bridges in America by bringing together transportation professionals from across America to develop a fresh strategy for bridge preservation. Several of their findings are helpful in this discussion of preserving a rich and significant grouping of historic bridges in Tinicum Township. The stated goal of the workshop was to "articulate and define efficient and economical strategies for historic bridge preservation and management." A questionnaire was sent out to all fifty state DOTs, selected State Historic Preservation Officers (SHPOs), several consulting engineers experienced in historic bridge rehabilitation, a couple of civil engineering educators interested in the subject, and several non-engineering preservationists and historic bridge scholars. Thirty-seven DOTs responded, including the District of Columbia.

The number one recommendation was to mandate historic bridge management plans. The group recommended that every attempt should be made to identify those bridges where rehabilitation and/or preservation is appropriate and feasible, and to develop specific treatments for these bridges. Such efforts would result from bridge inventories. Two other topics have bearing on our topic. One question asked "Speaking with individuals in state DOTs, there is concern of a "disconnect" between environmental and engineering interests and disciplines. Could you characterize the relationship between these two disciplines in your agency? This is a touchy issue confirmed by many equivocal responses from the state DOTs. Though many states indicated that relationships were improving, eight states responded that there was a "disconnect." In some states, environmental and preservation interests were still perceived as "scapegoats," something extra and not necessary. Other respondents cited different value systems between the two disciplines as one of the reasons for this disconnect. Despite the prevalence of engineering interests and the lack of interest to pursue alternative or non-traditional methods, many respondents said that relationships were improving because of better understanding of the respective disciplines. Some of the reasons for improvement included the intervention or mediation by the FHWA division office, change of leadership within the agency, the attitude of individual project managers, context sensitive design, and the integration of environmental and engineering disciplines within the same office. Vermont claimed that its historic bridge program helped instill a measure of pride among the engineers on staff."

The other question asked "What has been the fundamental reason(s) that historic bridges have been saved? By far, community interest was the primary factor, noted by thirty-one (31) of the states. Thirteen (13) cited flexible design standards and three mentioned adopt-a-bridge programs. Nine (9) states cited their historic bridge management plans as the reason bridges were saved. Many states cited the Section 106 compliance process. One reason cited for successful rehabilitation involved someone on the DOT staff or a focused, passionate citizen or citizen's group willing to make a conscience effort to save a bridge. Other reasons mentioned included SHPO interest, the availability of transportation enhancement funding, and the obvious cost effectiveness of rehabilitation."

The last perspective to offer in this report is evidence of a changing attitude among professional engineers about applying their expertise to preservation and rehabilitation efforts with historic bridges rather than continually asserting that every deteriorated older bridge must be replaced. The American Society of Civil Engineers developed a policy in support of the rehabilitation of historic bridges that shows professional recognition of the viability of repairing rather than replacing historic bridges that reads "The American Society of Civil Engineers (ASCE) supports the maintenance, repair and rehabilitation of historic bridges preferably in continued vehicular use, and when that is not possible, some alternative transportation means such as a pedestrian or bike bridge." In their rationale the ASCE offers "Historic bridges are important links to our past, serve as safe and vital transportation routes in the present, and can represent significant resources for the future. Rehabilitation maintains these important engineering structures in service and can represent significant cost savings." There is professional pride to be found in saving bridges, "bridges are the single most visible icon of the civil engineer's art. By demonstrating interest in the rehabilitation and reuse of historic bridges, the civil engineering profession acknowledges concern with these resources and an awareness of the historic built environment." By planning to maintain historic bridges with management plans, "Many historic bridges can still serve the nation's transportation needs given appropriate repair, maintenance and flexibility in interpreting transportation standards as suggested by national transportation policy. Due to perceived functional obsolescence, lack of cyclical maintenance, and any funding priority, historic bridges are a heritage at risk."

The ASCE places the loss of historic bridges at a much higher rate than seen in other sources stating "Over half the historic bridges of the United States have been destroyed during the last twenty years—a startling and alarming statistic." In considering how this high rate of historic bridge loss might affect the ASCE's view of the threatened bridges in Tinicum Township consider, "Certainly no one can argue that outstanding and representative examples of the nation's historic bridges shouldn't be preserved. The ASCE policy calls on engineers to play a leadership role in bridge preservation, "Citizens groups throughout the country are working to save historic bridges. We, as civil engineers, need to help lead and support these efforts. Bridges are engineered resources thus requiring the skills of engineers. There is little chance that the historic bridges of the United States can be saved without the interest and skills of engineers, until they become part of everyday transportation policy, receive the support of transportation officials at all levels, and the continued interests of citizen groups."

In conclusion, the Bridges of Tinicum Township, when viewed as a collection, warrant greater consideration for preservation. The bridge collection in Tinicum tells a remarkable story of Scotch-Irish, English and Germanic settlement and economic development. A Tinicum Township management plan with input from the local community that forecasts the options for future treatment of all township bridges would be of great benefit to all of the various entities seeking to conserve and preserve Tinicum's historical and natural environments in which bridges play a highly visible role in how residents and visitors experience the nationally significant layers of Delaware Valley history still evident in the environs of the Bridges of Tinicum Township.

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Determination of Effects Report

S.R. 1012, Section BRC

Headquarters Road Bridge Project

Bucks County, Pennsylvania

Prepared for:

Pennsylvania Department of Transportation
Engineering District 6-0
7000 Geerdes Boulevard
King of Prussia, Pennsylvania 19406

November 2015

Prepared by

A.D. MARBLE & COMPANY
Environmental, Cultural & Engineering Services

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19428

DETERMINATION OF EFFECTS REPORT

S.R. 1012, Section BRC
Headquarters Road Bridge Project

Tinicum Township, Bucks County, Pennsylvania

ER #05-8029-017

Prepared for:

Pennsylvania Department of Transportation
Engineering District 6-0
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November 2015

ABSTRACT

This Determination of Effects Report evaluates the effects of the proposed Headquarters Road (S.R. 1012, Section BRC) Bridge over Tinicum Creek project located in Tinicum Township, Bucks County, Pennsylvania (hereinafter the Headquarters Road Bridge project), to the historic properties within the Area of Potential Effects (APE) that are listed in or eligible for the National Register of Historic Places (National Register). The purpose of this project is to provide a crossing for Headquarters Road over Tinicum Creek that is structurally sound and capable of safely and effectively handling the expected vehicular need of the public and emergency services of the surrounding area.

There is one historic property in the APE for the Headquarters Road Bridge project, the Ridge Valley Rural Historic District, that is listed in the National Register. The Headquarters Road Bridge is a contributing element to the historic district. In addition, the project APE includes three properties that contribute to the historic district: two to the west side of the bridge (Parcel Nos. 44-14-2 and 44-14-8) and one to the east side of Sheep Hole Road (Parcel No. 44-14-3-1). The lead federal agency for the project is the Federal Highway Administration (FHWA), as it is providing funding for the project.

A.D. Marble & Company conducted a Phase IA archaeological investigation in June 2005. An Archaeological Letter Report was prepared that recommended no further work as it was determined that there were no prospects for intact, potentially significant sites within the archaeological APE. The letter was submitted to the Pennsylvania Historical & Museum Commission, Bureau for Historic Preservation (PHMC-BHP) for concurrence in July 2005; PHMC-BHP concurred with the recommendations on September 8, 2005. Although the PHMC-BHP concurrence letter was provided in 2005, this letter is still valid for the project.

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1.0 Introduction

1.0 INTRODUCTION

The existing three-span structure carries Headquarters Road (S.R. 1012) over Tinicum Creek and is currently closed to traffic. The project area for this evaluation is shown in Figure 1; it encompasses the Headquarters Road Bridge and surrounding parcels. The purpose of this project is to provide a crossing for Headquarters Road over Tinicum Creek that is structurally sound and capable of safely and effectively handling the expected vehicular needs of the public and emergency services of the surrounding area.

The entire Area of Potential Effects (APE) for the Headquarters Road Bridge project is located within the Ridge Valley Rural Historic District, which was determined eligible for listing in the National Register of Historic Places (National Register) on December 7, 1990, and was listed in the National Register on July 24, 1992 (Figure 2). The Headquarters Road Bridge is a contributing element to the historic district. In addition, the project APE includes three properties that contribute to the historic district: two to the west side of the bridge (Parcel Nos. 44-14-2 and 44-14-8) and one to the east side of Sheep Hole Road (Parcel No. 44-14-3-1).

The purpose of this Determination of Effects Report is to document the effects of the proposed project on historic properties located within the APE. The Determination of Effects Report was prepared in accordance with federal and state laws regarding significant cultural resources, including historic and archaeological sites. Federal and state mandates for cultural resources include: Section 106 of the *National Historic Preservation Act* of 1966, as amended; the *Procedures for the Protection of Historic Properties* set forth in 36 CFR 800, as amended; 23 CFR 771, as amended; guidance published by the Advisory Council on Historic Preservation (ACHP); Sections 1(3) and 2(b) of *Executive Order* 11593; the *National Environmental Policy Act* of 1969, as amended; the Commonwealth of Pennsylvania State Act Number 1978-273, amended as Act Number 1988-72; and the *Archaeological and Historic Preservation Act of 1974*. This legislation requires that the effects of any federal- or state-assisted undertaking on historically significant buildings, structures, districts, objects, or sites be taken into account during the project planning process. Significant resources are those listed in or eligible for listing in the National Register.

Figure 1
Project Location Map
S.R. 1012, Section BRC
Headquarters Road Bridge Project
Tinicum Township, Bucks County, Pennsylvania

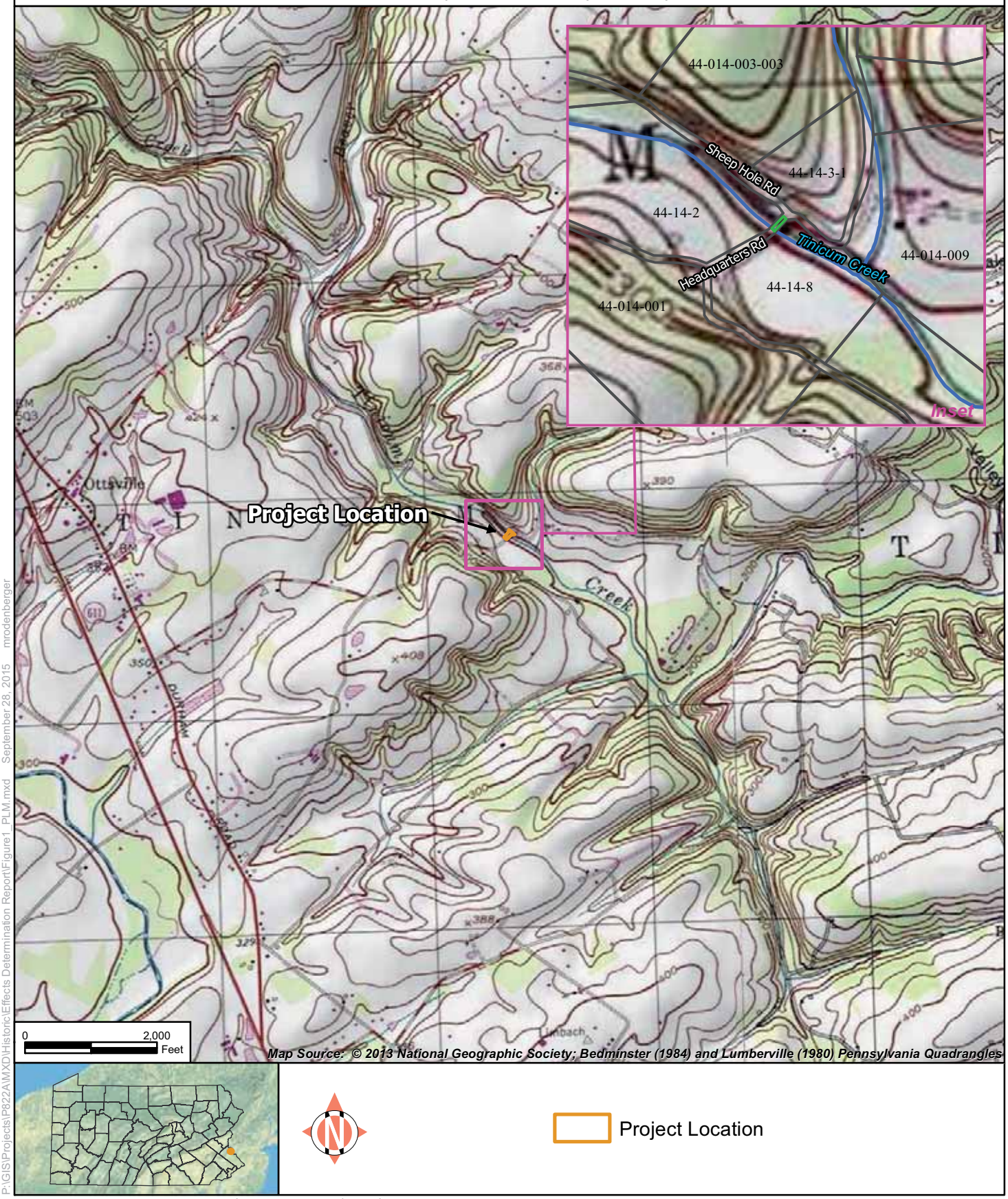

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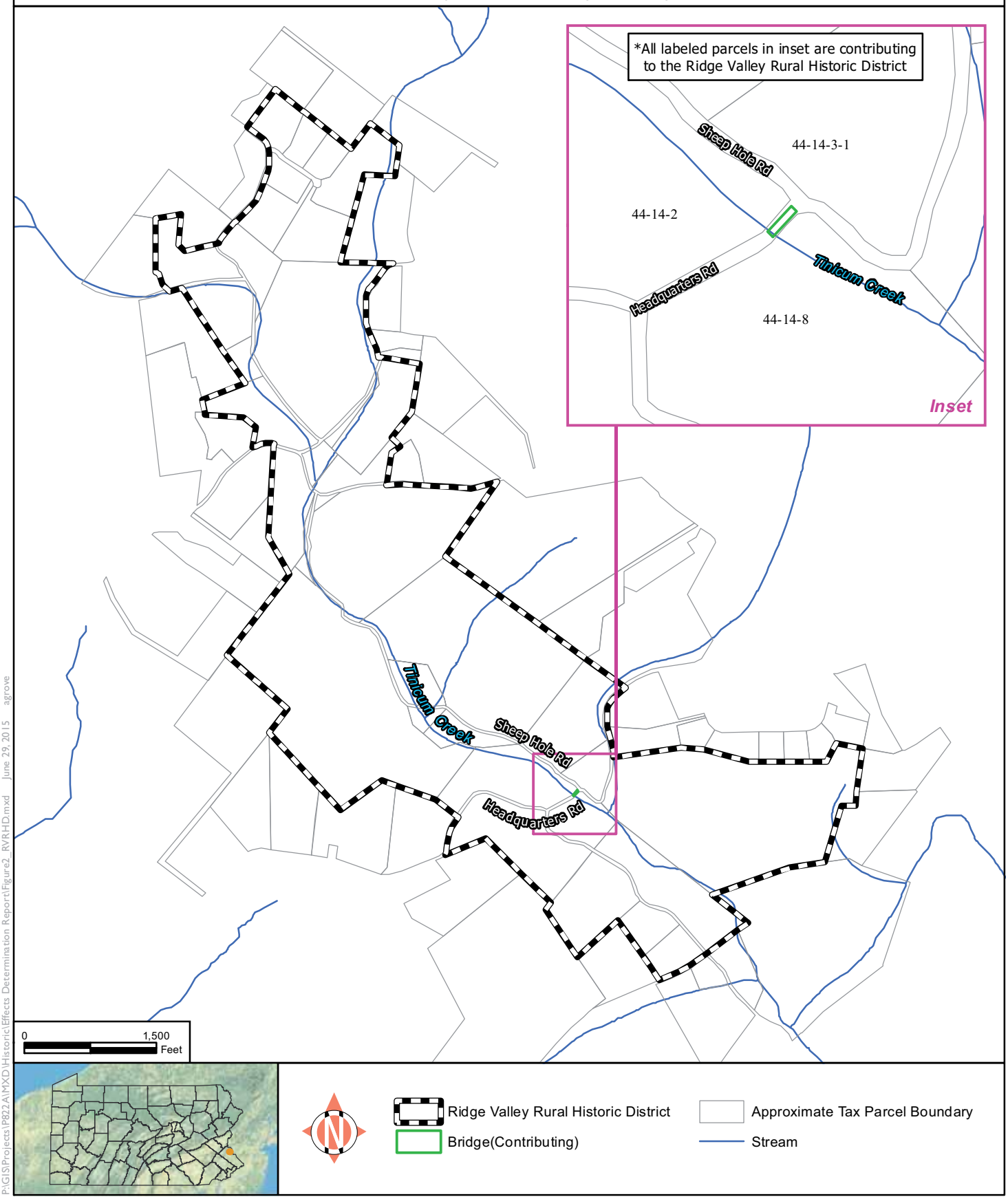
Figure 2
Ridge Valley Rural Historic District and Project Location

S.R. 1012, Section BRC
Headquarters Road Bridge Project
Tinicum Township, Bucks County, Pennsylvania



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Data Source: PADEP 2013; https://gisweb.co.bucks.pa.us/apps/floodplainviewer/

2.0 Project Description

2.0 PROJECT INFORMATION

2.1 Existing Conditions

The project area is rural in nature and consists of mostly residential and agricultural land. The entire project area is located within the Ridge Valley Rural Historic District (Figure 2). Tinicum Creek flows in an east to west direction through the project area. The project area for this evaluation follows the project location identified on Figure 1. Photographs of the project area are included in Appendix A.

The west side of the bridge is located in Ottsville, Pennsylvania, and the east side is located in Erwinna, Pennsylvania. There is a T-intersection on the east side of the structure, with Sheep Hole Road continuing to the north and Headquarters Road continuing to the south. Headquarters Road is classified as a Neighborhood Collector Road, according to the Pennsylvania Department of Transportation's (PennDOT's) *Publication 13M, Design Manual, Part 2 (DM-2).* The Average Daily Traffic (ADT) along this roadway prior to its closure varied from 900 in 2001 to 631 in 2008. The posted speed limit on both approaches is 25 miles per hour.

The bridge is currently closed to traffic. The Headquarters Road Bridge consists of a concrete-encased, steel I-beam superstructure supported on masonry piers and abutments. A General Plan and Elevation of the existing bridge is shown in Figure 3. The superstructure was constructed in 1919 and consists of three spans. The stone abutments, piers, and wing walls are estimated to have been originally constructed in 1812. When the bridge was open to traffic, it carried one 16-foot lane with no shoulders and a 1-foot wide curb on each side. The total width of the existing bridge is 18 feet.

The original bridge railing system consisted of concrete curbs with steel pipe rails. Since then, the bridge railing system has been improved to provide a greater level of protection for vehicles crossing the bridge. The pipe rail was replaced with steel beam guide rail attached to the concrete curbs in 1991. After a vehicular impact to the guide rail in 2001 led to the failure of the bridge railing anchorage to the concrete curb, 2-foot wide concrete jersey barriers were installed along the curb lines on each side of the bridge, which restricted the bridge width to a minimum of 10 feet.

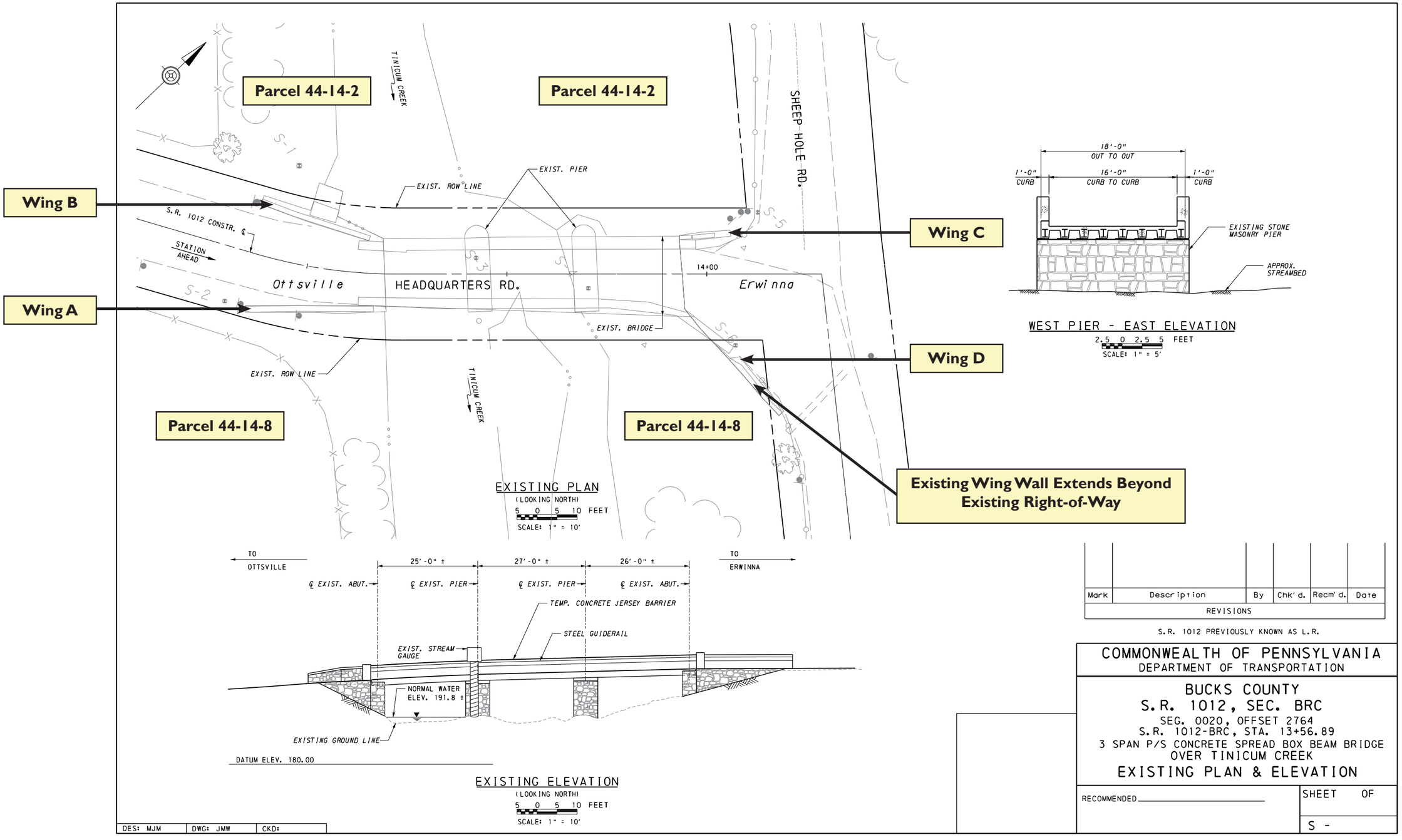


Figure 3

Existing Plan and Elevation

S.R. 1012, Section BRC, Headquarters Road Bridge Project

Tinicum Township, Bucks County, Pennsylvania

The existing Tinicum Creek waterway opening has meandered over the years. As the stream continues to meander, the upstream banks have become unstable. The existing channel under the existing bridge exhibits evidence of contraction scour. A large scour hole was observed adjacent to the west abutment and northwest wing wall. The normal stream depth upstream of the structure is approximately 6 inches deep. At the deepest point of the scour hole, the stream bed elevation is nearly 5 feet deep. Temporary scour countermeasures (grout bags) were installed. However, these items have been undermined and are only considered a short-term solution.

2.2 Project Purpose and Need

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.

Due to a hole found in the bridge deck during a routine inspection, the bridge was closed to the public on March 2, 2011. The most recent inspection, performed in October 2012, determined that the overall condition of the bridge is serious, and that the structure, in its current state, is structurally deficient. Prior to the closure of the Geigel Hill Road Bridge in 2002, the Headquarters Road structure accommodated approximately 900 vehicles per day (2001 PennDOT Traffic Count). Prior to its closure in 2011, an average of 631 vehicles per day used the Headquarters Road Bridge (2008 PennDOT Traffic Count).

The existing masonry substructure exhibits multiple areas of stone displacement and advanced streambed erosion, which has exposed the structure's foundation. The retaining walls that lie in the northwest, northeast, and southeast quadrants of the structure show signs of settlement and base slippage with some areas of wall displaced as much as 12 inches with localized collapse. Sediment deposition at the bridge coupled with the movement of the stream over time has caused the stream channel to intersect with the western most abutment, creating a scour hazard. To temporarily alleviate concerns of the substructure deteriorating further, grout bags were installed to address immediate scour concerns, and shotcrete repairs were made to areas of damaged masonry.

The superstructure is severely deteriorated with the majority of the concrete façade cracked and spalled, which has exposed the steel stringers. These exposed steel stringers exhibit extensive section loss, which has reduced their load carrying capacity, and the concrete deck exhibits full-depth longitudinal cracking and spalling, as well as several large holes that have been covered by steel plates.

In addition to the severely deteriorated state of the structure, the existing bridge has a curb-to-curb width of 16 feet, allowing only one lane of traffic to pass at any given time. A turning movement analysis showed that a single unit vehicle (30 feet in length) making a left-hand turn onto the bridge from Headquarters Road would impact the bridge. The structure, therefore, cannot accommodate Tinicum Township's largest fire response vehicle, a 41.5-foot ladder truck. Lastly, the sight distance and horizontal curve radius of the western approach to the Headquarters Road bridge does not meet PennDOT safety criteria.

In order to address the above issues, the needs for the project include:

- The bridge is structurally deficient;
- The bridge is functionally obsolete;
- The retaining walls exhibit failure;
- Due to the existing structure's geometry and limited roadway width, it cannot safely and effectively accommodate current and future traffic needs including emergency response vehicles; and
- Heavy scour exists along the western abutment resulting in the exposure of the bridge foundations and an increase in the structures' vulnerability to further deterioration.

A project goal is to develop a solution that is sensitive to the historic and rural nature of the surrounding area.

3.0 Alternatives Considered

3.0 ALTERNATIVES CONSIDERED

The following alternatives were studied during the transportation development process:

- No Build Alternative;
- New Roadway Alternative that Totally Avoids Ridge Valley Rural Historic District (Alternative 1);
- New Alignment Downstream (Alternative 2);
- One-Lane Bridge Alternatives (Alternative 3 and Alternative 5);
- Two-Lane Bridge Superstructure Replacement and Substructure Rehabilitation (Alternative 4);
- Two-Lane Bridge Replacement (Alternative 6);
- Two-Lane Bridge Replacement with Narrower Typical Section (Alternative 6A); and
- Two-Lane Bridge Replacement over Existing Substructure (Alternatives 6B and 6C).

No Build Alternative

In the No Build Alternative, the existing structure would remain unchanged from its present condition with no new construction taking place. The bridge would remain closed to vehicular traffic indefinitely, and the structure would continue to deteriorate. Eventually, the condition of the bridge would warrant its removal to avoid further obstruction of the stream should collapse occur due the bridge's continuing deterioration. The no build alternative results in no impacts to the Ridge Valley Rural Historic District or to the adjacent contributing elements. However, if the bridge's condition deteriorates enough to warrant its removal, then impacts to the district would occur.

The existing bridge would be left in place with this alternative; therefore, the existing stream encroachment would remain. The two piers in the channel would continue to cause debris accumulation during high flood events, which would lead to continued scouring of the stream bed around the existing piers and abutments.

The continued bridge closure would require the continued use of a detour of approximately 12.2 miles (Figure 4). The detour shown in Figure 4 utilizes all state-owned roadways. A detour is currently in place; the detour is utilized by residents and emergency services. The use of a detour would continue to negatively impact emergency services, local residents, and associated tourism through this portion of Bucks County. Increased user costs are associated with the detour, and it is an overall inconvenience for the local community.

New Roadway Alternative that Totally Avoids Ridge Valley Rural Historic District (Alternative 1)

This alternative was developed to totally avoid the Ridge Valley Rural Historic District. This alternative involves a new roadway (approximately 1.67 miles) around the historic district to the east and south of the existing bridge that would be constructed (Figure 5). The new roadway would travel through existing farm fields, bisecting parcels, and would connect to Frankenfield Road then connect to the intersection with Red Hill Road to the west of the historic district, and reconnect to Headquarters Road. This alternative alignment requires several intersections with township roads and would expose local roads to a higher volume of traffic. The existing Headquarters Road Bridge would be abandoned in place. Aerial utility lines located adjacent to the existing Headquarters Road Bridge would require relocation. Estimated costs for this alternative would be in excess of 10 to 15 million dollars.

Right-of-Way. This alternative requires the acquisition of a significant amount of right-of-way (ROW) for 1.67 miles of new roadway. This acquisition would result in the bisecting of farmed parcels, at least two total residential displacements, as well as eight partial acquisitions and temporary construction easements (TCEs) of residential properties. This is the only alternative studied that requires the displacement of residential properties.

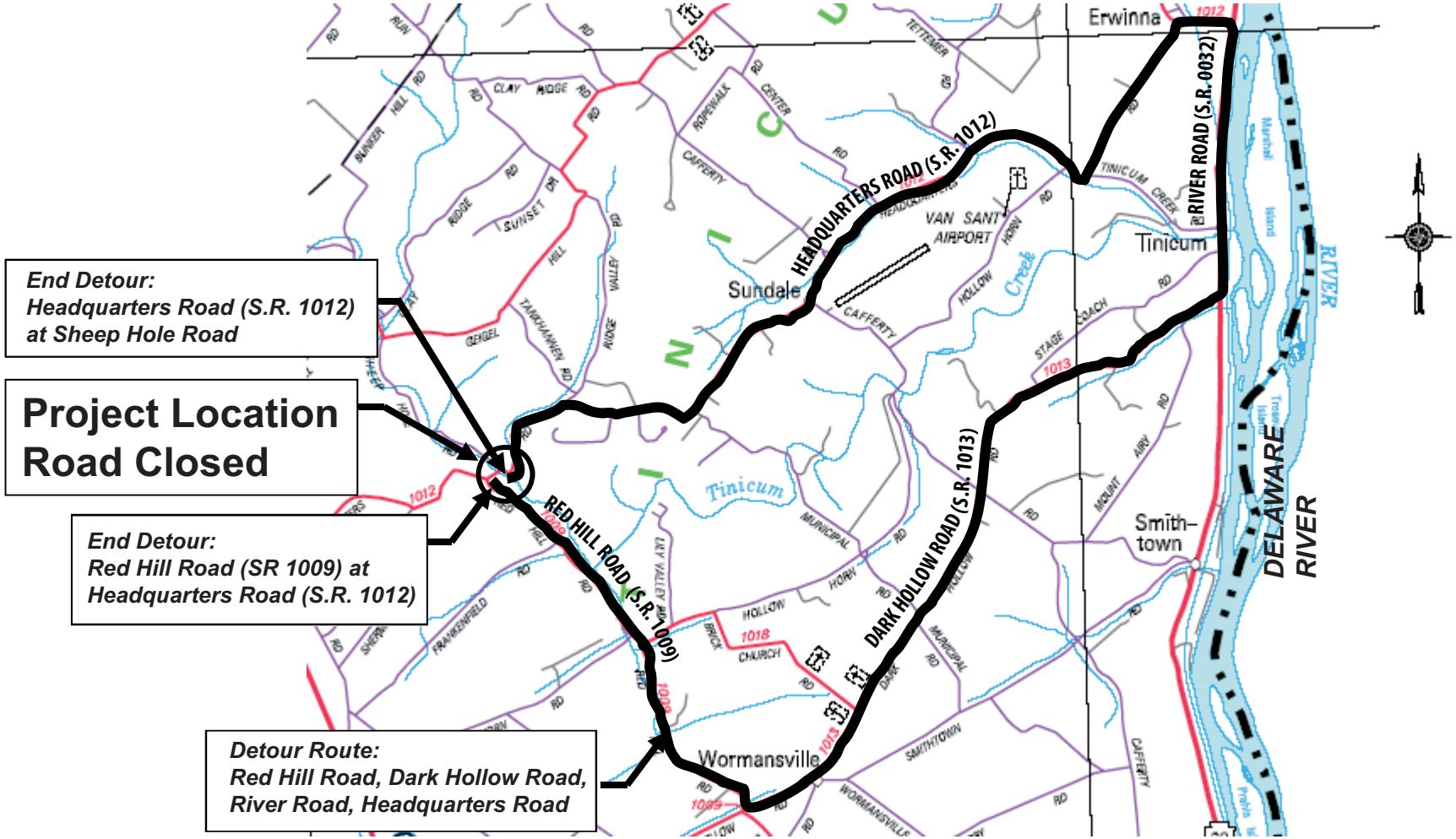


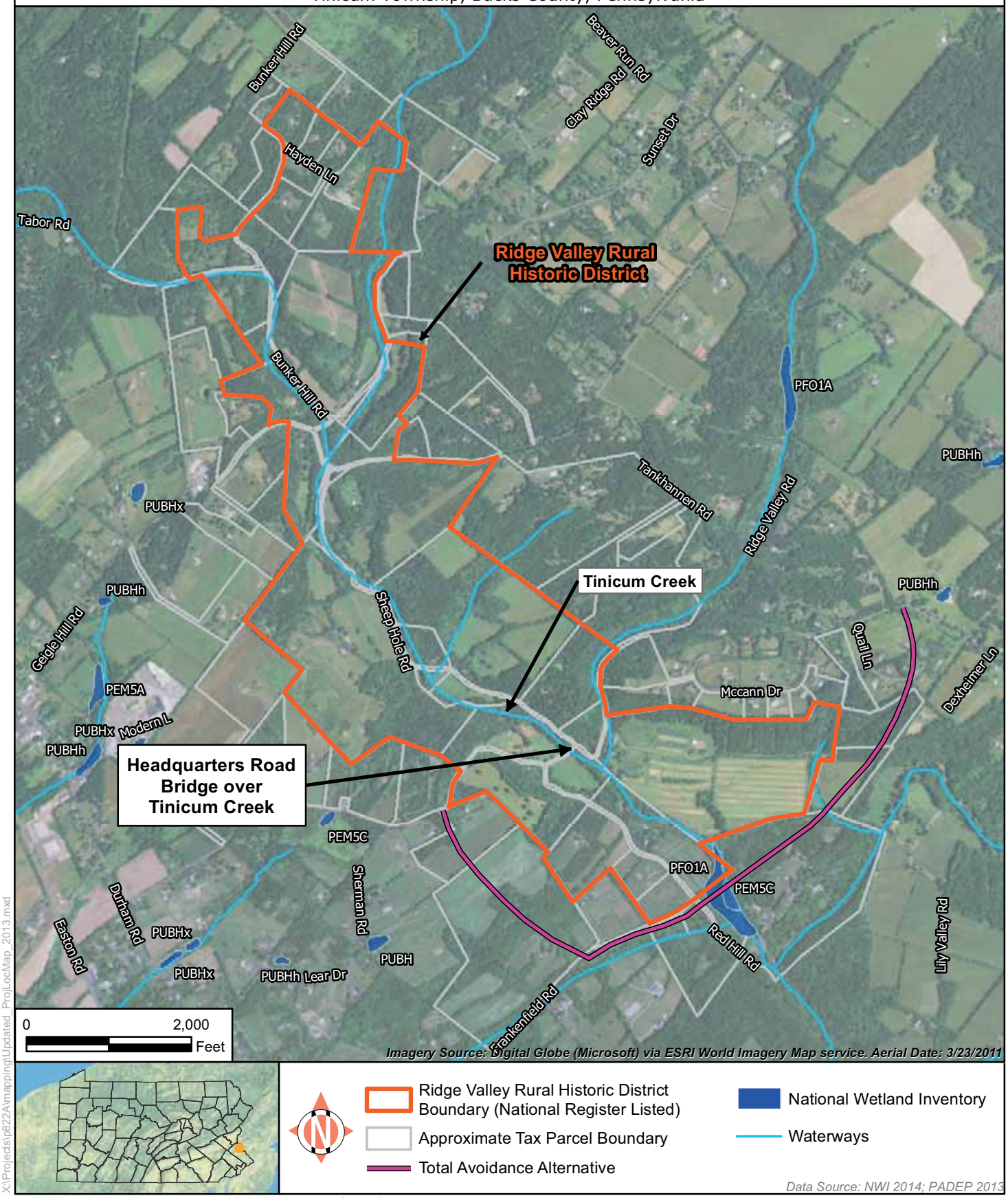
Figure 4

Detour Route

S.R. 1012, Section BRC, Headquarters Road Bridge Project

Tinicum Township, Bucks County, Pennsylvania

Figure 5
New Roadway that Totally Avoids the Ridge Valley Rural Historic District (Alternative 1)
S.R. 1012, Section BRC
Headquarters Road Bridge Project
Tinicum Township, Bucks County, Pennsylvania



Environmental and Cultural Resource Impacts. This alternative completely avoids the Ridge Valley Rural Historic District; however, it impacts several properties that border the historic district. Historic resource investigations would be needed to determine whether the properties and farms impacted by this new alignment are eligible for listing in the National Register. Since this new roadway is located in part within a floodplain and along waterways, the probability of finding intact archaeological artifacts increases; therefore, archaeological studies would be required along this alignment.

Two additional waterway crossings (Tinicum Creek and unnamed tributary to Tinicum Creek) are necessary. Forested riparian corridors would be impacted. Wildlife habitat would be impacted by the avoidance alternative. There is one National Wetland Inventory (NWI) Palustrine Forested/Palustrine Emergent wetland located to the north of the intersection of Frankenfield Road and Red Hill Road that would be impacted by this alternative. This wetland is approximately 4.5 acres. At least 2.0 acres of this wetland system would be permanently impacted by this alternative, requiring wetland mitigation at a 2:1 replacement ratio. Since the NWI is not a comprehensive database of wetlands, a field view would be required to determine the presence of additional wetlands along this alternative. Productive agricultural land, including pasture land and prime agricultural soils, along this avoidance alignment would be impacted. This alignment also impacts seven parcels that are included in the Tinicum Conservancy Public and Protected Lands program. These parcels are all within a Tinicum Conservancy Conservation Easement.

New Alignment Downstream (Alternative 2)

Alternative 2 involves the construction of a new roadway alignment and bridge crossing for Headquarters Road to avoid impacts to the existing bridge. Due to the geometry of the project area, the new alignment would be downstream of the existing Headquarters Road Bridge. The existing Headquarters Road Bridge would remain in place.

The downstream alignment would flatten the existing horizontal curve at Red Hill Road and would tie into the sharp curve along Headquarters Road located to the southeast of the existing

intersection with Sheep Hole Road (Figure 6). The proposed bridge would consist of a single-span adjacent box beam structure with aesthetic treatments that are context sensitive to the surrounding historic district and rural setting. As part of this alternative, the existing roadway and bridge could be preserved as a pedestrian crossing. Routine inspections and maintenance of the pedestrian crossing would be required.

Existing aerial utility lines cross the downstream floodplain in the vicinity of where Alternative 2 would be constructed. To accommodate this revised roadway and bridge alignment, these existing utilities (electric and telephone/cable) would be relocated. The proposed roadway and bridge alignment would be configured to meet all current PennDOT design criteria. Current substandard design elements such as stopping sight distance, horizontal curve radius, shoulder width, and bridge width would be improved and addressed in this alternative. The intersection with the projection of Sheep Hole Road would be configured to provide adequate turning radii for all emergency vehicles. The estimated construction cost of this alternative is $3,909,590.

Right-of-Way. This option would result in ROW acquisition due to the construction of a new roadway and bridge outside the existing PennDOT ROW. This alternative impacts one parcel (44-14-8) on the north and south sides of the existing roadway; this is within the floodplain, and the parcel contributes to the historic district. In addition to the required ROW for the new roadway and bridge areas, additional ROW would be needed to meet Pennsylvania Department of Environmental Protection (PADEP) Chapter 102 stormwater management regulations. The estimated ROW required for the new roadway is 0.4 acre, and the estimated ROW required for stormwater management facilities is 0.6 acre; this results in a total area of acquisition of 1.0 acre. TCEs are anticipated for the construction of a temporary causeway to construct the new bridge crossing.

Environmental and Cultural Resource Impacts. Construction of a new roadway and bridge would have impacts to the Ridge Valley Rural Historic District. While the existing bridge would be preserved under this alternative, approximately 1.0 acre of land from a contributing resource to the Ridge Valley Rural Historic District (Parcel 44-14-8) would be acquired. This new roadway

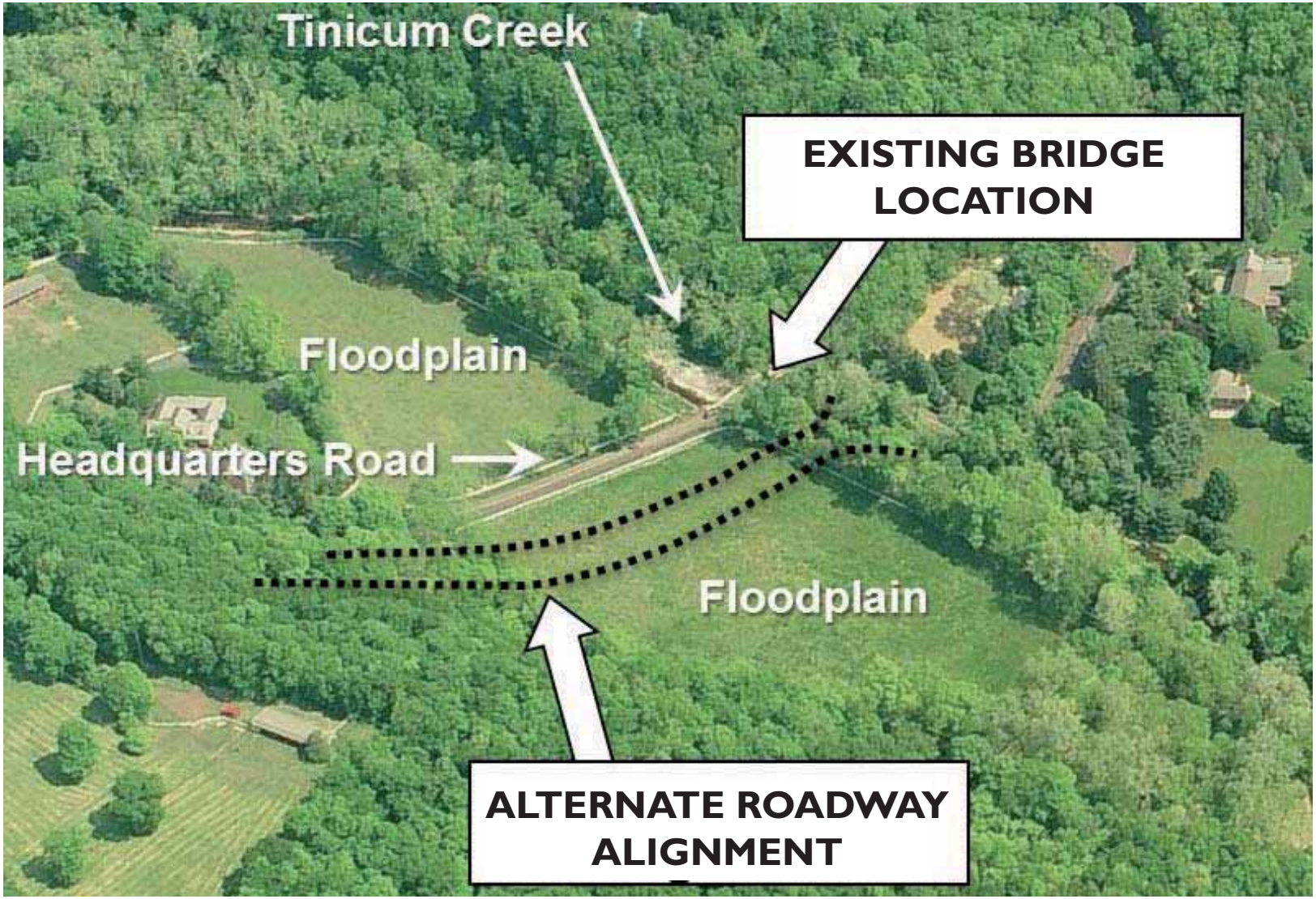


Figure 6

New Alignment Downstream (Alternative 2)

S.R. 1012, Section BRC, Headquarters Road Bridge Project

Tinicum Township, Bucks County, Pennsylvania

alignment is in an area that has not currently been explored for archaeological potential; therefore, this alternative requires additional archeological investigations.

From a hydraulic standpoint, an increase in the 100-year floodplain would be anticipated due to the addition of a new roadway within the floodplain and a second bridge over Tinicum Creek in relatively close proximity to the existing bridge (within 200 feet). Therefore, a Conditional Letter of Map Revision (CLOMR) would likely be required from the Federal Emergency Management Agency (FEMA) for this alternative. Also, due to the close proximity of the two bridges, an increase in streambed scouring is anticipated as a result of this alternative. Therefore, this alternative would have greater impacts to the water quality of Tinicum Creek, which is an exceptional value water.

One-Lane Bridge Alternatives (Alternative 3 and Alternative 5)

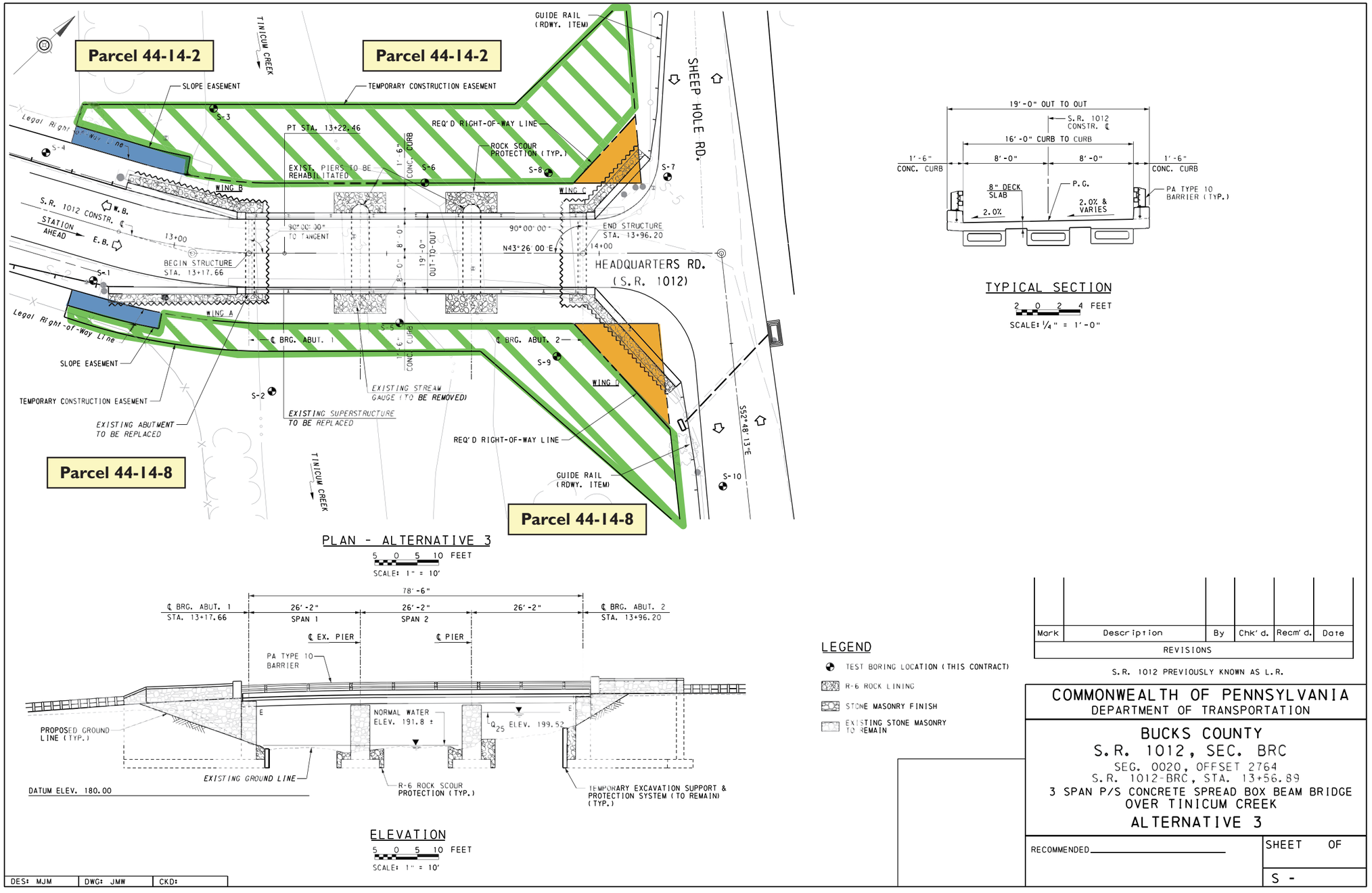
Through the project development, discussions with Section 106 consulting parties, the public, and public officials, a one-lane bridge alternative has been studied to determine if it meets the project needs. Headquarters Road is classified as a Neighborhood Collector Road, according to PennDOT's *Publication 13M, Design Manual, Part 2 (DM-2).* The ADT along this roadway prior to its closure varied from 900 in 2001 to 631 in 2008. PennDOT uses roadway classification and ADT estimates to assess safe roadway and bridge widths. The minimum lane and bridge width for a Neighborhood Collector roadway is 24 feet curb-to-curb. According to American Association of State Highway Transportation Officials (AASHTO) *Guidelines for Geometric Design of Very Low-Volume Roads (ADT<400),* one-lane bridges may be provided on single-lane roads and on two-lane roads with ADT volumes less than 100 vehicles per day when the designer confirms that the one-lane bridge can operate effectively. Given the traffic volumes on Headquarters Road listed above, this design criteria does not apply to this project. AASHTO 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. Given the existing design deficiencies and statistically high crash rates related to these deficiencies, there is a site-specific safety problem. A summary of the reported crashes is included in the *Bridge Width Evaluation,* which is posted to Project Path. According to PennDOT's DM-2, one-lane bridges are considered only if all of the following criteria are met:

- The ADT < 400 (*Note: Headquarters Road ADT exceeds 400.*);
- The road is classified as a Local Road not on the National Highway System (NHS; *Note: Headquarters Road is classified as a Neighborhood Collector Road. It is not on the NHS.*);
- There is no evidence of a site-specific safety problem (*Note: The Headquarters Road Bridge was the site of ten accidents in the ten years prior to its closure. Source: PennDOT Center for Highway Safety, Homogenous Report for State Road Crashes in Years 2002 to 2011.*);
- There are no existing or anticipated significant land use conflicts (*Note: There are no land use conflicts.*); and
- The alignment and sight distance should be carefully studied so that they are not compromised (*Note: The existing alignment has substandard horizontal and vertical curve values and insufficient sight distance*.).

All of the above criteria must be met in order to construct a one-lane bridge. During the transportation development process, two one-lane bridge alternatives were evaluated: Alternative 3 (one-lane bridge superstructure replacement and substructure rehabilitation) and Alternative 5 (one-lane bridge replacement).

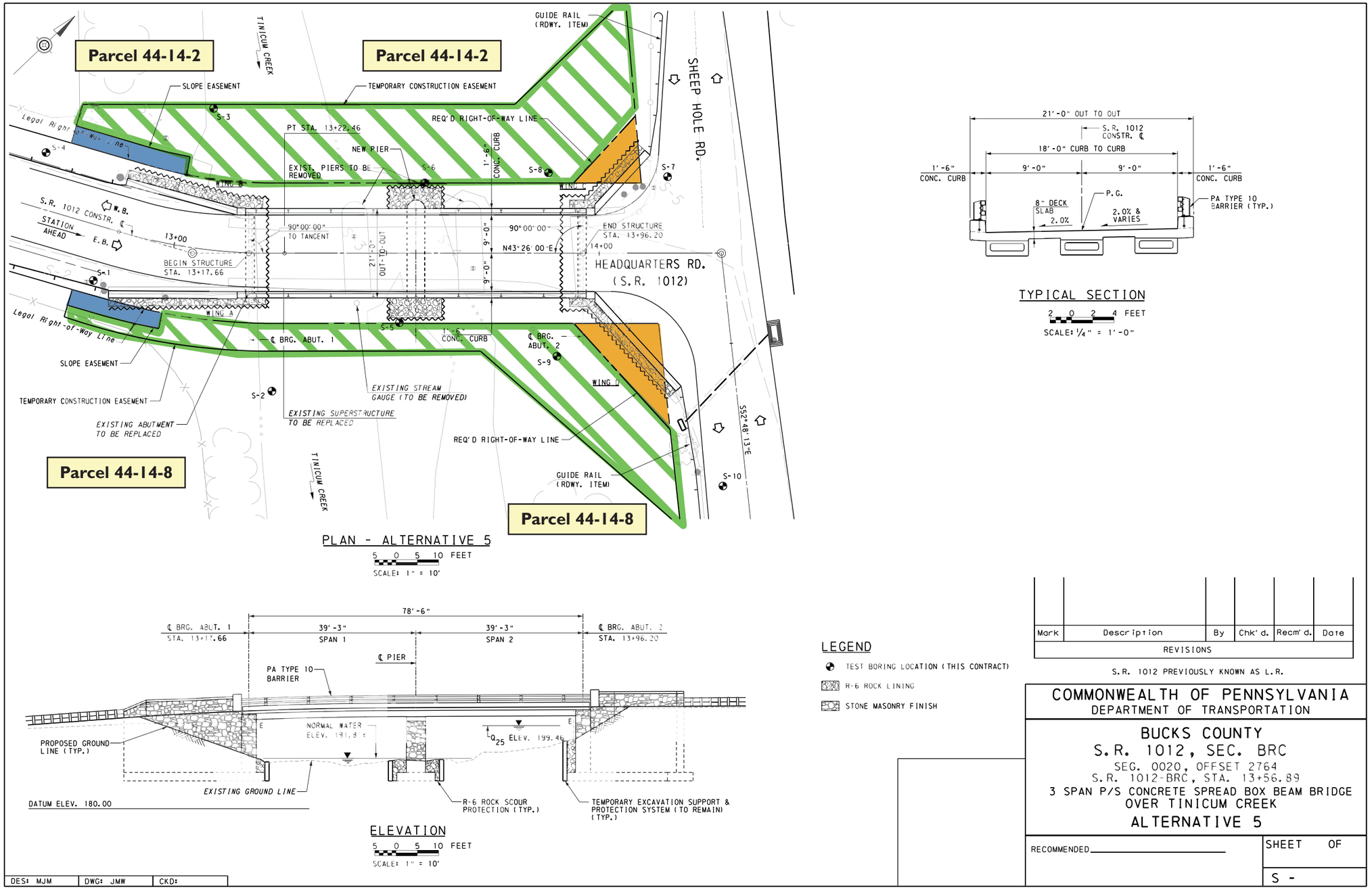
Alternative 3, the one-lane bridge superstructure replacement and substructure rehabilitation, involves the rehabilitation of the existing stone masonry substructure units (piers, abutments, and wing walls) and the construction of a new superstructure. The existing three-span configuration providing one lane of traffic would remain. The new superstructure for Alternative 3 would consist of a single 16-foot lane to match the existing conditions (Figure 7).

Alternative 5, the one-lane bridge replacement, involves the replacement of the substructure units and the construction of a new superstructure. This alternative would provide a single 18-foot lane of traffic, and the three-span configuration would remain (Figure 8).



Required Right-of-Way
Slope Easement
Temporary Construction Easement

Figure 7
One-Lane Bridge Superstructure Replacement and Substructure Rehabilitation (Alternative 3)
S.R. 1012, Section BRC, Headquarters Road Bridge Project
Tinicum Township, Bucks County, Pennsylvania



PLAN - ALTERNATIVE 5

5 0 5 10 FEET

SCALE: 1" = 10'

TYPICAL SECTION

2 0 2 4 FEET

SCALE: 1/4" = 1'-0"

ELEVATION

5 0 5 10 FEET

SCALE: 1" = 10'

LEGEND

- TEST BORING LOCATION (THIS CONTRACT)
- R-6 ROCK LINING
- STONE MASONRY FINISH

Mark	Description	By	Chk'd.	Recm'd.	Date

REVISIONS

S.R. 1012 PREVIOUSLY KNOWN AS L.R.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION

BUCKS COUNTY
S.R. 1012, SEC. BRC
SEG. 0020, OFFSET 2764
S.R. 1012-BRC, STA. 13+56.89
3 SPAN P/S CONCRETE SPREAD BOX BEAM BRIDGE
OVER TINICUM CREEK
ALTERNATIVE 5

RECOMMENDED _____

SHEET OF

S -

DES: MJM | DWG: JMW | CKD:

- Required Right-of-Way
- Slope Easement
- Temporary Construction Easement

Figure 8
One-Lane Bridge Replacement (Alternative 5)
S.R. 1012, Section BRC, Headquarters Road Bridge Project
Tinicum Township, Bucks County, Pennsylvania

Right-of-Way. The ROW acquisition for both Alternative 3 and Alternative 5 is limited to permanent ROW acquisition from Parcel 44-14-2 where Wing Wall C would be reconstructed with a taper and from Parcel 44-14-8 where Wing Wall D currently extends beyond the existing ROW (Figures 7 and 8). Total required ROW of 0.003 acre (or 0.02 percent) of the 15.42-acre 44-14-2 parcel and 0.006 acre (or 0.09 percent) of the 6.98-acre 44-14-8 parcel is necessary for this work. TCEs within the contributing resource parcels are 0.042 acre, and the anticipated area of slope easement within the contributing resource parcels is 0.005 acre. The slope easement occurs on the western approach in both the northwest and southwest quadrants.

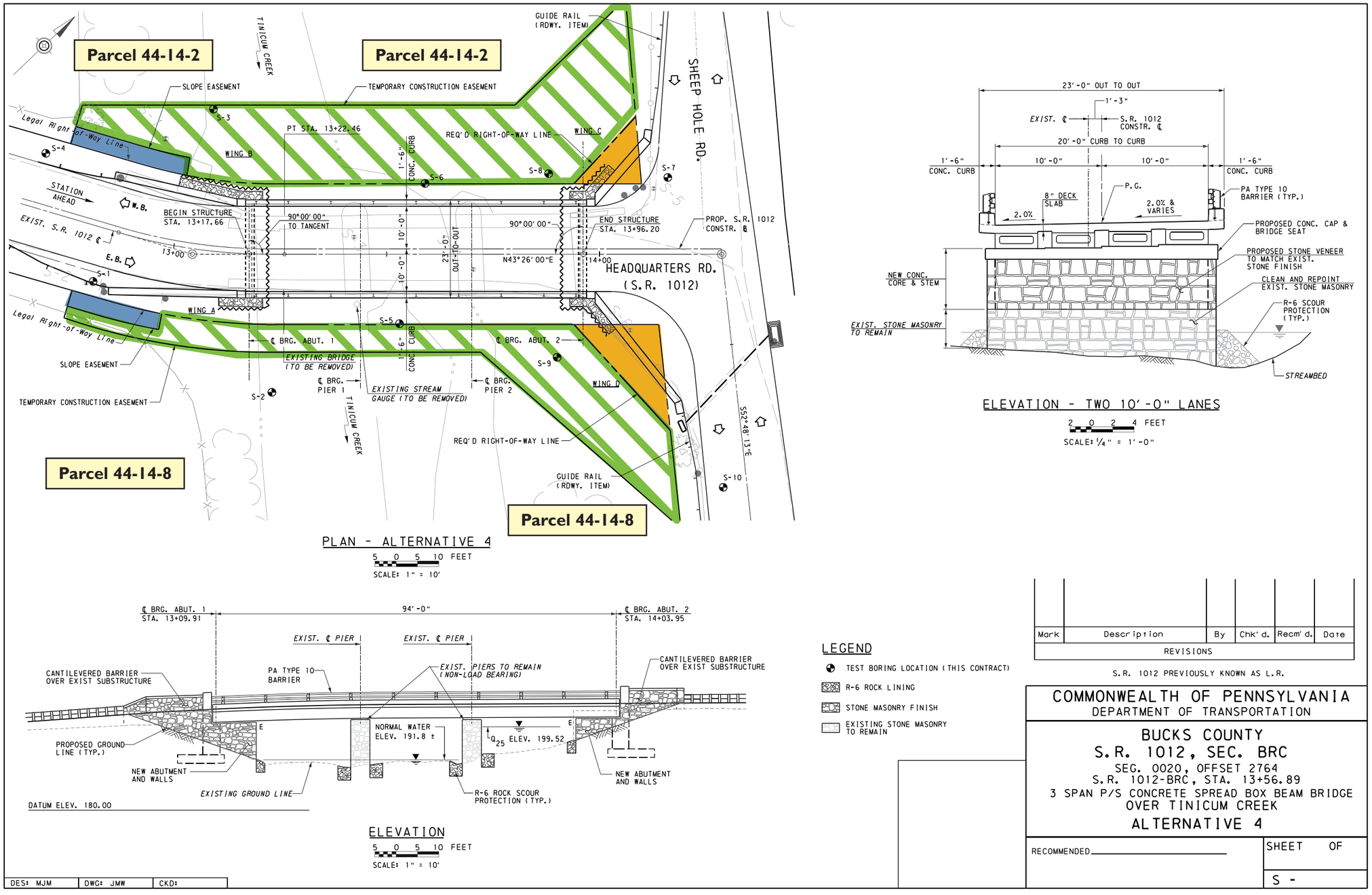
Environmental and Cultural Resource Impacts. Extensive reconstruction of the existing substructure units occurs with Alternative 3, and as such, in-stream work is anticipated. In-stream work associated with Alternative 5 involves demolition of the existing substructure elements, construction of new abutments, and construction of a center pier.

To document that the one-lane bridge does not adequately address the project purpose and need, Urban Engineers prepared a *Bridge Width Evaluation* memo, which is included on Project Path. In a letter dated June 16, 2015, the Federal Highway Administration (FHWA) agreed with the determination outlined in the *Bridge Width Evaluation* that a single-lane bridge would not meet the project's purpose and need.

Two-Lane Superstructure Replacement and Substructure Rehabilitation (Alternative 4)

The superstructure replacement and substructure rehabilitation alternative considers the rehabilitation of the existing stone masonry substructure units (piers, abutments, and wing walls) and the construction of a new superstructure. This alternative features a two-lane superstructure with 10-foot travel lanes (Figure 9).

Although the existing superstructure consists of concrete-encased steel stringers supporting a concrete deck slab, the in-kind replacement of the superstructure is not recommended since corrosion of the encased steel beam is inevitable. Also, concrete encasement of the beams prevents inspection of the underlying main structural framing members. Therefore, the proposed



Required Right-of-Way
Slope Easement
Temporary Construction Easement

Figure 9
Two-Lane Superstructure Replacement and Substructure Rehabilitation (Alternative 4)
S.R. 1012, Section BRC, Headquarters Road Bridge Project
Tinicum Township, Bucks County, Pennsylvania

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superstructure for this alternative would consist of durable prestressed concrete beams. Prestressed concrete box beams or prestressed concrete T-beams are efficient and cost-effective options that provide the same visual appearance as the existing superstructure (considering both beam fascias have an exposed concrete finish).

The existing three-span configuration with two piers in Tinicum Creek would remain with this alternative. Given that the majority of the deterioration in the piers is concentrated in the upper rubble masonry, replacement of the upper portions of both of the piers is recommended. Low pressure grouting would be utilized to fill the voids between internal stone courses. The pier rehabilitation would require the addition of reinforcement steel to provide confinement, ductility, and resistance to the applied lateral forces (i.e., stream flow, braking, and thermal forces). This would require drilling holes into the piers at uniform intervals (approximately 18 inches in both vertical and horizontal planes), then filling the pockets with non-shrink grout. This coring has the potential to disturb existing stone courses and leave an unaesthetic grid pattern in the original stone. The lower portions of the piers would remain and would be cleaned and repointed. In order to anchor the new superstructure to the substructure, a new 2-foot thick bridge seat/pier cap would be part of the rehabilitation alternatives.

The new two-lane superstructure would feature a concrete curb with a crash-worthy open steel tubular railing that provides clear sight lines to Tinicum Creek. This superstructure replacement and substructure rehabilitation alternative utilizes two 10-foot travel lanes and spans 20 feet curb-to-curb. Preliminary Turning Radius studies were performed for a 20-foot wide curb-to-curb superstructure width to confirm if this bridge width can accommodate the turning movements of Tinicum Township's largest fire truck. Dimensions of the vehicle (wheel base, axle spacing, width, and length) were entered into AutoTurn 9.0 swept path analysis software to determine the suitability of the bridge width for this design vehicle. All movements to and from the bridge were analyzed. The eastbound movements of the fire truck making the right hand turn onto Headquarters Road will need to veer into the lane of on-coming traffic to make this turning movement. This will require a design exception. Also, a fire truck making a right hand turn from southbound Sheep Hole Road onto westbound Headquarters Road will also need to veer into on-coming traffic. This movement is also very tight given the rock face on the east side of the T-

intersection. As a result, multiple movements may be required to avoid impacting the abutment and wing walls.

Due to the roadway classification and anticipated traffic volume on the bridge, PennDOT's DM-2 requires a roadway and bridge width of 24 feet, curb-to-curb. This alternative does not meet this criterion.

The estimated construction cost of this alternative is $1,917,717. This cost estimate does not account for the life cycle costs associated with this alternative. Continual maintenance of the stone masonry is required to prevent continued mechanical weathering of the original stone material. Mechanical weathering is the breaking down of stone through direct contact with atmospheric conditions, such as water, ice, and pressure. In stone masonry, water seeps into cracks in the base material. When it freezes, it expands and forms a wedge that widens the crack until it eventually splits. When the ice melts, the water assists in erosion by carrying away the tiny rock fragments lost in the splitting process. This process can gradually cause the failure of stone masonry units.

Right-of-Way. This alternative is limited to permanent ROW acquisition to Parcel 44-14-2 where Wing Wall C would be reconstructed with a taper and where Wing Wall D currently extends beyond the existing ROW into Parcel 44-14-8 (Figure 6). Total required ROW of 0.003 acre (or 0.02 percent) of the 15.42-acre 44-14-2 parcel and 0.006 acre (or 0.09 percent) of the 6.98-acre 44-14-8 parcel is necessary for this work. The TCE within the parcels that contributes to the historic district is 0.042 acre, and the anticipated area of slope easement within the parcels that contributes to the historic district is 0.005 acre. The slope easement occurs on the western approach in both the northwest and southwest quadrant.

To create a work area for the required stone masonry pier reconstruction and restoration, reconstruction of the proposed abutments, and installation of scour countermeasures, the areas around the piers and abutments would need to be dewatered by temporarily diverting flows through a series of flume pipes. A temporary causeway would also be required to provide access for construction equipment to the project site. To facilitate these operations, TCEs would be

required. Figure 6 shows the estimated areas of TCEs for the rehabilitation options, which for all options equates to approximately 0.042 acre.

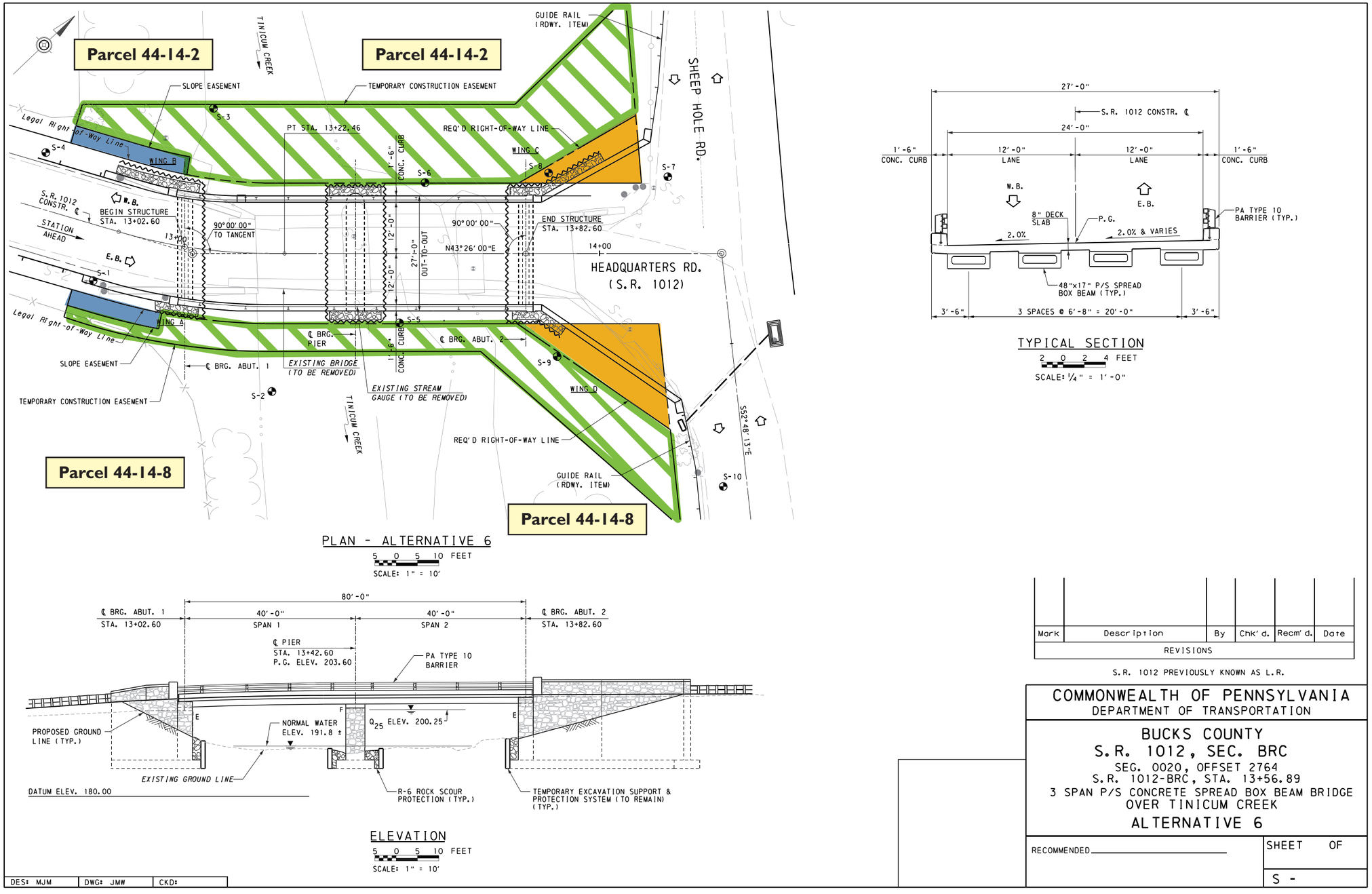
Environmental and Cultural Resource Impacts. This alternative requires ROW from the southeast and northeast quadrants for the wing wall reconstruction; a total of 0.009 acre is necessary for this work. A TCE of 0.042 acre is needed within the Ridge Valley Rural Historic District. This alternative will have an adverse effect to the Ridge Valley Rural Historic District, as it would result in the physical destruction of a contributing resource (36 CFR § 800.5(a)(2)(i)). The drilling and grouting of holes in the existing piers and the fact that a large percentage of the original stone masonry on the abutments would be removed and replaced will have an adverse effect determination on the Ridge Valley Rural Historic District.

Extensive reconstruction of the existing substructure units occurs with this alternative, and as such, in-stream work is anticipated. This in-stream work would include temporary stream diversions and the dewatering of the areas around the existing substructure units to provide a safe work area and to facilitate the installation of scour countermeasures. These countermeasures would likely include the construction of rip-rap around the abutments and piers.

Two-Lane Bridge Replacement (Alternative 6)

The bridge replacement alternative (Alternative 6) consists of a full replacement of the existing structure with a new, two-lane superstructure supported on a reinforced concrete substructure (Figure 10). Alternative 6 uses two 12-foot travel lanes for a 24-foot curb-to-curb width.

Although the existing bridge has two pier obstructions in the channel, per PA Code Chapter 105, a new bridge should minimize the use of obstructions in the waterway. PADEP Chapter 105-Dam Safety and Waterway Management regulations require that a waterway obstruction or encroachment be designed as to "minimize the adverse impact…upon the environment and protect the public natural resources of this commonwealth" (§ 105.14.[7]). Multiple piers in the channel are not needed from a structural standpoint, and multiple piers create unneeded waterway obstructions that can accumulate debris during high flood events and create scour



PLAN - ALTERNATIVE 6

5 0 5 10 FEET

SCALE: 1" = 10'

TYPICAL SECTION

2 0 2 4 FEET

SCALE: 1/4" = 1'-0"

ELEVATION

5 0 5 10 FEET

SCALE: 1" = 10'

Mark	Description	By	Chk'd.	Recm'd.	Date

REVISIONS

S.R. 1012 PREVIOUSLY KNOWN AS L.R.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION

BUCKS COUNTY
S.R. 1012, SEC. BRC
SEG. 0020, OFFSET 2764
S.R. 1012-BRC, STA. 13+56.89
3 SPAN P/S CONCRETE SPREAD BOX BEAM BRIDGE
OVER TINICUM CREEK
ALTERNATIVE 6

RECOMMENDED _____

SHEET OF

S -

DES: MJM | DWG: JMW | CKD:

Required Right-of-Way
Slope Easement
Temporary Construction Easement

Figure 10
Two-Lane Bridge Replacement (Alternative 6)
S.R. 1012, Section BRC, Headquarters Road Bridge Project
Tinicum Township, Bucks County, Pennsylvania

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issues. The two existing piers would be removed, and the bridge replacement alternative would construct one pier with a reinforced concrete stem and footing with a stone façade that does not carry structural loads. For scour protection, the pier would be founded on a spread footing notched 3 feet into bedrock. Rip-rap stone lining would be installed around the pier's perimeter as an additional scour countermeasure. The replacement pier would be slightly longer than the existing condition to accommodate a wider superstructure.

The waterway opening would be shifted to the west by approximately 15 feet (Figure 10). This would permit the location of the new center pier to coincide with the location of the existing west pier, thus minimizing the disturbance of streambed material during construction. This would also permit the proposed western abutment to be located at the existing bank of Tinicum Creek, which has experienced significant meandering since its original construction in the nineteenth century. This approach would also greatly improve the turning movements to and from the bridge onto Sheep Hole Road. The abutments would be configured to accommodate the proposed superstructure width. The abutments would have a rip-rap stone lining around their perimeter as a scour countermeasure.

There are no utility impacts with this alternative. Although a replacement bridge would be configured to improve the horizontal curve radius, the approach grades, and vertical curve length (to improve sight distance), these items would still require a design exception since they cannot meet the current standards. The estimated construction cost of the replacement alternative is $2,388,690. The replacement alternative would require less overall maintenance costs than the superstructure replacement and substructure rehabilitation alternative.

Right-of-Way. The ROW acquisitions for the replacement alternative are similar to the superstructure replacement and substructure rehabilitation alternative. Alternative 6 requires ROW from Parcels 44-14-2 and 44-14-8. Permanent ROW acquisition for Alternative 6 would be limited to Parcel 44-14-2 where Wing Wall C would be reconstructed with a taper, and where Wing Wall D currently encroaches beyond the existing ROW within Parcel 44-14-8 (Figure 9). Total required ROW of 0.005 acre (or 0.03 percent) of the 15.42-acre 44-14-2 parcel and 0.009

acre (or 0.13 percent) of the 6.98-acre 44-14-8 parcel is necessary for this work. The TCE within the parcels that contribute to the historic district is 0.042 acre, and the anticipated area of slope easement within the parcels that contribute to the historic district is 0.005 acre. The slope easement occurs on the western approach in both the northwest and southwest quadrant.

Removal of the existing substructure elements, construction of the new abutments and a center pier, as well as installation of scour countermeasures, would require dewatering of the work area by temporarily diverting flows through a series of flume pipes. A temporary causeway would also be required to provide access for construction equipment to the project site. To facilitate these operations, TCEs would be required, which equate to approximately 0.042 acre of the Ridge Valley Rural Historic District, including the adjoining contributing parcels.

Environmental and Cultural Resource Impacts. The replacement alternative requires ROW from the southeast and northeast quadrants for the wing wall reconstruction; a total of 0.014 acre is necessary for this work in Alternative 6. A TCE of 0.042 acre would be within the Ridge Valley Rural Historic District.

In-stream work involves demolition of the existing substructure elements, construction of new abutments, and construction of a center pier. The proposed approach to remove the two existing piers and replace them with one center pier improves water flow, which is required by PADEP per Chapter 105 regulations. This in-stream work would include temporary stream diversions and the dewatering of the areas around the existing substructure units to provide a safe work area and to facilitate the construction of the new pier and abutments. This alternative also involves the installation of rip-rap stone scour countermeasures. While the temporary environmental impacts may be more than for the rehabilitation alternative, the permanent condition is a benefit to the hydraulics of Tinicum Creek.

Two-Lane Bridge Replacement with Narrower Typical Section (Alternative 6A)

While the typical section associated with Alternative 6 includes a 24-foot travel corridor (two 12-foot lanes) and a total 27-foot out-to-out width, the reduction of the travel corridor to accommodate two 10-foot lanes instead of 12-foot lanes was evaluated as part of Alternative 6A

(Figure 11). This alternative proposes to replace the bridge as described in Alternative 6; however, the travel lanes are reduced to 10-foot travel lanes and a total 23-foot out-to-out width.

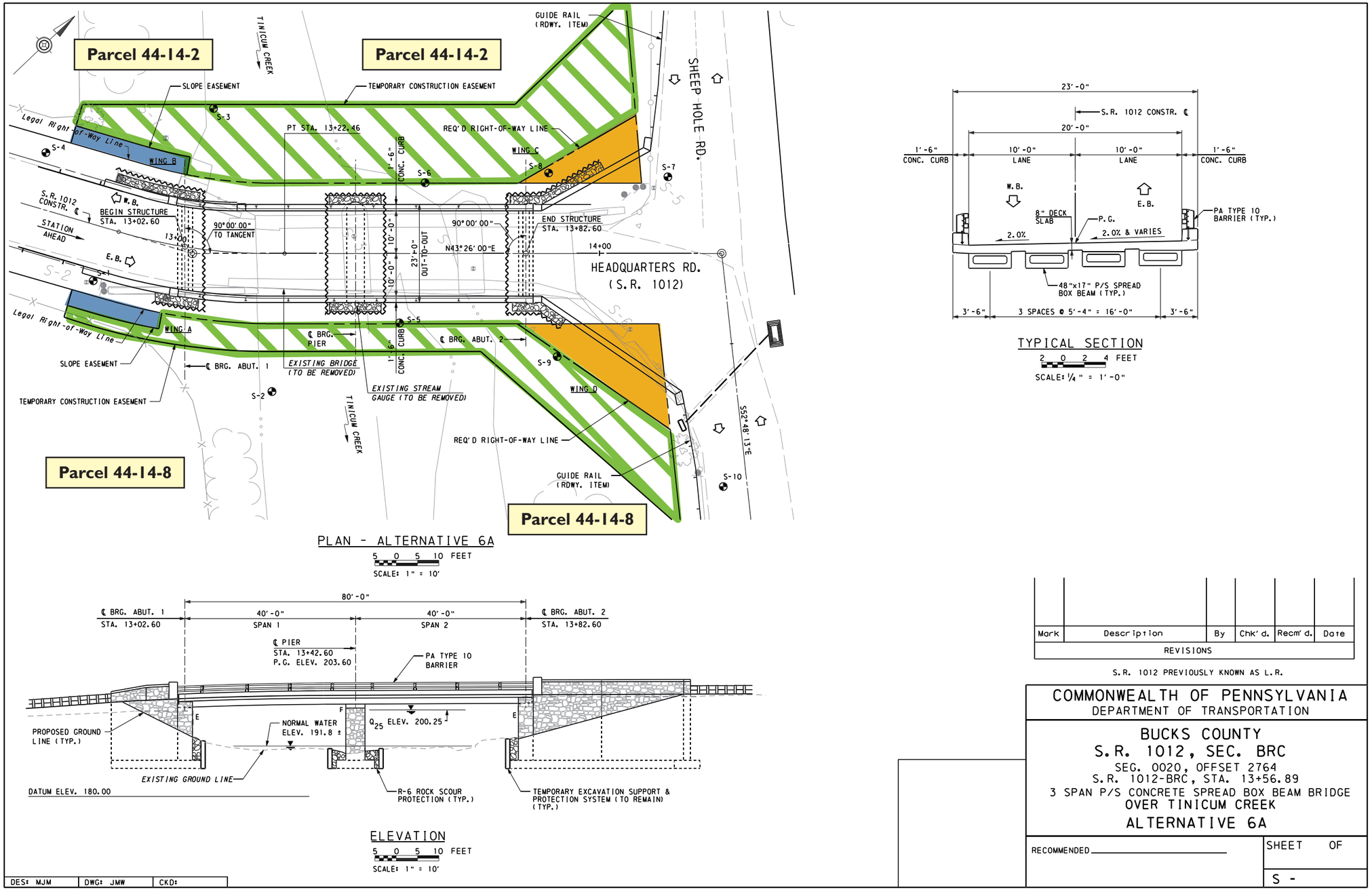
While this appears to be a reasonable option to minimize impact to the Ridge Valley Rural Historic District, due to the roadway classification and anticipated traffic volume on the bridge, PennDOT's DM-2 requires a roadway and bridge width of 24 feet, curb-to-curb.

Two-Lane Bridge Replacement over Existing Substructure (Alternatives 6B and 6C)

In an effort to minimize impacts to the contributing parcels adjacent to the bridge, two options were evaluated to replace the bridge over the existing substructure elements (Alternative 6B and Alternative 6C). Both of these alternatives replace the existing superstructure. The estimated construction cost for Alternative 6B is $2,504,470 and for Alternative 6C is $2,436,695.

For Alternative 6B, new abutments would be constructed behind the existing abutments to carry all loads from a new two-lane superstructure; this option preserves the existing substructure elements (Figure 12). The existing substructure units would be for aesthetic purposes only and would not carry any superstructure dead loads or live loads. By moving the abutments back, the required bridge span length would be increased to 94 feet. Alternative 6C considers the replacement of the existing abutments and wing walls and preservation of the existing piers (Figure 13). The existing superstructure would be replaced with a new two-lane superstructure. The existing piers would remain in the channel for aesthetic purposes only. By no longer using the piers as structural support, the bridge span length would be 78 feet 6 inches.

Alternative 6B has a longer span length (90 feet) that results in a deeper superstructure, which raises the roadway vertical profile or lowers the bridge's low chord (bottom of beam), or a combination of the two. The raising of the roadway's vertical profile would involve impacts to the adjacent floodplain on the west (Ottsville) side of the bridge; this is discouraged by PADEP Chapter 105 - Dam Safety and Waterway Management regulations. In addition, lowering the low chord could have a negative impact to the stream hydraulics as it would reduce the hydraulic opening of the structure. For both Alternatives 6B and 6C, the anticipated beam depth for these



TYPICAL SECTION

2 0 2 4 FEET

SCALE: 1/4" = 1'-0"

Mark	Description	By	Chk'd.	Recm'd.	Date

REVISIONS

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DEPARTMENT OF TRANSPORTATION

BUCKS COUNTY
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3 SPAN P/S CONCRETE SPREAD BOX BEAM BRIDGE
OVER TINICUM CREEK
ALTERNATIVE 6A

RECOMMENDED _____

SHEET OF

S -

- Required Right-of-Way
- Slope Easement
- Temporary Construction Easement

Figure 11
Two-Lane Bridge Replacement with Narrower Typical Section (Alternative 6A)
S.R. 1012, Section BRC, Headquarters Road Bridge Project
Tinicum Township, Bucks County, Pennsylvania

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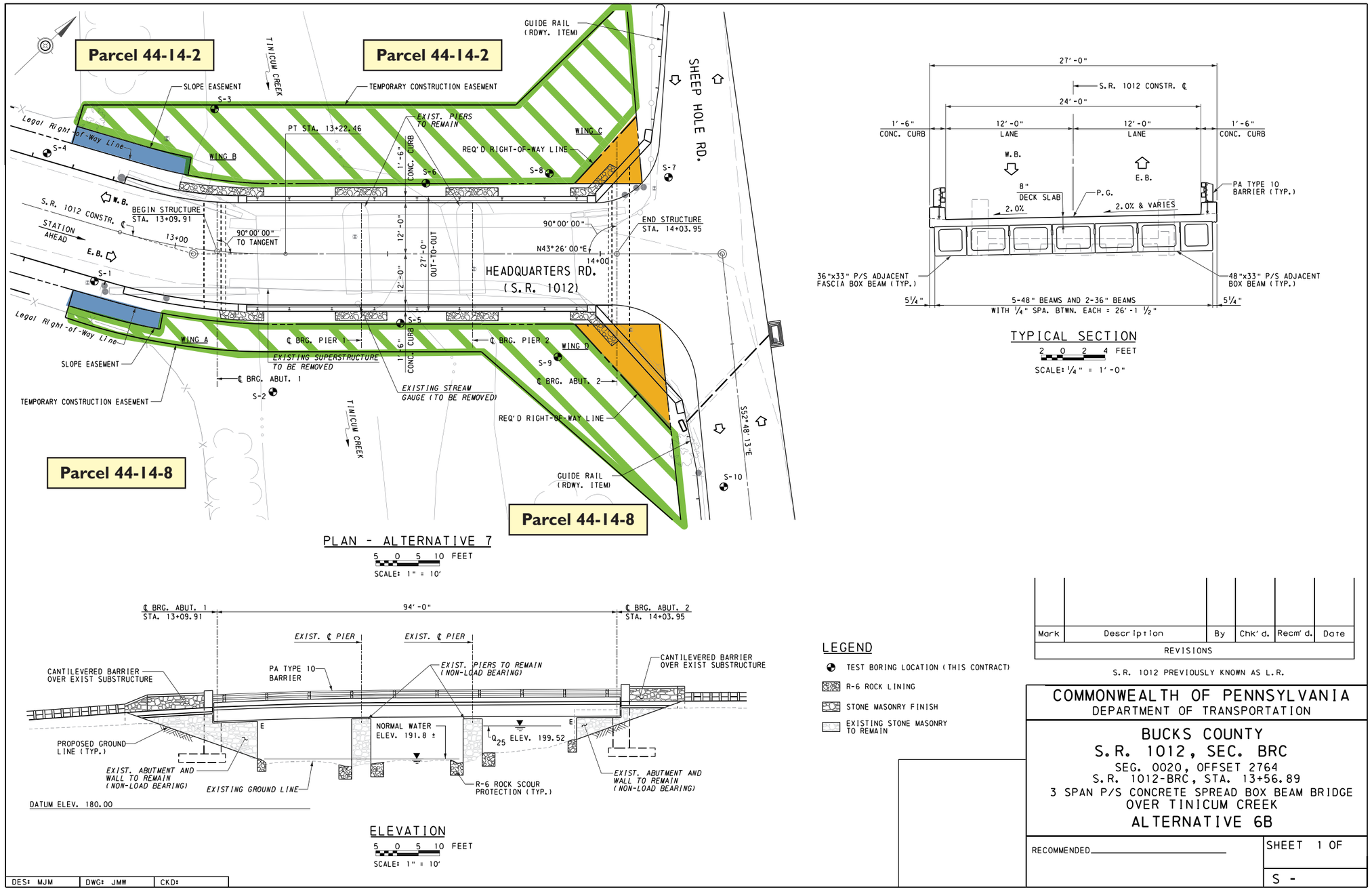

PLAN - ALTERNATIVE 7

5 0 5 10 FEET

SCALE: 1" = 10'

TYPICAL SECTION

2 0 2 4 FEET

SCALE: ¼" = 1'-0"

ELEVATION

5 0 5 10 FEET

SCALE: 1" = 10'

LEGEND

- TEST BORING LOCATION (THIS CONTRACT)
- R-6 ROCK LINING
- STONE MASONRY FINISH
- EXISTING STONE MASONRY TO REMAIN

Mark	Description	By	Chk'd.	Recm'd.	Date
	REVISIONS				

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DEPARTMENT OF TRANSPORTATION

BUCKS COUNTY
S.R. 1012, SEC. BRC
SEG. 0020, OFFSET 2764
S.R. 1012-BRC, STA. 13+56.89
3 SPAN P/S CONCRETE SPREAD BOX BEAM BRIDGE OVER TINICUM CREEK
ALTERNATIVE 6B

RECOMMENDED _____

SHEET 1 OF

S -

DES: MJM | DWG: JMW | CKD:

Required Right-of-Way
Slope Easement
Temporary Construction Easement

Figure 12
Two-Lane Bridge Replacement over Existing Superstructure (Alternative 6B)
S.R. 1012, Section BRC, Headquarters Road Bridge Project
Tinicum Township, Bucks County, Pennsylvania

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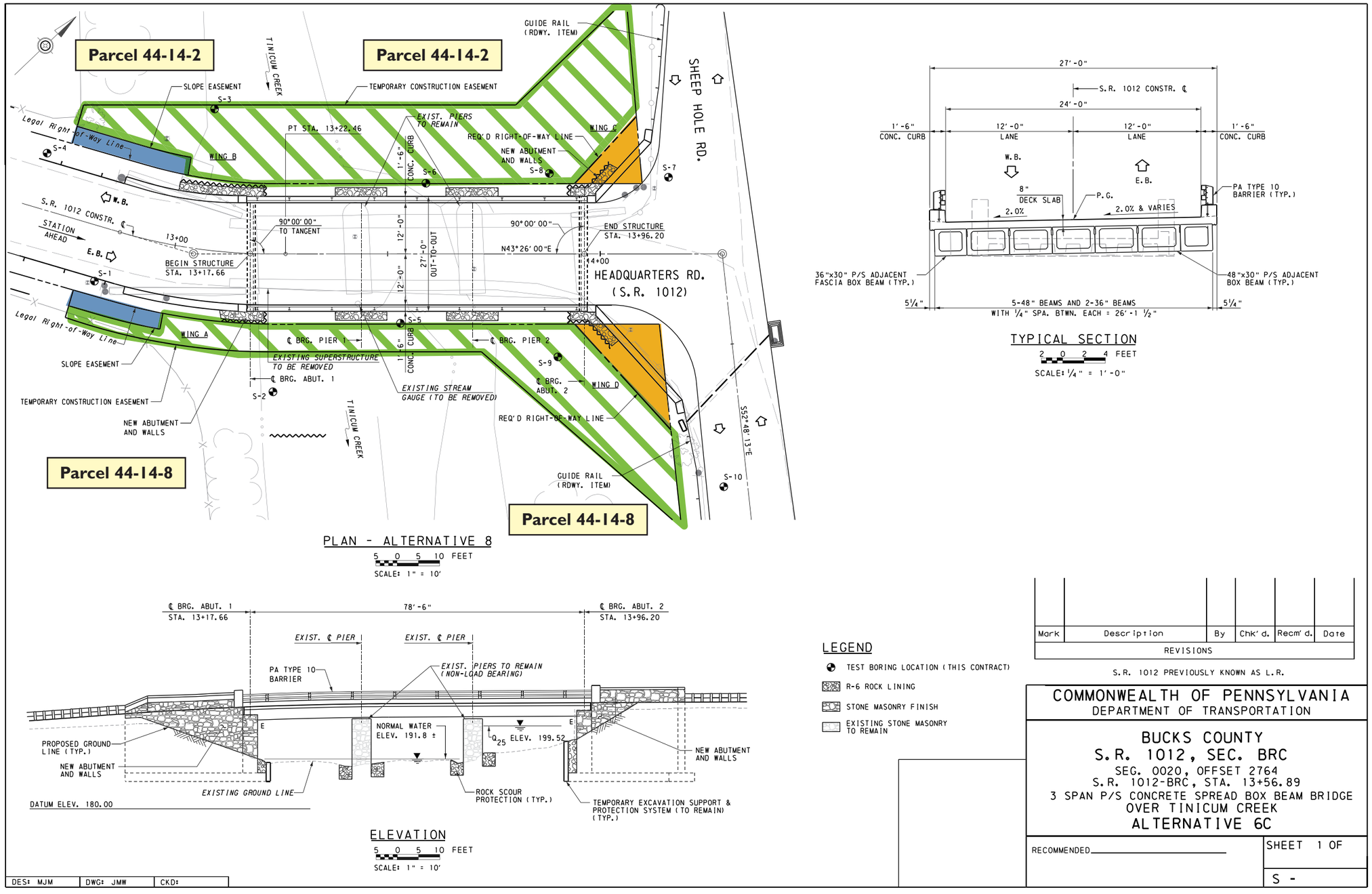

PLAN - ALTERNATIVE 8

5 0 5 10 FEET

SCALE: 1" = 10'

TYPICAL SECTION

2 0 2 4 FEET

SCALE: ¼" = 1'-0"

ELEVATION

5 0 5 10 FEET

SCALE: 1" = 10'

LEGEND

- TEST BORING LOCATION (THIS CONTRACT)
- R-6 ROCK LINING
- STONE MASONRY FINISH
- EXISTING STONE MASONRY TO REMAIN

Mark	Description	By	Chk'd.	Recm'd.	Date

REVISIONS

S.R. 1012 PREVIOUSLY KNOWN AS L.R.

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3 SPAN P/S CONCRETE SPREAD BOX BEAM BRIDGE
OVER TINICUM CREEK
ALTERNATIVE 6C

RECOMMENDED _____

SHEET 1 OF

S -

DES: MJM | DWG: JMW | CKD:

- Required Right-of-Way
- Slope Easement
- Temporary Construction Easement

Figure 13
Two-Lane Bridge Replacement over Existing Superstructure (Alternative 6C)
S.R. 1012, Section BRC, Headquarters Road Bridge Project
Tinicum Township, Bucks County, Pennsylvania

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spans using adjacent box beams is 33 inches and 30 inches, respectively, as opposed to the anticipated beam depth for spread box beams needed for a two-span option, which would be 17 inches. A deeper superstructure would require a raised roadway vertical profile, the lowering of the low chord, or a combination of the two. Furthermore, a clearance gap between the proposed bottom of the new beam at the existing pier of approximately 3 inches will be required to ensure that loads from the superstructure are not applied to the original stone piers.

Right-of-Way. Alternatives 6B and 6C reduce the amount of ROW needed compared to Alternative 6. Total required ROW of 0.003 acre (or 0.02 percent) of the 15.42-acre 44-14-2 parcel and 0.006 acre (or 0.09 percent) of the 6.98-acre 44-14-8 parcel is necessary for this work. Similar to the other alternatives studied, construction of the new abutment seats, as well as installation of scour countermeasures around abutments, would require dewatering the work area by temporarily diverting flows through a series of flume pipes. A temporary causeway would also be required to provide access for construction equipment to the project site. TCEs would be required to facilitate these operations, which equate to approximately 0.042 acre.

4.0 Project Description

4.0 PROJECT DESCRIPTION

Section 3.0 outlines the various alternatives that were evaluated for this project. The preferred alternative involves the replacement of the existing structure with a new, two-lane superstructure supported on a reinforced concrete substructure, which meets current PennDOT and AASHTO design and safety standards. The existing Headquarters Road Bridge is an approximately 78-foot long, three-span bridge with a 16-foot curb-to-curb width. The proposed new bridge will carry two 12-foot travel lanes (one in each direction), for a required minimum curb-to-curb width of 24 feet and two spans.

Existing Substandard Geometric Conditions

Safety issues associated with the existing roadway configuration and bridge are listed below that, if maintained, would require design exceptions. Many of the alternatives are not able to fully address these existing substandard criteria. These substandard geometric conditions must be considered when evaluating the service life and safety benefits of the alternatives explored during preliminary engineering.

- *Sight Distance* – At the west approach to the structure, the existing Stopping Sight Distance (SSD) is 162 feet, and the Headlight Sight Distance (HLSD) is 63 feet. For this roadway classification and speed limit, the required SSD and HLSD is 200 feet.
- *Approach Grades* – The existing roadway approach grade at the west end of the bridge (Ottsville side) of 12.3 percent exceeds the maximum allowable grade, which is 9 percent for a Rural Collector roadway with a 30 mile per hour design speed in "rolling" terrain.
- *Horizontal Curve* – The existing Headquarters Road has a horizontal curve on the west approach to the bridge. The radius of that curve is 125 feet. For this roadway classification and speed limit, the minimum required horizontal curve radius is 231 feet.
- *Turning Radius* – Preliminary Turning Radius studies using AutoTurn 9.0 software were performed for a one-lane, 16-foot wide (curb-to-curb) superstructure width to confirm if the bridge width can accommodate the turning movements of Tinicum Township's largest fire response vehicle, a 41.5-foot ladder truck. It was found that this bridge width cannot suitably accommodate the ladder trucks of the local fire departments. The turning

radius study also shows that even with the construction of a two-lane bridge, the ladder truck will need to encroach upon the opposing traffic lane to maneuver through the intersection. Therefore, a design exception will be required for this condition.

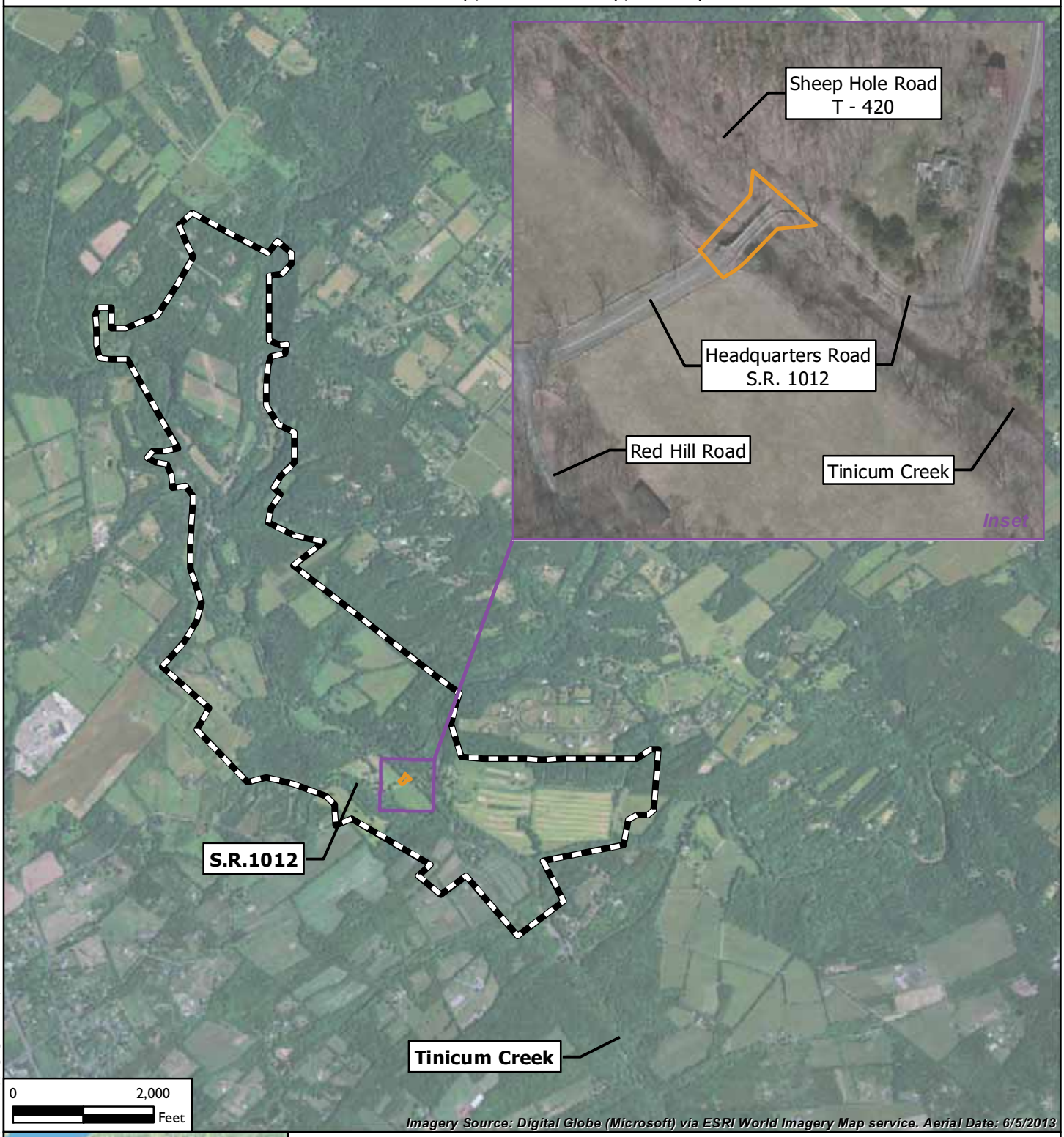
5.0 The Area of Potential Effects

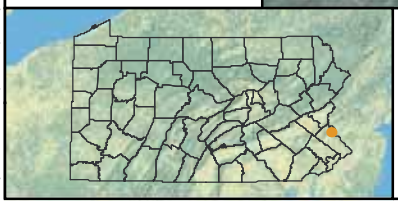
5.0 THE AREA OF POTENTIAL EFFECTS

The APE is defined as "the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist" (36 CFR Part 800.16[d], 2004).

The Headquarters Road over Tinicum Creek Bridge Replacement project APE is irregular in shape. It includes the bridge and approximately 35 feet along the southwest approach and approximately 60 feet along the northeast approach following Headquarters Road. The APE also extends approximately 45 feet along Sheep Hole Road. The APE also extends approximately 30 feet upstream and approximately 20 feet downstream from the bridge. The entire APE for the Headquarters Road Bridge Replacement project is located within the Ridge Valley Rural Historic District (Figure 14). Photographs of the project area are included in Appendix A.

Figure 14
Area of Potential Effects Map
S.R. 1012, Section BRC
Headquarters Road Bridge Project
Tinicum Township, Bucks County, Pennsylvania





Ridge Valley Rural Historic District
Area of Potential Effects

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6.0 Description of Historic Properties

6.0 DESCRIPTION OF HISTORIC PROPERTIES

6.1 Ridge Valley Rural Historic District

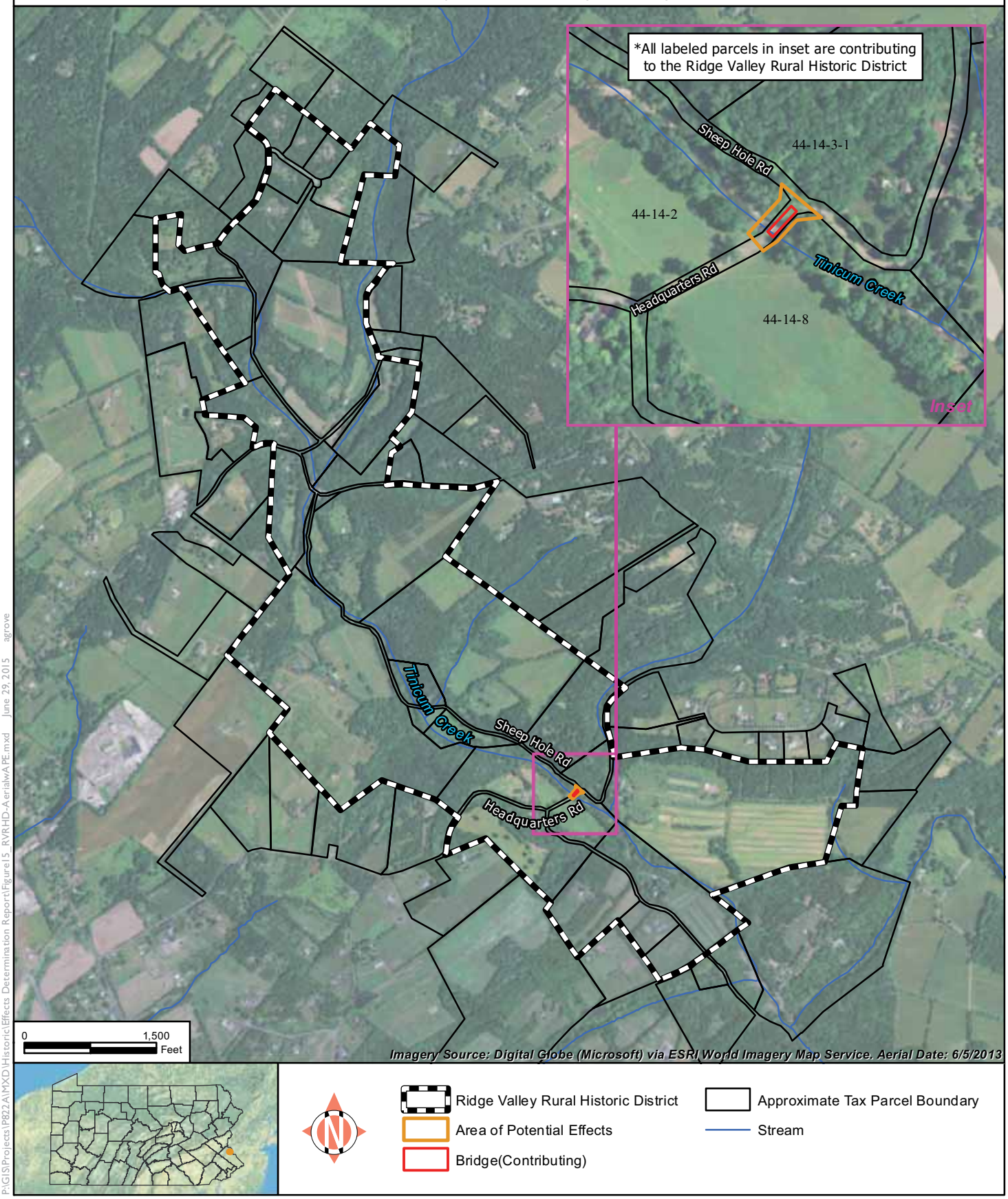
The Ridge Valley Rural Historic District was listed on the National Register of Historic Places (National Register) on July 24, 1992, under Criterion A in the area of agriculture as an example of farming in a small stream valley in Bucks County (Figure 15). It is also listed under Criterion C in the area of architecture as it contains representative examples of rural vernacular architecture in southeast Pennsylvania that date to the late-eighteenth through early-twentieth centuries. The district is comprised of modest farms (including their concentration of rural vernacular dwellings and associated outbuildings) along Tinicum Creek and its tributaries, the rolling topography, and its fields, meadows, wetlands, and woodland that provide a setting to the buildings, structures, and sites that comprise the district. The district contains approximately 575 acres of land in Tinicum Township and contains a total of 77 resources: 67 are contributing, and 10 are non-contributing (Reynolds 1992). The National Register nomination form can be downloaded from Pennsylvania Historical and Museum Commission's (PHMC's) Cultural Resources Geographic Information System (CRGIS) website.

The Headquarters Road Bridge (Bridge No. 286) is a contributing element to the district (Photographs 2 and 3). In an April 28, 2006 letter, the United States Department of the Interior's Keeper of the National Register stated the following:

> The Headquarters Road Bridge was listed in the National Register of Historic Places on July 24, 1992, as a contributing property to the Ridge Valley Rural Historic District, Bucks County, Pennsylvania. The bridge consists of early 19th century stone abutments and piers carrying an early 20th century replacement concrete deck supported on concrete-encased steel I-beams. Both its original construction and alternation occurred within the historic district's defined Period of Significance (1790-1940). The bridge is historically significant in the context of the development of the township, regional transportation, and the operation of local mills, and is of engineering significance both for its early 19th century construction and its sensitive modernization in 1919. Although the concrete deck shows signs of considerable deterioration and the deck has been altered with the removal of the 1919 railings, the bridge retains sufficient historic integrity to continue to contribute to the Ridge Valley Rural Historic District.

Figure 15
Ridge Valley Rural Historic District

S.R. 1012, Section BRC
Headquarters Road Bridge Project
Tinicum Township, Bucks County, Pennsylvania



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The adjoining tax parcels to the bridge (Parcel No. 44-14-2 and Parcel No. 44-14-8) are contributing elements to the district (Figure 16; Photographs 7 and 9, respectively). The parcel on the east side of Sheep Hole Road (Parcel 44-14-3-1) is also a contributing element to the district (Photograph 12, background). Photographs of the bridge, the contributing parcels, and the general project area are provided in Appendix B.

Photograph Location

Area of Potential Effects

Approximate Tax Parcel Boundary

*All labeled parcels are contributing to the Ridge Valley Rural Historic District

Figure 16
Headquarters Road Bridge Photograph Location Map
S.R. 1012, Section BRC
Headquarters Road Bridge Project
Tinicum Township, Bucks County, Pennsylvania

P:\GIS\Projects\P822A\MXD\Historic\Effects Determination Report\Figure16_PhotoLocMap.mxd September 28, 2015 mrodenberger

7.0 Status of Archaeology

7.0 STATUS OF ARCHAEOLOGY

A Phase IA Archaeological Letter Report summarizing the findings of the investigation was prepared and submitted to PennDOT District 6-0 for review on July 19, 2005. PennDOT's Qualified Cultural Resources Specialist concurred with the findings of this report on July 21, 2005. The following is a summary of that report:

On June 13, 2005, A.D. Marble & Company conducted a Phase IA geomorphological assessment in conjunction with the Headquarters Road Bridge project in Tinicum Township, Bucks County, Pennsylvania. The Phase IA assessment was conducted in compliance with Section 106 requirements for PennDOT District 6-0.

Although two landscape types are present in the vicinity of the Headquarters Road Bridge, investigations revealed that the project area soils and landscapes have essentially no prospects for intact cultural resources. Uplands predominate on the northeast side of Tinicum Creek, but these have not only been graded for the road's approach to the bridge, they are also too steeply sloping for human occupation. Very narrow and low-lying gravel bar strands also occur on this side of the creek; however, these unstable deposits are subject to frequent reworking and have no potential for cultural resources.

A pedestrian survey also located the remains of a mill depicted on the 1876 Scott atlas. These were manifested as a foundation remnant and abandoned raceway approximately 300 feet south of the Headquarters Road Bridge. As these remains are well outside the APE, there is little to no potential for historic archaeological deposits relating to this mill in the APE. Furthermore, an extant stone farmhouse (ca. 1740) is situated even further from the bridge (approximately 500 feet southwest of the bridge). Therefore, no deposits relating to this farmstead are expected in the APE.

In summary, the alluvial landscape on the south and west side of Tinicum Creek consists of a low-lying floodplain that is both too poorly drained and probably too young to have any potential

for precontact cultural resources. Upland positions on the opposite side of the creek are severely disturbed and too steeply sloping for human occupation.

Additionally, no potential historic archaeological resources relating to the extant stone farmhouse and razed mill site are expected in the APE, as the dwelling and former mill site are situated a considerable distance from the southwest edge of the Headquarters Road Bridge. Accordingly, no prospects for intact, potentially significant cultural resources exist within the expected project impact area. No further archaeological work was recommended for the Headquarters Road Bridge project; Pennsylvania Historical & Museum Commission, Bureau for Historic Preservation (PHMC-BHP) concurred with these recommendations on September 8, 2005.

8.0 Methodology

8.0 METHODOLOGY

The methodology for this report follows 36 CFR Part 800 - Protection of Historic Properties.

8.1 Definition of Effect

An *Effect* is defined in 36 CFR Part 800.16(i) as an "alteration to the characteristics of a historic property qualifying it for inclusion in or eligibility for the National Register."

8.1.1 No Historic Properties Affected

Per 36 CFR Part 800.4(d)(1),

> If the agency official finds that either there are no historic properties present or there are historic properties present but the undertaking will have no effect upon them as defined in § 800.16(i), the agency official shall provide documentation of this finding, as set forth in § 800.11(d), to the State Historic Preservation Office/Tribal Historic Preservation Office (SHPO/THPO). The agency official shall notify all consulting parties, including Indian tribes and Native Hawaiian organizations, and make the documentation available for public inspection prior to approving the undertaking.

8.1.2 Historic Properties Affected

Per 36 CFR Part 800.4(d)(2),

> If the agency official finds that there are historic properties which may be affected by the undertaking, the agency official shall notify all consulting parties, including Indian tribes or Native Hawaiian organizations, invite their views on the effects and assess adverse effects, if any, in accordance with § 800.5.

8.2 Criteria of Adverse Effect

Per 36 CFR Part 800.5(a)(1),

> An adverse effect is found when an undertaking may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the National Register in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association. Consideration shall be given to all qualifying characteristics of a historic property, including those that may have been identified subsequent to the

original evaluation of the property's eligibility for the National Register. Adverse effects may include reasonably foreseeable effects caused by the undertaking that may occur later in time, be farther removed in distance or be cumulative.

Per 36 CFR Part 800.5(a)(2)(i), "adverse effects on historic properties include, but are not limited to:

(i) Physical destruction of or damage to all or part of the property;
(ii) Alteration of a property, including restoration, rehabilitation, repair, maintenance, stabilization, hazardous material remediation, and provision of handicapped access, that is not consistent with the Secretary's Standards for the Treatment of Historic Properties (36 CFR part 68) and applicable guidelines;
(iii) Removal of the property from its historic location;
(iv) Change of the character of the property's use or of physical features within the property's setting that contribute to its historic significance;
(v) Introduction of visual, atmospheric or audible elements that diminish the integrity of the property's significant historic features;
(vi) Neglect of a property which causes its deterioration, except where such neglect and deterioration are recognized qualities of a property of religious and cultural significance to an Indian tribe or Native Hawaiian organization; and
(vii) Transfer, lease, or sale of property out of Federal ownership or control without adequate and legally enforceable restrictions or conditions to ensure long-term preservation of the property's historic significance.

8.3 Results of Assessment of Adverse Effect

8.3.1 No Adverse Effect

Per 36 CFR Part 800.5(d)(1)

The agency official shall maintain a record of the finding and provide information on the finding to the public on request, consistent with the confidentiality provisions of § 800.11(c). Implementation of the undertaking in accordance with the finding as documented fulfills the agency official's responsibilities under Section 106 and this part. If the agency official will not conduct the undertaking as proposed in the finding, the agency official shall reopen consultation under paragraph (a) of this section.

8.3.2 Adverse Effect

Per 36 CFR Part 800.5(d)(2), "If an adverse effect is found, the agency official shall consult further to resolve the adverse effect pursuant to § 800.6."

9.0 Application of Definition of Effect and Criteria of Adverse Effect

9.0 APPLICATION OF DEFINITION OF EFFECT AND CRITERIA OF ADVERSE EFFECT

Since the entire project APE is within the National Register-listed Ridge Valley Rural Historic District, it is necessary to assess project impacts to the historic district. A.D. Marble & Company assessed project impacts based upon the procedures outlined in the Section 106 regulations (36 CFR 800), as well as guidance published by the ACHP.

Table 1. Results of the Effect Evaluation for the Ridge Valley Rural Historic District.

Definition of Effect	Evaluation
An *Effect* may occur when there is alteration to the characteristics of a historic property qualifying it for inclusion in or eligible for the National Register as defined in Section 800.16(i).	The proposed project involves the removal and replacement of the Headquarters Road Bridge, which is a contributing resource to the National Register-listed Historic District. In addition, there will be permanent land acquisitions from two contributing properties to the Historic District. The existing flared wing wall (Wall D) on the southeast corner of the bridge extends beyond the existing PennDOT ROW. Due to this existing condition, the project will require the acquisition of additional ROW from Parcel 44-14-8 for the construction of Wing Wall D. In order to construct Wing Wall C, the project will require the acquisition of additional ROW from Parcel 44-14-2. See Figure 10. The project results in a permanent change in use of approximately 0.014 of the 575 acres (0.002 percent) within the Historic District. The project also involves a TCE within the historic district totaling 0.09 acre and a slope easement within the historic district totaling 0.005 acre. The TCE is needed to construct the new bridge and would consist of scour countermeasures such as riprap stone lining around the perimeter of the substructure units. The slope easement is needed to regrade the western approaches; the slope easement is not a permanent acquisition.
Finding:	Historic Property Affected

Table 2. Application of the Criteria of Adverse Effect for the Ridge Valley Rural Historic District.

An Adverse Effect is found when an undertaking may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the National Register in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association. Consideration shall be given to all qualifying characteristics of a historic property, including those that may have been identified subsequent to the original evaluation of the property's eligibility for the National Register. Adverse effects may include reasonably foreseeable effects caused by the undertaking that may occur later in time, be farther removed in distance, or be cumulative.	
Criteria of Adverse Effect	**Evaluation**
Adverse Effects on historic properties include but may not be limited to:	
(i) Physical destruction of or damage to all or part of the property;	All work within the Ridge Valley Rural Historic District will take place within and immediately adjacent to the existing footprint of the Headquarters Road Bridge. The bridge is a contributing resource to the historic district. The proposed undertaking will result in the removal and replacement of the Headquarters Road Bridge. The proposed undertaking will result in physical destruction to part of the historic district.* There will be permanent land acquisition from two contributing properties within the historic district. The existing flared wing wall (Wall D) on the southeast corner of the bridge extends beyond the existing PennDOT ROW. Due to this existing condition, the project will require the acquisition of 0.009 acre of ROW from Parcel 44-14-8 for the construction of Wing Wall D. In order to construct Wing Wall C, the project will require the acquisition of 0.005 acre of ROW from Parcel 44-14-2. These minor ROW acquisitions will not result in the physical destruction or damage to physical features that qualify the property for listing in the National Register. The proposed undertaking will require TCEs from Parcel No. 44-14-2 (0.06 acre) and Parcel No. 44-14-8 (0.03 acre), for a total of 0.09 acre, or 0.016 percent of the 575 acres within the historic district. However, the land within the TCEs will be restored to current conditions after construction is complete. There will be slope easements from two contributing properties within the historic district. There will be a 0.003-acre slope easement acquisition from Parcel No. 44-14-2, and a 0.002-acre slope easement acquisition from Parcel No. 44-14-8. The slope easements are needed to adjust grading on the property and are not considered a permanent acquisition.
(ii) Alteration of a property, including restoration, rehabilitation, repair, maintenance, stabilization, hazardous material remediation, and provision for handicapped access that is not consistent with the Secretary's Standards for the Treatment of Historic Properties (36 CFR part 68) and applicable guidelines;	The proposed undertaking will alter the historic district as one of its contributing resources, the Headquarters Road Bridge, will be removed and replaced with a 24-foot wide, two-lane bridge. In addition, roughly 0.002 percent of the land within the historic district will be permanently altered, and 0.016 percent of the land within the district will be subject to a TCE.

(iii) Removal of the property from its historic location;	The proposed undertaking will require the removal and replacement of one contributing resource to the Ridge Valley Rural Historic District: the Headquarters Road Bridge.*
(iv) Change of the character of the property's use or of physical features within the property's setting that contribute to its historic significance;	The bridge replacement will not change the character of the historic district's use. The bridge replacement will change physical features within the historic district's setting that contribute to its historical significance. The project will involve the removal and replacement of the Headquarters Road Bridge, a contributing resource to the historic district, from its historic setting, and its replacement with a new structure. The new structure will incorporate design elements that will complement and blend with the historic district's setting. In addition, there will be permanent land acquisitions from two contributing properties within the Ridge Valley Rural Historic District, including a 0.005-acre ROW acquisition and a 0.003-acre slope easement acquisition from Parcel No. 44-14-2, and a 0.009-acre ROW and 0.002-acre slope easement acquisition from Parcel No. 44-14-8. The total permanent land acquisition for ROW amounts to 0.014 acre, which represents roughly 0.003 percent of the 575 acres within the historic district; the slope easements are needed to adjust grading on the property and are not considered a permanent acquisition.
(v) Introduction of visual, atmospheric, or audible elements that diminish the integrity of the property's significant historic features;	No atmospheric or audible elements will be introduced that will diminish the property's integrity. Visual impacts of the new bridge will be minimized by designing a bridge, in consultation with the Section 106 consulting parties, to complement and blend with the historic district.
(vi) Neglect of a property which causes its deterioration, except where such neglect and deterioration are recognized qualities of a property of religious and cultural significance to an Indian tribe or Native Hawaiian organization; and	The proposed undertaking will not result in the neglect or deterioration of the historic district.
(vii) Transfer, lease, or sale of property out of Federal ownership or control without adequate and legally enforceable restrictions or conditions to ensure long-term preservation of the property's historic significance.	Not applicable.
Recommendation: The proposed project will have an *Adverse Effect* on the Ridge Valley Rural Historic District.	

*Although the removal and replacement of the existing Headquarters Road Bridge over Tinicum Creek will adversely affect the Ridge Valley Rural Historic District, it will not cause the historic district to be delisted from the National Register. The historic district will maintain the vast majority of the contributing resources (98.5 percent) and features that qualify it for inclusion in the National Register.

10.0 Consulting Party Coordination and Public Involvement

10.0 CONSULTING PARTY COORDINATION AND PUBLIC INVOLVEMENT

10.1 Consulting Party Coordination

A total of six Section 106 Consulting Party Meetings have been held for the project (Table 3). There are currently a total of 51 consulting parties participating in the project. The SHPO has been involved in the project since the project's April 2005 Scoping Field View meeting. The SHPO has been invited to and participated in each Section 106 Consulting Party Meeting. In late 2013, FHWA invited the ACHP to participate in consultation. The ACHP agreed to participate in the project in December 2013. ACHP attended the April 2014 Section 106 Consulting Party Meeting.

Table 3. Section 106 Consulting Party Meetings.*

Date of Meeting	Meeting Type
August 14, 2006	Section 106 Consulting Party Meeting
October 20, 2006	Section 106 Consulting Party Meeting
July 31, 2008	Section 106 Consulting Party Meeting
June 17, 2013	Section 106 Consulting Party Meeting
November 4, 2013	Section 106 Consulting Party Meeting
April 2, 2014	Section 106 Consulting Party Meeting

*The meeting minutes for each meeting after 2010 are included on Project Path. Meeting minutes prior to 2010 were distributed as a hard copy to the consulting parties on July 19, 2013.

Additional consulting party information is available via PennDOT's Project Path website at: http://search.paprojectpath.org/ProjectDetails.aspx?ProjectID=688.

10.2 Stakeholder/Public Coordination

PennDOT has had ongoing communication with the Tinicum Township Board of Supervisors, Tinicum Township Manager, federal and state elected officials, and the public since May 2005.

Table 4. Stakeholder/Public Coordination.

Date	Meeting Type	Meeting Discussion
September 6, 2005	Public Officials Meeting	• 2-span replacement structure agreed upon. • 24-foot wide structure agreed upon. • Use of existing stone agreed upon. • Replacement of stream gauge and dry hydrant agreed upon. • Township provides PennDOT comments received from Tinicum Historical Commission from September 5, 2005. • PennDOT explains that the requested design changes will delay project, which will allow existing bridge to further deteriorate. • 14-point agreement was developed at the meeting regarding bridge design. • 14-point agreement to be provided to PennDOT following review by Tinicum Historical Commission. • As a result of a request of the Tinicum Township Historical Commission presented at the meeting, the design would be modified to include open railings and a minimal footprint with no shoulders.
September 6, 2005	Public Meeting	• Public requests to move bridge a few feet downstream in order to preserve the original stone abutments and piers and the upstream face. • Public requests that new bridge use old substructure to preserve existing piers and abutments. • PennDOT explains that requested design changes will delay project, which will allow existing bridge to further deteriorate. • Public requests that HQ bridge not be closed for construction until Geigel Hill Road bridge is complete. • K. Auerbach provided information on the history and significance of the bridge. (Three-page report entitled HQ Road (Burnt Mills) Bridge, Significance of Resource. Argues bridge has historical significance as a transportation component, representative example of period stonework, and for its engineering and construction information.) • Section 106 consulting party identification. • It was noted that an effect report and archaeology reports had been submitted to PHMC in early August 2005. • A member of the public requested open railings, elimination of red timber siding, and a design in keeping with the Secretary of the Interior's Standards.
June 16, 2008	Public Officials Meeting	• PennDOT states that turn-back funding is not currently dedicated. • PennDOT offers to construct, own, and maintain two-lane bridge. • Township explains confidence in maintenance funding for one-lane bridge and requests PennDOT to advance one-lane bridge design. • PennDOT to hold public meeting on June 17, 2008, to present one-lane bridge configuration. Section 106 process to commence following this public meeting.
June 17, 2008	Public Meeting	• Subsequent to the receipt of the Township's turn-back agreement and at the request of the Township, PennDOT presented the following at a public meeting: • A rendering and conceptual plan view of a one-lane, 3-span bridge configuration presented to the public. • Public requests aggregate-finish to concrete be provided. • Public requests the use of timber barrier on bridge. • Public requests that deck overhang be eliminated to mimic existing bridge. • Public requests minimal change in vertical roadway alignment.

Date	Meeting Type	Meeting Discussion
		• Public requests that wing-wall configuration mimic the existing bridge and not be flared at Sheep Hole Road to improve turning radii. • Township requests that HQ Bridge not be closed until Geigel Hill Road is re-opened. • Township requests that turning movement studies be forwarded to their engineer for review.
October 19, 2010	Tinicum Township Meeting	• Township requests that PennDOT give public description of options going forward. • Options include a PennDOT owned/maintained two-lane bridge and Township owned/maintained one-lane bridge. • Township to have vote at later date to give PennDOT official direction on one-lane or two-lane design.
April 27, 2011	Public Meeting	PennDOT holds all-day public plans display showing proposed 3-span structure on existing alignment. Two-lane, 24-foot wide (curb-to-curb) design.
October 28, 2013	Public Meeting	Public Meeting held to update the community on the bridge project and to answer questions. The open house included a PowerPoint detailing the existing bridge condition, stream migration/meandering, existing scour conditions, bridge inspection summary, rehabilitation options, and replacement options.
July 30, 2014	Public Meeting	Public Meeting held to update the community on the infrastructure improvement project and answer questions. The open house included stations devoted to the National Environmental Policy (NEPA) process; State and Federal permitting processes; Section 106 of the National Historic Preservation Act; and Section 4(f) of the Department of Transportation Act. PennDOT also displayed various alternatives that have been studied for the project, as well as concepts for a temporary bridge.

Local stakeholders and residents stressed to PennDOT the need for a temporary bridge to immediately address the lack of a crossing along Headquarters Road, citing an increase in response times of emergency service vehicles. This feedback was obtained during public meetings held in October 2013 and in July 2014, meetings with the township supervisors and local representatives, and via a petition signed by township residents.

Other stakeholders in the project include the National Park Service (NPS) Wild and Scenic Rivers Program, the United States Army Corps of Engineers (USACE), PADEP, and Delaware Valley Regional Planning Commission (DVRPC). While not agencies with jurisdiction over Section 106 resources, these agencies play integral roles in the overall transportation development process. Also, coordination with USACE and PADEP has occurred; USACE and PADEP are the agencies responsible for issuing the waterway permit. Coordination with these agencies is necessary early in the project to ensure that the project is designed to be sensitive to

the exceptional value of Tinicum Creek. In addition, coordination with DVRPC occurred to ensure that the project information included on the Transportation Improvement Program (TIP) is accurate. Additionally, coordination with state and federal elected officials has occurred, and will continue to occur, for this project.

11.0 Minimization and Mitigation

11.0 MINIMIZATION AND MITIGATION

Section 106 consulting party coordination is ongoing. FHWA and PennDOT will consult with the consulting parties regarding minimization and mitigation measures.

References

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Advisory Council on Historic Preservation website
http://www.achp.gov. Accessed June 2015.

Appendix A

Project Photographs

Photograph 1: View facing northwest of Tinicum Creek from the Headquarters Road Bridge looking upstream (July 2005).

Photograph 2: View facing northeast of the Headquarters Road Bridge over Tinicum Creek. Photograph was taken prior to the bridge being closed to vehicular traffic (July 2005).

Photograph 3: View of the Headquarters Road Bridge over Tinicum Creek, facing west (July 2005).

Photograph 4: View facing southwest of Headquarters Road along the western approach of the bridge. The property (Parcel 44-14-8) to the left of the photograph and property (Parcel 44-14-2) to the right of the photograph are both contributing elements to the RVRHD. Photograph was taken prior to the bridge being closed to vehicular traffic (July 2005).

Photograph 5: View looking northwest along Sheep Hole Road on the eastern side of the Headquarters Road Bridge. A steep shale outcropping can be seen on the right side of the photograph (July 2005).

Photograph 6: View looking southeast along Headquarters Road on the eastern side of the Headquarters Road Bridge (July 2005).

Photograph 7: View looking northwest of a pasture on Parcel 44-14-2, this parcel is a contributing resource to the Ridge Valley Rural Historic District (July 2005).

Photograph 8: View facing southwest showing the end of Wing Wall B adjacent to contributing parcel 44-14-2. A slope easement and temporary construction easement may be required from this area for the reconstruction of Wing Wall B; however, no required ROW is needed (July 2005).

Photograph 9: View facing south of a pasture on Parcel 44-14-8, this parcel is a contributing resource to the Ridge Valley Rural Historic District (July 2005).

Photograph 10: View facing southwest showing the end of Wing Wall A adjacent to parcel 44-14-8. A slope easement and temporary construction easement may be required from this area for the reconstruction of Wing Wall A; however, no required ROW is needed. (July 2005).

Photograph 11: View facing northeast showing the upstream side of Tinicum Creek. Headquarters Road Bridge and Wing Wall C are shown on the right side of the photograph. Required ROW is needed to reconstruct Wing Wall C. This land is part of contributing resource, Parcel 44-14-2. (July 2005).

Photograph 12: View facing northeast showing the downstream side of Tinicum Creek and Headquarters Road. Portions of Wing Wall D were constructed outside of the existing ROW; therefore, required ROW is needed to reconstruct Wing Wall D. This land is part of contributing resource Parcel 44-14-8. Parcel 44-14-3-1 is visible in the background (July 2005).

Appendix B

Project Path Postings

S.R. 1012, Section BRC
Headquarters Road Bridge Project
MPMS 13716
Project Path Postings
http://search.paprojectpath.org/ProjectDetails.aspx?ProjectID=688

Posting Date	Posting Description
11/21/2005	Phase IA Archaeological Letter Report
07/25/2006	Letter to PHMC re: Bridge cannot be rehabilitated
01/29/2013	Section 106 Consulting Party Invitation
03/08/2013	Project Description and USGS Map
03/08/2013	Letters to Potential Section 106 Consulting Parties
04/02/2013	Comment Email from Dr. John Salerno to PennDOT (March 8, 2013)
06/10/2013	Letter from Sen. Casey to NPS and FHWA (June 5, 2013)
6/10/2013	Consulting Parties Meeting June 17, 2013
6/17/2013	Letters to Consulting Parties RE: June 17, 2013 Mtg Handouts
6/20/2013	Letters from Tinicum Twp. Residents to FHWA and PennDOT June 7 2013
6/24/2013	Letters to Consulting Parties (dated June 21, 2013) with Info. Requested from June 17 2013 CP Meeting
7/11/2013	Consulting Party Comments from June 17, 2013 CP Meeting
7/17/2013	FHWA Letter to ACHP Requesting Participation & ACHP Response Letter
7/24/2013	Letters to Consulting Parties (dated July 24, 2013) with Additional Info. Requested from June 17, 2013 CP Meeting
8/7/2013	Letter from Delaware Riverkeeper (July 24, 2013) & FHWA (August 7, 2013) Response
9/12/2013	Comment Response Document (for June 17, 2013 CP Meeting)
10/4/2013	Section 106 Consulting Party Meeting- November 4, 2013
10/4/2013	Consulting Party Meeting June 17, 2013- Revised Meeting Minutes
11/18/2013	FHWA Letter (September 26, 2013) to ACHP & ACHP Response Letter
01/27/2014	Section 106 Timeline (2002-January 17, 2014)
03/10/2014	Section 106 Consulting Party Meeting- April 2, 2014
03/14/2014	Core Drilling Investigation
04/15/2014	Kathy Auerbach Purpose and Need Comments
07/10/2014	Public Meeting- Open House Plans Display (July 30, 2014)
08/15/2014	National Register Status of Headquarters Road Bridge
09/26/2014	Cultural Heritage Partners Letter to PennDOT (September 26, 2014)
9/29/2014	Cultural Heritage Partners Letter to PennDOT (August 27, 2014)
10/01/2014	ACHP Letter to FHWA and FHWA Response
11/04/2014	Cultural Heritage Partners Letter to PennDOT (October 30, 2014)
11/04/2014	Cultural Heritage Partners Letter to PennDOT (July 30, 2013)
10/22/2015	Bridge Width Evaluation prepared by Urban Engineers (April 30, 2015) and FHWA response letter (June 16, 2015)

Appendix C

Qualifications of Researchers

Patricia Slovinac
Senior Architectural Historian

Ms. Slovinac has over nine years of experience in cultural resource management. Her primary responsibilities consist of conducting historic architectural surveys and research, evaluating architectural resources for National Register eligibility, documenting architectural resources, writing assessment of eligibility and effect reports, and preparing mitigation documents and materials. She has effectively coordinated and completed a multitude of projects as part of Section 106 of the NHPA and Section 4(f) of the U.S. Department of Transportation Act. She also has overseen historical/architectural field crew, and the scheduling and organizing of various projects. Ms. Slovinac served as an architectural historian for NRHP eligibility surveys at several National Aeronautics and Space Administration (NASA) centers, including the Kennedy Space Center in Florida, the Johnson Space Center in Texas, the Marshall Space Flight Center in Alabama, the Glenn Research Center in Ohio, and the Dryden Flight Research Center in California. Following these surveys, she compiled numerous HABS/HAER documentation packages for Kennedy Space Center facilities, such as the Vehicle Assembly Building, Launch Complex 39 Pad A, the Launch Control Center, and the Orbiter Processing Facility, which earned her a "Catch an Environmentalist Award" from the center. She also worked on the HAER documentation and National Historic Landmark nomination for the Space Shuttle Orbiter *Discovery.* Ms. Slovinac is knowledgeable of federal and state regulations and guidelines concerning the treatment of historic properties and exceeds the Secretary of the Interior's Professional Qualifications Standards for Architectural Historians.

Education

2013 M.B.A., University of Phoenix

2005 M.A.H., Medieval Architecture/Certificate in Historic Preservation, University of Virginia

1998 B.A.E., Lighting and Electrical, Pennsylvania State University

Professional Experience

2015 – Present	A.D. Marble & Company	*Senior Architectural Historian*
2010 – 2015	Archaeological Consultants, Inc.	*Senior Architectural Historian*
2006 – 2010	Archaeological Consultants, Inc.	*Architectural Historian*
2005	National Architectural Trust	*Donation Specialist*
1998 – 2003	C.M. Kling & Associates	*Lighting Designer*

Training

2013 Beyond Compliance, Historic Preservation in Transportation, National Highway Institute, Reston, VA.

2011 Section 4(f) Compliance for Historic Properties, National Preservation Institute, Richmond, VA.

2007 Section 106 Essential, Advisory Council on Historic Preservation, Orlando, FL.

Professional Presentations

2012 The Architecture of Spaceflight: Historic Properties at NASA's Kennedy Space Center in Florida and White Sands Space Harbor in New Mexico." Southeast Society of Architectural Historians annual meeting.

Professional Awards

2014 Catch an Environmentalist Award, John F. Kennedy Space Center

2007 Blue Marble Award, National Aeronautics and Space Administration

Russell L. Stevenson
Architectural Historian

Mr. Stevenson is an architectural historian with seven years of experience in cultural resource management, including two years assessing historic structural integrity and performing conservation work. His primary responsibilities consist of conducting historic architectural surveys and historic research for a variety of projects. Mr. Stevenson has identified, surveyed, and evaluated a wide array of residential, agricultural, and commercial properties in New Jersey, Delaware, and Pennsylvania. In addition, he spent two summers as an apprentice and one year as an architectural conservator technician performing conservation work for the Fairmount Park Historic Preservation Trust. As a conservator technician, his work regularly required him to assess the integrity of both interior and exterior architectural elements of historic buildings in order to decide on and apply the appropriate treatment. Mr. Stevenson is extremely knowledgeable of the Secretary of the Interior's Standards for Rehabilitation and Guidelines for Rehabilitating Historic Buildings. Mr. Stevenson served two years as a board member for the Allentown Preservation League; a small non-profit organization in Allentown, Pennsylvania, that operates an architectural salvage warehouse and promotes historic preservation in the city of Allentown. He meets the Secretary of the Interior Standards for Professional Qualifications (36 CFR 61).

Education

2007	M.A., University of Delaware, Historic Preservation
2001	B.A., Pennsylvania State University, History

Professional Experience

2009-Present	A.D. Marble & Company	*Architectural Historian*
2008-2009	Fairmount Park Historic Preservation Trust, Philadelphia, PA	*Conservator Technician*
2007	Hoffman Painting and Refinishing, Pipersville, PA	*Conservator/Asst. Project Manager*
2005-2007	Center for Historic Architecture and Design, Newark, DE	*Research Assistant*

Training

Summer 2006	Internship	*Fairmount Park Historic Preservation Trust, Philadelphia, PA*

Carol Lee
Architectural Historian

Ms. Lee is an architectural historian with 28 years of experience in cultural resource management. During her 17 years working at the Pennsylvania Historical and Museum Commission, she directed a major review and reorganization of the PASHPO National Register program and developed and presented training for the public, staff, agencies, and the Preservation Board. She has taught a broad range of social, economic, and political history courses in the U.S. and Pennsylvania. Her primary responsibilities consist of conducting historic architectural surveys, historic research, and writing assessments of eligibility and effects for transportation projects. Ms. Lee has identified, surveyed, and evaluated a wide array of residential, agricultural, industrial, commercial, and linear properties throughout the Mid-Atlantic region. She is knowledgeable of the Secretary of the Interior's Standards for the identification and evaluation of historic resources, as well as the federal historic preservation tax incentive program. Ms. Lee exceeds the National Park Service's professional requirements as specified in 36 CFR Part 61.

Education

1989 Ph.D., History, Pennsylvania State History

1976 M.A., American History, Duquesne University

1974 B.A., American Studies, Chatham University

Professional Experience

2014 – present	A.D. Marble & Company	*Architectural Historian*
1993 – 2013	Pennsylvania Historical and Museum Commission	*Manager for Historic Preservation and Technical Assistance Grants*
1988 – 1993	Bucknell University, History Department	*Visiting Assistant Professor/ Co-Director, Race/Gender Resource Center*
1987 – 1988	Pennsylvania State University Nuclear Engineering Department	*Community Education*
1981 – 1988	Pennsylvania State University History and Continuing Education Departments	*Instructor*
1979 – 1981	Smithsonian Institution, Museum of American History	*Office of Collections Management*
1977 – 1979	Agriculture Extension Service, Carroll County, MD	
1976 – 1977	Westinghouse Corporation	

United States Department of the Interior

NATIONAL PARK SERVICE
Philadelphia Support Office
U. S. Custom House - 3rd Floor
200 Chestnut Street
Philadelphia, PA 19106

IN REPLY REFER TO:

June 21, 2001

Mr. Robert Eppley, Jr.
Pennsylvania Department of Transportation, Region 6
Engineering District 6-O
7000 Geerdes Boulevard
King of Prussia, PA 19406-1525

Re: Tinicum Creek, Geigel Hill Road Bridge

Dear Mr. Eppley:

We have revised our opinion regarding the replacement of the Geigel Hill Bridge and believe that rehabilitation of the existing bridge is the preferred alternative. This is based on the May 21st Geigel Hill Road site visit, direction from the recently organized Lower Delaware National Wild and Scenic River Management Committee, and the fact that the 1997 Geigel Hill MOA with PHMC on historic issues is no longer in effect.

The Geigel Hill Road Bridge replacement project is located on Tinicum Creek, which was designated into the National Wild and Scenic Rivers System on November 1, 2000. Designated rivers are protected by Section 7(a) of the Wild & Scenic Rivers Act. Pursuant to Section 7(a): "no department or agency of the United States shall assist by loan, grant, license, or otherwise in the construction of any water resources project that would have a direct and adverse effect on the values for which such river was established." The Service considers water resource projects to include dams, diversion projects, bridge and roadway projects involving construction in the bed or on the banks of the river, bank stabilization projects and activities that require a section 404 permit from the Army Corps of Engineers.

The proposed bridge crossing will significantly and adversely affect values and resources for which the Tinicum Creek was designated into the Wild and Scenic Rivers System.

First, replacement of the existing steel truss bridge and natural stone retaining walls adversely affects the scenic and historic value for which the Tinicum Creek is classified as a scenic river. It removes a contributing resource from the Ridge Valley Rural Historic District. The historic district was identified as an outstandingly remarkable resource in the Lower Delaware National Wild and Scenic River Study Report and was crucial to Wild and Scenic River eligibility for the Tinicum. The historic district registration form identifies six bridges as contributing resources and states that, "as a collection, the bridges of the Ridge Valley strongly reflect two themes:

early settlement and transportation changes." Geigel Hill Road Bridge is the oldest existing bridge in the district. In addition, the Criteria of Effects Report, Geigel Hill Road Bridge Replacement Project, February 1997, states that "the removal of the contributing bridge from the historic district will have an Adverse Effect on the Ridge Valley Rural Historic District."

Second, installation of a box culvert replacement bridge will inhibit the free flowing character of the stream. A primary criterion for a National Wild and Scenic River is that it be maintained in a free flowing condition. The National Park Service generally prefers clear span bridges with abutments out of the floodplain. Proposed alterations to the west of the bridge will raise the roadway by approximately two feet and impede the floodplain. We believe these proposed impediments to stream flow and the floodplain will increase scouring above and below the bridge and increase stream bank erosion.

To maintain the free flowing, historic and scenic values of the Tinicum Creek we recommend that the existing bridge be rehabilitated as a truss bridge or reinforced with "I" beams if necessary.

Thank you for consulting with the National Park Service. Please call me at 215-597-1655 if you have any questions.

Sincerely,

William Sharp, Project Manager
Stewardship and Partnerships

cc: Lawrence M. Slavitter
Linda Wieand
Ann Safley

Meliora Design

July 7, 2016

Maya van Rossum
Delaware Riverkeeper Network
925 Canal Street, Suite 3701
Bristol, PA 19007

Re: Headquarters Road Over Tinicum Creek
Determination of Effects Report

Dear Ms. van Rossum:

Meliora Design has reviewed the comment response documents provided by Delaware Riverkeeper Network in order to respond to concerns over potential instream impacts to Tinicum Creek, an Exceptional Value stream, due to construction of various alternatives to replace or rehabilitate the Headquarters Road Bridge by the Pennsylvania Department of Transportation. The documents reviewed include:

- Determination of Effects Report for S.R. 1012, Section BRC in Tinicum Township, Bucks County, PA
- A.D. Marble "S.R. 1012, Section BRC, Headquarters Road Bridge Project, Tinicum Township, Bucks County, Pennsylvania, ER #05-8029-017, Response to PA SHPO comments on Determination of Effect Report, Alternatives Analysis- Additional Information
- Determination of Effects Report (November 2015) Comment Response Document - June 23, 2016
- Alternatives Analysis Hydraulic Summary (Urban Engineers, February 2012)

In response to Meliora Design comments and comments by others, PennDOT authored The Determination of Effects Report Comment Response Document. This document makes two key points in response to comments in support of the chosen alternative bridge design, Alternative 6. These two points are:

- 25 – Year Water Surface Elevations on drawings are not accurate and were part of a previous Hydrologic and Hydraulic Analysis that was not updated for updated scenarios.
- The long-term permanent impact to Tinicum Creek will be decreased for this alternative.

Both of these points are ***very*** concerning from a stream impacts point of view. Not only was incorrect information provided on a plan to be reviewed, but there is no intent by PennDOT to include updated information that would help the public evaluate and compare alternative bridge designs. Anecdotal information is provided throughout the response comments that suggests knowledge of bridge hydraulic performance but no report or data is provided to substantiate these claims. Beyond providing data, it is explicitly stated by PennDOT that the studies have not been updated. If the information provided in the Determination of Effects Report cannot be relied on, then what information is PennDOT relying on to determine how each bridge alternative will perform hydraulically? It is critical that this information help inform which alternative is chosen. The chosen alternative should not be the alternative that performs the worst hydraulically.

In a previous Alternatives Analysis Hydraulic Summary (2012), Urban Engineers determined that the hydraulic improvements of removing piers was "not as significant as anticipated." Additionally, the reduced low chord

elevations of the single-span options also did not provide as much hydraulic benefit as expected. Both of these findings led Urban Engineers to recommend the alternative where abutments and piers remain in existing locations for a three-span bridge. Chosing Alternative 6 as the preferred option ignores the recommendations of PennDOT consultants with respect to the hydraulic studies previously performed.

Additionally, this Hydraulic Report does not support the PennDOT comment response that Alternative 6 will provide a decrease to long-term impacts to the stream. An alternative similar to Alternative 6 (Two-span, shifted abutments) was evaluated by Urban Engineers to reveal that it increases the stream velocities at the bridge more than any other alternative evaluated for the 25-year water level. This increase in velocity will lead directly to additional scour of the stream bed and cause more erosion in the vicinity of the Headquarters Road bridge. This increase in velocity, as well as an unevaluated shift in bridge alignment, can lead to consequences that must be thoroughly analyzed and considered. PennDOT consultants should be aware of the different hydraulic implications of each plan and provide that information for review. The bridge's hydraulic implications play as much of a role for Tinicum Creek as traffic circulation across the bridge will impact the surrounding communities. Excessive erosion following a change in bridge design and/or location of bridge elements (including piers and abutments) is unacceptable. Based on the information provided, the Alternative 6 option will change the flow of Tinicum creek at and downstream of the bridge site, obviously resulting in a shift of the stream westward, causing bank erosion and flow alterations that will cause significant changes to the creek, its flows, habitats and quality at and downstream of the bridge site that have not been considered by PennDOT.

Meliora Design previously recommended incorporating natural channel design principals as a way to stabilize and rehabilitate the area around Headquarters Road Bridge and to address and prevent scour and erosion issues. PennDOT dismissed such solutions by stating that it is "beyond the scope of the current project to incorporate natural channel design and stream restoration principals beyond the project limits." This response fails to recognize that natural channel design and restoration interventions are not in fact outside the project limits given that they address issues at, and resulting from, the identified project area and are merely softer bioengineering approaches that would work with the design and location of the bridge to limit scour, streambank erosion, redirect flow, and protect the stream bed. The proposal to armor the bridge to protect against scour fails to evaluate the impacts of this approach on the stream.

Because Tinicum Creek is an Exceptional Value resource directly impacted by this project, the impacts to Tinicum Creek cannot be dismissed or ignored. Response #11 seems to indicate that there is current analysis of the bridge alternatives that are not being provided. These studies should be provided for review. Other features that would improve scour and erosion conditions around the bridge should also be evaluated. Natural Channel Design was dismissed as being out of this projects scope but preventing future scour and maintaining the exceptional quality of the stream is a priority of this project. A more holistic view of the alternatives is warranted to evaluate more than just the bridge itself, which would include impacts and alternatives to mitigate the impacts the bridge restoration will have on Tinicum Creek.

If you have any other questions or need additional information, I can be reached at
(610) 933-0123 or MarcH@melioradesign.com.

Sincerely yours,

Marc Henderson, PE

cc:
Michele C. Adams, P.E., LEED AP, President

Meliora Design

December 14, 2015

Maya van Rossum
Delaware Riverkeeper Network
925 Canal Street, Suite 3701
Bristol, PA 19007

Re: Headquarters Road Over Tinicum Creek
Determination of Effects Report

Dear Ms. Rossum:

Meliora Design has reviewed the documents provided by Delaware Riverkeep Network for potential instream impacts to Tinicum Creek, an Exceptional Value stream, due to construction of various alternatives to replace or rehabilitate the Headquarters Road Bridge by the Pennsylvania Department of Transportation. The documents reviewed include the Determination of Effects Report for S.R. 1012, Section BRC in Tinicum Township, Bucks County, PA.

The Determination of Effects Report evaluates the effects of the proposed Headquarters Road Bridge over Tinicum Creek project to the historic properties with the Area of Potential Effects on the National Register. Multiple alternatives for bridge replacement or rehabilitation are proposed in this document with the focus of the narrative on right-of-way and environmental and cultural resource impacts. Meliora Design has summarized the analysis below and provided professional opinions as to the environmental impact to Tinicum Creek of each alternative.

Because the Determination of Effects Report is not a Hydrologic and Hydraulic Analysis, it lacks fundamental information necessary to fully evaluate and analyze each alternative with respect to impacts to Tinicum Creek and the Tinicum Creek floodplain. By only looking at the 25 year flood stage of Tinicum Creek, important impacts of larger storm events are ignored. A formal Hydrologic and Hydraulic Analysis should be conducted to fully understand how altering the Headquarters Road Bridge from its current design will impact both the Ridge Valley Rural Historic District and Tinicum Creek and its floodplain.

No Build Alternative

The existing structure would remain and no construction would take place. This alternative notes the existing stream encroachment would remain, debris accumulation would continue due to the existing piers, and scour due to existing piers will continue as well.

- Impact due to future construction - zero impact due to construction
- Impacts due to existing encroachment – this alternative maintains existing abutments and piers, thus continues existing erosion, scour and flow impacts.

New Roadway Alternative that Totally Avoids Ridge Valley Rural District (Alternative 1)

The existing structure would remain and no construction would take place at the current Headquarter Road Bridge. An alternative 1.67 miles of road and Tinicum Creek crossing is proposed to avoid construction within the Ridge Valley Rural District.

- Impact due to construction activities - zero impact due to construction at existing Headquarters Road Bridge. The construction of an additional crossing would be necessary which has the potential to disturb areas within Tinicum Creek as well as an unnamed tributary to Tinicum Creek. Because a new crossing is proposed, additional hydraulic impacts to Tinicum Creek are possible with this alternative if abutments are not located outside of the floodway as this is proposed as a single span crossing. Temporary construction impacts may be present during construction of this alternative even if all portions of the built bridge are located outside of the floodway.
- Impacts due to encroachment – this alternative maintains existing abutments and piers of the Headquarters Road Bridge, while also proposing additional encroachments downstream of the analyzed crossing. This would increase the encroachment impact to Tinicum Creek due to the addition of a second bridge. Piers remain as an obstruction that impacts stream flows during storm events.
- Impacts to Tinicum Creek Watershed – increased impervious cover attributed to 1.67 miles of roadway. Loss of farmland, woods, and wetlands would occur. Stormwater runoff would increase due to landuse changes.

The impacts to both Tinicum Creek hydrology and hydraulics are unreasonable. This is the least desirable alternative proposed.

New Alignment Downstream (Alternative 2)

The existing structure would remain and no construction would take place at the current Headquarter Road Bridge. An alternative road alignment would require a Tinicum Creek crossing directly downstream of the existing Headquarters Road Bridge.

- Impact due to construction activities - zero impact due to construction at existing Headquarters Road Bridge. The construction of an additional crossing would be necessary which would cause disturbance within the Tinicum Creek floodplain.
- Impacts due to encroachment – this alternative maintains existing abutments and piers, and so maintains existing impacts. An additional crossing would be necessary which has the potential to encroach on Tinicum Creek. Because a new crossing is proposed so close to the existing bridge, hydraulic impacts to Tinicum Creek are amplified with this alternative. The results of this impact could be seen as increased scour and/or an increase in the 100 year floodplain.
- Impacts to Tinicum Creek Watershed – increased impervious cover attributed to additional roadway is required. This alternative notes the need for stormwater management to offset the increase in impervious area. Loss of farmland, woods, and floodplain would occur.

The impacts to Tinicum Creek hydraulics are compounded in this alternative by adding potential obstructions to both the stream and floodplain within 200 ft. of the existing bridge. The alternative should not be considered because it only degrades the quality of Tinicum Creek both temporarily due to construction and hydrologically/hydraulically over the life of the bridge.

One-Lane Bridge Alternative (Alternative 3)

The existing structure alignment would remain in place. The proposal involves the rehabilitation of the existing stone masonry substructure units (piers, abutments, and wing walls) and the construction of a new superstructure. The existing three-span configuration providing one lane of traffic would remain.

- Impact due to construction activities – impacts to Tinicum Creek would include dewatering and excavation related to rock scour protection. Existing stream hydraulics would remain and impacts would largely be temporary due to construction activity around existing piers and abutments.
- Impacts due to encroachment – this alternative maintains existing abutments and piers with additional protection against scour that erodes the stream around the existing piers. Only minor increased encroachment on Tinicum Creek would take place due to the rock scour protection.

This alternative has the least amount of instream work of all the alternatives and does not alter the 25-yr flood elevation of Tinicum Creek. By maintaining the piers and abutments in place, the only instream work proposed is the scour protection and any rehabilitation of the piers and abutments to improve structural integrity. This alternative does not explicitly detail the rehabilitation of the substructure that is required (can only assume it is similar to Alternative 4) because the narrative focuses on the alternative's project goal shortcomings rather than the work needed to accomplish the particular design intent. This alternative fails to consider environmentally beneficial options for addressing scour conditions which could both protect the bridge and enhance stream health.

Two-Lane Superstructure Replacement and Substructure Rehabilitation (Alternative 4)

The superstructure replacement and substructure rehabilitation alternative considers the rehabilitation of the existing stone masonry substructure units (piers, abutments, and wing walls) and the construction of a new superstructure. This alternative features a two-lane superstructure with 10-foot travel lanes. Extensive rehabilitation of the bridge piers is highlighted in this alternative with the full replacement of the superstructure.

- Impact due to construction activities – impacts to Tinicum Creek would include dewatering and excavation related to rock scour protection and pier rehabilitation. Existing stream hydraulics would remain and impacts would largely be temporary due to construction activity around existing piers and abutments.
- Impacts due to encroachment – this alternative maintains existing abutments and piers with additional protection against scour that erodes the streambed around the existing piers. Only minor increased encroachment on Tinicum Creek would take place due to the rock scour protection.

Alternative 4 is very similar to Alternative 3 in that the two piers remain in place as do the existing abutments. The alignment of the stream is not altered nor is the hydraulic characteristics since piers and abutment locations are not altered. More instream work may be required if access of equipment is needed for the concrete and steel reinforcement of the piers which is not noted in

Alternative 3. Like Alternative 3, this alternative has the same amount of temporary construction easement required to complete the reconstruction. This alternative fails to consider environmentally beneficial options for addressing scour conditions which could both protect the bridge and enhance stream health.

One-Lane Bridge Alternative (Alternatives 5)

The existing structure would be replaced with a single lane bridge with a single pier. The proposal involves the replacement of the existing stone masonry substructure units (piers, abutments, and wing walls) and the construction of a new superstructure.

- Impact due to construction activities – impacts to Tinicum Creek would include dewatering and excavation related to rock scour protection, pier demolition, and a single pier construction. Existing stream hydraulics have the potential to be improved by removing one of two piers and stream impacts would largely be temporary due to construction activity around existing piers and abutments. Additional information from a Hydrology and Hydraulics analysis is necessary to confirm any instream hydraulic benefits of removing the existing piers and adding a single pier in a new location.
- Impacts due to encroachment – this alternative removes existing piers and constructs a single pier with additional protection against scour. Overall, this option reduces the amount of encroachment on the stream by the bridge structure but requires more instream disturbance to accomplish this result.

This alternative has the same temporary construction easement area as Alternatives 3 and 4 but appears to have much more instream construction. The 25-yr flood elevation appears to drop due to the removal of one of the bridge piers but more detailed information from the H&H analysis would be necessary to confirm this observation. The benefits of such a minor drop in flood stage may not justify the extra instream disturbance and construction activity that this alternative requires.

Two-Lane Bridge Replacement (Alternative 6)

The bridge replacement alternative consists of a full replacement of the existing structure with a new, two-lane superstructure supported on a reinforced concrete substructure. This alternative proposes to replace one pier with a new pier and remove the other existing pier completely. Additionally, the abutments would shift, moving the waterway opening by 15 feet.

- Impact due to construction activities – impacts to Tinicum Creek would include dewatering and excavation related to rock scour protection, pier demolition, abutment reconstruction and relocation, and a single pier construction. Existing stream hydraulics appear to be diminished by removing one of two piers and moving the abutments. The 25-yr. flood elevation appears to increase from 199.52 to 200.25 in this alternative. Instream impacts would be attributed to the demolition of existing piers and the relocation of the bridge abutments. This alternative has a high level of instream work. The pier to be replaced will be rebuilt in the location of an existing pier which will minimize impacts to the Tinicum Creek streambed when the pier is rebuilt but the shifting

of abutments will create high levels of disturbance at the stream banks and alter the waterway opening. While it appears that the alternative will minimize streambed disturbance because of the replacement of an existing pier with a new pier, the additional construction activity to demolish two piers and relocate both abutments may outweigh this benefit.

- Impacts due to encroachment – this alternative removes existing abutments and adds a single pier with additional protection against scour. Overall, this option reduces the amount of physical encroachment on the stream by the bridge structure but increases the hydraulic impacts on the stream from a flooding perspective due to the increase in the 25-yr flood elevations. Other hydraulic characteristics should be examined to determine if the large amount of alterations to the abutments and waterway opening can be justified from a hydraulic standpoint. Based on the increase in 25-yr flood elevation, the initial observation would be no. Additional impacts should also be considered since stream realignment is likely with the proposed changes. This would accelerate streambank erosion, reduce tree cover do to the loss of trees from incised banks, and undercut the area of relocated bridge abutments. Not enough information is provided in this document to thoroughly quantify these impacts so additional study and documentation is required.

This alternative has the same temporary construction easement area as Alternatives 3 and 4 but appears to have much more instream construction and impacts. The 25-yr flood elevation appears to increase due to the removal of one of the bridge piers but more detailed information from the H&H analysis would be necessary to confirm this observation. The attempt to realign does not appear to provide hydraulic benefits and could increase channel erosion, impacts to the bridge itself, and nearby properties. These risks are not justified nor is the additional instream disturbance and construction activity that this alternative requires because the 25-yr flood stage is increased with this alternative. Alternative 6A has all the same characteristics of Alternative 6 but the lane widths are reduced.

Two-Lane Bridge Replacement over Existing Substructure (Alternatives 6B/7)

The alternative proposes new abutments that would be constructed behind the existing abutments to carry all loads from a new two-lane superstructure; this option preserves the existing substructure elements. The existing substructure units would be for aesthetic purposes only and would not carry any superstructure dead loads or live loads.

- Impact due to construction activities – impacts to Tinicum Creek would include dewatering and excavation related to rock scour protection. Existing stream hydraulics would remain up to the 25-yr storm and impacts would largely be temporary due to construction activity around existing piers and abutments.
- Impacts due to encroachment – this alternative maintains existing abutments and piers with additional protection against scour that erodes the stream around the existing piers. Only minor increased encroachment on Tinicum Creek would take place due to the rock scour protection.

This alternative has the least amount of instream work of all the alternatives (similar to Alternative 3) and does not appear to alter the 25-yr flood elevation of Tinicum Creek. By maintaining the piers and abutments in place, the only instream work proposed is the scour protection. Because

the bridge is proposed to be a single span, the superstructure will be longer, deeper, and cause changes to the floodplain in larger storms which are not proposed for other alternatives. These design characteristics require evaluation to properly evaluate this alternative to others being proposed.

Two-Lane Bridge Replacement over Existing Substructure (Alternatives 6C/8)

Alternative 6C/8 considers the replacement of the existing abutments and wing walls and preservation of the existing piers. The existing superstructure would be replaced with a new two-lane superstructure. The existing piers would remain in the channel for aesthetic purposes only.

- Impact due to construction activities – impacts to Tinicum Creek would include dewatering and excavation related to rock scour protection and instream/streambank impacts due to the rebuilding of the existing wing walls and abutments. Existing stream hydraulics would remain up to the 25-yr storm and impacts would largely be temporary due to construction activity around existing piers and abutments.
- Impacts due to encroachment – this alternative maintains piers with additional protection against scour that erodes the stream around the existing piers. Abutments and wing walls are replaced to minimize the length of single span needed. No permanent alterations to instream hydraulics are noted from alternative with the exception of the unknown proposed low-chord of the bridge. Only minor increased encroachment on Tinicum Creek itself would take place due to the rock scour protection.

This alternative appears not alter the 25-yr flood elevation of Tinicum Creek. By maintaining the piers and abutments in place, the instream encroachment is the scour protection but instream construction would be necessary in and around the stream to reconstruct wing walls and abutments.

Conclusions

All alternatives that increase bridge width or approach widths to increase turning radii decrease the riparian vegetation present along Tinicum Creek. A decrease in riparian vegetation can destabilize the creek banks and lead to a reduction in erosion protection.

Alternatives 3, 4, and 6B/7 appear to have the least amount of instream construction due to the fact that existing bridge piers and abutments will be left in place. All three will require additional scour protection to prevent undermining at piers and abutments. Stream hydraulics appear to remain unchanged from the existing condition in these three alternatives but road approach elevations and superstructure depth increases will have an increased impact on larger storm flood stages and the overall floodplain for 6B/7. These elevation changes should be analyzed with respect to the floodplain and flood elevations in larger storms. Documented occurrences of local property damage during larger storms indicate that this area is impacted by high flood stages. Because of this, all alternatives should have impacts to the floodplain fully evaluated for the 2 to 100 year storms to prevent negative impacts of this bridge design on life and property. This document only notes the 25 year elevation on the drawing preventing any conclusions to be made as to potential impacts to nearby floodplains and property. The larger storms, final elevations of the bridge superstructure, and road approach slopes and elevations should be

evaluated for any alternative listed due to the potential to impact the floodplain and adjacent property owners.

Alternatives 3 and 4 appear to have similar instream impacts to each other due to the required rehabilitation of the piers to maintain them as loadbearing supports for the bridge in question. These alternatives propose no changes to the floodplain. Because of the narrative's lack of information, Alternative 3's bridge design did not appear to be fully evaluated within the narrative. This could be because it does not address PennDot's design intent of the bridge replacement.

Any alternative that impacts instream hydraulics negatively should not be considered. These alternatives include 1, 2, 6, and 6A. Alternatives that do not avoid hydraulic impacts to stream flow should be avoided if acceptable alternatives are available. Alternative 5 is the only alternative that lowers the 25-yr flood elevation from existing. Alternatives 6 and 6A propose to relocate the stream channel which has both negative impacts to stream hydraulics but also appears to put the western streambank in jeopardy of experiencing increased streamflow velocities due to channel migration. Streambank impacts with this alternative need to be studied more closely.

The alternatives with the largest instream or streambank impacts are alternatives 5, 6, 6A, and 6C/8 due to the increased construction requirements to either the piers or abutments. Alternatives that do not minimize this need for instream construction should be avoided if acceptable alternatives are available. All options considered should include the use of natural channel design and stream restoration principles and strategies for addressing the scour and erosion issues around the piers and along the banks associated with the bridge. Erosion and scour practices that harm the instream water quality or the physical characteristics of creek should not be considered.

Meliora Design will follow up this document review with a review of existing conditions to further evaluate the current bridge configuration. By evaluating existing impacts and flooding conditions at the location of the Headquarters Road Bridge, we will be better able to provide analysis and further comment on the alternatives documented in the Determination of Effects Report.

If you have any other questions or need additional information, I can be reached at (610) 933-0123 or MarcH@melioradesign.com.

Sincerely yours,

Marc Henderson, PE

cc:
Michele C. Adams, P.E., LEED AP, President

Scientists, Engineers & Environmental Planners Designing Innovative Solutions for Water, Wetland and Soil Resource Management

MEMORANDUM

VIA EMAIL

To: Maya van Rossum, Delaware Riverkeeper

From: Mary Paist-Goldman, P.E.

Subject: Report on potential stream impacts from Sheep Hole Road bridge replacement
Tinicum Township, Bucks County, Pennsylvania
Princeton Hydro Project No. 1020.017

Date: July 7, 2016

Pursuant to your request, Princeton Hydro has completed a site assessment of the Headquarters Road Bridge at Sheep Hole Road. Our review included:

- Determination of Effects Report (DOE) prepared by PennDOT dated November 2015.
- A memorandum by A.D. Marble and Company dated June 20, 2016.
- A Comment Response Document prepared by PennDOT and dated June 23, 2016
- Photos taken by pH staff on January 17, 2016
- Site walk and photos taken by pH staff on June 29, 2016.

Based on the reviewed documents, it appears that PennDOT is recommending Alternative 6 as described in the DOE for final design of the Sheep Hole Road bridge. In summary, Alternative 6 includes the following elements:

- Alternative 6 requires 0.014 acres of ROW acquisitions but this does not appear to include acquisitions necessary for the new alignment to meet existing grade on the western side.
- There is a proposed 0.042 acres of Temporary Construction Easement in the Ridge Valley Rural Historic District.
- Alternative 6 will result in an increase in 468 square feet in impervious area, an increase of 33%.
- Based on the Alternative 3 (which includes maintaining the existing substructure and rehabilitating it; DOE Figure 7) and Alternative 6 ("Two-Lane Bridge Replacement;

DOE Figure 10) cross sections, the proposed bridge replacement will result in an increase of 0.73 feet in water surface elevation in the 25-year event.

- If Alternative 6 is anticipated to increase the 25-year water surface elevation by 0.73 feet over Alternative 3, it is likely that the 100-year water surface elevation will also be impacted. (It is noteworthy that the DOE mentions that Alternative 2 would increase the 100-year floodplain elevation, but no such discussion was included for the other alternatives.)

Below are anticipated environmental impacts resulting from the various alternatives proposed for implementation of the bridge replacement described in the DOE:

- The proposed increase in impervious area will result in an increase in the rate and volume of runoff entering the stream in the vicinity of the bridge. This could lead to increased erosion in and around the bridge within the stream. Since the footprint of disturbance is increasing, the disturbed lands during construction will result in compaction in areas not designated as impervious. This will result in further increases in the volume and rate of runoff.
- The increase in impervious surfaces will also, during periods of higher temperatures, increase the temperature of the runoff entering the creek, which is detrimental to sensitive fish and other aquatic organisms.
- In discussion of Alternative 2, the DOE report references a change in water surface elevation for the 25-year event, however, the hydraulic modeling was not provided and no additional storm events were noted. The existing conditions plan does not indicate the water surface elevation anywhere so it is difficult to ascertain how the proposed water surface elevation was determined. The increase in water surface elevation is of concern as the geometry in the channel is changing, which can indicate changes in velocity and shear stress in the vicinity of the bridge. These changes can indicate increases in erosion and scour potential.
- The existing bridge opening (between abutments, minus piers) for the existing bridge (neglecting the temporary erosion protection) is 63 feet. The proposed bridge opening for Alternative 6 is 73 feet. The existing configuration has two piers while Alternative 6 reduces it to one pier. PennDOT is claiming that the removal of one pier reduces the scour at that pier, thus improving downstream water quality. It is true that scour at that former pier location will be reduced, but what they have failed to acknowledge is the potential increase in scour just upstream of the bridge as a result of the larger opening. The large sand/gravel bars that currently exist upstream of the bridge are likely present because of the existing bridge configuration. If the bridge opening is expanded, there is potential that the upstream sediment will mobilize until a new stable equilibrium is reached. Because of this potential to mobilize upstream sediment, the proposed bridge alignment may increase scour in the creek from existing conditions. Since no hydraulic modeling for the existing and proposed alternatives has been provided, insufficient information and justification has been provided regarding scour potential in and around the bridge. The proposed west abutment and road raises the existing road elevation approximately 2.5 feet but the full extent of that fill (including intrusions into

neighboring properties and into the floodplain) are not included. Fill in the overbank of the creek can result in changes to water depths during flood events as well as velocities. These impacts can be detrimental depending on the magnitude of the changes. This is another example of the myopic approach focused only on the impact at the bridge rather than overall impacts to the stream and watershed area. The potential impacts should be detailed to ensure compliance with the existing PennDOT antidegradation policy.

- The pasture to the west of Tinicum Creek appears to be within the FEMA 100-year flood zone A. Extension/raising of the western approach road as proposed by PennDOT may result in fill within the floodplain. Fill in floodplain areas reduces the overall available conveyance area and can impact the overall flood flow patterns in the system. These changes can increase velocities and create erosion in overbank areas in and around the fill.
- The Tinicum Creek is an EV waterway warranting level 4 Post Construction Stormwater Management (PCSM). Level 4 PCSM includes:
    - reducing post-construction runoff peak rate to pre-construction runoff peak rate for the 1-yr through 100-yr storm events,
    - reducing runoff volume for 2-yr 24-hr storm events and smaller, and water quality analyses for TSS and TP.

  The Determination of Effects Report does not address these requirements.
- The existing cross section shown in Figure 3 does not accurately portray the existing ground line in the stream and also does not include the current scour protection that is in place.
- The following assertion from the Determination of Effects Report for Alternative 6 is not demonstrated by PennDOT's analysis:

  > "The permanent condition is a benefit to the hydraulics of Tinicum Creek, as the reduction of potential scour would improve water quality by reducing the deposition of sediment in this Exceptional Value stream. This alternative would also improve the free-flowing nature of the creek through the removal of two piers and the repositioning of the western abutment outside of the stream channel."

  While the change from two piers to one pier reduces the scour potential at the location of the removed pier, the extent to which the scour changes with the proposed design was not provided. And in fact, given the anticipated shifting of the west abutment into the existing banks, there is a significant potential for increased scour in and around the west abutment.

- The close proximity of the downstream pasture and fenceline to the stream makes the proposed alignment of primary concern. Given the potential for sediment mobilization both in the form of bed and bank materials resulting from the change in bridge configuration, a comprehensive geomorphic study should be undertaken to best quantify the sediment losses and stream impacts caused by the proposed bridge realignment in Alternative 6. This is primarily due to the shifting of the west abutment.

The Determination of Effects Report notes that over time, the stream has started to shift its alignment towards the west abutment, destabilizing the upstream banks.

- In its current configuration, the western cell of the bridge (between the abutment and the pier) contains the stream thalweg (the thalweg is a line drawn to join the lowest points along the entire length of a stream bed or valley in its downward slope, defining its deepest channel.) and majority of the flow. The west abutment serves to redirect the thalweg back towards the center of the channel. This redirection keeps the thalweg in the middle of the channel and keeps the stream energy off of the banks and no erosion of the banks in this area is currently evident.
- Moving the abutment 15 feet to the west may have immediate, temporary reductions to scour of the abutment itself, however, it will result in an overall shift in the stream thalweg to the west and into the downstream bank. This will ultimately result in an increase in scour in the vicinity of the bridge and the abutment itself. Potential loss of the banks could extend for 500 feet downstream of the bridge and be as wide as 30 feet depending on the amount of trees that are compromised and lost as a result of increased pressure on the banks.
- The proposed approach lacks consideration of the antidegradation policies in effect to protect EV streams like the Tinicum Creek.
- Among the many deficiencies, the PennDOT analyses fail to give due consideration to shifts in stream alignment at this location and the potential detrimental impacts resulting from the shift that will result from the proposed Alternative 6. These changes should be assessed from a hydrologic and hydraulic analysis as well as consideration of changes to the potential Bank Erosion Hazard Index in the stream.
- The shift in stream thalweg has the potential to endanger the integrity of the existing tree line, fence, and pasture downstream of the bridge. There are alternative practices beneficial to stream health and water quality that could provide more protection to the downstream section and encourage flow to remain in the current center of the channel.
- Although from a 1-D hydraulic modeling perspective, the bridge opening itself does not have an impact on downstream scour, the realignment of the bridge opening 15 feet to the west shifts the trajectory of the flow from the middle of the channel directly into the existing bank. The bank on river right is currently a narrow stand of mature trees in very close proximity to an agricultural fence line and active pasture; shifting the flow towards that bank will very likely destabilize it, resulting in the loss of existing trees and herbaceous vegetation, the fence, and part of the private pasture. Figure 10 does not address this potential loss from erosion of private property and established vegetation. This sediment would mobilize downstream, potentially causing issues for aquatic organisms, changing flow patterns, and raising concerns about water quality.
- In response to PennDOT's statement that the bridge scour will be addressed using riprap, we offer the following:
    - Riprap installation is the standard practice in and around bridges to address scour, however, there are other alternatives that could be utilized that take into consideration the natural function of the stream and also provide scour benefits.

Use of rock and large woody debris can be employed to provide both habitat for fish species and aquatic organisms while still ensuring scour protection.

- In addition, while all streams shift their positions over time, it is unnecessary to realign the bridge opening to "catch" the moving stream. Standard natural channel design measures could be installed upstream of the bridge to direct flow into the center of the stream channel and take the pressure off of the river right bank. There are various configurations of vanes made with stones or logs that span all or part of the channel that, when appropriately designed and installed could safely redirect flows into the existing channel without compromising the current bridge configuration or the downstream property owner.

- Per PADEP's Chapter 105, Subchapter C. Culverts and Bridges, the following must be addressed for all bridges and culverts.
- Per §105.161 the following are the design criteria for determining hydraulic capacity
  "(a) Bridges and culverts shall be designed and constructed in accordance with the following criteria:
  (1) The structure shall pass flood flows without loss of stability.
  (2) The structure may not create or constitute a hazard to life or property, or both.
  (3) The structure may not materially alter the natural regimen of the stream.
  (4) The structure may not so increase velocity or direct flow in a manner which results in erosion of stream beds and banks.
  (5) The structure may not significantly increase water surface elevations.
  (6) The structure shall be consistent with local flood plain management programs.

  Alternative 6 as described elsewhere in this report has the potential to impact the stability downstream of the bridge as well as direct flow in a manner which would result in erosion of the streambank.
- *(b) In determining flood flows and frequencies for purposes of this subchapter, hydrologic analysis shall be by methods generally accepted in the engineering profession.*
  Insufficient information has been provided to determine if this condition can be complied with.
- Per §105.165 Bridge Abutments
  (a) Bridge abutments shall be set well into the banks in such manner as to assure minimal increase in flood elevations
  (b) Bridge abutments shall be aligned with the flow of the stream. The Department may require, the construction of wing walls at the upstream side of the bridge to assist in directing flood flows through the bridge opening.

  The proposed bridge abutment on river right has not been aligned with the current flow of the stream and will result in potential downstream erosion as previously discussed. Given the sensitive nature of the historic district and potential destabilization of the existing agricultural use, the incorporation of natural channel design measures should

be considered and redirection of the stream away from the banks instead of encouraging the stream to flow towards the downstream banks should be encouraged.

Princeton Hydro

MEMORANDUM

Scientists, Engineers & Environmental Planners Designing Innovative Solutions for Water, Wetland and Soil Resource Management

VIA EMAIL

To: Maya van Rossum, Delaware Riverkeeper

From: Mary Paist-Goldman, P.E.

Subject: Response to PennDOT comments on
Sheep Hole Road bridge replacement
Tinicum Township, Bucks County, Pennsylvania
Princeton Hydro Project No. 1020.017

Date: January 12, 2017

Princeton Hydro offers the following responses to the comments in the August 22, 2016 PennDOT response letter to DRKN regarding the Sheep Hole Road Bridge. Specific responses are given to comments 6 through 10 of the PennDOT letter as they pertain to the prior report prepared by Princeton Hydro personnel.

*6. **"Natural stream channel design and stream restoration are important solutions that solve** the erosion and scour problems, and negate the need for the proposed damaging **infrastructure"***
Thank you for the examples of stream restoration provided, unfortunately there appears to be no specifics given as to the DRKN's recommendations for natural channel design as it relates to Headquarters Road (which restoration technique, length of impact to the stream). PennDOT will review the application of the methods such as live stakes, soil and brush layering and riparian plantings and incorporate them as appropriate to enhance surrounding habitat due to the Exceptional Value of Tinicum Creek. The application of these treatments in the immediate vicinity of the bridge can also be discussed during the upcoming consulting party meeting as a mitigation and minimization measure. Details of this mitigation will be finalized as design work progresses and discussed with the permitting agencies as design progresses.

Response: Specific stream channel restoration techniques should be designed by PennDOT's consultants. Based on the information provided, Princeton Hydro can offer limited guidance and recommendations at this time. In particular, the use and design of bioengineering techniques and other natural channel stabilization techniques rely heavily on the stream velocities and shear stresses during channel forming flows. Channel forming flows are typically between the 1- and 2-year storm events, however the data PennDOT analyzed does not include flows at this level. A flow was analyzed for the 2.33-year storm event, however no written documentation was included to explain why this storm was included in the analysis and the results generated from the model for this event were not discussed. Due to lack of other available information, this was used to assess the viability of bioengineering design solutions for the stream.

*7. **"PennDOT's fai**lure to consider impacts and solutions beyond the narrow project area it has designated prevents mandated consideration of effective options, and of direct and **indirect impacts to the creek"***
Your comment primarily relates to impacts to the stream caused by the recommended replacement alternative and Princeton Hydro's memo submitted on July 8th. A preliminary analysis of the existing and proposed conditions was conducted as part of the pre-application process for the waterway permit application. A variety of alternatives were studied as part of the preliminary analysis and compared to existing conditions. The preliminary analysis will be finalized as design progresses and will be submitted as part of the waterway permit application during final design.

The extensive level of impact described in your letter and Princeton Hydro's memo is not anticipated to occur based on this preliminary analysis. After the final analysis is conducted, PennDOT will perform coordination with the permitting agencies to review the results and, if needed based on the analysis, will propose stream stabilization measures to ensure the long term stability of adjacent banks and the proposed structure. Specific concerns raised in the Princeton Hydro memo are addressed in the below comment responses.

Response: Our comments are based on field visits and the limited available information on the preliminary hydrologic and hydraulic assessment. As stated previously, moving the abutment 15 feet to the west may have immediate, temporary reductions to scour of the abutment itself, however, it will result in an overall shift in the stream thalweg to the west and into the downstream bank. The revised alignment of the bridge has the potential to increase erosion of this bank due to a redirection of the thalweg and no information regarding velocities and shear stresses during channel forming flows has been provided for review that would prove otherwise. The preliminary analysis completed by PennDOT indicates an increase in velocity for all of the alternatives analyzed, however, it should be noted that no existing conditions detailed HEC-RAS output was provided with the report. The smallest increase in velocities was noted under Alternative 1 and recommended Alternative 1. According to the study completed by Urban Engineers in February 2012, "Alternative 1 shows the lowest velocity increases; which should be minimized to avoid erosion of stream beds and banks as directed the Code." In general the reported velocities are significant downstream of the bridge and would result in shear stresses that would cause erosion.

*8. **"There is no demonstration that flood levels would be reduced by Alternative 6"***
A preliminary H&H analysis was conducted and will be finalized as part of the permit application for this project. As discussed in the comment response document, removal of the pier and the eastern abutment from the stream is anticipated to result in lower flood elevations and reduced potential for debris buildup.

Response: Flood levels upstream of the bridge appear to decrease based on the preliminary study completed, however, downstream flood levels were constant for all scenarios modeled including existing conditions. The study notes that no water surface elevation data was available to set downstream boundary conditions, so normal depth was assumed. Because of this assumption and the short distance of stream modeled, the downstream predicted water surface elevations may not be accurate. It is recommended that the bridge model extend a minimum of 1,000 feet downstream of the bridge and that existing water surface information be utilized to calibrate the model where possible.

*9. **"PennDOT has failed to undertake the stream impact analyses necessary to support** alternative 6. The proposed after the fact analysis fails to fulfill the requirements of law. As such, demolition-**replacement is not supported by the record."** A preliminary H&H analysis was conducted and will be*

finalized as part of the permit application for this project. Many of the concerns brought forth by Princeton Hydro will be addressed as the design of the project progress through a final H&H analysis, antidegradation analysis, and erosion and sediment pollution control design. Pre and post conditions surrounding the structure will be analyzed to ensure that the proposed structure is in compliance with State and Federal regulations. All of this documentation and analysis will be completed in preparation for obtaining State and Federal waterway permits in coordination with the Department of Environmental Protection and the Army Corps of Engineers.

Response: Since basic information regarding assessment of low impact stream stabilization techniques is not included in the information provided, it is impossible to state whether stream impacts resulting from Alternative 6 would meet the antidegradation policy.

10. ***"Concerns regarding piers seems disproportionate and biased, as does the disregard for expert comments on associated issues."***
While removal of a pier from the stream is discussed in the analysis of alternative 6 as an improvement to the overall hydraulic condition of the structure, it is the combination of this pier removal and the subsequent reduction in debris buildup potential with the shifting of the western abutment outside of the stream channel which results in the overall improved condition.

Your statement that "experts have noted that alt. 6 will increase water surface elevations in the 25 year event…will materially alter the natural regimen of the stream…will increase velocity and/or direct flows in a manner that will result in erosion of beds and banks…will adversely impact floodplains…" appears to be in reference to the opinions of Princeton Hydro submitted with the July 8th material provided by the DRKN. While your summary of Princeton Hydro's opinion appears as a matter of fact, the statements offered by Princeton Hydro is incomplete and does not include any technical analysis to substantiate their opinions. As an example, Princeton Hydro indicates that moving the western abutment of the bridge outside of the existing stream channel "…will ultimately result in an increase in scour in the vicinity of the bridge and abutment itself. Potential loss of the banks could extend or 500 feet downstream of the bridge and be as wide as 30…" however no analysis is provided to verify this conclusion. Additionally, while Princeton Hydro offers opinions on the potential impacts of the preferred alternative, there is no engineering seal or signature on their memo confirming that a licensed engineer has reviewed their opinions. As indicated above, a preliminary H&H analysis was conducted to determine potential impacts of a variety of alternatives to assess potential increases in velocity, flood elevations, scour, etc.

While it is accurate to say that these aspects should be studied further, we do not anticipate the level of impacts described by Princeton Hydro and in your cover letter will occur. A finalized H&H analysis will be conducted to confirm that the stream and adjacent banks will not be negatively affected. Should the final analysis find that a velocity increase could occur to an extent that may encourage erosion of the surrounding banks, mitigating actions will be taken such as reinforcing adjacent banks using measures sensitive to the Exceptional Value quality of the stream. Based on the preliminary analysis however, an increase, if any, is anticipated to be minimal and contained to immediately adjacent to the structure, not "500 feet downstream of the bridge and ….as wide as 30 feet" as described by Princeton Hydro. Regarding the placement rip-rap and your assertion that it will negatively impact the stream, this concern can be addressed by choking the rip-rap with fill material. Rip-rap can be further enhanced by seeding it with a riparian seed mixture which can improve habitat along the stream banks adjacent to the structure. Additionally, the increase in impervious area will be minimal and will not result in a new point source discharge to the creek. Water from the roadway will continue to drain off the roadway shoulders and down into the stream resulting in limited impact to water quality. Any additional potential

impacts can be further mitigated through the introduction of vegetated swales or the introduction of a riparian seed mixture. Details such as these will be finalized as design progresses.

Response: The water surface elevations shown on Figures 7 and 10 in the Determination of Effects prepared by PennDOT, show an increase in water surface elevation at the bridge during the 25-year storm event of 0.73 feet. Even though no 25-year storm water surface elevation is shown on the existing conditions figure, it can be inferred that the water surface elevation shown on Alternative 3 would be the same under existing conditions since this alternative does not change the channel geometry at the bridge. PennDOT has provided insufficient data to support or substantiate the claim that "an increase, if any, is anticipated to be minimal and contained to immediately adjacent to the structure."

The hydrologic and hydraulic analysis prepared by Urban Engineers in February 2012 includes a summary table which contradicts the information provided in the DOE on Figure 10. The water surface elevation reported for the 25-year event on Figure 10 is 200.25, which does not appear in the detailed hydrologic analysis prepared by Urban Engineers in 2012.

With regard to PennDOT's comment on credentials of Princeton Hydro, it is important to note that Princeton Hydro has not prepared a detailed H&H analysis of the stream nor have we completed detailed engineering studies or designs to prepare our reports; as such, a signature and seal of a licensed professional engineer is not required nor would such a seal be appropriate at this time. Nevertheless, we offer the following summation of the author's credentials. All of these comments as well as those prepared in the July 8, 2016 memorandum were generated by Mary Paist-Goldman, P.E. and under the direct supervision of Ms. Paist-Goldman. She is a licensed professional engineer in the Commonwealth of Pennsylvania in addition to the States of New Jersey and New York. Mary has more than 15 years of experience in water resources engineering, specializing in stormwater management, floodplain management, stream restoration and stabilization, dam removal, wetland design and mitigation, and regulatory compliance. She routinely develops, adapts, and troubleshoots hydrologic and hydraulic models for all project types for a wide range of industry standard software. In addition, she is highly skilled in the development and assessment of pollutant loading models. Mary also routinely designs wetland mitigation and restoration projects in both fluvial and estuarine environments working hand in hand with the company's restoration ecologists. She is highly skilled in the design, permitting, and construction of a variety of stormwater, riverine, wetland, and wastewater management systems with an emphasis on low impact development and green infrastructure.

Placement of riprap in a stream channel should be considered a last resort for stream stabilization on an Exceptional Value stream. The need for riprap in EV streams should be limited to protection of infrastructure only when necessary. Riprap (much like concrete liners and gabion baskets) is a rigid engineering measure employed to inhibit movement of the stream that could negatively impact the infrastructure for which the measure is trying to protect. In the August 22nd letter, PennDOT states that there are methods to reduce the negative impacts to the stream by placing riprap and includes examples such as "choking the rip-rap with fill material" and "seeding it with a riparian seed mixture which can improve habitat along the stream banks adjacent to the structure." Using fill material to "choke" rip-rap is not sufficient to reduce negative impacts on the stream. Riprap's angular nature does not allow for fully choking of voids and the use of unspecified fill material does not achieve any habitat benefits. PennDOT has plans to put topsoil in the riprap to ensure germination of seed, however, in EV streams, optimal bank habitat typically includes tree canopy to reduce temperature in the stream for fisheries and macroinvertebrates. If the velocities and shear stresses allow, the use of bioengineering methods such as soil wraps and lives stakes and/or toe wood are desired. If the

anticipated scour is too high, there are alternative scour countermeasures that should be considered including the use of vane structures, engineered riffles, and other similar techniques that provide habitat enhancement for fish species.

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Impacts of New Highways and Subsequent Landscape Urbanization on Stream Habitat and Biota

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New highways are pervasive, pernicious threats to stream ecosystems because of their short- and long-term physical, chemical, and biological impacts. Unfortunately, standard environmental impact statements (EISs) and environmental assessments (EAs) focus narrowly on the initial direct impacts of construction and ignore other long-term indirect impacts. More thorough consideration of highway impacts, and, ultimately, better land use decisions may be facilitated by conceptualizing highway development in three stages: initial highway construction, highway presence, and eventual landscape urbanization. Highway construction is characterized by localized physical disturbances, which generally subside through time. In contrast, highway presence and landscape urbanization are characterized by physical and chemical impacts that are temporally persistent. Although the impacts of highway presence and landscape urbanization are of similar natures, the impacts are of a greater magnitude and more widespread in the urbanization phase. Our review reveals that the landscape urbanization stage is clearly the greatest threat to stream habitat and biota, as stream ecosystems are sensitive to even low levels (<10%) of watershed urban development. Although highway construction is ongoing, pervasive, and has severe biological consequences, we found few published investigations of its impacts on streams. Researchers know little about the occurrence, loading rates, and biotic responses to specific contaminants in highway runoff. Also needed is a detailed understanding of how highway crossings, especially culverts, affect fish populations via constraints on movement and how highway networks alter natural regimes (e.g., streamflow, temperature). Urbanization research topics that may yield especially useful results include a) the relative importance and biological effects of specific components of urban development—e.g., commercial or residential; b) the scenarios under which impacts are reversible; and c) the efficacy of mitigation measures—e.g., stormwater retention or treatment and forested buffers.

Keywords road, urbanization, motorway, macroinvertebrate, fish, urban

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Introduction

Due to their large surface area, high traffic volume, and potential to induce urban development, the construction of large (≥ four-lane) paved roads (herein defined as highways), are often detrimental to local ecosystems. Stream ecosystems are particularly sensitive to the construction of new highways due to characteristics of the fluvial environment and biota. Downstream transport of water and sediment spreads chemical and fine sediment pollution, causing the ecological impacts of highways to extend farther in aquatic than in terrestrial environments (Forman and Alexander, 1998). Aquatic fauna often have a more difficult time avoiding spreading impacts than terrestrial fauna because their movements are generally confined to the narrow linear geometry of the stream channel. In addition, highways and urban development alter the hydraulic connection of streams to their watersheds, fundamentally altering processes, which control channel geomorphology, form habitat, and ultimately contribute to biotic integrity (Wang et al., 2001; 2003).

Angermeier et al. (2004) conceptualized the extent and nature of highway impacts on streams in three consecutive stages: initial highway construction, highway presence, and eventual landscape urbanization (Table 1). Because this framework reflects the spatial and temporal dimensions of impacts, it is useful for organizing, describing, and evaluating the environmental concerns of new highways. The initial phase, highway construction, includes all the short-term impacts from the construction process. These impacts are generally physical, temporary (i.e., subside through time), and local. The second phase, highway presence, encompasses secondary impacts that are chronically generated from the physical presence of the highway including chemical pollutants from automobile traffic and stream channel alterations. These chemical and physical impacts are regional and occur as long as the highway exists. Finally, landscape urbanization includes the impacts from general economic development and results in a variety of chemical and physical impacts that are widespread and chronic. Previous reviews have focused on single phases of highway impacts (Atkinson and Cairns, 1992; Little and Mayer, 1993; Forman and Alexander, 1998; Trombulak and Frissell, 2000; Forman and Deblinger, 2000; Paul and Meyer, 2001) but not clearly described or considered the inherent connectivity of the nature and scales of the impacts.

Table 1

Conceptual framework for primary physico-chemical impacts of highway construction. The scale and nature of primary environmental impacts change from the direct effects of highway construction to the secondary and indirect effects associated with the presence of a highway and urban development. These may be viewed as a gradient of changing concerns and impacts through time. All physico-chemical impacts have important consequences for stream biota but the degree of peer-reviewed investigation differs among stages

	Developmental stage		
Impact characteristics	Highway construction	Highway presence	Urbanization
Temporal extent	Temporary	Chronic	Chronic
Spatial extent	Local	Regional	Regional
Primary nature	Physical	Physical and chemical	Physical and chemical
Degree of investigation	Low	Moderate	High

The predictable effects of the three consecutive stages of new highway construction are seldom considered simultaneously in environmental assessments. The National Environmental Policy Act (NEPA), the Council on Environmental Quality (CEQ), and various state environmental laws (CEQ, 1997) require state and federal transportation agencies to consider the significance of anticipated impacts in environmental assessments (EAs) or prepare environmental impact statements (EISs) when significant impacts are anticipated. However, these assessments generally focus almost exclusively on short-term, localized impacts and ignore the long-term secondary and cumulative impacts (Spaling and Smit, 1993; McCold and Holman, 1995; Burris and Canter, 1997; Cooper and Canter, 1997; Angermeier et al., 2004) that are often primary concerns of the government agencies and civilian stakeholders reviewing these documents (e.g., NCWRC and NCDPR, 2002). Although European countries more rigorously apply ecological principles to transportation projects than the United States (Forman and Alexander, 1998), inadequate assessment of cumulative effects is a global problem (Cooper and Sheate, 2002).

Evaluations of the thoroughness of EISs and EAs are often limited due to a lack of published summaries of the impacts that may be expected from proposed projects. For example, evaluations of EISs and EAs have searched for the assessments for key words or concepts rather than assessing how meaningful and thoroughly probable impacts were considered (e.g., Burris and Canter, 1997; Cooper and Canter, 1997). A new review of the extent and nature of impacts from new highways that considers the stages and changing impacts identified by Angermeier et al. (2004) will assist reviewers of EISs and EAs in explicitly linking the successive stages, a step often ignored in assessment-proposed highway projects. Our review summarizes investigations that will help environmental and fisheries scientists consider potential impacts of proposed highway projects over multiple dimensions, but are often unavailable in field offices, and spread widely across academic disciplines. In addition EISs, EAs, and previous reviews often make assertions based on unpublished government reports which suffer the general inadequacies of "grey" literature (Collette, 1990). In contrast, we rely almost exclusively on published, peer-reviewed studies.

The purpose of this article is to review the impacts of new highways through undeveloped land. Although not the focus of this review, much of the information presented may be relevant to more common highway improvements, such as lane additions and surface upgrades. We focus on studies conducted in the United States, but some relevant international research is included to supplement sparsely researched topics. Following our conceptual framework (Table 1), we synthesize the scientific knowledge on physical, chemical, and biological responses of streams during 1) highway construction, 2) highway presence, and 3) watershed urbanization. The ultimate goals of this review are to provide information that will: 1) improve the ability of transportation planners to prepare more through, meaningful, and science-based EISs and EAs, and 2) spur research in subject areas where rigorous studies are lacking but information is needed for comprehensive impact assessment of new highways.

Highway Construction

Highway construction can be highly destructive to stream habitat and biota. Impacts on streams are primarily acute, local, and physical in nature (Table 1). Highway construction primarily degrades stream habitat locally but some of these impacts may transport downstream. In contrast to impacts of highway presence and landscape urbanization, many construction impacts may be temporary and streams can recover if not recurrently disturbed. In this section, we review literature assessing these acute impacts (e.g., sedimentation). Other

impacts initiated during construction but posing long-term threats, such as channelization and culverts, are considered in the Highway Presence section.

Highway Construction and Physical Habitat

As with any earth-moving activity, the greatest threat of highway construction to streams is fine sediment pollution, which can cause a variety of problems for resident biota, including direct mortality, reduced reproductive success, and a reduction in the food base (reviewed in Waters, 1995). Fine sediment pollution originates as bare soil erodes into streams, usually after exposure to precipitation or flowing water. Streams impacted by highway construction accumulate (Clarke and Scruton, 1997) and transport (Weber and Reed, 1976) many times more sediment than undisturbed streams. Although a variety of erosion control procedures are available and often legally required, they are seldom evaluated for their effectiveness (but see Grace (1999), Benik et al. (2003a, 2003b)) and have a risk of failure seldom considered in published investigations or environmental impact statements. A Pennsylvania study found that, even in the presence of sediment control techniques, streams impacted by highway construction carried 5 to 12 times more fine sediment than a control stream (Weber and Reed, 1976). The suspended solids load of a Ontario stream increased from an average of 2.8 mg/l to 352.0 mg/l during the initial "clearing phase" and peaked at 1,390 mg/l during highway construction (Barton, 1977). In addition, Barton (1977) observed a 10-fold increase in fine sediment deposition following a highway construction channelization project but stream sediment loads approached preconstruction levels near the completion of the construction. Increases in suspended sediment are detectable for long distances (kms) downstream of construction sites (Wellman et al., 2000). These sediments deposit in downstream pools, riffles, and impoundments (Duck, 1985; Brookes, 1986).

Highway construction can result in a variety of other seldom studied physical habitat degradations by encroaching onto floodplains and damaging riparian areas. Heavy equipment accessing the stream may incidentally damage (Hubbard et al., 1993) or purposely remove (Stout and Coburn, 1989) riparian vegetation during highway construction. Riparian vegetation is a critical component of stream watersheds and performs many important functions for streams (see Urbanization section). Streams near highways are often channelized and the initial effect of heavy equipment modifying the stream channel may alter the dynamic equilibrium of streams and result in rapid channel reorganization, all of which can lead to additional sedimentation and erosion downstream.

Highway Construction and Stream Chemistry

We found no studies documenting chemical impacts of highway construction on streams. However, the use of heavy machinery in and around streams likely causes some chemical pollution. In addition, many highway construction materials are highly toxic to aquatic biota. For example, industrial waste materials and byproducts such as shredded tires, ashes, mining wastes, municipal sludge, and wood wastes may be used in highway construction (Eldin, 2002). These materials release heavy metals and hydrocarbons which are toxic to water fleas *Daphnia magna* and algae *Selenastrum capricornutum* (Eldin, 2002). The toxicity of these materials may be reduced when in contact with soil, and during typical construction these toxins are unlikely to reach detrimental levels in streams. Nevertheless, the proximity of toxic materials to streams increases the chances of accidental spills and releases.

Biological Effects of Highway Construction

The impact of highway construction on stream fishes and macroinvertebrates is rarely studied. Similar to other anthropogenic landscape changes, highway construction is difficult to research for several reasons. Highway construction consists of many individual impacts that occur concurrently; thus, specific causal mechanisms are difficult to establish. An additional obstacle to research is that construction timeframes are often unpredictable, and construction often takes longer than the tenure of a typical graduate student. In addition, highway construction presents statistical and study design difficulties; for example, treatments are difficult to replicate and meaningful controls difficult to establish.

We found only a few studies investigating the effects of highway construction on stream fishes and macroinvertebrates. However, fine sediment pollution occurs from a variety of anthropogenic sources and is widely studied outside the context of highway construction. The effect of fine sediments on stream biota has been recognized for decades (Ellis, 1936) and is the subject of many previous reviews (Chutter, 1969; Bruton, 1985; Ryan, 1991; Waters 1995; Wood and Armitage, 1997; Henley et al., 2000). Therefore, in addition to studies that directly focus on highway construction, this section includes more general investigations of the effect of fine sediment on stream biota.

Fine sediment pollution from highway construction can immediately alter macroinvertebrate and fish communities (Barton, 1977). Reductions in the abundance and diversity of macroinvertebrates may depend on the timing and duration of construction impacts (Cline et al., 1982). Stout and Coburn (1989) found an absence of macroinvertebrate shredders in pools below highway construction. Fine sediment from highway construction may result in reduced macroinvertebrate diversity and density (Lenat et al., 1981). Highway construction can immediately reduce the overall abundance of stream fishes by over 50% (Whitney and Bailey, 1959; Barton, 1977). Taylor and Roff (1986) reported that the abundance of bottom-feeding fishes is initially reduced, but recovers after fine sediment deposition rates decline. Fish and invertebrate communities begin recovering after the fine sediment loads are reduced and deposits wash downstream, but full recovery may require years (Taylor and Roff, 1986).

Fine sediment pollution degrades stream biotic communities through a variety of mechanisms. Stream periphyton and macrophytes are abraded, suffocated, and shaded by fine sediment (Waters, 1995). Fine sediment loads impact macroinvertebrates by inducing catastrophic drift (Culp et al., 1986), damaging individual's respiratory structures (Lemly, 1982), and reducing habitat by clogging interstitial spaces in streambeds (Lenat et al., 1981). Fine sediment can also clog the gills of fishes and reduce the quality of their habitats for feeding by impairing visibility and reducing prey abundance (Bruton, 1985). It is possible that construction interferes with a variety of feeding strategies; Berkman and Rabeni (1987) found that fine sediment deposition reduced populations of both insectivorous and herbivorous fishes. In addition, fine sediment suspended in the water can lower reproductive success of fishes (Burkhead and Jelks, 2001). For example, egg survival of some species depends on substrate that is permeable to water flow (Kondou et al., 2001).

Highway Presence

Although highway construction can be highly detrimental to stream habitat and biota, construction sites are sparse compared to the land covered and increasingly affected by existing highways. Currently in the United States, there are 6.3 million km of public roads, 60% of which are paved with a surface area of about 50,000 km^2 (Eldin, 2002). At present,

20% of the United States' land area is directly affected by road presence (Forman, 2000), and 50% is within 382 m of a road (Ritters and Wickham, 2003). In contrast to the localized, temporary effects of highway construction, the extensive effects of highway presence are persistently generated by highways with direct hydraulic connections to streams (Table 1).

Highways and Physical Habitat

Although pulses of highway runoff can substantially affect stream channels, we found no studies of its impact on physical stream habitat. However, many investigators have examined the impacts of logging roads (see Gucinski et al., 2001). Although unpaved forest roads are not the subject of this review and differ from paved highways in many aspects, they are similar in that their impervious surfaces collect stormwater and route runoff into streams. Collecting and routing runoff to streams causes logging roads to increase the magnitude and frequency of stream flooding (King and Tennyson, 1984; Jones and Grant, 1996). These runoff changes are also characteristic of urban areas and cause a variety of physical changes to stream channels, such as channel widening and downcutting (see Urbanization section). However, because paved roads are only minor components of the total impervious surfaces of an urban watershed, the presence of a single highway in a watershed likely results in less changes to flow regimes and, ultimately, less severe changes to physical stream habitat than urban development.

Streams near highways are often channelized during construction. However, unlike many construction impacts such as fine sediment pollution, this modification has continual long-term consequences for physical stream habitat. Channelization increases channel slope, reduces base flows, increases peak flows, alters substrate composition, and severs floodplain links (Hubbard et al., 1993). Overall, channelization reduces the habitat diversity characteristic of natural streams by replacing coarse substrates with finer substrates, reducing depth and velocity heterogeneity, creating more laminar flows, removing cover, and eliminating natural pool-riffle sequences (Peters and Alvord, 1964; Narf, 1985).

If engineered properly, bridges may cause minimal impacts on the physical stream channel; however, through channelization or poor construction practices, bridges can destabilize stream channels. Although culverts are generally more detrimental to stream habitat and biota, they are often installed as a cheaper alternative to spanning structures. The presence of cluverts destabilizes stream channels by interrupting the downstream transport of woody debris, sediment, substrate, and water. Although few quantitative studies of the impact of culverts on physical stream habitat are available, Gubernick et al. (2003) provided a qualitative overview. Unlike dynamic natural stream channels, culverts are rigid and unaccommodating to changes in channel morphology. In addition, the stream channel is often widened above the culvert, reducing current velocities and forming a sediment trap. Although downstream sediment flow is reduced above the culvert, it continues or accelerates below the culvert causing channel downcutting and resulting in an elevation drop, even if initial construction put the pipe at stream level. Typically, culverts are sized to accommodate rare flood flows but are too small to allow passage of woody debris. Accumulations of woody debris near the inlet can starve downstream areas of this important component of stream habitat (see Urbanization section) and may plug the culvert, causing failure of road fill during floods and increasing the risk of catastrophic debris torrents.

Highways and Stream Chemistry

Highway surfaces collect a variety of chemical pollutants from automobile traffic and are disproportionate contributors to overall pollutant loads. For example, public highways

cover 8% of Rhode Island, but produce 16% of the state's oil and grease pollution, and 77% of the state's zinc pollution (Hoffman *et al.*, 1985). These pollutants are mobilized by runoff water and transported to streams where they accumulate in sediments and biota and spread downstream, resulting in chronic and widespread effects. This runoff represents an important, but relatively unstudied, component of stream pollution (Wu et al., 1998).

Traffic residue adds a variety of metals to highway runoff, including iron, zinc, lead, cadmium, nickel, copper, and chromium. Tires contain up to 1% zinc by weight (Hedley and Lockley, 1975) and are a significant source of zinc in the environment (Davis et al., 2001). Brake pad dust contributes copper (Davis et al., 2001). These metals accumulate in roadside dust (Leharne et al., 1992), soil (Goldsmith et al., 1976; Garcia-Miragaya et al., 1981), and stream sediments (Van Hassel et al., 1979; Maltby et al., 1995b). The concentrations of metals in stream sediments are positively related to the volume of traffic (Van Hassel et al., 1980; Callender and Rice, 2000) and accumulate in proportion to the length of highway drained (Maltby et al., 1995b), suggesting that pollution will be most severe when large highways are drained by small streams.

Highway surfaces also accumulate petroleum from automobile traffic. Motor oil accumulates from crankcase drippings, washes off the highway surface, and accumulates in stream sediments (Hoffman et al., 1985). Until the Clean Air Act of 1970 phased out leaded gasoline, lead was the most widespread metal pollutant from automobile traffic. Unleaded gasoline permits the use of catalytic converters, which convert gaseous exhaust pollutants such as carbon monoxide, nitrous oxides, and hydrocarbons to less toxic chemicals such as carbon dioxide, nitrogen, and water. The chemical reactions are catalyzed in automobile exhaust systems by platinum group elements (PGEs), including platinum, palladium, and rhodium, which are emitted on highway surfaces during operation. Since the introduction of catalytic converters, PGEs have become a new and relatively unstudied metal pollutant of stream sediments (Rauch and Morrison, 1999). In addition, iridium, rubidium, and osmium are common impurities in PGE catalysts and may also be deposited on highways (Rauch et al., 2004). Concentrations of PGEs in roadside soils are related to traffic volume and are increasing to such a degree that their recovery (i.e., mining roadside soil) may become economically viable (Ely et al., 2001).

In areas that undergo winter weather, deicing salt is another widespread, but little studied, chemical pollutant of streams. Deicing salt is spread on highways in anticipation of and during snow and ice accumulation, from where it washes directly into streams or is stored in the soil. A study in Pennsylvania found 20- to 30-fold increases in a stream's conductivity during winter thaws (Koryak et al., 2001). Although concentrations harmful to fish are considered rare (Transportation Research Board, 1991), few studies have addressed the effects of these "shock loads" of salt on stream biota. Koryak et al. (2001) observed only pollution-tolerant macroinvertebrates and stressed fish communities in areas receiving shock loads of deicing salt. Furthermore, deicing salt may be contaminated by metals and nutrients. Phosphorous, lead, and zinc were found in highway deicing salt and anti-skid sand in Minnesota (Oberts, 1986) and iron, nickel, lead, zinc, chromium, and cyanide in deicing salt in England (Hedley and Lockley, 1975). Road salt that does not run off directly into streams may still cause chronic problems through slow release into adjacent soils; chlorine ions from road salt have a soil residence time of at least 2 years (Mason et al., 1999).

Another concern associated with the presence of a highway is the inevitability of toxic chemical spills. In 1982, hazardous materials made up more than 25% of all domestic freight shipments (List and Abkowitz, 1986). Almost all types of hazardous wastes and 62% of all hazardous materials (by weight) are moved by truck (Abkowitz et al., 1989; Atkinson and Cairns, 1992). Unfortunately, accidental releases during shipping are not infrequent.

Between 1990 and 1994 an average of 10,000 accidents per year were reported, releasing 2,445 kl of hazardous materials annually on U.S. highways (USEPA, 1996).

Biological Effects of Highways

Highways have many detrimental effects on stream biota. Toxic chemical spills often occur from truck accidents, and can cause fish kills extending downstream for great distances (kms). Stream crossings may be especially vulnerable to spills because bridge surfaces encourage automobile accidents because during winter weather conditions by icing more frequently than terrestrial paved surfaces. Furthermore, the inherent vicinity of bridge accidents to streams increases that risk that spilled chemicals may enter streams before containment. Accidental spills are particularly devastating for isolated populations of rare species with limited potential for movement and recolonization, such as freshwater mussels. Although there are many documented cases of such acute effects (USEPA, 1996), we found no studies describing chronic changes in macroinvertebrate or fish communities resulting from repeated toxic spills. Studies examining streams after catastrophic toxic spills have documented eventual recovery and recolonization from adjacent areas (Ensign et al.,1997; Meade, 2004), emphasizing the importance of well-connected habitats to increase resilience of stream biota to the effects of highway presence. Thus, stream reaches that are isolated by culverts, dams, or natural barriers may be particularly vulnerable to spills.

Macroinvertebrates and fishes near highways may have elevated metal concentrations in body tissues. Levels of lead and zinc in fishes and aquatic macroinvertebrates may be locally related to the amount of traffic at upstream highway crossings (Van Hassel et al., 1980) and regionally related to highway densities across large areas (Stemberger and Chen, 1998). Fish species accumulate metals from highway runoff at differential rates (Ney and Van Hassel, 1983). Aquatic macroinvertebrates may absorb platinum from stream sediments (Rauch and Morrison, 1999). The accumulation of toxic chemicals in animal tissue likely results in widespread impacts that spread to terrestrial communities, particularly animals that feed exclusively on aquatic species (e.g., many members of the avian order Ciconiiformes).

Many components of highway runoff such as metals and petroleum are suspected toxicants to aquatic organisms. Although few studies have addressed the toxicity of highway runoff, the sediment from contaminated streams is considered more toxic than the water. Although a variety of potential toxicants, including hydrocarbons, copper, and zinc are found in highway runoff, polycyclic aromatic hydrocarbons (PAHs) in stream sediments may be responsible for the majority of macroinvertebrate toxicity (Maltby et al., 1995a). Boxall and Maltby (1997) confirmed that three specific PAHs, pyrene, fluoranthene, and phenanthrene, were major sediment toxicants for *Gammarus pulex* and accounted for >30% of the toxicity of runoff-contaminated sediments.

Comparisons of macroinvertebrate communities above and below highway crossings are rare but indicate that reductions in diversity and pollution-sensitive species below highway crossing are most pronounced where small streams receive runoff from large sections of highways (Maltby et al., 1995b). These patterns may reflect greater hydrocarbon pollution in sediments below road crossings. Reductions in pollution-sensitive shredders may result in slower leaf litter breakdown (Maltby et al., 1995b), altering stream productivity, nutrient cycling, and food webs.

In addition to chemical effects, highways also impact biota through physical changes to the stream channel. Channelization can have numerous effects on the physical structure and natural environmental regimes of stream systems; these dynamics provide a mosaic of habitats to support resident organisms (Stanford et al., 1996; Poff et al., 1997; Poole, 2002).

Moyle (1976) compared channelized and unchannelized sections of a California stream and found the biomass of fish and invertebrates in channelized locations was less than one-third of that in unchannelized locations. He also found differences in fish and macroinvertebrate species composition between channelized and unchannelized areas. Channelization may reduce the recruitment and production of fishes by eliminating nursery habitat. For example, removal of gradually sloping streambanks increases the area of unsuitable habitat with velocities greater than the swimming speeds of age–0 fishes (Copp, 1991, 1997; Scheidegger and Bain, 1995; Mann and Bass, 1997; Mérigoux and Ponton, 1999; Meng and Matern, 2001).

Culverts are a feature of highway presence that can have a variety of negative impacts on stream biota. Culverts provide poor internal habitat due to low-bottom complexity and uniformly high-flow velocities inside culverts provide poor habitat (Slawski and Ehlinger, 1998), but most importantly, they are notorious fish movement barriers. The effects of highway crossings on stream fish movement depend on the swimming speed and behavior of individual species (Toepfer et al., 1999). Fish passage is obstructed by high current velocities and shallow depths inside culverts, as well as vertical drops at the culvert outflow (Baker and Votapka, 1990). In addition, concrete box culverts may develop internal gravel bars (Wellman et al., 2000) that impede fish movement. Warren and Pardew (1998) found that overall fish movement was an order of magnitude lower through culverts than through other crossing types or natural channels in small, warmwater Arkansas streams. Culverts throughout a tributary network can reduce production of species that require spawning migrations, such as coho salmon *Oncorhynchus kisutch*, by preventing adults from reaching spawning habitat (Beechie et al., 1994). Barriers can isolate populations, resulting in reduced genetic diversity and increased probability of extinction due to demographic instability and impeded recolonization. Most investigations of fish movement barriers have focused on economically important fishes with known migration patterns; for example, Belford and Gould (1989) determined combinations of water velocity and culvert length that prevented passage by brook trout *Salvelinus fontinalis*, rainbow trout *Oncorhynchus mykiss*, and brown trout *Salmo trutta*. However, entire fish communities are vulnerable to highway crossing movement barriers (Jackson, 2003) and the importance of movement and movement barriers to nongame fishes and fish communities is poorly understood. In one of the few published studies for a nongame species, Schaefer et al. (2003) found that a variety of culvert types significantly decreased the probability of movement of the federally threatened leopard darter *Percina pantherina* between habitat patches. Although culverts present a variety of obstacles to fish movement, engineers designing passable culverts may narrowly focus on the effects of singular parameters such as vertical outflow drop distance or current velocity (e.g., Rowland et al., 2003) and not consider the cumulative effects of multiple passage inhibiting features.

Urbanization

Urbanization is difficult to define, as the meaning of "urban" varies across disciplines (Paul and Meyer, 2001). We modify the definition by Kemp and Spotila (1997) and define urbanization as development in a watershed, such as building construction, that changes land use typical of rural areas (e.g., farming, grazing) to uses more typical of residential and industrial areas (e.g., retail, suburban residential areas, plants and factories). This definition describes the general process of watershed-altering development that is characteristic of the urban landscape and the focus of this review.

The construction of new highways is the "quintessential public sector investment" by which government attempts to encourage economic growth in rural areas (Chandra and Thompson, 2000). At the state level, new highways are ineffective at increasing economic activity (Evans and Karras, 1994; Holtz-Eakin, 1994; Dalenberg and Partridge, 1997), but they effectively redistribute economic activities among locales. New highways reduce traditional rural economic activities of nearby counties such as agriculture, but enhance and concentrate urban economic activities such as manufacturing and retail in the county the highway intersects (Rephann and Isserman, 1994; Chandra and Thompson, 2000). The construction of new highways also increases the price of agricultural land (Shi et al., 1997), thereby encouraging development. Shifting the economic productivity from rural to urban activities promotes urbanization, at least in the county the highway passes through, as reduced travel time to cities encourages establishment of commerce in previously undeveloped areas. Although final decisions for urban development are made by local governments, new highways clearly and purposely provide impetus for urban development.

Much of our understanding of the relation between new highways and urban development is based on patterns observed at interstate highway exits. Key characteristics of interstate exits related to the rate and nature of urban development in North Carolina include traffic volume of the interstate and crossroad, location, and population of nearby communities, distances to urban centers, degree of preexisting development, and distance to the next interchange (Hartgen et al., 1992). A later study concluded that these relationships were consistent for interstate exits nationally (Hartgen and Kim, 1998). Hartgen et al. (1992) described the general requirements, stages, and potential paths of interchange development, and all potential paths predict that interstate construction leads to the conversion of forested and agricultural areas to commercial or residential development. Improvements to existing highways, such as lane additions, also increase development activity along the highway corridor (Cervero, 2003).

Other studies have documented land use change induced by the presence of nearby highways. Although these studies do not address the construction of new highways, they provide insight into the relationship between a new highway and landscape urbanization at points other than exits. Bradshaw and Muller (1998) forecasted the conversion of farmland to urban areas in California, describing highways between cities as "magnets for decentralized growth." In the southern Appalachian Mountains, areas close to highways were more likely to experience development (Wear and Bolstad, 1998).

Although the relation between the construction of a new highway and urban development is intuitive, predictable, and often a declared political goal, few investigators have examined this connection. Indeed, this connection is a contentious issue for transportation planners. The position that new highways do not result in urban development, although apparently ubiquitous among transportation planners, is not well-supported by published studies and our literature review failed to produce any peer-reviewed examples refuting a positive relation between highway construction and urban development (but see Hartgen (2003a, 2003b)).

A stream's physical habitat and chemical environment are largely products of its watershed. Thus, as a watershed urbanizes, changes occur in stream habitat, water chemistry, and ultimately biota. Similar to the presence of a hydraulically connected highway, urban development continually affects streams and causes extensive and chronic impacts (Table 1), but at greater magnitudes. Runoff from urban areas contains all the chemical pollutants from automobile traffic as well as those from urban sources. In addition, urbanization drastically alters how a watershed produces stream flow, resulting in many changes in physical habitat.

Urbanization and Physical Habitat

Undeveloped watersheds are characterized by land surfaces that are pervious to precipitation. Rain falling in undeveloped watersheds infiltrates the soil and reaches streams slowly as subsurface flow. The urban landscape, however, is characterized by rooftops, asphalt, compacted soils, and other highly impervious surfaces (Schueler, 1994, 1995). These impervious surfaces with direct hydraulic connections to streams (Schueler, 1994; Wang et al., 2001, 2003), capture precipitation and route it quickly into storm sewers and gutters and, ultimately, into streams (Hollis, 1975). Similarly, precipitation falling on impervious surfaces without direct hydraulic connections to streams may reach streams quickly as overland flow (Horton, 1945; Leopold, 1973). Thus, urbanization fundamentally alters the delivery of water to streams (Booth, 1991).

These changes in precipitation delivery alter stream flow regimes. As a watershed urbanizes, peak flow volume from precipitation events increase (Hollis, 1975; Beard and Chang, 1979; Neller, 1988; Booth, 1990; Clark and Wilcock, 2000; Rose and Peters, 2001), thereby increasing the frequency of bankfull flows (Leopold, 1973; Hollis, 1975; Arnold et al., 1982; Moscrip and Montgomery, 1997). Even low levels of paving increase the magnitude of frequent floods (recurrence interval $\leq$ 1 year); for example, paving 20% of the watershed can increase the peak discharge of the mean annual flood by an order of magnitude (Hollis, 1975). Thus, discharge rates that previously occurred once every 2 years may double in frequency following watershed development (Booth, 1991). Ten-year floods may occur 2.5 to 10 times more frequently following watershed urbanization (Moscrip and Montgomery, 1997). In addition, precipitation events that produced no increase in stream flow prior to urbanization may generate substantial flooding following watershed urbanization (Booth, 1991).

These changes in flood frequency and magnitude result in a variety of changes to physical features of streams. Bankfull and greater flows cut and form stream channels and adjust channel capacity such that bankfull conditions occur on an average of once every 1 to 2 years (Wolman and Miller, 1960; Leopold, 1973). The increased frequency of bankfull flows following urbanization causes a stream to increase its channel capacity by eroding its banks, downcutting its channel, or both (Hammer, 1972; Leopold, 1973; Arnold et al., 1982; Allen and Narramore, 1985; Booth, 1990, 1991; Gregory et al., 1992; Pizzuto et al., 2000). Thus, urban streams are wider and deeper than unaffected channels.

Impervious surfaces increase peak flow at the expense of base flow. Base flows result from subsurface flow and groundwater that steadily contributes to streams between precipitation events. Because impervious surfaces prevent precipitation from infiltrating below the surface, urban streams are characterized by low base flows (Simmons and Reynolds, 1982; Wang et al., 2001, 2003). Low flows combined with the effects of channel enlargement, results in urban streams that feature oversized stream channels with little water between runoff events.

Streams in urbanized watersheds enlarge their channels by eroding their banks. Bank erosion as well as runoff from urban construction activities adds fine sediment to the receiving stream (Waters, 1995; Trimble, 1997). Typically, fine sediment is a minor component of pristine streams. For example, a stream flowing through a completely forested watershed receives about 11.3–33.8 metric tons per ha of sediment annually; in contrast, an urbanizing watershed may receive more than 226,000 metric tons per ha annually (Wolman, 1967; Wolman and Schick, 1967). This dramatic increase in fine sediment can devastate, and ultimately, extirpate stream biota (see Highway Construction section). Channel enlargement

may be balanced by rapid loading of fine sediment during the initial phases of urbanization. For example, Wolman (1967) hypothesized that high sediment loads from the construction phases of urbanization could temporarily clog and constrict stream channels, a phenomenon later observed by Leopold (1973).

When the extent of urbanization in a watershed stabilizes, stream channel enlargement may cease, and the channel banks may restablize. In addition, as the rate of urban development declines, fine-sediment loading may be greatly reduced as construction site soils are stabilized via revegetation or pavement, and prior deposits may be removed by scouring during subsequent flooding (Wolman, 1967; Clark and Wilcock, 2000; Finkenbine et al., 2000). However, the process of bank erosion, downcutting, and channel adjustment may continue for several decades, and some streams never stabilize (Henshaw and Booth, 2000).

Urbanization typically results in loss of streamside (riparian) vegetation as areas near streams are cleared. The degree of riparian disturbance varies with type of urban land use. For example, Thibault (1997) found the land used for transportation, schools, and industry had more intact riparian areas than residential, commercial, and recreational land. Riparian vegetation is a critical component of the watershed (reviewed by Karr and Schlosser, 1978; Gregory et al., 1991; Naiman and Décamps, 1997; Pusey and Arthington, 2003) and, although they cover a small percentage of the watershed, riparian areas are disproportionately important for stream health. Intact riparian areas absorb and filter out metals, fine sediment, and nutrients from overland runoff (Castelle et al., 1994) and generally mitigate the physical and chemical effects of urbanization (May et al., 1997). Riparian vegetation stabilizes streambanks and reduces bank erosion (Whipple et al., 1981; Beeson and Doyle, 1995; Finkenbine et al., 2000), and helps moderate urban stream temperatures (LeBlanc et al., 1997).

Riparian vegetation contributes leaves, wood, and other organic debris to streams. The biota of small ($\leq$ fourth-order) streams, such as those generally associated with urban areas (Heaney and Huber, 1984), depend on leaves and organic inputs as their energy base (Vannote et al., 1980; Hawkins and Sedell, 1981). Large woody debris is an important component of stream channels because it stabilizes stream banks (Keller and Swanson, 1979; Booth, 1991; Gregory et al., 1991; Finkenbine et al., 2000), creates pools (Keller and Swanson, 1979; Larson et al., 2001), and provides habitat for macroinvertebrates (Benke et al., 1985) and fishes (Angermeier and Karr, 1984; Flebbe and Dolloff, 1995). In urban areas, recruitment of woody debris declines as development removes floodplain trees and instream abundance is typically reduced by intentional debris removal (Larson et al., 2001).

Stream water temperature is a major determinant of the distribution and abundance of aquatic biota and is primarily regulated at two spatial scales, the riparian and the watershed. Riparian vegetation shelters streams from warming by absorbing or reflecting sunlight before it reaches the water. Thus, loss of riparian vegetation contributes to the warming of urban streams (Barton et al., 1985; LeBlanc et al., 1997). At the watershed scale, impervious surfaces, especially parking lots, collect and heat runoff water before it reaches streams. For example, Van Buren et al. (2000) developed a computer model to predict runoff temperature and observed that a parking lot produced runoff 5.9°C warmer than summer rainfall. The maximum daily water temperature in Wisconsin and Minnesota streams increase by 0.25°C with every 1% increase in the impervious area of the watershed (Wang et al., 2003). In addition to increases in average water temperature, urban streams exhibit increased temporal variability (Moglen et al., 2004).

Urbanization and Water Chemistry

Urban runoff contains a variety of chemical pollutants including petroleum, metals, and nutrients. Rivers and streams receive the majority of urban runoff (84%) (Heaney and Huber, 1984) and chemical pollutants are often stored in stream sediments. House et al. (1993) reviewed the constituents and impacts of urban runoff on receiving waters.

Oil and grease enter urban runoff from a variety of sources including deliberate dumping, automobile engine emissions, and chemical spills; however, the majority originates from automobile crankcase drippings (Hoffman et al., 1982). Parking lots accumulate oil and grease deposited by parked vehicles and become the primary land use source of oil and grease in urban runoff. Stenstrom et al. (1984) observed concentrations of oil and grease up to 15 mg/l in parking lot runoff. Automotive sources of metals in urban runoff include zinc from tire wear (Hedley and Lockley, 1975) and motor oil (Davis et al., 2001), platinum from catalytic converter emissions (Rauch and Morrison, 1999), and lead from motor oil (Davis et al., 2001).

In addition to automotive sources, urban runoff accumulates metals from a variety of other sources. For example, iron originates from the corrosion of steel (Characklis and Wiesner, 1997), zinc from the corrosion of galvanized metals (Hedley and Lockley, 1975), roofing, and painted wood (Davis et al., 2001), and lead from brick and painted surfaces (Davis et al., 2001). Other metals in urban runoff include chromium and nickel (Klein et al., 1974; Helsel et al., 1979; Rhoads and Cahill, 1999). Metals from urban runoff accumulate in stream sediments (Garie and McIntosh, 1986; Rauch and Morrison, 1999), where concentrations are related to both population and traffic densities (Callender and Rice, 2000).

Urban runoff is high in nutrients such as nitrogen and phosphorous that can result in detrimental algal blooms and decreased dissolved oxygen levels. Nutrient levels in streams are typically predictable from land use (e.g., Herlihy et al., 1998). For example, the risk of nutrient pollution increases as nonforest land cover reaches 10% of the watershed (Wickham et al., 2000). Historically, nutrient pollution has been associated with agricultural land use, but urban land often produces greater nutrient loading. For example, concentrations of total phosphorous and total nitrogen in urban streams were 2 to 10 times higher than agricultural and forested streams in Missouri (Smart et al., 1985). Other studies have reported higher concentrations of nitrogen and phosphorous in urban streams than in agricultural and forested streams (Osborne and Wiley, 1988; Wahl et al., 1997).

Biological Impacts of Urbanization

Altered and impaired biotic communities are characteristic of urban streams. Urban macroinvertebrate communities have reduced taxa richness (Garie and McIntosh, 1986; Jones and Clark, 1987; Kemp and Spotila, 1997), reduced density (Garie and McIntosh, 1986), lower index of biotic integrity (IBI) scores (Steedman, 1988; Kennen, 1999), lower functional diversity (Pedersen and Perkins, 1986), and lower taxonomic diversity (Pratt et al., 1981; Shutes, 1984; Pedersen and Perkins, 1986). In an extensive survey of New Jersey streams, Kennen (1999) found that locations with severe macroinvertebrate community impairment were most commonly downstream from urban areas. Urbanization reduced taxa-diversity and richness by reducing the density of pollution intolerant taxonomic orders (Ephemeroptera, Coleoptera, Megaloptera, and Plecoptera) and increasing the density of pollution tolerant Diptera in Virginia streams (Jones and Clark, 1987). Macroinvertebrate diversity may decline progressively as streams flow through urban areas (Pratt et al., 1981).

Macroinvertebrate diversity was reduced to taxa-tolerant of physical disturbances in an urban Washington stream (Pedersen and Perkins, 1986).

Fish communities are similarly impaired by urbanization. Urban stream fish communities have lower overall abundance (Weaver and Garman, 1994; Albaneese and Matlack, 1998; Wang et al., 2000, 2003), diversity (Tramer and Rogers, 1973; Klein, 1979; Scott et al., 1986; Weaver and Garman, 1994; Onorato et al., 2000; Wang et al., 2000), IBI scores (Schleiger, 2000; Wang et al., 2003), taxa richness (Weaver and Garman, 1994; Albanese and Matlack, 1998; Schleiger, 2000; Wang et al., 2000), darter species richness (Weaver and Garman, 1994; Albanese and Matlack, 1998; Schleiger, 2000), and darter abundance (Kemp and Spotila, 1997; Onorato et al., 2000), and are dominated by pollution tolerant species (Wichert, 1994, 1995; Kemp and Spotila, 1997; Albanese and Matlack, 1998; Wang et al., 2003). Lead content in fish tissue is higher in urban areas (Stemberger and Chen, 1998). Furthermore, the proximity of urban streams to humans increases the risk of nonnative species introduction and establishment.

Although many studies describe the alteration of stream macroinvertebrate and fish communities by urbanization, the mechanisms linking specific urban impacts to specific community responses are largely unknown. Since multiple chemical and physical impacts of urbanization occur simultaneously, it is difficult to determine how specific environmental stresses affect biotic communities. However, changes in physical habitat likely impacts biotic communities more than changes in water chemistry. For example, fish and macroinvertebrate communities become impaired at the onset of urbanization (Klein, 1979), when physical changes are more prevalent than water chemistry changes. Most water chemistry changes are not detectable until urban land cover exceeds 40% of a watershed (May et al., 1997).

Threshold Effect of Urbanization

In the last 100 years, the field of stream ecology has expanded its spatial focus from small habitat patches to entire watersheds (Miranda and Raborn, 2000). Consistent with this paradigm shift and advances in geographic information systems and remote sensing, recent studies have addressed how different spatial configurations of urbanization affect stream communities. For example, investigators have documented relations between percent urban land cover (ULC) (Steedman, 1988), percent impervious area (Klein, 1979; Booth and Jackson, 1997; Wang et al., 2000), percent impervious area with direct connections to streams (Booth and Jackson, 1997; Wang *et al.*, 2001, 2003), and biotic parameters. These studies overwhelmingly conclude that very low levels (8–10%) of ULC (or surrogate measures) result in highly altered fish and macroinvertebrate communities. Even after this low level of development, successful restoration of these communities back into preurban conditions may be near impossible, as this small change could result in a shift into a new, less desirable, stable state that is difficult to reverse (Mayer and Rietkerk, 2004).

Initial watershed urbanization following the construction of a new highway is more damaging to stream ecosystems than later, more extensive, development. In macroinvertebrate and fish communities, pollution- and stress-tolerant species rapidly replace intolerant species as ULC approaches 10%. After ULC exceeds 10%, further increases result in little or no fish community changes (Schueler, 1994; Booth and Jackson, 1997; Wang et al., 1997, 2000, 2001). For perspective, 10% ULC is characteristic of areas typically considered "suburban" rather than "urban" (Wang et al., 2000). Although agriculture can have similar effects, streams may support relatively healthy fish communities until agricultural land cover exceeds 80% of the watershed (Wang et al., 1997). Because fish communities in currently undeveloped or agricultural watersheds are likely to be severely degraded by the onset of urbanization (Wang et al., 2000), protection against urbanization impacts should focus on watersheds where urbanization has not yet begun (May et al., 1997). In the context of highway impacts, this means that the greatest damage to stream health is inflicted by building new highways through undeveloped watersheds, which, ultimately, become subject to urban sprawl.

Conclusions

The short-term environmental consideration of transportation projects in EISs and EAs focuses on the initial construction impacts. However, the most serious threats to stream ecosystems are the long-term secondary effects of a highway's presence in the watershed and the cumulative effects of urban development. For example, the biotic integrity of streams in undeveloped (primarily forested or agricultural watersheds) is substantially degraded by the onset of urbanization, thus, streams in undeveloped watersheds are more sensitive to the construction of new highways than streams in urban watersheds. Because many aquatic impacts from the existence of the highway and urban development are long-term considerations, the narrow, short term focus of EISs and EAs provides inadequate protection for stream ecosystems. As new highways continue to diminish the percentage of the landscape that is unaffected by roads, expanding the spectrum of environmental impacts considered for highway projects is increasingly important.

Highway construction and highway presence impose a variety of impacts on stream habitat and biota. Urban development results from the construction of new highways and is clearly the most pernicious threat, as stream habitat and biota are sensitive to even low levels (<10%) of development in a watershed. Watershed urbanization is a predictable indirect or secondary effect of the construction of new highways and NEPA, the CEQ, and various state environmental laws require consideration of indirect and cumulative effects in EISs and similar documents (CEQ, 1997). Although secondary and cumulative impacts are often important considerations of environmental agencies that comment on such assessments (e.g., NCWRC and NCDPR, 2002), landscape urban development resulting from the construction of new highways is generally ignored by the transportation agencies preparing the assessments. The importance of considering the impacts of landscape urban development during initial planning is amplified because this is the final opportunity to consider all effects cumulatively. Landscape urbanization ultimately results from the "tyranny of small decisions" (Odum, 1982) on many individual projects, the cumulative impacts of which are overlooked by the Clean Water Act section 404 permitting process (Stein and Ambrose, 2001), as well as other regulatory mechanisms.

Given the severity and extent of highway impacts on stream biota, we were impressed by the paucity of peer-reviewed literature on many aspects of those impacts. We believe the lack of published studies demonstrates a failure of both management agencies and academic researchers to address a severe and politically thorny environmental issue. Well-designed descriptive studies, in addition to conceptual or theoretical investigations, could contribute substantially to how society views and manages highway impacts. We urge scientists, managers, and policymakers to cooperate more closely to generate comprehensive knowledge about how highways affect ecosystem operation, make that knowledge available to the public (e.g., in EISs and EAs), and apply that knowledge to policy decisions regarding development of sustainable transportation systems.

Although highway construction is ongoing, pervasive, and has severe biological consequences, we found few published investigations of its impacts on streams. We encourage environmental and fisheries scientists to pay closer attention to the effects of new highway construction or highway improvements on streams. Carefully designed, comparative investigations could contribute substantially to our understanding of the differential impacts of various construction techniques, as well as the efficacy and risk of failure of various mitigation practices.

There are many unexploited opportunities to investigate the impacts of highway presence on stream biota. Researchers know little about the occurrence, loading rates, and biotic responses to specific contaminants in highway runoff. Understanding the dynamics and roles of specific pollutants could facilitate more effective mitigation. Future investigation should address the relative importance of chronic pollution, such as metals accumulated in stream sediments, versus acute impacts such as pulses of petroleum and deicing salt. Additional research is also needed to understand how highway crossings, especially culverts, affect fish populations via constraints on movement and how highway networks alter flow regimes of watersheds.

Impairment of stream biotic communities due to urbanization is severe and widely studied. However, opportunities still exist for relatively simple descriptive investigations. For example, we are impressed but the paucity of studies addressing stream thermal pollution from urban runoff and reduced riparian areas. In addition, techniques for minimizing impact or restoring biotic integrity are poorly developed. Research topics that may yield especially useful results include a) the relative importance and biological effects of specific components of urban development: e.g., highway, commercial, or residential, b) the scenarios under which impacts are reversible, and c) the efficacy of mitigation measures: e.g., stormwater retention or treatment and forested buffers. Finally, comprehensive risk analyses that incorporate both social and biotic components are badly needed to examine potential for catastrophic events during all phases of new highway impacts. Risks include mitigation failures and catastrophic spills during the highway construction, presence, and urbanization phases. Depending on the nature of the biotic community (e.g., is it isolated, is the stream small, does it contain sessile species), it may be more or less vulnerable to these kinds of events. Without a spatially explicit, rigorous risk analysis framework, managers cannot properly weigh the risks and benefits of road projects proposed in their areas and have no scientific basis for proposing alternatives that may be less damaging to stream ecosystems.

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A.D. MARBLE
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November 15, 2016

Chuck Barscz
National Park Service
U.S. Custom House
200 Chestnut Street
Philadelphia, PA 19106

REFERENCE: Headquarters Road (S.R. 1012, Section BRC) Bridge over Tinicum Creek Tinicum Township, Bucks County, PA (MPMS 13716)

Dear Section 106 Consulting Party:

On behalf of FHWA and PennDOT, we are sending you the Section 106 Mitigation and Minimization Memo for your review and comment. This memo summarizes the mitigation and minimization measures proposed for the Headquarters Road Bridge Project, including input received at the August 24, 2016 Consulting Party Meeting.

Please review the memo and provide written comments by December 15, 2016. Please send all comments to Monica Harrower, PennDOT CRP, at mharrower@pa.gov or 7000 Geerdes Boulevard, King of Prussia, PA 19406.

The memo has also been posted to Project PATH and can be found here: https://search.paprojectpath.org/PostingDetails.aspx?ProjectID=688&PostingID=25191

Sincerely,

Gina Burritt

Gina Burritt
Sr. Project Manager

cc: Jonathan Crum, FHWA
Monica Harrower, PennDOT District 6-0
Ryan Whittington, PennDOT Consultant Project Manager

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November 15, 2016

Maryann Naber, Sr. Program Analyst/FHWA Liaison
Advisory Council on Historic Preservation
401 F Street NW
Washington, D.C. 20001-2637

REFERENCE: Headquarters Road (S.R. 1012, Section BRC) Bridge over Tinicum Creek Tinicum Township, Bucks County, PA (MPMS 13716)

Dear Section 106 Consulting Party:

On behalf of FHWA and PennDOT, we are sending you the Section 106 Mitigation and Minimization Memo for your review and comment. This memo summarizes the mitigation and minimization measures proposed for the Headquarters Road Bridge Project, including input received at the August 24, 2016 Consulting Party Meeting.

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Sincerely,

Gina Burritt

Gina Burritt
Sr. Project Manager

cc: Jonathan Crum, FHWA
Monica Harrower, PennDOT District 6-0
Ryan Whittington, PennDOT Consultant Project Manager

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November 15, 2016

Robert Casey, Senator
c/o Kurt Imholf, Regional Representative
U.S. Senator Robert Casey, Jr.
2000 Market Street, Suite 1870
Philadelphia, PA 19103

REFERENCE: Headquarters Road (S.R. 1012, Section BRC) Bridge over Tinicum Creek Tinicum Township, Bucks County, PA (MPMS 13716)

Dear Section 106 Consulting Party:

On behalf of FHWA and PennDOT, we are sending you the Section 106 Mitigation and Minimization Memo for your review and comment. This memo summarizes the mitigation and minimization measures proposed for the Headquarters Road Bridge Project, including input received at the August 24, 2016 Consulting Party Meeting.

Please review the memo and provide written comments by December 15, 2016. Please send all comments to Monica Harrower, PennDOT CRP, at mharrower@pa.gov or 7000 Geerdes Boulevard, King of Prussia, PA 19406.

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Sincerely,

Gina Burritt

Gina Burritt
Sr. Project Manager

cc: Jonathan Crum, FHWA
Monica Harrower, PennDOT District 6-0
Ryan Whittington, PennDOT Consultant Project Manager

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November 15, 2016

Mike Fitzpatrick, Representative
c/o Stacey Mulholland, District Director
U.S. House of Representatives - 8th Congressional District of PA
1717 Langhorne Newtown Road, Suite 400
Langhorne, PA 19047

REFERENCE: Headquarters Road (S.R. 1012, Section BRC) Bridge over Tinicum Creek Tinicum Township, Bucks County, PA (MPMS 13716)

Dear Section 106 Consulting Party:

On behalf of FHWA and PennDOT, we are sending you the Section 106 Mitigation and Minimization Memo for your review and comment. This memo summarizes the mitigation and minimization measures proposed for the Headquarters Road Bridge Project, including input received at the August 24, 2016 Consulting Party Meeting.

Please review the memo and provide written comments by December 15, 2016. Please send all comments to Monica Harrower, PennDOT CRP, at mharrower@pa.gov or 7000 Geerdes Boulevard, King of Prussia, PA 19406.

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Sincerely,

Gina Burritt

Gina Burritt
Sr. Project Manager

cc: Jonathan Crum, FHWA
Monica Harrower, PennDOT District 6-0
Ryan Whittington, PennDOT Consultant Project Manager

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November 15, 2016

Nicole Minnichbach
U.S. Army Corps of Engineers, Philadelphia District
Wanamaker Building
100 Penn Square East
Philadelphia, PA 19107

REFERENCE: Headquarters Road (S.R. 1012, Section BRC) Bridge over Tinicum Creek Tinicum Township, Bucks County, PA (MPMS 13716)

Dear Section 106 Consulting Party:

On behalf of FHWA and PennDOT, we are sending you the Section 106 Mitigation and Minimization Memo for your review and comment. This memo summarizes the mitigation and minimization measures proposed for the Headquarters Road Bridge Project, including input received at the August 24, 2016 Consulting Party Meeting.

Please review the memo and provide written comments by December 15, 2016. Please send all comments to Monica Harrower, PennDOT CRP, at mharrower@pa.gov or 7000 Geerdes Boulevard, King of Prussia, PA 19406.

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Sincerely,

Gina Burritt

Gina Burritt
Sr. Project Manager

cc: Jonathan Crum, FHWA
Monica Harrower, PennDOT District 6-0
Ryan Whittington, PennDOT Consultant Project Manager

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November 15, 2016

Todd Schaible
U.S. Army Corps of Engineers, Philadelphia District
Wanamaker Building
100 Penn Square East
Philadelphia, PA 19107

REFERENCE: Headquarters Road (S.R. 1012, Section BRC) Bridge over Tinicum Creek Tinicum Township, Bucks County, PA (MPMS 13716)

Dear Section 106 Consulting Party:

On behalf of FHWA and PennDOT, we are sending you the Section 106 Mitigation and Minimization Memo for your review and comment. This memo summarizes the mitigation and minimization measures proposed for the Headquarters Road Bridge Project, including input received at the August 24, 2016 Consulting Party Meeting.

Please review the memo and provide written comments by December 15, 2016. Please send all comments to Monica Harrower, PennDOT CRP, at mharrower@pa.gov or 7000 Geerdes Boulevard, King of Prussia, PA 19406.

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Sincerely,

Gina Burritt

Gina Burritt
Sr. Project Manager

cc: Jonathan Crum, FHWA
Monica Harrower, PennDOT District 6-0
Ryan Whittington, PennDOT Consultant Project Manager

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November 15, 2016

Christian Vlot, Water Pollution Biologist, Waterways and Wetlands
PA Department of Environmental Protection - Southeast Region
2 East Main Street
Norristown, PA 19401-4915

REFERENCE: Headquarters Road (S.R. 1012, Section BRC) Bridge over Tinicum Creek Tinicum Township, Bucks County, PA (MPMS 13716)

Dear Section 106 Consulting Party:

On behalf of FHWA and PennDOT, we are sending you the Section 106 Mitigation and Minimization Memo for your review and comment. This memo summarizes the mitigation and minimization measures proposed for the Headquarters Road Bridge Project, including input received at the August 24, 2016 Consulting Party Meeting.

Please review the memo and provide written comments by December 15, 2016. Please send all comments to Monica Harrower, PennDOT CRP, at mharrower@pa.gov or 7000 Geerdes Boulevard, King of Prussia, PA 19406.

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Sincerely,

Gina Burritt

Gina Burritt
Sr. Project Manager

cc: Jonathan Crum, FHWA
Monica Harrower, PennDOT District 6-0
Ryan Whittington, PennDOT Consultant Project Manager

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November 15, 2016

Charles McIllhiney Jr., Senator
Tammi Mancuso, Administrative Assistant
PA State Senate - 10th District
22 S. Main Street, Suite 220
Doylestown, PA 18901

REFERENCE: Headquarters Road (S.R. 1012, Section BRC) Bridge over Tinicum Creek Tinicum Township, Bucks County, PA (MPMS 13716)

Dear Section 106 Consulting Party:

On behalf of FHWA and PennDOT, we are sending you the Section 106 Mitigation and Minimization Memo for your review and comment. This memo summarizes the mitigation and minimization measures proposed for the Headquarters Road Bridge Project, including input received at the August 24, 2016 Consulting Party Meeting.

Please review the memo and provide written comments by December 15, 2016. Please send all comments to Monica Harrower, PennDOT CRP, at mharrower@pa.gov or 7000 Geerdes Boulevard, King of Prussia, PA 19406.

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Sincerely,

Gina Burritt

Gina Burritt
Sr. Project Manager

cc: Jonathan Crum, FHWA
Monica Harrower, PennDOT District 6-0
Ryan Whittington, PennDOT Consultant Project Manager

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November 15, 2016

Bob Mensch, Senator
c/o Lisa Walter, Chief of Staff
PA State Senate - 24th District
404 Main Street, Suite A
Pennsburg, PA 18073-1502

REFERENCE: Headquarters Road (S.R. 1012, Section BRC) Bridge over Tinicum Creek Tinicum Township, Bucks County, PA (MPMS 13716)

Dear Section 106 Consulting Party:

On behalf of FHWA and PennDOT, we are sending you the Section 106 Mitigation and Minimization Memo for your review and comment. This memo summarizes the mitigation and minimization measures proposed for the Headquarters Road Bridge Project, including input received at the August 24, 2016 Consulting Party Meeting.

Please review the memo and provide written comments by December 15, 2016. Please send all comments to Monica Harrower, PennDOT CRP, at mharrower@pa.gov or 7000 Geerdes Boulevard, King of Prussia, PA 19406.

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Sincerely,

Gina Burritt

Gina Burritt
Sr. Project Manager

cc: Jonathan Crum, FHWA
Monica Harrower, PennDOT District 6-0
Ryan Whittington, PennDOT Consultant Project Manager

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November 15, 2016

Marguerite Quinn, Representative
c/o Diane Smith
PA House of Representatives - 143rd District
1032 North Easton Road
Doylestown, PA 18902

REFERENCE: Headquarters Road (S.R. 1012, Section BRC) Bridge over Tinicum Creek Tinicum Township, Bucks County, PA (MPMS 13716)

Dear Section 106 Consulting Party:

On behalf of FHWA and PennDOT, we are sending you the Section 106 Mitigation and Minimization Memo for your review and comment. This memo summarizes the mitigation and minimization measures proposed for the Headquarters Road Bridge Project, including input received at the August 24, 2016 Consulting Party Meeting.

Please review the memo and provide written comments by December 15, 2016. Please send all comments to Monica Harrower, PennDOT CRP, at mharrower@pa.gov or 7000 Geerdes Boulevard, King of Prussia, PA 19406.

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Sincerely,

Gina Burritt

Gina Burritt
Sr. Project Manager

cc: Jonathan Crum, FHWA
Monica Harrower, PennDOT District 6-0
Ryan Whittington, PennDOT Consultant Project Manager

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November 15, 2016

Barbara Frederick, Historic Preservation Supervisor
Pennsylvania Historical and Museum Commission
400 North Street, 2nd Floor
Harrisburg, PA 17120-0093

REFERENCE: Headquarters Road (S.R. 1012, Section BRC) Bridge over Tinicum Creek Tinicum Township, Bucks County, PA (MPMS 13716)

Dear Section 106 Consulting Party:

On behalf of FHWA and PennDOT, we are sending you the Section 106 Mitigation and Minimization Memo for your review and comment. This memo summarizes the mitigation and minimization measures proposed for the Headquarters Road Bridge Project, including input received at the August 24, 2016 Consulting Party Meeting.

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Sincerely,

Gina Burritt

Gina Burritt
Sr. Project Manager

cc: Jonathan Crum, FHWA
Monica Harrower, PennDOT District 6-0
Ryan Whittington, PennDOT Consultant Project Manager

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November 15, 2016

James Sabath, Interim Township Manager
Tinicum Township
163 Municipal Road
Pipersville, PA 18947

REFERENCE: Headquarters Road (S.R. 1012, Section BRC) Bridge over Tinicum Creek Tinicum Township, Bucks County, PA (MPMS 13716)

Dear Section 106 Consulting Party:

On behalf of FHWA and PennDOT, we are sending you the Section 106 Mitigation and Minimization Memo for your review and comment. This memo summarizes the mitigation and minimization measures proposed for the Headquarters Road Bridge Project, including input received at the August 24, 2016 Consulting Party Meeting.

Please review the memo and provide written comments by December 15, 2016. Please send all comments to Monica Harrower, PennDOT CRP, at mharrower@pa.gov or 7000 Geerdes Boulevard, King of Prussia, PA 19406.

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Sincerely,

Gina Burritt

Gina Burritt
Sr. Project Manager

cc: Jonathan Crum, FHWA
Monica Harrower, PennDOT District 6-0
Ryan Whittington, PennDOT Consultant Project Manager

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November 15, 2016

John Blanchard, Township Supervisor
Tinicum Township Board of Supervisors
163 Municipal Road
Pipersville, PA 18947

REFERENCE: Headquarters Road (S.R. 1012, Section BRC) Bridge over Tinicum Creek Tinicum Township, Bucks County, PA (MPMS 13716)

Dear Section 106 Consulting Party:

On behalf of FHWA and PennDOT, we are sending you the Section 106 Mitigation and Minimization Memo for your review and comment. This memo summarizes the mitigation and minimization measures proposed for the Headquarters Road Bridge Project, including input received at the August 24, 2016 Consulting Party Meeting.

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Sincerely,

Gina Burritt

Gina Burritt
Sr. Project Manager

cc: Jonathan Crum, FHWA
Monica Harrower, PennDOT District 6-0
Ryan Whittington, PennDOT Consultant Project Manager

A.D. MARBLE
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November 15, 2016

Vincent Dotti, Township Supervisor
Tinicum Township Board of Supervisors
163 Municipal Road
Pipersville, PA 18947

REFERENCE: Headquarters Road (S.R. 1012, Section BRC) Bridge over Tinicum Creek Tinicum Township, Bucks County, PA (MPMS 13716)

Dear Section 106 Consulting Party:

On behalf of FHWA and PennDOT, we are sending you the Section 106 Mitigation and Minimization Memo for your review and comment. This memo summarizes the mitigation and minimization measures proposed for the Headquarters Road Bridge Project, including input received at the August 24, 2016 Consulting Party Meeting.

Please review the memo and provide written comments by December 15, 2016. Please send all comments to Monica Harrower, PennDOT CRP, at mharrower@pa.gov or 7000 Geerdes Boulevard, King of Prussia, PA 19406.

The memo has also been posted to Project PATH and can be found here: https://search.paprojectpath.org/PostingDetails.aspx?ProjectID=688&PostingID=25191

Sincerely,

Gina Burritt

Gina Burritt
Sr. Project Manager

cc: Jonathan Crum, FHWA
Monica Harrower, PennDOT District 6-0
Ryan Whittington, PennDOT Consultant Project Manager

A.D. MARBLE
environmental·cultural·engineering

November 15, 2016

Rich Rosamilia, Township Supervisor
Tinicum Township Board of Supervisors
163 Municipal Road
Pipersville, PA 18947

REFERENCE: Headquarters Road (S.R. 1012, Section BRC) Bridge over Tinicum Creek Tinicum Township, Bucks County, PA (MPMS 13716)

Dear Section 106 Consulting Party:

On behalf of FHWA and PennDOT, we are sending you the Section 106 Mitigation and Minimization Memo for your review and comment. This memo summarizes the mitigation and minimization measures proposed for the Headquarters Road Bridge Project, including input received at the August 24, 2016 Consulting Party Meeting.

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Sincerely,

Gina Burritt

Gina Burritt
Sr. Project Manager

cc: Jonathan Crum, FHWA
Monica Harrower, PennDOT District 6-0
Ryan Whittington, PennDOT Consultant Project Manager

A.D. MARBLE
environmental·cultural·engineering

November 15, 2016

Janine Black, Chairperson
Tinicum Township Historical Commission
226 East Dark Hollow
Pipersville, PA 18947

REFERENCE: Headquarters Road (S.R. 1012, Section BRC) Bridge over Tinicum Creek Tinicum Township, Bucks County, PA (MPMS 13716)

Dear Section 106 Consulting Party:

On behalf of FHWA and PennDOT, we are sending you the Section 106 Mitigation and Minimization Memo for your review and comment. This memo summarizes the mitigation and minimization measures proposed for the Headquarters Road Bridge Project, including input received at the August 24, 2016 Consulting Party Meeting.

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Sincerely,

Gina Burritt

Gina Burritt
Sr. Project Manager

cc: Jonathan Crum, FHWA
Monica Harrower, PennDOT District 6-0
Ryan Whittington, PennDOT Consultant Project Manager

A.D. MARBLE
environmental·cultural·engineering

November 15, 2016

Robert Stanfield, Chair
Tinicum Township EAC
29 Ledge Lane
Pipersville, PA 18947

REFERENCE: Headquarters Road (S.R. 1012, Section BRC) Bridge over Tinicum Creek Tinicum Township, Bucks County, PA (MPMS 13716)

Dear Section 106 Consulting Party:

On behalf of FHWA and PennDOT, we are sending you the Section 106 Mitigation and Minimization Memo for your review and comment. This memo summarizes the mitigation and minimization measures proposed for the Headquarters Road Bridge Project, including input received at the August 24, 2016 Consulting Party Meeting.

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Sincerely,

Gina Burritt

Gina Burritt
Sr. Project Manager

cc: Jonathan Crum, FHWA
Monica Harrower, PennDOT District 6-0
Ryan Whittington, PennDOT Consultant Project Manager

A.D. MARBLE
environmental·cultural·engineering

November 15, 2016

Michael A. Smith, President
Tinicum Creek Watershed Association
P.O. Box 400
Ottsville, PA 18942

REFERENCE: Headquarters Road (S.R. 1012, Section BRC) Bridge over Tinicum Creek Tinicum Township, Bucks County, PA (MPMS 13716)

Dear Section 106 Consulting Party:

On behalf of FHWA and PennDOT, we are sending you the Section 106 Mitigation and Minimization Memo for your review and comment. This memo summarizes the mitigation and minimization measures proposed for the Headquarters Road Bridge Project, including input received at the August 24, 2016 Consulting Party Meeting.

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Sincerely,

Gina Burritt

Gina Burritt
Sr. Project Manager

cc: Jonathan Crum, FHWA
Monica Harrower, PennDOT District 6-0
Ryan Whittington, PennDOT Consultant Project Manager

A.D. MARBLE
environmental·cultural·engineering

November 15, 2016

Damon Aherne
Tinicum Creek Watershed Association
1057 River Road
Upper Black Eddy, PA 18972-9104

REFERENCE: Headquarters Road (S.R. 1012, Section BRC) Bridge over Tinicum Creek Tinicum Township, Bucks County, PA (MPMS 13716)

Dear Section 106 Consulting Party:

On behalf of FHWA and PennDOT, we are sending you the Section 106 Mitigation and Minimization Memo for your review and comment. This memo summarizes the mitigation and minimization measures proposed for the Headquarters Road Bridge Project, including input received at the August 24, 2016 Consulting Party Meeting.

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Sincerely,

Gina Burritt

Gina Burritt
Sr. Project Manager

cc: Jonathan Crum, FHWA
Monica Harrower, PennDOT District 6-0
Ryan Whittington, PennDOT Consultant Project Manager

A.D. MARBLE
environmental·cultural·engineering

November 15, 2016

Maya K. van Rossum, Delaware Riverkeeper
Delaware Riverkeeper Network
925 Canal Street, 7th Floor
Bristol, PA 19007

REFERENCE: Headquarters Road (S.R. 1012, Section BRC) Bridge over Tinicum Creek Tinicum Township, Bucks County, PA (MPMS 13716)

Dear Section 106 Consulting Party:

On behalf of FHWA and PennDOT, we are sending you the Section 106 Mitigation and Minimization Memo for your review and comment. This memo summarizes the mitigation and minimization measures proposed for the Headquarters Road Bridge Project, including input received at the August 24, 2016 Consulting Party Meeting.

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Sincerely,

Gina Burritt

Gina Burritt
Sr. Project Manager

cc: Jonathan Crum, FHWA
Monica Harrower, PennDOT District 6-0
Ryan Whittington, PennDOT Consultant Project Manager

A.D. MARBLE
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November 15, 2016

Jeff Keller, Trustee
Tinicum Conservancy
P.O. Box 206
965 River Road
Upper Black Eddy, PA 18972

REFERENCE: Headquarters Road (S.R. 1012, Section BRC) Bridge over Tinicum Creek Tinicum Township, Bucks County, PA (MPMS 13716)

Dear Section 106 Consulting Party:

On behalf of FHWA and PennDOT, we are sending you the Section 106 Mitigation and Minimization Memo for your review and comment. This memo summarizes the mitigation and minimization measures proposed for the Headquarters Road Bridge Project, including input received at the August 24, 2016 Consulting Party Meeting.

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Sincerely,

Gina Burritt

Gina Burritt
Sr. Project Manager

cc: Jonathan Crum, FHWA
Monica Harrower, PennDOT District 6-0
Ryan Whittington, PennDOT Consultant Project Manager

A.D. MARBLE
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November 15, 2016

Kitty Henderson, Executive Director
Historic Bridge Foundation
P.O. Box 66245
Austin, TX 78766

REFERENCE: Headquarters Road (S.R. 1012, Section BRC) Bridge over Tinicum Creek
Tinicum Township, Bucks County, PA (MPMS 13716)

Dear Section 106 Consulting Party:

On behalf of FHWA and PennDOT, we are sending you the Section 106 Mitigation and Minimization Memo for your review and comment. This memo summarizes the mitigation and minimization measures proposed for the Headquarters Road Bridge Project, including input received at the August 24, 2016 Consulting Party Meeting.

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Sincerely,

Gina Burritt

Gina Burritt
Sr. Project Manager

cc: Jonathan Crum, FHWA
Monica Harrower, PennDOT District 6-0
Ryan Whittington, PennDOT Consultant Project Manager

A.D. MARBLE
environmental·cultural·engineering

November 15, 2016

Evelyn Aherne
P.O. Box 18
27 Headquarters Road
Erwinna, PA 18920

REFERENCE: Headquarters Road (S.R. 1012, Section BRC) Bridge over Tinicum Creek Tinicum Township, Bucks County, PA (MPMS 13716)

Dear Section 106 Consulting Party:

On behalf of FHWA and PennDOT, we are sending you the Section 106 Mitigation and Minimization Memo for your review and comment. This memo summarizes the mitigation and minimization measures proposed for the Headquarters Road Bridge Project, including input received at the August 24, 2016 Consulting Party Meeting.

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Sincerely,

Gina Burritt

Gina Burritt
Sr. Project Manager

cc: Jonathan Crum, FHWA
Monica Harrower, PennDOT District 6-0
Ryan Whittington, PennDOT Consultant Project Manager

A.D. MARBLE
environmental·cultural·engineering

November 15, 2016

James Ambrogi
P.O. Box 117
34 Headquarters Road
Erwinna, PA 18920

REFERENCE: Headquarters Road (S.R. 1012, Section BRC) Bridge over Tinicum Creek Tinicum Township, Bucks County, PA (MPMS 13716)

Dear Section 106 Consulting Party:

On behalf of FHWA and PennDOT, we are sending you the Section 106 Mitigation and Minimization Memo for your review and comment. This memo summarizes the mitigation and minimization measures proposed for the Headquarters Road Bridge Project, including input received at the August 24, 2016 Consulting Party Meeting.

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Sincerely,

Gina Burritt

Gina Burritt
Sr. Project Manager

cc: Jonathan Crum, FHWA
Monica Harrower, PennDOT District 6-0
Ryan Whittington, PennDOT Consultant Project Manager

A.D. MARBLE
environmental·cultural·engineering

November 15, 2016

Kathryn Ann Auerbach
16 Center Road
Upper Black Eddy, PA 18972

REFERENCE: Headquarters Road (S.R. 1012, Section BRC) Bridge over Tinicum Creek Tinicum Township, Bucks County, PA (MPMS 13716)

Dear Section 106 Consulting Party:

On behalf of FHWA and PennDOT, we are sending you the Section 106 Mitigation and Minimization Memo for your review and comment. This memo summarizes the mitigation and minimization measures proposed for the Headquarters Road Bridge Project, including input received at the August 24, 2016 Consulting Party Meeting.

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Sincerely,

Gina Burritt

Gina Burritt
Sr. Project Manager

cc: Jonathan Crum, FHWA
Monica Harrower, PennDOT District 6-0
Ryan Whittington, PennDOT Consultant Project Manager

A.D. MARBLE
environmental·cultural·engineering

November 15, 2016

Samantha Beattie and Stephen Smith
414 Headquarters Road
Erwinna, PA 18920

REFERENCE: Headquarters Road (S.R. 1012, Section BRC) Bridge over Tinicum Creek Tinicum Township, Bucks County, PA (MPMS 13716)

Dear Section 106 Consulting Party:

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Sincerely,

Gina Burritt

Gina Burritt
Sr. Project Manager

cc: Jonathan Crum, FHWA
Monica Harrower, PennDOT District 6-0
Ryan Whittington, PennDOT Consultant Project Manager

A.D. MARBLE
environmental·cultural·engineering

November 15, 2016

Jerome and Kristine Becker
P.O. Box 20
569 Headquarters Road
Erwinna, PA 18920

REFERENCE: Headquarters Road (S.R. 1012, Section BRC) Bridge over Tinicum Creek Tinicum Township, Bucks County, PA (MPMS 13716)

Dear Section 106 Consulting Party:

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Sincerely,

Gina Burritt

Gina Burritt
Sr. Project Manager

cc: Jonathan Crum, FHWA
Monica Harrower, PennDOT District 6-0
Ryan Whittington, PennDOT Consultant Project Manager

A.D. MARBLE
environmental·cultural·engineering

November 15, 2016

Charles Boone
73 McCann Drive
Ottsville, PA 18942

REFERENCE: Headquarters Road (S.R. 1012, Section BRC) Bridge over Tinicum Creek Tinicum Township, Bucks County, PA (MPMS 13716)

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Sincerely,

Gina Burritt

Gina Burritt
Sr. Project Manager

cc: Jonathan Crum, FHWA
Monica Harrower, PennDOT District 6-0
Ryan Whittington, PennDOT Consultant Project Manager

A.D. MARBLE
environmental·cultural·engineering

November 15, 2016

Boyce Budd
160 Geigel Hill Road
Erwinna, PA 18920

REFERENCE: Headquarters Road (S.R. 1012, Section BRC) Bridge over Tinicum Creek Tinicum Township, Bucks County, PA (MPMS 13716)

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Gina Burritt

Gina Burritt
Sr. Project Manager

cc: Jonathan Crum, FHWA
Monica Harrower, PennDOT District 6-0
Ryan Whittington, PennDOT Consultant Project Manager

A.D. MARBLE
environmental·cultural·engineering

November 15, 2016

Timothy Cashman
6 Quail Lane
Ottsville, PA 18942

REFERENCE: Headquarters Road (S.R. 1012, Section BRC) Bridge over Tinicum Creek Tinicum Township, Bucks County, PA (MPMS 13716)

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Gina Burritt

Gina Burritt
Sr. Project Manager

cc: Jonathan Crum, FHWA
Monica Harrower, PennDOT District 6-0
Ryan Whittington, PennDOT Consultant Project Manager

A.D. MARBLE
environmental·cultural·engineering

November 15, 2016

Louis and Janet Cicalese
629 Headquarters Road
Ottsville, PA 18942

REFERENCE: Headquarters Road (S.R. 1012, Section BRC) Bridge over Tinicum Creek Tinicum Township, Bucks County, PA (MPMS 13716)

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Gina Burritt

Gina Burritt
Sr. Project Manager

cc: Jonathan Crum, FHWA
Monica Harrower, PennDOT District 6-0
Ryan Whittington, PennDOT Consultant Project Manager

A.D. MARBLE
environmental·cultural·engineering

November 15, 2016

Robert and Judith Esch
3 Quail Lane
Ottsville, PA 18943

REFERENCE: Headquarters Road (S.R. 1012, Section BRC) Bridge over Tinicum Creek Tinicum Township, Bucks County, PA (MPMS 13716)

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Sincerely,

Gina Burritt

Gina Burritt
Sr. Project Manager

cc: Jonathan Crum, FHWA
Monica Harrower, PennDOT District 6-0
Ryan Whittington, PennDOT Consultant Project Manager

A.D. MARBLE
environmental·cultural·engineering

November 15, 2016

Daniel and April Green
622 Headquarters Road
Ottsville, PA 18942

REFERENCE: Headquarters Road (S.R. 1012, Section BRC) Bridge over Tinicum Creek Tinicum Township, Bucks County, PA (MPMS 13716)

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Sincerely,

Gina Burritt

Gina Burritt
Sr. Project Manager

cc: Jonathan Crum, FHWA
Monica Harrower, PennDOT District 6-0
Ryan Whittington, PennDOT Consultant Project Manager

A.D. MARBLE
environmental·cultural·engineering

November 15, 2016

Chris Hackley
33 McCann Drive
Ottsville, PA 18942

REFERENCE: Headquarters Road (S.R. 1012, Section BRC) Bridge over Tinicum Creek Tinicum Township, Bucks County, PA (MPMS 13716)

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Sincerely,

Gina Burritt

Gina Burritt
Sr. Project Manager

cc: Jonathan Crum, FHWA
Monica Harrower, PennDOT District 6-0
Ryan Whittington, PennDOT Consultant Project Manager

A.D. MARBLE
environmental·cultural·engineering

November 15, 2016

Marilyn Herd
1 Quail Lane
Ottsville, PA 18942

REFERENCE: Headquarters Road (S.R. 1012, Section BRC) Bridge over Tinicum Creek Tinicum Township, Bucks County, PA (MPMS 13716)

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Sincerely,

Gina Burritt

Gina Burritt
Sr. Project Manager

cc: Jonathan Crum, FHWA
Monica Harrower, PennDOT District 6-0
Ryan Whittington, PennDOT Consultant Project Manager

A.D. MARBLE
environmental·cultural·engineering

November 15, 2016

Kevin Joy
P.O. Box 522
Solebury, PA 18963

REFERENCE: Headquarters Road (S.R. 1012, Section BRC) Bridge over Tinicum Creek Tinicum Township, Bucks County, PA (MPMS 13716)

Dear Section 106 Consulting Party:

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Sincerely,

Gina Burritt

Gina Burritt
Sr. Project Manager

cc: Jonathan Crum, FHWA
Monica Harrower, PennDOT District 6-0
Ryan Whittington, PennDOT Consultant Project Manager

A.D. MARBLE
environmental·cultural·engineering

November 15, 2016

Holly Krupp Kelly
81 McCann Drive
Ottsville, PA 18942

REFERENCE: Headquarters Road (S.R. 1012, Section BRC) Bridge over Tinicum Creek Tinicum Township, Bucks County, PA (MPMS 13716)

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Gina Burritt
Sr. Project Manager

cc: Jonathan Crum, FHWA
Monica Harrower, PennDOT District 6-0
Ryan Whittington, PennDOT Consultant Project Manager

A.D. MARBLE
environmental·cultural·engineering

November 15, 2016

Marion and Neil Kyde
15 Tankhannen Road
Ottsville, PA 18942

REFERENCE: Headquarters Road (S.R. 1012, Section BRC) Bridge over Tinicum Creek Tinicum Township, Bucks County, PA (MPMS 13716)

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Sincerely,

Gina Burritt

Gina Burritt
Sr. Project Manager

cc: Jonathan Crum, FHWA
Monica Harrower, PennDOT District 6-0
Ryan Whittington, PennDOT Consultant Project Manager

A.D. MARBLE
environmental·cultural·engineering

November 15, 2016

Richard and Stana Lennox
244 Headquarters Road
Erwinna, PA 18920

REFERENCE: Headquarters Road (S.R. 1012, Section BRC) Bridge over Tinicum Creek Tinicum Township, Bucks County, PA (MPMS 13716)

Dear Section 106 Consulting Party:

On behalf of FHWA and PennDOT, we are sending you the Section 106 Mitigation and Minimization Memo for your review and comment. This memo summarizes the mitigation and minimization measures proposed for the Headquarters Road Bridge Project, including input received at the August 24, 2016 Consulting Party Meeting.

Please review the memo and provide written comments by December 15, 2016. Please send all comments to Monica Harrower, PennDOT CRP, at mharrower@pa.gov or 7000 Geerdes Boulevard, King of Prussia, PA 19406.

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Monica Harrower, PennDOT District 6-0
Ryan Whittington, PennDOT Consultant Project Manager

A.D. MARBLE
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November 15, 2016

Norman MacArthur
P.O. Box 107
Erwinna, PA 18920

REFERENCE: Headquarters Road (S.R. 1012, Section BRC) Bridge over Tinicum Creek Tinicum Township, Bucks County, PA (MPMS 13716)

Dear Section 106 Consulting Party:

On behalf of FHWA and PennDOT, we are sending you the Section 106 Mitigation and Minimization Memo for your review and comment. This memo summarizes the mitigation and minimization measures proposed for the Headquarters Road Bridge Project, including input received at the August 24, 2016 Consulting Party Meeting.

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cc: Jonathan Crum, FHWA
Monica Harrower, PennDOT District 6-0
Ryan Whittington, PennDOT Consultant Project Manager

A.D. MARBLE
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November 15, 2016

F.A. Morgan
P.O. Box 110
Erwinna, PA 18920

REFERENCE: Headquarters Road (S.R. 1012, Section BRC) Bridge over Tinicum Creek Tinicum Township, Bucks County, PA (MPMS 13716)

Dear Section 106 Consulting Party:

On behalf of FHWA and PennDOT, we are sending you the Section 106 Mitigation and Minimization Memo for your review and comment. This memo summarizes the mitigation and minimization measures proposed for the Headquarters Road Bridge Project, including input received at the August 24, 2016 Consulting Party Meeting.

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cc: Jonathan Crum, FHWA
Monica Harrower, PennDOT District 6-0
Ryan Whittington, PennDOT Consultant Project Manager

A.D. MARBLE
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November 15, 2016

Brian Murphy
8 Annawanda Road
Ottsville, PA 18942

REFERENCE: Headquarters Road (S.R. 1012, Section BRC) Bridge over Tinicum Creek Tinicum Township, Bucks County, PA (MPMS 13716)

Dear Section 106 Consulting Party:

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cc: Jonathan Crum, FHWA
Monica Harrower, PennDOT District 6-0
Ryan Whittington, PennDOT Consultant Project Manager

A.D. MARBLE
environmental·cultural·engineering

November 15, 2016

Graham Place
505 Headquarters Road
Erwinna, PA 18920

REFERENCE: Headquarters Road (S.R. 1012, Section BRC) Bridge over Tinicum Creek Tinicum Township, Bucks County, PA (MPMS 13716)

Dear Section 106 Consulting Party:

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Sr. Project Manager

cc: Jonathan Crum, FHWA
Monica Harrower, PennDOT District 6-0
Ryan Whittington, PennDOT Consultant Project Manager

A.D. MARBLE
environmental·cultural·engineering

November 15, 2016

Mary and Amleto Pucci
P.O. Box 78
258 Headquarters Road
Erwinna, PA 18920

REFERENCE: Headquarters Road (S.R. 1012, Section BRC) Bridge over Tinicum Creek Tinicum Township, Bucks County, PA (MPMS 13716)

Dear Section 106 Consulting Party:

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Sr. Project Manager

cc: Jonathan Crum, FHWA
Monica Harrower, PennDOT District 6-0
Ryan Whittington, PennDOT Consultant Project Manager

A.D. MARBLE
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November 15, 2016

Joan Ramage-Macdonald
280 Headquarters Road
Erwinna, PA 18920

REFERENCE: Headquarters Road (S.R. 1012, Section BRC) Bridge over Tinicum Creek Tinicum Township, Bucks County, PA (MPMS 13716)

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Sr. Project Manager

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Monica Harrower, PennDOT District 6-0
Ryan Whittington, PennDOT Consultant Project Manager

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November 15, 2016

Charles Reichner
P.O. Box 2336
267 Rock Ridge Road
Revere, PA 18972

REFERENCE: Headquarters Road (S.R. 1012, Section BRC) Bridge over Tinicum Creek Tinicum Township, Bucks County, PA (MPMS 13716)

Dear Section 106 Consulting Party:

On behalf of FHWA and PennDOT, we are sending you the Section 106 Mitigation and Minimization Memo for your review and comment. This memo summarizes the mitigation and minimization measures proposed for the Headquarters Road Bridge Project, including input received at the August 24, 2016 Consulting Party Meeting.

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Sr. Project Manager

cc: Jonathan Crum, FHWA
Monica Harrower, PennDOT District 6-0
Ryan Whittington, PennDOT Consultant Project Manager

A.D. MARBLE
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November 15, 2016

David Rothschild
61 Sheephole Road
Ottsville, PA 18942

REFERENCE: Headquarters Road (S.R. 1012, Section BRC) Bridge over Tinicum Creek Tinicum Township, Bucks County, PA (MPMS 13716)

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Sr. Project Manager

cc: Jonathan Crum, FHWA
Monica Harrower, PennDOT District 6-0
Ryan Whittington, PennDOT Consultant Project Manager

A.D. MARBLE
environmental·cultural·engineering

November 15, 2016

Vladimir and Jesse Salamun
325 Headquarters Road
Erwinna, PA 18920

REFERENCE: Headquarters Road (S.R. 1012, Section BRC) Bridge over Tinicum Creek Tinicum Township, Bucks County, PA (MPMS 13716)

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Sr. Project Manager

cc: Jonathan Crum, FHWA
Monica Harrower, PennDOT District 6-0
Ryan Whittington, PennDOT Consultant Project Manager

A.D. MARBLE
environmental·cultural·engineering

November 15, 2016

John Salerno
649 Headquarters Road
Ottsville, PA 18942

REFERENCE: Headquarters Road (S.R. 1012, Section BRC) Bridge over Tinicum Creek Tinicum Township, Bucks County, PA (MPMS 13716)

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Sr. Project Manager

cc: Jonathan Crum, FHWA
Monica Harrower, PennDOT District 6-0
Ryan Whittington, PennDOT Consultant Project Manager

A.D. MARBLE
environmental·cultural·engineering

November 15, 2016

Bruce Wallace
84 Sheep Hole Road
Ottsville, PA 18942

REFERENCE: Headquarters Road (S.R. 1012, Section BRC) Bridge over Tinicum Creek Tinicum Township, Bucks County, PA (MPMS 13716)

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Monica Harrower, PennDOT District 6-0
Ryan Whittington, PennDOT Consultant Project Manager

A.D. MARBLE
environmental·cultural·engineering

November 15, 2016

Paul Wieand and June Rothkopf
196 Red Hill Road
Ottsville, PA 18942

REFERENCE: Headquarters Road (S.R. 1012, Section BRC) Bridge over Tinicum Creek Tinicum Township, Bucks County, PA (MPMS 13716)

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Sr. Project Manager

cc: Jonathan Crum, FHWA
Monica Harrower, PennDOT District 6-0
Ryan Whittington, PennDOT Consultant Project Manager

pennsylvania
DEPARTMENT OF TRANSPORTATION

November 15th, 2016

Headquarters Road (SR 1012) over Tinicum Creek
Tinicum Township, Bucks County

TO: Headquarters Road Section 106 Consulting Parties

RE: Section 106 Mitigation and Minimization

Introduction

The Determination of Effect Report, sent to consulting parties in November 2015 for comment, reviewed various alternatives considered and measured them against their ability to meet the project's purpose and need. At the conclusion of this report and as supplemented by additional information requested by the Pennsylvania State Historic Preservation Officer (PA SHPO) and sent to consulting parties in June of 2016, it is PennDOT's determination that the only alternative which fully meets the purpose and need for this project is Alternative 6, a two lane concrete replacement bridge. As alternative 6 is the only alternative to meet the project's purpose and need, it is the recommended preferred alternative meaning that it is the only alternative which will be carried through to discussion of mitigation and minimization under Section 106 of the National Historic Preservation Act.

In their letter dated July 22nd,2016, the PA SHPO stated that after review of the additional material submitted that "…there has been sufficient consideration of designs that accommodate project purpose and need while avoiding/minimizing effects to the National Register listed Ridge Valley Rural Historic District" and that "The proposed project will result in the physical destruction of a contributing resource and introduction of a two-lane bridge; therefore we are in agreement with the finding of Historic Properties Adversely Affected". Concluding their letter, PA SHPO explained that "additional consultation with FHWA, PennDOT and the consulting parties regarding relevant minimization and mitigation efforts including visual compatibility of the new bridge with the surrounding historic district" would take place.

Summary of Mitigation and Minimization Breakout Session

A consulting party meeting was held on August 24th, 2016 to discuss ways to minimize and/or mitigate the project's adverse effect. During the August 24th consulting party meeting a group breakout session was held for consulting parties to work together to brainstorm and present ideas for minimization and mitigation. After each breakout group was given an opportunity to present their ideas recorded on large sheets of paper (newsprints), consulting parties were given a set of green, yellow, and red stickers to be used to represent that they are like, neither dislike or like, or dislike ideas. Each consulting party was given 3 of each sticker and asked to place their stickers on each of the newsprints in order to provide feedback on the ideas developed by consulting parties. The results of the feedback session for the newsprints are summarized in the attached document which records each idea from each table and lists how many of each sticker were associated with the ideas developed by consulting parties.

pennsylvania
DEPARTMENT OF TRANSPORTATION

Based on the attached summary, the following mitigation and minimization ideas were most favored by consulting parties (received greater than 4 green stickers):

Table	Mitigation/Minimization Idea	Green	Yellow	Red
Table 6	Spend last 10 minutes talking about a temporary bridge	19		
Table 3	Rehabilitate existing 1812 bridge	12	1	
Table 2	Keep 1 lane bridge and stone substructure & More archaeology along stream banks*	10		
Table 5	Temporary Bridge before final PennDOT solution	9	2	1
Table 6	Rehabilitate existing bridge	7		

The following mitigation and minimization ideas were the least favored by consulting parties (received greater than 4 red stickers):

Table	Mitigation/Minimization Idea	Green	Yellow	Red
Table 1	Did not participate*		7	18
Table 2	Do not disturb surrounding properties or stream banks		2	5
Table 3	Not associated with any written ideas**			5

*Although table 1 did not participate in developing mitigation and minimization, yellow and red stickers were placed on the table 1 newsprint and recorded.

**There were 5 red stickers located at the bottom right half of the newsprint. As it was not clear which idea these applied to, these were counted separately.

Finally, ideas which received at least some favorable (green) stickers are as follows:

Table	Mitigation/Minimization Idea	Green	Yellow	Red
Table 2	Rehab Existing Stone Work	3		
Table 5	Use old stones	3		
Table 5	Minimalist bridge, smallest possible height/width	2		1
Table 2	1-lane Travel over bridge	2	1	
Table 2	Real stone wall wing walls	1		
Table 5	Design Advisory Committee	1		
Table 5	Investigation into reuse of abutments/piers	1		
Table 5	Move bridge off alignment to preserve	1		
Table 5	Railing that allows to see the stream	1		

Minimization and Mitigation Responses

In accordance with Section 106 of the National Historic Preservations Act (NHPA), further consultation to resolve the adverse effect will occur when impacts are unavoidable. Minimization and mitigation commitments developed during consultation with consulting parties and are formalized in a Memorandum of Agreement (MOA), a legal agreement that stipulates the measures that will be taken to mitigate or minimize adverse effects. While there were many ideas shared at the August 24th consulting party meeting, many did not constitute

minimization or mitigation measures, rather they were reiterations of alternatives which were previously dismissed or were avoidance measures.

As indicated in the above summary the most favored mitigation and minimization ideas are the following:

1. Construction of a temporary bridge
2. Rehabilitation of the existing bridge rather than replacement
3. Maintain a one lane crossing & additional archaeology along the stream banks

1. Construction of a temporary bridge

As discussed at the August 24th consulting party meeting, PennDOT is currently looking into the community's request to provide a temporary bridge while deliberations and potential litigation concerning the permanent bridge take place. As part of the discussion during the August 24th meeting, it was indicated that PennDOT would continue to evaluate the best possible way forward environmentally, legally and technically to fully realize a temporary crossing. The Department will continue with the investigation into the ideal type size and location for the temporary bridge as well as determining the potential environmental and legal issues while the recommended preferred alternative is progressed.

Although the temporary bridge was a topic which received the most vocal support at the August 24th consulting party meeting, it does not serve to mitigate or minimize the adverse effect that the recommended preferred alternative will have on the historic district.

While PennDOT may pursue implementation of a temporary bridge, provision of a temporary bridge will not be included in the MOA as a mitigation commitment as it does not mitigate or minimize impact to the Ridge Valley Rural Historic District.

2. **Rehabilitation of the existing bridge and maintain it as a one lane crossing**

Rehabilitation of the substructure and replacement of the superstructure with a new one lane superstructure was evaluated as alternative 3 in the Determination of Effect Report submitted to consulting parties in November of 2015. As documented in the Determination of Effect Report and supplemental information submitted to THE PA SHPO in June of 2016, the one lane rehabilitated bridge alternative (Alternative 3) does not meet the project's purpose and need. Regarding the mitigation measure to further investigate re-use of the existing piers and abutments, please reference the 2014 Core Drilling Investigation and 2006 Existing Structure Condition Evaluation Report which demonstrate that the existing structure cannot safely be re-used. Additionally, as clarified in the comment responses and after consideration of material submitted by the Delaware Riverkeeper Network

consultants, PennDOT maintains that the one lane rehabilitation alternative does not meet the purpose and need of the project and therefore will not be carried forward for discussion of mitigation and minimization measures.

Although this alternative does not meet the project's purpose and need and therefore was not selected as the recommended preferred alternative, it is clear that there is significant interest among consulting parties in preserving the look of the existing bridge including the layout and orientation of existing stone. Additionally, at least one consulting party requested that the existing plaque be retained. In order to best represent the look of the existing structure in the preferred alternative the following mitigation will be incorporated into the MOA:

- During construction, stone from the existing structure's masonry components will be salvaged for use in the proposed structure. Using a stone mason with experience in similar project's, salvaged stone will be used as a stone facing on concrete components of the preferred alternative including the abutments, wingwalls and approach roadway barriers. The stone facing should closely match, to the extent possible, the orientation and layout of existing stone, taking special care to place larger cut stones at the base of the substructure and transitioning to smaller rubble course at the top. The existing plaque will be retained and incorporated into the recommended preferred alternative.

To ensure that a sufficient level of detail is retained and that the above commitment is met to the expectation of the consulting parties, the following additional measure will be carried into the MOA:

- A masonry sample panel will be developed prior to the start of the application of any masonry facing to demonstrate the layout and orientation of the proposed stone work as well as mortar pointing. A field meeting will be held with members of the Design Advisory Committee (DAC) to review the masonry sample panel and provide comment. The result of the field meeting together with the masonry sample panel will serve as a guide for all stone work which is to take place on the structure.

3. Additional archaeology along the upstream and downstream banks

A Phase 1A archaeological study was conducted on June 13th, 2005 including a site investigation, geomorphological study, review of historic mapping and other available files. Study of historic maps identified a combined grist- and sawmill approximately 300 feet southwest of the Headquarters Road Bridge as well as a farmhouse of "A. Henry" approximately 500 feet southwest of the bridge. Geomorphological investigation was

undertaken to assess soil and landscape relationships pertinent with the intent of identifying the potential for presence of buried pre-contact cultural resources or other cultural resources in the project area.

The alluvial landscape in the south and west side of Tinicum Creek consists of a low-lying floodplain that is both too poorly drained and too young to have any potential for pre-contact cultural resources. Upland positions on the opposite side of the creek are severely disturbed and too steeply sloping for human occupation. Site survey located the remains of the mill and farmhouse depicted on the historic map however these features are located 300 feet and 500 feet, respectively, south of the bridge well outside the Area of potential effect (APE) and therefore will not be impacted. Note that stream impacts, if any, for the recommended preferred alternative are expected to be minimal, easily mitigated and limited to the area of the stream immediately adjacent to the bridge and will not extend for any significant distance upstream or downstream. Therefore the APE for the project is limited to the area immediately adjacent to the bridge encompassing anticipated permanent and temporary Right-of-way needs.

Based on this study it was determined that no prospects of intact, potentially significant archaeological resources exist within the expected project impact area and no further archaeological work was recommended. Therefore, further archaeological study will not be included as a commitment in the MOA.

Additional mitigation and minimization ideas which were favored by consulting parties (received at least one green sticker) which are not covered above are as follows:

4. Minimalist Bridge with as small a footprint as possible

Headquarters Road is classified as a Neighborhood Collector Road in a rural setting according to PennDOT's Design Manual 2 (DM-2). The minimum allowed roadway width for this type of roadway is 24 feet curb-to-curb. This width has been shown to be able to accommodate the turning movement of the largest fire truck which services the township moving from Sheephole Road on to the bridge. Recognizing that minimizing the overall footprint of the bridge the following commitment will be included in the MOA:

- PennDOT will construct a bridge with the minimum allowable roadway width, in accordance with PennDOT design standards and safety review, within the same approximate footprint as the existing bridge.

5. **Open railings for views of the stream**
   The use of open railings has been proposed for many structures in rural settings so that drivers can see views of the stream and surrounding landscape as they cross the bridge. While barriers must meet certain strength requirements in order to fulfill PennDOT's criteria for crash worthiness should a vehicle impact the railing, the Type 10m railing (most recently used on the River Road bridge over Tochickon Creek in Point Pleasant) provides the required level of safety while also providing views of the stream. To accommodate this request the following commitment will be included in the MOA:

   - The structure will incorporate brown, painted, Type 10M railing.

6. **Design Advisory Committee**
   A design advisory committee could consist of a small group of stakeholders tasked with providing feedback on or working through design related decisions as the project progresses through the design process. This committee could serve to provide feedback to ensure that, in the case of the recommended preferred alternative, the final structure plans and specifications reflect the vision of the community. An example of an informal design advisory committee is the role that the Point Pleasant Community Association (PPCA) took as part of the River Road (SR 0032) over Tohickon Creek Bridge project. During final design the PPCA worked with PennDOT to finalize aesthetic details of the new concrete arch structure.

   In order to have a productive conversation, it is recommended that the number of participants in the design review committee be limited. We have experienced that in part, due to the number of consulting parties in attendance at each of the Section 106 consulting party meetings, it is difficult to have a meaningful and organized conversation. This is true for the Headquarters Road project and for other projects with a large number of consulting parties and/or high level of controversy. The following is therefore recommended as a commitment for incorporation into the MOA:

   - PennDOT will form a Design Advisory Committee (DAC) for the project, consisting of no more than 9 members. Membership will be drawn from the following groups: National Park Service, Bucks County Officials, Tinicum Township Supervisors, the PA State Historic Preservation Office, the Advisory Council on Historic Preservation, The Delaware Riverkeeper Network and the local public.

   - The DAC will be invited to review project plans and specifications and provide feedback on aesthetic elements. DAC review will occur at least twice during the

project development process at roughly the 30% and 90% phases. The DAC will again be engaged during the early stages of construction to provide input on the masonry sample panel.

- PennDOT will incorporate the recommendations of the DAC, as practicable.

7. Preserve the existing bridge off alignment

While a new bridge could be constructed on an alternate alignment upstream or downstream, an additional obstruction in the stream would likely result in an impact to the 100 year flood elevations and require significant permanent right-of-way acquisition to realign Headquarters Road.

There are examples of truss structures preserved off alignment however there are differences and challenges when considering moving the Headquarters Road Bridge off alignment. Truss structures are typically tied into steel beams/girders. The steel beams serve as a stable base which can be used to move the entire truss structure relatively easily. The Headquarters Road Bridge by contrast would need to be disassembled stone by stone and reassembled off alignment which is a significantly higher cost. Additionally, the Headquarters Road Bridge is surrounded by private property within the floodplain. Placement of a reassembled off-alignment masonry bridge within the floodplain would also likely impact the 100 year flood elevations and require extensive right of way acquisition. Since this structure would not be maintained for pedestrian or vehicular use, State transportation money could not be used for the maintenance of this off-alignment structure and therefore would need to be owned and maintained by a local entity.

Finally, preserving the bridge off alignment would eliminate the re-use of existing stone on a new structure. Due to the above challenges and impacts, off-alignment preservation of the Headquarters Road Bridge will not be included as a mitigation commitment in the MOA and not considered further.

Conclusion and MOA Stipulations

In summary, the following mitigation and minimization measures will be incorporated into the MOA:

1. During construction, stone from the existing structure's masonry components will be salvaged for use in the proposed structure. Using a stone mason with experience in similar

project's, salvaged stone will be used as a stone facing on concrete components of the preferred alternative including the abutments, wingwalls and approach roadway barriers. The stone facing should closely match, to the extent possible, the orientation and layout of existing stone, taking special care to place larger cut stones at the base of the substructure and transitioning to smaller rubble course at the top. The existing plaque will be retained and incorporated into the recommended preferred alternative.

a) A masonry sample panel will be developed prior to the start of the application of any masonry facing to demonstrate the layout and orientation of the proposed stone work as well as mortar pointing. A field meeting will be held with members of the Design Advisory Committee (DAC) to review the masonry sample panel and provide comment. The result of the field meeting together with the masonry sample panel will serve as a guide for all stone work which is to take place on the structure.

b) PennDOT will construct a bridge with the minimum allowable roadway width, in accordance with the applicable design standards, within the same approximate footprint as the existing bridge.

c) The structure will incorporate brown, painted, Type 10M railing.

2. PennDOT will form a Design Advisory Committee (DAC) for the project, consisting of no more than 9 members. Membership will be drawn from the following groups: National Park Service, Bucks County Officials, Tinicum Township Supervisors, the PA State Historic Preservation Office, the Advisory Council on Historic Preservation, The Delaware Riverkeeper Network and the local public.

   a) The DAC will be invited to review project plans and specifications and provide feedback on aesthetic elements. DAC review will occur at least twice during the project development process at roughly the 30% and 90% phases. The DAC will again be engaged during the early stages of construction to provide input on the masonry sample panel.

   b) PennDOT will incorporate the recommendations of the DAC, as practicable.

Should you have any questions, comments or feedback on minimization and mitigation measures proposed for the recommended preferred alternative (Alt. 6- Two lane replacement) please contact Monica Harrower at 610-205-6709 or mharrower@pa.gov by December 15th, 2016.

pennsylvania
DEPARTMENT OF TRANSPORTATION

Enclosed:
Attachment 1- Mitigation and Minimization Totals
Attachment 2- Consulting Party Newsprints

Attachment 1: Mitigation and Minimization Totals

Table 1	Green	Yellow	Red
Did not participate*		7	18
*Note although table 1 did not participate in developing mitigation and minimization, yellow and red stickers were placed on the table 1 newsprint and recorded here			

Table 2	Green	Yellow	Red
Rehab Existing Stone Work	3		
1-lane Travel over bridge	2	1	
Stop signs at each end of the bridge			3
Save 1919 bridge plaque	0	0	0
Open Railings	0	0	0
Real stone wall wing walls	1		
Do not disturb surrounding properties or stream banks		2	5
Keep 1 lane bridge and stone substructure & More archaeology along stream banks*	10		
Total	**16**	**3**	**8**

*note that green stickers for these 2 ideas were grouped together. 5 green stickers were clearly associated with the idea of "Keep 1 lane bridge and stone

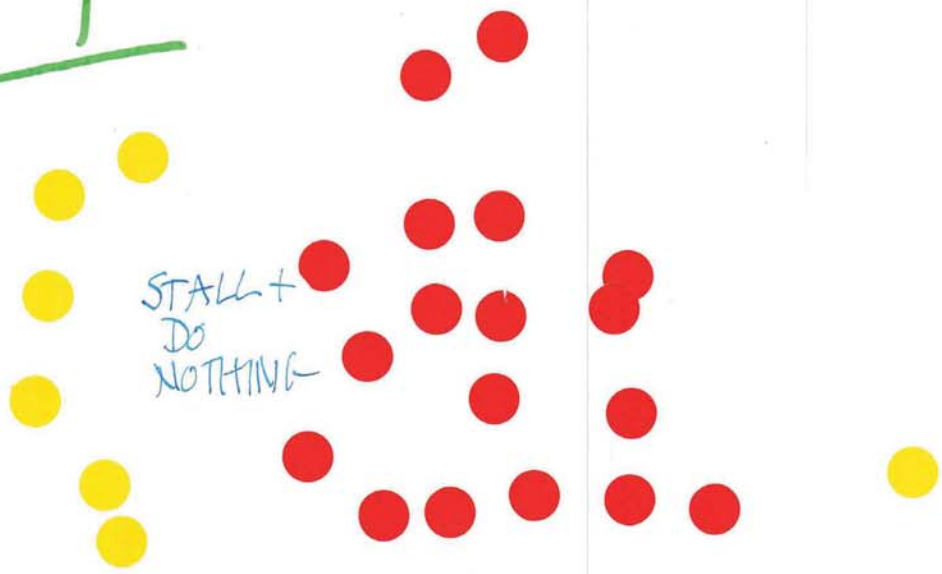
Table 3*	Green	Yellow	Red
Temporary 1 lane bridge	0	0	0
Rehabilitate existing 1812 bridge	12	1	
PennDOT Leave Tinicum		1	
Maintain historic character of RVRHD			
No change in stone substructure			
No plan but new bridge			2
Total	**12**	**2**	**2**
*Note table 3 filled in three newsprints. Similar ideas and stickers were combined above. For example, Table 3 newsprint 1 had the idea of "Rehab 1812 bridge" with 3 green and 1 yellow sticker. Table 3 newsprint 2 had the idea of "Refurbishing and rehabilitating the historic bridge" with 2 green stickers and "it is ludicrous to promte design to imitate a historic bridge when we could save it" with 7 green stickers. These three ideas were combined above into "Rehabilitate existing 1812 bridge" for a total of 12 green stickers and 1 yellow sticker.			

Table 5	Green	Yellow	Red
Tempoary Bridge before final penndot solution	9	2	1
Design Advisory Committee	1		
Minimilist bridge, smallest possible height/width*	2		1
Investigation into reuse of abutments/piers	1		
Move bridge off alignment to preserve	1		
Use old stones	3		
Railing that allows to see the stream	1		
Total	**18**	**2**	**2**
*Note the idea of "Minimilist bridge" and "foot print minimal" and the associated stickers were combined			

Table 6	Green	Yellow	Red
Rehabilitate existing bridge	7		
Spend last 10 minutes talking about a temporary bridge	19		
Drawing of lips			1
Not associated with any written ideas*			5
Total	**26**	**0**	**6**
*Note there were 5 red stickers located at the bottom right half of the newsprint. As it was not clear which idea these applied to, these were counted seperately above.			

Attachment 2: Consulting Party Newsprints

#1



#2 TABLE

REHAB EXISTING STONEWORK

1-LANE TRAVEL OVER BRIDGE

STOP SIGNS AT EACH END OF BRIDGE

SAVE 1919 BRIDGE PLACQUE

Open railing - Real stone wall wing walls

Best Mitigation is to Keep one lane bridge + stone substructure

Need archaeology - more stone ruins along streambank

#3

1. TEMP BRIDGE

2. REHAB 1812 BRIDGE

3. PENNDOT LEAVE TINICUM

#3

Refurbishing and Rehabilitating the historic bridge gets the community a safe, adequate crossing and maintains the historic integrity of the Ridge Valley Historic District.

It is ludicrous to promote design to imitate a historic bridge when we could save it !!

NO PLAN BUT NEW BRIDGE

TIP 2004 - BRIDGE REPLACEMENT
TIP 2010 - " "
REBUILD PA 2011 - " "
BRIDGE PROBLEM REPORT 2011 - A NEW BRIDGE

NO MAINT. NO TEMP BRIDGE
NO BRIDGE

#3 Rehab the existing bridge where it is.

Build a temporary bridge, one lane

No change in stone substructure.

NO BRIDGE MAINTENANCE BY PENNDOT SINCE 1992

+ NO TEMPORARY BRIDGE BY PENNDOT SINCE 2011

= NO BRIDGE FOR RESIDENTS OF TINICUM THANKS TO PENNDOT

#5

TEMPORARY BRIDGE

TEMPORARY BRIDGE

" "

" "

" "

" "

FINAL PENDOT SOLUTION

→ 1) Design Advisory Committee

→ 2) Minimalist Bridge

→ 3) Foot Print Minimal — Need smallest Bridge Possible — height & Width for Emergency Vehicles

→ 4) Explore Use of Existing Abutments in New Bridge Design — Truck can pass

- Use old stones
- Railing that allows the to seen the stream

New Bridge

Creek

* Second Bridge on Valley Street

Take stones from old Bridge to build one at Wall in 1800's Example Walnut Lane Germantown, PA

#6

Rehabilitate existing

With 10 min left in this meeting, this is going nowhere - lets talk about a temporary bridge.

Lets talk about the design that the supervisors have researched and see how everyone feels about it.

1) Rehab existing bridge ASAP

2) BUILD A temporary BRIDGE ASAP using this 106 process.

NOTE: Don't put the fake rock on the wrong side ala Caffrey & HQ RDS.

CE public comment period
12.13.16

went through purpose and need

resources considered
Tinicum creek
Floodplain to west
Ridge valley historic district
HQ bridge

Accommodate ottsfille fire dept with one turn ability

Key impacts of selected alternative:
Construction within the 100 yr floodplain
Won't significantly impact property or require property owner to move

Project can be completed in 9 mos
Current design schedule – construction to begin summer 2018

NEPA
No significant impacts and so ea or eis not required

Bruce Wallace
18th century rd
tight valleys and streams
are physical limitations cannot explain
other padot projects a disaster
tettemer where fire truck could pass in past can no longer make turn
cafferty caused flooding for half mile downstream and loss of trees and causing erosion
will move stream in order to make room for the proposed HQ bridge
even with move, can't meet modern stds. All HQ rd does not work with modern stds
stream, bridge, field, etc all impacted
channel stable now – that will be lost
all streams in Tinicum one lane b/c of physical limitations
PADOT one size fits all plan not fit
Stop wasting time and money and rehab bridge

Michael smith
Padot lost credibility with what did at tettemer and cafferty
Character of twp should be maintained – rural twp with windy roads
Character of area around tettemer and cafferty destroyed by padot
It a state scenic river as well as ev and fed wild & scenic

Valdimir salamon
At cafferty little Tinicum constrained by cafferty bridge and velocity increased 11 times according ot penndot
Caused scouring and silting of creek
Scouring continuous as move down creek
My property had significant erosion on banks
Bank shifted 4 to 6 feet

Jessie Salamon
Padot misstatements
Padot through shop office said bridge delisted – keeper of register said it continues to be elegible as contributing property and individually eligible
In year the project proposed there effort to delist – this to lower bar

Judy esch
Matter of safety
Pile of stone and rubble
Cannot be fixed in my opinion
Can't sell homes b/c of bridge out

Graham place
Lived in hq rd for over 70 yrs
Bridge important part of legacy of twp
Pattern in padot bridge replacement strategy---we shown reasonable and aesthetically nice looking option but what actually built not in keeping with that proposal
Moving banks and trees falling in – ce not appropriate
$70 k wasted in dayglow signs that prevent drivers seeing rd at night
Envtl study should take place

Karen gladfelter?
I urging EA for this project
Will have significant envtl impact
Bridge will be moved 15 ft
Rip rap over 305 linear ft of creek
Invasion of nonnative plant species – huge threat to envt
First plants that come into highly disturbed area are nonnatives – this irreversible form of pollution
Spread of nonnative species is second only to habitat loss as greatest threat to biodiversity
She cited an EO and gave number – it passed in 1999
$138 billion spent annually to try to stop invasive species
do not hold soil so increase erosion
no value to wildlife

Boyce Budd

Asked for EIS to protect water resources

Mary ann Pucci
Asked for H&H, stream profile, cross channel sections, estimates of flood frequency and flows Etc.
All of which needed for permitting
This info not presented as part of draft CE
So cannot be serious examination of project
Need EA or EIS

Laurie Duvall
This mtg about whether penndot can get CE – not about whether to repair and rebuild bridge
Move bridge
Stream impacts
Will have significant impacts
CE not appropriate
For health and safety need bridge made useful again – what at issue is how this gets done
PennDOT now says bridge needed for trucks as a critical issue
Bridge never washed out
Penndot trying to split community agst each other

Am Pucci
Licensed engineer and experienced hydrologist
Info I provided on this project been ignored
He laid out info he given and when that ignored

Pennrose Hallowell
Amazing that bridge built when used by horse and carrieage still serving prupose
I don't' think penndot can built a bridge that will last 200 years.

Kathy auerbach
The ev stream here b/c bridge is here
It one of only 2 pier to pier bridges left in PA
Bridge is repairable.
Bridges across Delaware that this old well maintained and serving communities well
Federal W&S designation here b/c bridge is here
We here b/c laws protect our historic and natural resources
Laws encourage preserve, rehab, protect – not destroy

(Bill Shick signed up but did not testify)

Nick domiano
I live on headquarters road
Bridge being out is a pain

I understand need for emergency services
I not understand why need of 2 lane bridge
I lived there 38 years and never a problem
I worried about use for heavy trucking
Repair what we have – little wider maybe

Susan Wallace
PADOT wants to say no signficiant impacts
Should not qualify for CE
The very roads that go through Tinicum were foot paths for native americans
Bridge and stream are ancient and beautiful – they feel magical
Cumulative impact of losing bridges and buildings here and there
Tinicum worthy of protection – we have so much left – we need to keep it

Helen Shibley
Resident of Tinicum for 20 yrs
Back wood goes to HQ rd
Really appreciate and enjoy area
Last 5 years it terrible in Tinicum – difficult to get around
I want bridge – 1 lane or 2 lane
Neighbor has down syndrome child
Elderly with health issues
Neighbors can't sell house b/c people can't get there
We need a bridge
Community needs to come together
I don't like tettemer or cafferty bridge either
I disappointed by geigel hill bridge – that bridge as one lane a hazard
We just need something to get over creek

John salerno
This bridge at my home
This community cannot trust penndot to act in best interests of community
To maintain no signficiant envtl impact is a falsehood

Maya van Rossum

Craig olsen
Moved to speak
We in 2016
We respect builders of past --- proposal incorporates the past and does that
Clear span best way
80 million ways to do this right environmentally

Michael smith spoke second time

Talked about importance of landscape
Project as penndot conceived will be intrusive

19 spoke – 2 for and 17 agst

hrg closed 8:20

Comments on the PennDOT Determination of Effects Report on the Headquarters Road Bridge

A report prepared for the Delaware Riverkeeper by:

Mark L. Stout, PhD
Mark L. Stout Consulting

14 December 2015

The Determination of Effects report asserts that there is a "site-specific safety problem" at the Headquarters Road Bridge. This is a critical assertion – one that leads the authors to conclude that the bridge fails a critical test in the AASHTO Design Policy: "AASHTO states that existing bridges can remain in place without widening unless there is evidence of a site-specific safety problem related to the bridge." The evidence cited for a site-specific safety problem is "the existing design deficiencies and statistically high crash rates related to these deficiencies." The report refers the reader to a previous PennDOT document, the Bridge Width Evaluation report, for a summary of reported crashes.

The PennDOT "site-specific safety problem" argument, as set out briefly in the DOE report and discussed in more detail in the Bridge Width Evaluation report, has four main components:

1. There are many geometric deficiencies in the existing bridge design and its approach roadways, which could induce more frequent crashes,
2. The crash rate in the vicinity of the bridge is higher than at comparable locations,
3. There is a history of crashes which is consistent with these findings, and
4. A one-lane bridge impedes emergency vehicle access.

These arguments will be addressed in turn.

1. Geometric deficiencies

The report states that a one-lane bridge at this location does not meet PennDOT design standards and implies 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, as we have argued in a previous report (*Tinicum Township and the Headquarters Road Bridge: Planning the Future*, 14 April 2014), 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 and/or analysis of roadway safety at one-lane bridges and research and/or analysis of one-lane versus two-lane bridges. No applicable specific research was found on either subject, but some anecdotal information about the traffic calming effects of one-lane bridges was found. It was asserted that due to the narrowing of the roadway to one lane, traffic naturally slows down. An analogy would be the installation of a one-lane "choker" and/or a neck-down. A choker narrows the width of a roadway, generally at mid-block locations, to "allow travel in only one direction at a time, operating similarly to one-lane bridges." Neck-downs are similar in nature but are at intersections. The Institute of Transportation Engineers (ITE) estimates that speed is reduced by 14% when one-lane chokers are implemented for roadway

> widths under 20 feet and greater than 17 feet. Speed reduction can enhance safety and, if a crash does occur, severity has a tendency to be reduced at the lower speeds. The same ITE reference also states that one-lane chokers can have a traffic volume reduction of 20%. A reduction in volume also decreases the risk of a crash and can enhance the safety of the location.

The DOE report does not explicitly address other potential design deficiencies in the area, but it should be presumed that the "deficiencies" referenced here include those addressed in the Bridge Width Evaluation report. These include sight distance, horizontal curves, and approach grades (turning radius will be discussed below in connection with emergency vehicle access). This is, in fact, a rural area, with wooded slopes and steep and winding roads. The report notes that "many" of the alternatives analyzed "are not able to fully address these existing substandard criteria." There is no discussion of how or to what extent the preferred alternative (presumably Alternative 6) addresses these issues. All of these alternatives, including Alternative 6, would likely require design exceptions to address the real issues of designing a project in this type of environment. In fact, a STOP sign in advance of the bridge on the western approach would resolve the sight distance issue, while improved road markings and signage should reduce the incidence of run-off-the-road events and other problems that might be associated with horizontal curves and grades near the bridge.

2. Crash rate

The DOE report refers to "statistically high crash rates," which is presumably based on the safety discussion in the Bridge Width Evaluation report. 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.

3. Crash history

As the Determination of Effects report notes, a narrative summary of the crash history for the area in the last 10 years before the bridge was closed is provided in the BWE report. The BWE narrative is based on another report, the "PennDOT Crash History Summary," which is listed as Attachment 7 to the BWE report. Portions of this document have been made available to us to review, but the actual crash records have not.

We were able, however, to review 10 crash reports which were supplied by Tinicum Township for the period 2003 to 2010 in the area of the bridge. A comparison of the 10 records supplied by Tinicum Township and the summary analysis in the "PennDOT Crash History Summary" suggests that the two lists may not be identical, although without seeing the actual records reviewed by PennDOT it is impossible to be certain.

Our review of the crash records received from Tinicum Township yields a very different conclusion from the one set out in the BWE and DOE reports.

Of the 10 crash reports reviewed, 3 are located on or at the Headquarters Road Bridge, 1 is nearby, and 6 are unrelated.

Following are the reported crashes on or at the bridge:

- 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 (see figures 1 and 2).
- 1 April 2006 – An unregistered, uninsured vehicle left the scene of the crash while the driver and passengers were out for a "joyride." Details of the crash are minimal but do indicate that contact was made with the Jersey barrier on the bridge.
- 7 May 2006 – A motorcyclist reported losing control of his eastbound motorcycle on loose gravel as he entered the bridge (see figures 3 and 4).

While the width of the bridge (a 10-foot cartway at the time) may have been a minor factor in these crashes, it does not appear that bridge width was the primary causal factor in any of these crashes.

The partial "PennDOT Crash History Summary" also identifies only 3 crashes at the bridge, a fact which was not included in the summary discussions in the BWE and DOE documents.

A fourth crash, on 6 July 2007, appears to have been near the bridge. 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 (figure 5), the

vehicle probably made contact with the fence on the western end of the bridge (figure 6).

Of the 6 remaining crashes, 1 occurred on Sheephole Road (10 February 2003), as two vehicles collided under icy conditions. The remaining 5 were all associated with the curve located approximately 250 feet east of the intersection of Headquarters Road and Sheephole Road:

- 24 May 2005
- 26 September 2008
- 21 January 2009
- 5 May 2009
- 16 March 2010

Of the crashes at the curve, 3 occurred when the road surface was wet and all 5 involved a westbound vehicle crossing the centerline (see figures 7 and 8). These crashes are all well beyond the influence of Headquarters Road Bridge, but do indicate a "hotspot" where PennDOT should consider upgrading such safety measures as signing and striping.

Our conclusion from reviewing the crash history in the vicinity of the Headquarters Road Bridge is that this history provides no evidence of a site-specific safety problem at that bridge.

4. Emergency vehicle access

The DOE report repeats PennDOT's assertion, made in previous documents, that one of the needs of the project is the fact that the existing structure "cannot safely and effectively accommodate current and future traffic needs including emergency response vehicles." With a curb-to-curb width of 16 feet, the bridge "cannot accommodate Tinicum Township's largest fire response vehicle, a 41.5-foot ladder truck." In fact, this ladder truck – Ladder 49 of the Ottsville Volunteer Fire Company – operated across the Headquarters Road Bridge when it had a 10-foot cartway. In an interview (a summary of which is attached), the fire chief of the Ottsville Fire Company confirmed that Ladder 49 could operate on a 16-foot bridge, although it would need to back up once to make the left turn into Sheephole Road, a common procedure in the township. He would also find a cutback of the embankment on the east side of the bridge desirable.

A wider bridge is <u>not</u> necessary to accommodate fire company operations. A traffic engineering analysis conducted for us by MBO Engineering in 2013 found the following:

> MBO Engineering has reviewed the 2009 turning radius study done by Urban Engineers for the Headquarters Road Bridge, discussed the possible scope of

work of a bridge rehabilitation project with McMullan Engineering, and undertaken multiple field visits in the vicinity. Based on this work, MBO Engineering believes that it is possible to satisfy the turning radius needs identified by Urban within the scope of a bridge rehabilitation project that includes some reconstruction of the wingwalls at the eastern end of the bridge, some reduction of the slope in the northeast quadrant of the bridge, and possibly some adjustment of the curb-to-curb width of the proposed new bridge deck.

Figures

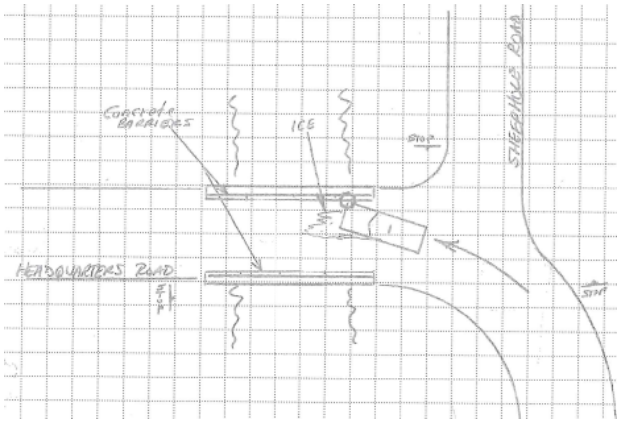


Figure 1
Police sketch of 24 October 2003 crash, vehicle skidding on icy surface into Jersey barrier

Figure 2
Jersey barrier on Headquarters Road Bridge, showing impact scrapes, possibly resulting from the 24 October 2003 crash

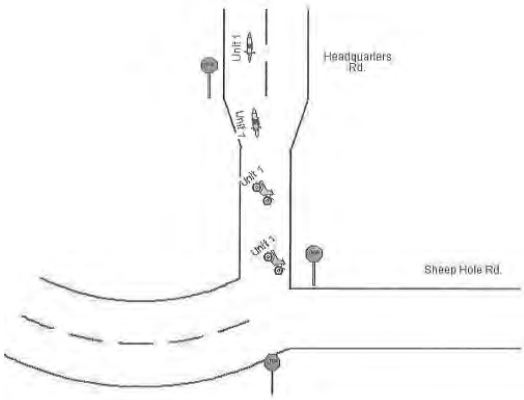


Figure 3
Police sketch of 7 May 2006 crash, motorcyclist losing control on loose gravel

Figure 4
Eastbound view of Headquarters Road Bridge in the area in which the motorcyclist lost control in the 7 May 2006 crash

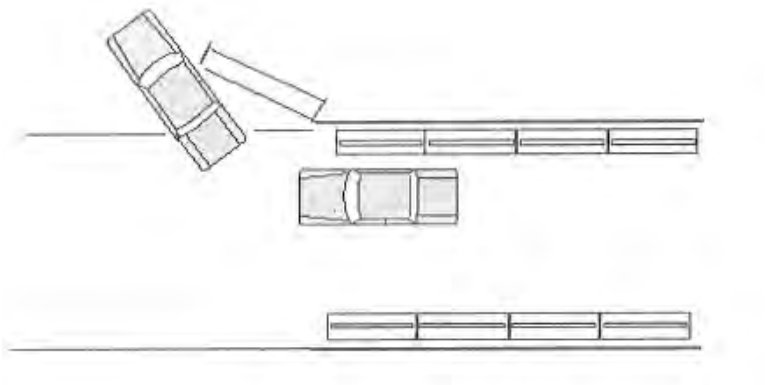


Figure 5
Police sketch of 6 July 2007 crash, impact on the fence to the west of the bridge

Figure 6
The fence to the west of the bridge, the apparent site of impact in the 6 July 2007 crash

Figure 7
Westbound view of the curve on Headquarters Road located 250 feet east of the intersection with Sheephole Road, the site of 5 crashes within the reporting period

Figure 8
Guiderail along the Headquarters Road curve, showing signs of multiple impacts

Attachment A
Meeting with Ottsville Fire Chief Bill Shick
14 October 2015

Bill Anderson and Mark Stout met with Bill Shick, Fire Chief of the Ottsville Volunteer Fire Company, at the Ottsville Firehouse on October 14 for approximately one hour. Following the meeting, he took us on a tour of local roads on Ladder 49, the Company's longest truck.

Key points:

- Chief Shick stated that as fire chief, he has no preference whether a one-lane or a two-lane bridge is built; his priority is to get a bridge opened as soon as possible. He thinks it is important to inject a sense of urgency into the discussions. I explained that in my view, the rehabilitation option would be completed more quickly.
- Ottsville will soon open a second firehouse in the northern portion of the district. The equipment being relocated to the new firehouse will not include Ladder 49 or Rescue 49, the two vehicles identified as having turning radius issues.

Chief Shick discussed in detail the routing issues associated with the Headquarters Road Bridge:

- With the closing of the Headquarters Road Bridge, the main detour route for Ladder 49 from the Ottsville Firehouse to Sheephole Road is Geigel Hill Road – Tankhannen Road – Ridge Valley Road – Headquarters Road. The detour route takes 3 minutes longer than the route over Headquarters Road Bridge. Since Tankhannen Road is unpaved, with tight curves and steep grades, Chief Shick explained that individual drivers of Ladder 49 may choose a slightly longer detour route (Geigel Hill Road – Ridge Valley Road – Headquarters Road) if they feel it is safer. The longer detour route adds another 2 minutes.
- Ladder 49 cannot enter or exit Sheephole Road at Geigel Hill Road. This means that the vehicle must reverse direction in a private driveway on Sheephole Road (a time consuming maneuver) in order to leave Sheephole Road the way it arrived, via Headquarters Road.
- Rescue 49 is a shorter vehicle but with a long wheelbase, so it also has turning radius challenges, although not as serious as Ladder 49. Rescue 49 can enter Sheephole Road via the Geigel Hill Road intersection, but needs to exit via Headquarters Road.
- The jurisdiction of the Ottsville Company extends to the east along Headquarters Road as far as Municipal Road, where Del Val company (based in Erwinna) assumes primary coverage. Even with the detours related to Headquarters Road Bridge, the Ottsville Company can reach this area of Headquarters Road faster than equipment from Erwinna.

We spent some time onsite at the Headquarters Road Bridge and talked about structural and geometric options:

- Chief Shick repeated that he would be happy with any width bridge that allowed the connection to reopen, even though some Ottsville equipment picked up "scrapes and bangs" when the bridge was open and the Jersey barrier was in place.
- With a 16-foot wide bridge, Ladder 49 needed to back up once to make the left turn onto Sheephole Road. Chief Shick does not consider that to be a problem, as the same situation exists in a number of places within the fire company's coverage area.
- Chief Shick would welcome a cutback of the embankment on the east side of the Bridge. He estimated that a 5-foot cutback would enable the largest fire apparatus to make the left turn without a backup.
- Chief Shick would be happy with a 16-foot wide bridge, although he thinks 18 feet would be better. He sees no benefit for his trucks in widening to 24 feet.

Attachment B
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 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.

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To: Maya van Rossum, Delaware Riverkeeper
From: Mark Stout
Subject: Supplement to my 14 December 2015 ñComments on the PennDOT Determination of Effects Report on the Headquarters Road Bridgeò report
Date: 18 January 2016

In our report to you entitled ñComments on the PennDOT Determination of Effects Report on the Headquarters Road Bridge,ò dated 14 December 2015, we analyzed the assertion in PennDOTôs report that there is a ñsite-specific safety problemò at the Headquarters Road Bridge and found it unpersuasive. An important element of that analysis was a review of the crash history at the bridge. We reviewed (1) ten Tinicum Township police reports of accidents in the vicinity of the bridge for the period 2003 to 2010 provided to us by the township and (2) those elements of the ñPennDOT Crash History Summaryò which were available to us at the time. Since the submission of our 14 December report, we have received previously missing information from the ñPennDOT Crash History Summary,ò specifically, the ñCDART Crash Resume Data,ò a summary of the ten accidents PennDOT used in reaching the conclusions stated in the Determination of Effects report. The purpose of these supplementary remarks is to review our assessment in light of the fresh data received.

You will recall that in our analysis of the 10 accident reports provided by Tinicum Township we determined that 3 were located on or at the Headquarters Road Bridge, 1 was nearby, and 6 were unrelated to the bridge. This determination was based on a review of the narratives and sketches included in the police reports as well as field visits. My colleague Bill Anderson, an experienced traffic engineer and former Manager of the Bureau of Traffic Engineering at the New Jersey Department of Transportation, played a critical role in this analysis.

The partial ñPennDOT Crash History Summaryò available to us for our 14 December 2015 report also identified only 3 crashes actually located at the bridge out of a total of 10 crashes summarized. However, as we stated at the time, comparison of the 10 records supplied by Tinicum Township and the summary analysis in the ñPennDOT Crash History Summaryò suggested that the two lists might not be identical.

The new data enables us to compare the two lists in detail. The newly available PennDOT ñCDART Crash Resume Dataò provides summary data for 10 accidents, including exact location by milepost and ñoffsetò (distance in feet from the nearest milepost).

A collision diagram illustrating the crashes found in the lists is attached. The diagram is based on details identified in the crash reports and on locations referenced to the PennDOT Straight Line Diagram.

We find the following in comparing the two lists:

- Only 3 crashes are on both the Township and PennDOT lists.
- All 3 duplicate reports are of crashes at or near the bridge.
- Of the 7 PennDOT reported crashes which are not on the Township list (and are also not at or near the bridge), 5 are located to the west of the bridge (4 of these west of the intersection with Red Hill Road) and 2 are located east of the bridge in the area of the curve discussed in our 14 December 2015 report. **None of these 7 crashes has any relation to Headquarters Road Bridge.**

The 3 crashes identified on both lists are:

1. 24 October 2003. Our description (from the 14 December 2015 report): ñA 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.ò This crash occurred at the bridge but in our opinion was not caused by the geometry of the bridge. There is nothing in the CDART Crash Resume Data report to contradict this assessment.
2. 7 May 2006. Our description: ñA motorcyclist reported losing control of his eastbound motorcycle on loose gravel as he entered the bridge.ò This crash occurred at the bridge but in our opinion 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. Our description: ñA 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.ò 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 (ñhit fence or wall,ò as distinguished from other possible choices, such as ñhit bridge pier or abutment,ò ñhit parapet end,ò ñhit bridge rail,ò or ñhit concrete or longitudinal barrierò) all suggest contact with the fence west of the bridge. In any event, in our opinion 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.

There is one crash on the Township list ï but not on the PennDOT list ï which we determined to be at the bridge:

> 1 April 2006. Our description: ñAn unregistered, uninsured vehicle left the scene of the crash while the driver and passengers were out for a ñjoyride.ò Details of the crash are minimal but do indicate that contact was made with the Jersey barrier on the bridge.ò This crash occurred at the bridge but in our opinion was not caused by the geometry of the bridge.

We draw the following conclusions from this analysis:

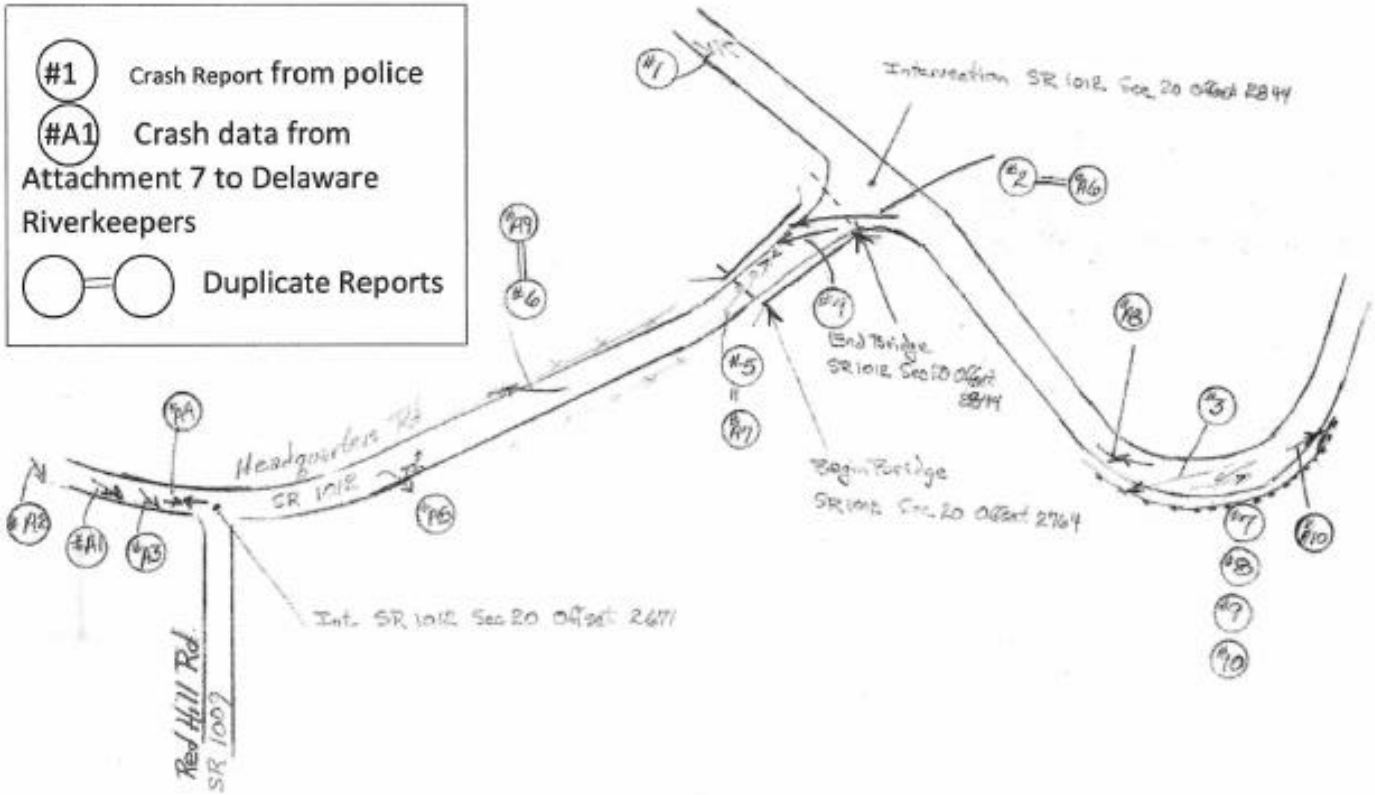
First, there were ï at most ï 4 crashes on or at the Headquarters Road Bridge during the last ten years of its service.

Second, the ñPennDOT Crash History Summaryò leaves the impression that 10 crashes occurred on or at the bridge, when the CDART Crash Resume Data report clearly identifies only 3.

Third, there is no evidence that the 3 (or 4 using a more generous definition) crashes that occurred on or at the bridge were caused in any way by the geometry or condition of the bridge.

Fourth, the crash history points to problems at the curve to the east of the bridge (which we discussed in the 14 December 2015 report) and at the curve west of Red Hill Road (which we did not analyze but which show several accidents in the PennDOT data), not at the bridge.

Finally, the additional data provided in the CDART Crash Resume Data report reinforces our opinion that the crash history does not support the conclusion that there is a site-specific safety problem at the Headquarters Road Bridge.



COLLISION DIAGRAM

Headquarters Rd near Bridge over Tinicum Creek

Tinicum Twp., Bucks Co.

12/21/2015

Headquarters Road (S.R. 1012, Section BRC) Bridge over Tinicum Creek
Tinicum Township, Bucks County, PA (MPMS 13716)

Determination of Effects Report (November 2015) Comment Response Document
June 23, 2016

CONSULTING PARTY: Pennsylvania Historical and Museum Commission, Douglas C. McLearen, Chief, Division of Archaeology and Protection (December 15, 2015)

COMMENT #1: As presented in the effects report, the alternatives analysis is inadequate. There is relatively little discussion as to how the various alternatives would affect the character-defining features of the historic district. When discussion of effects to the district is included, it is focused on retention of the abutments, wing walls, and piers of the bridge and potential land acquisitions from contributing properties in the historic district. The discussion of alternatives should document consideration of minimization of effects to the surrounding landscape and setting of the historic district. For example, it would be useful if general renderings of the proposed structures could be provided for assessment of compatibility of scale with the surrounding historic district. The report should also address visual effects of the introduction of riprap material along the stream banks, piers, and abutments.

RESPONSE #1: PennDOT has submitted additional information about the Alternatives Analysis to the SHPO and the Section 106 consulting parties.

COMMENT #2: The two-lane bridge replacement is identified as the preferred alternative for the project in the Project Description (Chapter 4) of the effects report; however, no justification for selection of the two-lane bridge replacement as the preferred alternative is provided in the alternatives analysis.

RESPONSE #2: PennDOT has submitted additional information about the Alternatives Analysis to the SHPO and the Section 106 consulting parties.

COMMENT #3: Finally, based on our experience, the large group format of the consulting party meetings has not been conducive to the effective exchange of ideas. For future meeting, we suggest PennDOT and FHWA work with the consulting parties and ACHP to develop measures to facilitate more effective discussion and consideration of alternatives to avoid, minimize, or mitigate adverse effects to the Ridge Valley Rural Historic District.

RESPONSE #3: Thank you for this comment. PennDOT and FHWA will continue to work with ACHP and SHPO to develop a more effective format for future consulting party meetings.

CONSULTING PARTY: Charles Reichner, via email (Catherine@heatshed.com; November 10, 2015)

COMMENT #1: I personally believe that the alternate 2 is the best solution because it allows the existing bridge to be reconstructed to its historically correct look and it gives the users of the road the straight line between two points; however one of the objections to this alternative will

be that cars/trucks will now speed through this area. This is an advantage for emergency services but a worry for residences. Stop signs would slow the traffic. Unfortunately this alternative will bring lawsuits as there will property seized by eminent domain (sic). That said there will be lawsuits no matter which alternative is decided upon!

RESPONSE #1: Alternative 2 results in the most amount of right-of-way needed from the historic district compared to the other alternatives. Alternative 2 also results in increased impacts to the floodplain and to Tinicum Creek. In balancing all of these factors, Alternative 2 was dismissed from further consideration.

COMMENT #2: My second choice would be alternative 6. A new 2 lane bridge built to fit into the historic district. This road is a state highway and is for the benefit of ALL the residences of PA. and is paid for by our taxes whether state or federal. It is not the sole property of Tinicum Twp but only runs through Tinicum Twp.

RESPONSE #2: Thank you for your comment.

CONSULTING PARTY: Delaware Riverkeeper Network Consultant- Douglas E. Bond, PE, McMullan & Associates, Inc. (December 7, 2015; revised comments provided December 15, 2015)

COMMENT #1: The full replacement alternative with new two-lane superstructure and new reinforced concrete substructure is stated as the "preferred alternative." There is no discussion why this is preferred or who prefers it. The entities who prefer this alternative should be listed and the reasons why it is preferred stated. Is this PennDOT and their consultants? Is it preferred because it best meets the design standards for a new bridge?

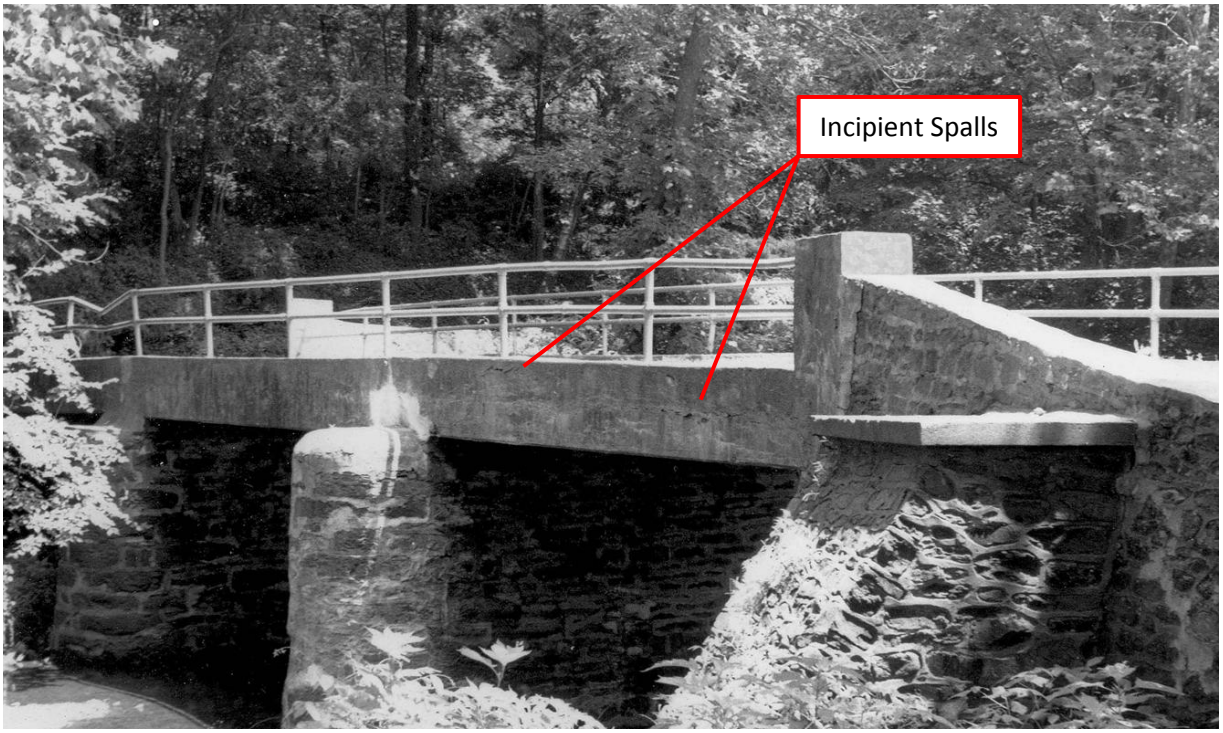
RESPONSE #1:As a result of Urban Engineers studies, Alternative 6 (full replacement) was identified as the preferred alternative. Alternative 6 best meets the project's purpose and need and PennDOT's design criteria for this type of roadway.

COMMENT #2: Each of the 10 alternatives is described in the document. However, only one is evaluated for adverse effect. Why aren't other alternatives that may have little or no adverse effect evaluated and compared?

RESPONSE #2: PennDOT submitted additional information to PA SHPO and the Section 106 consulting parties on June 21, 2016 about the alternatives. The Determination of Effect report only assessed the effect of the preferred alternative (Alternative 6) on the Ridge Valley Rural Historic District since the other alternatives were dismissed. Determination of Effect reports typically only evaluate the effect of the preferred alternative on historic properties.

COMMENT #3: Pg. 4 4th par – The bridge railing installed in 1991 contains post installed anchors that may not have had sufficient edge distance for the 1919 concrete that contains large rounded stones, resulting in a design with little capacity. It should be noted that the condition of the 1919 concrete could have significantly contributed to failure of the railing.

RESPONSE #3: A photo from 1990 prior to the installation of the steel beam guide rail shows what appears to be incipient spalling along the northwest fascia, which would not be out of the ordinary on a 70+ year old superstructure (see photo below). Due to the deterioration of the superstructure and the fact that the pipe railing did not meet crash safety standards, PennDOT installed structure mounted guiderail. We agree that the condition of the 1919 concrete could have contributed to the failure of the railing.



COMMENT #4: Pg. 6 2nd par – The purpose and need statement for the project should contain text about evaluating the project's needs with regard to their impact to the historic district since that is a required component of the project. Safety and structural integrity and minimizing adverse effects are all needs.

RESPONSE #4: This comment was previously addressed in the Comment Response Document dated September 10, 2013 (Response to Comment B on page 2 of 43) which is attached as Appendix A.

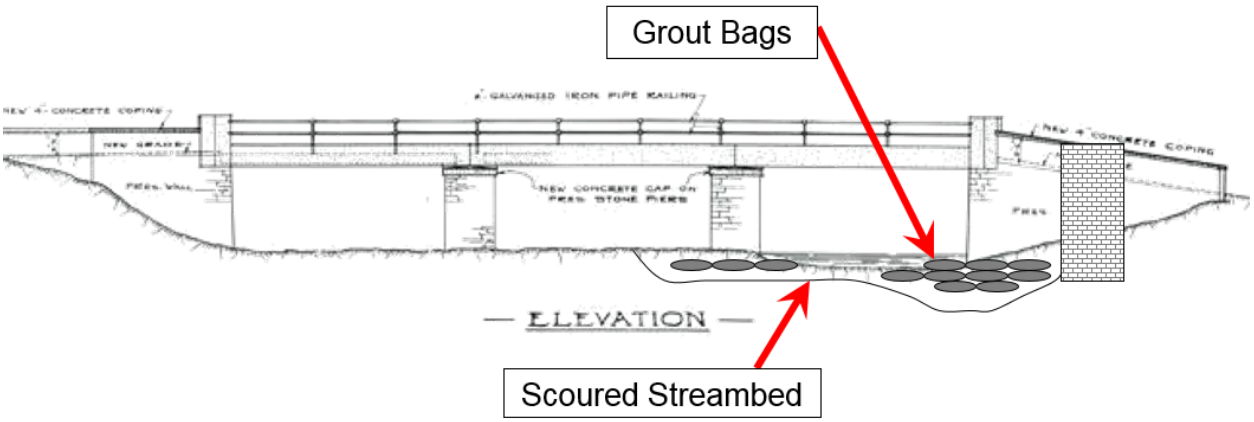
COMMENT #5: Pg. 6 4th par – There is a statement about "signs" of base slippage and 12 inches of wall displacement which is unclear. Where does the possible base slippage occur? The west abutment or its wing walls?

RESPONSE #5: The observed base slippage is located at the Northwest wingwall, which is part of the West Abutment. This slippage appears to be a global stability issue, which is likely the cause for the addition of the buttress at this wall sometime after 1919. The buttress was likely installed to arrest the failure of the wall due to sliding. However, the buttress is no longer in full

contact with the wall, possibly due to further movement in the wall. The face of the wall shows an angle in excess of 10 degrees in areas.

COMMENT #6: Pg. 6 4th par – There is a statement that grout bags were installed "to temporarily alleviate concerns of the substructure deteriorating further" but there is no description of what in the substructure had deteriorated from scour. Furthermore, the grout bags restrict the stream channel possibly increasing flow velocity, and have themselves been undercut. It is also possible that the undercut occurred because the grout bags were placed on the sediment on the stream bottom and not directly on the rock. It should also be noted that the scour concerns may have been made worse by this temporary repair due to flow restriction.

RESPONSE #6: This comment was previously addressed in the Comment Response Document dated September 10, 2013 (Response to Comment 1.j.ii on page 23 of 43) which is attached as Appendix A. There is no evidence that the scouring of the substructure has been accelerated by the grout bags. Grout bags are not meant to be a permanent solution to streambed scour and were installed around the perimeter of the foundations to prevent further risk of deterioration of substructure elements. The added grout bags filled in areas where the stream bed material has been scoured (as shown below).



COMMENT #7: Pg. 7 3rd par – The statement "Heavy scour exists along the western abutment…" would be more clear by explaining that the stream bottom and grout bags have been undercut, not necessarily the masonry of the pier or abutment.

RESPONSE #7: As described above, grout bags were installed as a temporary measure to protect substructure elements against further risk of deterioration of substructure elements. Further details regarding substructure deterioration and susceptibility of scour can be found in the 2006 Existing Structure Condition Evaluation Report.

COMMENT #8: Pg. 8 2nd par – The statement about "the condition of the bridge would warrant its removal to avoid further obstruction…"should be clarified that the superstructure could be removed without removing the substructure.

RESPONSE #8: If the No Build Alternative was carried forward as the preferred alternative, the bridge would continue to deteriorate and would eventually require removal of the superstructure and the substructure, to prevent damage to Tinicum Creek.

COMMENT #9: Pg. 15 3rd par through pg 16- The jersey barriers installed in 2001 significantly reduced the lane width. All 10 accidents referenced in this section occurred after 2001. There appears to be no evidence presented that the 16 foot lane width of the bridge prior to the jersey barriers had a similar site-specific safety problem. The fact that the accidents occurred on a 10 foot lane bridge which is not proposed in any of the alternates should be pointed out in the text.

RESPONSE #9: See the response to Comment #1 on page 11.

COMMENT #10: Pg. 16 first section – it should be noted that the alignment and site distance are substandard for alternatives 3 through 6, including the preferred alternative.

RESPONSE #10: Yes, the alignment and site distance are substandard for all alternatives. In order to address alignment and sight distance concerns, the scope of the project would be increased and the study area would also be increased, resulting in significant increases to construction costs and impacts to the environment. For this reason, 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.

COMMENT #11: Pg. 16 first section – There is some question that the traffic counts were taken during a time when the Headquarters Road was used as a detour. This should be clarified in the discussion on ADT exceeding 400. Is there a traffic count available when the bridge would not have been a detour? Also it should be mentioned that a design exception could be obtained for a one lane bridge.

RESPONSE #11: This comment was previously addressed in the Comment Response Document dated September 10, 2013 (Response to Comment F on page 5 of 43) which is attached as Appendix A. The 2001 traffic count with 900 ADT was taken when both Dark Hollow Road and Giegel Hill Road were open to traffic.

COMMENT #12: Pg. 16 and 17 – Alternative 3 which involves rehabilitation of the existing stone masonry. Why does Alternative 5 require replacement of the existing masonry if that same masonry can be rehabilitated as in Alternative 3? Rehabilitating the masonry would likely have less adverse effect than replacing it with reinforced concrete. This alternative should be reconsidered. There was a turning radius study done with the 18-foot span and removal of some of the bank on the east side of the bridge, but this is not mentioned in the text.

RESPONSE #12: The Determination of Effect Report noted that the bridge abutments would be rehabilitated with Alternative 3. However, the abutments would be replaced. Given the advanced deterioration in parts of the piers, partial pier rehabilitation would be required retaining some of the existing masonry. Due to concerns regarding the long term serviceability of the existing stone masonry, Alternative 5 was presented as an option that provides a one-lane bridge with

modern concrete piers and abutments (with a masonry cladding) that has a 100-year service life and improved hydraulics (eliminating one of the piers in the channel). Both alternatives would have an adverse effect on the Ridge Valley Rural Historic District due to the removal of the bridge superstructure.

COMMENT #13: Pg 17 – Figure 7 – Alternative 3 – There is a note on the drawing that the existing abutment is to be replaced, but this does not match the text that describes rehabilitation for both piers and abutments. The foundations are shown on the drawing to have a footing but all evidence suggests that the existing piers bear directly on the rock. Also the rip rap shown around the piers and abutments could have a negative effect on historic integrity and stream flow. Other measures should be considered to improve scour protection. There is a note about temporary excavation support and protection system to remain but this is not explained in the text. The elevation of this protection system appears well above normal water and so could negatively impact the bridge. It appears that this protection system extends into the rock below the abutment but this is not explained in the text. There are options available to improve the turning radius that should be explored.

RESPONSE #13: The Determination of Effect Report noted that the bridge abutments would be rehabilitated with Alternative 3. However, due to the extent of abutment deterioration and localized failure, full replacement of the abutments is recommended. This was clarified in additional information provided to the SHPO and the Section 106 consulting parties. The foundations are likely founded on bedrock, although we have observed a concrete collar around some of the units. In the additional information provided to SHPO and the Section 106 consulting parties, the graphic on Figure 7 was revised to show that the abutments will be replaced and the note about the temporary excavation support and protection system was removed.

Stone rip-rap will be utilized around the base of the piers and abutments as a countermeasure to help prevent scour for each alternative studied. In an effort to minimize the visual effects to the Ridge Valley Rural Historic District, the following scour countermeasures are proposed. The scour countermeasure would be depressed to a depth of approximately one foot below the finished grade and choked with smaller stone and natural stream bottom material. Much of the rip-rap will be obscured by the water of Tinicum Creek; however, some rip-rap will be visible above the water line at the base of the piers and abutments. The visual impact will be minor as stone is a natural material found abundantly in the project area. The rip-rap will only be located at the base of the piers and abutments, and much of it will be located under the superstructure which will further obscure it from view to the traveler. Lastly, to further minimize the visual impacts of the rip-rap to the Ridge Valley Rural Historic District, stone will be locally sourced if possible in an effort to match the visual appearance of the rip-rap to the stone found in the project area. No stone rip-rap is planned to be utilized on the stream banks.

Alternatives to improve the turning radius such as further cutting into the stone face along Sheep Hole Road and Headquarters Road were considered. However, there is limited available right-of-way, and there was a concern regarding the stability of the exposed rock face with further excavation, as well as the adverse impacts to its historic setting considering a steel and concrete soldier pile wall would likely be needed to retain the embankment.

COMMENT #14: Pg. 19 – There do not appear to be any costs provided for Alternatives 3 or 5 as compared to the other Alternates.

RESPONSE #14: The cost of Alternative 3 is estimated to be $1,779,000. The cost of Alternative 5 is estimated to be $2,176,000.

COMMENT #15: Pg. 21 – 2nd par – The description of rehabilitating the masonry abutments and piers is similar to what has been proposed by some consulting parties and what is contained in the PennDOT Stone Arch Bridge maintenance Manual for substructure. There are materials and procedures for grouting existing stone masonry that are more compatible with stone than non-shrink grout and may result in less maintenance.

RESPONSE #15: The Headquarters Road Bridge is a concrete encased steel I-beam bridge. It is not a stone arch bridge. Due to the type of bridge, extensive strengthening of the piers would be required. Applicable sections of the Stone Arch Bridge Maintenance Manual (such as repointing and replacing stone) could be incorporated with any alternative; however, the manual does not address the strengthening requirement for masonry substructure units subjected to lateral loads.

COMMENT 16: Pg. 21 – 3rd par – In the discussion about turning radius there is no mention of removing part of the east bank to improve the radius. Was this considered?

RESPONSE #16: This was not considered as a viable option as turning radius can be improved by providing a wider structure and because the one lane bridge criteria is not applicable to this project. See the above response to comment #13.

COMMENT #17: Page 22 – 3rd par – There is a statement that continual maintenance for the stone masonry is required, however there is no statement that all bridge materials require continual maintenance or that most of the stone masonry substructure appears to have been there since its construction in 1812. If life cycle costs are not considered for all alternates, why mention anything about maintenance of masonry for this alternative?

RESPONSE #17: Old stone masonry structures require more rigorous inspection and maintenance than new concrete structures. A new concrete structure would be designed with an average service life of 75 years requiring minimal maintenance. Although parts of the existing stone masonry have been around since 1812, there is evidence that large areas have been reconstructed over time (e.g., the southeast and northwest wing walls). Failure of a small area of stone masonry could lead to global failure in time if not addressed. This is not the case with modern reinforced concrete structures.

COMMENT #18: Pg. 23 – 3rd par – Rip rap placement could have a significant negative effect on the historic district. There are other countermeasures which could be employed that are more compatible with this historic bridge and protected stream. This issue needs more consideration and discussion.

RESPONSE #18: See above response to Comment #13.

COMMENT #19: Page 25 – 1st par – Alternative 6 – Replacing two historic load bearing masonry piers with one reinforced concrete pier with a fake stone façade would diminish the integrity of the property's design, setting, materials, feeling and association as described on page 42 regarding the guidelines for Protection of Historic Properties CFR part 800. The finding that Alternative 6 will have an adverse effect on page 47 is consistent with the guidelines.

RESPONSE #19: Yes, Alternative 6 would result in an adverse effect to the Ridge Valley Rural Historic District.

COMMENT #20: Page 25 – 1st par – Excavating 3 feet into rock for new foundations could impact stream environment but it is not clear if this has been evaluated. This seems in conflict with statement in next paragraph that moving new center pier would "…minimize the disturbance of streambed material during construction". One page 26, in the "Environmental and Cultural Resource Impacts" section, removal of the rock is not discussed. How is the rock removal proposed to be accomplished?

RESPONSE #20: Spread foundations on erodible rock (such as the material at the project site) are required by PennDOT's Design Manual, Part 4 to be founded 3-feet into the rock. The minimization of disturbance noted in the 2nd paragraph considers the fact this alternative only requires one pier in the stream and not 2 piers as presently exists. The center pier of Alternative 6 would be in the same place as the existing pier, and would not require excavation/removal of the original two piers and construction of a separate new pier in a new location (resulting in three excavations in the channel). The method of removal will be left to contractor's means and methods and will be monitored by PennDOT Construction engineers.

COMMENT #21: Page 27 – 2nd par – Since alternative 6 was found to have an adverse effect on page 47, it appears to be in conflict with the statement that "…this appears to be a reasonable option to minimize impact to the Ridge Valley Rural Historic District…"

RESPONSE #21: . Your comment is referring to Alternative 6A, not Alternative 6. Alternative 6A is a full bridge replacement with a two-lane superstructure with a reduced roadway width accommodating two 10-foot travel lanes. The full statement that appears on page 27 is as follows: While this appears to be a reasonable option to minimize impact to the Ridge Valley Rural Historic District, due to the roadway classification and anticipated traffic volume on the bridge, PennDOT's DM-2 requires a roadway and bridge width of 24 feet, curb-to-curb.

COMMENT #2: Page 27 – Alternatives 6B and 6C – Both options result in a thicker superstructure (33 or 30 inches versus 17 inches) and as stated "would involve impacts to the adjacent floodplain…" Removing the weight of the superstructure from the existing piers and abutments in 6B would make them less stable and more likely to be damaged in addition to destroying the character of the bridge. Removing the abutments in 6C would have an even greater negative impact on the "historic integrity" to contribute to the Ridge Valley Rural Historic District as described by the Keeper of the National Register in their 2006 letter.

RESPONSE #22: Thank you for your comment, we agree.

CONSULTING PARTY: Linda McNeil, Township Manager, Tinicum Township Board of Supervisors (December 7, 2015)
COMMENT #1: The 'Bridge Width Evaluation' report, used as a basis for the 'Determination of Effects Report,' concluded that "the accident rate for the area in the vicinity of the Headquarters Road (sic) Bridge is 20.53, which is well above the statewide average." We request that a further evaluation of the accident reporting be performed as the 10 accidents cited in the project area did not seem to be attributable to or related specifically to the Headquarters Road Bridge. Further clarification of the project area i.e., Segment 0020 Offset 2313 to Segment 0020 offset 2983 is requested. In addition, the report contains the statement that "the study area is a higher than statewide average of crashes involving ice", noting that "33% of the crashes involved ice on the roadway," and "suggests that there may be poor drainage available in roadways leading to the bridge." The Board of Supervisors reviewed the Police Crash Reporting (copies available upon request) for the ten (10) accidents in the Bridge vicinity between the years of 2002 and 2011 and note the following:

Three (3) of the accidents were "Non-Reportable":

1. The 2003 non-reportable accident involved 2 vehicles that slid into one another on Sheephole Road due to an icy road surface.
2. The 2006 non-reportable accident where an unregistered vehicle being taken out for a "joy ride" lost control on a curve, hit a guard rail on Headquarters Road and left the scene. The passenger stayed on scene, declining to travel further with the driver.
3. The 2009 non-reportable accident involved a report from a school bus driver that believed a car struck the rear tires of the bus. No damage was observed.

Four (4) of the Reportable accidents had the following scenarios:

1. The 2005 reportable accident occurred on Headquarters Road between Sheephole and ridge Valley when the vehicle failed to negotiate a curve on the wet highway.
2. The 2008 reportable accident occurred on Headquarters Road between Sheephole and Ridge Valley and involved a curve and slippery conditions.
3. The 2009 reportable accident occurred on Headquarters Road between Sheephole and Ridge Valley and involved a curve and wet roadway conditions.
4. The 2010 reportable accident occurred on a curved portion of Headquarters Road, east of Sheephole.

The Three (3) accidents that occurred on the bridge between 2002 and 2011 had the following scenarios:

1. 2003 – The operator after stopping at the stop sign encountered ice upon entering the bridge and slid into the concrete barrier.
2. 2006 – The operator of a motorcycle was traveling eastbound on Headquarters Road, slid on gravel and the motorcycle slid out from under the operator.

3. 2007 – The accident is listed as an accident on Headquarters Road at Sheephole Bridge but does not contain a narrative. The indicated prime factor is "Possible Vehicle Failure, Tires."

RESPONSE #1: To try to determine if the crash total is normal or abnormal, a summary level crash analysis was completed taking account the type of crash, potential cause and its location and comparing the crash rate to similar roadways. The crash rate takes into account the amount of traffic that uses the roadway over a specified section of road. In the case of the Headquarters Road project, the volume is relatively low within a relatively small project limit, resulting in a crash rate that is significantly higher than statewide average. A review of the type of crashes indicated that 70% of the crashes were hit-fixed-object, which indicates that there may be an issue with the availability of clear space along the approach roadways to maneuver if the vehicle leaves the roadway. Upon a more detailed investigation into individual accident reports, recorded by police, while the police do not report that the accidents were directly caused by the bridge, there remains concern over approach roadway sight distance and sharp horizontal curvature leading into the bridge from the eastern approach roadway. Additionally, repeated collision damage to the bridge (as evidenced in 2000 and 2001 PennDOT inspection reports prior to a reduction of the bridge width below 16 feet) coupled with the late 2001 collision, which resulted in guiderail dislodging from the bridge and falling into the creek, and the subsequent placement of concrete barriers, indicates that there is an issue with vehicles negotiating turns onto the bridge. This is further corroborated by comments received by consulting parties and in comments made at consulting party meetings. For example, Ms. Marilyn Herd's account of a near accident on the bridge (December 15th, 2015 comment to the DOE). Comments by a consulting party (Tim Cashman) at the June 2013 consulting party meetings indicate that school busses have impacted the bridge when it was still open to traffic.

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 Road onto Headquarter 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.

COMMENT #2: The Board of Supervisors requests more information about the traffic counts that the Determination of Effects relied upon. Since there are three (3) major East-West routes, through the Township, traffic counts should be measured when each of these routes were fully functional. (Headquarters Road, Geigel Hill Road, E. Dark Hollow Road). The Report gives two traffic counts: in 2001, when Dark Hollow was closed, and in 2008, when Geigel Hill was closed.

RESPONSE #2: This comment was previously addressed in the Comment Response Document dated September 10, 2013 (Response to Comment F on page 5 of 43) which is attached as Appendix A. Also see response to Comment #11 on page 6.

COMMENT #3: Ottsville Fire Company ladder Truck 49, which at 41.5 feet is the Township's longest emergency response vehicle, has been a controlling factor for the bridge design, and the Board of Supervisors agrees that public safety is paramount in consideration of purpose and

need. Your report states that Preliminary Turning Radius studies were performed using Autoturn 9.0 software to show that the 16-foot one lane bridge "cannot accommodate" the turning movement of this ladder truck. Our understanding is that this Autoturn study was performed in 2006, but the turning radius area has changed since then. Specifically, in 2009 the Tinicum Township Public Works Department Performed work to cut back the rock face of a cliff along Sheephole Road under the direction Mike McAtee of Urban Engineers, so as to facilitate the turning movement of this ladder truck. When the work was completed, Tinicum Township's director of Public Works, Doug Skelton, was the Chief of the Ottsville Volunteer Fire Company. Skelton was able to safely negotiate a turn in Ladder Truck 49, Eastbound on Headquarters, onto Sheephole Road. An additional Autoturn study should therefore be performed, to evaluate the changed conditions relating to the turning radius at the bridge.

RESPONSE #3: The turning radius study has been updated several times since its initial iteration in 2006, and as recently as 2015. All studies since 2009 have accounted for the localized widening of Sheep Hole Road. The limits of widening requested by Urban along Sheep Hole Road in 2009 were not attained by the Township maintenance crews. For a one-lane, 16-foot wide proposed superstructure in its current location, Urban requested 17-feet of widening into the rock face to facilitate the turning movements to and from Sheep Hole Road. The actual widening was only approximately 5-feet. If the abutments and bridge were to be replaced and shifted to the west, the available space for turning movements would be increased, and the previous widening could be acceptable. The latest turning radius study accounts for the widened conditions.

CONSULTING PARTY: Judith C. Esch, via email (tenrten10@gmail.com, December 10, 2015)

COMMENT #1: We need a bridge for safety. There are so many unintended consequences to this bridge being out. Just as in the Geigel Hill Bridge outage, the local folks suffered financial and sometimes, life threatening hardships. And this is happening now.

RESPONSE #1: Thank you for your comment. We understand the frustration that the closed bridge creates for the surrounding community.

COMMENT #2: I have read this report and believe it is accurate in developing proposals that are feasible. Those who nitpick this document to death are ignoring its fundamental professional conclusions. They want to draw attention away from facts.

RESPONSE #2: Thank you for your comment.

CONSULTING PARTY: Delaware Riverkeeper Network Consultant- Mark L. Stout, PhD, Mark L. Stout Consulting (December 14, 2015)

COMMENT #1: Geometric deficiencies

The report states that a one-lane bridge at this location does not meet PennDOT design standards and implies 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, as we have argued in a previous report (*Tinicum Township and the Headquarters Road Bridge: Planning the Future*, 14 April 2014), 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 and/or analysis of roadway safety at one-lane bridges and research and/or analysis of one-lane versus two-lane bridges. No applicable specific research was found on either subject, but some anecdotal information about the traffic calming effects of one-lane bridges was found. It was asserted that due to the narrowing of the roadway to one lane, traffic naturally slows down. An analogy would be the installation of a one-lane "choker" and/or a neck-down. A choker narrows the width of a roadway, generally at mid-block locations, to "allow travel in only one direction at a time, operating similarly to one- lane bridges." Neck-downs are similar in nature but are at intersections. The Institute of Transportation Engineers (ITE) estimates that speed is reduced by 14% when one-lane chokers are implemented for roadway 2 widths under 20 feet and greater than 17 feet. Speed reduction can enhance safety and, if a crash does occur, severity has a tendency to be reduced at the lower speeds. The same ITE reference also states that one-lane chokers can have a traffic volume reduction of 20%. A reduction in volume also decreases the risk of a crash and can enhance the safety of the location.

The DOE report does not explicitly address other potential design deficiencies in the area, but it should be presumed that the "deficiencies" referenced here include those addressed in the Bridge Width Evaluation report. These include sight distance, horizontal curves, and approach grades (turning radius will be discussed below in connection with emergency vehicle access). This is, in fact, a rural area, with wooded slopes and steep and winding roads. The report notes that "many" of the alternatives analyzed "are not able to fully address these existing substandard criteria." There is no discussion of how or to what extent the preferred alternative (presumably Alternative 6) addresses these issues. All of these alternatives, including Alternative 6, would likely require design exceptions to address the real issues of designing a project in this type of environment. In fact, a STOP sign in advance of the bridge on the western approach would resolve the sight distance issue, while improved road markings and signage should reduce the incidence of run-off-the-road events and other problems that might be associated with horizontal curves and grades near the bridge.

<u>RESPONSE #1:</u> As Headquarters Road and Headquarters Road Bridge are state owned infrastructure, PennDOT has a responsibility to the traveling public to provide a safe driving experience. This means adherence to State and Federal standard design criteria which, for this type of work and for this location, require a two lane structure. When those standards cannot be met due to extraordinary circumstances, design exceptions can be considered. While deviations from required criteria through design exceptions will be required for most if not all alternatives considered, PennDOT has a responsibility to improve upon existing conditions which could contribute to a safety issue when possible. To address the assertion that a one-lane bridge will have a traffic calming effect on Headquarters Road, it is important to note that the existing road is two lanes from end to end. If there were to be a traffic calming effect caused by the bridge, it

would be minimal and would not have a measurable impact on the travel speeds for the remainder of the roadway.

COMMENT #2: Crash rate
The DOE report refers to "statistically high crash rates," which is presumably based on the safety discussion in the Bridge Width Evaluation report. 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.

RESPONSE #2: It is standard PennDOT practice to report if a crash total is normal or abnormal by comparing it to the statistical statewide crash rate of similar roadways. This is used as a starting point to assess site specific safety issues but is, by no means, the only method of establishing whether there is a site specific safety issue. Additionally, it is important to note that in the BWE, while it was mentioned that there were 10 crashes over a 10 year period, the crash rate was calculated for 3 crashes in the most recent 5 year period. The crash rate takes into account the amount of traffic that uses the roadway over a specified section of road in a set period of time (5 years). In the case of the Headquarters Road project, the volume of traffic is relatively low within a relatively small project limit, resulting in a crash rate that is significantly higher than the statewide average. See also the Response to comment #1 on page 10 for additional safety considerations.

COMMENT #3: Crash history
As the Determination of Effects report notes, a narrative summary of the crash history for the area in the last 10 years before the bridge was closed is provided in the BWE report. The BWE narrative is based on another report, the "PennDOT Crash History Summary," which is listed as Attachment 7 to the BWE report. Portions of this document have been made available to us to review, but the actual crash records have not.

We were able, however, to review 10 crash reports which were supplied by Tinicum Township for the period 2003 to 2010 in the area of the bridge. A comparison of the 10 records supplied by Tinicum Township and the summary analysis in the "PennDOT Crash History Summary" suggests that the two lists may not be identical, although without seeing the actual records reviewed by PennDOT it is impossible to be certain.

Our review of the crash records received from Tinicum Township yields a very different conclusion from the one set out in the BWE and DOE reports.

Of the 10 crash reports reviewed, 3 are located on or at the Headquarters Road Bridge, 1 is nearby, and 6 are unrelated.

Following are the reported crashes on or at the bridge:

- 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 (see figures 1 and 2).
- 1 April 2006 – An unregistered, uninsured vehicle left the scene of the crash while the driver and passengers were out for a "joyride." Details of the crash are minimal but do indicate that contact was made with the Jersey barrier on the bridge.
- 7 May 2006 – A motorcyclist reported losing control of his eastbound motorcycle on loose gravel as he entered the bridge (see figures 3 and 4).

While the width of the bridge (a 10-foot cartway at the time) may have been a minor factor in these crashes, it does not appear that bridge width was the primary causal factor in any of these crashes.

The partial "PennDOT Crash History Summary" also identifies only 3 crashes at the bridge, a fact which was not included in the summary discussions in the BWE and DOE documents.

A fourth crash, on 6 July 2007, appears to have been near the bridge. 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 (figure 5), the 4 vehicle probably made contact with the fence on the western end of the bridge (figure 6).

Of the 6 remaining crashes, 1 occurred on Sheephole Road (10 February 2003), as two vehicles collided under icy conditions. The remaining 5 were all associated with the curve located approximately 250 feet east of the intersection of Headquarters Road and Sheephole Road:

- 24 May 2005
- 26 September 2008
- 21 January 2009
- 5 May 2009
- 16 March 2010

Of the crashes at the curve, 3 occurred when the road surface was wet and all 5 involved a westbound vehicle crossing the centerline (see figures 7 and 8). These crashes are all well beyond the influence of Headquarters Road Bridge, but do indicate a "hotspot" where PennDOT should consider upgrading such safety measures as signing and striping.

Our conclusion from reviewing the crash history in the vicinity of the Headquarters Road Bridge is that this history provides no evidence of a site-specific safety problem at that bridge.

<u>RESPONSE #3:</u> It is our opinion that accidents located on the adjacent approach roadways should still be considered in the crash analysis, since the bridge and its geometry (particularly for

a reduced width bridge) may contribute to the course of vehicles entering and leaving the bridge. The PennDOT crash resumes and those reported from Tinicum Township are fairly similar to the three crashes reported on the bridge. 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). Additionally, as noted in Response #2 on Page 14, the crash rates are a standard statistical evaluation for the roadway and were calculated based on 3 reportable crashes from the previous 5 years.

COMMENT #4: Emergency vehicle access
The DOE report repeats PennDOT's assertion, made in previous documents, that one of the needs of the project is the fact that the existing structure "cannot safely and effectively accommodate current and future traffic needs including emergency response vehicles." With a curb-to-curb width of 16 feet, the bridge "cannot accommodate Tinicum Township's largest fire response vehicle, a 41.5-foot ladder truck." In fact, this ladder truck – Ladder 49 of the Ottsville Volunteer Fire Company – operated across the Headquarters Road Bridge when it had a 10-foot cartway. In an interview (a summary of which is attached), the fire chief of the Ottsville Fire Company confirmed that Ladder 49 could operate on a 16-foot bridge, although it would need to back up once to make the left turn into Sheephole Road, a common procedure in the township. He would also find a cutback of the embankment on the east side of the bridge desirable.

A wider bridge is not necessary to accommodate fire company operations. A traffic engineering analysis conducted for us by MBO Engineering in 2013 found the following:

MBO Engineering has reviewed the 2009 turning radius study done by Urban Engineers for the Headquarters Road Bridge, discussed the possible scope of work of a bridge rehabilitation project with McMullan Engineering, and undertaken multiple field visits in the vicinity. Based on this work, MBO Engineering believes that it is possible to satisfy the turning radius needs identified by Urban within the scope of a bridge rehabilitation project that includes some reconstruction of the wingwalls at the eastern end of the bridge, some reduction of the slope in the northeast quadrant of the bridge, and possibly some adjustment of the curb-to-curb width of the proposed new bridge deck.

RESPONSE #4: See the response to Comment #3 on page 12.

It should be noted that McMullan's representative rehabilitation projects were for pedestrian applications or load posted bridges, not bridges responsible for carrying the design live loads required by modern bridge standards, including a 72,000-lb HS-20 vehicle. The HS-20 vehicle includes an 8,000-lb front axle load, and two 32,000-lb rear axle loads. This standard design conservatively accounts for variability in truck loading, including Class 8 vehicles such as delivery or moving trucks, fuel trucks, and fire trucks. According to the Ottsville Volunteer Fire Company, its Ladder 49 truck is 70,000-lbs.

While it is true that a wider bridge is not necessary to simply "accommodate fire company operations", it is also true that every second counts when a fire company is responding to a call.

Providing a structure which allows for the unrestricted movement of the Ladder 49 truck allows for the fastest possible response time when compared with the above limited cart way which would require the fire truck to back up prior to making a turn. Additionally, a one lane bridge, providing either minimal or no shoulder does not provide for adequate area for snow storage or drainage of snow melt further reducing the available width of the bridge and contributing to unsafe conditions as the cycle of melting and refreezing of water occurs.

Regarding the minutes prepared by the Delaware Riverkeeper Network for a meeting held with the Ottsville Fire Chief Bill Shick, after speaking with Chief Shick, it is clear that the minutes and summary statements were developed and provided to PennDOT without first allowing Chief Shick an opportunity to review and verify the statements attributed to him. After speaking with Chief Shick, it is clear that some statements were taken out of context or were erroneously recorded. We encourage the Delaware Riverkeeper Network to contact Chief Shick regarding these errors and misstatements.

CONSULTING PARTY: Kathryn Ann Auerbach, Preservation Consultant, Preservation is Real (December 11, 2015)

COMMENT #1: I do not feel that the recent reports regarding the above project, including the Bridge Width Evaluation and the above DOE reports have been properly made available to consulting parties. Several concerned parties with whom I spoke were either unaware of these reports or were expecting their copies to be received via US Postal Service, in order to easily review. I understand that not even Tinicum Township received hard copies, and that the township secretary had to print multiple copies for the use by township representatives and staff. That is unacceptable. I am disappointed with such failure to easily make available reports, critical to the above project and its outcome.

Many in the township, including myself, hold Federal and State designations, including Lower Delaware Wild & Scenic River, National Register Ridge Valley Rural Historic District and all its components and the Exceptional Value Tinicum Creek, very seriously, as well as the W & S Memorandum of Agreement with signatories of several Tinicum organizations, State agencies and representatives, and Federal representatives. Critical to these designations is the preservation and careful stewardship of ALL of the components that support such distinguished classifications. Many in Tinicum have worked very hard over the years to assure that the unique and irreplaceable qualities that have garnered such levels of recognition and "protection" will continue to be enjoyed for present and future generations. PennDOT is no less exempt than any other organization or person to uphold what is so ably and directly specified in the State Constitution of Pennsylvania, Article 1, Section 27, namely "the people have a right to clear air, pure water and to the preservation of natural, scenic, and historic values... generations yet to come."

Public agencies, as caretakers and stewards of resources collectively owned and held by the citizens of Pennsylvania, are bound by the State History Code, Wild & Scenic Rivers Act, National Historic Preservation Act and National Highway Act, as well as Clean Stream Act and other ecological legislation to preserve, protect AND maintain our resources, to AVOID any adverse impacts and to be leaders in best preservation and environmental standards.

RESPONSE #1: PennDOT is conducting the environmental and cultural resource studies for this project in accordance with all applicable state and federal regulations. All of the Section 106 related documentation is posted to the ProjectPATH website, which was developed by PennDOT and Preservation PA to facilitate the review of project related materials. It is publically accessible and acts as a clearinghouse for all materials so they can be consulted or reviewed at any time. Hardcopies of the reports and documentation are mailed to those Consulting Parties that have not provided, or do not have, email addresses or access to the ProjectPATH website. You can also refer to the ACHP's Citizens Guide for more information on the Section 106 process (http://www.achp.gov/citizensguide.pdf.)

COMMENT #2: There are a number of inaccuracies and deficiencies with the *Determination of Effects Report* of November 2015. The following several items I wish to address. Report deficiencies are not limited to just these items.

- Reliance on a faulty *Bridge Width Evaluation Report* of April 2015- see comments previously sent, and appended herewith.
- Failure to properly define "Purpose & Need" of the project.
- Failure to identify all of the resources impacted by the proposed "Preferred Alternative", including the bridge, stream, roadway and landscape resources.
- Failure to assign proper significance to the bridge itself, in particular including new and additional information regarding the bridge's engineering design and rarity.
- Failure to provide within the report appropriate photos and elevations of the bridge itself, the very resource being threatened.
- Failure to place higher priority on avoidance of impact.
- Failure to provide thorough stone masonry assessments & repair estimates from recognized, high caliber stone masons, some already PennDOT approved, who utilize Sec. of the Interior standards and state-of-the-art techniques and materials.
- Failure to address current closure as an active ADVERSE EFFECT not mitigated.
- Failure to include substantive comments, information and reports offered by Consulting Parties and specialists.
- Failure to identify a broader Area of Potential Effect to include the valued scenic vistas to the bridge area from extended areas within the historic district.

RESPONSE #2:

- Please see previous responses to Comment #1 (page 11); Comment #2 (page 14); Comment #3 (page 16), and Comment #14 (page 16).
- This comment was previously addressed in the Comment Response Document dated September 10, 2013 (Response to Comment B on page 2 of 43) which is attached as Appendix A.
- The Section 106 Determination of Effects report considers impacts to historic resources, i.e., those eligible for or listed in the National Register. While the stream, roadway, and landscape resources are considered character-defining features of the Ridge Valley Rural Historic District, the historic district is the historic property for Section 106 purposes.

- This comment was previously addressed in the Comment Response Document dated September 10, 2013 (Response to Comment G on page 5 of 43) which is attached as Appendix A. The comment was also further clarified in an email from SHPO to Jesse Salamun dated August 15, 2014 (see attached).
- Photographs were included in Appendix A of the Determination of Effect report. Bridge renderings were also included in the additional information submitted to the SHPO and the Section 106 consulting parties.
- All of the alternatives considered, with the exception of the No Build and the Total Avoidance Alternative (Alternative 1), have an adverse effect to the Ridge Valley Rural Historic District due to the removal of the bridge superstructure.
- A thorough inspection of the structure was performed in 2006 by Urban Engineers and summarized in the Existing Structure Condition Evaluation Report. This was provided to the SHPO and the Section 106 Consulting Parties; it is also on ProjectPATH. This report was supplemented with core boring investigations that were conducted in March 2014. The results of this investigation were provided to the SHPO and the Section 106 Consulting Parties; it is also on ProjectPATH.
- Pursuant to 36 CFR § Section 800.16(i), "an Effect may occur when there is an alteration to the characteristics of a historic property qualifying it for inclusion in or eligible for the National Register". Closing the bridge did not result in an Effect to the Ridge Valley Historic District as none of the characteristics that qualify the historic district for the National Register are altered.
- The Determination of Effect report notes that all of these items are available through ProjectPATH, a publically-accessible website (www.paprojectpath.org). ProjectPATH also has responses to previous comments submitted.
- PennDOT and FHWA defined the APE in the Determination of Effect report, and the SHPO had no comments about the APE.

COMMENT #3: **Inaccurate information utilized in the *Bridge Width Evaluation Report* is repeated** numerous times within the *DOE* report, thus amplifying the inaccuracy of both reports and **rendering both reports INVALID**. Detailed comments on the *Bridge Width* report are included in my letter of December 9, 2015. To highlight a few:

- Use of 900 vehicles per day ADT traffic count unsubstantiated. Traffic closer to 400-631. The 900 number is repeated in the *DOE* report (p. 4, 6, 15, 16, 27) and utilized to engage artificial standards to the bridge and force an argument for two-lanes. Stone arch bridges recently rehabilitated and currently owned by PennDOT are one-lane, some with 6400 ADT. #ADT not critical to determine bridge width.
- Use of 30 mph in road geometry and travel models. Road posted at 25 mph, section with bridge has Stop sign and obtuse road curves, thus 0-10 mph. To utilize 30mph in road/bridge geometry and travel models is deceptive and not based on real conditions (p. 16, 25). Road/bridge geometry comments invalid per 30mph.
- Accident reports are presented to infer fault with bridge (p. 7, 15, 16). IN FACT, NONE OF THE ACCIDENTS IDENTIFIED WERE THE RESULT OF BRIDGE DESIGN OR WIDTH. THEY WERE EITHER LOCATED OFF THE BRIDGE OR DUE TO POOR MAINTENANCE & ROAD SURFACE CONDITIONS.

- Fire-truck turning radius off bridge onto Sheep Hole Road HAS BEEN SATIFACTORILY RESOLVED AND DOES NOT REQUIRE CHANGE IN BRIDGE WIDTH OR DESIGN (p. 7). See comments made by Tinicum Township.

RESPONSE #3:

- The PennDOT District 6-0 Stone Arch Bridge Management Plan "provides guidance to state and local bridge forces on maintaining, repairing, rehabilitating, and restoring stone arch bridges. PennDOT has rehabilitated some one-lane masonry arch bridges; however, the determination to maintain a one-lane bridge was made on a case-by-case basis after considering approach roadway alignment, sight distances, traffic volumes and arch barrel length. In some cases, masonry arch bridges were widened by cantilevering the new reinforced concrete moment slab beyond the arch barrel due to site-specific safety issues (geometry, alignment). All available traffic data for Headquarters Road exceeds the ADT threshold of 400 used as one of the criteria in determining whether a one-lane bridge is appropriate.
- Standard design practice considers design speeds 5 mph greater than the posted speed to account for typical driver behavior and tendencies for speeding (for example, posting the speed limit at 25 mph, while designing for 30 mph).
- See previous response to Comment #1 (page 11).
- See previous response to Comment #3 (page 12).

COMMENT #4: Other issues are addressed in my letter. Most importantly, the above criterion utilized to evaluate the suitability of a two-lane vs. one-lane bridge are entirely faulty and do not provide any substance or threshold of conditions to argue for a two-lane bridge (p. 32-33). The "Existing Geometric Conditions" (before Jersey barrier installation) ARE NOT SUBSTANDARD. The existing one-lane bridge at a T-intersection of 0-10 mph on a winding road with no crash history related to design and ADT 400-631 and adequate turning radius is THE SAFEST BRIDGE FOR THIS LOCATION. It provides adequate movement for cars and trucks, with greater traveling width than a two-lane bridge and greater areas for pedestrians and snow removal. There are no known future traffic needs that vary significantly from present. ONE-LANE BRIDGE IS SAFE & PREFERRED.

RESPONSE #4: Based on the existing site-specific safety issues and the feedback from local residents who have experienced near head-on collisions on the bridge, we respectfully disagree. A one lane bridge does not meet PennDOT's required design criteria, cannot accommodate the turning movement of the Ottsville Fire Companies largest vehicle and does not provide for adequate shoulder width for drainage.

COMMENT #5: Consistently through the project, PennDOT has failed to properly define the "Purpose & Need" for the project. With multiple designations at the Federal and State levels for the area, the bridge and the stream, it is implicit that while there is a purpose to provide a safe crossing, the need is to respect and preserve the resources that contribute to these designations. This project is not being designed in a vacuum, but rather with stringent guidelines with regard to preservation- of the resource, of the setting and of the creek. In addition to the Secretary of the Interior Guidelines for actions involving resources listed in the National Register, and clear

directive that the Secretary "never recommends removal of the resource, even if damaged or deteriorated, if it can be rehabilitated" the Federal Highway Administration, the lead agency and funder of the project, is specifically directed to make a "special effort to preserve". Preservation of the bridge, especially the stone substructure, goes hand-in-hand with preservation of the Tinicum Creek, both as a contributing feature of the historic district, and as a PA EV stream. In addition, the creek, bridge, landscape amenities and historic resources, and the Ridge Valley Rural Historic District itself, are all significant factors to the Lower Delaware Wild & Scenic Federal designation, thus all reinforce action of least impact and greatest preservation. This is part of the Need of the project- to AVOID ADVERSE ACTION.

RESPONSE #5: Your definition of Purpose and Need is incorrect. The Purpose is what the proposal is intended to accomplish while the Need(s) describes the key problem(s) to be addressed by the proposal and explains the underlying causes of those problems. Although not part of the purpose and need, the preservation of historic resources is considered during the Section 106, Section 4(f) and NEPA processes. This comment was previously addressed in the Comment Response Document dated September 10, 2013 (Response to Comment B on page 2 of 43) which is attached to Appendix A.

COMMENT #6: Frequent use of the language "Expected Vehicular Need" in the Purpose & Need suggests a major change to the land usage in the area, NOT DEFINED OR IDENTIFIED BY ANY OTHER SOURCE. In addition, constant mention of the accommodation of large, heavy vehicles, such as in the FHWA letter of June 16, 2015, the Bridge Width Report, and similar references to large heavy vehicles for the Headquarters Road 61M bridges recently completed with multiple design and safety issues and violations of Section 106, **points to a larger purpose, not currently identified, which will be enabled by these independent, incremental projects**. Federal laws require that a larger view of impacts be given, that a project should not enable another project inconsistent with the character defining features of the area and the resource being protected. The question begs an answer: **Just what is being EXPECTED?** Frequent use by "large, heavy vehicles" of Headquarters Road is inconsistent with its design, with the safety of local residents, township & regional plans and inconsistent with the character of the two rural NR historic districts through which it traverses. The needs of the township residents were ably met by the current bridge before its closure. Nothing different is expected.

RESPONSE #6: PennDOT is required to design facilities to accommodate existing and future needs. For Headquarters Road, an existing need is to accommodate the Ottsville Fire Company's Ladder No. 49 truck. It is not anticipated that there will be a significant increase in ADT in the coming years. Federal laws (Section 106) require agencies to consider the larger view when studying alternatives or assessing known project effects to a particular resource. They do not in any way require a specific predefined outcome of the project. Further, several local residents who are consulting parties for this project have expressed on numerous occasions that they feel the one-lane bridge is more dangerous and they desire a new two-lane bridge. These comments and statements are posted on the ProjectPATH website and are available for your review. Their needs are not being met by the current conditions or a one-lane option, be it a new structure or rehabilitated structure.

COMMENT #7: **Arbitrary closure, failure to maintain & repair does NOT meet the purpose & need** of PennDOT's responsibility as a state agency to provide a functional road through maintenance. PennDOT's routine inspection report of November 2010 recommended repairs to the bridge. It did not recommend to lower weight restrictions**, it did not recommend to close the bridge**. Failure to make immediate and appropriate repairs, then closing the bridge March 2, 2011 immediately after an indecisive township meeting does mean that **PennDOT is engaging in bullying tactics** to create hardship, compromise public safety (conditions stated on p. 9) and engender anger in the community to arrive at a solution by force, not fact.

RESPONSE #7: Due to the impact to the surrounding community, PennDOT takes the decision to close a bridge very seriously. Over the course of the life of the Headquarters Road Bridge, repairs were made when possible to keep the bridge open. The bridge was closed due to a large hole that developed in the deck which could not be repaired. Claims that PennDOT performed no maintenance of this structure are also untrue. Maintenance records for this bridge indicate that between 2005 and 2011, maintenance work for the bridge continued including repairs to bridge parapets, repointing of masonry, sealing of the deck joint, bituminous repair work, concrete deck repair and repair of a wingwall. For a more detailed response regarding maintenance, please see the response to Comment #2 on page 54.

COMMENT #8: The DOE Report identifies only one resource that can be affected: the Ridge Valley Rural Historic District. However, it is necessary to **identify ALL the resources** within the district that can be affected to assure as much AVOIDANCE of adversity as possible. An historic district is defined by the strength of integrity of ALL of its components and their ability to collectively and by visual and historical interaction convey a full story of our past. Each resource is a link in a chain, without the link, the chain is broken.

Removal of one resource significantly impacts the total collection and message conveyed. Removal of a highly visible, frequently experienced resource compounds the impact and cannot be assessed by mere statistical percentages. It is the same as a full set of beautiful teeth, worthy of a commercial photograph, but to have a front tooth knocked out- only one tooth, 95% remain, but UGLY and NOT WORTHY OF CELEBRATION. The whole set is diminished significantly, and while the person may still be able to chew, they have lost their function as a model, or inspiration of beauty. The Headquarters Road Bridge is located centrally and with high visibility in the Ridge Valley Rural Historic District. *Adverse impacts to the bridge and its setting adversely impact the adjoining resources, adversely impact the traveling experience and adversely impact the collection of bridges, character of stone masonry construction and record of historical activity in the district*.

Public action, in particular lead and/or funded by Federal agencies should take the lead, **set the highest standards for preservation**, not allow the incremental removal of one resource, then another, then another. Any changes must adhere to proper materials and scale and sustain a record of history, namely retain salient elements of previous actions that can be physically read by the next generations.

The National Register makes NO DISTINCTION between individually listed and those resources identified as contributing to an historic district. Technically one cannot list a resource

within a district as an individual NR property once the district is listed. All receive equal protection and consideration. The following resources contribute to the historic district and must be considered under adverse effect as the proposed removal of one resource alters the perception and understanding, the context and setting of others:

- **Burnt Mill Bridge** aka Headquarters Road Bridge SR1012/ BRC, dating from 1812 with deck replaced 1919, demonstrating Federal era stonework, pillar bridge engineering, handiwork of skilled local craftsmen Barnet Snyder & Christian Fretz (whose direct descendants constructed the famous Horseshoe Curve near Altoona thirty years later). Deck & pylons record work of A. Oscar Martin 1919. There is no mitigation for loss of actual stonework, actual engineering design & craftsmanship.
- The **collection of creek crossings**, of which Burnt Mill is the oldest, excepting only the stream fords, and provides visual and technical context to the others. Note: A submission to provide additional information on the roads, stream crossings and bridges in the Ridge Valley Historic District was submitted to the Bureau for Historic Preservation **May 2008**. **2013 Sec. 106 meeting inquiry noted NO RESPONSE RECEIVED.** There is no excuse for a 5-year delay for NR process. There is no mitigation for the loss of the earliest type of bridge in this collection.
- The **Tinicum Creek**, which is the link connecting all the major properties within the district, and provided the water power for the nearby 18th c. mill. Its stream bank characteristics verify crossing location & choice of bridge builders as to the size, length and height of the bridge. November 2010 inspection report noted stream banks "well-vegetated, stable". Alternatives that dramatically cut into the stream bank, and destabilize conditions inviting further erosion and alterations will significantly diminish understanding of early choices for a road path to the mill. Such destruction cannot be mitigated.
- The Ridge Valley Rural District is characterized by **bucolic view-sheds** enhanced by winding roads along streams turning to unveil meadowland and farmstead panoramas, the most expansive and frequently viewed being the Headquarters Road path through the Christian Fretz farm and over the bridge. This vista is a treasured component of the district, a joy to encounter by tourists and everyday life for many residents. All resources are of handmade character and scale and natural materials. The road leads the eye to the bridge and creek crossing, thus a new, larger structure would permanently and negatively impact the district, and from distant views.
- Nearby **stone buildings & mill ruins** are contemporary with the bridge and its location and history, thus all work together to inform the visitor of a strong 200+ year heritage. **Masonry techniques and stone types are character defining**. To alter the masonry heritage would significantly diminish the area's ability to convey the skills and traditions of the historical persona evident through the stonework.
- **Roads are integral to the experience of a rural historic district**, in contrast to a dense urban district. Rural roads are characteristically narrow, winding with grassy shoulders. In the case of Ridge Valley, the roadway experience is amplified by carved rock outcrops and adjacent Tinicum Creek & tributaries. The roads are molded into the rugged landscape and offer allegiance to it. They are core to the district. Headquarters Road was the first to cut through the Tinicum Creek valley, confirmed by 1747 at the

location of the bridge. Roads are critical to the understanding of the development of the district. Any alteration would be adverse.

In addition to the character defining stonework and natural rural landscape, **the handmade construction and scale of a pre-mechanized society** are hallmarks of the rural environment. The bridge with authentic original stone substructure, 16 foot width and 25 foot beam spans records traditional sizing and capabilities of rural artisans and builders.

RESPONSE #8: The Section 106 Determination of Effects report only considers the effect of the undertaking on historic properties, i.e., those eligible for or listed in the National Register. While the roadway creek, and landscape elements are considered character-defining features of the Ridge Valley Rural Historic District, the district is the historic property for the Section 106 review. While character-defining features and contributing elements to a historic district are considered and analyzed when assessing project effects, the overall effect is to the identified historic property (in this case the Ridge Valley Historic District) and not the individual contributing elements or character-defining features within the historic district. We do not assess effect on contributing elements that are outside the project APE. Regarding your comment regarding the collection of creek crossings and information you sent to the PA SHPO in May 2008, please contact the PA SHPO directly about your submission.

COMMENT #9: **Significance of Bridge**: PennDOT sought unsuccessfully to have the Headquarters Road aka Burnt Mill Bridge deemed non-contributing to the historic district, thus diminishing National Register protection. Temporary change in status was considered during the earlier years of this project, but not found valid. The Keeper of the National Register's April 2006 letter affirmed the valuable historical status of the bridge. Thus items listed in timelines before April 2006, such as the Stakeholder/Public Coordination chart on p. 49, representing actions & discussions regarding the bridge should be removed from the report as they took place under false premise and conditions.

Additional studies have highlighted the bridge's individual significance: that of the 4th oldest bridge extant in Bucks County, and the 11th oldest in Pennsylvania, and even more important: the **oldest known stone substructure for a pillar- wooden stringer- multi-span bridge in Pennsylvania AND ONE OF ONLY TWO KNOWN REMAINING EXAMPLES.** The pillar bridge, which enabled the growth of our country, and became the PROTOTYPE FOR ALL TRUSS SPANS, was once fairly common, **now nearly extinct**. Burnt Mill aka Headquarters Road Bridge has fully intact stone substructure components and demonstrates the engineering techniques successfully utilized to allow free standing stone pillars and abutments to ably support decks and work with the stream. This information was offered several times during the 106 process but is purposefully missing from the *DOE Report*. It must be included as a part of the record and given preservation priority in the decision making process.

It is alarming that a recent posting by Monica Harrower on Project Path in November lists the bridge as not historic. This demonstrates an attempt to mislead the public and decision making agencies and must be rescinded and notice of correction sent out.

To amplify the minimizing of significance in the *DOE Report* photographs included are simply of the adjoining fields. There are **NO Proper Photos of the Bridge**, the subject of discussion and a significant historical resource.

Furthermore derogatory and misleading comments regarding the condition of the bridge must be amended to better reflect the resource. Comments regarding the installation of the new guide rail in 1991 could include the observation that it was improperly installed and resulted in spalling of the exterior fascia of the concrete and eventual failure of the guiderail pins & seats. The letter of Carol Lee, BHP, PHMC in 2005 well describes this inappropriate treatment as "hostile repair work". Failure was not due to the bridge itself, nor its design.

The substructure must be described in components to better reflect its condition. The abutment stems and majority of the pier structures exhibit original batter configurations and horizontal bed lines to the masonry, thus demonstrating almost no stress or displacement. Wing walls (below ground approaches) exhibit various levels of deterioration, mostly due to missing mortar and poor drainage conditions exacerbated by the Jersey barriers. Large sections can be restored. Guide walls (above ground approaches) have suffered the most over the years and would require reconstruction.

Salient features of the 1919 deck, namely the N pylon with datestone and evidence of the former pipe railing are intact and could be restored to provide a record of history. While there has never been an objection to the replacement of the actual deck floor, it still exhibits an incredibly level surface, with lateral cracks in the bituminous exactly where the expansion joints were from 1919, namely over the piers. Thus any deterioration is simply due to poor maintenance and failure to repair holes over the last 20 years.

<u>RESPONSE #9:</u> We will not remove any information before April 2006 in the project timeline. All coordination is part of the project development process and is documented for the project record. We disagree that the Headquarters Road Bridge is the 4th oldest bridge extant in Bucks county and the 11th oldest bridge in Pennsylvania. The bridge was built in 1919 on circa-1812 piers, abutments, and wingwalls. Bridges are dated by their superstructure not their substructure. Reuse of masonry substructure was a very common practice. There is no evidence that reusing stone substructure "became the prototype for all truss spans…".

The PennDOT CRP noted that the Headquarters Road Bridge is not individually eligible for the National Register of Historic Places. This information is not going to be rescinded because it is a correct statement. The bridge is a contributing element to the National Register listed rural historic district. The bridge was determined not individually eligible for the National Register as part of the PennDOT historic bridge inventory. The Keeper also noted that the bridge contributes to the district, not that it is individually eligible. The PASHPO concurred with this finding and further clarified it in the attached email to Jesse Salamun August 15, 2014. This comment was previously addressed in September 2013 (See Response to Comment G in the Comment Response Document dated September 10, 2013 (page 5 of 43)) which is attached as Appendix A.

Regarding your comment concerning "proper photos of the bridge", we feel that the photographs provided in the Determination of Effect report are adequate.

We will not amend our comments concerning the condition of the bridge. The descriptions in the Determination of Effect report reflect our observations and professional engineering opinion based on the evidence provided in Response #3 on page 3 of this document. Please also refer to Response #3 regarding a discussion on the guiderail.

Regarding your comments on the bridge substructure and its components, the professional engineers observed in the 2006 Existing Structure Condition Evaluation Report that extensive loss of stone and mortar base along existing piers and wingwalls, evidence of settlement and/or base slippage and sliding failure at the wingwalls, several locations of stone bulging due to settlement or stone displacement, a high percentage of cracked and crushed stone masonry in the abutments, and undermining of existing foundations at the Ottsville abutment due to scour.

COMMENT #10: **Area of Potential Effect 5.0 (p. 35) is defined too narrowly**. The effect of the project, in particular with any replacement option, or poorly designed new-deck alternative, in NOT limited to the immediate area around the bridge, but includes the entire view-shed of the entire meadowland Tinicum Creek valley flanking Headquarters Road. The location of the bridge, central in this open valley, can be seen from Red Hill Road, Headquarters Road both directions and Sheep Hole Road. This would include the **entirety** of Parcels No 44-14-3-31, 44-14-2 and 44-14-8 and also the parcel with the Christian Fretz Homestead. The map on page 35 must be corrected, with emphasis shaded of specific work area. *In fact several maps should be created to show the varied amount of work areas required for each alternative*. The work area impacted by should be lengthened along Headquarters Road west of the bridge to reflect the 15 foot cut into the stream bank, longer 94 foot deck and longer bermed approach roadway for Alternatives 4 & 6B.

The overriding purpose of the National Register- National Historic Preservation Act and National Highway Act, both of 1966, as well as the Lower Delaware Wild & Scenic Federal designation is to ***Avoid Adverse Impacts & Effects***. All efforts should be directed to careful evaluations of rehabilitation of the bridge, with more substantial replacement of the deck and railings. This avoids adverse impacts to the stone substructure (if work carefully monitored and conducted by an approved stone mason), it avoids adverse impacts to the stream, stream banks, overall landscape and approach road settings and the view-shed (provided surface treatments of the deck are compatible). It is inconceivable that other options can be given any credence what-so-ever**. Both the Bridge Evaluations by Urban in 2006 and McMullan in 2012 state that the stone substructure CAN BE REHABILITATED, AND AT LESS COST THAN REPLACEMENT. Why are not these observations included?**

RESPONSE #10: As stated in the PennDOT Cultural Resources Handbook (Publication No. 689), "The purpose in setting an APE is to define the area in which an historic property survey will be conducted; however, it must be set in relation to the project, not in relation to the resources that are, or may be, present." The APE is defined as "the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist" (36 CFR Part 800.16[d], 2004). It is our opinion that the APE described is adequate for this project. There are figures showing the required right-

of-way, slope easement, and temporary construction easement for each alternative studied in the Determination of Effect Report.

Section 106, Wild & Scenic Rivers Act, and NEPA are procedural laws that only require impacts to be considered, there is no requirement that adverse impacts/effects be avoided under these laws. Section 4(f) does not prohibit adverse effects or impacts if no feasible and prudent alternative exists.

Rehabilitation of the bridge was given careful consideration and was documented in the Existing Structure Condition Evaluation Report dated November 2006. Urban's professional engineering opinion is that rehabilitation of stone masonry wall piers and abutments to their original condition will not provide a safe structure which meets the purpose and need. The alternative which considers a two-lane rehabilitation of the existing structure (Alternative 4) would result in the full replacement of abutments, wingwalls and the superstructure and substantial reconstruction of the piers, resulting in an adverse effect. A very low percentage of the stone would be salvageable for the rehabilitation alternatives given the extent of deterioration. If widespread reconstruction or replacement is required, the use of modern building materials (reinforced concrete) would be recommended with the addition of original stone facing, to the extent possible, to provide a context sensitive finish and a durable core material.

Urban's Existing Structure Condition Evaluation Report concluded that "Rehabilitation of the existing structure will not provide a safe and economically viable solution to the problems that exist on this project. The limited remaining life expectancy of the existing substructure elements do not justify the extensive costs involved with rehabilitation. A full replacement will provide a safe structure that meets all current design standards and provides an adequate service life." Furthermore, it is the professional opinion of Urban Engineer's that work associated with the rehabilitation of the bridge would be much more extensive than the recommendations outlined in McMullan's 2012 opinion.

<u>COMMENT #11:</u> In evaluating **alternatives**, to even state a "No Build" alternative is a shameful disgrace.

Neglect is identified as an *Adverse Effect* by the Secretary of the Interior Standards that apply to historic resources listed in the National Register, in particular under Section 106. However, this policy is currently utilized by PennDOT as per the "Alternative - No Build", as well as stated in comments made at meetings of 2005 (p. 49) Changes in design proposed during meetings did/does not cause the bridge to further deteriorate. PennDOT's neglect and refusal to maintain the bridge could. **Thus PennDOT is fully aware that it is currently and actively participating in and causing an adverse effect to an historic resource being reviewed under Section 106 of the National Historic Preservation Act and has not offered nor provided any mitigation, remedy or appropriate action to stabilize the resource.**

Repair and Rehabilitation of the stone substructure and sensitively designed new one-lane deck would comply with the Secretary of the Interior's and FHWA's mandates to make a special effort to preserve and sustain the function and use of the roadway compatible with the township, the Ridge Valley Rural Historic District and the integrity of the historic bridge itself.

The *June 14, 2013 letter of Douglas E. Bond, P. E. McMullan & Associates, Inc. to the Delaware Riverkeeper Network*, reinforces Section 106 presentations made by Mr. Bond and *ably demonstrates an engineered solution which meets the need to provide safe travel on Headquarters Road and sustain the historical, environmental and landscape values that characterize the Ridge Valley Rural Historic District and Wild & Scenic and EV designations*. PennDOT fails to recognize this most appropriate solution, with open I-beams under the deck and side fascia treatments similar to 1919 design. The McMullan design is never mentioned in the *DOE report*, suggesting that **PennDOT has failed to consider the best alternative**.

Consulting Party and Expert testimonies and presentations, as well as written comments, are not represented in the *DOE Report*, in fact, such comments and valuable recommendations are entirely missing. There is no input reflected in the *DOE Report* of professional stone masons utilizing Sec. of I. Standards. This would suggest strong bias in the *DOE Report*. It would suggest a total futility of the Section 106 process and that PennDOT has chosen to exclude valuable Consulting Party recommendations and is pursuing the worst alternative over Federal and State guidelines, over the objections of many, over the State's constitution to protect historic and natural values and resources for the present and future to enjoy.

RESPONSE #11: NEPA requires the No Build Alternative to be considered and Section 4(f) requires that the No Build alternative be considered during evaluation of an Alternative that Completely Avoids the Use of Section 4(f) Property. The No Build alternative was dismissed as it does not meet the project's purpose and need.

To address your comment regarding the lack of maintenance, please see the response to Comment #7 (page 22) and Comment #2 (page 54).

The statement that "PennDOT is fully aware that it is currently and actively participating in and causing an adverse effect to an historic resource being reviewed under Section 106 of the National Historic Preservation Act and has not offered nor provided any mitigation, remedy or appropriate action to stabilize the resource" is not only inaccurate, but is false and misleading. Mitigation will be discussed with the consulting parties at the next consulting party meeting.

FHWA does not mandate the preservation of historic properties. The Secretary of the Interior's Standards "are a series of concepts about maintaining, repairing, and replacing historic materials, as well as designing new additions or making alterations. The Guidelines offer general design and technical recommendations to assist in applying the standards to a specific property. Together, they provide a framework and guidance for decision-making about work or changes to a historic property." (www.nps.gov). These are not mandates. Any rehabilitation alternative would also involve the replacement of the bridge's superstructure which results in a Section 106 Adverse Effect which would not meet the Secretary of the Interior's Standards for Rehabilitation.

Although McMullan and Associates have failed to provide a signed and sealed recommendation by a licensed engineer, the McMullan rehabilitation concept was reviewed by the Department and Urban Engineers. However, , it is the professional engineering opinion of Urban Engineer's that the McMullan proposal will not result in a structure which meets the purpose and need of the project. Sample rehabilitation projects provided by McMullan included non-highway bridges that

carry only pedestrian traffic or stone masonry arch bridges that are currently load-posted for 6-tons. Efforts were made to have a dialogue with the Delaware Riverkeeper Network and McMullan Engineers; however, the Delaware Riverkeeper Network refused to meet unless the Department agreed to hold such a meeting behind closed doors, without a written record, and agreed that the results of the meeting would not be used in the future for any purpose. The Department has evaluated other forms of rehabilitation alternatives that better meets the project needs.

Finally, PennDOT has considered the comments, questions, and input of the consulting parties throughout the project. All consulting party comments, questions, and input have been posted on ProjectPATH and have been responded to. Therefore, this information was not included as an attachment to the Determination of Effect report.

COMMENT #12: To Summarize:
***Bridge Width Evaluation* of April 2015 is invalid**. It is based on inaccurate information and misinterpretation of data. It cannot be included, nor utilized to argue favor of a two-lane alternative. There is no change in the anticipated or expected future volume and type of traffic through this valley and on this road. The *Bridge Width Evaluation* acknowledges No Significant Growth projections for the township, nor change in land use. The existing bridge ably served the township, thus there is no need to alter the size, width, alignment or geometry of the bridge. To do so would encourage more intense use and altered use of the roadway in excess of current and "expected" needs.

Emphasis on the accommodation of large, heavy vehicles, is inconsistent with the character and use of the NR Ridge Valley Rural Historic District, and Headquarters Road in general. It is not consistent with township and county planning objectives to sustain the township as a rural, residential, recreation and tourist resource. **To encourage large, heavy trucks would alter the function and use of the road, bridge, historic district and township. This violates the Secretary of Interior's Standards**.

Two-lane bridge alternatives not only destroy the existing historic resource, but also the stream and stream banks, road characteristics & elevation, and scale: 24 foot wide, 90 foot long and much deeper floor beams. This creates an inauthentic image, loss of masonry and bridge engineering knowledge and a large intrusive structure in the most visible portion of the Ridge Valley Rural Historic District. Replacement alternatives, two-lane alternatives are not viable, THEY ARE NOT FEASIBLE. REPLACEMENT WILL SIGNIFICANTLY DETRACT FROM THE DISTRICT'S CHARACTER.

It has been found that the one-lane bridge of **16 foot width provides a safe crossing** over the Tinicum Creek (*M. Stout, transportation specialist*). It has been found that the stone **substructure can be rehabilitated** to carry a one-lane bridge (*Doug Bond, P.E., McMullan & Assoc. Structural Engineers*). The masonry repair, if carried out by professional stone masons trained in historic preservation techniques (such as PennDOT approved deGruchy Masonry), does **not require substantial intrusion into the creek**, nor the creek banks. The bridge design does not obstruct the natural flow of the creek. Both have had a healthy co-existence for over 200 years. It has been found that the natural stream **channel of the PA EV Tinicum Creek can**

be easily restored utilizing environmentally sound methods that preserve the stream banks, the water quality and the historical landscape record (presentation by *John Nysted, restoration specialist*).

It has been found that this bridge is a **rare type**, nearly extinct, **demonstrates high masonry craft, engineered form, heritage associations** with individuals and families who further contributed to the building and engineering fields (*K. Auerbach, preservation consultant*). The bridge is a significant component of the Ridge Valley Rural Historic District (*Keeper of the NR*), the Tinicum Collection of Bridges, the Lower Delaware Wild & Scenic River status. It is a valued resource worthy of preservation. IT IS FEASIBLE TO PRESERVE. IT PROVIDES SAFE TRAVEL.

I recommend that PennDOT relinquish its role in the rehabilitation of the Burnt Mill aka Headquarters Road Bridge and assign the project and monies to an agency better suited to carrying out responsible rehabilitation according to the FHWA's mandate to preserve and to uphold the Secretary of the Interior Standards. *I would recommend a joint project committee with Tinicum Township, the National Park Service and the Historic Preservation Training Center of the NPS- skilled in the craftsmanship and direction of rehabilitation projects.* As a component of the Lower Delaware Wild & Scenic River this area should be managed by the National Park Service and/or in accordance with NPS, Secretary of the Interior Standards to sustain the qualities for which it has been recognized.

At the end of the day, after the conclusion of the 106 process, we, the citizens of Tinicum Township, of Pennsylvania, of the United States of America, should be able to enjoy the authentic stone 1812 substructure and drive over the new 16 foot deck, celebrating the rich heritage that worked within the unique geologic landscape of the Ridge Valley Rural Historic District to produce an image of our nation's rural past, secure in the knowledge that our designations, our laws and our administrators are working to preserve this rich image for future generations to enjoy as well.

<u>RESPONSE #12:</u> Please see our previous responses that have addressed your summarized comments. Regarding your proposal to form a joint project committee with Tinicum Township, the National Park Service and the Historic Preservation Training Center of the NPS, we suggest that you contact Tinicum Township and NPS to further discuss your idea.

CONSULTING PARTY: Delaware Riverkeeper Network Consultant- Marc Henderson, PE, Meliora Design (December 14, 2015)

<u>COMMENT #1:</u> Because the Determination of Effects Report is not a Hydrologic and Hydraulic Analysis, it lacks fundamental information necessary to fully evaluate and analyze each alternative with respect to impacts to Tinicum Creek and the Tinicum Creek floodplain. By only looking at the 25 year flood stage of Tinicum Creek, important impacts of larger storm events are ignored. A formal Hydrologic and Hydraulic Analysis should be conducted to fully understand how altering the Headquarters Road Bridge from its current design will impact both the Ridge Valley Rural Historic District and Tinicum Creek and its floodplain.

RESPONSE #1: A draft Hydrologic and Hydraulic Analysis was performed earlier in the project to initiate discussions with the PADEP regarding hydraulic impacts. HEC-RAS was used to simulate water surface elevations and velocities associated with the existing and proposed conditions. This evaluated several earlier bridge configurations, and has not been updated to slight alterations associated with each alternative discussed in the Determination of Effects Report and Alternatives Analysis. The analysis accounted for 2-year, 10-year, 25-year, 50-year, 100-year and 500-year peak discharges. The 25-year flood was shown on the plans since it is the design storm for this roadway classification (rural collector roadway). This draft study will be updated and presented to the PADEP as part of the permit application as the project develops.

COMMENT #2: **No Build Alternative**
The existing structure would remain and no construction would take place. This alternative notes the existing stream encroachment would remain, debris accumulation would continue due to the existing piers, and scour due to existing piers will continue as well.

- Impact due to future construction - zero impact due to construction
- Impacts due to existing encroachment – this alternative maintains existing abutments and piers, thus continues existing erosion, scour and flow impacts.

RESPONSE #2: Thank you for your summary of the alternative. We agree that if the bridge is left in place, there will be continued erosion, scour and flow impacts.

COMMENT #3: **New Roadway Alternative that Totally Avoids Ridge Valley Rural District (Alternative 1)**
The existing structure would remain and no construction would take place at the current Headquarter Road Bridge. An alternative 1.67 miles of road and Tinicum Creek crossing is proposed to avoid construction within the Ridge Valley Rural District.

- Impact due to construction activities - zero impact due to construction at existing Headquarters Road Bridge. The construction of an additional crossing would be necessary which has the potential to disturb areas within Tinicum Creek as well as an unnamed tributary to Tinicum Creek. Because a new crossing is proposed, additional hydraulic impacts to Tinicum Creek are possible with this alternative if abutments are not located outside of the floodway as this is proposed as a single span crossing. Temporary construction impacts may be present during construction of this alternative even if all portions of the built bridge are located outside of the floodway.
- Impacts due to encroachment – this alternative maintains existing abutments and piers of the Headquarters Road Bridge, while also proposing additional encroachments downstream of the analyzed crossing. This would increase the encroachment impact to Tinicum Creek due to the addition of a second bridge. Piers remain as an obstruction that impacts stream flows during storm events.
- Impacts to Tinicum Creek Watershed – increased impervious cover attributed to 1.67 miles of roadway. Loss of farmland, woods, and wetlands would occur. Stormwater runoff would increase due to landuse changes.
- The impacts to both Tinicum Creek hydrology and hydraulics are unreasonable. This is the least desirable alternative proposed.

RESPONSE #3: Thank you for your summary of the alternative. We agree that the piers on the existing bridge, if left in place, will impact stream flows during storm events and that this alternative results in the largest impact to the surrounding environment (farmland, woods, and wetlands).

COMMENT #4: **New Alignment Downstream (Alternative 2)**
The existing structure would remain and no construction would take place at the current Headquarter Road Bridge. An alternative road alignment would require a Tinicum Creek crossing directly downstream of the existing Headquarters Road Bridge.

- Impact due to construction activities - zero impact due to construction at existing Headquarters Road Bridge. The construction of an additional crossing would be necessary which would cause disturbance within the Tinicum Creek floodplain.
- Impacts due to encroachment – this alternative maintains existing abutments and piers, and so maintains existing impacts. An additional crossing would be necessary which has the potential to encroach on Tinicum Creek. Because a new crossing is proposed so close to the existing bridge, hydraulic impacts to Tinicum Creek are amplified with this alternative. The results of this impact could be seen as increased scour and/or an increase in the 100 year floodplain.
- Impacts to Tinicum Creek Watershed – increased impervious cover attributed to additional roadway is required. This alternative notes the need for stormwater management to offset the increase in impervious area. Loss of farmland, woods, and floodplain would occur.

The impacts to Tinicum Creek hydraulics are compounded in this alternative by adding potential obstructions to both the stream and floodplain within 200 ft. of the existing bridge. The alternative should not be considered because it only degrades the quality of Tinicum Creek both temporarily due to construction and hydrologically/hydraulically over the life of the bridge.

RESPONSE #4: Thank you for your summary of the alternative; we agree.

COMMENT #5: **One-Lane Bridge Alternative (Alternative 3)**
The existing structure alignment would remain in place. The proposal involves the rehabilitation of the existing stone masonry substructure units (piers, abutments, and wing walls) and the construction of a new superstructure. The existing three-span configuration providing one lane of traffic would remain.

- Impact due to construction activities – impacts to Tinicum Creek would include dewatering and excavation related to rock scour protection. Existing stream hydraulics would remain and impacts would largely be temporary due to construction activity around existing piers and abutments.
- Impacts due to encroachment – this alternative maintains existing abutments and piers with additional protection against scour that erodes the stream around the existing piers. Only minor increased encroachment on Tinicum Creek would take place due to the rock scour protection.

This alternative has the least amount of instream work of all the alternatives and does not alter the 25-yr flood elevation of Tinicum Creek. By maintaining the piers and abutments in place, the only instream work proposed is the scour protection and any rehabilitation of the piers and abutments to improve structural integrity. This alternative does not explicitly detail the rehabilitation of the substructure that is required (can only assume it is similar to Alternative 4) because the narrative focuses on the alternative's project goal shortcomings rather than the work needed to accomplish the particular design intent. This alternative fails to consider environmentally beneficial options for addressing scour conditions which could both protect the bridge and enhance stream health.

RESPONSE #5: Thank you for your summary of the alternative. However, there are aspects of your summary that we disagree with. Regarding your statement about dewatering of the creek, dewatering would also be required to reconstruct the existing piers and the western abutment. Regarding your comment on stream hydraulics, as you pointed out in the No Build, the Total Avoidance Alternative, and the New Alignment Alternative, leaving the existing structure in place would result in the continued erosion, scour and flow impacts as well as impact to stream flows during storm events. While this alternative does not alter the 25-year flood elevation of Tinicum Creek, it also does not improve the flood elevation. Regarding your comment that this alternative has the least amount of instream work of all of the alternatives, since extensive reconstruction of the substructure is required, we would anticipate temporary impacts to the creek would be similar to the replacement alternatives, as noted in your summary of Alternative 4.

Minimizing the visual and environmental impact of scour protection is addressed as part of Response #12 on page 6.

COMMENT #6: **Two-Lane Superstructure Replacement and Substructure Rehabilitation (Alternative 4)**
The superstructure replacement and substructure rehabilitation alternative considers the rehabilitation of the existing stone masonry substructure units (piers, abutments, and wing walls) and the construction of a new superstructure. This alternative features a two-lane superstructure with 10-foot travel lanes. Extensive rehabilitation of the bridge piers is highlighted in this alternative with the full replacement of the superstructure.

- Impact due to construction activities – impacts to Tinicum Creek would include dewatering and excavation related to rock scour protection and pier rehabilitation. Existing stream hydraulics would remain and impacts would largely be temporary due to construction activity around existing piers and abutments.
- Impacts due to encroachment – this alternative maintains existing abutments and piers with additional protection against scour that erodes the streambed around the existing piers. Only minor increased encroachment on Tinicum Creek would take place due to the rock scour protection.

Alternative 4 is very similar to Alternative 3 in that the two piers remain in place as do the existing abutments. The alignment of the stream is not altered nor is the hydraulic characteristics

since piers and abutment locations are not altered. More instream work may be required if access of equipment is needed for the concrete and steel reinforcement of the piers which is not noted in Alternative 3. Like Alternative 3, this alternative has the same amount of temporary construction easement required to complete the reconstruction. This alternative fails to consider environmentally beneficial options for addressing scour conditions which could both protect the bridge and enhance stream health.

RESPONSE #6: Thank you for your summary of the alternative. To clarify, the Determination of Effect report incorrectly described Alternative 4; this was also clarified in the SHPO Response letter. Alternative 4 involves the superstructure replacement and the rehabilitation of the existing stone masonry piers, the replacement of the abutments and wing walls, and the construction of a new superstructure. Minimizing the visual and environmental impact of scour protection is addressed as part of Response #12 on page 6.

COMMENT #7: **One-Lane Bridge Alternative (Alternatives 5)**
The existing structure would be replaced with a single lane bridge with a single pier. The proposal involves the replacement of the existing stone masonry substructure units (piers, abutments, and wing walls) and the construction of a new superstructure.

- Impact due to construction activities – impacts to Tinicum Creek would include dewatering and excavation related to rock scour protection, pier demolition, and a single pier construction. Existing stream hydraulics have the potential to be improved by removing one of two piers and stream impacts would largely be temporary due to construction activity around existing piers and abutments. Additional information from a Hydrology and Hydraulics analysis is necessary to confirm any instream hydraulic benefits of removing the existing piers and adding a single pier in a new location.
- Impacts due to encroachment – this alternative removes existing piers and constructs a single pier with additional protection against scour. Overall, this option reduces the amount of encroachment on the stream by the bridge structure but requires more instream disturbance to accomplish this result.

This alternative has the same temporary construction easement area as Alternatives 3 and 4 but appears to have much more instream construction. The 25-yr flood elevation appears to drop due to the removal of one of the bridge piers but more detailed information from the H&H analysis would be necessary to confirm this observation. The benefits of such a minor drop in flood stage may not justify the extra instream disturbance and construction activity that this alternative requires.

RESPONSE #7: Thank you for your summary of the alternative; we agree that removal of one of the piers from the stream results in an improved hydraulic condition. However, there are aspects of your summary that we disagree with. It is anticipated that the extent of dewatering of the stream would be similar to the rehabilitation alternative as described above in Response #5. Additionally, the removal of one pier would reduce the chance for debris accumulation and associated scouring.

COMMENT #8: **Two-Lane Bridge Replacement (Alternative 6)**

The bridge replacement alternative consists of a full replacement of the existing structure with a new, two-lane superstructure supported on a reinforced concrete substructure. This alternative proposes to replace one pier with a new pier and remove the other existing pier completely. Additionally, the abutments would shift, moving the waterway opening by 15 feet.

- Impact due to construction activities – impacts to Tinicum Creek would include dewatering and excavation related to rock scour protection, pier demolition, abutment reconstruction and relocation, and a single pier construction. Existing stream hydraulics appear to be diminished by removing one of two piers and moving the abutments. The 25-yr. flood elevation appears to increase from 199.52 to 200.25 in this alternative. Instream impacts would be attributed to the demolition of existing piers and the relocation of the bridge abutments. This alternative has a high level of instream work. The pier to be replaced will be rebuilt in the location of an existing pier which will minimize impacts to the Tinicum Creek streambed when the pier is rebuilt but the shifting of abutments will create high levels of disturbance at the stream banks and alter the waterway opening. While it appears that the alternative will minimize streambed disturbance because of the replacement of an existing pier with a new pier, the additional construction activity to demolish two piers and relocate both abutments may outweigh this benefit.
- Impacts due to encroachment – this alternative removes existing abutments and adds a single pier with additional protection against scour. Overall, this option reduces the amount of physical encroachment on the stream by the bridge structure but increases the hydraulic impacts on the stream from a flooding perspective due to the increase in the 25-yr flood elevations. Other hydraulic characteristics should be examined to determine if the large amount of alterations to the abutments and waterway opening can be justified from a hydraulic standpoint. Based on the increase in 25-yr flood elevation, the initial observation would be no. Additional impacts should also be considered since stream realignment is likely with the proposed changes. This would accelerate streambank erosion, reduce tree cover do to the loss of trees from incised banks, and undercut the area of relocated bridge abutments. Not enough information is provided in this document to thoroughly quantify these impacts so additional study and documentation is required.

This alternative has the same temporary construction easement area as Alternatives 3 and 4 but appears to have much more instream construction and impacts. The 25-yr flood elevation appears to increase due to the removal of one of the bridge piers but more detailed information from the H&H analysis would be necessary to confirm this observation. The attempt to realign does not appear to provide hydraulic benefits and could increase channel erosion, impacts to the bridge itself, and nearby properties. These risks are not justified nor is the additional instream disturbance and construction activity that this alternative requires because the 25-yr flood stage is increased with this alternative. Alternative 6A has all the same characteristics of Alternative 6 but the lane widths are reduced.

<u>RESPONSE #8:</u> Thank you for your summary of the alternative. However, there are aspects of your summary that we disagree with. In addition to the extent of dewatering of the creek being similar to the other alternatives, the long-term permanent impact to the creek will be decreased with this alternative. The design flood elevations shown for each alternative were from previous

studies and had not been updated. These values were inadvertently included on the plans, but not intended to be a part of this study. As such, will be omitted from the plan to avoid confusion.

COMMENT #9: **Two-Lane Bridge Replacement over Existing Substructure (Alternatives 6B/7)**
The alternative proposes new abutments that would be constructed behind the existing abutments to carry all loads from a new two-lane superstructure; this option preserves the existing substructure elements. The existing substructure units would be for aesthetic purposes only and would not carry any superstructure dead loads or live loads.

- Impact due to construction activities – impacts to Tinicum Creek would include dewatering and excavation related to rock scour protection. Existing stream hydraulics would remain up to the 25-yr storm and impacts would largely be temporary due to construction activity around existing piers and abutments.
- Impacts due to encroachment – this alternative maintains existing abutments and piers with additional protection against scour that erodes the stream around the existing piers. Only minor increased encroachment on Tinicum Creek would take place due to the rock scour protection.

This alternative has the least amount of instream work of all the alternatives (similar to Alternative 3) and does not appear to alter the 25-yr flood elevation of Tinicum Creek. By maintaining the piers and abutments in place, the only instream work proposed is the scour protection. Because the bridge is proposed to be a single span, the superstructure will be longer, deeper, and cause changes to the floodplain in larger storms which are not proposed for other alternatives. These design characteristics require evaluation to properly evaluate this alternative to others being proposed.

RESPONSE #9: Thank you for your summary of the alternative. It should be clarified that the design flood elevations were listed erroneously for this option. A detailed H&H analysis was not performed on this alternative. By using a longer span, the roadway profile has to be raised (to maintain the existing low-chord elevation), which results in impacts to the floodplain on the west approach to the bridge. Elevating the roadway and cutting restricting flood waters is anticipated to have a negative impact on the hydraulics for this alternative and increasing upstream water surface elevations.

COMMENT #10: **Two-Lane Bridge Replacement over Existing Substructure (Alternatives 6C/8)**
Alternative 6C/8 considers the replacement of the existing abutments and wing walls and preservation of the existing piers. The existing superstructure would be replaced with a new two-lane superstructure. The existing piers would remain in the channel for aesthetic purposes only.

- Impact due to construction activities – impacts to Tinicum Creek would include dewatering and excavation related to rock scour protection and instream/streambank impacts due to the rebuilding of the existing wing walls and abutments. Existing stream

hydraulics would remain up to the 25-yr storm and impacts would largely be temporary due to construction activity around existing piers and abutments.

- Impacts due to encroachment – this alternative maintains piers with additional protection against scour that erodes the stream around the existing piers. Abutments and wing walls are replaced to minimize the length of single span needed. No permanent alterations to instream hydraulics are noted from alternative with the exception of the unknown proposed low-chord of the bridge. Only minor increased encroachment on Tinicum Creek itself would take place due to the rock scour protection.

This alternative appears not alter the 25-yr flood elevation of Tinicum Creek. By maintaining the piers and abutments in place, the instream encroachment is the scour protection but instream construction would be necessary in and around the stream to reconstruct wing walls and abutments.

RESPONSE #10: Thank you for your summary of the alternative. As noted above, it should be clarified that the design flood elevations were listed erroneously for this option. A detailed H&H analysis was not performed on this alternative. By using a longer span, the roadway profile has to be raised (to maintain the existing low-chord elevation), which results in impacts to the floodplain on the west approach to the bridge. Elevating the roadway and cutting restricting flood waters is anticipated to have a negative impact on the hydraulics for this alternative and increasing upstream water surface elevations.

COMMENT #11: **Conclusions**
All alternatives that increase bridge width or approach widths to increase turning radii decrease the riparian vegetation present along Tinicum Creek. A decrease in riparian vegetation can destabilize the creek banks and lead to a reduction in erosion protection.

Alternatives 3, 4, and 6B/7 appear to have the least amount of instream construction due to the fact that existing bridge piers and abutments will be left in place. All three will require additional scour protection to prevent undermining at piers and abutments. Stream hydraulics appear to remain unchanged from the existing condition in these three alternatives but road approach elevations and superstructure depth increases will have an increased impact on larger storm flood stages and the overall floodplain for 6B/7. These elevation changes should be analyzed with respect to the floodplain and flood elevations in larger storms. Documented occurrences of local property damage during larger storms indicate that this area is impacted by high flood stages. Because of this, all alternatives should have impacts to the floodplain fully evaluated for the 2 to 100 year storms to prevent negative impacts of this bridge design on life and property. This document only notes the 25 year elevation on the drawing preventing any conclusions to be made as to potential impacts to nearby floodplains and property. The larger storms, final elevations of the bridge superstructure, and road approach slopes and elevations should be evaluated for any alternative listed due to the potential to impact the floodplain and adjacent property owners.

Alternatives 3 and 4 appear to have similar instream impacts to each other due to the required rehabilitation of the piers to maintain them as loadbearing supports for the bridge in question. These alternatives propose no changes to the floodplain. Because of the narrative's lack of

information, Alternative 3's bridge design did not appear to be fully evaluated within the narrative. This could be because it does not address PennDot's design intent of the bridge replacement.

Any alternative that impacts instream hydraulics negatively should not be considered. These alternatives include 1, 2, 6, and 6A. Alternatives that do not avoid hydraulic impacts to stream flow should be avoided if acceptable alternatives are available. Alternative 5 is the only alternative that lowers the 25-yr flood elevation from existing. Alternatives 6 and 6A propose to relocate the stream channel which has both negative impacts to stream hydraulics but also appears to put the western streambank in jeopardy of experiencing increased streamflow velocities due to channel migration. Streambank impacts with this alternative need to be studied more closely.

The alternatives with the largest instream or streambank impacts are alternatives 5, 6, 6A, and 6C/8 due to the increased construction requirements to either the piers or abutments. Alternatives that do not minimize this need for instream construction should be avoided if acceptable alternatives are available. All options considered should include the use of natural channel design and stream restoration principles and strategies for addressing the scour and erosion issues around the piers and along the banks associated with the bridge. Erosion and scour practices that harm the instream water quality or the physical characteristics of creek should not be considered. Meliora Design will follow up this document review with a review of existing conditions to further evaluate the current bridge configuration. By evaluating existing impacts and flooding conditions at the location of the Headquarters Road Bridge, we will be better able to provide analysis and further comment on the alternatives documented in the Determination of Effects Report.

RESPONSE #11: Alternative 3 was fully evaluated and was provided as an option that retains some of the existing stone masonry. However, given the advanced condition of deterioration in parts of substructure, widespread reconstruction would be required.

Preliminary H&H models were prepared for several alternatives to check the 2 through 100 year design floods. However, Alternatives 6B and 6C were not studied due to their increased profile elevation, which would have negative hydraulic impacts to the upstream properties. The water surface elevations listed on the previous sketches should be disregarded, as they do not reflect current hydraulic models of each alternative. Please note that the hydraulic design flood for a Rural Collector Roadway is the 25-year storm, which is why the 25-year flood elevations were previously listed.

Scour countermeasures will be set at a lower elevation and choked with smaller stone and native stream bed material to avoid negatively impacting water quality.

The project area for this project encompasses the area immediately surrounding the existing bridge. It is beyond the scope of the current project to incorporate natural channel design and stream restoration principles beyond the project limits. Best Management Practices and an

Erosion & Sedimentation Control Plan will be implemented; these will be reviewed and approved by PADEP during the permit process.

CONSULTING PARTY: F.A. Morgan, Erwinna, PA (December 11, 2015)

COMMENT #1: PennDOT's comments state the Bridge in question cannot withstand "large heavy trucks."

But let's bear in mind that PennDOT has placed Jersey barriers on the bridge with the approximate weight of 50,000 pounds. And in addition, a dump truck weighing anywhere from 12 to 17 tons, which transfers to 24,000 to 34,000 pounds, was backed onto the center of the Bridge, and a load of gray rock weighing somewhere between 10 to 27 tons, which transfers to 20,000 to 54,000 pounds, was dumped. That total weight would be 94,000 to 138,000 pounds. We can be more than sure that any truck crossing the Bridge couldn't weigh that much. Let's also pay attention to the fact that PennDOT has drilled many holes in the Bridge telling the residents of Tinicum Township that the strength of the Bridge has been compromised over the years (BUT the drilling of holes hasn't contributed to the lack of strength?) and the integrity of the Bridge still supports the added weight. Did I miss something here?

RESPONSE #1: Per the standard design code, the design vehicle being used for evaluation is the HS-20 vehicle, which is 72,000 pounds. (Please see the description above in Response #4, page 17 about the HS-20 vehicle and its comparison to other trucks that will be expected to utilize the bridge. This includes the Ottsville Fire Truck.) Bridge design standards also account for an added factor of safety on the bridge's dead load (self-weight) and live loads (vehicles), which accounts for unknown factors and the potential crossing of overweight vehicles.
The core borings were taken at the request of other Consulting Parties to confirm the composition of the existing piers. The 3" diameter corings will not compromise the strength of the bridge, and the holes were filled with high strength, non-shrink grout, and covered with stone to conceal the location of the holes.

COMMENT #2: We need to remember to always follow the money. It is my opinion, as well as many others, that PennDOT hasn't been totally honest with the Tinicum Township residents. Perhaps the plan is to widen and overly strengthen the Bridges along Headquarters Road to accommodate tanker trucks for the fracking in Nockamixon Township. After all it is a straight run from the Delaware River to the proposed fracking sites. Coincidence? Probably not. Most definitely not.

RESPONSE #2: PennDOT has no plans "to widen and overly strengthen the bridges along Headquarters Road to accommodate tanker trucks for the fracking in Nockamixon Township". The local roadways in the vicinity of the bridge are not conducive to truck traffic. To the west, Headquarters Road has grades as steep as 13%, and to the east, Headquarters Road has a tight 50-foot radius curve. Furthermore, the Federally mandated Surface Transportation Assistance Act of 1982 was established to provide a network of highways for large trucks. These roads meet the geometric requirements for safe operation of trucks. With the exception of Route 611, no roads in Tinicum Township meet these requirements. Also consider there are no east-west bridge crossings over the Delaware River that can handle heavy trucks, there is no easy access to

Route 611, and River Road (Route 32) at the east terminus of Headquarters Road prohibits heavy trucks. These reasons demonstrate that the intent of the project is not to accommodate tanker trucks. Also this comment was previously addressed in the Comment Response Document dated September 10, 2013 (Response to Comment B on page 3 of 43) which is attached as Appendix A.

COMMENT #3: In Tinicum Township alone, we have stone masons that are International recognized for their expertise. Wouldn't it make perfect sense to hire them, at half the cost of PennDot, and see the repair of the Headquarters Road Bridge being completed in half the time? Certainly, contracting superb masons the beauty of our area wouldn't be destroyed with the designs/abominations PennDot has shown us at Cafferty and Tettemer Roads.

RESPONSE #3: The public bidding of highway projects involves an open solicitation to all PennDOT qualified contractors to pursue this work. Upon receipt of estimates from qualified contractors, PennDOT will select the lowest bid. They have the option to hire local craftsmen and masons to assist with specialty work. The work will be required to meet the terms defined in the project specifications. Also consider that the full reconstruction of a stone masonry structure would likely take more time that it would to form and cast a concrete bridge foundation due to the intricate nature of the construction.

COMMENT #4: It has also been my personal observation that many cars/trucks do NOT stop at the traffic sign located at Tettemer Road. The speed with which these cars and trucks sail through the stop sign, creates more hazardous conditions, We also know the Fire Company had alerted us and PennDOT that the intersection that presently exists at Tettemer Road compromises the turn of fire trucks onto Tettemer Road if traveling from the Erwinna Fire Department. If PennDOT had left the previous intersection alone, these problems wouldn't exist.

RESPONSE #4: Thank you for your comment.

COMMENT #5: PennDot has falsely claimed there have been 10 accidents at the Headquarters Bridge. There has NEVER been a two vehicle accident at the Bridge. One vehicle slipped on the ice, but not on the Bridge----driver error. One motorcycle slid on loose gravel--again, not the fault or design of the Bridge. Another vehicle hit a deer in close proximity to the Bridge--again, not a faulty Bridge. Actually, It Is quite embarrassing to think PennDot believes the residents will swallow this ridiculousness.

RESPONSE #5: Please see the response to Comment #1 on page 11.

COMMENT #6: Speaking of insanity, one of the proposals from PennDOT is to circumvent the Bridge entirely and build roadways through several properties if the Bridge can't be widened to two lanes and lengthened. These are fear tactics by PennDOT and absolutely ludicrous!

RESPONSE #6: A Total Avoidance Alternative (an alternative that completely avoids impacts to the historic resource) is required to be considered under Section 4(f) of the US DOT Act. Due to the magnitude of costs, the residential displacements, and the significant impacts to the natural environment, this alternative was dismissed.

COMMENT #7: The Headquarters Road Bridge has also experienced some scouring, but even the DEP has stated the original stream flow could easily be redefined which would eliminate the need for a longer bridge span. Why is PennDOT trying to create more work for themselves? Just follow the suggestions of the DEP and work can commence post haste.

RESPONSE #7: Although we are aware that the Delaware Riverkeeper Network has proposed the realignment of the stream, we do not have a record in which "DEP has stated that the original stream flow could easily be redefined which would eliminate the need for a longer bridge span."

COMMENT #8: Apparently the "Powers-To-Be" have stated the residents ***just want a bridge....they*** *are* correct, we DO want a bridge, but not if we have to compromise the beauty of our area. So, "Powers-To-Be", please come to Tinicum Township and try to appreciate the beauty, that *we* all love and cherish and at the same time, realize how the bridges at Cafferty and Tettemer Roads have, indeed, ruined the eye appeal of a half mile stretch of Headquarters Road, Bear in mind also, PennDOT promised to paint the Cafferty and Tettemer Road bridges. Has that happened? NO. We did get graffiti painting, which makes me wonder if that were what Penn DOT had in mind. We want our environment intact, not destroyed. The Headquarters Road Bridge In question should be REPAIRED, not replaced. The cost differences are astronomical.

RESPONSE #8: Rehabilitation of the bridge was given careful consideration and was document in the Existing Structure Condition Evaluation Report dated November 2006. Urban's professional engineering opinion is that rehabilitation of stone masonry wall piers and abutments to their original condition will not provide a safe structure which meets the purpose and need. The alternative which considers a two-lane rehabilitation of the existing structure (Alternative 4) would result in the full replacement of abutments, wingwalls and the superstructure and substantial reconstruction of the piers, resulting in an adverse effect. A very low percentage of the stone would be salvageable for the rehabilitation alternatives given the extent of deterioration. If widespread reconstruction or replacement is required, the use of modern building materials (reinforced concrete) would be recommended with the addition of original stone facing, to the extent possible, to provide a context sensitive finish and a durable core material.

COMMENT #9: Attached to this, is another document written in July of 2014, which apparently fell on deaf ears or more accurately blind eyes.

RESPONSE #9: We received your comments after the Public Open House held on July 30, 2014. All comments are being considered and are included in the project technical file.

CONSULTING PARTY: Bruce Wallace, Ottsville, PA (December 14, 2015)
COMMENT #1: This report acknowledges for the first time that rehabilitation of the existing historic piers and abutments is possible and that the rehabilitated substructure could then carry a replacement superstructure. And, this appears to be the least costly option. This acknowledgement points the way at last to a viable consensus solution to this long running bridge closure. While the document as a whole attempts to argue that this is not the right thing to

do and instead the historic bridge should be demolished and replaced as PennDOT has planned from the beginning, those arguments as represented in these documents are no longer credible.

RESPONSE #1: The Determination of Effect Report mistakenly noted that the bridge abutments would be rehabilitated with Alternatives 3 and 4. However, due to the deteriorated condition of the abutments as documented in the 2006 Existing Structure Condition Evaluation Report, the abutments will be replaced in both alternatives.

COMMENT #2: We are approaching five years without a bridge because of PennDOT's relentless pursuit of their predetermined outcome in this unusual, sensitive, and highly protected situation. In support of demolishing the bridge, PennDOT has argued the bridge was not historic, that history is irrelevant to the purpose and need of this project, that the Federal Wild and Scenic status of the stream and its Exceptional Value water quality are irrelevant, that the bridge could not physically be saved, that federal standards would prohibit rehabilitation, and now that the bridge, when it was open, was not safe. It is time to let go of these false arguments and embrace the reality that this unique and special pillar bridge, the oldest of its type in Pennsylvania and possibly the whole country, one of only two known survivors, should be saved, celebrated and cherished and continue to proudly serve its community and the Ridge Valley National Register Rural Historic District that it anchors and ennobles for generations to come.

Because these two reports still cling to the original agenda, they are riddled with examples of distortions, omissions and errors introduced to support demolition of the historic bridge and a two-lane replacement, to obscure PennDOT's role in creating the problems it says it wants to solve, and to avoid responsibility for the long bridge closure.

RESPONSE #2: PennDOT is conducting the environmental and cultural resource studies for this project in accordance with all applicable state and federal regulations. Coordination with PADEP, Army Corps of Engineers, and National Park Service will continue due to the stream's Exceptional Value and Wild and Scenic River designations.

COMMENT #3: The section on purpose and need beginning on page 6 collects and exaggerates the negatives of the location, the road network, and the bridge's need for repair, ignores the inconveniently easy and low tech solutions, and tries once again to combine them into a hopeless picture with no solution besides bridge replacement.

This argument starts with traffic counts, most if not all of which were taken when the road served as a detour for one or more adjacent, parallel state roads with equal or greater traffic. While they are not definitive of a particular solution in any case, these counts are too high.

RESPONSE #3: This comment was previously addressed in the Comment Response Document dated September 10, 2013 (Response to Comment F on page 5 of 43) which is attached as Appendix A. Also see response to Comment #11 on page 6.

COMMENT #4: A slight migration of the stream just above the bridge, easily addressed by ecologically sound streambank work, becomes in this document an argument to move the bridge instead.

For obvious reasons, scour has occurred underneath several 4' wide pouches of concrete that PennDOT unfortunately poured on top of the gravel stream bottom next to the bridge. These 18" thick pouches severely restrict both normal and flood flows which have blown out the gravel from underneath the pouches, making caves beneath them down to the bedrock 5' below. There is no evidence that the bridge itself, which sits on the bedrock, is affected by this. But, rather than acknowledging their mistake and proposing normal and sound scour solutions instead, the text tries to give the impression that the scour problem is so bad it pretty much defies solution.

RESPONSE #4: Please see response to Comment #6 on page 4.

COMMENT #5: Similarly, the crumbling bridge deck and collapsed guiderail are the direct result of drilling guiderail mounting bolts into concrete not designed for that purpose and too close to the edge. In the attempt to create the impression of safety problems on the bridge, this document blames guiderail collapse entirely on an unspecified accident, but the real cause was a misguided PennDOT "improvement" that spectacularly failed.

The condition of the bridge is presented here as bleakly as possible with questionable details and no reflection of the true picture—that most of the bridge is, in fact, basically sound and readily repairable despite years of absent or misguided maintenance.

RESPONSE #5: Please see response to Comment #3 on page 3.

COMMENT #6: The bridge geometry is also presented as hopeless, even though the analyses indicate that the issues cited would be sufficiently resolved by little more than the simple cutback of one road bank and this would give a result as good as or better than any of the costlier two-lane alternatives PennDOT recommends.

RESPONSE #6: Please see responses to Comment #3 on page 12 and Comment 3 on page 6.

COMMENT #7: None of the five listed "needs" on page 7 are especially problematic in this situation and despite the handwringing, all can be addressed by simple measures in addition to historic rehabilitation of the historic bridge.

RESPONSE #7: Nine alternatives were studied plus the No Build. Of those alternatives considered, five of the alternatives meet the project need: Alternatives 1, 2, 6, 6B, and 6C. The remaining alternatives (No Build, Alternatives 3, 4, 5, and 6A) do not meet the project needs. Alternative 6 is the alternative that best meets the project's purpose and need while minimizing overall impacts and is considered the preferred alternative.

COMMENT #8: Alternative 3, rehabilitation of the existing bridge, is nevertheless dismissed without complete review essentially for one reason--it is claimed that accident data showed it was not safe. But what accident data? None is provided, and the accident data from the local police shows the exact opposite, that the present alignment was not the direct cause of any accident in the period studied. This was apparently true even though PennDOT had narrowed the deck from 16' to a single difficult 10' lane as shown in this photo during the entire study period.

What the accident data does show is the need for traffic calming in this location because of the narrow winding roads that lead to the bridge. That's what a one lane bridge provides here, at least as well as any artificial method would.

RESPONSE #8: Rehabilitation was not disregarded for the sole reason of an accident history. That was a contributing factor, but the primary reason was the widespread deterioration (e.g., cracking or crushed stone courses, bulging, internal voids) and localized failure (e.g., global stability issues, collapsed walls from impacts or flooding). Long term durability of the existing structure over its service life (25-years per AASHTO's Guidelines for Historic Bridges) must be considered. A one lane bridge will not address the steep grades approaching the bridge from the west. Also see response to Comment #1 on page 11.

COMMENT #9: The "preferred alternative", demolition of the historic bridge with construction of an unspecified new two-lane bridge, would, it is claimed on page 32, meet current PennDOT and AASHTO design and safety standards. But what is this magical alternative then? It's not shown here. None of the realistic alternatives presented in the report meet all those standards, all would need design exceptions. This site is topographically constrained and can't practically be re-engineered to fit modern highway standards because the entire surrounding area is historic, environmentally sensitive and protected. No realistic alternative that would respect the protected historic and water assets here would meet all PennDOT standards without design exceptions.

RESPONSE #9: While deviations from required criteria through design exceptions will be required for most if not all alternatives considered, PennDOT has a responsibility to improve upon existing conditions which could contribute to a safety issue when possible. Alternative #6 meets the projects purpose and need while improving upon the existing conditions. This alternative would also require design exceptions since it would not fully meet all current design standards. However, bridge width criteria would be met by Alternative 6.

COMMENT #10: On page 47, it is argued that this is only one of the six bridges in the district and there are other historic resources too, so it won't be missed, really, or cause delisting of the District. That is just PennDOT's opinion of course, but it also ignores the plain fact that PennDOT has not agreed to save and protect any of the six bridges. It tried for years to completely demolish the Geigel Hill Road 1887 truss bridge and is right now proposing to remove one of the others, a low volume concrete arch bridge by famed Bucks County bridge architect Oscar Martin over Clay Ridge Road. The fact is that PennDOT is now on a course to compromise or remove altogether all six of these historic and listed bridges and that would certainly threaten continued listing of the district. Now is the time to stop pushing for demolition, recognize that this is a unique and important historic district and its rare collection of intact bridges serves the community well and should be preserved.

RESPONSE #10: The Ridge Valley Historic District is listed under Criteria A for its agriculture and under Criteria C for its architecture as it contains representative examples of rural vernacular architecture in southeast Pennsylvania that date to the late-eighteenth through early twentieth century. In addition, the District's character-defining features include the roadway, creek, and landscape elements that provide a setting to the buildings, structures, and sites that comprise the Historic District. A new context sensitive designed bridge will not compromise the district's

significance. Coordination with the SHPO will confirm that the bridge replacement will not delist the Historic District.

The Clay Ridge Road bridge is owned by Bucks County. The approach roads are under the jurisdiction of Tinicum Township.

COMMENT #11: On page 49, there are two missing dates that should be on any calendar dealing with the history of negotiation on the Headquarters Road bridge. They are March 1st and 2nd, 2011. On March 1, 2011, the first 106 process collapsed finally after PennDOT withdrew its standing offer to provide an endowment fund with the specified replacement bridge, and the Township then refused to take ownership of it. The following morning of March 2, 2011, PennDOT abruptly closed the bridge, and since then they've kept it closed, refusing to consider repairs to temporarily reopen the bridge to any traffic, keeping the pressure on the community to force it to accept PennDOT's plans for demolition and new two lane replacement.

While it might be possible to say these events were not part of the stakeholder-PennDOT interaction, historically events like these have been exactly how PennDOT has interacted with stakeholders. In this case, it is very hard to believe temporary fixes could not have been identified to reopen the bridge to lightweight traffic and PennDOT's actions speak for themselves.

RESPONSE #11: Due to the impact to the surrounding community, PennDOT takes the decision to close a bridge very seriously. Over the course of the life of the Headquarters Road Bridge, repairs were made when possible to keep the bridge open. The bridge was closed due to a large hole that developed in the deck which could not be repaired. The March 1 and 2, 2011 dates were included in the timeline of events dated January 17, 2014 and distributed to the consulting parties on January 24, 2014.

COMMENT #12: **Comments Related to Particular Alternatives:** Alternatives 6 and 6A show the most destructive way to improve turning onto Sheep Hole Road. Moving the entire bridge 15' west would move the stream below with it, destroying its fragile banks of alluvial soil held in place by a narrow row of trees. The affected landowner would risk losing not only the use of his pasture, but a very significant amount of land itself could be lost to the shifting stream. The result, new sandbars of alluvial rocks and downed trees diverting the stream, would disrupt the now stable conditions far downstream for decades. The costs assigned to these alternatives do not include the costs of attempting to re-stabilize the stream.

RESPONSE #12: One of the challenges PennDOT encounters on bridges crossing waterways is the natural migration of stream channels over time. Because Alternative 6 would remove a pier and abutment from the stream, it is anticipated that flood levels will decrease due to the removal of the obstructions. The long-term permanent impact to the creek will be decreased with this alternative.

COMMENT #13: Alternative 3 is by far the best alternative for historical preservation, stream and floodplain protection, and cost. It has a proven record of safety and has the support of the two property owners from which ROW is required. This option would enable a simple fix for the

eastbound turn onto Sheep Hole Road and intersection sight distance by combining cutback of the road bank as necessary along Sheep Hole Road with a package of slight modifications to the east end of the historic bridge. The landowner involved supports and will cooperate with this approach if Alternative 3 is the choice.

RESPONSE #13: In addition to not meeting the project purpose, Alternative 3 does not address the structurally deficient need nor does it address the functionally obsolete need since the one-lane structure does not meet the 24 feet curb-to-curb criteria per PennDOT's DM-2. See also the response to Comment 13 on page 6.

COMMENT #14: Alternative 4 is the same as Alternative 3 except that it widens the bridge to two lanes. This would require the substructure to have twice as much load bearing capacity as Alternative 3 as well as a wider deck, and yet it is still considered doable for under $2,000,000 making this the cheapest option for which costs are provided. Obviously Alternative 3 would cost even less, but no estimate is provided in this report. While Alternative 4 is the least destructive two-lane option, the wider deck would overshadow the historic bridge and it would appear to be less safe than Alternative 3. The geometry remains problematic for two-lane alternatives like this because of the difficulty of keeping vehicles within their narrow lanes on tight turns. All the two-lane options have lanes 12' wide or less. The single 16' travel lane of Alternative 3 would be much easier to navigate safely than the 10' lanes proposed for Alternative 4; the wide single lane also allows room for pedestrians and cyclists who would be squeezed out of the two-lane options.

RESPONSE #14: Alternative 4 addresses some of the structural deficiencies of the existing bridge. Alternative 4 was dismissed since it does not meet PennDOT criteria of a bridge width of 24 feet curb-to-curb and therefore does not address the functionally obsolete need.

COMMENT #15: Alternatives 6B and 6C raise the height of the deck, creating issues on both sides of the bridge. On the east side, this would increase the likelihood that the final design would require that the steep banks between the road and the stream be supported by concrete retaining walls. On the west side, this would increase the intrusion into the floodway. The latest FIRM maps show that flood flows, which historically inundate Headquarters Road west of the bridge every five years or so, are concentrated at the foot of the west abutment. Raising the deck at least 16" as proposed for Alternative 6B would lengthen the bridge approach ramp by 15' if a 9% slope is used, as proposed. The FIRM maps show that this area this would block is entirely floodplain, in fact the maps suggest it may be the entire current floodplain for floodwaters not going under the bridge. Because the functional abutment would be built behind the historic abutment, the flood flow would be correspondingly pushed back or blocked at least 8' further, the Alternative 6B bridge deck itself would be 16' longer than the deck on other alternatives. *West approach after flooding in August 2011.*

RESPONSE #15: We agree with your comments. Alternative 6B and 6C were dismissed from consideration.

COMMENT #16: **Historic Properties Review by Monica Harrower** This short document attached to the Determination of Effects Report apparently revives the long discredited claim that

this is a 1919 bridge of no historic significance that is not eligible for the National Register. This claim, erroneously made in PennDOT's 1997 bridge survey, has been repeated by PennDOT representatives many times since, in 106 meetings and other venues long after it was proved that the bridge was actually built in 1812, not 1919, and even after the Keeper of the National Register certified that the bridge was in fact significant, fully listed, and protected by the national register, as acknowledged elsewhere in these reports. It is surprising to see this claim resurfacing yet again at the top of the second page where this phrase appears without context or qualification: 1.Headquarters Road Bridge over Tinicum Creek; Key #131387; Not Eligible.

RESPONSE #16: The bridge is a contributing element to the National Register listed rural historic district. The bridge was determined not individually eligible for the National Register as part of the PennDOT historic bridge inventory. The PASHPO concurred with this finding and further clarified it in the attached email to Jesse Salamun dated August 15, 2014. This comment was previously addressed in September 2013 (See Response to Comment G in the Comment Response Document dated September 10, 2013 (page 5 of 43)) which is attached as Appendix A.

COMMENT #17: **Bridge Width Evaluation** This document was withheld from Project Path for 6 months and only provided to stakeholders after it was obtained by a freedom of information act request. Apparently, it was not meant to be shared. Its conclusions are supposedly based on accident data that has not been provided. This appears to be an exercise in attempting to justify the need for a two-lane bridge in this location, but, if anything, it proves the opposite.

Some of the points have been discussed above, such as the attempt to misrepresent the guide rail failure as a safety problem at the bridge, and the apparent alteration of accident data to claim a safety problem where none appears to exist. The astonishing claim is actually made on Page 9 in bold face type that "**Given the history of accidents at the bridge (including the accident that impacted the steel beam guiderail and caused failure to this bridge railing) the current Headquarters Road Bridge does not meet this criteria** [of safety.]

Other safety standards that the single lane bridge passes in this report would not be so easy for the two-lane alternatives. Narrow traffic lanes and lack of shoulders would make the two-lane options less friendly to cyclists and pedestrians and harder for snow removal. The challenges relating to geometry are just as challenging to a two-lane alternative.

The Determination of Effects report says on page 15, "AASHTO states that existing bridges can remain in place without widening unless there is evidence of a site-specific safety problem relating to the bridge." Despite making every effort to find a real safety problem, this report is evidence that there simply isn't any.

RESPONSE #17: FHWA requested that PennDOT prepare a Bridge Width Evaluation report to evaluate whether the purpose and need could be met by providing a one-lane bridge. It was an engineering-based evaluation. Initially, this report was prepared as interagency coordination between FHWA and PennDOT; therefore, this was not initially posted to ProjectPATH. Due to the sensitive nature of the information contained in crash data, it was redacted from the Bridge Width Evaluation report.

Please see the Response #1 on page 11, Response #2 on page 14, Response #3 on page 16, Response #4 on page 16 regarding the Bridge Width Evaluation report and crash analysis. Cyclists and pedestrians currently navigate the existing road network on narrow two lane roadways; therefore, we disagree that a narrower bridge is safer for cyclists and pedestrians. Motorists are expected to yield to pedestrians and cyclists whether they are on a roadway or a bridge.

COMMENT #18: **Conclusion** In light of the many advantages of Alternative 3 and the potential it has to address the full range of the actual purposes and needs in this unique situation, it should become the preferred alternative. No other alternative has the potential to achieve the consensus support necessary to quickly reopen a safe and strong bridge at this location in a cost effective way.

RESPONSE #18: PennDOT must balance the needs and safety of the travelling public, impacts to environmental and cultural resources and consider public input. While achieving consensus is ideal, it is not a requirement and is likely unattainable in many situations due to varying views and opinions on how to best meet the projects needs. Alternative 3 was evaluated as an option that retains some of the existing stone masonry. However, given the advanced condition of deterioration in parts of substructure, widespread reconstruction would be required. Due to the extent of abutment deterioration and localized failure, full replacement of the abutments is recommended.

CONSULTING PARTY: Jesse Barbara Salamun (December 14, 2015)

COMMENT #1: PennDot continues to maintain that the Burnt Mill Bridge is only a contributing element to the Ridge Valley Historic District and not eligible itself. This is very significant misinformation which is being used to lower the bar for PennDot to replace/destroy the Historic 1812 Burnt Mill Pillar bridge which is only one of two bridges of its type remaining in PA.

Under Previously Recorded and Evaluated Resources:
The Headquarters Rd. Bridge over Tinicum Creek(aka Burnt Mill Bridge) is marked Not Eligible. It is then described as a contributing element to the Ridge Valley Rural Historic District. This is signed by Monica Harrower.

This in contradiction to the report issued by the United States Department of the Interior dated 4/28/06 in reference to the Headquarters Road Bridge(AKA Burnt Mill Bridge) which states: The Secretary of the Interior has determined that this property is: Eligible Under comments it indicates the Headquarters Road Bridge is eligible for the National Register of Historic Places as a contributing property in the National Register-listed Ridge Valley Rural Historic District. "The bridge is historically significant in the context of the development of the township, regional transportation, and the operation of local mils, and is of engineering significance both for its early 19th century construction and its sensitive modernization in 1919."

I believe the PennDot reports needs to be corrected to reflect the bridge as Eligible, as opposed to Not Eligible. This is a major distinction because under the Aashto Guidelines bridges that have a high level of historic significance are to be given greater effort towards preservation. As

PennDot's level of greater effort has only been towards destruction/replacement this is not following the principle of the Aashto Guidelines.

As the Burnt Mill Bridge is in actuality the center piece of the Ridge Valley Historic District, its loss would be a significant degradation to the entire Ridge Valley Historic District. The 1812 Burnt Mill Bridge exists as an historic treasure in Tinicum Township which should be preserved for future generations and afforded its legal protections.

RESPONSE #1: The bridge is a contributing element to the National Register listed rural historic district. The bridge was determined not individually eligible for the National Register as part of the PennDOT historic bridge inventory. The PASHPO concurred with this finding and further clarified it in the attached email to you dated August 15, 2014. This comment was previously addressed in September 2013 (See Response to Comment G in the Comment Response Document dated September 10, 2013 (page 5 of 43) which is attached to Appendix A).

COMMENT #2: The Safety concerns listed for the existing 16 foot width bridge is based on false information which has been addressed by other consulting parties and needs to be corrected. The number of accidents occurring at the bridge appear to be three, as opposed to ten cited by PennDot. The turning radius issue has also been addressed for the largest of the fire trucks and should negate the description of the bridge as 'obsolete', as well as the safety concern for emergency vehicles.

RESPONSE #2: Please see the Response #1 on page 11 and Response #3 on page 12. PennDOT has considered the comments of the consulting parties to date. See Comment Response document dated September 10, 2013 and other written responses on the ProjectPATH website for the project.

COMMENT #3: While consulting parties have attended the 106 meetings and contributed much valuable information, there is no evidence in the Determination of Effects Report of their input being incorporated into PennDot's final conclusions. This would seem to totally negate the intended purpose and spirit of federal law mandating the 106 process which is designed to offer some protection for the preservation of historic properties being considered for destruction by a state agency using federal funds. Further as misinformation has been used in the Determination of Effects, a conclusion based on false information cannot be considered a valid conclusion.

RESPONSE #3: PennDOT has considered the comments, questions, and input of the consulting parties throughout the project. All consulting party comments, questions, and input have been posted on ProjectPATH and have been responded to. Since this information is available on ProjectPATH, all consulting party comments, questions, and input were not included as attachments to the Determination of Effect report.

CONSULTING PARTY: Marilyn Herd, Ottsville, PA (December 15, 2015)

COMMENT #1: I know PennDot knows what they are doing has to be two lanes because curves! Can’t see if someone is coming! Don’t fit! So stupid!

RESPONSE #1: Thank you for your comment. We agree that the existing sight distance is a safety concern.

COMMENT #2: Headquarters Bridge – I was almost killed coming onto the Bridge; stopping at the stop sign 1st of course before proceeding. No one coming in sight. Bridge was empty or I wouldn't have proceeded. All of a sudden a speeding car was coming toward me. I realized he couldn't be able to stop and would have hit and killed me at that speed. There was a stop sign at his end also which apparently he didn't stop; because if he had wouldn't have been able to get going that fast if he had. I had to quickly back up and swerve to the right to get out of his way; getting off the bridge and hitting the stop sign. Still have the dent! I tried to get his license as he sped by me but was going much too fast. I would have certainly reported him! I should have followed him and got his license!

RESPONSE #2: Thank you for your comment. Incidents such as these which go unreported to police are important to consider in evaluating whether there is a site-specific safety issue.

COMMENT #3: The people of this community have suffered long enough! Whoever is fighting this shouldn't have the power to destroy our [writing cut off on page] from our communities!

RESPONSE #3: Thank you for your comment.

COMMENT #4: P.S. They should make the covered Bridges higher and wider so that the larger vehicles can fit and not keep breaking them! Another solution!

RESPONSE #4: Thank you for your comment.

CONSULTING PARTY: Damon Aherne, Upper Back Eddy, PA (December 15, 2015)

COMMENT #1: **Project Purpose**
It is amazing to see how much the purpose of this project has been twisted around over the years to achieve PennDOT's predetermined goal of removing a historic bridge and providing an unneeded, expensive 2-lane bridge.

Back in 2011, PennDOT identified the need for this project in the DVRPC TIP documentation, as *"The purpose is to replace a deteriorated and functionally obsolete bridge."*

Jump to the referenced report and it has somehow morphed over the years to now be *"The purpose of this project is to provide a crossing for Headquarters Road over Tinicum Creek that is structurally sound and capable of safely and effectively handling the expected vehicular need of the public and emergency services of the surrounding area."*

PennDOT never had a reason to be concerned about the emergency services utilization of the bridge until they realized they had no good reason to remove the existing bridge. The problem

has been redefined to achieve PennDOT's predetermined goal - removing a historic bridge and providing an unneeded, expensive 2-lane bridge.

The appropriate project purpose would be the preservation and rehabilitation in place of this historic structure.

RESPONSE #1: We agree that the DVRPC TIP description of the project in 2011 was not appropriate. This comment was previously addressed in the Comment Response Document dated September 10, 2013 (Response to Comment B on page 2 of 43) which is attached as Appendix A.

COMMENT #2: **Source of Bridge Deterioration**
The report fails to provide the appropriate background and history as to why the bridge has deteriorated. The report also fails to note that the bridge never had its weight limit lowered or change right up until the day PennDOT performed an "emergency" closure of the bridge.

I would suggest that the record needs to be clear – PennDOT ignored their own maintenance inspection reports and recommendation for over two decades!

Looking at PennDOT District 6-0 NBIS Bucks County Bridge I.D. Number 09 1012 0020 2764 Inspection Report (November 3, 2010) and other sources one finds the following:

INSPECTION DATE	**IDENTIDFIED (sic) NEEDED WORK**	**WHAT DOES PENNDOT DO?**
March 28, 1992	Repair Guiderails	Deferred due to scheduled project #137161 to be let 4/15/2008
March 28, 1992	Repair Concrete Diaphragm	Work not planned
December 18,1997	Repair Piers	Work not planned
November 8, 2002	Patch Pavement	Work not planned
November 8, 2002	Repair Bituminous Surface	Work not planned
October 31, 2004	Repoint Masonry	Work not planned
November 28, 2006	Repair Steel Beam	Work not planned
November 28, 2006	Repair Guiderail	Deferred due to scheduled project #137161 to be let 4/15/2008
March 8, 2010	Repair Wingwall	Work not planned
March 8, 2010	Repair Abutment	Work not planned
March 8, 2010	Repair Concrete Deck	Maintenance item was reset for project replacement
November 3, 2010	All prior needed work	Work not planned

It is obvious that PennDOT always planned on a new bridge coming someday, and they did not provide the appropriate level of care that a national historical treasure from 1812 warrants.

RESPONSE #2: Throughout PennDOT's ownership of the Headquarters Road Bridge, it has been inspected in accordance with National Bridge Inspection Standards (NBIS) on a routine basis (every two years). These inspections ensure that the bridge remains safe for vehicular use and recommend maintenance activities to address issues which may impact public safety. These recommended maintenance actions are given priority codes to indicate the urgency of the repair. Priority 0, 1 and 2 actions are identified as critical, high priority and priority maintenance activities, respectively. Priority 3 and above are deemed as minor, but documentation-worthy deficiencies which do not need to immediately be addressed. All structures in PennDOT's inventory are inspected in this manner.

With the exception of the concrete deck repair item, all of the work listed in the above comment was rated priority 3 or above, indicating that the actions were minor but documentation worthy. It is likely that the repair of the concrete deck was deferred due to the fact that a project to address the major deficiencies of the bridge was already planned in 2010 which, at a minimum, would include complete replacement of the superstructure including the bridge deck.

Claims that PennDOT performed no maintenance of this structure are also untrue. Maintenance records for this bridge indicate that between 2005 and 2011, maintenance work for the bridge continued including repairs to bridge parapets, repointing of masonry, sealing of the deck joint, bituminous repair work, concrete deck repair and repair of a wingwall.

Regarding the claim that the weight limit was never lowered up until the closure of the bridge in 2011, based on findings during inspection a load capacity analysis of each bridge is performed. Based on this analysis for the Headquarters Road bridge, the bridge was posted for a reduced weight of 19 tons on February 7th, 2006. This posting was later further reduced to 10 tons on May 11th, 2010. It is clear that significant deterioration of the structure has occurred over time.

COMMENT #3: **Existing Substandard Geometric Conditions**
The report's statement – *"Safety issues associated with the existing roadway configuration and bridge are listed below that, if maintained, would require design exceptions. Many of the alternatives are not able to fully address these existing substandard criteria. These substandard geometric conditions must be considered when evaluating the service life and safety benefits of the alternatives explored during preliminary engineering."* – without noting that this statement applies to the majority of the roadway system in Tinicum Township is misleading.

Most of Tinicum's roads follow steam (sic) valleys and were first established by the Native American population that preceded the area's settlement. Narrow, twisting roads with cliff walls and stream channels adjacent to them are a fact of life here. There is no way the roadway system could be (or should be) brought to meet PennDOT's standards.

Tinicum also has the largest collection of Covered Bridges in the state. None of these bridges comply with PennDOT's design requirements.

The majority of bridges in Tinicum are single-lane bridges, and expected to remain so.

The 1841 Uhlerstown–Frenchtown Bridge over the Delaware River, owned and operated by the Delaware River Joint Toll Bridge Commission, is only 16’ 6” wide. The bridge handles two-lanes of traffic with over 4,000 vehicle trips per day.

The project is located in a historic region with a multitude of historic structures and roadway alignments that don’t and should not be expected to meet PennDOT’s modern standards. In this context the most appropriate outcome is the preservation and rehabilitation in place of this historic bridge.

RESPONSE #3: We agree that many roads in Tinicum Township do not meet current PennDOT safety criteria. While PennDOT has no plans to address safety issues with all of the roads in Tinicum Township, when state or federal funds are used for a project, such as Headquarters Road Bridge, PennDOT must adhere to applicable design criteria and make every reasonable effort to address site-specific safety issues. While meeting the required design criteria is not always possible due to various site restrictions, ignoring site safety issues which could reasonably be remediated is not acceptable engineering practice. While Tinicum Township contains many steep, winding roadways, this is not appropriate justification to ignore the safety issues present at the Headquarters Road Bridge.

COMMENT #4: **Conclusion**
This report, like every effort by PennDOT since the project’s inception back in 2005, is an attempt to force a two-lane bridge where it is not needed, wanted nor fiscally prudent.

This report twists facts and ignores context in truly breathtaking ways.

PennDOT, it’s (sic) agents and consultants, have been consistently disingenuous in their presentations and reports about this bridge project.

In fact – I would say they are disingenuous with information about all their bridge projects in District 6-0.

RESPONSE #4: Thank you for your comment. While we disagree with your assertion that PennDOT and its consultants have been disingenuous, your opinions have been noted.

CONSULTING PARTY: Maya K. van Rossum, the Delaware Riverkeeper (December 15, 2015)

COMMENT #1: The facts laid out in the introduction and other portions of the report fail to provide critical and accurate information. For example, the report fails to articulate the Exceptional Value status of the Tinicum Creek or its inclusion in the Wild & Scenic Rivers program, both of which heighten the level of protection and regulatory requirements that must be complied with. In addition, the report totally misrepresents the accident data that PADOT collected from Tinicum Township, manufacturing a concern about safety issues associated with rehabilitation of the existing one-lane structure. Furthermore, the report continues to assert safety issues associated with the structural status of the piers despite evidence provided by McMullen

Associates and the examination of the borings undertaken by PADOT, both of which demonstrate the contrary.

RESPONSE #1: PennDOT is conducting the environmental and cultural resource studies for this project in accordance with all applicable state and federal regulations. Coordination with PADEP, Army Corps of Engineers, and National Park Service will continue due to the stream's Exceptional Value and Wild and Scenic River designations. Regarding your statement about accident data, see Tinicum Township response #1 on page 11. Although McMullan and Associates have failed to provide a signed and sealed recommendation by a licensed engineer, the McMullan rehabilitation concept was reviewed by the Department and Urban Engineers. It is the professional engineering opinion of Urban Engineer's that the McMullan proposal will not result in a structure which meets the purpose and need of the project. Sample rehabilitation projects provided by McMullan included non-highway bridges that carry only pedestrian traffic or stone masonry arch bridges that are currently load-posted for 6-tons.

COMMENT #2: As PADOT's report states, "AASHTO 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." There is no site specific safety problem that mandates widening of the Headquarters Road bridge – PADOT's claims to the contrary are knowingly false. While PADOT has deliberately shielded the crash data upon which it relies from public view, the Delaware Riverkeeper Network has secured the information from other public sources and was able to confirm that the historic width of the bridge has not in fact presented a safety hazard. In fact, most of the crash data PADOT has relied upon in order to make this false assertion of a hazardous condition consisted of accidents that didn't even involve the bridge, let alone its width.

RESPONSE #2: Please see the Response #1 on page 11, Response #2 on page 14 and Response #3 on page 16. Crash data, due to its sensitive nature, is not considered public information. Furthermore, the concrete barriers were added to the bridge only after a vehicle impacted the bridge railing, which demonstrates the potential hazard of a narrow, one-lane bridge and its susceptibility to damage from long vehicles (e.g., landscaping trucks, low-boys, moving or delivery trucks, emergency vehicles, and buses).

COMMENT #3: Expert analysis demonstrates that the Alternative 6 series PADOT considered are the options with the most deleterious impacts on the stream and stream hydraulics. This means they are also the most damaging to downstream communities and ecological systems. In their rush to the pre-determined outcome they desire, PADOT's truncated review process fails to consider the very important water quality, erosion, and flooding impacts that could result.

RESPONSE #3: PennDOT is considering water quality, erosion, and flooding impacts. Removing a pier from the waterway was considered by the design team to be an improvement to the downstream communities and ecological systems. The existing short spans with two piers in the channel contribute to the potential of contraction scour due to its susceptibility to debris accumulation during flood events. This can be seen by the bars of stream bed material deposits immediately downstream of the bridge and the scour hole at the west abutment. A greater opening will reduce the potential for further removal of stream bed sediment from the channel.

Previous water surface elevations shown on the elevation views of the alternatives should be disregarded. They were based on earlier H&H studies and were not updated for all alternatives presented in the Determination of Effects Report.

COMMENT #4: While the various alternatives put forth include a section with the subheading "Environmental and Cultural Resource Impacts" the information included in this category is extremely sparse in terms of environmental and cultural considerations. In addition, the information provided varies in scope and detail from alternative to alternative, providing no basis for comparison between the options.

RESPONSE #4: This comment was addressed in a response letter to SHPO.

COMMENT #5: The Project alternatives all fail to consider environmentally beneficial strategies for addressing common problems across alternatives, such as the stream scour that happens around instream piers. In every instance PADOT suggests additional hardening protections around the piers which are detrimental to the aesthetics and historic integrity of the structures being considered and exacerbate environmental damage rather than mitigating, minimizing and avoiding harm. The Delaware Riverkeeper Network has repeatedly urged consideration of natural channel design strategies that could avoid and mitigate scour that result around and from the piers, and yet nowhere in this document or others does PADOT ever give this beneficial approach any consideration.

RESPONSE #5: See previous Response #6 on page 4.

COMMENT #6: Removal of the Headquarters Road Bridge and its impacts on the Ridge Valley Historic District are sorely understated by PADOT because, once again, PADOT views this destruction/construction project as a project in a vacuum. In fact, PADOT has been pursuing a systematic effort to remove and replace (with new construction) a series of historic bridges in Tinicum Township; the collected impact is far greater than the effect of each project independently. PADOT needs to do a comprehensive impact review of all of its bridge projects – past, proposed, and anticipated – on the Ridge Valley Historic District and the environment.

RESPONSE #6: It is not true that PennDOT is "pursuing a systematic effort to remove and replace (with new construction) a series of historic bridges in Tinicum Township". A comprehensive impact review is beyond the scope of this project.

COMMENT #7: PADOT continues to fail to follow regulatory guidance to ensure the most efficient and appropriate decision-making process and outcome. PADOT's continuing failure to adhere to applicable guidance on the process, as evidenced by this most recent report, is further evidence of its goal to reach a pre-determined outcome rather than a well-informed and most beneficial outcome.

- PADOT should coordinate the NEPA and Section 106 reviews in order to encourage public participation in the Section 106 process, and accurately assess the impacts to all cultural and natural resources. The Section 106 implementing regulations strongly

encourage this coordination (36 C.F.R. § 800.8(a)(1)); and the Advisory Council on Historic Preservation and the Council on Environmental Quality have published a handbook on NEPA and Section 106 integration.

- In addition, PADOT should coordinate the Section 106 review with the Section 4(f) review, because the Section 4(f) process can greatly affect the outcome of the Section 106 process. The agency should familiarize participants in the Section 106 process with the mandates of Section 4(f) so that all project participants will understand how 4(f) will influence the project decisions.

RESPONSE #7: PennDOT continues to concurrently coordinate the NEPA, Section 4(f) and Section 106 processes as well as the other applicable federal and state regulations.

COMMENT #8: PADOT's report uses every opportunity to try to skew the picture it paints. For example, Table 4 provides detailed bullet points of early meetings about the project, but fails to include a similar level of detail in the most recent set of meetings— where a significant amount of expert data has been brought to bear on the discussion and there were well-informed requests for consideration of a rehabilitation alternative. Examples of omissions that help demonstrate this point are (1) at a meeting of the Tinicum Township Supervisors on March 1, 2011, the Township rejected the chance to own a new fake-historic, one lane bridge with no funding from the state; (2) in apparent reaction, PADOT crews closed the bridge permanently the next day, on March 2, 1011 ; (3) dates of the multiple meetings where the Delaware Riverkeeper Network urged an appropriate combined section 106 and NEPA process; (4) the multiple meetings where members of the public spoke firmly for restoration of the historic structure and expert reports and materials were brought forth to support the appropriateness and achievability of this request.

RESPONSE #8: The meeting minutes for the Section 106 consulting party meetings are included on ProjectPATH. Table 4 is a summary of public and public official meetings, not Section 106 meetings. Due to the impact to the surrounding community, PennDOT takes the decision to close a bridge very seriously. Over the course of the life of the Headquarters Road Bridge, repairs were made when possible to keep the bridge open. The bridge was closed due to a large hole that developed in the deck which could not be repaired. The March 1 and 2, 2011 dates were included in the timeline of events dated January 17, 2014 and distributed to the consulting parties on January 24, 2014.

COMMENT #9: In the report discussion, PADOT states that there has been "coordination" with other regulatory agencies, suggesting that they have been involved in the review and design of alternatives. Right to Know and Freedom of Information Act documents, however, do not support such a characterization.

RESPONSE #9: As this project site is characterized by numerous environmental designations (Exceptional Value and Wild & Scenic River), PennDOT has and will continue to coordinate closely with State and Federal agencies with jurisdiction over those resources.

COMMENT #10: With respect to Section 9.0, Application of Definition of Effect and Criteria of Adverse Effect:

- COMMENT #10A: The Report notes, "The project results in a permanent change in use of approximately 0.014 of the 575 acres (0.002 percent)" (p. 45). While this math may be accurate, the statistic appears to be designed to understate the impact of losing this 200-year-old Bridge, one of the last of its kind. This statistic is also misleading because it includes only land within the Historic District (see p. 46). The Bridge, which crosses over Tinicum Creek, presumably is not included in that acreage.
- RESPONSE #10A: The statistic is used to show the amount of land that will be impacted within the historic district. Correct, the bridge is not included in the overall acreage impacted but was identified as a contributing structure impacted by the project.
- COMMENT #10B: The Report also states that "There will be permanent land acquisition from two contributing properties within the historic district" (p. 45). The Report does not reveal that the affected landowners have indicated they will not agree to an easement for a 2-lane bridge. FHWA and the Consulting Parties should be aware of this challenge; it may influence the outcome, in light of the high costs typically involved in eminent domain proceedings.
- RESPONSE #10B: Conversations with the landowners regarding potential property acquisition and temporary use will occur as part of the right-of-way process, not the Section 106 process.
- COMMENT #10C: PADOT admits in a footnote on page 47 that the removal and replacement of the Bridge will adversely affect the Ridge Valley Rural Historic District. PADOT goes to say, however, that the removal and replacement "will not cause the historic district to be delisted from the National Register." That decision is the Keeper's to make, not PADOT's. PADOT cannot state with certainty that the Bridge's removal will not cause delisting of the District. It is important to note that PADOT is targeting a growing number of the historic bridges in Tinicum for destruction and replacement. As more and more bridges are destroyed, the many designations, historic and environmental (such as Wild & Scenic), become increasingly at risk from the individual and cumulative harm.
- RESPONSE #10C: PennDOT will request that the SHPO comment on whether this project would result in the delisting of the historic district.
- COMMENT #10D: Finally, the Report says, "The new structure will incorporate design elements that will complement and blend with the historic district's setting" (p. 47). PADOT has proved many times that it is unwilling or unable to honor this promise. Many local residents and Consulting Parties have personally witnessed PADOT's failure to consider Bucks County's rural and historic setting when rebuilding a bridge. In fact, experience with PADOT has been that it doesn't even implement the construction and design practices committed to in advance of construction, such as reuse of stone or fundamental designs. For example, the construction of the bridge at Cafferty Road bore no resemblance to the much less intrusive design PADOT committed to before demolition.
- RESPONSE #10D: PennDOT will continue to coordinate with the consulting parties and other stakeholders on mitigation measures. Please reference the November 2013 Consulting Party meeting minutes in which Mr. Rob Reynolds notes that the Geigel Hill Road Bridge is an example of context sensitive treatments of historic bridges and calls for the same sympathetic treatment for the Headquarters Road Bridge.

COMMENT #11: In addition to the above concerns, the Delaware Riverkeeper Network submits the attached reports to expand upon and support these comments.

RESPONSE #11: Please see individual responses received from your consultants' reports.

CONSULTING PARTY: Dr. John Salerno (December 16, 2015)

COMMENT #1: I participated in the 106 meetings in 2006 regarding this bridge project. As part of this process, it was agreed by PennDOT to rehabilitate/replace the bridge as a one lane structure. Tinicum Township would have taken ownership of the bridge with a substantial maintenance fund provided by PennDOT. Ultimately the funding offer was withdrawn. Had that not occurred, this ONE LANE bridge project would have been completed. So how is it possible that PennDOT now considers rehabilitation/replacement as a one lane structure as the least desired option?

RESPONSE #1: PennDOT agreed to construct a one-lane bridge at that time, despite related safety concerns, if Tinicum Township would take ownership and maintenance responsibility of the bridge.

COMMENT #2: It is also my understanding that the decision to close the bridge in 2011 was related to deck deterioration which was the result of a lack of maintenance by PennDOT. If this deck issue had not developed, it appears likely that the bridge would have remained open.

RESPONSE #2: Due to the impact to the surrounding community, PennDOT takes the decision to close a bridge very seriously. Over the course of the life of the Headquarters Road Bridge, repairs were made when possible to keep the bridge open. The bridge was closed due to a large hole that developed in the deck which could not be repaired.

COMMENT #3: It is my opinion that PennDOTs indiscriminate policy of replacing one lane bridges with two lane structures needs to be called into question. There are site specific safety issues, environmental impact issues, and historical issues that need to be considered in the rehabilitation/replacement of these bridges. I have been here long enough to see PennDOT replace a one land bridge with a two lane bridge further east on Headquarters Road which include eliminating a natural traffic calming S curve. The results of this project created a dangerous speedway making it difficult to accept representation by PennDOT that this is acting in the best interests of safety. Replacing the Headquarters/Sheephole bridge with a two lane structure would eliminate the natural traffic calming affect that a one lane structure provides. Rather than creating a safer stream crossing it would make for a more dangerous situation as cars could enter the bridge at the same time. The eastbound approach involves a significant curve which limits site line to the bridge. A two lane structure will likely increase the speed at which cars travel through this area making accidents more likely. It is my understanding that the accidents which have occurred in the vicinity of this one lane bridge have been misrepresented by PennDOT to support an argument that the one lane structure is not as safe an alternative as a two lane replacement. Replacement with a two lane structure would also allow larger truck traffic which would also decrease the safety of the roadway. The steps from my main house exit into the roadway. My guesthouse is directly on the opposite side and within a few feet of

Headquarters Rd. My wife has Multiple Sclerosis and uses a walker to navigate. My young grandchildren live with us in my guest house. The positioning of the guest house, the natural curvature of the road, and narrowness of the road create site line issues. Beside my concern for the safety of anyone travelling in this area, the safety issue is quite personal to me. I have no doubt that a two lane structure would increase the travel speed in both directions and allow for the increase of larger truck traffic creating a safety nightmare.

RESPONSE #3: As part of all of PennDOT's projects, impacts to environmental and cultural resources must be balanced with meeting the projects' purpose and need. The replacement of the bridge, if required, is not expected to result in an increase in vehicular traffic because of geometric deficiencies and a lack of a connection to Route 611 and Route 32. For additional detail see response to Comment C (page 3 of 43) in the Comment Response Document dated September 10, 2013, which is attached to Appendix A.

COMMENT #4: Alternative 3 is the safest option, least costly option, most historically sensitive option, would have the least amount of environmental impact, would guarantee that Headquarters Rd would not become a larger truck route, and could be completed in the least amount of time.

RESPONSE #4: We disagree with your summary of Alternative 3. Alternative 3 does not improve the site-specific safety issues. Extensive reconstruction of the existing substructure units occurs with Alternative 3, and as such, in-stream work is anticipated. The piers remain in Alternative 3; these impact the creek's free-flowing nature. The two piers in the channel would continue to cause debris accumulation during high flood events, which would lead to continued scouring of the stream bed around the piers and abutments impacting water quality. Alternative 3 will have an Adverse Effect to the Ridge Valley Rural Historic District due to the superstructure replacement of the Headquarters Road Bridge. While the initial costs for rehabilitation are expected to be less than the initial costs for replacement, life cycle costs will be greater with rehabilitation, as regular maintenance would be required to preserve the original stone material in the substructure.

COMMENT #5: In the Determination of Effects report is it cited on page 15 that "AASHTO states that existing bridges can remain in place without widening unless there is evidence of a site-specific safety problem relating to the bridge." In the case of this bridge project, the site-specific safety problem relates to a two lane structure.

RESPONSE #5: 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. Please see previous response to Comment #1 on page 11.

Appendix A

HEADQUARTERS ROAD (S.R. 1012, SECTION BRC) BRIDGE OVER TINICUM CREEK
TINICUM TOWNSHIP, BUCKS COUNTY, PA (MPMS 13716)

Responses to Consulting Party Comments Received by July 30, 2013
Document dated September 10, 2013

General Responses to the Most Frequently Submitted Topics

A. The Consulting Party meetings should be videotaped

Response: *A request has been made by several individuals to record (video and audio) the Section 106 consulting party meetings. Section 106 requires Federal Highway Administration (FHWA) to involve consulting parties (as defined by the regulation 36 C.F.R. Part 800) in findings and determinations made during the Section 106 process. Consultations shall be appropriate to the scale of the project and scope of federal involvement. 36 C.F.R. § 800.2 (a)(4). The goal of consultation is "to identify the historic properties potentially affected by the undertaking, assess its effects and seek ways to avoid, minimize or mitigate any adverse effects on historic properties." 36 C.F.R. § 800.1(a). Consulting parties need to maintain confidentiality on shared information that might cause a significant invasion of privacy or risk harm to a historic resource. See Page VI-3 of PennDOT's Cultural Resource Handbook, Publication 689. For example, locations of Archeological sites are confidential and not disclosed to the public. Consulting party meetings are not public meetings – only consulting parties are notified of meetings – no advertisements are placed in the local newspapers notifying the public of the consulting party meetings. Finally, the Department has an interest relative to the Section 106 consulting parties meetings to foster candid discussion and the free flow of information between the Department, FHWA, and the consulting parties. Recording the meeting has the potential to expose confidential information and may have a chilling effect to the discussions which is contrary to the purpose of the meetings.*

The Pennsylvania Wire Tap Law, 18 Pa.C.S. § 5703, provides that "a person is guilty of a felony of the third degree if he… intentionally intercepts, endeavors to intercept, or procures any other person to intercept or endeavor to intercept any wire, electronic or oral communication." 18 Pa.C.S. § 5702 defines "intercept" as: "[a]ural or other acquisition of the contents of any wire, electronic or oral communication through the use of any electronic, mechanical or other device. Further, section 5702 defines "oral communication" as: "[a]ny oral communications uttered by a person possessing an expectation that such communication is not subject to interception under circumstances justifying such expectation." It is clear that the legislature intended the interception of oral communication via video recording device to fall within the purview of section 5703.

Based on the expectation of confidentially under the Section 106 process and other applicable laws and the fact that these meetings are not public meetings, video and audio taping will not be permitted.

B. The Purpose and Need Statement is deficient as it does not include preservation of the existing bridge.

Response: *The Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) (49 U.S.C. 5317) "requires a clear statement of identified objectives that the proposed project is intended to achieve for improving transportation conditions. The objectives should be derived from needs and may include, but are not limited to, the following outlined in SAFETEA-LU:*

- *Achieving a transportation objective identified in an applicable statewide or metropolitan transportation plan;*
- *Supporting land use, economic development, or growth objectives established in applicable Federal, State, local, or tribal plans;*
- *Serving national defense, national security, or other national objectives, as established in Federal laws, plans, or policies."*

The intent of the Purpose and Need statement is not to select an alternative; rather it is a clear statement of the objectives that the proposed project is intended to achieve and serves as the basis for the development of the criteria which will be used to eventually select an alternative.
The current purpose and need for the Headquarters Road project reviews the deterioration of the structure over time, describes the condition of the superstructure and substructure, and details the geometric deficiencies of the bridge and its approach roadway. It also gives background information on the use of the bridge including traffic count information and specifies that emergency service vehicles, including those used by the fire department, use the bridge.

The chosen alternative must meet the purpose of the project "…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, public utilities and emergency services of the surrounding area" and address the needs which are outlined as followed:

- *The bridge is structurally deficient*
- *The bridge is functionally obsolete*
- *The retaining walls exhibit failure*
- *Due to the existing structure's geometry and limited roadway width, it cannot safely and effectively accommodate current and future traffic needs including emergency response vehicles.*
- *Heavy scour exists along the western abutment resulting in the exposure of the bridge foundations and an increase in the structures vulnerability to further deterioration.*

Although not part of the purpose and need, the preservation of historic resources is considered during the Section 106, Section 4(f) and NEPA processes. See response to Question 1.b.1 in Specific Comments section below. The purpose and need will be discussed further at the next consulting party meeting.

C. Providing a two lane bridge will increase traffic on Headquarters Road, development, water and noise pollution

Response: *The replacement of the bridge, if required, is not expected to result in an increase in vehicular traffic because of existing geometric deficiencies and there is no direct connection to Route 611 and Route 32 (River Road). Large trucks will likely continue to avoid using Headquarters Road despite the lifting of the load posting limits because of the steep approach grades immediately to the west of the bridge and the tight radius curves to the east. The National Truck Network (refer to PennDOT Publication 411, ftp://ftp.dot.state.pa.us/public/PubsForms/Publications/PUB%20411.pdf), authorized through the Surface Transportation Assistance Act of 1982, was established as a network of highways for large trucks to access interstate highways. These roads must meet certain geometric requirements for safe operations (sight distance, minimum grades, pavement width, clearances, and intersection geometry). Headquarters Road and River Road are not listed on this network.*

While the project has the potential impact to the Exceptional Value Tinicum Creek, it is not a Section 106 issue. Coordination with the Pennsylvania Department of Environmental Protection (PADEP) and the Army Corps of Engineers (ACOE) will take place later in design as part of the waterway permit application process to determine potential impacts to water quality and to mitigate these impacts.

D. PennDOT should rehabilitate existing masonry abutments and piers to carry new substructure

Response: *Based upon Urban's professional opinion and the opinion of other Pennsylvania-registered consulting engineers and local stone masons, the existing piers, abutments and walls would require extensive reconstruction due to the evidence of movement (e.g., sliding, bulging, stone displacement) throughout the structure. This would involve removing the deformed and distorted portions of the wall and fill material, then laying new courses, adding new core material, and pointing. External reinforcement would also be required to provide ductility and added resistance to horizontal forces (i.e., lateral forces such as braking forces, wind on structure, hydraulic forces during floods, seismic forces). This would involve removing large portions of the historically significant structure and replacing it with a modern replica of the original stone masonry. According to the Secretary of the Interior's Standards for Rehabilitation, when deterioration is so extensive that repair is not possible, replacement with a compatible substitute material that conveys the same visual appearance may be considered. Considering the use of stone masonry on roadway infrastructure has not been considered prudent over the past 100 years (since the advent of Portland cement and reinforced concrete) due to its poor durability, difficult methods of construction, and*

need for extensive routine maintenance, Urban would recommend the use of a reinforced concrete core with a stone facing to replicate the finish of the existing bridge.

The 2006 Existing Structure Condition Evaluation Report was conducted to determine if the existing bridge could be rehabilitated to meet the project purpose and need. Due to the advanced deterioration, distortion, and localized failure of the existing substructure units, the rehabilitation of the existing bridge was not deemed prudent in the 2006 report. AASHTO's Guidelines for Historic Bridge Rehabilitation and Replacement was used as a reference when evaluating preservation, as well as PennDOT's Design Manual – Part 4, which states that a rehabilitation of an existing substructure must provide a design service life of 40 to 50 years. Considering the evidence of prior substructure failure (base sliding, bulging, cracked stone courses), this service life is not considered possible through rehabilitation.

Furthermore, considering the size of PennDOT's bridge inventory, the agency must consider Life Cycle Costs when assessing a project from a cost perspective. Initial costs for rehabilitation are expected to be less than the initial costs for replacement. However, life cycle costs will be greater with rehabilitation, as regular maintenance would be required to preserve the original substructure. Also, the existing substructure has a finite life expectancy, and full replacement at a later date (possibly due to further collapse at a later date) has to be included in the projected future costs associated with rehabilitation. The Delaware Riverkeeper Network's rehabilitation alternative provides for a reuse of the substructure. Regarding the existing substructure's adequacy, the actual load capacities cannot be confirmed without a full scale load test, which is not practical in this case. Considering the evidence of localized failure and distortion presented in the June 2013 Section 106 meeting, there is not ample evidence to indicate that the existing substructure units can be salvaged to be serviceable without major reconstruction and external reinforcement.

E. Were core borings collected in the project area and/or on the bridge? Was any testing completed to determine the makeup of the piers?

Response: *There were no core borings done on the bridge. A draft foundation report was prepared earlier in the project (2005), which involved soil / rock borings. However, borings through the existing stone masonry were not performed because it was potentially destructive to the existing masonry and foundations. Urban Engineers conducted their evaluation of the bridge based on non-destructive inspection methods.*

Probing of the piers was conducted, but no coring. Dowels measuring 40 inches in length were used as a nondestructive testing method. The main concern with testing was displacing stone. Clay and dirt were found to be present in the piers through this probing. A trip to the bridge in February 2013 provided supporting information as to the composition of the piers. The 2013 trip produced a photo log which was provided to the consulting parties in a June 21, 2013 transmittal.

Coring into the existing pier is not recommended since this may further deteriorate and fracture the stone courses and provide new locations for moisture to infiltrate into the core of the structures. Also, the existing bridge cannot carry the load of a truck-mounted drill rig due to the extensive deterioration of the deck and superstructure. Furthermore, the compressive strength of the stone masonry is not the issue with the load carrying capacity of the bridge; rather, the in-situ lateral capacity and bond/interlocking strengths are in question due to the evidence of localized collapse, base sliding, bulging, and stone displacement that is evident throughout the structure. Compressive strength tests on the stone courses or mortar tests will not provide justification that the existing structure can be rehabilitated to provide the required long-term durability and load carrying capacity.

F. Average daily traffic numbers need further explanation.

Response: *The daily traffic numbers, presented during the June 17, 2013 Section 106 Consulting Party Meeting Presentation and provided to all of the consulting parties via a June 21, 2013 transmittal, represent the roadway's average daily traffic (ADT). This is the volume of traffic counted on the roadway over a given time period (greater than one day but less than one year) divided by the number of days in that time period. The Delaware Valley Regional Planning Commission (DVRPC) is responsible for acquiring these traffic volumes. The portion of Headquarters Road monitored for these traffic volumes extended between Red Hill Road and Geigel Hill Road. This was typically monitored on a 5 year count cycle. In 2002, the Dark Hollow Road and Geigel Hill Road bridges were closed, which may have caused an in increase in traffic along Headquarters Road. Since the ADT in 2002 was abnormally high, the DVRPC performed an additional count the following year in 2003 to confirm this change. The ADT returned to a value more akin to what was seen prior to 2002 and so the 5 year cycle was reset with a count in 2008. PennDOT also performed independent traffic counts in 2001 (prior to the closing of Geigle Hill Road), 2008 and 2009. Those volumes were 900, 643, and 584, respectively. All traffic data exceeds the ADT threshold defined by AASHTO for Very Low Volume Roads, which is an ADT of under 400. This is also consistent with PennDOT's Design Manual – Part 2 (Highway Design).*

G. The bridge is individually eligible for the National Register of Historic Places.

Response: *The bridge was determined not individually eligible as part of the PennDOT Bridge Inventory; the findings of that inventory were concurred upon by PHMC. However, the Keeper's finding is that the bridge is a contributing element to the historic district. The U.S. Department of the Interior National Park Service Keeper of the National Register in a letter dated April 28, 2006 states the following:*

The Headquarters Road Bridge is eligible for the National Register of Historic Places as a contributing property in the National Register-listed Ridge Valley Rural Historic District.

The Headquarters Road Bridge was listed in the National Register of Historic Places on July 24, 1992, as a contributing property in the Ridge Valley Rural Historic District, Bucks County, Pennsylvania. The bridge consists of early 19th century stone abutments and piers carrying an early 20th century replacement concrete deck supported on concrete-encased steel I beams. Both its original construction and alteration occurred within the historic district's defined Period of Significance (1790-1940). The bridge is historically significant in the context of the development of the township, regional transportation, and the operation of local mills, and is of engineering significance both for its early 19th century construction and its sensitive modernization in 1919. Although the concrete deck shows signs of considerable deterioration and the deck has been altered with the removal of the 1919 railings, the bridge retains sufficient historic integrity to continue to contribute to the Ridge Valley Rural Historic District.

H. The Delaware River Joint Toll Bridge Commission (DRJTBC) is able to inspect, repoint, and maintain their bridges. The same is expected of PennDOT.

Response: *PennDOT conducts priority repairs after each biennial inspection (every two years, per NBIS standards). After every biennial inspection, Priority 1 repairs are conducted based upon the inspection report's recommendations. Crews are sent to those bridges in most need of repairs. However, defects and deterioration occur in between inspection intervals, which may lead to accelerated deterioration until repairs are able to be implemented. The DRJTBC maintains 20 bridges, some of which consist of masonry piers similar to the Headquarters Road Bridge. While the DRJTBC is responsible for 20 structures, PennDOT has over 24,000 bridges state-wide, including 6,000 bridges in the District 6-0 region alone, and does not have the maintenance staff and resources required to perform the kind of maintenance which is performed by DRJTBC.*

Inspection reports for 2006, 2008, 2010 and 2012 were provided to the consulting parties in a July 24, 2013 transmittal.

Future Agenda Items recorded by Consulting Parties on an Easel Pad:

1. Would like to videotape next meeting for the public record

   Response: *See the response to Comment A in the "General Responses to the Most Frequently Submitted Topics".*

2. Revisit purpose and need statement

   Response: *See the response to Comment B in the "General Responses to the Most Frequently Submitted Topics".*

3. Presentation by all public's experts at 2 meetings to allow enough time. And other follow-ups to dialogue on these presentations

   Response: *At this time, PennDOT acknowledges that additional meetings will be required and welcomes input from the consulting parties who wish to present opinions and studies. At the next meeting, Urban Engineers will finish its presentation and others will be invited to present on the structural concerns of the bridge and the ability to rehabilitate the bridge (PADEP, McMullan & Associates, and other consulting parties). The exact number of future meetings has not been determined.*

   The 2006 Existing Structures Condition Evaluation Report was presented at the June 17, 2013 meeting. This presentation will be concluded at the next consulting party meeting. Consulting party input on this report and its findings was requested. The next phase will evaluate alternatives, and a Determination of Effect Report will be prepared; consulting party input will be requested. Following the Effect Report, if an adverse effect is determined, a meeting will occur to discuss mitigation and the Memorandum of Agreement. If a consulting party would like to provide expert opinions or other comments or would like to present during an open forum during the next consulting party meeting, we encourage you to submit a request in writing. Please address all comments and requests to Colleen Meiswich, A.D. Marble & Company, 375 East Elm Street, Suite 101, Conshohocken, PA 19428. Due to limitations on time, presentations will be made on a first come first serve basis.

4. Riverkeeper Consultant Presentation

   Response: *The Delaware Riverkeeper Networks' consultant, McMullan & Associates, will be asked to present the findings of their 2012 report entitled "Preliminary Condition Assessment and Proposed Rehabilitation" at the next Consulting Party Meeting.*

5. Hydraulic calculations used for examining alternatives was not clearly presented. Data was important and possible incorrect assumptions made.

   Response: *While this is not a Section 106 issue nor is this included in the purpose and need, it will be addressed during the Chapter 105/Section 404 permitting process. The goal of consultation is "to identify the historic properties potentially affected by the undertaking, assess its effects and seek ways to avoid, minimize or mitigate any adverse effects on historic properties." (36 C.F.R. § 800.1(a)). Hydraulic calculations at this early phase of the engineering design process are considered preliminary and will not be made*

final until later in design. Final H&H calculations will be reviewed and approved through the Chapter 105/Section 404 permitting process.

6. Schedule time to hear from the consulting parties. There are a lot of issues that need to be heard.

   Response: *See response to Comment 3 above. Time will be allotted for input/presentation by individual consulting parties.*

7. Get Kathryn Auerbach on the agenda. She is an extremely knowledgeable bridge expert.

   Response: *See response to Comment 3 above.*

Parking Lot issues recorded by Consulting Parties on an Easel Pad: *To clarify, the Parking Lot is not a listing of topics to be discussed at future consulting party meetings. These are issues that do not pertain to Section 106.*

1. Address indiscriminate PennDOT policies to replace one lane bridges with two lane bridge (historic/EV Stream/Safety perspectives)

   Response: *PennDOT does not have a policy to indiscriminately replace one lane bridges. PennDOT policies are based on nationwide studies of what is needed for safety of travelling public. According to PennDOT's Design Manual – Part 2 (Publication 13M – Highway Design), the minimum bridge width for a reconstructed bridge (superstructure replacement or bridge replacement) is 28-feet when the ADT is between 401 and 1500. If the ADT was below 400, the minimum bridge width would be 24-feet. It states that when ADT is below 250, the bridge width can be reduced to 22-feet, as long as the bridge width is not less than the approach roadway width. AASHTO's Guidelines for Geometric Design of Very Low Volume Local Roads permit one-lane bridges when the ADT is less than 100. PennDOT's Design Manual – Part 2 also permits that the bridge can be replaced at the same width as the existing structure only when the ADT is less than 400 and there is no evidence of a safety problem. In the past 10 years, there have been 10 recorded accidents at the bridge location.*

   PennDOT is tasked with maintaining nearly 25,000 State owned bridges across the Commonwealth of Pennsylvania. Typically, bridges are inspected bi-annually until their condition worsens to a point where annual inspection is required. When a structure degrades to a point where major deterioration has occurred to one or more of its major components, it is said to be "Structurally Deficient". The Headquarters Road Bridge is structurally deficient and qualifies for Federal Funding for rehabilitation or replacement.

   As noted above, PennDOT will only build and maintain a single lane structure if the ADT is less than 400 or if the funding being used prohibits in some way the replacement of a single lane bridge with a two lane structure. PennDOT's Publication 13M (DM-2) Chapter

1- General Design "General Bridge Width Table Notes" Note (m) (page 1-39) is the source for this reference. The reason for the standards is the safety of the travelling public. PennDOT will build a single lane structure if an agreement is made whereby the municipality takes ownership of the bridge after construction and assumes responsibility for future maintenance costs associated with ownership and liability. This is called a "turn-back" agreement. In March of 2011, Tinicum Township issued a letter to PennDOT outlining their decision that they would not take ownership of a single lane structure at the Headquarters Road bridge location.

"Information Needed" recorded by Consulting Parties on an Easel Pad:

1. Copies of all records, documents, data, reports, memos, letters, emails, correspondence, pictures, graphs and/or any or all documents created for, received about, in reference to or otherwise in the possession of the agencies about this project.

   Response: *During the June 17th Consulting Party meeting, attendees requested to review information used to develop the Purpose and Need Statement as well as inspection and maintenance records among other items. To date, PennDOT has responded to the requests of the consulting parties by releasing the following information:*

   In a package dated June 21, 2013 the following information was sent to consulting parties:

   - *Travel Monitoring Data (2001-2008) from PennDOT & DVRPC used in the creation of the Purpose and Need statement.*
   - *November 2006 Existing Structure Condition Evaluation Report prepared by Urban Engineers to assess the feasibility of rehabilitation of the existing substructure.*
   - *February 2013 Photo Log prepared by Urban Engineers*
   - *June 17, 2013 Consulting Party Meeting PowerPoint*

   In a package dated July 24, 2013 the following information was sent to consulting parties:

   - *Summary of Section 106 review for the Headquarters Road Project to date including the following documents:*
     - *April 6, 2005: Environmental Scoping Field View Meeting notes*
     - *May 9, 2005: Meeting minutes for the first public officials meeting*
     - *September 6, 2005: Meeting minutes for the public meeting and second public officials meeting*
     - *April 28th, 2006: Determination of Eligibility Notification by the Keeper of the National Register of Historic Places*
     - *August 14, 2006: Meeting minutes for the first Consulting Party Meeting*
     - *October 20, 2006: Meeting minutes for the second Consulting Party Meeting*
     - *June 16, 2006: Meeting minutes for the third public officials meeting*

    - *June 17, 2008: Meeting minutes for the public meeting*
    - *June 31, 2008: Meeting minutes for the third Consulting Party Meeting*
    - *July 12, 2013 updated list of consulting parties*
  - *Inspection reports for 2006, 2008, 2010 and 2012*
  - *Maintenance Records from 2005 to 2011*
  - *April 2009: Turning Radius Study completed by Urban Engineers*

While we were able to provide this information in response to specific requests by the consulting parties, more general requests to review the entirety of the project file will need to completed by filing a Right-to-Know request (see Response for Comment 5 below).

2. To receive and review everything in the project file. 60 days to receive and comment upon them and opportunity for additional review and comment as needed without prejudice

   Response: *See the response to Comment 1 above and the right-to-know request requirements detailed below in Comment 5.*

3. Revisit purpose and need

Response*: See the response to Comment B in the "General Responses to the Most Frequently Submitted Topics". The purpose and need will be discussed further at the next consulting party meeting.*

4. Updated historic form

Response: *PennDOT has requested a copy of this information from PHMC.*

5. Right-to-know requirements

Response: *Right-to-Know requests can be made in writing by submitting either a letter or PennDOT's Right To Know Law (RTKL) request form to PennDOT in person, via email to PENNDOT-RightToKnow@pa.gov, or by U.S. mail or fax as indicated in the instructions to the RTKL request form. The Right-to-Know request form can be found at the following address: ftp://ftp.dot.state.pa.us/public/PubsForms/Forms/Os-100.pdf. Draft documentation and pre-decisional information is not provided through the RTKL process since the documentation is in draft mode and may change. The Right-to-Know requests received from the Delaware Riverkeeper Network were responded to on the following dates: November 1, 2012; November 7, 2012; and December 27, 2012.*

Specific Responses to Comments

1. Maya K. van Rossum, the Delaware Riverkeeper Network. 925 Canal Street, Suite 3701, Bristol. Letter dated June 17, 2013.
    a. Removing and replacing the Headquarters Road Bridge with a two lane, modern structure, as is being myopically pursued, will increase environmental harm, including to the high quality waters, flows and habitats of the Tinicum Creek; it will diminish the ecological and historic attractiveness of the community which currently is a draw for visitors from all over the country bringing economic benefits to our community; it will result in a loss of this country's history that can never be replaced; and it is likely to undermine the Wild & Scenic designation granted to the Lower Delaware River which provides an important layer of recognition and protection that we can ill-afford to lose. The Headquarters Road Bridge, along with other historic bridges of Tinicum Township, comprise a rare and irreplaceable asset that help support an environmentally friendly economy (ecotourism, etc.). It is critical that transportation project decisions do not erode this asset."

    Response: *While these issues are not Section 106 issues, they will be addressed during permitting or through the NEPA process. As noted above, the goal of consultation is "to identify the historic properties potentially affected by the undertaking, assess its effects and seek ways to avoid, minimize or mitigate any adverse effects on historic properties." 36 C.F.R. § 800.1(a). Wild & Scenic designation (W&S) is being considered and coordination with NPS, the agency with jurisdiction over the Wild & Scenic River status, is occurring. Any work on the bridge, whether rehabilitation or replacement, will be subject to the environmental regulations established and enforced by the PADEP and Bucks County Conservation District. As previously presented to the Section 106 Consulting Parties and the Township, if a replacement structure is required, then the plans presented for a replacement structure will be consistent with the existing bridge's aesthetics in order to fit into the surrounding historic district. Additionally, a replacement structure, if required, has the potential to improve the stream hydraulics by adjusting the bridge location with respect to the meandered Tinicum Creek.*

    b. "PennDOT, on behalf of the Federal Highway Authority, has failed to conduct an objective, well rounded, informational supported assessment of the Headquarters Road bridge project including, but not limited to: and having arrived at a final determination for this project before engaging in the require historic and environmental reviews that should be informing the decision not being used as mere check-offs after a decision has already been made."

1. "…there has not been appropriate consideration of options for accommodating the traffic needs PennDOT asserts, including alternative travel routes for through traffic;"

Response: *The purpose of this project, as described in the Purpose and Need statement, is to provide a crossing which is structurally sound and capable of safely and effectively handling the expected vehicular need of the public, public utilities and emergency services. The structure, whether rehabilitated or replaced, must meet the criteria of the purpose and need statement. The Existing Structure Condition Evaluation Report prepared by Urban in 2006 was commissioned at the request of the consulting parties to investigate the feasibility of rehabilitating the existing structure. Additional alternatives were not evaluated as part of this report, but will be studied as part of the Section 106 process, Chapter 105/Section 404 process, Section 4(f) process, and NEPA process.*

2. "…PennDOT has failed to use accurate information on the traffic, community, growth, environmental impacts, and historic impacts of a variety of possible options;"

Response: *The traffic information used in the Purpose and Need Statement was collected by DVRPC and PennDOT and was released to consulting parties as attachments to the June 21, 2013 Letter. The project team is aware of the Exceptional Value status of TInicum Creek, its protection under the Wild and Scenic Rivers Act as a tributary to the Delaware River, and the bridge's status as a contributing resource to the Ridge Valley Rural Historic District. The environmental impacts are being considered during the NEPA process. The chosen alternative must balance impacts to all of these resources while still meeting the purpose and need of the project. For additional information on ADT, see "General Responses to the Most Frequently Submitted Topics" response to Comment F.*

3."… PennDOT is poorly complying with the legal requirements and guidance for historic and environmental reviews including inappropriately planning for a categorical exclusion assertion from the requirements of NEPA, failing to conduct the 106 and NEPA reviews jointly as federal policy recommends, among others;"

Response: *While this is not a Section 106 issue, additional studies will be conducted under NEPA, Section 4(f) and Chapter 105/Section 404 permitting process.*

4. "and having arrived at a final determination for this project before engaging in the required historic and environmental reviews that should be informing the

decision not being used as mere check-offs after a decision has already been made."

Response: *The 2006 Existing Structure Condition Evaluation Report was conducted by Urban Engineers to determine the feasibility of rehabilitation of the existing structure. The draft findings of this report were issued to consulting parties during the second consulting party meeting in October of 2006 prior to the report being finalized in November of 2006. A final copy of this report was mailed to consulting parties.*

In March, April, and May 2013, PennDOT solicited additional consulting parties through Project Path and also received requests from individuals/organizations to be consulting parties. Due to the number of additional consulting parties currently involved, the findings and recommendations associated with this report were presented by Urban Engineers during the fourth consulting party meeting on June 17, 2013. This presentation will be completed during the next consulting party meeting in September of 2013. A final determination regarding the selected alternative has not yet been made.

c. The Delaware Riverkeeper Network would like a commitment to 6 additional Section 106 Consulting party meetings.
    i. "Two for the community to come and present our expert findings, allow for questions, and accommodate public comment (The Delaware Riverkeeper Network has several experts we have hired and so would require at least two meetings to give the necessary time for them to present their findings and answer any questions.)"
    ii. "Two for there to be dialogue between FHWA, PennDOT and the experts after each party has had opportunity to review and digest the materials that have been provided and the questions and answers that were discussed at the presentation meetings. Again, the Delaware Riverkeeper Network has hired several experts and so at least two meetings would be required to ensure adequate time for dialogue, and public comment."
    iii. "Two meetings to allow for consideration of specific topics that will arise once PennDOT has shared information with the public that we still are waiting for. PennDOT has not provided a fully copy of the current record for our review and to ensure informed discussions and participation by all consulting parties."
    iv. "In addition, we ask for immediate release of the full record associated with this project to all interested parties and that at least 60 days be provided for review and comment upon those documents."

Response: *See response to Comment 3 in the "Future Agenda Items recorded by Consulting Parties on an Easel Pad" section. Also see response to Comments 1 and 5 in the "Information Needed Easel Pad" section.*

d. "The Purpose and Need Statement is obviously deficient in that it is missing the most obvious goal: protecting the historic bridge and all historic elements in the Area of Potential Effects and the Ridge Valley Historic District. That this would not be a desired outcome of the project is inconceivable but speaks volumes to the predetermined nature of this process."

   Response: S*ee the response to Comment B in the "General Responses to the Most Frequently Submitted Topics".*

e. "The Area of Potential Effects and Consideration of Effects are too Narrow: This APE should include an area larger than simply the bridge and its approaches. A wider, new bridge will result in increased traffic on Headquarters Road and have adverse effects to other historic resources, including other contributing properties to the Ridge Valley Historic District; these effects must be identified, reviewed, analyzed and assessed. It seems that PennDOT has identified an APE that is far too narrow and has failed to consider the impacts to other historic resources, impacts to resources that must be considered in order to comply with Section 106."

   Response: *Regulation 36 C.F.R. 800.16(d) explains that the APE is defined as "the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist." The Programmatic Agreement among FHWA, ACHP, PHMC and PennDOT delegates PennDOT to act on behalf of FHWA in implementing 36 C.F.R. 800. PennDOT guidelines for determining APEs are outlined in Part III-B of the 2010 Programmatic Agreement Handbook, which is published online here:* http://paprojectpath.org/penndot-crm/publications*. Since the 36 C.F.R 800 regulations allow for "area or areas", guidelines for considering the APE for above-ground historic resources and the APE for archaeological properties are both discussed in the guidelines. The PennDOT CRP's will define the APE once the scope of work is defined.*

   i. "Without question, the project will have an adverse effect on the historic Headquarters Road/Sheephole/Burnt Mill Bridge, a contributing resource to the Ridge Valley Historic District. However, other effects must also be analyzed in the Area of Potential Effects, which have not been, including but not limited to:"
      1. "Widening the bridge from one to two lanes will have significant environmental and other historic impacts in the highly sensitive rural historic district immediately surrounding the bridge."

         Response: *Throughout development of the project, impacts to environmental and cultural resources have been and will be*

considered. Mitigation will be considered for any adverse environmental and historic impacts. For example, if a replacement bridge is required, mitigation may include, but may not be limited to, an aesthetic treatment designed to blend in with the historic and rural setting. After an alternative is chosen a Determination of Effect Report will be prepared and consulting party input requested. Following the Determination of Effect Report, if an adverse effect is determined, mitigation will be developed with the consulting parties input.

2. "Widening the one lane bridge to two lanes will result in increased traffic and traffic speeds."

   Response: *The existing speeding problems experienced in the vicinity of the project site are attributed to the high roadway grades approaching the project site from the west (grades exceed 12%). Considering a 3-way stop condition would be maintained at the intersection, the existing level of traffic calming would be maintained to slow vehicles that approach the bridge and intersection. See the response to Comment C in the "General Responses to the Most Frequently Submitted Topics" for a response to the increased traffic concern.*

3. "The induced traffic will result in secondary or cumulative impacts to the area, including but not limited to increased noise, fumes, visual impacts as well as secondary development."

   Response*: See the response to Comment C in the "General Responses to the Most Frequently Submitted Topics".*

4. "The recent PennDOT bridge replacement projects at Tettemer and Cafferty roads has invited an increase in graffiti, compounding the aesthetic harms to the historic district and inviting graffiti to other historic resources – the same would be expected if a new structure were built at Headquarters Road.

   Response: *PennDOT cannot control graffiti or other illegal activities. When notified, however, PennDOT maintenance forces do remove graffiti from State owned bridges such as the Headquarters Road bridges at Tettemer and Cafferty Roads.*

f. "Full Environmental Review Should be Undertaken, not Avoided as is Apparently Intended and Should be Coordinated with 106 Compliance: In March of this year (2013) the Council on Environmental Quality and the Advisory Council on Historic

Preservation encouraged agencies to integrate their NEPA and Section 106 reviews and to do so early in the process. However, PennDOT and FHWA appear not to be complying with this guidance, instead undertaking 106 review in a vacuum with the environmental consideration to be undertaken later."

i. "Of equal concern is that it appears as though PennDOT is poised to take the position that this project should be categorically excluded from review under NEPA as a "minor transportation" project. This classification fails to take into account that this Project could result in significant environmental impacts, is certain to have significant impacts to travel patterns, could have ramification for both Wild & Scenic designation of the Delaware River and the Exceptional Value qualities of the Tinicum Creek, is likely to have air and noise impacts to the community, and that it most certainly will have a "significant impact on properties protected by section 4(f) of the DOTA Act or section 106 of the National Historic Preservation Act," and therefore involves "unusual circumstances" that require the FHWA "to conduct appropriate environmental studies to determine if the CE classification in proper." 23 C.F.R. § 771.117(b)""

   Response: S*ee the response to Comment 1.b.3 above.*

ii. The Delaware Riverkeeper Network asserts that increasing the size of the bridge from one to two lanes will have environmental impacts to Tinicum Creek, including increased runoff and pollutants entering the creek, impact the stream flows, and will lead to degradation of water quality, erosion and sedimentation. "The Delaware Riverkeeper Network documented significant impacts to the Sundale Creek as the result of two PennDOT replacement projects and so we have recent evidence of the environmental harms that result."

   Response: *While this is not a Section 106 issue, environmental impacts will be addressed under NEPA and the Chapter 105/Section 404* permitting process. *Section 106 requires Federal agencies to take into account the effects of their projects on historic resources. The goal of Section 106 consultation is to identify historic properties potentially affected by the project, assess the effects of the project on the resource, and seek ways to avoid, minimize, or mitigate any adverse effects on historic properties (36 C.F.R. § 800.1). The stormwater runoff generated during construction will be mitigated using E&S BMPs and the additional stormwater runoff generated as a result of the project will be mitigated with post construction BMPs.*

iii. "At a minimum, an Environmental Assessment ("EA") should be prepared to assess the environmental and community impacts of the various alternatives to the project. When will this process begin?

Response: S*ee the response to Comment 1.b.3 above.*

g. "Review mandated by Section 4(f) of the Department of Transportation Act, 23 U.S.C. § 138 is being Potentially Undermined by Section 106 Review: The Section 106 regulations emphasize the need to coordinate Section 106 compliance with the review mandated by Section 4(f) of the Department of Transportation Act 36 C.F.R. § 800.3(b). We are concerned that the analysis of alternatives that will be conducted by PennDOT under Section 106 is insufficient to satisfy the FHWA's responsibilities under Section 4(f). Section 4(f) bars the FHWA from rejecting any reasonable alternative in favor of the bridge replacement if these alternatives do not cause other severe problems of a magnitude that substantially outweighs the importance of protecting the Section 4(f) property. 23 C.F.R. § 774.17."

Response: *A final alternative has not yet been selected; however, the chosen alternative must meet the Purpose and Need of the project as described in the Response B of the "General Responses to the most Frequently Submitted Topics" and will satisfy Section 4(f) regulations.*

i. "An analysis of the bridge prepared by Delaware Riverkeeper Network's experts and shared already with PennDOT and FHWA, indicates that rehabilitation of the bridge is feasible and prudent. No evidence has been provided demonstrating that the bridge cannot be rehabilitated to an acceptable level of safety, or that the costs of rehabilitation reach the levels that would permit this alternative to be rejected under Section 4(f). No supporting data has been provided to suggest that the capacity of the rehabilitated bridge is inadequate to accommodate current or projected future traffic using the most up to date and place specific data available. Until this analysis is completed, it would be premature to reject the rehabilitation alternative as part of the Section 106 process."

Response: *See the 2006 Existing Condition Evaluation Report, prepared by Urban Engineers and submitted to the consulting parties via mailing on June 21, 2013. Note that this report was also submitted to the Delaware Riverkeeper Network as a response to the Right-to-know request on December 27, 2012. The Delaware Riverkeeper Network will have an opportunity to present their consultants 2012 findings at the next consulting party meeting.*

See response to Comment D of the "General Responses to the Most Frequently Submitted Topics".

h. "Purpose and Need Document is Defective and Does Not Provide the Basis for the Replacement Option: The purpose and need document seems to be based upon flawed information and to reach conclusions that are challenged by others and so need significantly more documentation to prove."

   i. "There seems to be a dramatic overstatement in the number of vehicle trips per day for the bridge. The figures provided range from 631 to 900 vehicle trips per day. Long time residents challenge this count. Additional information is needed to fully assess the accuracy of the assertions on either side:"

      1. "Over what period was the count conducted?"
      2. "Hours and then extrapolated?"
      3. "One day or multiple days and then averaged?"
      4. "Did PennDOT do multiple counts and use the high or low or average figure?"
      5. What specific dates, day(s) of the week and time of the year was the count done?
      6. "Were other bridge and/or roads closed at the time of the count(s) and if so which ones?"
      7. "PennDOT should provide detailed reports from earlier traffic counts so that adequacy and comparability of the data can be reviewed."

Response: *For additional information on ADT, see "General Responses to the Most Frequently Submitted Topics" response to Comment F.*

   ii. "Furthermore, updated traffic data that reflects current condition (post-Headquarters Road Bridge closure) on the local network should be collected and made available – the information apparently relied upon is dated and fails to take into consideration current traffic needs and up to date, locally focused, population projections."

   Response: S*ee the response to Comment F under the "General Responses to the Most Frequently Submitted Topics" and the traffic data submitted as an attachment to the June 21st, 2013 letter to the consulting parties.*

   iii. "The bridge has previously accommodated "current" traffic. It is inappropriate in this case to increase its capacity for "future" traffic.

Response*: Design controls for this project include (but are not limited to) design vehicles and traffic characteristics. Design vehicles represent the selected motor vehicles with the weight, dimensions and operating*

characteristics used to establish the highway design controls for accommodating vehicles of design classes. The largest vehicle likely to use the roadway is used to determine the applicable design loading criteria. With regard to traffic characteristics, the design of a highway and its features should be based upon the explicit consideration of the traffic volume which serves to establish the geometric highway design. Current and future traffic volumes are considered. See the Minimum Bridge Width Criteria for Bridges, Chapter 1 of the Design Manual – Part 2, and Chapter 2, Section 2.19.

When considering the load that the bridge must carry, the current or future traffic volumes do not affect the existing structure suitability for reuse. This is defined by the structural and hydraulic adequacy, geometry and safety, and load carrying capacity. The traffic volumes do not factor into this assessment. A low volume road will still need to carry the same design live load vehicle (a 72,000 pound truck).

iv. "Our expert does not agree with the assessment that the pier structures cannot be rehabilitated. Based on technical information obtained and site reviews McMullen Associates has put forth a sound report regarding the availability of safe rehabilitation for the bridge. PennDOT has not provided any information that would undermine this finding. At this time we would ask PennDOT to please provide McMullen Associates access to the piers to conduct the borings they have requested to further inform their analysis regarding the rehabilitation option."

    Response: *See the response to Comments D and E in the "General Responses to the Most Frequently Submitted Topics". Time will be set aside at the next consulting party meeting for McMullen & Associates to present the findings of their 2012 report.*

v. "Regarding the assertion that the horizontal curve radius of the western approach does not meet safety criteria – in the case of an historic bridge, functional obsolescence does not qualify as a project need."

    Response: *According to the Guidelines for Historic Bridge Rehabilitation and Replacement (AASHTO), an historic structure's load capacity, geometry, and safety features must be considered when determining when rehabilitation is prudent and feasible and when it is not.*

vi. "Regarding the fire truck assertions:"
    1. "No information has been provided to defend the assertion that in the absence of bridge reconstruction the delivery of emergency services by fire, police and ambulance could not be accommodated."

Response: *The absence of a crossing of Tinicum Creek at Headquarters Road and Sheephole Road has been identified by local residents and Township officials as an important issue for emergency responders. Feedback received from the Delaware Valley Volunteer Fire Company indicated that the existing intersection was tight for their smaller equipment to make the turns on to and off of the bridge. This is consistent with previous discussions with the Ottsville Fire Department Chief.*

2. The bald-faced assertion regarding the 41.5 ft ladder truck does not, on its face, support the assertion that emergency response is denied in the absence of an increase in the bridge size. Historically the bridge did in fact accommodate all emergency service vehicles and needs. As June 10, 2013 survey conducted by McMullan and Associates determined emergency vehicles could use a rehabilitated structure."

   Response: *Design controls for this project include design vehicles. See PennDOT Publication 13M, Section 2.19. Design vehicles represent the selected motor vehicles with the weight, dimensions, and operating characteristics used to establish highway design controls for accommodating vehicles of design classes. The largest vehicle likely to use the roadway is used to determine the applicable design criteria. The Ottsville Ladder 49 Truck is a design vehicle.*

   Due to the overall structural deficiencies, distortion, bulging and evidence of localized collapse and failure, the long-term structural integrity of the existing substructure is questionable. According to PennDOT's Design Manual – Part 4 (Bridge Design) Section 5.5.4, the targeted design life of the rehabilitation of an existing substructure is desired to be 50-years, or at a minimum, the design life of the new deck and superstructure is 40 years. Due to the condition of the existing substructure, its composition (earth filled stone masonry), and evidence of distortion and failure, a 40-year design life of these substructure units is highly doubtful.

   In situations of emergencies, additional space for turning movements is in the best interest of the Township. A turning radius study was performed to determine if the design vehicle (Ottsville Ladder 49 Truck) could make the turns in one movement without backing up. It was found that additional widening would be required to perform this turn in one movement according to the

industry standard turn simulation modeling software. Without widening, the potential for future impacts to the U-wall in the northeast quadrant (which is currently collapsed) would continue, considering other large vehicles (i.e., school buses, landscape trucks, low boys, and trailers) are likely to also have difficulty making this turn.

3. "Furthermore, this truck is located at only one of the two fire departments located in Tinicum; the 41.5 ft ladder truck is located at Ottsville fire department. What other emergency response vehicles does Ottsville have and surely the Erwinna/DelVal fire department has emergency response vehicles despite not having this 41.5 ft ladder truck meaning that there are other emergency response vehicles available even if PennDOT's assertion regarding the Headquarters Road bridge were true."

   Response: *A full inventory of Ottsville Fire Department (FD) apparatus was received from the fire chief. The Ladder 49 truck had the greatest overall length at 41.5-feet, but two of their other vehicles (Rescue Pumper and Tanker 49) were both in excess of 31-feet in length, had similar wheelbases (20-feet) and width (9.5-feet), indicating those vehicles would also experience similar difficulties navigating this intersection. Requests for the vehicle inventory of the Delaware Valley (DelVal) Volunteer Fire Departments have not been responded to yet. According to the DelVal fire chief, the project site is in the Ottsville FD's coverage area, and the DelVal station only uses the bridge when providing mutual aid to the Ottsville FD.*

4. "When was the 41.5 ft ladder truck obtained? After the closing of Headquarters Road bridge or prior to it?"

   Response: *Information from the Ottsville Fire Department was received on August 24, 2006, during the initial inspection and structure evaluation for use in the turning radius study. The Headquarters Road bridge was closed in 2011.*

5. "There are not any buildings in the middle of Tinicum large enough to require a 105 foot tall ladder truck thus further arguing against PennDOT using the presence of this vehicle in one of the two Tinicum fire departments as justification for the removal and replacement of the historic Headquarters Road bridge with its proposed oversized, modern structure."

Response: *Based upon normal engineering judgment, the Ladder 49 truck was used for evaluation considering it had the greatest overall length at 41.5-feet. As noted above, two of their other vehicles (Rescue Pumper and Tanker 49) were both in excess of 31-feet in length, and had similar wheelbases (20-feet) and width (9.5-feet), indicating those vehicles would also experience similar difficulties navigating this intersection. Discussions with DelVal FD (who only use the bridge when coming from Headquarters Road to the east, and make the left hand turn onto the bridge) also reinforce this theory. The added roadway width to provide two lanes across the bridge would only be additional 3-feet on either side, which would improve the mobility of emergency responders, who currently have to slow to a stop and carefully navigate the intersection while responding to emergencies.*

6. "There are many routes available to the 41.5 ft ladder truck that could get it to the locations and buildings that would need an emergency response vehicle of that size."

   Response: *According to both the Ottsville and DelVal Fire Departments, the Headquarters Road Bridge was used by emergency responders until the bridge was closed. Using longer alternate routes to respond to incidents that may involve life and death situations is not considered prudent or favorable by the residents of Tinicum Township.*

i. "PennDOT Should be Applying Context Sensitive Design: PennDOT should apply Context Sensitive Design in the case of this and other historic resource projects. PennDOT has more than adequate authority to apply Context Sensitive Design standards to this project under the provisions of its own *Smart Transportation Guidebook*, FHWA's *Flexibility in Highway Design*, and other documents."

   Response: *All project features developed thus far in the project development have focused on implementing context sensitive solutions (CSS). If a replacement bridge is required, this could include the use of original stone facing applied to the substructure units (as opposed to concrete form liners), open bridge railing (as opposed to a conventional concrete jersey barrier), as well as textures and finishes that would be consistent with the existing bridge and blend into the surrounding environment.*

   i. "The local roadway network should be planned, designed, improved, and maintained under an appropriate local transportation plan that supports the area's environmentally sensitive nature (Ridge Valley Historic District, Tinicum Creek Conservation Landscape, Tinicum Nockamixon Greenspace

Corridor, etc.). Most local roads in the area should be managed as low-volume roads."

Response: *In accordance with Smart Transportation guidelines and PennDOT's Traffic Calming Handbook, a two-lane bridge width would be kept to 24-feet in width (two 12-foot lanes, or two 10-foot lanes striped for 2-foot shoulders). The omission of full shoulders (as typically required for new bridges) serves as a traffic calming measure.*

j. "The Assertion that Sediment Deposits and Erosion Mandate a New Bridge are not Supported: The issues of sediment deposit and erosion can be better addressed by natural channel design and upstream stormwater practices than a new bridge."

   i. "Increase upstream development results in increased runoff and will cause changes to the stream regardless of the structure in place. So it is better to address increasing runoff and stream flows than try to change the structure because any structure will be similarly afflicted."

      Response: *While this is not a Section 106 issue, the issue of stream quality and runoff concerns will be addressed during the Chapter 105/Section 404 permitting process. The goal of consultation is "to identify the historic properties potentially affected by the undertaking, assess its effects and seek ways to avoid, minimize or mitigate any adverse effects on historic properties." (36 C.F.R. § 800.1(a)).*

      This project cannot address upstream overdevelopment and its impact to Tinicum Creek. Development issues are within the Township's jurisdiction. The stream meandering and shifting of the channel banks is one factor considered in determining whether or not the bridge can be rehabilitated; however, it is not the sole factor.

   ii. "If there is a concern about the direction of the flows and erosion as pertains to the bridge structure, natural channel design practices can and will more effectively address the specific concern in an immediate and long-term way and provide benefits to creek health, habitat and water quality at the same time."

      Response: *As noted above, stream channel instability and its impact into bridge scour at the West Abutment is considered another contributing issue supporting the design team's recommendation for bridge replacement. In discussions with the PADEP, efforts to realign the stream from its naturally meandered position to its original position are not recommended.*

k. "Other Federal Programs for the Headquarters Road Project: The Headquarters Road bridge project, restored as a one lane bridge, would best protect the historic structure, integrity and beauty of the bridge, and best protect the surrounding environment, historic district, and continue to economically benefit the community and educationally protect the region and nation. As such, we would suggest FHWA look to enroll this project in the federal Transportation Alternatives Program, it seems a perfect fit.

Response: *The following is excerpted from FHWA's website (http://www.fhwa.dot.gov/map21/guidance/guidetap.cfm) regarding the Transportation Alternatives Program (TAP) Guidance, June 10, 2013:*

> *The Transportation Alternatives Program (TAP) was authorized under Section 1122 of Moving Ahead for Progress in the 21st Century Act (MAP-21) and is codified at 23 U.S.C. sections 213(b), and 101(a)(29). Section 1122 provides for the reservation of funds apportioned to a State under section 104(b) of title 23 to carry out the TAP. The national total reserved for the TAP is equal to 2 percent of the total amount authorized from the Highway Account of the Highway Trust Fund for Federal-aid highways each fiscal year. (23 U.S.C. 213(a))"*

> *The TAP provides funding for programs and projects defined as transportation alternatives, including on- and off-road pedestrian and bicycle facilities, infrastructure projects for improving non-driver access to public transportation and enhanced mobility, community improvement activities, and environmental mitigation; recreational trail program projects; safe routes to school projects; and projects for planning, designing, or constructing boulevards and other roadways largely in the right-of-way of former Interstate System routes or other divided highways."*

There are various activities that are no longer described as eligible activities under the definition of transportation alternatives. Activities that are no longer eligible include: "Historic preservation, and rehabilitation and operation of historic buildings, structures, or facilities (including historic railroad facilities and canals). Historic preservation activities now are limited to historic preservation and rehabilitation activities relating to a historic transportation facility."

i. "The federal Transportation Alternatives (TA) program funds 10 different types of transportation-related activities. Through the Historic preservation and rehabilitation activity, communities rehabilitate and restore transportation facilities significant to the history of transportation in America. These rehabilitated facilities help to educate the public and to give communities a unique sense of character that attracts tourists and

generates a vibrant economic life. Since the Transportation Enhancements (TE) program began in 1992, approximately 17 percent of available TE/TA funds have been programmed for historic preservation and rehabilitation projects. (http://www.ta-clearinghouse.info/10_definitions)"

Response: *See response above to Comment 1.k.*

l. "Conclusion: These comments are preliminary and based upon the very limited amount of information made available in anticipation of the June 17, 2013 meeting. It is critical that PennDOT and FHWA immediately provide full copies and access to all information that is part of PennDOT's current decision making for the Headquarters Road Bridge. And we ask that you honor our process requests regarding:
    i. Making information fully and immediately available
    ii. Providing at least 60 days for review and comment upon any materials released
    iii. Committing to at least 6 additional Section 106 consulting party meetings
    iv. Committing to undertake an Environmental Assessment pursuant to NEPA that will be used to make a determination regarding the need for a full Environmental Impact Statement and
    v. Ensuring that the 106 process is not carried out in such a way as to impede full and appropriate analysis pursuant to NEPA and DOTA 4(f)."

Response: *See response to Comment 3 in the "Future Agenda Items recorded by Consulting Parties on an Easel Pad". Also see response to Comment 1 in the "Information Needed" recorded by Consulting Parties on an Easel Pad". Also see the response to Comment 1.b.3 above.*

2. Additional Comments from Maya K van Rossum mailed on July 1, 2013.
    a. At minimum, the Delaware Riverkeeper Network would like copies of the following reports:
        i. Copies of all PowerPoint documents from the June 17th meeting (already provided)
        ii. Any and all documentation from Urban Engineers from their February 2013 site visit
        iii. All inspection reports for the bridge in the possession of PennDOT
        iv. An update on the DRN's Right to Know request
        v. All past and present traffic count information that was used in PennDOT's decision making to date
        vi. Any information regarding emergency vehicles as it pertains to the bridge
        vii. All past and present accident data for the bridge

Response: *See response to Comments 1, 2 and 5 in the "Information Needed" recorded by Consulting Parties on an Easel Pad" section. Information on correspondence with the Ottsville and Delaware Valley Volunteer Fire Department are provided above in response to Comment 1.h.vi.*

b. "Project's Purpose and Need Statement Deficient: As asserted in our previous comment, we believe the project's Purpose and Need Statement is deficient and fails to best serve the 106 process. The Purpose and Need Statement provided for the June 17 meeting is more a statement of condition than a statement of need. A revised Purpose and Need Statement should include:
    i. A safe bridge that can serve the traffic needs of the Tinicum Township community in a timely fashion.
    ii. Preservation of the historic characteristics of the bridge so it can continue to serve the Historic District designation, support the economic value it brings to the community, and continue to support the goal of environmental protection including supporting the Wild & Scenic designation of which it is a part.
    iii. Protection of private property rights as is in keeping with the policies and goals of the Commonwealth of Pennsylvania.
    iv. Elimination of current text in the Purpose and Need Statement that precludes bridge rehabilitation as a viable option and presumes bridge replacement as the superior option."

Response: S*ee the response to Comment B under "General Responses to the Most Frequently Submitted Topics" and response to Comment 1.e. above.*

c. "It is important that PennDOT is also considering preservation of the deck structure as well as the piers and substructure of the bridge, as the 1919 deck structure supports the characteristics that are the focus of the Historic District designation."

Response: *The bridge (superstructure and substructure) is a contributing feature to the historic district; therefore, the bridge is being addressed as a whole.*

d. "PennDOT talked about the Bridge being functionally obsolete: please define this term for us so we may respond."

Response: *The term "Functionally obsolete" means that the bridge does not meet current design standards, and is not considered suitable for its current use. In this case, the functionally obsolete features include the following: the lack of safety shoulders; single lane configuration at the bridge (resulting in the road's inability to handle two-way traffic given the current traffic volumes); omission of guide rails on the west approaches; fixed objects in the clear zone on the west approaches (e.g., trees, fence posts, and culverts); inadequate vertical and*

horizontal curve lengths given the posted speed limits; inadequate load carrying capacity; and insufficient sight distance lengths.

e. "We reiterate that the assertion of heavy scour and impacts to structural elements such as wingwalls cannot be used to justify the invasive removal and reconstruction of the bridge. These are issues that will affect any bridge, albeit in different ways, and so to the extent they are to be raised as issues of concern PennDOT needs to include how these issues, upstream and instream, would be handled any differently with a new bridge as compared to a rehabilitated one, and why a new bridge is required in order to take those steps of addressing stream flows."

   Response: *The hydraulics of the bridge and the scour impacts to the bridge are not the only factors used in assessing the ability to rehabilitate the bridge. If the bridge is replaced, it would address the hydraulic issues and bridge scour. Modern bridge foundations must be founded at a depth greater than the anticipated scour depths (considering contraction and local scour, as prescribed in the Federal Highway Administration's Hydraulic Engineering Circular No. 18).*

f. "During the presentation, the Urban Engineers representative said that they used the 2008 AASHTO Standards versus the 2006. Was PennDOT aware of this use? How does PennDOT justify the use of 2008 by Urban Engineers when PennDOT itself uses the 2006 standards? Did PennDOT approve the use of the 2008 standards?"

   Response: *PennDOT uses all AASHTO publications as design guidelines, as supplemented by its Publication 15M (Design Manual, Part 4).*

g. "PennDOT Maintenance Deficiencies and Historical Recognition: The Urban Engineers presentation at the meeting made clear that much of the asserted degradation of the bridge was the result of the maintenance practices, and lack thereof, of PennDOT. PennDOT must not be allowed to benefit from its own maintenance shortcomings and be allowed to use them as a means for securing the pre-determined outcome it has already reached (i.e., new oversized bridge in total)."

   Response: *As noted in the presentation, PennDOT is responsible for the operation and maintenance of over 25,000 bridges throughout the state with a limited source of funding. Of these, 25% are considered structurally deficient and in need of repairs or replacement. PennDOT is not benefiting from its lack of resources to maintain this bridge in recent history. Rather, it is proactively making funds available to design a bridge that will provide a safe crossing for the community that has a life expectancy of 50-100 years. The size of the bridge is*

intended to enhance safety for motorists, pedestrians and bicyclists that use the bridge and improve turning movements for emergency responders.

i. "In the presentations at the meeting it was suggested, through the materials and information referenced, that the Headquarters Road bridge was not an individually contributing factor to the Historic District designation. This is a false premise based on inaccurate information regarding the age of the bridge that has been debunked on the record and so we ask that at the next meeting a clear concise statement as to PennDOT's current position regarding the contributing status of the bridge be presented so that we can understand its position and challenge it or support it as appropriate."

   Response: *It was stated at the June 17, 2013 consulting party meeting that the bridge is considered a contributing resource to the historic district. See Response to Comment H under "General Responses to the Most Frequently Submitted Topics". Also see Response to Comment 2.c.*

h. Agenda items proposed for the next meeting:
   i. "Discussion of the Purpose and Need document with a goal of a statement that all consulting parties can agree on;"
   ii. "Discussion of how FHWA plans to expand the review process to include Section 4(f) review and NEPA review, including disclosure of any plans regarding NEPA categorical exclusion claims;"
   iii. "Urban Engineers finishing up their presentation;"
   iv. "A presentation by McMullen Associates."

i. "Subsequent meeting agendas should include:
   i. Presentation by the Delaware Riverkeepers Network's two hired experts focused on the historic elements of the bridge;
   ii. Presentation by the Delaware Riverkeepers Network's hired expert examining daily traffic and safety issues surrounding the structure;
   iii. Presentation by John Nystedt, Delaware Riverkeeper Network Restoration Director, regarding stream scour and erosion issues;
   iv. Presentation by the Delaware Riverkeeper Network's hired engineer looking at stream flow issues."

j. "We also suggest that future 106 meetings are held for a longer duration and at a more convenient location."

k. "We also would like all future meetings to be videotaped; the Delaware Riverkeeper Network is fully prepared to provide that service, or PennDOT can provide it. But videotaping the meetings to ensure an accurate accounting of what was discussed is important, particularly for such a controversial issue as this one. The suggestion that handwritten notes taken by folks in the room will suffice is not responsive to the need for accurate reporting – especially when some of the folks who raised their hands to indicate they were among those

taking the meeting minutes were also presenters during the meeting (specifically the representative from A.D. Marble & Company). If videotaping is not agreeable then we ask that a stenographer be present."

Response: *Thank you for your input on the agenda items to be included for the next meeting. With regard to videotaping consulting party meetings, see response to Comment A under "General Responses to the Most Frequently Submitted Topics." Also see response to Comment 3 under "Future Agenda Items recorded by Consulting Parties on an Easel Pad". Also see response to Comment 17 for a response on the NEPA review comment.*

3. Jerome M. Becker, Consulting Party, emailed June 18, 2013
    a. "A 106 Hearing is a public hearing notwithstanding a representative conducting the meeting on behalf of its principle. Your counsel's statement to the contrary was against public policy and created the impression of attempting to subvert the intention of the law."

        Response: S*ee response to Comment A under "General Responses to the Most Frequently Submitted Topics".*

    b. "The prohibition against Consulting Parties from recording the meeting based upon wire-tapping laws is an erroneous interpretation of the Federal Statutes and 4th Amendment, both of which protect privacy. No privacy issue existed at the 106 meeting to limit recording rights of the public, no less a Consulting Party. This was not private assemblage such as a theatre performance where recording rights can be limited as a condition to attendance. The acoustics were poor. Speakers could not be heard by everyone in the room. Perhaps at the next meeting, portable microphones will be available."

        Response: S*ee response to Comment A under "General Responses to the Most Frequently Submitted Topics". Due to the number of consulting parties, we plan on using microphones for the next consulting party meeting.*

    c. "The Chairman did not require each speaker to identify himself or herself, making it impossible to record accurate minutes containing the views of various Consulting Parties."

        Response: *Thank you for your input. For the next meeting, attendees will be required to introduce themselves and the organization they are representing or if they are a resident prior to speaking.*

    d. "The Facilitator hindered rather than help(ed) the meeting. Certainly any Chairperson worth his or her salt could do better. The Facilitator was ineffective in "controlling" the meeting by undermining the role of the Chairperson, as they quite often stepped on each other's toes."

Response: *The interruptions which occurred unfortunately served as a detriment to the presentations being made and other questions being asked. We are investigating adjusted methods of participation for future meetings which would allow for participation in an organized and undisruptive manner. For example, at the next meeting, all questions will be reserved to follow the individual's presentations.*

e. "Much backup information was sought from various Consulting Parties to corroborate certain assumptions made by PennDOT, which I only mention because of the desire of all to have equal access to it."

   Response: S*ee response to Comment 1 under "Information Needed" recorded by Consulting Parties on an Easel Pad" section.*

4. Joan Ramage Macdonald, Ph.D., Consulting Party, mailed June 25, 2013
   a. "The Sheephole/Headquarters Road bridge is an important route within and through this area, and it is in the interests of the community to repair the bridge and get it open. It is extremely important that revitalization of the bridge is sensitive to the local area due to the old (1812) and historic architecture of the bridge representing one of the earliest and few well-preserved remaining examples of its type, as well as the Exceptional Value designation of Tinicum Creek, and the Ridge Valley Historic District it flows through. Refurbishing the beautiful, historic bridge by replacing the bridge deck is a sensible approach to getting the route open and accessible to the community and importantly, to emergency vehicles. Repairing the existing bridge would maintain the character and quality of the area, and probably get the job done both faster and cheaper than a demolition and rebuilding project that is opposed by many."

      Response: *A replacement bridge may take longer (one full construction season) and cost more initially, but it would provide a safer, more durable structure (50-100 year design life) and result in reduced life cycle costs (considering the reduced maintenance costs over its lifetime and avoidance of its ultimate replacement cost at a later date at an inflated cost).* Also s*ee the response to Comments D and E in the "General Responses to the Most Frequently Submitted Topics" and the response to Comment 1.h.v.*

   b. PennDOT replaced a different bridge on Headquarters Road (near Tettemer Road) with a widened bridge and barriers on the approaches. This creates a safety issues as pedestrians and cyclists on the road have no place to get off the road when speeding vehicles pass by. The bridge was poorly designed and placed and has made it more difficult for full sized fire trucks to make the turn. I hope these same problems will not be introduced at the Headquarters/Sheephole Bridge.

Response: *The existing one lane bridge poses safety issues for pedestrians and bicyclists considering its width. A two lane replacement bridge would be sized to provide additional bridge width for the safe passage of pedestrians and bicyclists, as passing vehicles could encroach on the opposing lane if needed to pass.*

i. "These observations are relevant because the Headquarters Bridge over Tinicum Creek was adequate for emergency vehicles prior to its closing due to deck problems, so a rehabilitated Headquarters Road bridge over Tinicum Creek would serve the community's needs for traffic and safety."

Response: *The structure's long-term structural integrity is in question and its ability to provide an adequate service life can not be confirmed due to the numerous locations of localized failure. Also refer to response to Comment D and E in the "General Responses to the Most Frequently Submitted Topics" and responses to Comment 1.h.v, and Comment 1.h.vi.*

c. People come to this area because of its historic and bucolic nature. Hundreds of bicyclists, motorcycles and classic cars drive on Headquarters Road every day during warm weather. I'm concerned that if the roads are straightened and the bridge is replaced with a generic widened structure it will hurt the scenic nature of the area and decrease the number of visitors who drive these roads and patronize local businesses. Keeping the bridge as a single or narrow two-lane bridge will help calm traffic.

Response: *The approach roadways will not be straightened. Rather, the curve will be slightly improved, and the sight lines will be revised to be closer to the design standards, thus improving motorist, pedestrian and bicyclist safety. Considering a replacement structure would be configured to have similar features to the existing bridge (e.g., original stone cladding, open railing, site specific concrete colors and textures, rounded pier geometry, etc.), this structure would not be generic in any way. It would be intended to blend in with the surrounding environment. The narrow two lanes (without the standard width shoulders, as described above) would be intended to serve as a traffic calming measure while improving pedestrian and bicyclist safety.*

d. "At the first Section 106 meeting on June 17th, I was concerned to see that the Purpose and Need Statement did not include the important and obvious goal of protecting the Historic Bridge and Ridge Valley Historic District while investigating the range of bridge repair options. It is very important that the Purpose and Need Statement include (even focus on) evaluating the bridge in the context of its Historic nature and Historic District setting."

Response: S*ee response to Comment B under "General Responses to the Most Frequently Submitted Topics". The June 17th meeting was the fourth consulting party meeting for this project.*

e. "I support the Delaware Riverkeeper Networks request for six additional meeting to ensure that all of the experts, citizens, consulting parties, questions, public comments and dialogs are heard and taken into consideration."

   Response: *See response to Comment 3 in the "Future Agenda Items recorded by Consulting Parties on an Easel Pad" section.*

f. "The key is evaluating the potential to rehabilitate the existing bridge. The engineer (Urban Engineers) who presented at the meeting discussed replacement options but did not fully address conservation or rehabilitation options. Other experts, including engineers, do not necessarily share his opinions."

   Response: *See the response to Comment D in the "General Responses to the Most Frequently Submitted Topics".*

g. "Maintenance on the bridge has lapsed over the last several years (at least), and it is very sad that PennDOT might use their lack of caretaking of this bridge as a way to force it to be destroyed. The 200 year old bridge has lasted well until recently, and given the history of other bridges being maintained in the area (by DRJTBC), there is reason to believe this bridge can be rehabilitated, and maintained in the future. Rehabilitation is consistent with everybody's goals: road access for cars, cyclists, motorcycles, emergency vehicles, and maintaining the historic bridge, historic district, and Exceptional Value stream. I strongly urge both PennDOT and FHWA to make sure to explore fully the rehabilitation option and to make all data available to the public and Consulting Parties before considering a replacement of this bridge."

   Response: *See response to Comment D in the "General Responses to the Most Frequently Submitted Topics" section.*

5. A total of 36 consulting parties/Tinicum Township residents signed the letter below, received June 19, 2013
   a. "We understand that plans to rebuild the bridge have been in the works for over a decade. There has been conversation and debate as to whether the "new bridge", should be one lane or two, maintained by the Commonwealth or the Township. The situation is urgent, the bridge needs to be re-opened as quickly as possible."

Response: *Thank you for your concerns. We are committed to progressing the design of this project while at the same time working with the community to develop a solution which balances impacts to the environmental and historic resources surrounding the site.*

b. "We would like a structural evaluation be made of the existing stone bridge foundation to determine the integrity. If the existing structure is determined to be sound, and can be restored within a reasonable budget and timeframe, we urge the authorities to replace the bridge deck, parapets and existing approach roadways. This seems to be the common sense solution which should please all, while maintaining the historic and bucolic nature of this stream crossing."

   Response: *See response to Comment D in the "General Responses to the Most Frequently Submitted Topics" section.*

c. "The adverse effects of continued bridge closure to our safety and livelihood include: extended response time for fire and rescue crews, additional time and expense spent traveling to and from work and school, excessive wear and tear on Frankefield Bridge, diminished property value, and inconvenience in general. The time is now to make a determination, fix the bridge and re-open Headquarters Road."

   Response: *Thank you for your comment. We are in agreement that this project needs to move forward as quickly as possible while still fulfilling our obligations under Section 106, NEPA, Section 4(f), Chapter 105/Section 404 permitting, and their associated regulations.*

6. Marion M. Kyde, Tinicum Township EAC, OSC, Landowner, June 17, 2013
   a. "I have grave doubts about the traffic data. I want to know the exact hours the counts were made and whether some type of interpretation was done to arrive at the published number. I would also like to know the dates these data were collected and whether or not the alternative road (Geigle Hill Bridge) was closed at the time."

      Response: S*ee response to Comment F to the "General Responses to the Most Frequently Submitted Topics" and the traffic data attached to the June 21, 2013 mailing to consulting parties collected by PennDOT and DVRPC.*

7. Peter Glascott, homeowner, comment card received at June 17, 2013 Consulting Party Meeting
   a. "Because of length and delays, unable to stay for entire meeting. Please forward meeting minutes and announcements of future meetings. Peter.glascott@sanofi.com.

Response: *Meeting minutes and other materials have been provided to Mr. Glascott.*

8. Robert Stanfield, Tinicum EAC Chair, comment card received at June 17, 2013 Consulting Party Meeting
    a. "Original reports with raw data in hardcopy or digital form. Traffic count – dates, location of count, raw data. Masonry report, dates, locations, raw data, photographers, etc."

    Response: S*ee response to Comment 2 under "Information Needed" recorded by Consulting Parties on an Easel Pad" section*.

9. No name, comment card received at June 17, 2013 Consulting Party Meeting
    a. "Need to keep things on time, please let people complete presentations and take questions at the end. Disappointed – I thought they were going to be able to salvage this bridge. Move presenters over so we can see the slides (standing in front of the screen)."

        Response: *Thank you for your feedback. We are working on methods to ensure that future meetings stay on the agenda and are considering holding questions until the end of presentations.*

10. Brian Murphy, Tinicum Historical Commission, comment card received at June 17, 2013 Consulting Party Meeting
    a. "In the bi-annual repairs to the Burnt Mill Bridge, has PennDOT used lime mortar?"

    Response: *The material used in the repairs by PennDOT's maintenance forces could not be confirmed. The upper portions of the repairs appear to be a 'shotcrete' to seal joints left by cracked, crushed, or displaced stone. This was likely intended to provide resistance to infiltration of water and confinement of the pier in response to the observed displacement and bulging.*

11. Michael A. Smith, Tinicum Creek Watershed Association, comment card received at June 17, 2013 Consulting Party Meeting
    a. "Right to know request to see all backup documentation upon which PennDOT decisions and conclusions have been made to date, specifically those things that are included in the "needs" for the project."

        Response: S*ee responses to Comments 2 and 5 under "Information Needed" recorded by Consulting Parties on an Easel Pad" section*.

12. Amelto A. Pucci, Jr., Resident of Tinicum along Headquarters Road, comment card received at June 17, 2013 Consulting Party Meeting
    a. "Why were the alternative bridge analysis only one width, a 24' bridge? It would be easy to evaluate a design for 18' width, which was consistent with improved hydrologic conditions. Doesn't this have merit as an alternate analysis option?"

       Response: *An 18-foot wide single lane bridge design (which does not satisfy design standards) was prepared and presented to the Township for their consideration, assuming the Township would be responsible for maintaining the bridge in the future (with PennDOT preparing a turn-back agreement). However, per the March 16, 2011 Tinicum Township letter:*

       > *"The Supervisors approved a two lane bridge replacement for the Headquarters Road at Sheephole Road during their meeting last night. Their motion was as follows: Forte moved that subject to Section 106 approval, the Township instruct PennDOT that is wishes the Headquarters Road Bridge over the Tinicum Creek at Sheephole Road be constructed as a two-lane bridge as described in the project summary prepared by Urban Engineering, Inc. for PennDOT for S.R. 1012, Section BRC for the Headquarters Road Bridge over the Tinicum Creek, Bucks County, MPMS 13716. Motion seconded by Pearson. Voted upon and passed with Budd voting against."*

13. Chuck Barscz, National Park Service (Wild & Scenic Rivers), comment card received at June 17, 2013 Consulting Party Meeting
    a. "Will PHMC & PA SHPO support a replacement of this bridge? If a replacement is supported, how would this impact the status of the Ridge Valley National Historic District (i.e. would this action delist or nullify the National District Status)?"

       Response: *Although we cannot speak for SHPO, if replacement of the bridge is required, FHWA and PennDOT will conduct an assessment of the effect of the bridge's replacement on the Historic District and document its findings in a Determination of Effects Report. This report will be provided to the SHPO and the consulting parties for review and comment.*

14. Bruce Wallace, Comments on the AD Marble Minutes from the June 17, 2013 Section 106 Consulting Party Meeting for the Headquarters Road Bridge. Letter dated July 22, 2013. *(It should be noted that there were five individuals who provided comments to the meeting minutes. The comments provided by these other individuals will be addressed in a separate document.)*

a. After the traffic count comments by Mr. Whittington on page 7, I made the following unreported comments. I pointed out that he'd given us no opportunity to comment on

the purpose and need statement which fails to mention historical preservation at all. It doesn't mention that the bridge contributes to an historic district and that there is a purpose or a need in this project to respect that history. It doesn't mention that this 1812 bridge is a rare survivor of its type, possibly the oldest of its type in the country. The purpose and need statement instead makes unsubstantiated and wrong claims about the condition of the bridge. It states that the bridge cannot safely accommodate current and future needs, including emergency response vehicles, even though the existing bridge safely accommodated those needs and no studies have been produced to justify his statement to the contrary, including the Urban report.

Response: *See the response to Comment B in the "General Responses to the Most Frequently Submitted Topics".*

b. After the Russ Stevenson presentation on behalf of AD Marble, I commented that the 1997 Pennsylvania Historic bridge inventory that he cited to show that the bridge was not individually eligible for the national register was simply wrong. That study, which incorrectly classified and dated the bridge to 1919 instead of 1812, was Marble's only evidence on the subject of individual eligibility even though it was discredited long ago in relation to this bridge.

Response: *See the response to Comment G in the "General Responses to the Most Frequently Submitted Topics".*

c. When Mr. Aherne asked why the consultant did not add/utilize the Keeper of the Registers Finding about the Headquarters Road Bridge, a Finding that established that the bridge was historically significant and also significant for its engineering.

Response: *See the response to Comment G in the "General Responses to the Most Frequently Submitted Topics".*

d. My comment at the bottom of page 13 was actually that Section 106 requires that the first option be to save the bridge, but that all we were hearing was a list of problems presented as if no solutions existed. The minutes say the DRJTBC's bridges were cited again. The minutes should provide the citation. I asked if PennDOT was really suggesting their plan was not to maintain their bridges as DRJTBC does, but to regularly replace their 24,000 bridges because that would be somehow cheaper or better given their limited resources? At this point, Mr. McAtee admitted that they had already decided that rehabilitation was not prudent here, which led to general objections since PennDOT had been going to some pains to say that decisions had NOT been made.

Response: *See the response to Comment D in the "General Responses to the Most Frequently Submitted Topics".*

e. On page 15, Mr. McAtee is reported saying the township supervisors voted for a two lane bridge on March 15, 2011. Not mentioned is that the Township immediately clarified that their letter referred only to a specific choice between two poor options, based on funding, not lane, issues. The fact that their first choice was rehabilitation of the historic bridge to its existing width had also been clearly conveyed to PennDOT in writing.

Response: *See the response to Comment 12.a above.*

f. On page 16 there is a very misleading report of an exchange. In full, my comment was that in 1992 PennDOT removed the rails and bolted steel guide rail to the then-intact structure of the bridge. Within 6 months, the masonry had begun to fail from the hammered bolt holes, and within two years the unsupported guide rail had begun to fall into the creek. That's why there are jersey barriers on the bridge, the guide rail bolts had destroyed the masonry and there was now nothing left to attach to. The bridge used to be much wider. It had been 16' wide, but with the jersey barriers it is only 10' wide, that is why people perceive it as narrow and why it appeared dangerous.
It is hard to see how the minutes could report this properly without reporting it in full. However, instead comments like mine are reported only in disjointed and confusing fragments and then words are put in Mr. McAtee's mouth that he could not have said without being challenged because they are so misleading. Several times he is quoted as saying something like this, "guide rail was not attached to the stone masonry. He indicated that the bridge was so narrow that any kind of truck could hit the barrier." But the walls were masonry and there was stone in that masonry and the guide rail was attached to it—one bolt was even blasted right through the bridge plaque. Other bolts went through concrete, including the concrete of the deck, and the effect was the same – they shattered whatever concrete or masonry they penetrated which then collapsed and the guide rail inevitably fell into the creek. Rather than acknowledge that the narrowness of the bridge in recent years was due to the guide rail mountings and resulting jersey barriers which shrunk the width from 16 to 10 feet, Mr. McAtee's augmented comments seem to be trying to confuse the issue and give the opposite impression, to blame the guide rail failure on trucks confused by the narrow bridge, to blame the cause on the effect.

Response: *As shown on the below photographs, the steel beam guiderail was mounted to the concrete curbs, and then anchored to the concrete pylons at the end of the bridge deck. There was no attachment to the stone masonry. The attached photos from 2003 show how the guiderail terminates before the stone masonry wing walls. The presence of concrete jersey barriers was referenced in the presentation, and the 16-foot bridge original deck width was mentioned and is clearly noted in the slides. An impact to the guide rail by a low-boy truck in 2001 caused the steel railing to collapse into the creek. The addition of concrete jersey barrier was added in response to this as an added safety precaution. The turning radius study noted in the presentation evaluated the 16-foot wide bridge width with the concrete jersey barriers removed.*

g. Regarding AASHTO, I actually said that the substructure carried full loads until it was closed due to a superstructure failure, not “until the 1960’s” as your minutes report on page 21. And, I then asked why Mr. McAtee would rate the geometry of the bridge as unacceptable when the bend at the bridge is pretty much the same as the next bend on

Headquarters Road 150 feet to the east that nobody is considering changing. His answer was that the other bend was outside the scope of work so he didn't even look at it. Both my question and his answer are not in the minutes—they never mention that very relevant adjacent bend in Headquarters Road at all. Nor is my question about whether AASHTO accepts conditions that may not meet modern technical specifications if they match surrounding conditions and have a history of being safe as this did before the jersey barriers. Nor do the minutes reflect that Mr. McAtee agreed his study did not support Mr. Whittington's assertion that trucks could not make the Headquarters Road turn at the existing bridge. Nor do they show that Mr. McAtee specifically stated that his ratings of the bridge were admittedly "subjective."

Response: *The geometry of the roadway to the east of the bridge is outside the project limits and beyond the scope of this project. Substandard conditions elsewhere along this roadway is not relevant, and cannot be considered justification when evaluating the geometric and safety conditions within this project. PennDOT will consider substandard design features (design exceptions) under certain conditions. All geometric features associated with this project (horizontal and vertical curvature, sight distance, shoulder width, clear zone, bridge width, etc.) will require design exceptions. However, the proposed conditions are intended to meet or exceed the existing conditions to create an improvement to the substandard design features and therefore improve the safety to the travelling public. The reference to AASHTO was intended to demonstrate that the existing conditions do not need the criteria for assessing a structure's suitability for rehabilitation.*

References to the turning radius study were mentioned, and Mr. McAtee stated that his analysis of the geometry of a 16-foot wide bridge deck showed that larger trucks and emergency vehicles could not make the turn on to or off of Sheep Hole Road in a single pass without backing up, even with the Township's widening of the intersection in 2009.

The minutes clearly state the items which are considered subjective. On page 19 of the minutes, it states that "the exact capacity of the stone masonry piers and abutments is unknown" and that it is "Urban Engineers' professional opinion that the bridge is unlikely to have rehabilitation potential."

15. Maya K. van Rossum, the Delaware Riverkeeper Network. 925 Canal Street, Suite 3701, Bristol. Letter dated July 24, 2013.
    a. A review of the website for the Delaware Valley Regional Planning Commission Transportation Improvement Program describes the option to be pursued as "replacement" of the Headquarters Road Bridge by June of 2014. The DVRPC works in partnership with PennDOT in developing this website. This characterization of the work confirms our concern that there is already a predetermined outcome to the 106 process and that both PennDOT and the Federal Highway Authority have no intention of considering rehabilitation as an option for this historic structure. I should also note that neither the Section 4

[sic] review nor the NEPA decision has been completed for this project. To have the project already decided upon before key reviews have even begun is not just disturbing but is also a violation of the letter and spirit of these laws.

Response: *FHWA replied via an August 7, 2013 letter to this comment. The following is from the response. "The current project description in the TIP indicates "replacement" of the bridge, but this does not reflect that the project development process has followed and will continue to follow the procedural requirements established by law and will evaluate all reasonable alternatives. We acknowledge that the description may be misleading, but because the TIP is a financial planning document, planning organizations sometimes include the estimate for the most expensive possible outcome to ensure that adequate funding is committed for the project. Please understand that steps are being taken to revise the language in the TIP.*

b. This website also indicates $2.9 million in funding has been awarded even though regulations prohibit the expenditure of funds until the 106 process is complete. Are any of these funds being used to carry out the 106 process and so being expended?

Response: *FHWA replied via an August 7, 2013 letter to this comment. The following is from the response. "Further, the current DVRPC TIP does include approximately $2.9 million in funding. However, these funds have not been "expended", but are programmed on the TIP for use during subsequent phases (for example, Final Design and Construction). The programming of funds on the TIP ensures that the transportation planning program in the region is fiscally constrained."*

16. Jerome Becker. Email received July 25, 2013.

a. I can only speak for myself, but as I indicated to PennDOT earlier, I found the facilitator, though well intended, highly ineffective. Having once Chaired several NYS authorities, I found no need when meeting with the public, to enlist the services of such a person to control the agenda. As Chair, those were my duties, so I ask you to consider dispensing with the need for a facilitator. Moreover, I am somewhat confused with the structure, which apparently allows the reconfiguration of a meeting by the body at large, before each meeting. All well and good, but are we or are we not governed by Roberts Rules of Order, which would supersede the need to adjust the procedure going forward.

Response*: Thank you for your feedback on the facilitator. We are working with the facilitator and project team to develop methods to improve the next meeting for all attendees. In particular, we are looking at how to hear from more consulting parties during the meeting and how to limit interruptions during presentations.*

b. We were told by your counsel at the beginning of the meeting that it was not open to the public, notwithstanding the fact it was held in a public space and the fact, as I understand it, that nowhere in the 106 regulatory process is there any language to the contrary. Moreover, your counsel said the meeting could not be recorded because it would be a violation of the wiretapping laws. Counsel was unable to cite the law and gave the feeble answer, when questioned, that this is what General Counsel told her. I have some familiarity with wiretapping prohibitions as a former judge and cannot recall any such civil or criminal restrictions. I'd like a clarification. Regardless, it appeared the will of the majority wanted to record the meeting whose content contained no privileged information.

Response*: See response to Comment A of the "General Responses to the Most Frequently Submitted Topics".*

17. Marion F. Werkheiser, Attorney at Law, Cultural Heritage Partners, PLLC (counsel to the Delaware Riverkeeper Network). Letter dated July 26, 2013.
    a. We write to reiterate the Delaware Riverkeeper Network's objection to the prohibition on electronic recording devices at the June 17, 2013, Section 106 Consulting Party Meeting. Several attendees expressed concern that the hand-written meeting minutes would not accurately reflect the nature of the discussion and that the only way to establish a complete record of the interested parties' comments would be to videotape the meeting. Indeed, we are disappointed the draft minutes circulated by the agency do not reflect accurately the discussion at the meeting.

       The Section 106 process encourages public participation and requires that agencies consider the views of the public. Consulting party meetings are open to the public and held in public forums, like the Quakertown Public Library, which hosted the June 17th meeting. There is no law that prohibits individuals from recording these public discussions.

       Pennsylvania's Wiretapping and Electronic Surveillance Control Act, which was cited by PennDOT officials at the meeting, does not prohibit the recording of public communication. 18 PA. CONS. STAT. ANN. §§ 5701–5782 (West). Communication is only protected from interception if it is "uttered by a person possessing an expectation that such communication is not subject to interception under circumstances justifying such expectation." 18 PA. CONS. STAT. ANN. § 5702 (West). For the law to apply, an individual must have a reasonable expectation that his or her communication will not be recorded. *Kelly v. Borough of Carlisle*, 622 F.3d 248, 257 (3d Cir. 2010). A reasonable expectation of privacy is one that "society is prepared to recognize as reasonable." *Agnew v. Dupler*, 717 A.2d 519, 523 (Pa. 1998).

Response: *See response to Comment A of the "General Responses to the Most Frequently Submitted Topics".*

b. The attendees did not have an expectation of privacy at the Section 106 Consulting Party Meeting, particularly once they were aware that the meeting may be recorded. Thus, Pennsylvania's wiretapping law does not apply in this situation. The Delaware Riverkeeper Network intends to record future Section 106 Consulting Party Meetings. Please articulate any objections in writing to us, as counsel, no less than fourteen (14) days prior to any meeting at which PennDOT contends it can prohibit recording.

Response: *See response to Comment A of the "General Responses to the Most Frequently Submitted Topics".*

18. Marion F. Werkheiser, Attorney at Law, Cultural Heritage Partners, PLLC (counsel to the Delaware Riverkeeper Network). Letter dated July 30, 2013.

a. The Headquarters Road Bridge is Subject to NEPA Review

b. PennDOT Should Coordinate NEPA and Section 106 Reviews

c. PennDOT Should Coordinate Section 4(f) and Section 106 Reviews

i. Identifying Historic Resources
ii. Assessing Use of Section 4(f) Properties
iii. Obtaining Project Approval
iv. Purpose and Need Statement

d. PennDOT Should Conduct the Section 106 Process in Good Faith
i. Area of Potential Effects
ii. Identifying Historic Properties and Assessing Adverse Effects
iii. Public Participation

Response: *PennDOT and FHWA are fully committed to following the principles and procedures outlined in the National Environmental Policy Act, Section 106 of the National Historic Preservation Act, Section 4(f) of the Department of Transportation Act, and the other federal and state laws and regulations that apply to all transportation projects. Each of these laws has specific processes that must be followed; however, research efforts and associated documentation for all activities that fall under the "NEPA umbrella" will be coordinated, as appropriate. Further, public involvement will be incorporated into project development. During Scoping in 2003, it was decided that the project should be documented as a Categorical Exclusion Evaluation. If throughout project*

development it is determined that the level of environmental documentation needs to change, PennDOT, in coordination with FHWA, will make the change.

For a response to the purpose and need statement concerns, see the response for Comment B in the "General Responses to the Most Frequently Submitted Topics".

For a response to the comments about ensuring that PennDOT is following the Section 106 process, refer to the "Summary of Section 106 Review As of July 22, 2013". This was distributed to all of the Section 106 consulting parties via cover letter dated July 24, 2013.

Public involvement efforts have occurred throughout the project and will continue. A general public meeting is anticipated after the September Section 106 Consulting Party meeting, and the purpose of the public meeting would be to reintroduce the project to the general public, discuss project progress since the last public meeting (April 27, 2011), and gather stakeholder input.

The comments concluded with a recommendation to add an agenda item to the next Section 106 Consulting Party meeting to include an informational session on NEPA, Section 106, and Section 4(f). The consulting party meetings will continue to focus on Section 106 topics and concerns. There will be other opportunities for the public to comment on NEPA, Section 4(f), and Chapter 105/Section 404permitting issues during the project development.

From:	Frederick, Barbara
To:	vsalamun@epix.net
Cc:	jonathan.crum@dot.gov; Barscz, Charles <charles_barscz@nps.gov> (charles_barscz@nps.gov) (charles_barscz@nps.gov); Harrower, Monica; Frantz, April
Subject:	follow up to Headquarters Road public meeting inquiry
Date:	Friday, August 15, 2014 11:17:27 AM
Attachments:	HQ Rd May 17 2006 determination from Keeper.pdf HQ Rd Historic Bridge Survey.pdf

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Ms. Salamun,

I enjoyed meeting you at the Headquarters Road Bridge public meeting on July 30, 2014 and would like to follow up on your inquiry about the National Register eligibility status of the bridge. As requested, I am attaching a copy of the determination of eligibility for the bridge made by the Keeper of the National Register. This indicates the bridge is considered listed in the National Register because it is a contributing resource within the listed Ridge Valley Rural Historic District.

With regards to the individual eligibility status of the bridge, the structure was determined individually not eligible for listing in the National Register as part of the Statewide Bridge Survey. I have attached a copy of the related bridge survey form.

If you require additional information on the National Register status of the bridge, please do not hesitate to contact me at the number below or April Frantz, the National Register coordinator for the Eastern Region, at 717-783-9922. Ms. Frantz is also copied on this email.

Thank you for your interest,

Barbara

Barbara Frederick | Historic Preservation Supervisor
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Phone: 717.772.0921 | Fax: 717.772.0920
www.phmc.state.pa.us

United States Department of the Interior

NATIONAL PARK SERVICE
1849 C Street, N.W.
Washington, D.C. 20240

RECEIVED
MAY 17 2006
PHMC 9926
Executive Office

IN REPLY REFER TO:

DETERMINATION OF ELIGIBILITY NOTIFICATION

National Register of Historic Places
National Park Service

Name of Property: Headquarters Road Bridge (AKA Burnt Mill Bridge) Key # 1909116

Location: Bucks County **State:** Pennsylvania

Request submitted by: Frank J. Cianfrani, Chief, Regulatory Branch, Dept of the ARMY, Philadelphia District, Corps of Engineers

Date received: 03/16/2006 **Additional information received**

Opinion of the State Historic Preservation Officer:

__Eligible X Not Eligible __No Response __Need More Information

Comments:

The Secretary of the Interior has determined that this property is:

X Eligible **Applicable criteria: A and C** __Not Eligible

Comment:

The Headquarters Road Bridge is eligible for the National Register of Historic Places as a contributing property in the National Register-listed Ridge Valley Rural Historic District. See attached for detailed comment.

for Patrick Andrus
Keeper of the National Register

Date: 4/28/2006

WASO-28

United States Department of the Interior

NATIONAL PARK SERVICE
1849 C Street, N.W.
Washington, D.C. 20240

IN REPLY REFER TO:

DETERMINATION OF ELIGIBILITY NOTIFICATION

National Register of Historic Places
National Park Service

Name of Property: Headquarters Road Bridge (AKA Burnt Mill Bridge)

Location: Bucks County **State:** Pennsylvania

The Headquarters Road Bridge was listed in the National Register of Historic Places on July 24, 1992, as a contributing property in the Ridge Valley Rural Historic District, Bucks County, Pennsylvania. The bridge consists of early 19th century stone abutments and piers carrying an early 20th century replacement concrete deck supported on concrete-encased steel I beams. Both its original construction and alteration occurred within the historic district's defined Period of Significance (1790-1940). The bridge is historically significant in the context of the development of the township, regional transportation, and the operation of local mills, and is of engineering significance both for its early 19th century construction and its sensitive modernization in 1919. Although the concrete deck shows signs of considerable deterioration and the deck has been altered with the removal of the 1919 railings, the bridge retains sufficient historic integrity to continue to contribute to the Ridge Valley Rural Historic District.

Patrick Andrus
Historian
National Register of Historic Places
4/28/2006

PENNSYLVANIA DEPARTMENT OF TRANSPORTATION
BUREAU OF ENVIRONMENTAL QUALITY

A.G. LICHTENSTEIN & ASSOCIATES, INC.

PENNSYLVANIA HISTORIC BRIDGE INVENTORY & EVALUATION

BMS #: 09101200202764 **DIST:** 6 **UTM:** 18/488414/4479722
OLD BMS #: **CTY:** BUCKS **OWNER:** PADOT
MUNICIPALITY: TINICUM **LOCATION:** AT RED HILL ROAD 10K09
FACILITY CARRIED: HEADQUARTERS ROAD
NAME/ FEATURE INTERSECTED: HEADQUARTERS ROAD OVER TINICUM CREEK
TYPE: STRINGER **DESIGN:** ENCASED
MATERIAL: STEEL **# SPANS:** 3 **LENGTH:** 80 (24.4 m) **WIDTH:** 18 (5.5 m)
YR BUILT: 1919 **ALTERATION:** 1990 CA **SOURCE:** INSP FILE
DESIGNER/BUILDER:

SETTING/CONTEXT:
The bridge carries a 2 lane road over a stream in a sparsely developed, forested setting with some 19th century farms.

CURRENT NATIONAL REGISTER STATUS:
Previously Not Evaluated

SURVEY NR RECOMMENDATION:
Not Eligible

SUMMARY:
The 3 span, 80'-long encased steel stringer bridge is supported on an ashlar substructure. The original pipe railings have been lost, and ca. 1990 beam guide rail railings are now in place. Concrete encasement was favored in the state because it provided protection for the steel and eliminated the need to periodically paint the beams. A representative example of one of the most common, mid-20th century bridge types and designs in the state, it has no innovative or distinguishing details. It is one of 639 surviving pre-1956 examples. The altered bridge is not historically or technologically noteworthy.

PHOTO INDEX (DATE): 3/97 Report **REVIEWED BY/ DATE:** MEM (10/96)

COMMENTS:

Roberts
ENGINEERING GROUP LLC
Women Business Enterprise Certified

1670 Whitehorse-Hamilton Square Rd.
Hamilton, New Jersey 08690
609-586-1141 fax 609-586-1143
www.RobertsEngineeringGroup.com

Preliminary Design for Intersection Improvements at Headquarters Road Bridge and Sheephole Road

Prepared for

Mark L. Stout Consulting

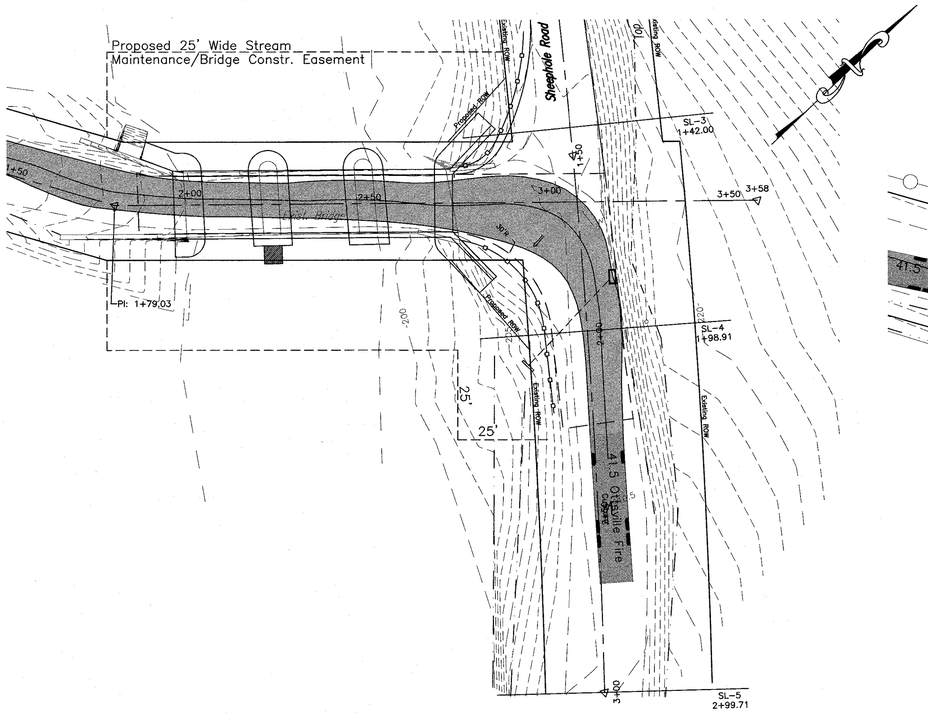
June 21, 2016

Our File No.: P1611

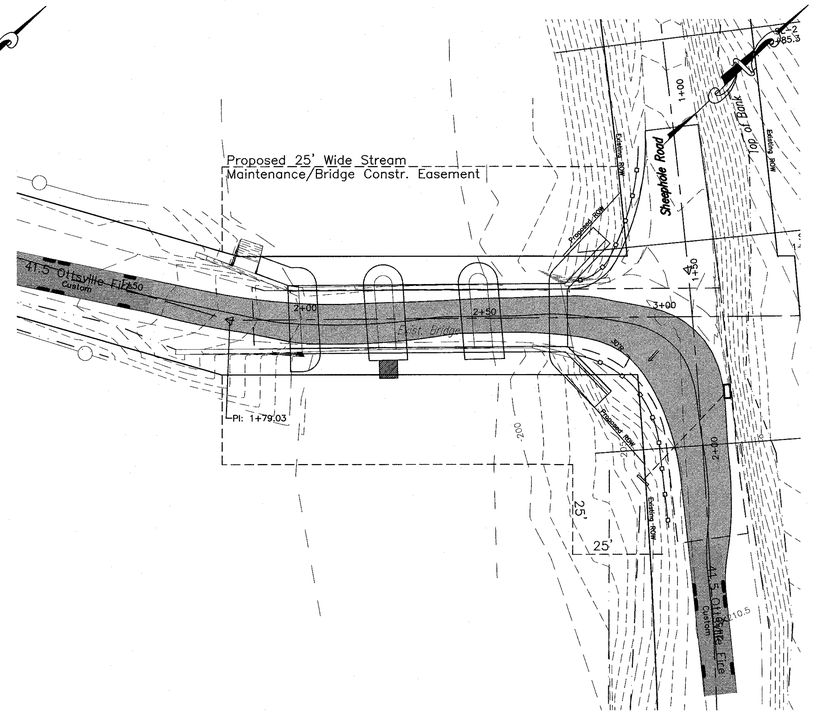
Mark L. Stout Consulting commissioned Roberts Engineering Group, LLC to evaluate alternatives other than the replacement of the Headquarters Road Bridge with a two-lane bridge. The Pennsylvania Department of Transportation has proposed the removal of the existing one-lane bridge and replacement with a larger two-lane bridge in order to accommodate emergency vehicles (PennDOT ID No. MPMS13716). Specifically, PenDOT has called attention to the movement of the largest vehicle in use by the Ottsville Volunteer Fire Company – Ladder 49 – which is currently unable to make the left-hand, westbound turn from Headquarters Bridge Road onto Sheephole Road in one continuous movement. The Delaware Riverkeeper Network (DRN) is seeking to preserve and rehabilitate the existing one-lane bridge rather than the replacement with a larger bridge.

Roberts Engineering Group, LLC has performed a field survey of the existing site conditions and prepared conceptual drawings which show the turning radii of the Ladder 49 Truck as well as larger aerial apparatus, on and off of the existing one-lane bridge. The analysis was conducted by computer aided simulations of vehicular movements from the south side of the bridge and turning west (left) onto Sheephole Road. Similarly, computer simulations were conducted for vehicular movements from the east side of Sheephole Road and turning south (left) onto the Headquarters Road Bridge.

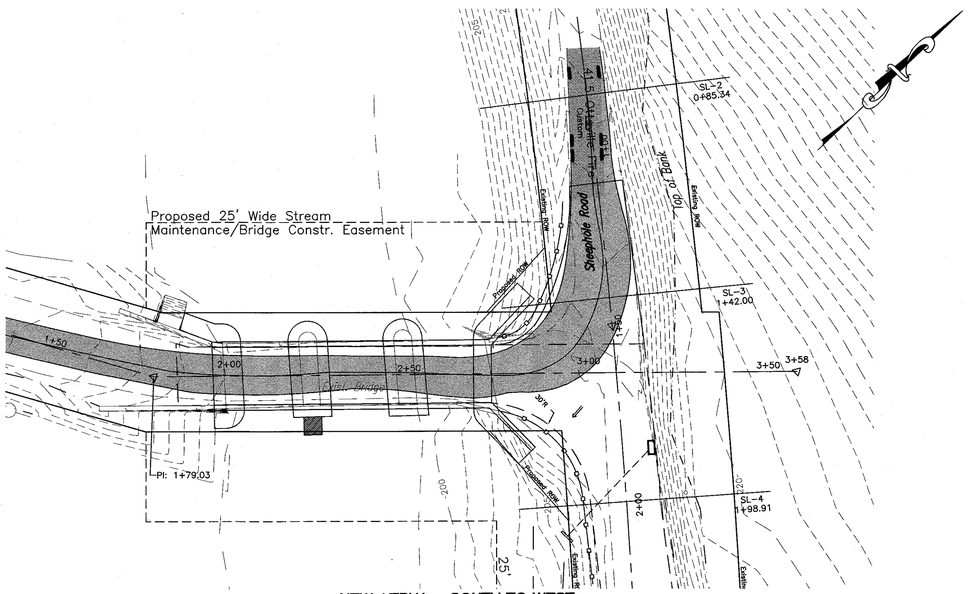
The simulations confirmed that the alignment and layout of the existing bridge and intersection were not sufficient for the turning radii of the emergency vehicles. In order to accommodate the turning radii while maintaining the alignment of the existing one-lane bridge, approximately five feet of widening is required on the north side of the intersection at Sheephole Road. The north side of the intersection is heavily vegetated and has steep slopes that exceed 50%. To accomplish the intersection widening, a four to six foot high retaining wall or similar method must be constructed, and the land behind the new retaining wall regraded for a width of approximately eight feet. The height of the proposal wall will not exceed the height of the top of bank in the area in question. The regraded area at the top of the retaining wall will be restored with vegetation similar to existing vegetation. In addition, the wall is intended to be constructed in a color which will blend with the natural wooded surroundings.



NEW AERIAL - EAST TO SOUTH
SCALE: 1"=20'



NEW AERIAL - SOUTH TO EAST
SCALE: 1"=20'



NEW AERIAL - SOUTH TO WEST
SCALE: 1"=20'

GRAPHIC SCALE

20 0 10 20 40 80

(IN FEET)
1 inch = 20 ft.

GENERAL NOTES:

1. THIS PLAN REFLECTS EXISTING SITE CONDITIONS AS THE RESULT OF AERIAL PHOTOS, TAX MAPS, AND A FIELD SURVEY PERFORMED BY ROBERTS ENGINEERING GROUP, LLC. DATED APRIL 21, 2016.
2. THIS PLAN IS NOT INTENDED TO GUARANTEE OWNERSHIP. DOCUMENTS OF RECORD WHICH MAY HAVE BEEN REVIEWED AND CONSIDERED AS PART OF THIS PLAN OF SURVEY ARE NOTED HERON AND HAVE BEEN OBTAINED BY ROBERTS ENGINEERING GROUP, LLC. THERE MAY EXIST OTHER DOCUMENTS OF RECORD WHICH WOULD AFFECT THIS PLAN.
3. THIS PLAN IS SUBJECT TO ANY EASEMENTS OR AGREEMENTS, WHICH MAY OR MAY NOT BE OF THE PUBLIC RECORD AND DISCLOSED AT THE TIME OF AN ABSTRACT OF TITLE OR TITLE SEARCH, WHICH MAY BE LOCATED BELOW THE SURFACE OF THE LANDS AND NOT VISIBLE AT THE TIME OF SURVEY. THE LOCATIONS OF UNDERGROUND UTILITIES AS SHOWN HEREON ARE BASED UPON ABOVE GROUND STRUCTURES VISIBLE AT THE TIME OF THE FIELD SURVEY AND RECORD OR AS-BUILT DRAWINGS PROVIDED TO ROBERTS ENGINEERING GROUP, LLC.
4. LOCATIONS OF UNDERGROUND UTILITIES/STRUCTURES MAY VARY FROM LOCATIONS SHOWN HEREON; WHEREAS ADDITIONAL BURIED UTILITIES/STRUCTURES MAY BE ENCOUNTERED. NO EXCAVATIONS WERE MADE DURING THE PREPARATION OF THIS SURVEY TO LOCATE BURIED UTILITIES OR STRUCTURES. BEFORE EXCAVATIONS ARE BEGUN, THE UNDERGROUND UTILITIES LOCATION SERVICE AT 1-800-242-1776 SHALL BE CONTACTED AT LEAST 72 HOURS PRIOR TO COMMENCEMENT OF ANY DEMOLITION OR EXCAVATION ACTIVITIES, IN APPLICABLE LAWS, RULES, AND REGULATIONS.
5. ALL BUILDINGS, SURFACE AND SUBSURFACE IMPROVEMENTS, ON OR ADJACENT TO THE SITE ARE NOT NECESSARILY SHOWN.
6. RIGHT-OF-WAY AND PROPERTY LINE INFORMATION ARE APPROXIMATE AND ARE BASED UPON TAX MAP INFORMATION AND LIMITED FIELD SURVEYING, AND HAS BEEN TAKEN FROM VARIOUS SOURCES AND IS NOT GUARANTEED FOR COMPLETENESS OR ACCURACY.
7. BOTH HORIZONTAL AND VERTICAL DATUM ARE ASSUMED SITE SPECIFIC.
8. TRUCK TURNING PLANS ARE BASED ON THE 41.5' FIRE TRUCK AS PER OTTSVILLE.

MARK	DESCRIPTION	BY	CHK'D	RECM'D	DATE

REVISIONS

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION

BUCKS COUNTY
HEADQUARTERS ROAD
AND SHEEPHOLE ROAD

TRUCK TURNING PLAN

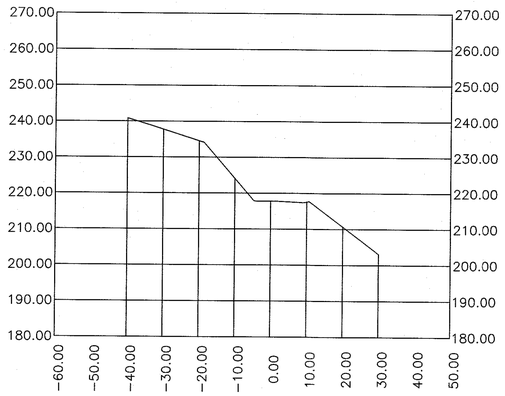
RECOMMENDED _____

SHEET 1 OF 3

P1611

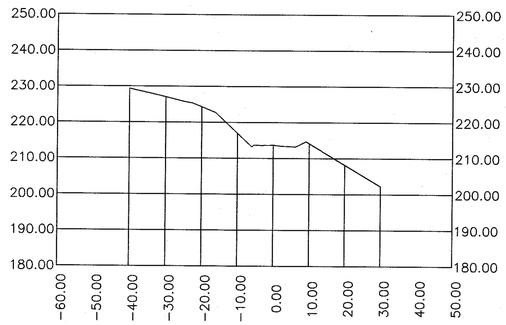
DES: GMG	DWG: AED/CNK	CKD: MPG/GMG

0+00.00



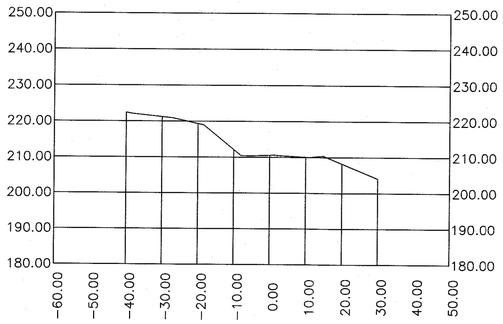
SECTION A-A
SCALE: 1"=20'

0+85.34



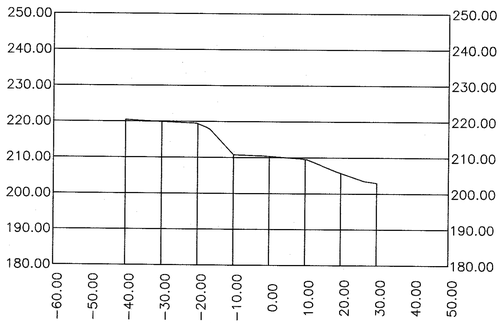
SECTION B-B
SCALE: 1"=20'

1+42.00



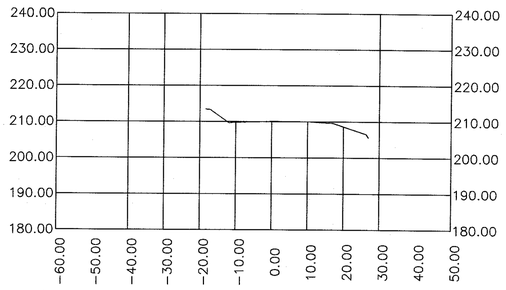
SECTION C-C
SCALE: 1"=20'

1+98.91

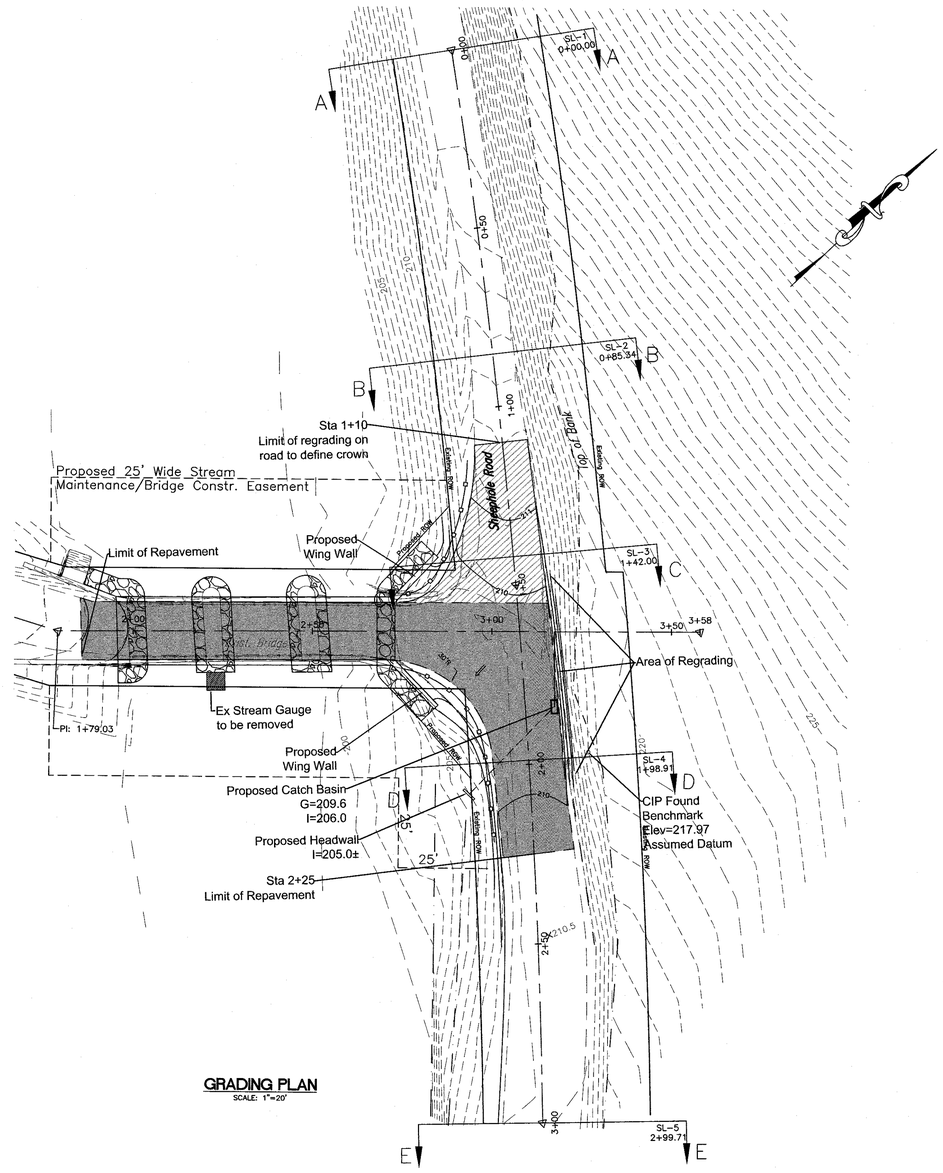


SECTION D-D
SCALE: 1"=20'

2+99.71



SECTION E-E
SCALE: 1"=20'



GRADING PLAN
SCALE: 1"=20'

GRAPHIC SCALE

20 0 10 20 40 80

(IN FEET)
1 inch = 20 ft.

DES: GMG	DWG: AED/CNK	CKD: MPG/GMG

MARK	DESCRIPTION	BY	CHK'D	RECM'D	DATE

REVISIONS

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION

BUCKS COUNTY
HEADQUARTERS ROAD
AND SHEEPHOLE ROAD

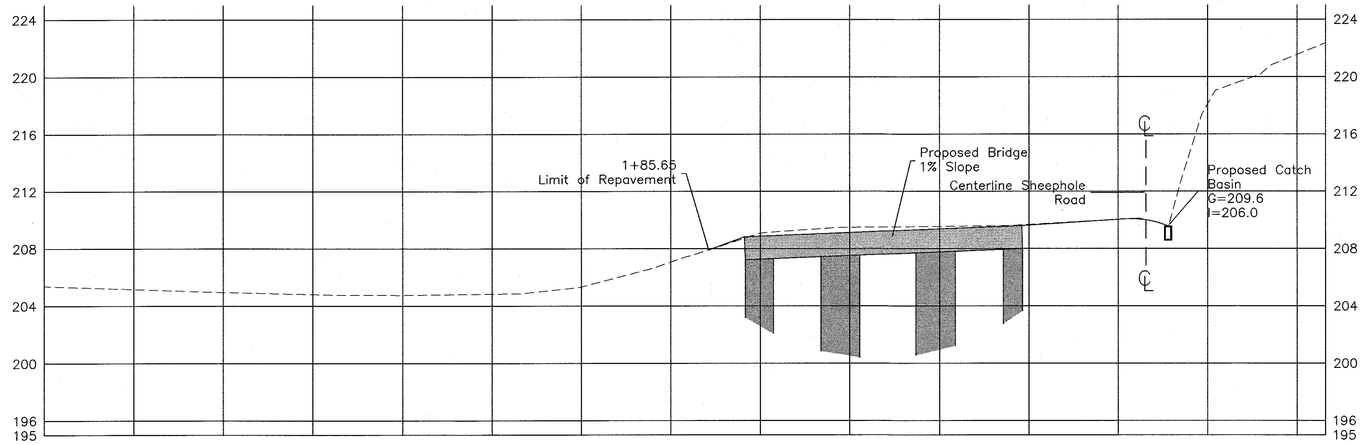
SECTIONS AND DETAILS

RECOMMENDED _____

SHEET 2 OF 3

P1611

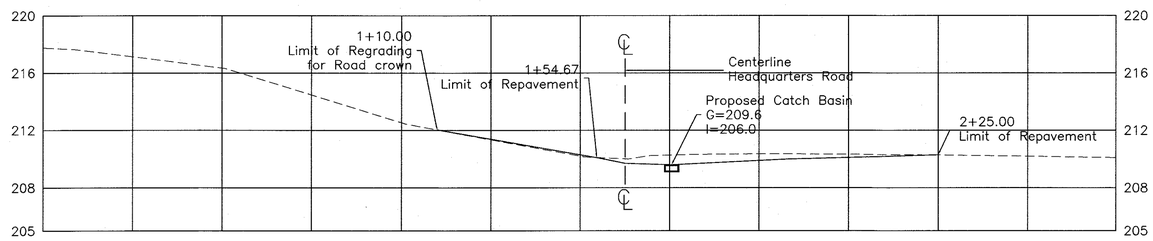
Profile View of Headquarters Bridge Road



Profile Data														
0+00.00	0+25.00 205.17	0+50.00 204.96	0+75.00 204.81	1+00.00 204.76	1+25.00 204.84	1+50.00 205.33	1+75.00 1+79.03 207.41	2+00.00 209.07	2+25.00 209.49	2+50.00 209.55	2+75.00 209.68	3+00.00 210.04	3+25.00 218.10	3+50.00 221.55 3+57.93 222.36

HEADQUARTERS ROAD PROFILE

SCALE HOR: 1"=20'
SCALE VERT: 1"=2'



Profile Data												
0+00.00 217.76	0+25.00 217.14	0+50.00 216.34	0+75.00 214.47	1+00.00 212.53	1+25.00 211.35	1+69.86 210.23	1+75.00 210.27	2+00.00 210.36	2+25.00 210.33	2+50.00 210.29	2+75.00 210.19	2+99.71 210.09

SHEEPHOLE ROAD PROFILE

SCALE HOR: 1"=20'
SCALE VERT: 1"=2'

GRAPHIC SCALE

20 0 10 20 40 80

(IN FEET)
1 inch = 20 ft.

MARK	DESCRIPTION	BY	CHK'D	RECM'D	DATE

REVISIONS

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION

BUCKS COUNTY
HEADQUARTERS ROAD
AND SHEEPHOLE ROAD

ROAD PROFILES

RECOMMENDED _____

SHEET 3 OF 3

P1611

DES: GMG	DWG: AED/CNK	CKD: MPG/GMG

Incorporated March 12, 1738

TINICUM TOWNSHIP

Bucks County

BOARD OF SUPERVISORS

163 Municipal Road
Pipersville, Pennsylvania 18947

VINCENT J. DOTTI, CHAIRPERSON
NICHOLAS C. FORTE, VICE-CHAIRPERSON
RICHARD ROSAMILIA, SUPERVISOR

TINICUM TOWNSHIP BOARD OF SUPERVISORS
MEETING AGENDA
OCTOBER 20, 2015

Chairperson Vincent Dotti called the meeting to order at 7:30 p.m. Vice Chairperson Nick Forte was in attendance with Supervisor Richard Rosamilia, Treasurer Teri Lewis, Engineer Tom Fountain, Solicitor Stephen Harris and Manager Linda McNeill. There were approximately 25 persons in the audience including Chris Ruvo of the Intel and Cliff Lebowitz of the Herald.

PLEDGE OF ALLEGIANCE: Dotti led those present in the Pledge of Allegiance.
PUBLIC SESSION:
Headquarters Road Bridge

Dotti said that the Board has been dealing with the closure of the Headquarters Road Bridge for four years. He said that Supervisor Rosamilia had prepared a public statement to read into the record.

Rosamilia read the following into the record:

"In an effort to bring the public up to date on the status of the Headquarters Road Bridge at Sheephole Road, I would like to read this statement into the record.

Since I have taken office nearly two years ago I along with the other members of your Board of Supervisors, have actively sought a solution to the reopening of the Headquarters Road Bridge at Sheephole Road. The closure in 2011 has and continues to place a heavy burden on travel for residents going to and from shopping, school and work. Moreover, it has a negative impact on residential housing values. But most important, it causes a critical loss of time by emergency services, when responding to calls by residents in need.

Normally, my instincts are to allow the process to play out and let the professionals do their job, which should result in a well thought out and superior end product. However, an unreasonable amount of time has passed and I've become more cynical that a solution is within reach. This past week we were once again told by PennDOT consultants that the in house Section 4(f) process, which includes the Evaluation and Determination of Effects Report to be distributed to the consulting parties for comments as required by the Section 106 procedure has been delayed further. Therefore, I would like to recap what has transpired since my coming on the Board and offer some concluding comments.

In the past two years we have had several meetings with our PennDOT officials and their consultants along with other elected representatives of our community to try and expedite the opening of this roadway. We first presented what we believed was a practical and affordable solution, that is to erect a temporary bridge while the 106 process takes its course. This was not a novel approach but one that could have been completed within a month or so with the aid of prefab temporary crossing structures, which are used throughout the United States. This idea was rejected by PennDOT for procedural and environmental permitting reasons. Our next approach was an attempt to reach a solution with PennDOT which could have provided an acceptable result to those who favor restoration, by advocating that the existing deteriorated concrete deck be replaced with a new, clear span concrete deck constructed over the existing stone piers. This technique would have given the appearance that the piers were supporting the deck, when in fact they would have had no structural function whatsoever other than for aesthetic purposes.

This proposed solution, in our view, would have preserved the historic piers, and perhaps satisfied those residents who opposed an entirely new bridge. This concept was likewise dismissed by PennDOT as unworkable. What's troubling to me is that while PennDOT is building a permanent replacement bridge in Point Pleasant, they have constructed a temporary one so as not to inconvenience those residents. It appears to me that what's good for one part of Bucks County should be good for all parts of the County.

Meanwhile, on a separate parallel track, ideas were being discussed at the ongoing Section 106 hearings about either rehabilitating or rebuilding the bridge. It is to be noted that The River Keeper Network assumed the lead at the hearings with their input that a rehabilitation effort was all that was needed, and the concerns of other Consulting Parties in attendance were minimized. PennDOT, on the other hand, was of a mind to rebuild the bridge for a multitude of reasons. Foremost was their contention that the bridge was in total disrepair, and needed to be replaced and repair was impractical. Nevertheless, a time frame was established by PennDOT- when it would render its findings, which was delayed due to The River Keeper's request for a meeting with PennDOT to the exclusion of the other Consulting Parties. Then, after PennDOT agreed to the meeting in spite of its exclusionary nature, The River Keeper Network imposed a further condition, which prohibited the recording of minutes, which PennDOT rightfully opposed. As such, no meeting was held, with each side blaming the other.

Thereafter, when it finally appeared there was light at the end of the tunnel by PennDOT agreeing to come to a decision on a date certain, the process was delayed once again. Why? Because The River Keeper Network appealed to the FHWA (Federal Highway Administration), to intervene in the 106 proceedings by asking it in essence, to supersede PennDOT's authority. This end run was made notwithstanding the FHWA's prior statement, which was explained to all the Consulting Parties at a previous 106 hearing, that the final decision was to be made exclusively by PennDOT. The reason why I am making this statement is because I am of the opinion, that-the best efforts of the Supervisors to resolve the bridge issue have been impeded by The River Keeper Network who, if left to their own devices, might possibly lead us all into endless litigation, where the bridge will be closed indefinitely. A democracy accepts that every citizen enjoys the right in having their voice heard; however, you have to ask yourselves why is The River Keeper Network making a crusade out of the bridge to the detriment of Tinicum? Ask too, why are they involving themselves in a bridge issue, be it historic or not, one lane or two, when they state publicly they exist to champion the rights of the Delaware River and its tributary streams. Presumably their rehabilitation posture is to minimize the impacts on the stream. If true, why wouldn't they champion the clear span proposal mentioned above which would reduce any potential adverse effects even further? Isn't it strange too, when the Headquarters Road Bridge issue was being hotly debated years ago, The River Keeper Network was nowhere to be found? Why all of a sudden, an interest now?

I am mindful of all the good work The River Keeper Network does in protecting our waterways. Therefore, I have no objection if The River Keeper Network wants to monitor bridge construction to assure the exceptional value stream is protected-which is their mission. Determining whether a bridge is historic, is not their mission, nor are construction issues. It's a sad commentary, when a party, who has a limited focus within our township, yet has enormous resources, can undermine the Supervisors, place our residents at risk and make PennDOT tentative.

Finally, it is my opinion that regardless of any outside interference, PennDOT's rejection of alternative solutions, indecision, and tentative reaction to those opposing their initial conclusion is truly inexcusable. After all, it is ultimately PennDOT's responsibility to provide and maintain our road infrastructure. We should expect that after four plus years, an agency of the Commonwealth of Pennsylvania would have made a decision regarding their preferred alternative which could have been rendered months or even years ago. Therefore when you ask why is the bridge still closed, I've given you some answers and reasons to consider tonight.

Thank you."

Forte said that he did not know if there was any dialog about the clear span with The Riverkeeper Network. He said that PennDOT had given the Township meeting dates numerous times that had not been held to.

Judy Esch of Quail Lane said that everyone on the other side of the bridge was at risk until this bridge was reopened. She said that there must be someone to contact to push this forward. She offered to organize busses to go to Harrisburg and protest. She said that much wear and tear on the other small bridges in the Township was also a problem.

Dotti said that the public safety issues were unconscionable as four years have passed and there was still no solution. He said that the Township needed a temporary bridge at the very least.

Ottsville Volunteer Fire Chief, Bill Shick said The Riverkeeper requested a meeting with him. He said that the meeting was held at the Ottsville Volunteer Fire station. He said that the Riverkeeper spoke about how the one lane bridge was best for the Township. He said that he told them that he didn't care which bridge, but he just wanted " a bridge ". He said that their consultant told him that if a decision was made now, it would still be four years until the bridge was opened. He said he did not understand why the environmental studies were not being done now so that they were out of the way. Shick said they asked him about the trucks. He said that the company only has one truck that can make the turn on the small lane. He said that he took Mark Stoudt of The Riverkeeper in the fire truck on the detour and he was able to see all the delays on Geigel Hill and Tankhannen which is the shortest way around. He said that he explained that fire doubles itself every minute and his guests were able to see the delays created by the detour.

Dotti said that the Board just wants " a bridge" as well. He thanked Shick for generously taking the time to meet with The Riverkeeper. He said that a meeting with PennDOT representatives might be helpful as well. Shick said he would be happy to meet with them.

Holly Kelly suggested a YouTube video about the bridge. She asked who the highest person at PennDOT was so that she could contact them. She said that she had four children to drive around and it was eight miles out of her way and dangerous. She said that her commute was dangerous and people were speeding because they were frustrated. Forte said that the current Secretary of Transportation, Leslie Richards was directly involved with the administration of the PennDOT projects.

A. Old Business:

B. Police, Emergency Services & Public Works:

Ottsville Volunteer Fire Chief, Bill Shick said the Company responded to 126 calls in Tinicum as of September. He said that there were ten additional calls in October. He said that the fire prevention held last week was a success – approximately 275 people attended.

Shick said that they were starting the process for replacement of the ladder truck. He said that with the soon to be opening station in Nockamixion, the current truck did not have the ladder and pumper capabilities, and that truck was first out. Dotti asked if that was a truck that also provided those services to neighboring companies. Shick said that it was, and it was the only vehicle like that in this corner of the County.

Shick said that he was again requesting an opti-com for the traffic light at 611 & 113. He said that visibility is not good at this intersection and the fire truck must stop if the light was red. He said that the opti-com would automatically change the light for an emergency vehicle. Shick said that this was the only light that did not have the opti-com between here and Abington Hospital. Dotti said that going through that light the company was going to Bedminster and maybe it was a possibility to share that expense with that community. Shick said that Nockamixon would be putting an opti-com on their traffic light as well.

C. New Business:

<u>The Proposed Budget for 2016:</u> Authorize advertising the proposed budget for public inspection and review with a Hearing to be held on November 17, 2015.b

Dotti said that there was no tax increase proposed and there had not been a tax increase since 2010. He said that he wanted to thank the staff, especially Lewis, for all the hard work on this budget – it is something that is built line-by-line beginning in August. He said that the proposed revenue for the

General Fund is 1.835,000 – largely similar to last year due to our rateable base. He said that the proposed expenses are matched with the revenue. He said that one of the things that makes Tinicum unique is that we are able to fund all of the Township services with 8.5 mills. He said that the commitments made to natural resources and land preservation were funded along with the commitment to public safety police services were funded. He said that the Township tries to do its fair share of funding to fire and rescue squads. He said that the Township is very proud of its Public Works Department and all of the projects and maintenance they do. He said that the Township does all of this on only 8.5 mills and he was really proud of the work of the people here that make that possible.

Motion by Forte, seconded by Rosamilia to authorize advertisement of the proposed 2016 budget for public inspection and a hearing on November 17th. Voted upon and passed.

Update from the Manager of the Eastern Upper Bucks Senior Center, Margie Jesiolowski:

Jesiolowski was present to give the Board an update. She listed activities available to the Seniors through the center, trips, shows and activities that get people out. She said that AARP sends people out to do taxes for the seniors in April - last year there were 70 – this year it would be 100 coming to have their taxes done. She said that this is offered to any senior in Bucks County. She said that the center issues produce vouchers from PA produce to low income Seniors. She said that twenty-six seniors attended a two-part workshop sponsored by the Bucks County Area on Aging "Healthy Steps" that focuses on nutrition, home safety and fall safety. She said that the "Cookie Walk" will be held on December 12th. She said that the raffle prizes are donated by local businesses.

Jesiolowski said that the Bucks County Area on Aging has required the center to join its "Co-Pilot" data base system – they also funded it. She said that every member gets a card and swipes it when they come and the County receives data showing the seniors that come to the center, what they are doing and how much. She said that funding would be based on this information in the future.

Dotti noted that there was a line item in the proposed budget for a $500.00 donation to the center.

Marjorie Mayer said that the center was nicely renovated and holds quite a few people – and if you are not a senior yet, stop in anyway to see it. She said that Manager Jesiolowski and the others at the center were very nice and doing a great job for the community.

The Board thanked the Senior Center for the services they provide to our seniors.

Report from Township Engineer, Tom Fountain regarding sight distances and addressing traffic safety at the intersection of E. Dark Hollow Road and Cafferty Road:

Fountain presented a report to the Board. He said traveling on Cafferty in either direction at the intersection of Dark Hollow, you can see to the right, but very poorly to the left. He said that if you were traveling North on Cafferty, there is a tree on your left (looking west) about 120 from the intersection, which limits your sight line to 150 feet. He said that if you were traveling South on Cafferty, again if you look to the left (this time, looking east), because of the slope in the road, the slope in the road, a property owner fence, and a bush, there was poor sight distance. He said that it was not as poor as Northbound traffic, but not the PennDOT optimum of 400'+ sight distance for that intersection. He said that PennDOT calculates the speed limit, driver perception time, wet pavement friction stopping distance and incline or decline of the road approaching the intersection.

Fountain said that the bush could be removed or trimmed back and that would make a difference of 40-50 feet of sight distance, but the fence was within the property line. He said that there were four way stop signs in other areas and PennDOT had put these in where nothing else can be done to improve sight distance and they would have allowed this if the Township controlled both roads at this intersection. He said that the Township did not control East Dark Hollow Road so the findings and analysis must be sent to PennDOT for its review.

Forte said that he read the crash reports and everyone was heading south. He said that PennDOT had a criteria that if there are five accidents in a given amount of time they would then install a four way stop. Fountain said that he associates that rule to an intersection that had no sight distance issues. He said that in this case, the topography could not really be remedied.

Rosamilia said that he remembered that one of the concerns that PennDOT had was that by installing a sign in East Dark Hollow, people could be hit while stopped. Fountain said that flashing advance warning signs could be installed at least temporarily until people have their behavior pattern adjusted. Dotti said he felt that the Board had to be careful not to replace one hazard with another. He outlined the options as described by Fountain:

1. Leave all as is
2. Remove the tree, the shrub, and the berm, which would not bring the intersection up to standards, but would be an improvement.
3. The four-way stop sign, which the Township cannot do itself because this was a state highway.

Dotti asked Fountain, if the four-way stop was installed if there would be any sense in having the trees and shrubs removed? Fountain said no. Fountain said he would suggest sending this report to PennDOT for review and suggestions.

Dotti polled the Board.

The Board agreed that that the Engineer's report should be forwarded to PennDOT for review and the Board would then discuss the matter again.

Ted Leister said that Bedminster installed a blinking stop sign at Elephant and Route 113. Forte said that those are usually installed temporarily. Fountain said that the residents in Bedminster asked PennDOT to leave the blinking lights as long as they could as this intersection had multiple fatalities.

<u>Request for a Waiver from Contractor Robert Rutherford on behalf of property owners Amos and Patricia Snyder to retain the recently installed PVC driveway pipe at 580 Hollow Horn Road Ottsville</u>.
Ordinance 161 and Resolution No. 06.15.04.01 set forth the Driveway Pipe regulations
Section D. (4) requires that all driveway pipes must be reinforced concrete pipe unless approved otherwise by the Board of Supervisors.
Section D (5) requires that a minimum of twelve (12) inches of cover must be maintained between the top of pipe and finished paving elevations.

Rutherford was present for the discussion. He brought photos for the Board. Fountain said that he was made aware of this and he inspected the pipe. He said that this was a 12-inch pipe and did have the minimum cover over the pipe. He said that the project iappeared to have been done very well; the grass is in. Fountain said there was a drainage area – about 800 feet – above the pipe on Oak Grove Road. He said that about half the drainage of that road comes down. Fountain asked Rutherford if he obtained a permit.

Rutherford said he did not. He said he was under the mistaken impression that this was a repair as the driveway and pipe were already there.

Fountain said he did not see the benefit of having the pipe removed at this time, but he would suggest a caveat to both the contractor and property owner, that if there was flooding on the road, clogging in winter that results in water and freezing on the road, the Township was going to have to come to the contractor or owner and have this replaced with the approved township pipe as written in the ordinance.

Rutherford said that the pipe was the same size, but was galvanized and half of it was rotten. He said that it actually fell and lowered the driveway. Dotti asked McNeill if there were flooding issues there. McNeill said that she was unaware of any problem there.

Forte said that it seemed that this was a professional job but needed resolution
Motion by Dotti, seconded by Rosamilia, that the Township send a letter to the property owner, copied to the contractor, stating that that the Township will allow the pipe to remain, but if there were future flooding or freezing conditions, to make the property owner come into compliance with Township regulations and install an 18 inch reinforced concrete pipe.

Voted upon and passed.

1) MINUTES:

Motion by Dotti, seconded by Forte, to approve the Minutes of the October 6, 2015 Meeting Minutes as written. Voted upon and passed.

2) TREASURER'S REPORT & BUDGET RECAP:
Motion by Dotti, seconded by Rosamilia, to approve the Treasurer's Report and Budget Recap for September 2015. Voted upon and passed.

3) PAYROLL REPORT:
Motion by Forte, seconded by Rosamilia, to approve the Payroll Report for the period of October 3, 2015 and ending October 16, 2015. Voted upon and passed.

4) DISBURSEMENTS: Motion by Dotti, seconded by Forte, to approve the below listed disbursements:
General Fund :
Allied Administrators for Delta Dental 507.70; Eagle's Peak 20.00; Delguerico's Disposal Service 240.00; Courier Times, Inc. 323.40; Sands Ford 442.19; Grainger 278.57; Wehrung's 425.50; Harris and Harris 2,453.75; Keystone Municipal Engineering 920.00; Met-Ed 125.38; Met-Ed ; 484.98; Met-Ed 32.59; Met-Ed 17.53; United Inspection Agency, Inc. 235.00; Keystone Municipal Services Inc. 2,850.00; Federal Express 18.36; Bucks County Planning Commission 567.27; Stevens, Mark and Joan 1,258.48; Warrington Township 25.00; VISA322.50; Staples 209.29; Wehrung's 14.54; PA DCED 72.00; Internal Revenue Service 2,304.40. *note Correction of disbursement from prior meeting should have read "Aetna Life Insurance" (-not Allied Administrators) 7,717.00.
Payroll Fund
Payroll for pay period ending 10/16/15; eftps Internal Revenue Service $5,793.08; eftps Dept of Revenue $924.78.
Groundwater Fund
Lennon's Small Jobs 862.74; Onset Computer Corp $340.00.
State Fund
Vandereley's Truck Sales and Service 3,499.93; ATCO International 85.00; NAPA of Ottsville 193.46; Blooming Glen Quarry 215.04; Michael's Garage 90.00; Choice Concrete 250.00.

5) A. PLANNING:
B. SUBDIVISION & LAND DEVELOPMENT:
Tom and Priscilla Vanderlely, 34 Durham Road Ottsville, PA Tax Parcel No. 44-11-46, request approval of the Waiver of Land Development Application & Plan submitted for the construction of a 50 x 80 (4,000 s.f.) pole barn to be used for storage:

Tom Vanderlely was present for the discussion. Dotti said that the Board waived most of the requirements for land development and asked Fountain for his recommendation. Fountain said everything seemed in order and that the only thing that the Board could consider as this was in the village, was the requirement for sidewalks, or a fee in lieu of sidewalks. Harris explained that this money would be held in an account until such time that the Board decided to put in sidewalks. The Applicant, Supervisors, Engineer and Solicitor discussed the location of any possible sidewalk. Forte said that the he was not sure that this discussion was germane to this Township. Dotti said that he agreed with Forte and he was also uncomfortable with assets being held in accounts indefinitely.

Dotti said that he was not sure why Fountain's memo had a concern about number of employees in the future. Vanderlely said that the proposed building was for storage. Dotti said that it could be in the Township's best interests to have more employees on that site. Harris said that if the septic failed, the Board of Health would get involved. Dotti said that he saw no value in restriction of number of employees.

Motion by Rosamilia, seconded by Forte, to approve the requested waiver of land development for Tom Vanderely subject to the applicant entering into a professional services agreement. Fountain said that the applicant had agreed to a professional services agreement to cover the costs of the Township's consultants in regard to this project; and submission of a signed and recorded plan; and agreement that there are no new utilities and no additional water usage. The applicant will need to obtain the required permits and the as built inspection will be done upon completion. Voted upon and passed.

Harris said he would send a letter outlining the steps to complete the application.

Tinicum Township Zoning Officer Karyn Hyland recommends that the proposal of Terry Brett, President of Kimberton Whole Foods, 239 Durham Road, Ottsville, PA, Tax Parcel No. 44-4-7 be presented to the Board of Supervisors as a land development waiver.

Terry Brett proposes a temporary dock expansion of 8 x 12 feet for a Freuhauf straight box truck with an overall size of 8.5 x 27 feet for the storage of locally sourced produce, milk and meat in anticipation of the extra food demand with the upcoming holiday season. The PC recommends that this waiver be approved as an (H6) Temporary Structure or Use.

Peter Bickford was present for Kimberton, for the discussion. The Board received a letter from Kimberton requesting the temporary dock expansion and straight box refrigerator truck in anticipation holiday season. Fountain said he spoke with Brett about the potential long-term enlargement of the facilities, both storage and retail space because of the success of this location. He said they have already contracted with Ottsville Fire Company for additional parking. He said that the Bretts have now decided not to do the permanent expansion at this time, but the holidays were coming up so they have requested this temporary solution. Fountain showed the plan to the Board. He said that he spoke with Bickford about this and he expected that this would come down after the holiday season. He said that this would not obstruct the residential use in the front and there was adequate space for a box truck to back up to the loading dock. He said that he did not have a problem with this temporary situation, but he suggested if the Board considered this temporary use, he felt that they should also consider a time limit so that this does not turn into something permanent.

Harris said that the plan that was submitted, was not what they are proposing to do. He said that the grading was permanent and the dock appeared to be permanent. Dotti said he understood that this plan, was what was proposed. Harris said that if that was the case, this was a land development application, because they are proposing a permanent addition. Fountain said that the applicant was going to propose an addition in the future but he understood it would be larger than this. Forte said that could be handled with the time limit. Harris asked if the applicant was proposing to remove the dock. Bickford said yes. Harris said that a grading permit would be necessary.

Bickford said that a narrative and map was submitted. He said that Kimberton was planning to come in with the plan for the permanent addition in the spring of 2016. Harris asked if the permanent addition was not done, would the dock be removed. Bickford said it would.

Harris asked if this was going to be there just for the holiday season? Bickford said that the truck and dock would be there until the permanent addition was constructed. He said that the store was growing and it needed storage and retail space. Dotti said that he did not want this to be a temporary structure that just ended up staying. He asked Harris if this could fit under emergency, construction, or special circumstances. Harris said that it was simply a question of what is temporary. He said that there was no question that this was a structure, even if it was on wheels. He said that he was fine with the holiday season, but he did not think that meant 12 months. He said that his thoughts were that six months was reasonable to allow time to get an application and plans together for a permanent addition. Harris said that if they come in with the plan in six months, it would be recorded at that time and if they did not, this would have to be removed. He said that this was not a waiver of land development, but just a delay of land development.

Judy Esch said that she saw this as getting in through the back door. She said that this was an eyesore should be removed after the holiday season. Harris said that the Board clarified the intension and felt this was a reasonable compromise.

John Blanchard said everyone was getting hung up on the word temporary. He asked if in this case, is temporary until such time until the permanent structure was built. Dotti said that the Board's interpretation of temporary is six months.

Jerome Becker asked Bickford if he recused himself for the Planning Commission vote on this matter. Bickford said he did.

Ted Leister said he understood the trailer portion, but not the purpose of the loading dock. Bickford said that current dock was only ten feet wide for deliveries and in order to have a second truck parked there for storage there must be additional dock to access it.

Dotti asked Fountain if he thought the box truck would create an unsafe condition in the parking

lot.

Motion by Dotti, seconded by Forte, to approve the waiver of land development for the temporary dock and refrigeration truck with a time limit of six months. Voted upon and passed.

6) ZONING:
7) POLICE:
8) PUBLIC WORKS:

9) ZONING HEARING BOARD APPLICATIONS:
Dotti announced the following:
Appeal #1-2015 REMAND, in accordance with the Order of the Court of Common Pleas, Bucks County Docket No. 2015-01293-26-33, remanding the application of John McBride to the Tinicum Township Zoning Hearing Board for the purpose of hearing and receiving additional evidence and testimony.
The Tinicum Township Zoning Hearing Board postponed the Hearing advertised for October 8th to November 12, 2015 at 7:00p.m. The Planning Commission will review evidence first on October 27, 2015 at 7:45 p.m.

10) MISCELLANEOUS:
Consideration of an Ordinance similar to New Britain Borough's that imposes a fine and requires restitution from drivers who violate the height restriction posted at the Covered Bridges in Tinicum Township:

Dotti said that the Board was looking for everything it could do to prevent the damage to our covered bridges. McNeill said that the driver that damaged the Frankenfield Covered Bridge was two feet above the height limit. She said that the driver will have to pay restitution to the County for the repairs, but it was a terrible inconvenience to our residents. She said that the County did not have the timbers, but they responded immediately and as soon as the material arrives, the County would be repairing the bridge.

McNeill said that Bucks County Director of Operations, Jerry Anderson asked if the Township would consider posting Hollow Horn Road for "No Trucks" and she had asked the Public Works Director Skelton, and Police Chief Sabath to look into this. Dotti asked if "No Trucks" include pick up trucks. McNeill said that she did not think that was the case.

Rosamilia read from New Britain Township's Ordinance for the public. Forte said that the Ordinance would deal with all the covered bridges in the Township. He said that he would like the Chief and/or Public Works Director to supply the Board with a proposal, idea or formal plan for consideration. He said that in that plan, he would like to see what type of trucks would be limited. Forte said that he did not want to see pickup trucks excluded from the road or bridge.

John Blanchard asked if there was any data from New Britain Township that indicates how any damage to their covered bridge was reduced since that ordinance was put in place. McNeill said that she did not know of any. She said that this was recommended by the Covered Bridge Association and Bucks County. Blanchard said that there was a park at the eastern end of the Keely Avenue Covered Bridge in New Britain and there was a very strict enforcement effort where patrol cars were posted at the park to stop any vehicle that was too large or heavy for that bridge. He asked if our police department had a location similar to the park for enforcement. Rosamilia said that anyone too large for the bridge would be caught by the bridge. Harris said that what struck him about the New Britain Ordinance was the signage requirements. Blanchard said that he would consider going a step further with overhead signage so that if someone hits something, it was before they got to the bridge. Forte said that the Township had one of those at the top of Uhlerstown Hill to protect the bridge at the bottom. He said that what Blanchard was talking about were close to the bridges and you have to consider character, aesthetics, historical value, and rural atmosphere and all those concerns came up each time and there was a consensus that we have too many signs. He said that that these accidents did not happen cognitively, they were just stupidity. He said that he did not know how much a crossbar would help.

Jerry Becker asked why people who drive recklessly and destroy property things are not arrested. Harris said that these were accidents and it would be difficult to prove the drivers were reckless.

John Cole said he would like to thank the Township Manager and Commission Marseglia for getting the bridge open for the covered bridge ride. He said that he did not disagree with the ordinance, but we have signage for this already and Hollowhorn was already posted for no trucks in areas. He said that this was punitive, but no preventative. Forte said that if the road was posted, the police could stop them for that, before they got to the bridge.

Judy Esch suggested a video camera so that the person who hit it could be identified. Dotti said that in most cases, we know who did it – we don't want it to happen in the first place. Rosamilia said that he thought people get desensitized to signs and there were many in Tinicum.

Peter Bickford said that if you drive a truck, it was already difficult to get around the Township, especially with the bridge closures. He said that the Township could allow local traffic only so that people can still get deliveries. Bickford said that he did know if it was appropriate for the Township to get restitution for a bridge the County was repairing. Harris said that the County would receive the restitution for the bridge repairs. McNeill said that the Township would get the fine to help offset the hours it spent on activities including police, public works, traffic control, and posting road closures.

Dotti said that Harris would draft an ordinance for further discussion.

Park and Recreation Committee members Vicky Dexheimer and Ted Leister were present. They said that they were looking into fund raising idea. Dexheimer said that they would like to erect a little library cabinet where people can bring a book and take a book and this would have a donation box for the park. She said that they would like one somewhere near the light in the Township parking lot. She said that they have someone who has volunteered to construct this, but they may need the Public Works Department to dig holes for the posts to install it.

Rosamilia said he would like to see a sketch and some details about how this would be maintained. Dotti said his initial reaction is favorable, but the Board would like to know more about it. He asked Dexheimer to return with a sketch that includes proposed sizes, location and maintenance and the Board would discuss it further. Dexheimer said that if this were successful, they would like to do more.

Dotti recessed the regular meeting at 9:17 p.m. to discuss matters of litigation.

Dotti reconvened the meeting at 9:50 p.m. and said that litigation had been discussed and that there was nothing to report.

11) ADJOURNMENT:

Motion by Dotti, seconded by Rosamilia, to adjourn the meeting at 9:50 p.m. Voted upon and passed. The next meeting of the Board of Supervisors is scheduled for November 17, 2105 at 7:30 p.m.

TINICUM TOWNSHIP SUPERVISORS

Vincent J. Dotti, Chairperson

Attest:

Linda McNeill, Township Manager

Nicholas C. Forte, Vice Chairperson

Richard Rosamilia, Supervisor

McMullan & Associates, Inc.

December 7, 2015

Ms. Maya K van Rossum, The Delaware Riverkeeper
Delaware Riverkeeper Network
925 Canal St., Suite 3701
Bristol, PA 19007 M&A 3575-1

RE: Review of Headquarters Road Bridge Project – Determination of Effects Report

Dear Maya,

We have reviewed the subject report dated November 2015 as you requested, and offer the following comments:

1. General: The full replacement alternative with new two-lane superstructure and new reinforced concrete substructure is stated as the "preferred alternative". There is no discussion why this is preferred or who prefers it. The entities who prefer this alternative should be listed and the reasons why it is preferred stated. Is this PennDOT and their consultants? Is it preferred because it best meets the design standards for a new bridge?
2. General: Each of the 10 alternatives is described in the document. However only one is evaluated for adverse effect. Why aren't other alternatives that may have little or no adverse effect evaluated and compared?
3. Pg. 4 4th par – the bridge railing installed in 1991 contains post installed anchors that may not have had sufficient edge distance for the 1919 concrete that contains large rounded stones, resulting in a design with little capacity. It should be noted that the condition of the 1919 concrete could have significantly contributed to failure of the railing.
4. Pg. 6 2nd par – The purpose and need statement for the project should contain text about evaluating the project's needs with regard to their impact to the historic district since that is required component of the project. Safety and structural integrity and minimizing adverse effects are all needs.
5. Pg. 6 4th par – There is a statement about "signs" of base slippage and 12 inches of wall displacement which is unclear. Where does the possible base slippage occur? The west abutment or its wing walls?

Consulting Structural Engineers
8381 Old Courthouse Road, Suite 350 ▣ Vienna, Virginia 22182
Telephone: (703) 556- 0651 ▣ Facsimile: (703) 556- 0378 ▣ Website: www.mcmse.com

6. Pg. 6 4th par – There is a statement that grout bags were installed "to temporarily alleviate concerns of the substructure deteriorating further" but there is no description of what in the substructure had deteriorated from scour. Furthermore, the grout bags restrict the stream channel possibly increasing flow velocity, and have themselves been undercut. It is also possible that the undercut occurred because the grout bags were placed on the sediment on the stream bottom and not directly on the rock. It should also be noted that the scour concerns may have been made worse by this temporary repair due to flow restriction.
7. Pg. 7 3rd par – The statement "Heavy scour exists along the western abutment…" would be more clear by explaining that the stream bottom and grout bags have been undercut, not necessarily the masonry of the pier or abutment.
8. Pg. 8 2nd par – the statement about "the condition of the bridge would warrant its removal to avoid further obstruction…" should be clarified that the superstructure could be removed without removing the substructure.
9. Pg. 16 first section – It should be noted that the alignment and sight distance are substandard for alternatives 3 through 6, including the preferred alternative.
10. Pg. 16 first section – There is some question that the traffic counts were taken during a time when the Headquarters Road was used as a detour. This should be clarified in the discussion on ADT exceeding 400. Is there a traffic count available when the bridge would not have been a detour? Also it should be mentioned that a design exception could be obtained for a one lane bridge.
11. Pg. 16 and 17. Alternative 3 which involves rehabilitation of the existing stone masonry. Why does Alternative 5 require replacement of the existing masonry if that same masonry can be rehabilitated as in Alternative 3? Rehabilitating the masonry would likely have less adverse effect than replacing it with reinforced concrete. This alternative should be reconsidered. There was a turning radius study done with the 18 foot span and removal of some of the bank on the east side of the bridge but this is not mentioned in the text.
12. Pg 17 – Figure 7 – Alternate 3 – there is a note on the drawing that the existing abutment is to be replaced, but this does not match the text that describes rehabilitation for both piers and abutments. The foundations are shown on the drawing to have a footing but all evidence suggests that the existing piers bear directly on the rock. Also the rip rap shown around the piers and abutments could have a negative effect on historic integrity and stream flow. Other measures should be considered to improve scour protection. There is a note about temporary excavation support and protection system to remain but this is not explained in the text. The elevation of this protection system appears well above normal water and so could negatively impact the bridge. It appears that this protection system extends into the rock below the abutment but this is not explained in the text. There are options available to improve the turning radius that should be explored.
13. Pg. 19 – there do not appear to be any costs provided for Alternatives 3 or 5 as compared to the other Alternates.
14. Pg. 21 – 2nd par – The description of rehabilitating the masonry abutments and piers is similar to what has been proposed by some consulting parties and what is contained in

the PennDOT Stone Arch Bridge Maintenance Manual for substructure. There are materials and procedures for grouting existing stone masonry that are more compatible with stone than non-shrink grout and may result in less maintenance.

15. Pg. 21 – 3rd par – In the discussion about turning radius there is no mention of removing part of the east bank to improve the radius. Was this considered?
16. Page 22 – 3rd par – There is a statement that continual maintenance of the stone masonry is required, however there is no statement that all bridge materials require continual maintenance or that most of the stone masonry substructure appears to have been there since its construction in 1812. If life cycle costs are not considered for all alternates, why mention anything about maintenance of masonry for this alternative?
17. Pg. 23 – 3rd par – Rip rap placement could have a significant negative effect on the historic district. There are other countermeasures which could be employed that are more compatible with this historic bridge and protected stream. This issue needs more consideration and discussion.
18. Page 25 – 1st par – Alternative 6 -Replacing two historic load bearing masonry piers with one reinforced concrete pier with a fake stone façade would diminish the integrity of the property's design, setting, materials, feeling and association as described on page 42 regarding the guidelines for Protection of Historic Properties CFR Part 800. The finding that Alternative 6 will have an adverse effect on page 47 is consistent with the guidelines.
19. Page 25 – 1st par – Excavating 3 feet into rock for new foundations could impact the stream environment but it is not clear if this has been evaluated. This seems in conflict with statement in next paragraph that moving new center pier would "…minimize the disturbance of streambed material during construction". On page 26, in the "Environmental and Cultural Resource Impacts" section, removal of the rock is not discussed. How is the rock removal proposed be accomplished?
20. Page 27 – 2nd par – Since Alternative 6 was found to have an adverse effect on page 47, it appears to be in conflict with the statement that "…this appears to be a reasonable option to minimize impact to the Ridge Valley Rural Historic District…."
21. Page 27 – Alternatives 6B and 6C – both options result in a thicker superstructure (33 or 30 inches versus 17 inches) and as stated "would involve impacts to the adjacent floodplain….". Removing the weight of the superstructure from the existing piers and abutments in 6B would make them less stable and more likely to be damaged in addition to destroying the character of the bridge. Removing the abutments in 6C would have an even greater negative impact on the "historic integrity" to contribute to the Ridge Valley Rural Historic District as described by the Keeper of the National Register in their 2006 letter.

In summary, although the finding that the preferred alternative #6 has an adverse effect on the historic district is consistent with the CFR 800 guidelines, there appears to be missing or unclear information in this report as noted above that could affect decisions in the future regarding this project. Since Alternative 3 appears to have the least adverse impact on the historic district as compared to the other alternatives, it should be further developed by the looking at ways to improve the turning radius such as removing part of the earthen bank, and more research into traffic data that may alleviate concerns about its 16 foot width.

Very truly yours,

Douglas E. Bond, PE
McMULLAN & ASSOCIATES, INC.

pennsylvania
DEPARTMENT OF TRANSPORTATION
www.penndot.gov

July 27th, 2016

Maya van Rossum, the Delaware Riverkeeper
Delaware Riverkeeper Network
925 Canal Street, Suite 3701
Bristol, PA 19007

VIA EMAIL

RE: Headquarters Road Bridge over Tinicum Creek

Dear Ms. Van Rossum,

We are in receipt of your letter dated July 7th, 2016 regarding the Headquarters Road Project. In your letter, you state that "PennDOT initiated the NEPA, NHPA and DOT Act processes to select a preferred alternative for Headquarters Road Bridge…with a predetermined outcome in mind: replacement". Let me assure you that this is not the case and that the project development process has and will continue to be conducted in accordance with all applicable laws and regulations. I've responded to the individual concerns raised in your letter below.

1. "PennDOT contracted Urban Engineers to replace three bridges in Bucks County, including Headquarters Road, for 1.3M"

   During the planning phase of all projects the Department is tasked with developing an anticipated scope of work so that funding can be programmed by the regional planning organization (DVRPC in this region) years in advance of anticipated construction. During the planning phase of a project, it is often necessary to make conservative assumptions as to the scope of projects so that there is not a funding shortfall when it comes time for construction. For Headquarters Road Bridge over Tinicum Creek, funding was programmed and an engineering agreement was advertised assuming the most expensive case scenario: that a replacement would be required. This in no way impacted the project development process which included a significant amount of analysis and study into a vast array of alternatives, including rehabilitation.

2. "…the Scope of work (page 9) directs subcontractor A.D. Marble & company that the outcome of the report will be that there are no feasible or prudent alternatives"

   You note in your letter that the technical proposal report is dated July 2013. Please note that this is incorrect as this is the date the technical proposal report was printed in order to fulfill your Right-to-know Law request (see the time stamp at the bottom of the print out which reads

"7/17/2013"). The actual date the technical proposal report was completed is November 29th, 2004. Please note that the section you have referenced of the Technical Proposal Report entitled "Approach" was written by AD Marble and is not indicative of PennDOT directing AD Marble to come to a pre-determined conclusion. It is far more likely that this statement was made in error by AD Marble and/or is a typo as it is made clear in the approach write up by AD Marble that "A Section 4(f) Evaluation will be prepared in accordance with Section 4(f) US DOT Act of 1966, Section 138 of the Federal-Aid Highway Act of 1968 and PennDOT Publication 349, Section 4(f) Handbook". Regardless, this language did not impact the actual process followed by PennDOT which has been conducted in accordance with all applicable laws and regulations including Section 106, Section 4(f) and NEPA.

PennDOT has considered all consulting party and public feedback to date including all studies made available by the Delaware Riverkeeper Network and its consultants and has recommended a preferred alternative (two-lane replacement with a 24ft curb to curb width) as indicated in the Determination of Effect report. We will continue the conversation with consulting parties later this summer regarding mitigation and look forward to working with the community to move this project forward so that a crossing can be re-opened as quickly as possible.

If you have further questions or concerns please feel free to contact me at c-rwhittin@pa.gov or 610-205-6871.

Sincerely,

Ryan Whittington
Consultant Project Manager.

SR 1012, Section BRC
Headquarters Road over Tinicum Creek – E00342

MPMS 13716
Urban Project Number 503501

TINICUM TOWNSHIP
BUCKS COUNTY, PENNSYLVANIA

EXISTING STRUCTURE CONDITION EVALUATION REPORT

November, 2006

Prepared For:

Pennsylvania Department of Transportation
District 6-0

Prepared By:

Urban Engineers, Inc.
530 Walnut Street, 14th Floor
Philadelphia, PA 19106

CONFIDENTIAL – Structure Condition Evaluation Study

Existing Structure Condition Evaluation Report

SR 1012 Section BRC
Headquarters Road over Tinicum Creek

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Inspection Summary

DATE OF INSPECTION: **August 18, 2006**

LOCATION: **Tinicum Township**
Bucks County, PA

INSPECTED BY: **James Mastrilli, P.E.**
Michael J. McAtee, P.E.

PREPARED FOR: **Pennsylvania Department of Transportation**
District 6-0

PREPARED BY: **URBAN ENGINEERS INC.**
530 Walnut Street, 14th Floor
Philadelphia, PA 19106

Urban Engineers, Inc.

A. Project Overview

On August 18, 2006, Urban Engineers conducted a site visit to the existing Headquarters Road Bridge over Tinicum Creek to check the overall condition of the structure in an attempt to determine the degree of integrity of the existing stone masonry piers and abutments. This report documents our findings as well as options to consider for rehabilitation or replacement.

The existing three-span structure carries S.R. 1012 (Headquarters Road) over Tinicum Creek. The west side of the bridge is located in Ottsville, PA while the east side is located in Erwinna, PA. A T-intersection exists on the east side of the structure, with Sheep Hole Road continuing to the north and Headquarters Road continuing to the south.

The structure consists of concrete-encased steel I-beams supported on stone masonry piers and abutments. The superstructure, constructed in 1919, features three 27-ft ± spans (see Figures 1 and 2). The stone abutments, piers and wingwalls were originally constructed in 1812. They are founded on bedrock approximately 3-ft below the ground line.

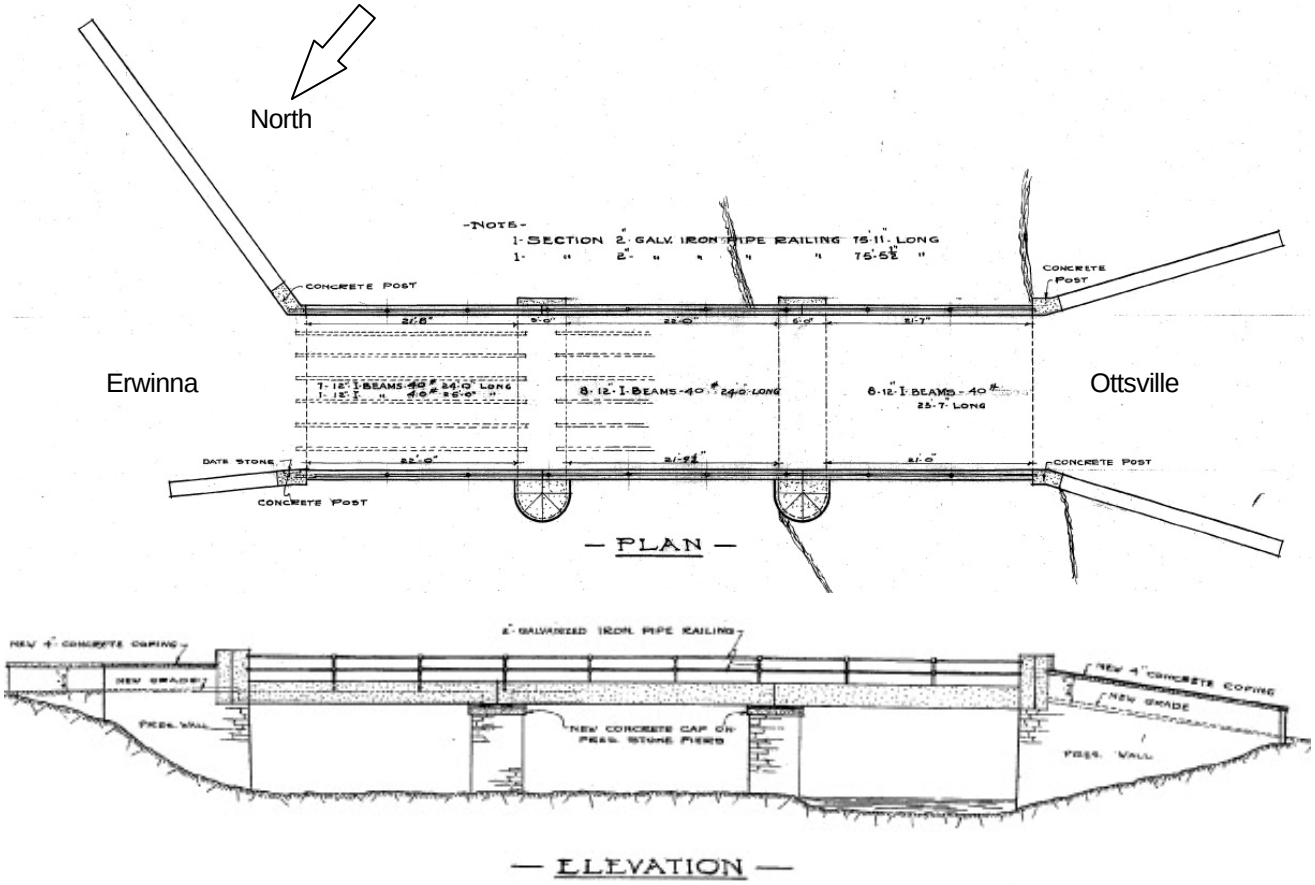

Figure 1 – General Plan & Elevation of existing bridge from 1919 Rehabilitation Plans

The original bridge deck consists of a concrete slab with a bituminous overlay. (See Figure 2.) The original deck width is 18-ft out to out and 16-ft curb to curb. In 1991, the original iron bridge railing was removed and replaced with structure-mounted galvanized steel guide rail. Concrete Jersey barriers were later added to the deck due to vehicular impacts to the guide rail. This has restricted the roadway width across the bridge to 12-ft between barriers.

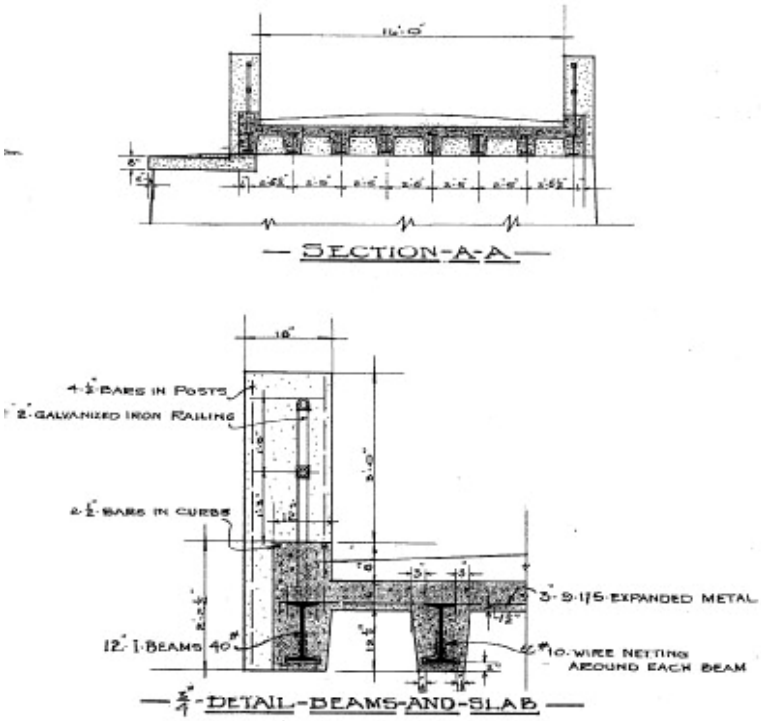

Figure 2 – Typical sections of existing bridge from 1919 rehabilitation plans

B. Existing Substructure Evaluation

The existing stone masonry piers, abutments and wingwalls were visually inspected, probed and sounded to evaluate their composition and condition.

Since plans of the original substructure units are not available, Urban's bridge inspectors estimated the contents of the existing abutments and piers through the use of non-destructive measures (see Figure 3).

Figure 3 – Field probing of existing joints to determine pier composition

Advanced Substructure Deterioration:
The following substructure deficiencies were identified:

1. The upstream sides of the existing abutments exhibit extensive deterioration as a result of high flood elevations and damage from debris flows (see Figure 3). The joints are in poor condition in several areas, and shotcrete repairs have been randomly applied as a temporary repair measure.
2. The upstream sides of the existing piers exhibit extensive deterioration (see Figure 4). The pier geometry has been distorted by loss of stones and pointing. Shotcrete repairs have been randomly applied to the upstream circular ends and along the channel faces of the piers as a temporary repair measure.
3. Both piers exhibit evidence of stone displacement and shifting. Approximately 15 square feet of stone has bulged from the pier face. This bulging was measured as much as 4" on the Ottsville pier. Measurable bulging was also evident on the Erwinna Pier.

Figure 3 – NW Wingwall showing pointing damage and local loss of stone masonry (prior to shotcrete repairs)

Figure 4 – West Pier, showing pointing damage, local loss of stone masonry (prior to shotcrete repairs), and bulging.

Susceptibility to Scour:

The existing structure exhibits evidence of significant local and contraction scour. Scour holes of up to 40" in depth were identified on the upstream sides of the existing substructure elements, as shown in Figures 5, 6 and 7. This erosion of the streambed has exposed the foundations and increased their vulnerability to further deterioration.

According to PennDOT Publication 238, Part IP, Chapter 2, this structure is categorized as Scour-Critical. This is because its footings are founded above the calculated scour depth and founded on erodible rock. The following bridge features and conditions are also contributing factors:

1. The existing piers do not currently have scour protection.
2. Due to the presence of the two existing closely-spaced piers, the short spans (26-ft) have a high potential for debris accumulation during flooding events (Cinotti and White 2000). Extensive tree growth along the bank which shows evidence of undercutting also demonstrates the high debris potential. Debris accumulation in front of piers reduces the hydraulic opening and increases flow velocities, thus adding to the risk of contraction and local scour and upstream flooding. (See Figure 8.) Properly designed scour protection would be required to protect the structure.
3. Due to the frequency of high flood waters along Tinicum Creek, the tops of the piers and abutments are susceptible to scour and erosion, which could undermine the smaller rubble masonry that comprises the beam seats and lead to collapse.

Figures 5 and 6 – Views of scour hole and exposed footing at the West Abutment

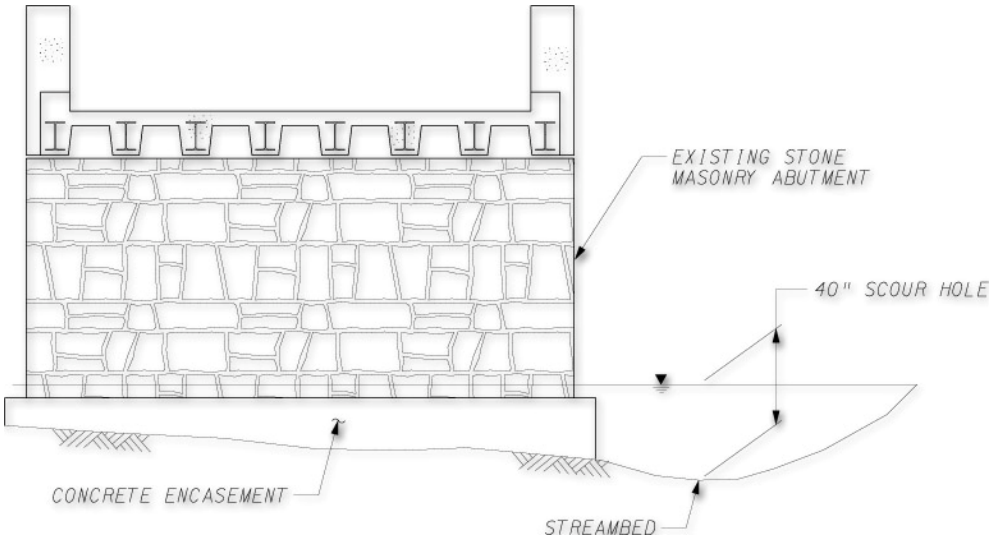

Figure 7 – Stream profile at West Abutment showing scour hole

Figure 8 – Debris accumulation on upstream face of bridge

Substructure Stability:

The existing West Abutment demonstrates evidence of horizontal movement indicating sliding failure in addition to overall stability concerns. The NW wingwall exhibits the following indications of foundation sliding failure:

- Stepped cracking along joints indicates settlement along the wingwall or base slippage (see Figure 9).
- Base slippage has occurred, resulting in wall displacement and non-plumb wall face. The base of the wall has displaced up to 12-inches from the vertical. A stone masonry buttress has been constructed to repair this condition (see Figure 10). According to the 1919 rehabilitation plans shown in Figure 1, this buttress was constructed after 1919. This buttress also displays evidence of base slippage, as it has shifted approximately 3-inches from the face of the wall at the top.
- Base slippage is also evident at the NE and SE wingwalls.

Figure 9 – Stepped cracking due to settlement and/or base slippage

Evaluation of Existing Stone:

The lower portions of the existing piers, abutments and wingwalls are constructed of dressed, squared stone masonry laid out in a broken-range pattern. This indicates that the larger base stones are not laid in continuously horizontal courses. The upper portions of the substructure consist mostly of dressed, coursed rubble masonry, that is, unsquared stones leveled off at the approximately horizontal surfaces. Irregularities in the stones are made up by filling the interstice with mortar.

Figure 10 – NW Wingwall showing the buttress retrofit to control base slippage

Approximately 40-50% of the large base stone of the existing piers and abutments are fractured (see Figure 11). The fractures were likely caused by non-uniform loading caused by a loss of bedding mortar. Fractures in the stone can lead to slipping along joints, which can result in differential displacement or settlement and damage to the mortared joint. However, without long-term monitoring, it cannot be determined if the stone has settled into a stable position or if the cracking is a result of ongoing movement of the foundations. Fractured stone can lead to further structural problems, as the joints become susceptible to the infiltration of water and moisture which leads to spalling from freeze/thaw cycles and possible further loss of filler material.

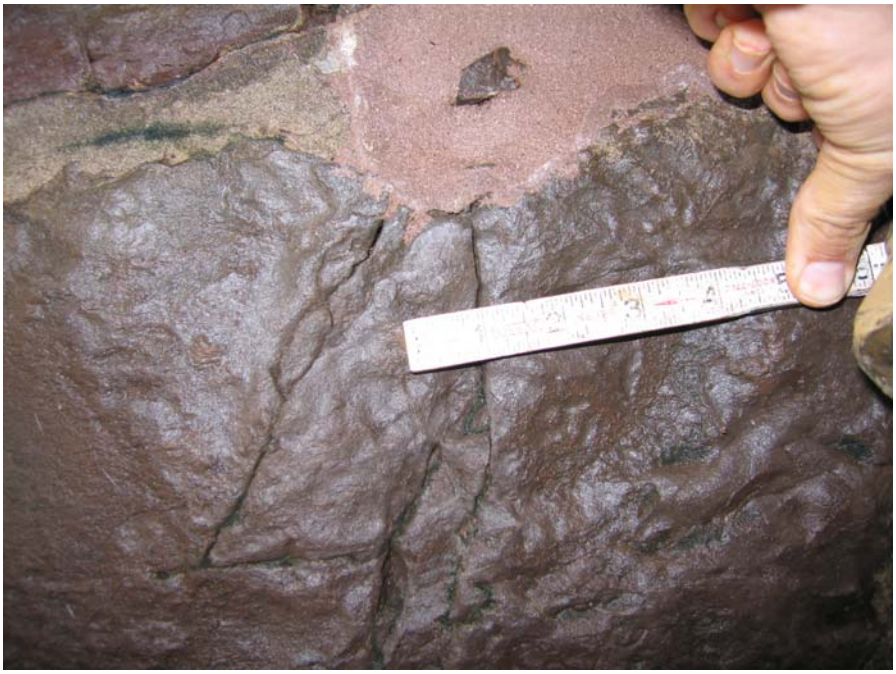

Figure 11 – Representative view of fractured stone

Stone Masonry Properties:

- Uniaxial Compressive Strength of Stone = 814.9 TSF (Lithifield argillaceous rock – Siltstone, per Foundation Report testing)
- Allowable Inventory Compressive Strength of Grouted Masonry = 360 psi (Assumes sandstone or equivalent and Type M or S Mortar, per AASHTO Manual for Condition Evaluation of Bridges, 2nd Edition, Table 6.6.2.6)
- N_{ms}, Coefficient for Estimation of Ultimate Bearing Capacity of Footings = 0.056 (For fair rock quality, with several sets of moderately weathered joints spaced 1 to 3-ft apart, per Foundation Report and DM-4, Table 10.6.3.2.2-1)

Bedrock Properties:

- Technical Data (per Foundation Report & boring logs from June 2005):
  - The bridge is located in the Gettysburg-Newark Lowland Section of the Piedmont Province (Physiographic Provinces of Pennsylvania, Map 13). The bedrock below the overburden soil is comprised of mainly red shale, siltstone and sandstone with some conglomerate and diabase.
  - The Soils Map (Soil Survey of Bucks County, Pennsylvania compiled by U.S. Department of Agriculture Soil Conservation Service) indicates that the project area is underlain by the Rowland silt loam. Bedrock is typically encountered at depths of 3.5 to 6 feet below the ground surface.
  - Average Rock Quality Designation (RQD) = 53%

C. Existing Superstructure Evaluation

Advanced Superstructure Deterioration:
The existing superstructure is severely deteriorated and in critical condition as noted in the most recent safety inspection report. This can be attributed to 87 years of weathering, substandard construction materials, and fatigue from live loads that well exceed the design vehicle used in 1919. The concrete used in the deck, beam encasements, curbs and pylons utilized smooth river rock as the aggregate. This type of stone does not provide a strong bond between the concrete and the aggregate, thus resulting in poor performing concrete without long-term durability and strength.

The following major superstructure defects have been identified:

1. The majority of the concrete superstructure façade has spalled, exposing the encased steel stringers and accelerating deterioration (see Figure 12). Several stringers that are still encased in concrete contain incipient spalls and longitudinal cracking of the concrete encasement.
2. The exposed steel stringers exhibit extensive section loss, with a corresponding reduction in their load-carrying capacity.
3. The concrete deck exhibits numerous major defects, including full-depth longitudinal cracking, and spalling. A large hole in the deck extends along the East Abutment (see Figure 13). This has been covered with a steel roadway plate.

Figure 12 – Superstructure soffit, showing extensive spalling and section loss of encased stringers

Figure 13 – Hole in concrete deck repaired with steel plate

Biennial Inspection Report
The existing bridge was posted for 19 Tons (except combinations, 34 Tons) as a result of the November 2004 biennial inspection. The existing bridge is expected to experience a continued reduction in capacity in the absence of immediate extensive repairs. The structure received an overall rating of "Poor – 4" due to the overall condition of the superstructure and substructure ratings.

D. Design Considerations

Seismic Considerations:
Seismic considerations should be closely evaluated considering the frequency of earthquake events recorded in the past 40 years. Bucks County has experienced 11 earthquakes in this period of time, many of which have occurred in central Bucks County, including magnitude 3.0 and 3.1 events in 1980 (Bureau of Topographic and Geologic Survey, 2004). The most recent seismic event was in 1997 east of Doylestown. The project is located in Seismic Zone II (Acceleration Coefficient, A = 0.15g).

The following seismic considerations should be accounted for when evaluating the existing stone masonry piers, abutments and wingwalls:

1. Masonry wall piers, abutments and wingwalls can not resist seismic forces, mainly because they have inadequate lateral stiffness to distribute the seismic loads from bridge deck to foundation. As a result, this structure is vulnerable to earthquakes and could be severely damaged or destroyed in an earthquake event. Stone masonry wall piers do not meet the seismic design requirements specified in AASHTO and DM-4 such as ductility due to the lack of reinforcement needed to form a plastic hinge for flexural yielding.
2. Collapse of the existing structure would create an obstruction of the channel, which would result in upstream flooding, potentially damage upstream structures and properties, and require costly debris removal.
3. The existing superstructure does not provide an adequate beam bearing seat length per AASHTO 4.7.4.4 and DM-4 4.7.4.4 (see Figure 14). Thus, superstructure collapse could result from displacement during a seismic event even if the substructure does not collapse. Fixity at the pier bearings cannot be maintained due to the advanced deterioration of the concrete.

Figure 14 – East Pier, showing insufficient beam bearing length

Substructure Drainage

The existing mortared joints and parged surfaces along the abutments, piers and retaining walls can trap water and enable a build-up of hydrostatic pressure. This can cause further damage to the foundation by not allowing proper drainage of the embankment or fill material. If the existing repointing and/or parging is to be retained, the installation of new weep holes should be considered to allow drainage to exit the abutment and wing walls. Geotextile should be used to prevent the loss of fill material.

E. Suitability for Bridge Rehabilitation

The following items would have to be addressed in order to rehabilitate the Headquarters Road Bridge while preserving the existing substructure:

- For a bridge rehabilitation, the new superstructure would be replaced with a deck similar in size to the existing structure. Thus, the cartway width of the bridge would be approximately 15-ft wide, which does not meet PennDOT's standard minimum curb-to-curb width of 30-ft (12-ft lanes, with 3-ft shoulders). Since the date which this inspection was conducted, PennDOT has issued a Strike-Off Letter permitting the use of a narrower, 24-ft wide bridge width for select rural bridge projects. In this specific case, PennDOT has conceded a Design Exception to permit a 24-ft curb-to-curb bridge deck due to its relatively low traffic volumes, and its setting in a Rural Historic District. However, this superstructure width could not be accommodated on the existing substructure due to width limitations (see Figure 15).
- The existing horizontal alignment does not provide an adequate turning radius for trucks and emergency vehicles turning on to or off of Sheep Hole Road. Figure 16 shows the turning radius of a Single-Unit (SU) truck making the turn onto Headquarters Road at Sheep Hole Road. This graphic shows that the existing alignment can not accommodate this turning movement due to the

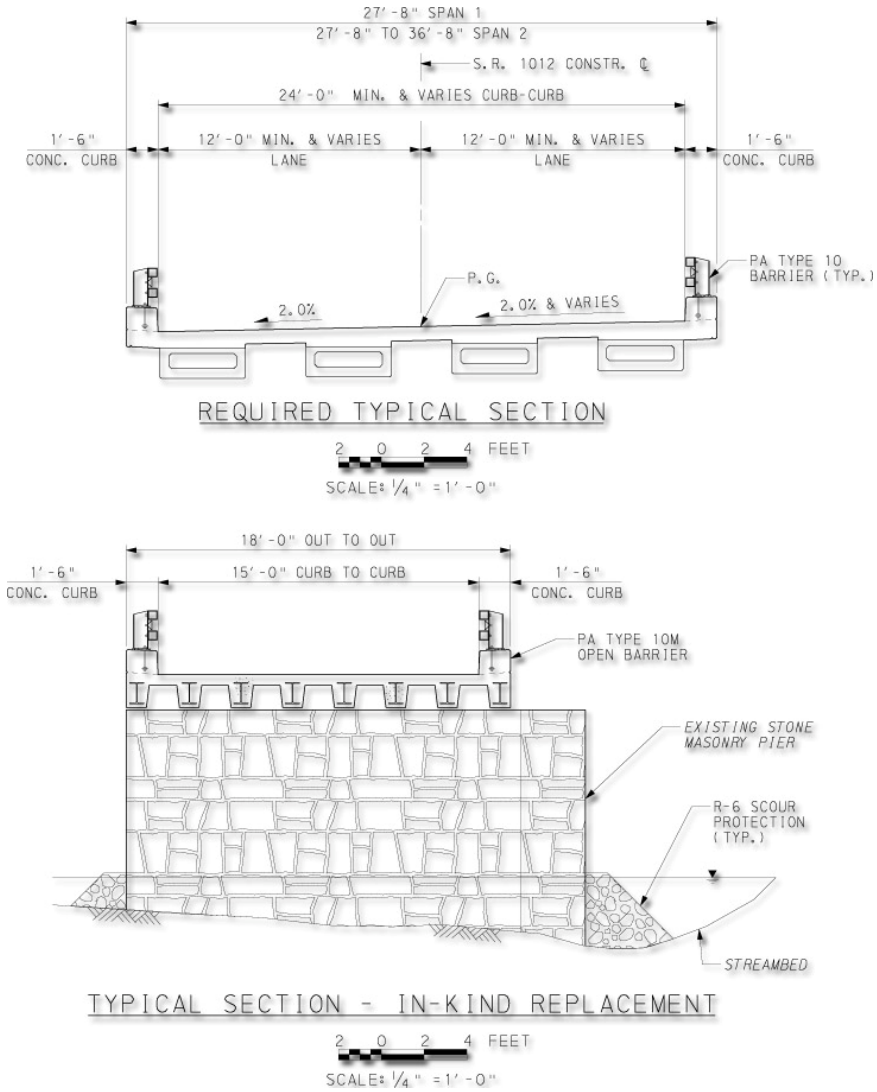

Figure 15 – Typical section of superstructure replacement and the required structure width

limited roadway and structure width. A further description of this analysis can be found in Appendix B.

- In accordance with PennDOT's DM-4, Section 7.2.4, abutments constructed on erodible rock must be placed a minimum of 1.5-ft into the rock and piers must be placed a minimum of 3-ft into the rock. Based upon field inspection and probing, the existing foundations are constructed directly on the bedrock.
- The stone masonry piers due not meet current Load and Resistance Factor Design (LRFD) standards for ductility and flexural resistance. This form of masonry can not resist lateral loads generated by a seismic event, and as a result, are susceptible to deformation and collapse.
- Per DM-4, Section 5.5.5.1b, the substructure elements that are preserved in a bridge rehabilitation must be analyzed for adequacy using a minimum live loading of HS-20 (72,000-lb vehicle). A superstructure replacement using current design criteria would result in a net dead load increase of 23.3% at abutments and 22.8% at piers. This additional dead load combined with the required live loading results in a significant increase in loads, well beyond the bridge's intended purpose and initial design criteria.

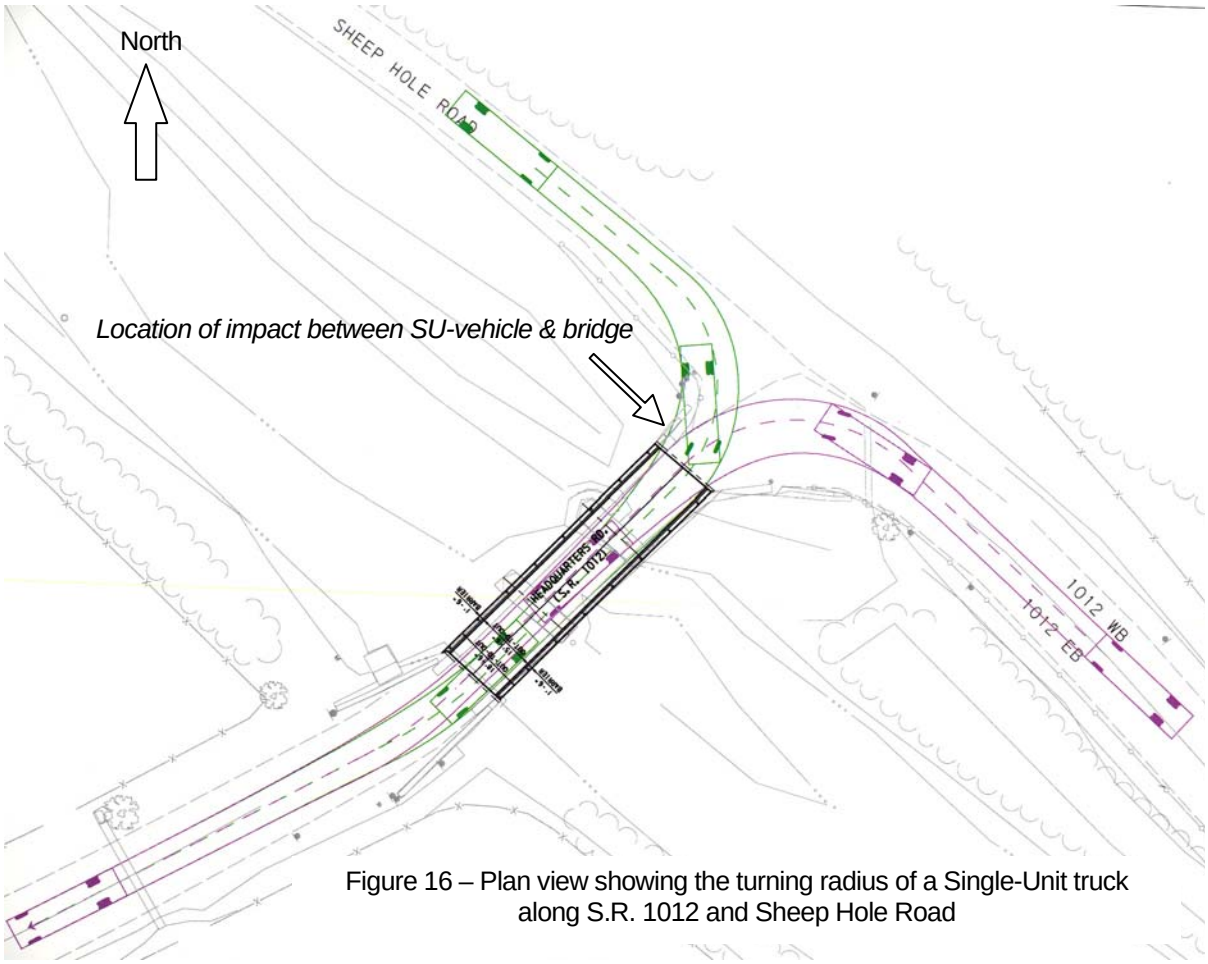

Figure 16 – Plan view showing the turning radius of a Single-Unit truck along S.R. 1012 and Sheep Hole Road

F. Conclusions

Based upon the structural deficiencies documented in Section E, a full replacement of the Headquarters Road Bridge is required. A summary of these defects is provided below:

1. Extensive loss of stone and mortar base along abutments, piers and wingwalls.
2. Evidence of settlement and/or base slippage and sliding failure at the wingwalls.
3. Several locations of stone bulging due to settlement and/or stone displacement.
4. High percentage of cracked and crushed stone masonry in the piers and abutments.
5. Undermining of existing foundations at the Ottsville abutment due to scour.
6. Widespread deterioration of superstructure.
7. Inadequate ratings of superstructure and substructure.
8. Inability to meet seismic design requirements due to insufficient flexural capacity and ductility of substructure.
9. Insufficient width to provide two lanes of traffic for safety purposes.
10. Inadequate turning radius at Sheep Hole Road Intersection.
11. Foundations on erodible rock require notching into bedrock.
12. Current live loads have exceeded the intended capacity of the existing substructure.
13. Insufficient scour protection considering limited hydraulic opening and susceptibility to extensive debris accumulation.

In evaluating the feasibility of rehabilitating the existing structure, a life-cycle cost analysis has been considered. The following factors contributed to the decision to replace the existing structure:

1. First cost of the structure – Rehabilitation would initially be less costly when compared to a full-replacement. However, the residual value of the structure is significantly less considering its reduced service life. PennDOT's targeted service life for a rehabilitated substructure is 50-years, or 100-years ideally. Considering the evidence of failure of the existing substructure and poor condition of the stone masonry, this expected service life is not feasible.
2. Design and engineering costs – There would be negligible cost savings for engineering services required for rehabilitation.
3. Maintenance costs – Costs involved with the maintenance of the existing substructure elements would be much higher for rehabilitation when compared to a full replacement. This does not include the greater potential for accidents resulting in damage to the rehabilitated structure.
4. Unknown construction costs – Unforeseen field conditions of historic masonry structures often lead to extensive construction cost overages, which often result in full replacements due to budgetary limitations or safety concerns for the construction workers.

Rehabilitation of the existing structure will not provide a safe and economically viable solution to the problems that exist on this project. The limited remaining life expectancy of the existing substructure elements do not justify the extensive costs involved with rehabilitation. A full replacement will provide a safe structure that meets all current design standards and provides an adequate service life.

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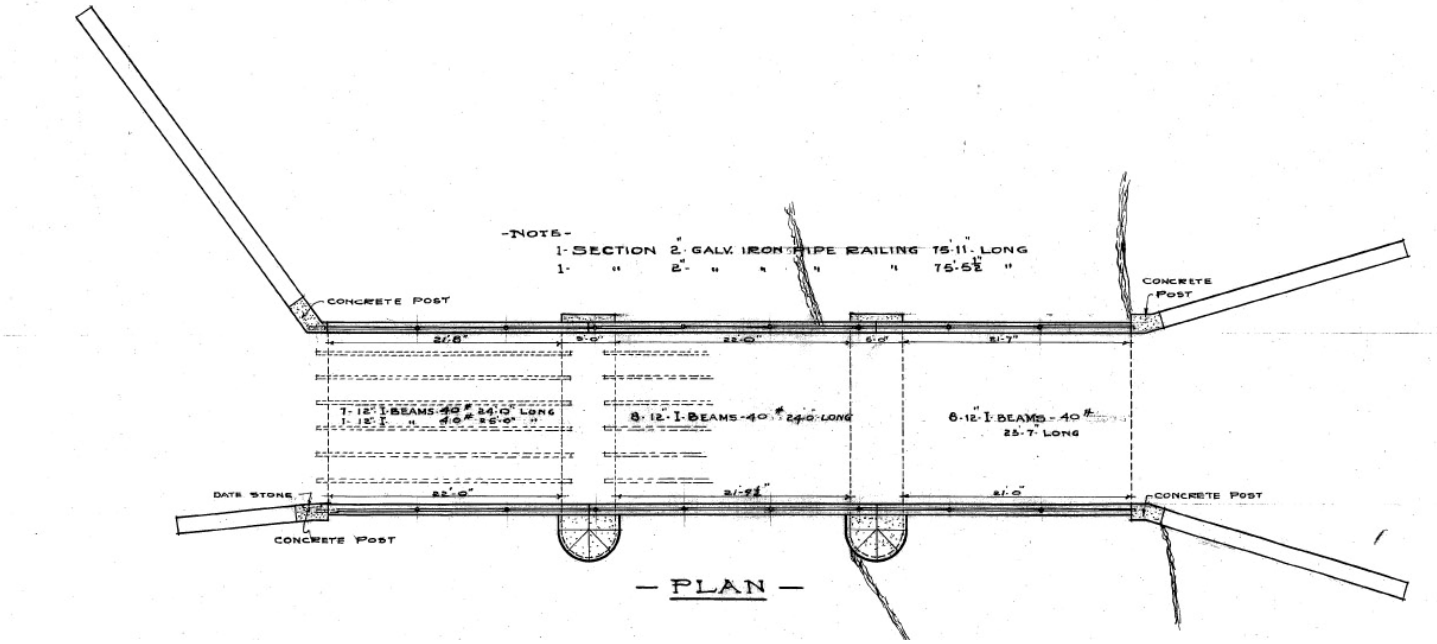
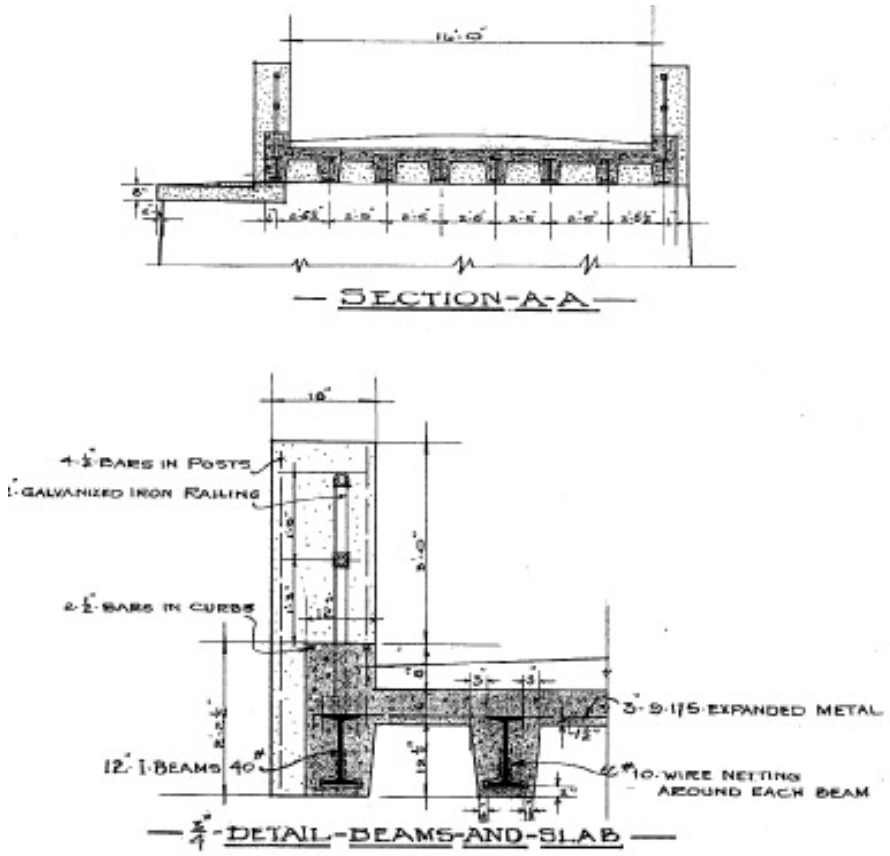
Appendix A
Photo Log

Original Bridge Plans



Plan View of the Existing Structure from 1919 Rehabilitation Plans



Section Views of the Existing Structure from 1919 Rehabilitation Plans

Pier Photos

Loss of mortar base and pointing at upstream face of Ottsville pier prior to repairs.

Loss of mortar base and pointing at upstream face of Ottsville pier prior to repairs.

Evidence of bulging and stone displacement at upstream face of Ottsville pier prior to repairs.

Loss of stone at base and bulging of upstream face of Erwinna pier.

Probing of the Erwinna pier with 4-ft steel dowel.

Close-up view of internal contents of pier.

Loss of stone at beam seat at downstream side of Erwinna pier.

Measurement of bulging at downstream side of Ottsville pier.

Abutment and Wingwall Photos

Loss of stone, mortar base, and pointing at upstream face of Ottsville abutment prior to repairs.

Stepped cracking due to settlement and base slippage at upstream face of NW wingwall prior to repairs.

Measurement of base slippage at upstream face of NW wingwall and buttress.

Extensive loss of mortar and stone at NW wingwall after repairs.

Representative view of spalled concrete pylons.

View of base slippage at NE wingwall (Erwinna abutment).

Collapsed end portion of NE wingwall due to vehicular impact.

View of base slippage at SE wingwall (Erwinna abutment).

Collapsed portion of SE wingwall showing crushed stone masonry.

Superstructure Photos

Extensive spalling and delamination of concrete encasement and section loss of steel stringer.

Extensive spalling of concrete encasement and curbs along downstream face of superstructure.

Extensive spalling and delamination of concrete encasement and section loss of steel stringer.

Deteriorated concrete encasement at pier beam seats.

Full-depth holes in concrete deck, spalling of concrete encasement, and section loss of steel stringer.

Full-depth longitudinal crack in concrete deck.

Wide cracks in concrete encasement, and incipient spalls.

Stone Photos

Cracked and crushed stone in NW wingwall.

Cracked and crushed stone at Ottsville abutment.

Cracked and crushed stone at Ottsville abutment.

Fractured stone at Ottsville abutment.

Measurement of fractured stone at Ottsville abutment.

Measurement of cracked and crushed stone at Ottsville abutment.

Evidence of Scour

Debris accumulation at upstream side of bridge.

Scour hole at upstream side of Ottsville abutment and exposed abutment foundation.

Scour hole at upstream side of Ottsville abutment and exposed abutment foundation.

Measurement of scour hole at upstream side of Ottsville abutment (39”).

Measurement of scour hole at upstream side of Ottsville pier (30”).

Debris accumulation from undermined tree at Ottsville abutment.


Probing for bedrock at NW wingwall (Ottsville abutment).

Appendix B
Turning Movement Analysis at Sheep Hole Road

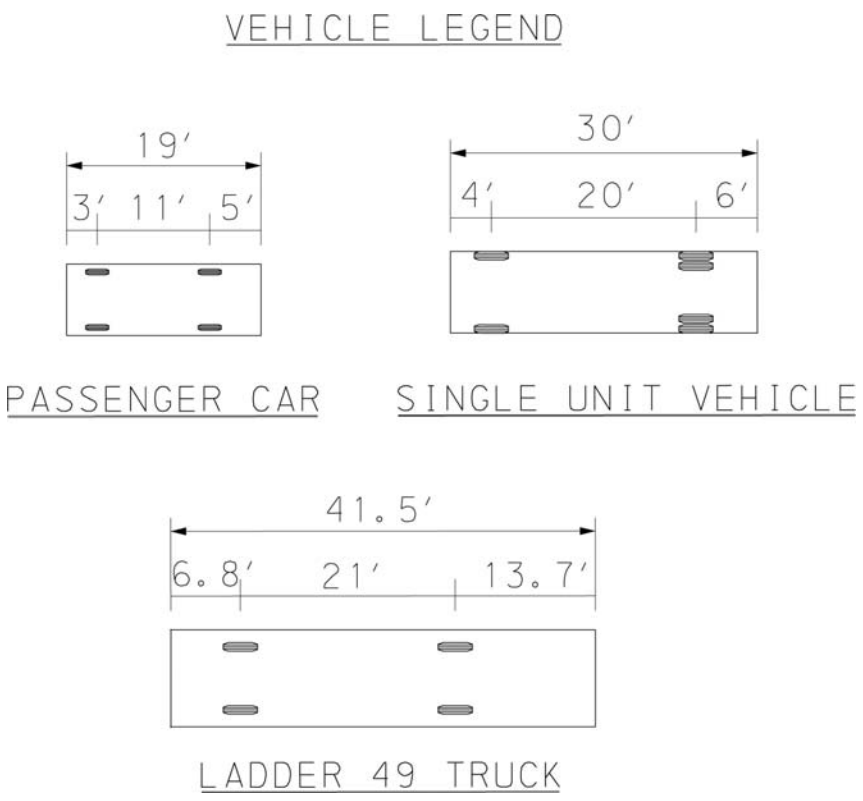
Summary of Intersection Analysis at Sheep Hole Road:

Urban Engineers evaluated the turning movements at the Sheep Hole Road intersection to determine the safety of the existing and proposed horizontal geometry at this intersection. The study was prepared using a CAD-based software tool that analyzes and evaluates vehicle maneuvers for intersections that may involve access, clearance, and maneuverability checks. The program, AutoTURN 4.1, includes simulation modes that enable the designer to view how a vehicle traverses a path in live-animated simulations. The program also incorporates guidelines for minimum turn radii, transition curves, superelevation, and lateral friction from known standards such as the AASHTO Green Book.

Three vehicle types were considered for this evaluation. These vehicles included:

- A standard-sized passenger vehicle (19-ft).
- A single-unit (SU) truck (30-ft). This would represent a two-axle moving van or delivery truck.
- A fire truck (41.5-ft). Dimensions were provided by Doug Skelton at the Ottsville Volunteer Fire Company. The controlling vehicle was Ladder 49.

The vehicle axle arrangements are shown below:

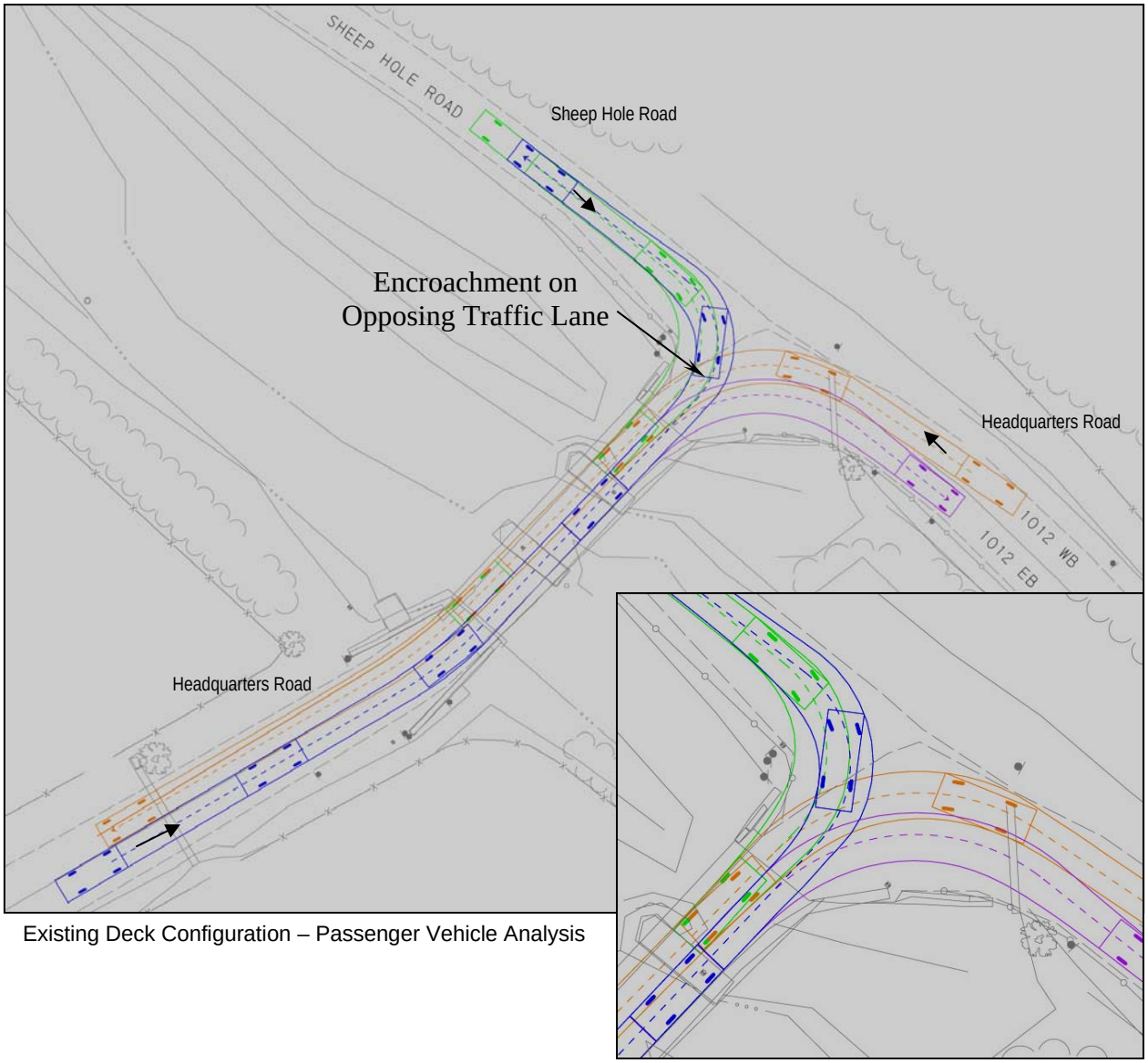


Design Vehicle Configuration

Existing Geometry Analysis – Passenger Vehicle

An evaluation of the existing bridge geometry was prepared using the original deck geometry. This considered a 16-ft curb-to-curb deck width, assuming the temporary 2-ft concrete jersey barriers were removed from both sides of the bridge.

The AutoTURN analysis showed that passenger vehicles can maneuver through the intersection. However, it did demonstrate that vehicles making a right hand turn off of Sheep Hole Road onto westbound Headquarters Road will encroach on the opposing traffic lane.



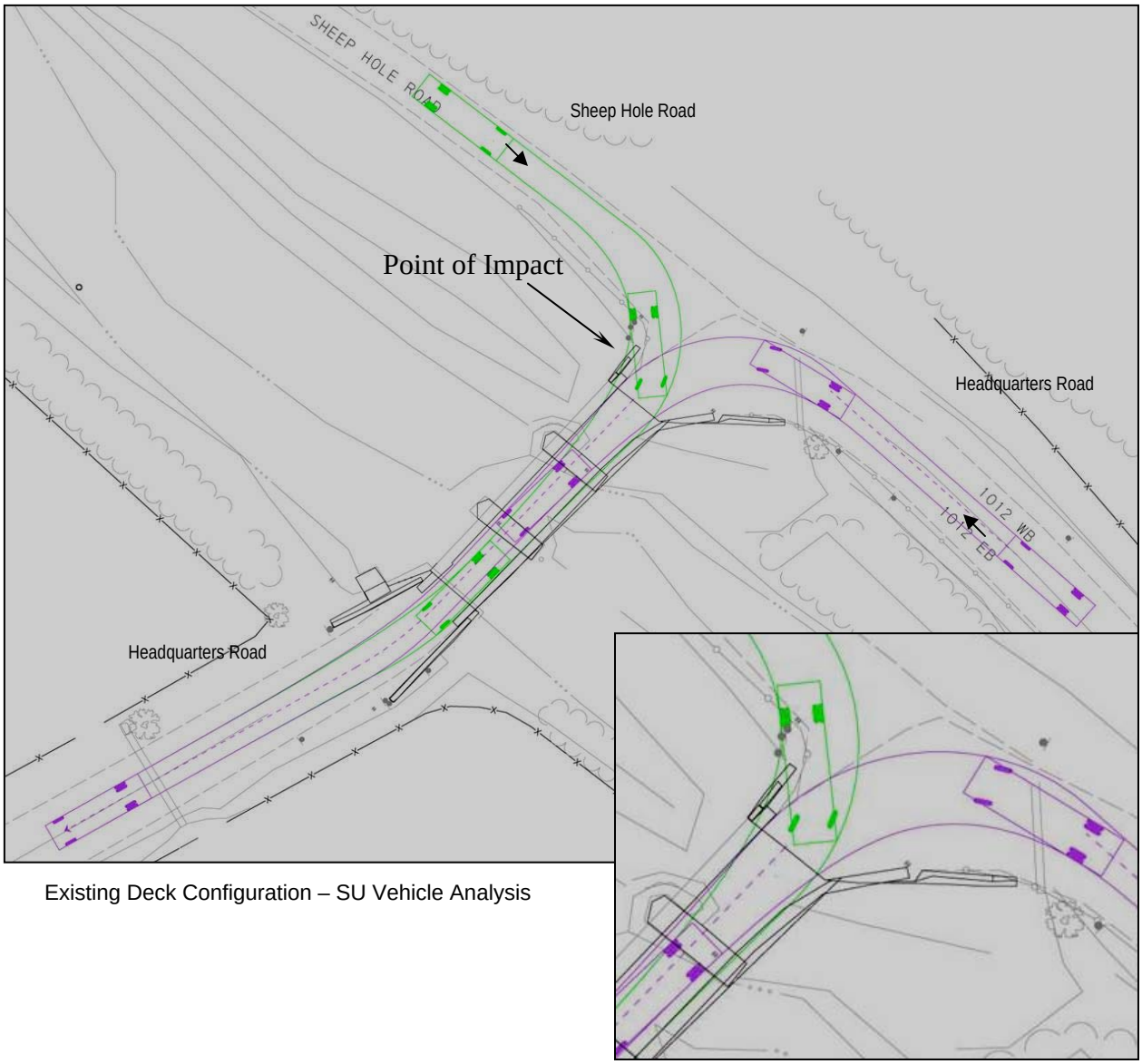
Existing Deck Configuration – Passenger Vehicle Analysis

Existing Geometry Analysis – SU Vehicle

An evaluation of the existing bridge geometry was prepared for a Single-Unit (SU) vehicle using the original deck geometry. This considered a 16-ft curb-to-curb deck width, assuming the temporary 2-ft concrete jersey barriers were removed from both sides of the bridge.

The AutoTURN analysis showed that SU vehicles cannot maneuver through a right hand turn off of Sheep Hole Road onto westbound Headquarters Road without impacting the wingwall adjacent to Sheep Hole Road. An impact would also occur at this wall from an eastbound SU vehicle making a left hand turn onto northbound Sheep Hole Road.

This turning movement analysis demonstrates that the geometry of the intersection at Sheep Hole Road can not permit the turning movement of any vehicle larger than a passenger vehicle on to or off of Sheep Hole Road. And since all SU vehicles will encroach on the opposing traffic lane due to the limited lane width across the bridge, the bridge would have to remain posted as a one-lane bridge.

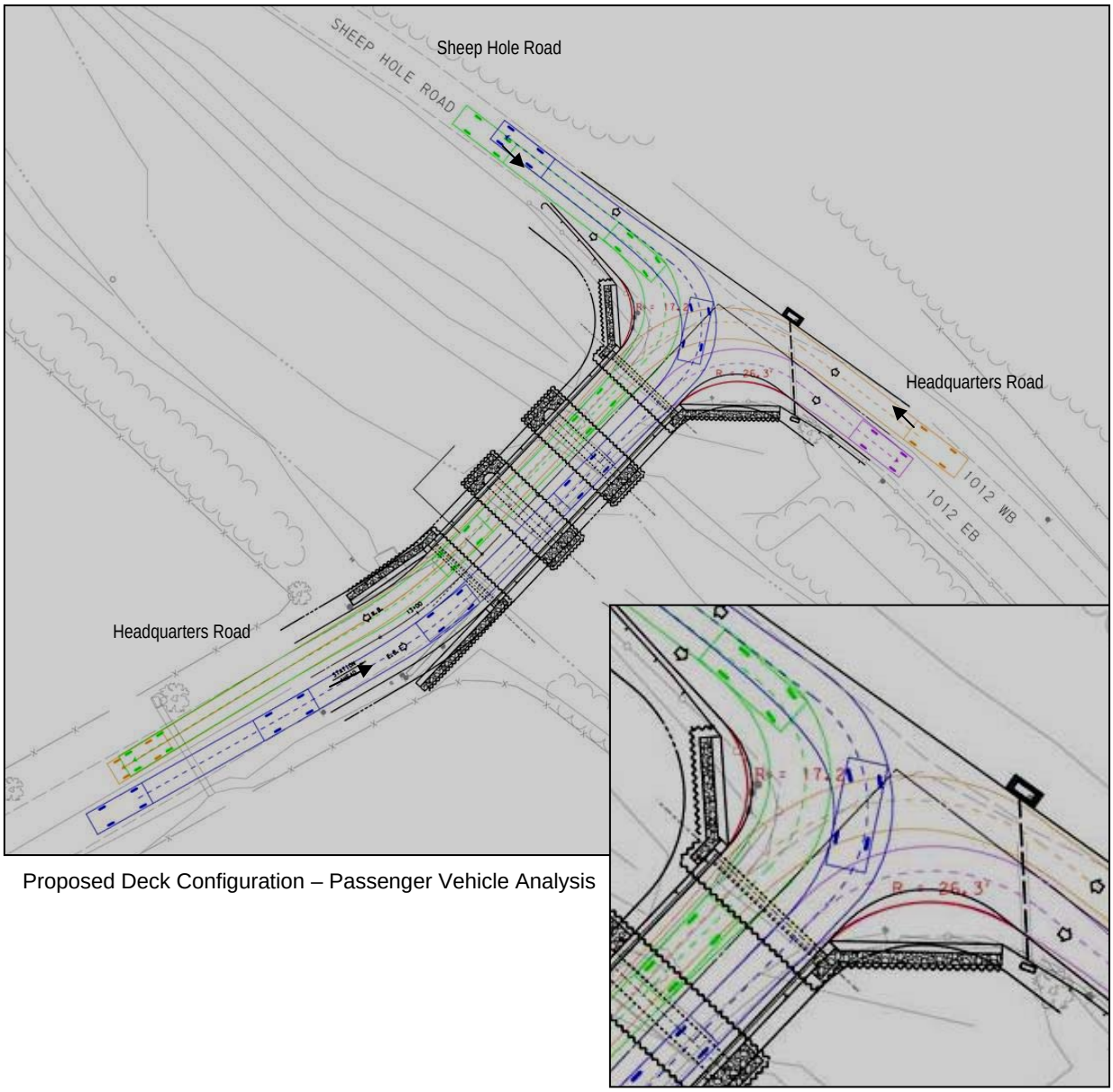


Existing Deck Configuration – SU Vehicle Analysis

Proposed Geometry Analysis – Passenger Vehicle

Next, Urban evaluated the turning movements for a new bridge with a reconfigured intersection at Sheep Hole Road. The design team prepared a bridge layout with a 24-ft curb-to-curb width that would allow turning movements by single-unit trucks and a Tinicum Township fire truck. Encroachment into the opposing lane would be permitted, but a Design Exception from PennDOT would be required for this bridge arrangement since it does not meet the current safety standards. Final approval of this arrangement will need to come from PennDOT's Safety Review Committee.

An evaluation of the proposed bridge geometry was prepared to analyze turning movements of passenger vehicles. The AutoTURN analysis showed that the passenger vehicles can maneuver all turns on to and off of Sheep Hole Road without impacting the adjacent wingwalls. Flared wings were proposed to provide ample space for turning vehicles at Sheep Hole Road.

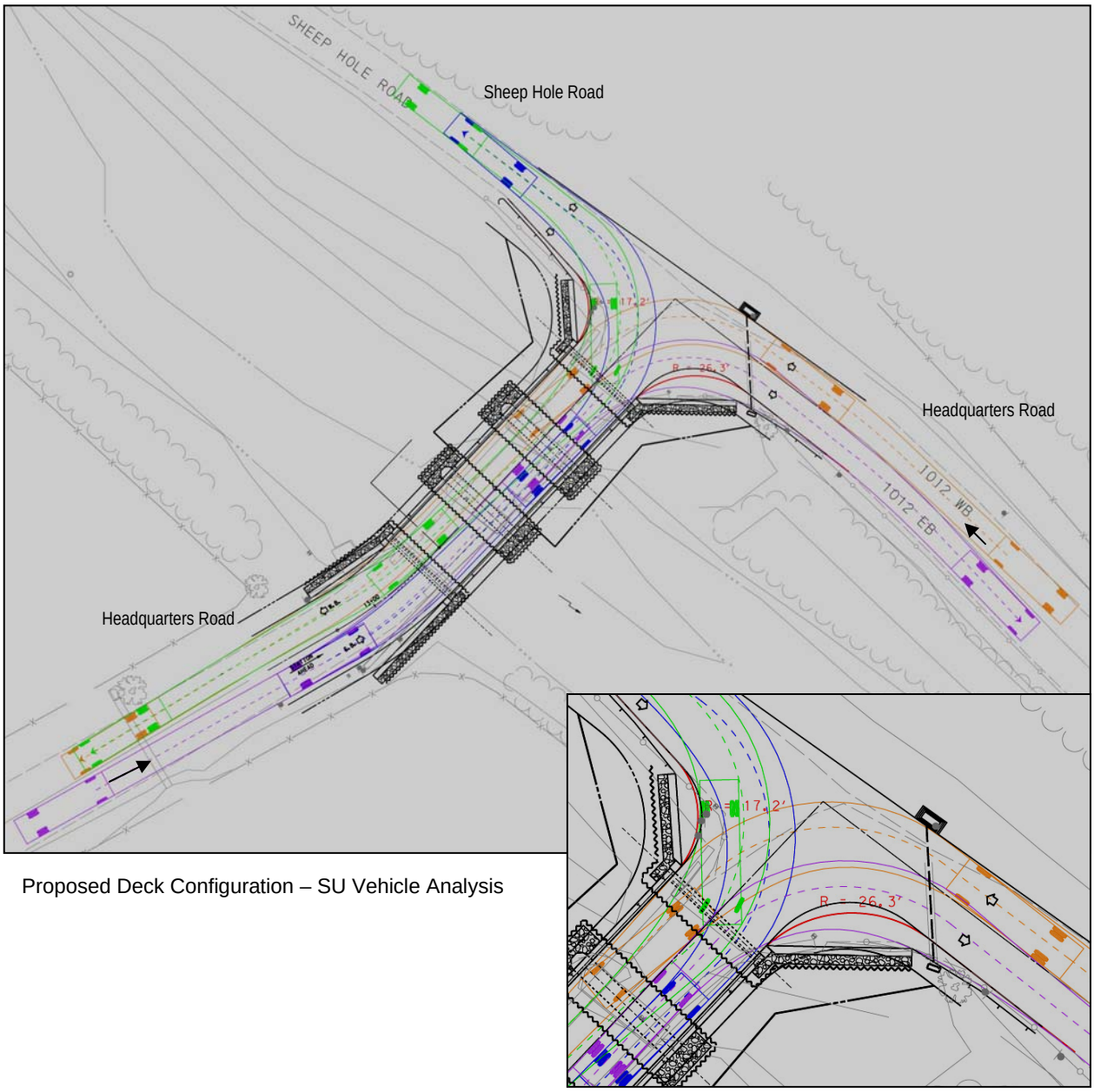


Proposed Deck Configuration – Passenger Vehicle Analysis

Proposed Geometry Analysis – SU Vehicle

An evaluation of the proposed bridge geometry was prepared to analyze turning movements of a 30-ft single-unit vehicle. The AutoTURN analysis showed that the SU vehicle can maneuver all turns on to and off of Sheep Hole Road without impacting the adjacent wingwalls. Flared wings were proposed to provide ample space for all turning vehicles at Sheep Hole Road. However, the SU vehicles will encroach on the opposing lane of traffic during the turning movement. As discussed above, this will likely require a Design Exception.

A 3-way stop condition at the T-intersection at Sheep Hole Road and Headquarters Road will be investigated prior to the Safety Review Submission.

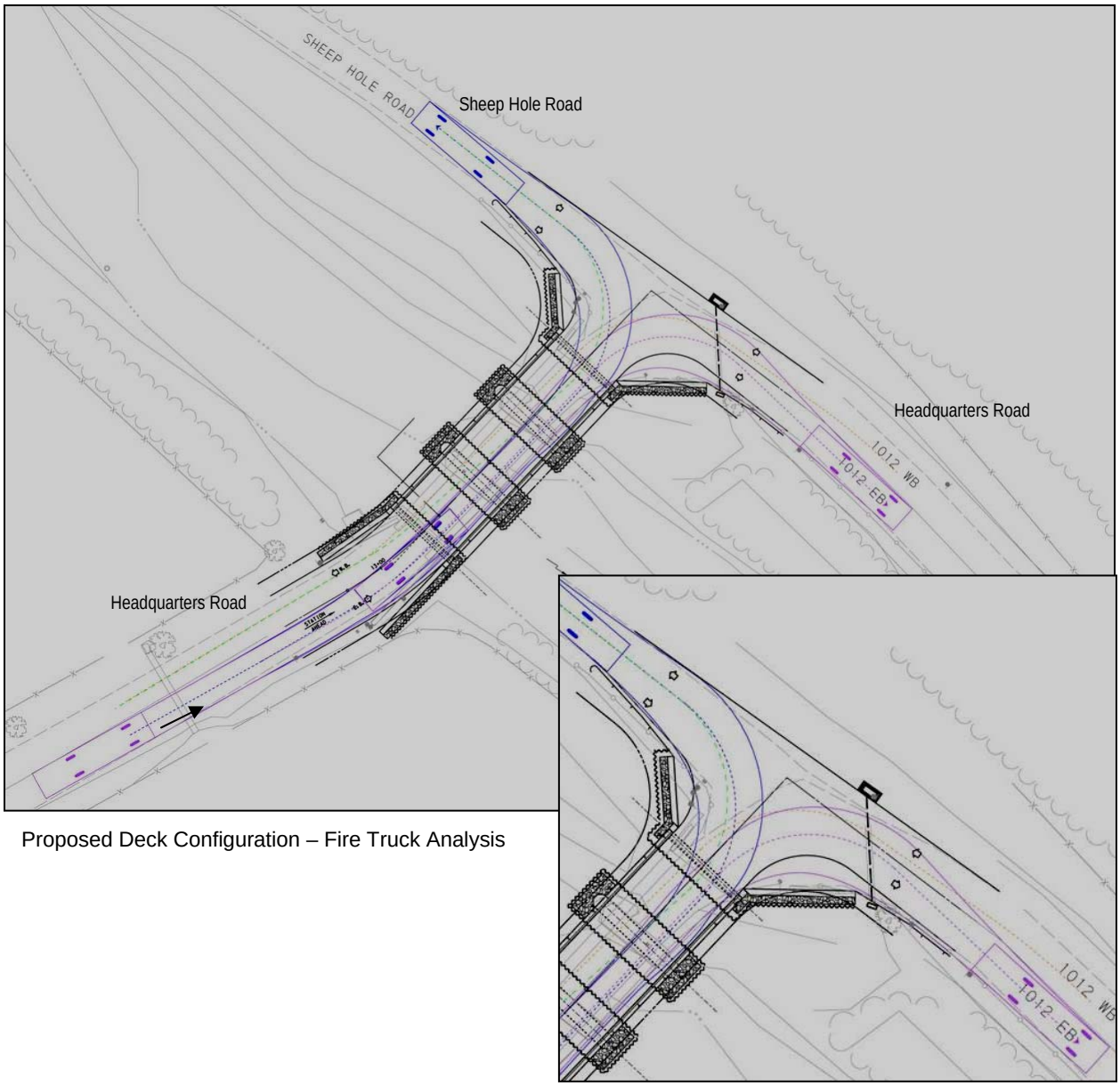


Proposed Deck Configuration – SU Vehicle Analysis

Proposed Geometry Analysis – Fire Truck

An evaluation of the proposed bridge geometry was prepared to analyze turning movements of a 41.5-ft ladder truck. The AutoTURN analysis showed that this fire truck can maneuver all turns on to and off of Sheep Hole Road without impacting the adjacent wingwalls. Flared wings were proposed to provide ample space for all turning vehicles at Sheep Hole Road. However, the ladder truck will encroach on the opposing lane of traffic during the turning movement. As discussed above, this will likely require a Design Exception.

A 3-way stop condition at the T-intersection at Sheep Hole Road and Headquarters Road will be investigated prior to the Safety Review Submission.



Proposed Deck Configuration – Fire Truck Analysis

LEGAL DOCUMENT

Agreement: E00342	Project Specific	Active
Name: Three (3) Bridge Replacements in Bucks County	Selection Process: Normal	
	Initiating Org: Engineering District 6-0	

• denotes required fields

Project Specific Agreement E00342

Engineering District 6-0
Initiating Organization

$1,306,833.97
Maximum Agreement Cost

Urban Engineers, Inc. 23-1575527
Consultant - FID

Cost Plus Fixed Fee
Specific Rate of Compensation
Method(s) of Payment

County	State Route/Section
Bucks	1012/BRC
Bucks	2014/BBR

THIS AGREEMENT, made and entered into on 3/23/2005 , at Harrisburg, Pennsylvania, between the Commonwealth of Pennsylvania, acting through its Department of Transportation, by the Secretary, ("Department"), and Urban Engineers, Inc., a Corporation of CONSULTANTS, registered as such in the Commonwealth of Pennsylvania, their heirs, executors, administrators, successors, or assigns, ("Consultant").

WITNESSETH:

A. **Scope Of This Agreement**

1. **Project Identification**

The Consultant, for and in consideration of the payment or payments specified in this AGREEMENT, shall perform all work and services, and furnish all equipment and materials not otherwise provided, for Parts 1 and 2 preliminary engineering and environmental studies, Parts 3 and 4 final design, and Parts 5 and 6, consultation during construction and shop drawing review on S.R. 1012, Section BRC and S.R. 2014, Section BBR in Bucks County.

Part 1 - Preliminary Design

State Project Number:	40101203BRC0610
Program Code:	321
Federal Project Number:	Not Federal
MPMS Number:	13716
Maximum Amount:	$459,674.29
Method of Payment:	Cost Plus Fixed Fee

Part 2 - Preliminary Design

State Project Number:	40201403BBR0610
Program Code:	321
Federal Project Number:	Not Federal
MPMS Number:	13207
Maximum Amount:	$186,722.55
Method of Payment:	Cost Plus Fixed Fee

Part 3 - Final Design

State Project Number:	40101203BRC0610
Program Code:	321
Federal Project Number:	Not Federal
MPMS Number:	13716
Maximum Amount:	$394,761.61
Method of Payment:	Cost Plus Fixed Fee

Part 4 - Final Design

State Project Number:	40201404BBR0610
Program Code:	321
Federal Project Number:	Not Federal
MPMS Number:	13207
Maximum Amount:	$194,712.13
Method of Payment:	Cost Plus Fixed Fee

Part 5 - Services During Construction

State Project Number:	40101207BRC0610
Program Code:	361
Federal Project Number:	Not Federal
MPMS Number:	13716
Maximum Amount:	$43,651.89
Method of Payment:	Specific Rate of Compensation

Part 6 - Services During Construction

State Project Number:	402014BBR070610
Program Code:	361
Federal Project Number:	Not Federal
MPMS Number:	13207
Maximum Amount:	$27,311.50
Method of Payment:	Specific Rate of Compensation

2. **Terms, Conditions and Provisions**

   a. The Consultant agrees to comply with and to provide the required work and

with the provisions listed below, which are incorporated into this AGREEMENT by reference, as though physically attached.

i. Commonwealth Contractor Responsibility Provisions, dated April 16,1999
ii. Consultant Integrity Provisions, dated December 20, 1991
iii. Commonwealth Nondiscrimination/Sexual Harassment Clause, dated June 30, 1999
iv. Federal Nondiscrimination and Equal Employment Opportunity Clauses, dated January 1976
v. Offset Provision for Commonwealth Contracts, dated April 16, 1999
vi. Pennsylvania Election Code, dated February 22, 2001
vii. Publication No. 442, Bureau of Design Specifications for Consultant Agreements, dated 3/13/2001
viii. Provisions Concerning the Americans With Disabilities Act, dated 01/2001

b. By signing this Agreement, the Consultant certifies their compliance with the following requirements:

i. Consultant's Certification of Non-Collusion, dated February 1990
ii. Certification Regarding Debarment, Suspension and Other Responsibility Matters, dated August 1990
iii. Certificate of Restrictions on Lobbying, dated August 6, 1990
iv. Consultant's Acceptance of PA Workmen's Compensation Act, dated August, 1999

c. By signing this Agreement, the Department certifies their compliance with the following requirement:

i. Department's Certificate of Non-Collusion, dated January 1999

d. The Consultant agrees to comply with and to provide the required work and services in accordance with the Department's Standard Agreement Special Requirements, dated April 26, 2001 and the following standard method of payment special provisions: Method of Payment - Cost Plus Fixed Fee, dated 5/16/2001, Method of Payment - Specific Rate of Compensation, dated 2/28/2001, which have been made available to the Consultant in electronic or paper form, and the Consultant's Technical Proposal, and Price Proposal, which are incorporated into this Agreement by reference.

e. The scope of work and services, as set forth in the Consultant's technical proposal, are to be performed in conformance with the requirements of this Agreement and the applicable provisions of the current Department Publications, Manuals, Handbooks, Policies and Procedures. The Department and the Consultant shall confer at any time when the Department issues an amendment, revision, amplification, increase, and/or change to any Publication, Manual, Handbook, Policy or Procedures to determine whether there is a change in scope and/or accepted work and services completed by the Consultant which is ordered changed. The Department, with the approval of the Federal

Highway Administration (FHWA) when applicable, where there is such a change, will issue a Supplemental Agreement

B. Agreement Duration

1. Notice To Proceed

The consultant shall not proceed with work and services required under any Part of this Agreement until specifically authorized by the Department to proceed on that Part in the form of an electronic Notice to Proceed (NTP) issued through the Engineering and Construction Management System (ECMS).

2. Time Of Completion

a. The Consultant shall complete all of the work and services covered by each Part of this Agreement within the time period indicated below:

Part 1 - Within 18 calendar months after the NTP date.

Part 2 - Within 18 calendar months after the NTP date.

Part 3 - Within 12 calendar months after the NTP date.

Part 4 - Within 12 calendar months after the NTP date.

Part 5 - Within 12 calendar months after the NTP date.

Part 6 - Within 12 calendar months after the NTP date.

b. The Consultant shall not be eligible for and shall not request reimbursement from the Department for any costs incurred under an Agreement Part after the expiration of that Part.

c. The time of completion for a Part may be extended by the execution of a Supplemental Agreement or by a letter signed by the Deputy Secretary for Highway Administration, or his Designee. The Consultant must initiate a time extension request in the form of a letter, to the Department's Manager of this Agreement, providing justification for the time extension prior to the termination date of the Part. An authorized Department Representative shall submit a transmittal letter and a copy of the Consultant's time extension request to the Consultant Agreement Division, Bureau of Design, for approval by the Deputy Secretary for Highway Administration, a minimum three (3) weeks prior to the termination date of the Agreement Part. If justified, the Deputy Secretary for Highway Administration, or his Designee, will issue a time extension approval letter prior to the expiration date of the Agreement Part. A copy of the time extension approval letter shall be forwarded to the Department's Project Manager and the Document Review and Control Division, Comptroller's Office.

C. Compensation

1. Maximum Cost

a. The total cost of each Part of this Agreement shall not exceed the maximum cost for each Part as specified in the Consultant's Price Proposal. The total maximum cost of this Agreement shall not exceed $1,306,833.97 without prior approval by the Department and by the Federal Highway Administration (FHWA), where applicable, in the form of a Supplemental Agreement signed by the Department and the Consultant.

b. The maximum costs under each Part may be adjusted when the Consultant establishes and the Department agrees that there has been or is to be a significant change in the following:

i. Scope, complexity, or character of the original work and services to be performed, induced, caused or directed by the Department.

ii. Conditions under which the original work and services were required to be performed, neither foreseen by the Department nor by the Consultant at the time of execution of the original Agreement, nor created thereafter by the Consultant.

iii. Duration of work, if the change from the time of completion specified in the Agreement was induced, caused or was the result of directions issued by the Department.

iv. The Department will not reimburse the Consultant for any costs incurred in excess of the maximum amount stipulated for any category of funds on the Consultant's invoice template as approved by the Department at the time the costs were incurred.

D. Additional Agreement Conditions

1. Disadvantaged Business Enterprise Goal

The Consultant shall attain the Disadvantaged Business Enterprise goal of 10 % of the total cost, excluding non-professional costs, of this Agreement, including all supplements hereto. Costs included in a DBE firm's price proposal as direct cost of work and services by others shall not count as DBE participation in this Agreement. In the alternative a showing of good faith effort shall be made.

For agreements with an established Disadvantaged Business Enterprise goal, documentation of good faith effort shall be made by the Consultant and be subject to the concurrence of the Department. A list of the requirements constituting good faith effort is included in this provision: Good Faith Effort, dated May 4, 2001 .

2. Miscellaneous

a. Specific Rate Factor Condition

Overhead rate(s) used to establish specific rate factors under this Agreement are subject to further review and modification by the Department. The statement "These specific rate

factors shall remain fixed for the life of this Agreement" in the standard method of payment special provision attached hereto is null and the Department reserves the right to adjust specific rate factors, by supplemental Agreement, if further review of compensation components included in the overhead rates used to establish the specific rate factors are determined to be unreasonable. Revisions to a specific rate factor by supplement would be effective the execution date of this original Agreement.

Document Status: Executed
Prepared By: Templeton, Thomas M.

Attachments

Name	Created By	Created On
No records found.		

Workflow

Status	Name	Disposition	Date/Time
Consultant Review	Joseph P Mcatee PE/PennDOT BP-000037 - Vice-President	Sign	03/18/2005 10:28:15 AM
Signed by Joseph P Mcatee PE/PennDOT BP-000037 on 03/18/2005 at 10:28:15 AM.			
Deputy Secretary Review	Dean A Schreiber/PennDOT	Sign	03/18/2005 10:58:34 AM
Signed by Dean A Schreiber/PennDOT on 03/18/2005 at 10:58:34 AM.			
Chief Counsel Review	Michael H Kline/PennDOT	Approve	03/18/2005 02:48:17 PM
Approved by Michael H Kline/PennDOT on 03/18/2005 at 02:48:17 PM.			
Comptroller Review	Richard C Lepley II/PennDOT	Approve	03/18/2005 03:35:17 PM
Approved by Richard C Lepley II/PennDOT on 03/18/2005 at 03:35:17 PM.			
CAD Chief Approval	Chris A Drda/PennDOT	Execute	03/23/2005 07:26:23 AM
Executed by Chris A Drda/PennDOT on 03/23/2005 at 07:26:23 AM.			

Audit Information

Created By	Created On	Modified By	Modified On
Thomas M Templeton/PennDOT	03/18/2005 08:29:57 AM	Chris A Drda/PennDOT	03/23/2005 07:26:42 AM

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Wed Jul 17 10:27:02 EDT 2013
Official ECMS Date/Time

LEGAL DOCUMENT

Agreement: E00342	Project Specific	Active
Name: Three (3) Bridge Replacements in Bucks County	Selection Process: Normal Initiating Org: Engineering District 6-0	
Supplement: 1	Normal	Executed
Description: provide for, under Part 1, additional work and services for the preliminary design of S.R. 1012, Sec. BRC due to changes to the roadway geometry and intersection configuration and modifications to the TS&L		

Project Specific Agreement E00342
Supplement # 1

Engineering District 6-0
Initiating Organization

$110,020.66
Supplemental Agreement Cost

Urban Engineers, Inc. 23-1575527
Consultant - FID

Cost Plus Fixed Fee
Method(s) of Payment

THIS SUPPLEMENTAL AGREEMENT, made and entered into on 10/12/2010, at Harrisburg, Pennsylvania, between the Commonwealth of Pennsylvania, acting through its Department of Transportation, by the Secretary, ("Department"), and Urban Engineers, Inc., a Corporation of CONSULTANTS, registered as such in the Commonwealth of Pennsylvania, their heirs, executors, administrators, successors, or assigns, ("CONSULTANT").

WITNESSETH:

WHEREAS, the Department and the Consultant, under date of 03/23/2005, entered into an Agreement, designated in the Department's files as No. E00342, wherein the Consultant agreed to perform all work and services, and furnish all equipment and materials not otherwise provided, for Parts 1 and 2 preliminary engineering and environmental studies, Parts 3 and 4 final design, and Parts 5 and 6, consultation during construction and shop drawing review on S.R. 1012, Section BRC and S.R. 2014, Section BBR in Bucks County; and

WHEREAS, the Department and the Consultant desire to supplement the Agreement to provide for, under Part 1, additional work and services for the preliminary design of S.R. 1012, Sec. BRC due to changes to the roadway geometry and intersection configuration and modifications to the TS&L;

Now, THEREFORE, the parties hereto, for and in consideration of the foregoing premises and mutual promises, hereinafter contained, with the intention of being legally bound thereby, agree as follows:

1. **Terms, Conditions and Provisions**

   a. The Consultant agrees to comply with and to provide the required work and services in accordance with the provisions listed below, which are incorporated into this AGREEMENT by reference, as though physically attached.

      i. Commonwealth Contractor Responsibility Provisions, dated April 16, 1999
      ii. Consultant Integrity Provisions, dated July 30, 2010
      iii. Commonwealth Nondiscrimination Clause for Consultant Agreements, dated July 30, 2010
      iv. Federal Nondiscrimination and Equal Employment Opportunity Clauses, dated January 1976
      v. Offset Provision for Commonwealth Contracts, dated April 16, 1999
      vi. Pennsylvania Election Code, dated February 22, 2001
      vii. Publication 442, Bureau of Design Specifications for Consultant Agreements, dated August 4, 2010
      viii. Provisions Concerning the Americans With Disabilities Act, dated January 2001

   b. By signing this Agreement, the Consultant certifies their compliance with the following requirements:

      i. Consultant's Certification of Non-Collusion, dated February 1990
      ii. Certification Regarding Debarment, Suspension and Other Responsibility Matters, dated August 1990
      iii. Certificate of Restrictions on Lobbying, dated August 6, 1990
      iv. Consultant's Acceptance of PA Workmen's Compensation Act, dated August 1999

   c. By signing this Agreement, the Department certifies their compliance with the following requirement:

      i. Department's Certificate of Non-Collusion, dated January 1999

   d. The Consultant agrees to comply with and to provide the required work and services in accordance with the Department's Standard Agreement Special Requirements, dated April 26, 2001 and the following standard method of payment special provisions: Method of Payment - Cost Plus Fixed Fee, dated May 1, 2009, which have been made available to the Consultant in electronic or paper form, and the Consultant's Technical Proposal, and Price Proposal, which are incorporated into this Agreement by reference.

   e. That the maximum cost of each part of this supplement is as follows:

Part	Current Cost	Supplemental Adjustment	New Part Total
1	459,674.29	110,020.66	569,694.95

   f. That the maximum cost of this Agreement is as follows:

Current Cost	Supplemental Adjustment	New Agreement Cost
1,306,833.97	110,020.66	1,416,854.63

   g. That the time of completion for each Part shall be the termination date of this Agreement or as shown below, whichever occurs first:

      Part 1 - 09/25/2011 .

h. That the Department approved invoice template has been amended and will be available to the Consultant effective the execution date of this Supplemental Agreement.

i. That all other terms and conditions of the Agreement, which are not changed by this Supplemental Agreement, remain in full force and effect.

Document Status: Executed
Prepared By: Templeton, Thomas M.

Attachments

Name	Created By	Created On
No records found.		

Workflow

Status	Name	Disposition	Date/Time
Draft	Thomas M Templeton/PennDOT	Submit	09/27/2010 01:10:18 PM
Consultant Review	Edward M D'alba PE/PennDOT BP-000037 - President	Approve	10/07/2010 01:34:10 PM
Deputy Secretary Review	Brian D Hare/PennDOT	Approve	10/07/2010 02:33:23 PM
Chief Counsel Review	Michael H Kline/PennDOT	Approve	10/08/2010 05:18:11 PM
Comptroller Review	Brenda A Zorbaugh/PennDOT	Approve	10/12/2010 12:42:44 PM
CAD Chief Approval	Gary R Kleist/PennDOT	Execute	10/12/2010 05:12:51 PM

Audit Information

Created By	Created On	Modified By	Modified On
Thomas M Templeton/PennDOT	09/27/2010 01:10:18 PM	Gary R Kleist/PennDOT	10/12/2010 05:12:51 PM

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LEGAL DOCUMENT

Agreement: E00342	Project Specific	Active
Name: Three (3) Bridge Replacements in Bucks County	**Selection Process:** Normal **Initiating Org:** Engineering District 6-0	
⊟ **Supplement:** 2	**Normal**	**Executed**
Description: add additional coordination efforts with PADEP and extend the time of completion for Part 1		

Project Specific Agreement E00342
Supplement # 2

Engineering District 6-0
Initiating Organization

$36,951.29
Supplemental Agreement Cost

Urban Engineers, Inc. 23-1575527
Consultant - FID

Cost Plus Fixed Fee
Method(s) of Payment

THIS SUPPLEMENTAL AGREEMENT, made and entered into on 03/15/2012, at Harrisburg, Pennsylvania, between the Commonwealth of Pennsylvania, acting through its Department of Transportation, by the Secretary, ("Department"), and Urban Engineers, Inc., a Corporation of CONSULTANTS, registered as such in the Commonwealth of Pennsylvania, their heirs, executors, administrators, successors, or assigns, ("CONSULTANT").

WITNESSETH:

WHEREAS, the Department and the Consultant, under date of 03/23/2005, entered into an Agreement, designated in the Department's files as No. E00342, wherein the Consultant agreed to perform all work and services, and furnish all equipment and materials not otherwise provided, for Parts 1 and 2 preliminary engineering and environmental studies, Parts 3 and 4 final design, and Parts 5 and 6, consultation during construction and shop drawing review on S.R. 1012, Section BRC and S.R. 2014, Section BBR in Bucks County; and

WHEREAS, the Department and the Consultant, under date of 10/12/2010 entered into Supplement Agreement 1 to provide for, under Part 1, additional work and services for the preliminary design of S.R. 1012, Sec. BRC due to changes to the roadway geometry and intersection configuration and modifications to the TS&L; and

WHEREAS, the Department and the Consultant desire to supplement the Agreement to add additional coordination efforts with PADEP and extend the time of completion for Part 1;

Now, THEREFORE, the parties hereto, for and in consideration of the foregoing premises and

mutual promises, hereinafter contained, with the intention of being legally bound thereby, agree as follows:

1. Terms, Conditions and Provisions

a. The Consultant agrees to comply with and to provide the required work and services in accordance with the provisions listed below, which are incorporated into this AGREEMENT by reference, as though physically attached.

i. Commonwealth Contractor Responsibility Provisions, dated October 25, 2010
ii. Consultant Integrity Provisions, dated October 7, 2010
iii. Commonwealth Nondiscrimination Clause for Consultant Agreements, dated July 30, 2010
iv. Federal Nondiscrimination and Equal Employment Opportunity Clauses, dated January 1976
v. Offset Provision for Commonwealth Contracts, dated October 25, 2010
vi. Pennsylvania Election Code, dated February 22, 2001
vii. Publication 442, Bureau of Design Specifications for Consultant Agreements, dated August 4, 2010
viii. Provisions Concerning the Americans With Disabilities Act, dated January 2001

b. By signing this Agreement, the Consultant certifies their compliance with the following requirements:

i. Consultant's Certification of Non-Collusion, dated February 1990
ii. Certification Regarding Debarment, Suspension and Other Responsibility Matters, dated August 1990
iii. Certificate of Restrictions on Lobbying, dated August 6, 1990
iv. Consultant's Acceptance of PA Workmen's Compensation Act, dated August 1999

c. By signing this Agreement, the Department certifies their compliance with the following requirement:

i. Department's Certificate of Non-Collusion, dated January 1999

d. The Consultant agrees to comply with and to provide the required work and services in accordance with the Department's Standard Agreement Special Requirements, dated April 26, 2001 and the following standard method of payment special provisions: Method of Payment - Cost Plus Fixed Fee, dated May 1, 2009, which have been made available to the Consultant in electronic or paper form, and the Consultant's Technical Proposal, and Price Proposal, which are incorporated into this Agreement by reference.

e. That the maximum cost of each part of this supplement is as follows:

Part	Current Cost	Supplemental Adjustment	New Part Total
1	569,694.95	36,951.29	606,646.24

f. That the maximum cost of this Agreement is as follows:

Current Cost	Supplemental Adjustment	New Agreement Cost
1,416,854.63	36,951.29	1,453,805.92

g. That the time of completion for each Part shall be the termination date of this Agreement or as shown below, whichever occurs first:

Part 1 - 04/01/2013 .

h. That the Department approved invoice template has been amended and will be available to the Consultant effective the execution date of this Supplemental Agreement.

i. That all other terms and conditions of the Agreement, which are not changed by this Supplemental Agreement, remain in full force and effect.

Document Status: Executed
Prepared By: Harter, Michele L.

Attachments

Name	Created By	Created On
No records found.		

Workflow

Status	Name	Disposition	Date/Time
Draft	Michele L Harter/PennDOT	Submit	03/12/2012 09:46:06 AM
Consultant Review	Edward M D'alba PE/PennDOT BP-000037 - President	Approve	03/13/2012 02:29:25 PM
Deputy Secretary Review	R. Wayne Willey/PennDOT	Approve	03/14/2012 07:36:05 AM
Chief Counsel Review	Michael H Kline/PennDOT	Approve	03/15/2012 09:31:38 AM
Comptroller Review	Brenda A Zorbaugh/PennDOT	Approve	03/15/2012 10:35:05 AM
CAD Chief Approval	J. Michael Long/PennDOT	Execute	03/15/2012 10:48:33 AM

Audit Information

Created By	Created On	Modified By	Modified On
Michele L Harter/PennDOT	03/12/2012 09:46:02 AM	J. Michael Long/PennDOT	03/15/2012 10:48:33 AM

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RYAN M. WHITTINGTON

SCOPE OF WORK DETAIL

Agreement: E00342 Project Specific Active

Name: Three (3) Bridge Replacements in Bucks County **Selection Process:** Normal

Initiating Org: Engineering District 6-0

⊟ **Part: 5** **Specific Rate of Compensation** **Executed**

Description: Services during construction as they pertain to parts 1 and 3 of the agreement. **PennDOT Project Manager:** fullard, leanne e.

Phase: Services During Construction

Scope of Work Published

Executive Summary Required: No **Technical Proposal Due:** 11/29/2004

Question and Answer Period End: 06/27/2003

Tasks

Task.Detail Task	WBS ID	WBS Revised
1 - Shop Drawing Review	2.11.2	01/12/2001
1.1 - Shop Drawing Review		
2 - Construction Consultation	2.11.3	01/17/2001
2.1 - Construction Consultation		

Attachments

Name	Created By	Created On
No records found.		

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Session size: 0.1k

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Wed Jul 17 10:19:30 EDT 2013
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pennsylvania DEPARTMENT OF TRANSPORTATION home site map help ECMS pennsylvania PA RYAN M. WHITTINGTON

SCOPE OF WORK DETAIL REPORT

Agreement: E00342 Project Specific Active

Name: Three (3) Bridge Replacements in Bucks County **Selection Process:** Normal

Initiating Org: Engineering District 6-0

Part: 3 **Cost Plus Fixed Fee** **Active**

Description: Final Design Services pertaining to the bridge replacement project with MPMS # 13716 and BMS #s 09101201000278 & 09101200202764.

PennDOT Project Manager: fullard, leanne e.

Phase: Final Design

Task 1 - Project Management/Administration

Objective:

2.1.1

This task consists of the administrative effort required by principals, project manager, and involving personnel to complete the project on time, within budget, and provide a quality product.

Scope:

2.1.1

Project Management involves the planning, scheduling, organizing and controlling of resources to achieve specific objectives within established schedule, budget and quality standards. The Project Manager is responsible for but not limited to the tasks outlined in the Department Detail.

Detail Task 1 - Project Management/Administration

Department Details:

2.1.1

1. Monitor design team performance and project development.
2. Control project costs.
3. Coordinate the flow of information concerning the project.

Task 2 - Cross Sections

Objective:

2.4.5

This task consists of preparing representative cross sections on all alignments considered in previous environmental studies at intervals such that approximate right-of-way limits can be defined. Earthwork calculations are included in this task.

Scope:

2.4.5

This task is the preparation of cross sections during preliminary engineering to assist in evaluating alternate alignments. It includes development of sections at critical locations to assess impacts on right-of-way limits, earthwork, existing structures, drainage controls, environmentally sensitive areas and other features that could be impacted by the alignment.

Following identification of the preferred alternate, the designer will prepare critical cross sections as part of the Design Field View Submission in accordance with Design Manual Part 1A.

Detail Task 1 - Cross Sections

Department Details:

Cross sections every 50 ft for roadway approaches.

Task 3 - Roadway

Objective:

2.10.2
This task includes survey, roadway, pavement and drainage design, plans, cross sections, soil profile, final design office meeting, draft special provisions and final design field view.
2.10.2.1
This task includes the design of roadway drainage items. Publication 13M, Design Manual Part 2 applies to this task.
2.10.2.2
This task is the preparation of the final pavement design.
2.10.2.3
This task includes the preparation of the final roadway plans and profiles in accordance with Publication 10A, Design Manual Part 1A.

Scope:

2.10.2
Needs completed.
2.10.2.1
One copy of the plan depicting the drainage design and the hydraulic design computations for roadway drainage structures shall be submitted to the appropriate District Office for review and comment by the Project Manager or designated drainage engineer. As directed by the District, one additional copy of the drainage submission shall be sent to Central Office, Bureau of Design for quality assurance review.

The following work elements are required for the successful completion of this task:

1. Develop a drainage design that provides the proper capacity, spacing, size and type of drainage facility (existing and proposed) for each drainage area, location, fill height, roadway type and environmental condition including all inlets, pipes, culverts, ditches and base drains.

2. Prepare hydraulic design computations using appropriate methodologies for all roadway drainage structures. Include energy grade line and hydraulic grade line computations for existing and proposed systems.

3. Develop alternate pipe designs as required with corresponding hydraulic computations for each alternate. Provide "For Information Only" quantities for each pipe type and alternate as well as minimum and maximum fill heights as required.

4. Verify that downstream drainage capacity is sufficient for the proposed design. Conform to local municipal storm water requirements, if a local storm water ordinance exists.

5. Show all existing and proposed drainage facilities on construction cross sections and profiles.

6. Prepare transmittal letter to include, plans showing drainage design and hydraulic design computations. Provide PE seal on all plans and computations.
2.10.2.2
Follow Publication 13M, Design Manual Part 2, which refers to Publication 242, Pavement Policy Manual for the preparation of final pavement design.
2.10.2.3
The submission will include the completion of the following work items:

1. Interchange Design

2. Intersection Design - Prepare pavement elevation plans to describe the horizontal and vertical geometry that cross sections cannot describe.

3. Airport Clearances - Review Part 77 of the Federal Aviation Regulations and adjust the design accordingly when the project is within 2 (3.2 km) miles of an operating airport. If the project is within 2 (3.2

km) miles of an operating airport, an Airport Clearance Submission to the FAA is required.

Prepare all the following work elements:
(Note: Plans listed below are highway design plans only and do not include also plans.)

1. Title sheet
2. Index/General Note Sheet
3. Typical Section Sheet (Location Map and General Notes)
4. Summary of Quantities Sheets
5. Tabulation of Quantities Sheets
6. Detail Plan Sheets
7. Profile Sheets
8. Contour, Grading, and Drainage Plans
9. Landscaping Plans
10. Cross Sections
11. Special Detail Sheets
12. Required Forms, Special Provisions and Estimates

Detail Task 1 - Roadway

Department Details:

Roadway plans for the approachews to the bridges. Including but not limited to drainage and pavement design.

Task 4 - Final Right-of-Way Plan

Objective:

2.10.5
This task includes all work necessary to prepare the final R/W plan in accordance with Publication 14M, Design Manual Part 3.

Scope:

2.10.5
Right-of-Way Plans, when specified in the project scope of work, will be the basis for determining all property damages which are involved in the construction requirements of a highway project. They will also serve as the legal record of the location, the extent, and the character of any acquisition of Right-of-Way, Permanent Easements, and Temporary Easements by the Commonwealth.

The Right of Way Plan presentation format will be as specified in the project scope of work. The Right-of-Way Plan format could be either, or a combination of the following:

A. Standard Right-of-Way Plan - For the authorization of acquisition of both total take and partial take property, for both Free Access and Limited Access highways.

B. Final Plan - Reestablishes and/or authorizes the GAP Plan right-of-way, if necessary, and establishes right-of-way and authorizes acquisition of property requirements that were not included under the GAP Plan.

C. Combination Plan - This plan combines both the Right-of-Way and Construction requirements on the drawings. This plan shall be acceptable only for small Federal Aid and 100% state-financed projects involving few properties with no relocation problems.

D. Simplified Right-of-Way Plan - This plan is a simple one (1) or two (2) sheet Right-of-Way Plan, applicable to small projects, where construction is primarily within existing legal right-of-way where only a few properties are involved and the area of taking is minor.

The following are general tasks and their description for Right-of-Way Plan preparation:
1. Current Property Owner Record Research
2. Deed Plotting
3. Composite Deed Plot Matrix Map
4. Property Owner Name

5. Parcel Numbers
6. Right-of-Way Plan Preparation

The following are the basic requirements comprising Right-of-Way Plan preparations:
1. Title Sheet
2. Index Sheet
3. Location Map, General Notes, Etc., Sheets
4. Typical Sections
5. Summary of Project Coordinates
6. Summary of Required Right-of-Way Line Coordinates
7. Detail Plan Sheets
8. Profile Sheets
9. Property Plats
10. Right-of-Way Plan Revisions

Detail Task 1 - Final Right-of-Way Plan

Department Details:

Preparation of final RoW plans in accordance with established procedures and in colaboration with the District's RoW unit.

Task 5 - Final Geotechnical Engineering Report

Objective:

2.5.3
This task is the preparation of the Final Geotechnical Engineering Report in accordance with Publication 10A, Design Manual Part 1A.

Scope:

2.5.3
This task consists of the development of the Final Geotechnical Engineering Report (GER) presenting final geotechnical design and construction recommendations for the project, along with supporting documentation, based on the subsurface conditions determined from the Final Design roadway investigations and any previous project geotechnical investigations. It also includes preparation of geotechnical reports for Structure TS&L Submissions (Reconnaissance Soils and Geological Engineering Reports) and Structure Foundation Submissions (Geotechnical Engineering Reports for Structures). Previous geotechnical investigations may include: Phase I Preliminary Design GER (prepared during EIS Step 4), Phase II Preliminary Design GER (prepared during EIS Step 5 or EA alternatives analysis), and Pre-Final Design GER (prepared for the Design Field View Submission).

The following work elements are required for the successful completion of this task:

1. Coordinate the geotechnical effort in Final Design. Coordinate with the District Geotechnical Engineer (DGE), BOCM Chief Geotechnical Engineer (CGE), District Bridge Engineer (DBE), BOD Bridge Quality Assurance Division (BQAD), and other disciplines involved in design. Attend meetings necessary for the design process. Perform QA/QC on all subtasks and deliverables.

2. Perform an office investigation. Review background geological information and maps, boring logs, project files and reports, environmental documents, and R/W plans to describe the soil/rock/hydrologic setting.

3. Visit the site, interviewing local residents and engineers. Perform a detailed field reconnaissance and refine the soil/rock/hydrologic setting description.

4. Prepare the Problem Statement and Draft Exploration Plan (PSDEP) for the project in accordance with Publication 293. Determine the field and laboratory investigation needs. Assemble a soil/rock boring and testing plan, water/soil-sediment sampling and testing plan, a field instrument plan and a geophysical investigation plan based on project needs.

5. Prepare a Reconnaissance Soils and Geological Engineering Report (RSGER) for each TS&L

submission, in accordance with Publication 15M, Design Manual Part 4.

6. Perform the soil/rock boring investigation. Notify the affected public. Locate the borings in the field. Assemble, advertise, award and administer the test boring contract in accordance with Publication 222M.

7. Administer the soil/rock testing program. Perform the water/soil sediment sampling and testing.

8. Collect readings and present reduced data from field instruments. Perform the geophysical investigation.

9. Perform analysis and design associated with embankment and cut slope construction, storm water management facilities, culverts and conduits, retaining structures, bridges, other structures, pavements, unsuitable materials, special geotechnical treatments, benching and transition zones, and geotechnical instrumentation for construction control. Develop recommendations for use by the design team and special provisions and details for construction.

10. Prepare a Geotechnical Engineering Report for foundations at each structure in accordance with Design Manual Part 4.

11. Prepare the GER for Final Design, presenting the recommendations and providing supporting documentation and following the outline in Publication 293. Prepare the "Subsurface Profile" in accordance with the requirements of Publication 14M, Design Manual Part 3. Submit both a draft (95%) and a final (100%) version of the GER to the DGE and CGE.

12. Review the plans, specifications and estimates for construction of the project, to verify proper implementation of the geotechnical recommendations and incorporation of the special provisions and details.

Detail Task 1 - Final Geotechnical Engineering Report

Department Details:

2.5.3

Borings must be performed by an approved drilling contractor. Installation of field instrumentation may be included with that contract. The engineer should review the environmental documents to determine if a Health and Safety Plan (HASP) is required as part of the drilling contract. The District should alert the engineer if other environmental constraints potentially could impact field operations.

Maintenance and protection of traffic for the drilling program should be in accordance with Publication 203M. The District should determine if a formal Traffic Control Plan (TCP) is required, if it is necessary to notify the affected public prior to performing the work, or any other special requirements are necessary.

The amount of boring in the drilling contract often varies from that assumed during earlier phases of design. The District should verify the adequacy of committed funds prior to approval of the contract.

Laboratory soil testing must be performed by an AMRL-accredited facility, and should not be a part of the drilling subcontract.

Emphasis is on modifications to geotechnical roadway recommendations resulting from changes during final design, implementation of design guidance, and finalization of special provisions and details for construction.

The Soil Profile is an appendix to this report.

Task 6 - Traffic Control Plan

Objective:

2.10.14
This task is the development of the final traffic control plan. Publication 14M, Design Manual 3; the MUTCD and Publication 203M apply to this task.

Scope:

2.10.14
Phasing schemes, sign messages, and approximate locations of signs and traffic control devices should be approved at the Design Field View stage, prior to the development of the final plans.

The Traffic Control Plan will be a stand-alone plan and will include the following:
- Title sheet with general notes, location map, and pay item quantities,
- Tabulation of Traffic Control Devices,
- Typical-sections
- Narrative describing each stage and phase by stating the work to be performed and the traffic control to be implemented
- General plan layout
- Temporary road plan, typical-section and profile (if necessary)
- Temporary signal plan (if necessary)
- Temporary Highway Lighting (if necessary)
- Special Sign Details (if necessary)

The plan will also include, but will not be limited to, sign messages, sign sizes, general sign locations, tapers lengths, barricades, channelizing devices, impact attenuators, temporary pavement markings, temporary roadway locations, temporary highway lighting locations, detours, portable changeable message signs, and arrow boards. Detail of temporary roads cross-section and profile will be included as well as other details as appropriate.

If detours are necessary, the detour route(s) will be identified and driven to determine general safety issues and restrictions. State roads requiring a detour will utilize other State owned roadways. If detour routes formed from State owned roads are found to be unacceptable because of length or other reasons, then agreements between the State and municipalities will need to be developed to utilize local roadways. This scope does not include support activities needed to develop agreements between the State and municipalities.

In locations where pedestrian movements are prominent, either safe passage or restrictions will be addressed. Scope associated with construction temporary pedestrian structures and signals will be included in either the Amendments to the Standard Scope of Work or the Detailed Project Approach.

Provide temporary highway lighting for limited access crossovers and at locations as directed by the District. Contact the Highway Lighting Unit in Harrisburg for design requirements. Submit the lighting design to the Highway Lighting Unit for approval prior to the release of the Traffic Control Plans to the District for PS&E Development.

This scope of work does not provide for a temporary traffic signal plan. If the implementation of the traffic control plan impacts a signalized intersection such that a temporary signal design is necessitated, the temporary signal plan will be incorporated into the traffic control plan. However, the scope of work for the temporary signal design will be provided in the Detailed Project Approach or in the Amendments to the Standard Scope of Work.

Specifications will include the description of the construction staging and phasing. Special provisions will also be written for traffic control devices outside the scope of the specifications included in the Publication 408M.

If required for boring and drilling work associated with geotechnical studies, the subconsultant will develop traffic control plans. Details of the design for these plans will be provided in the Detailed Project Approach.

Detail Task 1 - Traffic Control Plan

Department Details:

The following items may require an amendment to the standard statement of work.
- Any commitments, phasing schemes, and work limitations that have been approved during the design field view process.
- Plan presentation preferences including showing sign pictorially
- Any restrictions associated with the reduction of lanes, stoppages of traffic, or use of one lane-two way alternating traffic.

- Preferences for removal of pavement markings.
- Details for anticipated temporary traffic signal designs, pedestrian requirements, and local access requirements.

Task 7 - Final Type, Size & Location (TS&L) Report

Objective:

2.7.3
This task consists of the assembly of Type, Size and Location studies and development of recommendations for proposed structures within the project. Publication 15M, Design Manual Part 4 apply to this task.

Scope:

2.7.3
Review any previous studies or preliminary designs with respect to the selection of structure type, span arrangements, horizontal and vertical clearances, design controls and typical section. Coordinate with the District on the logical selection of span arrangements, types of piers, and structure types suitable at each location.

The preliminary structure designs will be performed at a stage when the highway alignment and profile are well defined. Review structure requirements with the District prior to Design Field View (Line and Grade) submission and approval.

The following work elements are required for the successful completion of this task:
1. Develop a location plan showing the feature to be crossed or retained, design controls and regulated areas
2. Identify possible pier and abutment locations
3. Evaluate geotechnical conditions to identify potential foundation types
4. Recommend locations for structure foundation borings
5. Evaluate constructibility, vertical and horizontal clearances and site constraint issues in determining the most suitable structure design for the particular location
6. Prepare cost estimates for alternative structure designs
7. Prepare justification for recommended alternative
8. Prepare transmittal letter, plans and report for TS&L Submission

Detail Task 1 - Final Type, Size & Location (TS&L) Report

Department Details:

- Number of Bridges, Culverts, Retaining Walls, Sound Walls, etc. in the project
- Number of alternatives to be studied for each structure

Task 8 - Final Structure Foundation Report

Objective:

2.5.5
This task includes all items necessary to prepare the Final Structure Foundation Report in accordance with Publication 15M, Design Manual Part 4.

Scope:

2.5.5
This task consists of the development of a Final Structure Foundation Report for each structure in the project. The report presents recommendations for design and construction of the structure foundations, and provides geotechnical data in support of the recommendations.

The following work elements are required for completion of this task:

1. Coordinate the effort with the District Geotechnical Engineer (DGE), District Bridge Engineer, BOD Bridge Quality Assurance Division (BQAD), and the other engineering disciplines involved. Perform QA/QC on work processes and products.

2. Perform an office investigation, reviewing available geotechnical reports for the project including the Reconnaissance Soils and Geological Engineering Report (RSGER) for the specific structure. Review the Preliminary Foundation Report. Obtain the record copy of the engineers logs for the borings drilled for the structure.

3. Perform the soil, rock, and water testing required to allow analysis of foundation conditions. Tabulate the results of the testing.

4. Perform analyses to determine the preferred foundation for the structure, and document the rationale for the preference. Include cost comparisons for foundation alternatives. Prepare a tabular summary of the site conditions and foundation recommendations at each substructure location.

5. Identify and address special site conditions through appropriate design. Develop foundation notes, construction details, and special provisions as warranted.

6. Prepare plotted boring log sheets for the core borings used in foundation analysis and design.

7. Prepare the Final Foundation Report for the structure, presenting the information required in Design Manual Part 4, with the tabular summary of foundation recommendations, foundation notes, construction details, special provisions, and plotted boring log sheets appended. Submit the report, with the other documentation required by Design Manual Part 4, for approval.

8. Prepare quality assurance (QA) form for foundations.

Detail Task 1 - Final Structure Foundation Report

Department Details:

2.5.5

Structure Boring Task must be completed prior to this task, unless the District determines sufficient information is available from the RSGER to determine the structure foundation.

Subsurface profiles and cross sections are required in complex conditions and when requested by the District.

The plotted structure boring log sheets become part of the structure plans after approval.

Task 9 - Final Structure Plans

Objective:

2.10.13
This task is the development of the final structure plans.

Scope:

2.10.13
1. Complete final engineering design(s) for structures on the project based upon the approved type, size and location (TS&L) plans and approved foundation recommendations. Prepare design calculations, construction documents and QA/QC forms in accordance with the Department's Design Manuals as amended by current strike-off letters.

2. Provide pay items and special provisions for design alternate bidding.

3. Provide plan details and special provisions as required for support of excavation and for construction phasing.

4. Provide special provisions for items not covered by Department specifications. Obtain current standard special provisions list from District and utilize standard special provisions whenever possible. Write project specific special provisions, if needed.

5. Prepare cost estimate for each structure based upon estimated quantities and historical data for similar structures in the project region. Consider access, phasing, and relative difficulty of construction in establishing unit prices.

6. Make a pre-final submission to the Department of completed plans, special provisions, quantity estimates, cost estimates, QA/QC forms and computations.

7. Revise the previously submitted documents as required to address the Department's comments thereon. Document responses to comments in writing.

8. Submit the final plans, special provisions, quantity estimates, cost estimates, QA/QC forms and computations properly signed and sealed and in the form described in Publication 15M, Design Manual Part 4.

Detail Task 1 - Final Structure Plans

Department Details:

2.10.13

The following elements should be included as applicable:
- Seismic design requirements
- Construction phasing
- Additional review submissions or progress submissions
- Restrictions on permitted alternates
- Special considerations such as historic or environmentally sensitive sites which may impact design and construction
- Co-ordination of highway and structural design if not all being performed by same consultant.

Task 10 - Erosion and Sedimentation Control Plan / NPDES Permit

Objective:

2.10.25
This task is the development of the Erosion & Sedimentation Control Plan and submission of the NPDES Permit Application.

Scope:

2.10.25
The Erosion and Sediment Pollution Control Plans and supporting documentation shall be submitted to the applicable Engineering District for review and approval. Upon acceptance of the plans by the District, the submission will be forwarded to the County Conservation District for review and approval.

The following work elements are required for the successful completion of this task:

1. Develop Erosion and Sedimentation Control Plans to include:
- cover sheet
- location map
- topography of the area including watershed areas and watercourses receiving runoff from the project
- proposed alterations to the area
- limits of the project
- the location of all temporary and permanent erosion and sediment pollution control measures and facilities
- all pertinent erosion control and construction details

2. Develop a narrative report describing the project and indicating the purpose, the engineering assumptions, the specifications, and the calculations for erosion control measures and facilities. The narrative shall include a schedule of installation and removal of temporary and permanent erosion control measures and facilities as they relate to the various earthmoving operations and a maintenance program for each type of temporary and permanent erosion control measure and facility.

3. Provide detailed instructions relating to the sequence of construction on the plan and in the narrative. Include staging, sequencing and scheduling of earthmoving activities and installation and removal of erosion

and sediment pollution control measures and facilities as required.

4. Provide a detailed description in the narrative report of all soil types located within the project limits including each soil type, depth, slope and resistance to erosion. The soil boundaries and a summary table of the soil types and limitations should also be included on the plans.

5. Provide all applicable construction schedules, maintenance programs (including the removal and disposal of accumulated soil materials).

6. Prepare transmittal letter, plans and narrative report for submission to the County Conservation District. If necessary, on large projects meet with the County Conservation District prior to submission to discuss submission requirements and review conceptual plan.

7. For projects exceeding 5 acres of earth disturbance or impacting High Quality/Exceptional Value (HQ/EV) waterways, prepare a Notice of Intent (NOI) Application for an NPDES Storm Water Permit and a Preparedness, Prevention and Contingency (PPC) Plan (see below). The PPC plan should also be incorporated into the narrative report and the plans.

8. Address all applicable comments from the County Conservation District and/or PADEP and re-submit the revised package for approval.

The following tasks are required for the preparation of the NPDES permit application:

1. Develop an NPDES boundary map that includes the following information: limits of disturbance, highway alignment, cut & fill limits, ROW lines, contours, stations, location identifiers and, the permit boundary.

2. Complete the NPDES Permit Application. The application package will consist of the following items: Act 14 Notification, PNDI Form, location map, NPDES Application Form, Cultural Resources Notice (if involves a Special Protection Watershed), General Information Form (if project involves a Special Protection Watershed or an Individual NPDES Application), and the Erosion and Sediment Pollution Control Plan.

3. Submit NPDES Permit Application package to PennDOT for review. Revise as necessary. Obtain PennDOT's notarized signature on the application and make the designated amount of copies to submit to the County Conservation District and, if applicable, the PADEP.

4. Schedule review meetings with the agencies prior to submitting the NPDES permit package to expedite the permitting process.

5. Submit permit package to the Conservation District/PADEP.

Detail Task 1 - Erosion and Sedimentation Control Plan / NPDES Permit

Department Details:

2.10.25

The following items may require an adjustment to the amount of time it takes to complete this task:
- Applicable watershed information pertaining to special protection watersheds
- Erosion and Sediment Control Plans for off-site borrow or disposal areas
- Evidence of compliance with other permitting or regulatory requirements

Task 11 - Final Plan Checks

Objective:

2.10.28
This task is the time required to attend/perform all final plan checks.

Scope:

2.10.28
The Final Plan Check is performed by representatives of: Bureau of Design - Field Liaison Engineer, District Engineer/Administrator, and Consultant.

The Field Liaison Engineer is in charge of the Final Plan Check and prepares a Plan Review Report on any items which are not correct a the time of the Final Plan Check.

The District Engineer/Administrator provides qualified personnel to perform all required design review; prepares Form 407, Form D-444D and a list of Structural Special Provisions, and notifies the Field Liaison Engineer when the plans will be ready for the Final Plan Check.

The Consultant is required to have the plans adequately checked prior to the Final Plan Check, and will have the Project Engineer and adequate design personnel to make any required corrections, present at the Final Plan Check. It is expected that all required corrections will be made by the Consultant prior to leaving the Final Plan Check.

Detail Task 1 - Final Plan Checks

Department Details:

Submission of final plans to check for completeness and accuracy in accordance with DM.

Task 12 - Assemble Final Project Documents for Contract Management

Objective:

2.10.29
This task is the preparation of the PS&E submission to District contract management.
2.10.29.16
This task is the time required to let the project in the District Office.
2.10.29.2
This task is to prepare the final pre-bid construction schedule/special provisions.
2.10.29.6
This task is the preparation of the engineer's estimate.
2.10.29.7
This task is the preparation of the final construction schedule.
2.10.29.9
This task consists of the final items of work quality assurance review.

Scope:

2.10.29
Before any attempt is made to develop and submit a proposal, it is very important to obtain all required documents, contract drawings, design estimates and supporting data. Supporting documents such as environmental clearances and re-evaluations, funding authorizations, PMC approvals, DEP and Corps of Engineer permits, utility and right-of-way clearances, agreements and related administrative requirements must be resolved. Missing supporting documents complicate the PS&E process, and may affect project advancement to letting.

Assemble all available information on the project from the designers, such as plans or sketches, permits, non-standard special provisions, agreements, construction trainee requirements, Utility Form D-419 clearance and right-of-way certification.

Contract proposals should appear as uniform as possible on a State-wide basis to assist prospective bidders as well as Department personnel who use the proposal. All proposals are to be prepared by utilizing the Contract Management System (CMS) automated bid proposal development software, in accordance with the principles in the current "CMS Users Manual."

Assemble project documents in accordance with requirements of Publication 51M, "Contract Proposal Preparation Guide."

2.10.29.16
All bids received in accordance with the terms of the proposal shall be publicly opened at the time, date and place indicated. A secured depository is to be established. A bid opening official and designated employee of the Contract Management Section will be authorized to open the depository. Bids will be read and

documented and the apparent low bid announced.
2.10.29.2
Provide provisions, requirements, or directions applying to the project, as set forth in the proposal, that are not contained in Publication 408M or its supplements. Generally, the design engineer will submit draft special provisions to be reviewed, finalized and incorporated into the Bid proposal by Contract Management.
2.10.29.6
Prepare a detailed estimate, which will be used to verify funding requirements and to determine acceptability of bids, and submit with the PS&E to Contract Management.
2.10.29.7
Prepare Form D476 & D476A, or CPM schedule, for construction of the project.
2.10.29.9
Identify and prepare form work as it relates to items that will require subsequent QA involvement.

Detail Task 1 - Assemble Final Project Documents for Contract Management

Department Details:

Compile and submit PS&E package.

Attachments

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SCOPE OF WORK DETAIL REPORT

Agreement: E00342 Project Specific Active

Name: Three (3) Bridge Replacements in Bucks County **Selection Process:** Normal

Initiating Org: Engineering District 6-0

Part: 1 **Cost Plus Fixed Fee** **Active**

Description: preliminary engineering, environmental studies, final design and consultation during construction for the replacement of two structures on Headquarters Rd, Tinicum Township in Bucks County.

PennDOT Project Manager: fullard, leanne e.

Phase: Preliminary Design

Task 1 - Project Management/Administration

Objective:

2.1.1
This task consists of the administrative effort required by principals, project manager, and involving personnel to complete the project on time, within budget, and provide a quality product.

Scope:

2.1.1
Project Management involves the planning, scheduling, organizing and controlling of resources to achieve specific objectives within established schedule, budget and quality standards. The Project Manager is responsible for but not limited to the tasks outlined in the Department Detail.

Detail Task 1 - Project Management/Administration

Department Details:

2.1.1

1. Monitor design team performance and project development.
2. Control project costs.
3. Coordinate the flow of information concerning the project.

Task 2 - Surveys

Objective:

2.4.1
This task consists of providing the survey requirements associated with specific PennDOT projects designated for studies, reports, design and construction. Publication 122M applies to this task.

Scope:

2.4.1
Surveys may consist of either; Conventional or Three- Dimensional Data Collection, or a combination, as directed by the District.

Base mapping must be supplemented with conventional survey applications.

The following subtasks are considered survey requirements, relative to the existing topography within specific project boundaries.

1. County Tax Records investigation(s) to obtain names and addresses of involved property owners.
2. Issue a "Notice of Intent to Enter" letter (Form 983) to each property owner by certified mail.
3. Obtain published horizontal and vertical control data for specific project use.

4. Prior to initiating surveys, develop a Traffic Control Plan for implementation during surveys within existing highways and streets.
5. Establish horizontal and vertical control relative to referenced monumentation.
6. Establish the preliminary mainline horizontal alignment in the field.
7. Obtain profiles and cross sections along each of the project's established roadways, baselines, and centerlines.
8. Field edit mapping topography, including the type, size, location, and elevation of existing storm drain and utility facilities; and evident property corners.
9. Establish existing stream baseline and obtain stream profile and cross sections.
10. Establish existing railroad baseline, tied to the centerline, and obtain railroad profile and cross sections, subject to the railroad's inspector and protection requirements.
11. Perform existing bridge structure surveys including type, size, location and pertinent elevation data.
12. Perform Map Accuracy Tests to verify spatial accuracy.
13. Flag horizontal alignment prior to the Design Field View.
14. Stakeout the approved Baselines and Centerlines.
15. Stakeout the Core Boring Hole locations.
16. Establish and record final Benchmarks and References for construction stakeout.
17. Set monumentation points on the Legal Right-of-Way Lines.
18. Field Survey Notebook compilations, numbering and content indexing.

Detail Task 1 - Surveys

Department Details:

2.4.1

The following items may require an adjustment to the length of time it takes to complete this task.

* Excessive distance from the project to achieve tie-ins to establish vertical and horizontal control points.
* Unusual traffic control requirements needed to perform field survey work.
* Hostile denial of entry by property owner(s) to allow surveys to e performed.
* Special equipment and/or crafts required for waterway and tunnel surveys.
* Sight line clearing of dense vegetation for surveys
* Traverse line establishment for inaccessible area surveys.

Task 3 - Hydrologic and Hydraulic Report

Objective:

2.7.1
This task consists of the preparation of Hydrologic and Hydraulic reports for all bridges, culverts and longitudinal encroachments to size waterway openings properly and to satisfy permitting requirements. Publication 13M, Design Manual Part 2; Publication 15M, Design Manual Part 4; and PADEP Chapter 105 apply to this task.

Scope:

2.7.1
A separate Hydrologic and Hydraulic Report is required for each hydraulic structure. However, dual structures or structures located within the same hydraulic system should be combined into one report.

The following work elements are required for the successful completion of this task:

1. Gather existing information to be used in the development of the hydrologic and hydraulic analyses and in the preparation of the H&H Report.

2. Perform a hydrologic analysis of the watershed at each proposed crossing using one or more of the Department approved methodologies. The use of a particular model shall be justified as valid for the situation in which it is being used. All assumptions and/or limitations of each model shall be clearly identified and referenced. Multiple hydrologic models are recommended to assist in validating the selected approach. An analysis of the flood history according to the guidelines contained in Design Manual Part 2 should also be considered.

3. Perform a hydraulic analysis for each proposed crossing including alternatives, if necessary, using one or more of the Department approved hydraulic models. The use of a particular model shall be justified as valid for the situation in which it is being used. All assumptions and/or limitations of each model shall be clearly identified and referenced. Where a Flood Insurance Study has been established by FEMA, the hydraulic data included in the study should be utilized to the maximum extent deemed appropriate. Each proposed alternative shall be modeled to assist in the justification for the selected alternative. The hydraulic model shall extend a sufficient distance upstream and downstream to adequately evaluate the potential impacts due to the proposed construction. The hydraulic model should be used to compare existing and proposed conditions with respect to water surface elevations and channel velocities for the design discharge rate(s), including the 500-year event for the scour evaluation and the "overtopping event" for the risk assessment.

4. Evaluate the scour potential at bridge abutments and piers in accordance with Design Manual Part 4. Evaluate the erosion potential at culvert outlets in accordance with HEC-14.

5. Evaluate the channel stability and design countermeasures, if needed.

6. Perform a risk assessment or analysis for each applicable waterway structure or encroachment alternative.

7. Evaluate the hydraulic impacts as a result of temporary encroachments and/or permanent bank protection, if applicable.

8. Prepare the Hydrologic and Hydraulic Report following the general outline described in Design Manual Part 2.

9. If applicable, prepare a Conditional Letter of Map Revision (CLOMR) in accordance with FEMA regulations. The scope of work for the preparation of the CLOMR is not included herein and should be developed prior to initiating the work.

Detail Task 1 - Hydrologic and Hydraulic Report

Department Details:

2.7.1 Develop an H&H report in accordance with established PENNDOT guidelines.

The following items may require an adjustment to the length of time it takes to complete this task.

* Involvement with the federal and state resource agencies.
* Involvements with Municipal Officials and Local\Public Interest
* Involvement with the regional River Basin Commissions.
* Involvement with FEMA, relative to existing floodway data.

Task 4 - Level 2 CE

Objective:

2.3.3
This task consists of the assembly and approval of the Level 2 Categorical Exclusion

Scope:

2.3.3
Complete Part A and B, of the Categorical Exclusion Evaluation (CEE) form (Publication 294), which includes: Additional narrative will be included, as appropriate. Supplemental information will be attached to the CEE form or placed in the technical file, as appropriate.

Conduct secondary document research and review, and project site walkovers in order to complete an environmental evaluation.

Determine the level of Public and Agency Involvement required. Work items for Public Involvement have been defined in task 2.1.6.

Determine the need for permits required for all project resultant temporary and permanent actions. Work items for permit activities are defined under other work tasks.

Determine what if any supporting documents are required for the CEE. Work items to complete these supporting documents are defined under other work tasks.

Specify and define mitigation measures for impacted environmental issues listed under Section A, Environmental Evaluation Areas, listed above. Provide the general description and the location of any resources within or adjacent to the project work limits that are to be avoided during construction. Also provide measures to mitigate impacts to resources that can not be avoided.

Sheet C-2 will also require completion.

Submit the completed CEE form and pertinent supporting documents for review, concurrence, and approval to the District Office (Step 4 of the CE Process). If necessary, the consultant will revise the CEE form and or supporting documentation as directed. The District will submit the CEE to the Bureau of Design and FHWA for approval.

Detail Task 1 - Level 2 CE

Department Details:

As part of the Environmental Documentation ralated work, the following subtasks will be performed.
1/ Wetland Studies. If wetlands are present, must perform a Phase I bog turtle habitat evaluation
2/ Streams and Waterways
3/ Threatened and Endangered Species
4/ National Historic Landmark
5/ Cultural Resource Early Coordination
6/ Archaeology/Geomorphology. It is assumed that any testing within each study area won't exceed 1/2 acre in size. Floodplain settings with these areas will be archaeologically tested using the PHMC's recommended interval of four one-meter square test units per acre. All test units will be examined by the project geomorphologist.

7/ Historic Structures
8/ Resolution of Adverse Effects

Task 5 - Public Involvement

Objective:

2.1.3
This task includes the attendance and preparation of informational materials to be viewed and/or distributed to the general public at public meetings. This task may also include the preparation of newsletters, public announcements and all other aspects of public involvement as outlined in Publication 295.

Scope:

2.1.3
1. Obtain approval from PMC to proceed with public involvement activities.

2. Prepare announcement for public meeting.

3. Prepare visual materials and/or flyers for general public meetings.

4. Attend all public meetings and address comments made at the meeting.

5. Prepare minutes to the meeting and submit to the Project Manager for review. Revise if necessary.

Detail Task 1 - Public Involvement

Department Details:

Attend to public concerns and listen to the their suggestions, incorporating them into the projectsolutions whenever feasible.
Implement an open minded attitude paying special attention to Contest Sensitive solutions to solve

problems.

Task 6 - Line and Grade

Objective:

2.4.6
This task consists of the development of the horizontal and vertical geometry. Publication 13M, Design Manual Part 2 applies to this task

Scope:

2.4.6
Prior to developing the vertical and horizontal geometry, all environmental and property constraints will be identified. The engineer will have a comprehensive understanding of all of the constraints and will discuss these with the District prior to finalizing the geometry.

Secure sufficient field survey information to develop the final geometry. Develop all control points for the vertical and horizontal geometry. The engineer will analyze the compatibility and acceptability of the horizontal and vertical geometry.

The following work elements are required for the successful completion of this task:
1. Finalize horizontal and vertical geometry and submit plans in accordance with Publication 10A, Design Manual Part 1A.
2. Review for compliance with design criteria and environmental constraints.
3. Tabulate project control point coordinates (POT, PC, PT, and PI) for all roadways and channel relocations.
4. Apply the project traffic data to the design criteria to determine lane requirements, turning movements, and weaving movements.
5. Check final structure depths and adjust vertical alignment as necessary. If alternative structures are being utilized, use the worst case scenario.
6. Tabulate pavement grades and superelevation for development of cross sections.

Detail Task 1 - Line and Grade

Department Details:

- Airport clearance if an airport is within a 2 mile radius
- The Department may want to combine the line and grade with the typical section submission

Task 7 - Preliminary Geotechnical Engineering Report

Objective:

2.5.2
This task is the preparation of a Geotechnical Engineering Report for Pre-Final Design in accordance with Publication 10A, Design Manual Part 1A and Publication 293.
2.5.2.1
This task is the preparation of a Reconnaissance Soils and Geological Engineering Report in accordance with Publication 15M, Design Manual Part 4.

Scope:

2.5.2
The following work elements are required for the successful completion of this task:

1. Coordinate the effort with the District Geotechnical Engineer (DGE) and the other engineering disciplines involved. Perform QA/QC on work processes and products.

2. Perform analysis and design associated with embankment and cut slope construction, stormwater management facilities, drainage conduits, pavements, unsuitable materials, special geotechnical treatments, benching and transition zones, and geotechnical instrumentation for construction control.

3. Develop recommendations for use by the design team, and draft special provisions and details for construction.

4. Identify the anticipated scope of geotechnical investigations required during Final Design.

5. Prepare the GER for Pre-Final Design, presenting the recommendations and providing supporting documentation. Follow the outline in Publication 293, including a summary of the structure-related geotechnical investigations and reports for the project. Submit both a draft (95%) and a final (100%) version of the GER to the DGE.

6. Gather the information and materials necessary to assemble a preliminary soil profile plan. Obtain plan and profile sheets for the alignment from the design team. Obtain approval of the proposed graphics layout, scales and symbology.

7. Prepare the preliminary soil profile cover sheet and index sheet. Develop graphic logs of the borings. Prepare the profile sheets, showing the graphic boring logs and test results. Assemble the cover, index and profile sheets and submit a half-size copy as an appendix to the GER.

2.5.2.1
The following work elements are required for completion of this task:

1. Coordinate the effort with the District Geotechnical Engineer (DGE), District Bridge Engineer, BOD Bridge Quality Assurance Division (BQAD), and the other engineering disciplines involved. Perform QA/QC on work processes and products.

2. Perform an office investigation. Review background geological information and maps, boring logs, project files and reports, environmental documents, and right-of-way plans to describe the soil/rock/hydrologic setting. Contact Federal and State agencies with access to soils and geologic data. Review previous geotechnical work performed in the vicinity of the structure.

3. Visit the site, interviewing local residents and engineers. Perform a detailed field reconnaissance and refine the soil/rock/hydrologic setting description.

4. Determine the important site characteristics and evaluate their impact on the proposed construction.

5. Develop a plan for core boring and testing, based on the requirements of Design Manual Part 4. Prepare a tabular summary of the proposed drilling following the format of Publication 222M.

6. Prepare the RSGER, presenting the information required in Design Manual Part 4, with the boring and testing plan as an appendix. Submit the report for approval.

Detail Task 1 - Preliminary Geotechnical Engineering Report

Department Details:
2.5.2

This task should be performed in conjunction with the other tasks under the "Geotechnical" task.

Emphasis in the preliminary (pre-final) phase is on developing roadway-related geotechnical recommendations, and providing guidance to allow design finalization.

The RSGER is a required part of the TS&L submission for each structure on the project.

Preliminary structure core borings may be performed prior to the RSGER if roadway borings are taken or if the complexity of structure or site conditions warrant.

Task 8 - Preliminary ROW Activities

Objective:

2.6.1
This task includes the requirements as stipulated under Publication 14M, Design Manual Part 3.
2.6.1.1

This task involves the determination of legal right-of-way widths in accordance with the Publication 14M, Design Manual Part 3, and research of property owner records in County Deed Recorder's office.
2.6.1.2
This task is the preparation of individual property plats in accordance with Publication 14M, Design Manual Part 3.

Scope:

2.6.1
A preliminary right-of-way plan will be prepared for all Department projects where the construction activities require property acquisition beyond the footprint of existing Department of transportation property. The right-of-way plan shall be prepared in accordance with the requirements and contents as stipulated in Design Manual Part 3.

The right-of-way plan(s) is(are) subject to a plan check review by the District Right-of Way Unit, Chief of Surveys and the Central Office Bureau of Design, Field Liaison Engineer, Highway Quality Control Division. The plan and all supporting data shall be submitted to the District in advance of the scheduled plan check review meeting. The person(s) responsible for the plan preparation will attend the review meeting. Departments and comments stemming from the plan review shall be addressed and incorporated in the subsequent right-of-way plan submission.

The right-of-way plan will be prepared on mylar with appropriate Pennsylvania professional engineer and surveyor seals affixed.

Until NEPA clearance has been obtained, the Department may not perform final negotiations and acquisitions of property.

A right-of-way certificate is issued when the Department has adequately acquired right-of-way to allow project construction.

2.6.1.1
All public legal right-of-way and private right-of-way within the project area shall be determined from plans and documents recorded in the County Courthouse, or on file in the offices of: PennDOT District, Municipality and involved agency. Copies of all right-of-way record data will be obtained, where available, and included with the R/W plan submission to the District.

The existing public and private right-of-way corridors shall be delineated and labeled on the highway plans. A description of, and the establishment record data for right-of-way, shall be included in the project General Notes for all involved public highways. When recorded subdivision plans exhibit public right-of-way corridors, determinations must include whether the local municipality has, or has not, adopted them.

Property owner research is generally initiated by reviewing the tax maps and records at the County Tax Assessors' Office. Once the highway project location is identified on the tax map(s), the anticipated property involvement's can be listed by tax map and parcel numbers. With this information, the tax assessment files can be researched to provide: Owners name and address, Deed Book and Page Number, parcel area, list of property improvements, and the assessed value of the property. Copies of the tax maps and assessment records may be purchased for subsequent use by the designer, and inclusion as backup data to the R/W plan submissions.

Based on the obtained tax record information, the records in the Recorder of Deeds office shall be researched to verify, or update, the involved property(s) ownership, deed book and page number. Upon verification of property ownership, property investigation shall continue to ascertain if any exceptions, adverse conveyances, easement rights, sale agreements, or subdivision plans associated with property are recorded. When the property research reaches a point that exhibits the best available records available, copies of the involved deeds will be purchased from the Recorder of Deeds for plotting and project property matrix map compilation.

When metes and bounds descriptions of the deed are vague, or lacking information, prior chain of title deed descriptions shall be reviewed and copied when their descriptions provided better clarification for boundary plotting purposes. If overlaps, or gaps, result on the property matrix map due to deed metes and bounds

descriptions plots, the District Right-of-Way Administrator should be notified of these conditions, and to solicit his/her direction in resolving these issues.
2.6.1.2
Individual property plats will be prepared for all parcels with takes on highway projects, unless otherwise directed by the District.

The property plat shall contain all information necessary to provide a clear understanding, by all parties, of the existing conditions and the highway's taking requirements for the parcel, in accordance with Design Manual Part 3, Guidelines and Stipulations.

The proposed highway affects on the individual property plat must be consistent with those shown on the highway right-of-way plan sheet, however, the showing of details and labels beyond the boundary lines of parcel shall be avoided when practical.

Detail Task 1 - Preliminary ROW Activities

Department Details:

Not to develop any special requirements beyond the standard Scope of Work for Right-of-Way Plan preparations. The situations will be specific to only certain projects, as required and directed by District.

Task 9 - Preliminary Type, Size and Location (TS&L)

Objective:

2.7.2
This task consists of the assembly of Type, Size and Location studies and development of recommendations for proposed structures within the project. Publication 15M, Design Manual Part 4 apply to this task.

Scope:

2.7.2
Review any previous studies or preliminary designs with respect to the selection of structure type, span arrangements, horizontal and vertical clearances, design controls and type section. Coordinate with the District on the logical selection of span arrangements, types of piers, and structure types suitable at each location.

The preliminary structure designs will be performed at a stage when the highway alignment and profile are well defined. Review structure requirements with the District prior to Design Field View (Line and Grade) submission and approval.

The work elements are required for the successful completion of this task:
1. Develop a location plan showing the feature to be crossed or retained, design controls and regulated areas
2. Identify possible pier and abutment locations
3. Evaluate geotechnical conditions to identify potential foundation types
4. Recommend locations for structure foundation borings
5. Evaluate constructability, vertical and horizontal clearances and site constraint issues in determining the most suitable structure design for the particular location
6. Prepare cost estimates for alternative structure designs
7. Prepare justification for recommended alternative
8. Prepare transmittal letter, plans and report for TS&L submission

Detail Task 1 - Preliminary Type, Size and Location (TS&L)

Department Details:

Develop preliminary TS&L submission.

Task 10 - Safety Review/Audit

Objective:

2.8.7

This task consists of the time required for the Safety Review Committee to review the preliminary plans and the Project Design Criteria Report.
2.8.7.1
This task consists of the time required for the Safety Review Committee to prepare the safety review committee recommendations.
2.8.7.2
This task consists of preparing collision diagrams and the analysis used for developing alternatives to reduce crash rates.

Scope:

2.8.7
1. Conduct the safety review/audit as early in the design process as possible.
2. Identify all applicable items on the Safety Review Checklist (see Publication 10A, Design Manual Part 1A). Add any additional items based on engineering judgement and experience.
3. Detect safety deficiencies in the design.
4. Recommend safety enhancements.
5. Prepare the Safety Review Submission (two copies) at least two weeks before the design field view (if applicable). Include the following:
* Color coded plans
* Profiles
* Typical sections
* Project Design Criteria Report (see Design Manual 1A for details)

2.8.7.1
Prepare a memo concerning the following:

1. Approval/disapproval of safety features
2. Safety recommendations
3. Approval/rejection of Design Exceptions
2.8.7.2
1. Review and evaluate root causes of crashes at a given location or area along a highway.

2. Prepare collision diagrams (if applicable) in accordance with the Manual of Transportation Engineering Studies. Consider the following per PennDOT Publication 201 Engineering and Traffic Studies:
* Total number of crashes during last 5 years
* Number of crashes by type or causation factor
* Vehicle type involved
* Pedestrian involvement
* Type of traffic control present
* Roadway or intersection geometric
* Cause of crash
* Time of crash
* Environmental conditions

Detail Task 1 - Safety Review/Audit

Department Details:

Prepare and submit Safety Review for approval.

Task 11 - Preliminary Maintenance and Protection of Traffic

Objective:

2.8.2
This task consists of developing preliminary maintenance and protection of traffic plans in accordance with Publication 14M, Design Manual Part 3, the Manual on Uniform Traffic Control Devices and Publication 203M, Work Zone Traffic Control to maintain safe and efficient traffic operations through the construction work zone.

Scope:

2.8.2
Prepare a preliminary Maintenance and Protection of Traffic plan for anticipated work areas involving

existing roads. The plans will include a conceptual sequence of operations and identify the type of traffic control needed for each roadway impacted by the anticipated work zones.

Plans will be developed at an appropriate scale.

Drawings will show the work areas and note the traffic control requirements for each area.

A conceptual sequence of operations will be developed identifying the anticipated phases and stages of work necessary to control traffic during hours of construction and at all other times during construction. Illustration of traffic control signs and devices, temporary pavement markings, temporary roads, detours, and other necessary details will not be developed.

The plans will include a title sheet with index map and general notes, and a listing of anticipated traffic control devices without quantities. The plan will also include the sequence of operations and plans sheets depicting the work areas.

Detail Task 1 - Preliminary Maintenance and Protection of Traffic

Department Details:

Preliminary submission of Plans for Maintenance and Protection of Traffic.

Task 12 - Utilities

Objective:

2.9.1
This task involves project specific work requirements in accordance with Publication 16M, Design Manual Part 5.
2.9.1.1
This task is the verification of existing aerial, surface and underground utility locations.
2.9.1.5
This task is the coordination requirements with utilities from the time of official project notification contact up to the time of contract bid proposal preparation, including Form D-419.

Scope:

2.9.1
PADOT projects which involve public utilities must include all necessary provisions for the safety and protection of both existing and any required relocation of utilities.

Subsequent to the preparation of the existing utility location plan for the project, the plan will be submitted to each of the involved utility company for their verification of the type, size and location of the facility.

Coordination efforts will be maintained with the utility throughout the project design process to allow amicable solutions for known and potential utility/highway project conflicts.

When directed, utility relocation engineering, either by the project design consultant, or by others, shall be incorporated into the project construction contract documents.

When circumstances require, the design consultant shall provide all information and prepare application forms necessary to secure agreements and permits associated with the utility on the project, in accordance with policies and procedures outlined in Design Manual Part 5.

Once the involvements for each utility has been defined for the project, the utility clearance Form D-419 will be prepared to indicate the nature and the work, the days required to perform the work, work to be performed: prior, or concurrent, or restrictive of the highway work. This information shall be included in the contract bid proposal packages and will also serve as a tool for the development of the projects construction schedule.

2.9.1.1

It is the responsibility of the designer to prepare project base mapping showing all existing utility facilities.

Aerial and surface utility data may be obtained by either aerial photography and/or conventional survey.

Underground utility data may be obtained from utility owner as-built plans and maps and/or test pits or non-destructive probe methods.

The existing utility location plan compilation will include the appropriate label and number, as applicable, for each facility. For all existing underground utility installation, the locations will be supplemented with profiles and/or cross sections.

Once the utility location plan is compiled, the designer will submit copies of the plan to each utility owner on the project with a formal request for their verification of the facilities data depicted.

The designer will incorporate all revisions, additions, or deletions resulting from the verification comments received from the owners.
2.9.1.5
Coordination with public utility company representatives shall be maintained throughout the project design duration. Utility coordination begins with the issuance of the project notification letter to the utilities and ends when all utility involvement issues have been adequately settled to allow project construction.

The requirements for utility coordination include, but may not be limited to, the following:

1. Initial contact by project notification letter.
2. Document and distribute all meeting minutes, correspondence, memorandums and telephone conversations regarding project related utility issues.
3. Formally solicit copies of existing facility location record information for underground installations from the utility company.
4. Subsequent to preparing the existing utility location plan, submit plan copies to each company and request their verification, or revision, of the type, size, and location of their facilities.
5. Transmit Form D4181X with supporting information to each utility and request their intent for bridge occupancy on the project structure(s).
6. Schedule and conduct an initial project utility meeting to explain the project improvement goals, schedules, and targeted utility clearance dates.
7. Provide authorizations to perform utility relocation engineering and estimates, when formally requested by the utility company and approved by the Department.
8. Invite utility representatives to the project Design Field View meeting. Solicit utility company input relative to project design/utility conflicts, and potential need for substitute right-of-way corridors for utility relocations.
9. Transmit copies of project preliminary design plans, profile and cross sections to the utility companies for their relocation engineering design, cost estimate and reimbursement agreement application package preparation.
10. Keep utility companies informed of all design changes made during the final right-of-way plan and final construction plan preparations which could impact existing or planned utility facilities.
11. Incorporate utility relocation, abandonment and removal information onto the roadway construction plans, based on plans and information received from the utility company.
12. Schedule and conduct a utility meeting to review the proposed utility route matrix, and to resolve any outstanding design, conflict or schedule problem issues.
13. Incorporate utility work to be performed by the PADOT contractor into the project construction package.
14. Obtain utility working day schedules and complete form D-419, Utility Clearance.
15. Complete and execute all utility related permits.
16. Solicit utility representative attendance at the pre-bid, pre-construction, and all construction status meetings.

Detail Task 1 - Utilities

Department Details:

Coordination and Location of Utilities.

Task 13 - Design Field View

Objective:

2.4.10
This task consists of the development, submission and approval of the Design Field View submission.
2.4.10.1
This task consists of the assembly of the Design Field View submission. Reference Publication 10/10A, Design Manual Part 1/1A.
2.4.10.2
This task is the preparation of the design field view submission based on the selected alignments, attendance at the design field view, preparing meeting minutes and responding to District's comments.
2.4.10.4
This task consists of preparing a draft design exception report in accordance with Strike-off-Letter 430-93-40 and Publication 10A, Design Manual Part 1A.

Scope:

2.4.10
1. Conduct design field view at the end of the preliminary engineering and within several weeks of the Design Field View Submission.
2. Evaluate the proposed alternatives under field conditions.
3. Solicit comments from review agencies for further project development.
4. Determine the preferred alternative if applicable.

2.4.10.1
Upon receipt of NEPA Clearance/Design Approval, the drawings will be further refined and developed to prepare a submission for the Design Field View.

The submission will include the following:
1. Line and Grade
2. Alternate Interchange Schematics
3. Rough preliminary signing layout including the type of sign supports, paint markings, and other traffic control devices to determine if the project is operational and can be signed.
4. Typical sections
5. Structure locations
6. Approximate pavement depth
7. Mass diagrams of grading quantities
8. Draft of Soils and Geological Engineering Report and Profile.
9. Traffic Control Plan
10. Drainage and Preliminary Hydraulic studies
11. Service road justification
12. Utilities
13. Preliminary traffic signals plan
14. Comments from the District Safety Review Committee
15. Agreements with Cities and other Political Subdivisions
2.4.10.2
1. Secure design field view approval for the preferred alternative developed during preliminary engineering.
2. Obtain written approval from the agency of authority to advance to final design.
2.4.10.4
Prepare the Design Exception Submission after the approval of the proposed design exception(s) by the District Safety Review Committee. Include this report in the Design Field View Submission. Address the following items as applicable:

* Provide project identification information
* Describe proposed work, design criteria, include typical sections
* Provide traffic information
* Identify substandard design elements
* Provide cost information with and without design exception
* Provide justification for retention of the design exception
* Evaluate accident history
* Describe remediation
* Provide collision diagrams and/or accident cluster diagrams

* Compare accident rates to statewide averages
* Describe mitigation measures
* Describe date and type of future upgrades
* Describe advantages and disadvantages of meeting full criteria

Complete the "Design Exception Data Checklist" Design Manual 1A. Include the following in the submission:

* Project location map
* Scoping field view minutes
* Accident analysis with collision diagrams
* Letter of recommendation from Safety Review Committee
* Plan, profiles, cross sections, typical sections if not previously included in the Design Field View Submission
* Bridge sufficiency rating and letter from District Bridge Engineer (if applicable)
* Ramp design sheet (Publication 13M, Design Manual Part 2), if applicable
* Photographs of existing conditions, if applicable

Detail Task 1 - Design Field View

Department Details:

Develop the Design Field View package in accordance with DM.

Attachments

No records found.

You are currently logged in as **Ryan M. Whittington**.

Release: 25.2
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RYAN M. WHITTINGTON

SCOPE OF WORK DETAIL REPORT

Agreement: E00342 **Project Specific** **Active**

Name: Three (3) Bridge Replacements in Bucks County **Selection Process:** Normal

Initiating Org: Engineering District 6-0

Supplement: 1 **Normal** **Executed**

Description: provide for, under Part 1, additional work and services for the preliminary design of S.R. 1012, Sec. BRC due to changes to the roadway geometry and intersection configuration and modifications to the TS&L

Part: 1 **Cost Plus Fixed Fee** **Active**

Description: preliminary engineering, environmental studies, final design and consultation during construction for the replacement of two structures on Headquarters Rd, Tinicum Township in Bucks County.

PennDOT Project Manager: fullard, leanne e.

Phase: Preliminary Design

Task 1 - Project Management/Administration

Objective:

2.1.1
This task consists of the administrative effort required by principals, project manager, and involving personnel to complete the project on time, within budget, and provide a quality product.

Scope:

2.1.1
Project Management involves the planning, scheduling, organizing and controlling of resources to achieve specific objectives within established schedule, budget and quality standards. The Project Manager is responsible for but not limited to the tasks outlined in the Department Detail.

Detail Task 2 - Project Management/Administration

Department Details:

In addition to the presently scoped project management tasks, consultant will create and update an Open Plan schedule on a monthly basis.

Task 2 - Surveys

Objective:

2.4.1
This task consists of providing the survey requirements associated with specific PennDOT projects designated for studies, reports, design and construction. Publication 122M applies to this task.

Scope:

2.4.1
Surveys may consist of either; Conventional or Three- Dimensional Data Collection, or a combination, as directed by the District.

Base mapping must be supplemented with conventional survey applications.

The following subtasks are considered survey requirements, relative to the existing topography within specific project boundaries.

1. County Tax Records investigation(s) to obtain names and addresses of involved property owners.
2. Issue a "Notice of Intent to Enter" letter (Form 983) to each property owner by certified mail.
3. Obtain published horizontal and vertical control data for specific project use.
4. Prior to initiating surveys, develop a Traffic Control Plan for implementation during surveys within existing highways and streets.
5. Establish horizontal and vertical control relative to referenced monumentation.
6. Establish the preliminary mainline horizontal alignment in the field.
7. Obtain profiles and cross sections along each of the project's established roadways, baselines, and centerlines.
8. Field edit mapping topography, including the type, size, location, and elevation of existing storm drain and utility facilities; and evident property corners.
9. Establish existing stream baseline and obtain stream profile and cross sections.
10. Establish existing railroad baseline, tied to the centerline, and obtain railroad profile and cross sections, subject to the railroad's inspector and protection requirements.
11. Perform existing bridge structure surveys including type, size, location and pertinent elevation data.
12. Perform Map Accuracy Tests to verify spatial accuracy.
13. Flag horizontal alignment prior to the Design Field View.
14. Stakeout the approved Baselines and Centerlines.
15. Stakeout the Core Boring Hole locations.
16. Establish and record final Benchmarks and References for construction stakeout.
17. Set monumentation points on the Legal Right-of-Way Lines.
18. Field Survey Notebook compilations, numbering and content indexing.

Detail Task 2 - Surveys

Department Details:

Update the existing survey information to reflect the topography changes at the Headquarters Road intersection with Sheep Hole Road in Tinicum Township.

Task 3 - Hydrologic and Hydraulic Report

Objective:

2.7.1
This task consists of the preparation of Hydrologic and Hydraulic reports for all bridges, culverts and longitudinal encroachments to size waterway openings properly and to satisfy permitting requirements. Publication 13M, Design Manual Part 2; Publication 15M, Design Manual Part 4; and PADEP Chapter 105 apply to this task.

Scope:

2.7.1
A separate Hydrologic and Hydraulic Report is required for each hydraulic structure. However, dual structures or structures located within the same hydraulic system should be combined into one report.

The following work elements are required for the successful completion of this task:

1. Gather existing information to be used in the development of the hydrologic and hydraulic analyses and in the preparation of the H&H Report.

2. Perform a hydrologic analysis of the watershed at each proposed crossing using one or more of the Department approved methodologies. The use of a particular model shall be justified as valid for the situation in which it is being used. All assumptions and/or limitations of each model shall be clearly identified and referenced. Multiple hydrologic models are recommended to assist in validating the selected approach. An analysis of the flood history according to the guidelines contained in Design Manual Part 2 should also be considered.

3. Perform a hydraulic analysis for each proposed crossing including alternatives, if necessary, using one or more of the Department approved hydraulic models. The use of a particular model shall be justified as valid for the situation in which it is being used. All assumptions and/or limitations of each model shall be clearly identified and referenced. Where a Flood Insurance Study has been established by FEMA, the hydraulic data included in the study should be utilized to the maximum extent deemed appropriate. Each proposed

alternative shall be modeled to assist in the justification for the selected alternative. The hydraulic model shall extend a sufficient distance upstream and downstream to adequately evaluate the potential impacts due to the proposed construction. The hydraulic model should be used to compare existing and proposed conditions with respect to water surface elevations and channel velocities for the design discharge rate(s), including the 500-year event for the scour evaluation and the "overtopping event" for the risk assessment.

4. Evaluate the scour potential at bridge abutments and piers in accordance with Design Manual Part 4. Evaluate the erosion potential at culvert outlets in accordance with HEC-14.

5. Evaluate the channel stability and design countermeasures, if needed.

6. Perform a risk assessment or analysis for each applicable waterway structure or encroachment alternative.

7. Evaluate the hydraulic impacts as a result of temporary encroachments and/or permanent bank protection, if applicable.

8. Prepare the Hydrologic and Hydraulic Report following the general outline described in Design Manual Part 2.

9. If applicable, prepare a Conditional Letter of Map Revision (CLOMR) in accordance with FEMA regulations. The scope of work for the preparation of the CLOMR is not included herein and should be developed prior to initiating the work.

Detail Task 2 - Hydrologic and Hydraulic Report

Department Details:

Revise Hydrologic and Hydraulic Report to incorporate revisions to PennDOT Drainage Design Manual and the bridge span arrangement that was agreed upon at the Section 106 Consulting Party meeting.

Task 4 - Level 2 CE

Objective:

2.3.3
This task consists of the assembly and approval of the Level 2 Categorical Exclusion

Scope:

2.3.3
Complete Part A and B, of the Categorical Exclusion Evaluation (CEE) form (Publication 294), which includes: Additional narrative will be included, as appropriate. Supplemental information will be attached to the CEE form or placed in the technical file, as appropriate.

Conduct secondary document research and review, and project site walkovers in order to complete an environmental evaluation.

Determine the level of Public and Agency Involvement required. Work items for Public Involvement have been defined in task 2.1.6.

Determine the need for permits required for all project resultant temporary and permanent actions. Work items for permit activities are defined under other work tasks.

Determine what if any supporting documents are required for the CEE. Work items to complete these supporting documents are defined under other work tasks.

Specify and define mitigation measures for impacted environmental issues listed under Section A, Environmental Evaluation Areas, listed above. Provide the general description and the location of any resources within or adjacent to the project work limits that are to be avoided during construction. Also provide measures to mitigate impacts to resources that can not be avoided.

Sheet C-2 will also require completion.

Submit the completed CEE form and pertinent supporting documents for review, concurrence, and approval to the District Office (Step 4 of the CE Process). If necessary, the consultant will revise the CEE form and or supporting documentation as directed. The District will submit the CEE to the Bureau of Design and FHWA for approval.

Detail Task 2 - Level 2 CE

Department Details:

Revise and resubmit CE to address adverse affects of replacing the bridge that has been identified as a contributing element to the Ridge Valley Rural Historic District by the US Department of the Interior.

Task 5 - Public Involvement

Objective:

2.1.3
This task includes the attendance and preparation of informational materials to be viewed and/or distributed to the general public at public meetings. This task may also include the preparation of newsletters, public announcements and all other aspects of public involvement as outlined in Publication 295.

Scope:

2.1.3
1. Obtain approval from PMC to proceed with public involvement activities.

2. Prepare announcement for public meeting.

3. Prepare visual materials and/or flyers for general public meetings.

4. Attend all public meetings and address comments made at the meeting.

5. Prepare minutes to the meeting and submit to the Project Manager for review. Revise if necessary.

Detail Task 2 - Public Involvement

Department Details:

Hold additional meetings with 106 Consulting Parties and local emergency officials to mitigate the adverse affect of replacing the bridge and to coordinate bridge and roadway widths necessary for the use of emergency vehicles..

Task 6 - Line and Grade

Objective:

2.4.6
This task consists of the development of the horizontal and vertical geometry. Publication 13M, Design Manual Part 2 applies to this task

Scope:

2.4.6
Prior to developing the vertical and horizontal geometry, all environmental and property constraints will be identified. The engineer will have a comprehensive understanding of all of the constraints and will discuss these with the District prior to finalizing the geometry.

Secure sufficient field survey information to develop the final geometry. Develop all control points for the vertical and horizontal geometry. The engineer will analyze the compatibility and acceptability of the horizontal and vertical geometry.

The following work elements are required for the successful completion of this task:
1. Finalize horizontal and vertical geometry and submit plans in accordance with Publication 10A, Design Manual Part 1A.
2. Review for compliance with design criteria and environmental constraints.

3. Tabulate project control point coordinates (POT, PC, PT, and PI) for all roadways and channel relocations.
4. Apply the project traffic data to the design criteria to determine lane requirements, turning movements, and weaving movements.
5. Check final structure depths and adjust vertical alignment as necessary. If alternative structures are being utilized, use the worst case scenario.
6. Tabulate pavement grades and superelevation for development of cross sections.

Detail Task 2 - Line and Grade

Department Details:

Update existing Line and Grade information to reflect horizontal and vertical geometry changes to the intersection between Sheep Hole Road and Headquarters Road in Tinicum Township.

Task 7 - Preliminary Geotechnical Engineering Report

Objective:

2.5.2
This task is the preparation of a Geotechnical Engineering Report for Pre-Final Design in accordance with Publication 10A, Design Manual Part 1A and Publication 293.
2.5.2.1
This task is the preparation of a Reconnaissance Soils and Geological Engineering Report in accordance with Publication 15M, Design Manual Part 4.

Scope:

2.5.2
The following work elements are required for the successful completion of this task:

1. Coordinate the effort with the District Geotechnical Engineer (DGE) and the other engineering disciplines involved. Perform QA/QC on work processes and products.

2. Perform analysis and design associated with embankment and cut slope construction, stormwater management facilities, drainage conduits, pavements, unsuitable materials, special geotechnical treatments, benching and transition zones, and geotechnical instrumentation for construction control.

3. Develop recommendations for use by the design team, and draft special provisions and details for construction.

4. Identify the anticipated scope of geotechnical investigations required during Final Design.

5. Prepare the GER for Pre-Final Design, presenting the recommendations and providing supporting documentation. Follow the outline in Publication 293, including a summary of the structure-related geotechnical investigations and reports for the project. Submit both a draft (95%) and a final (100%) version of the GER to the DGE.

6. Gather the information and materials necessary to assemble a preliminary soil profile plan. Obtain plan and profile sheets for the alignment from the design team. Obtain approval of the proposed graphics layout, scales and symbology.

7. Prepare the preliminary soil profile cover sheet and index sheet. Develop graphic logs of the borings. Prepare the profile sheets, showing the graphic boring logs and test results. Assemble the cover, index and profile sheets and submit a half-size copy as an appendix to the GER.

2.5.2.1
The following work elements are required for completion of this task:

1. Coordinate the effort with the District Geotechnical Engineer (DGE), District Bridge Engineer, BOD Bridge Quality Assurance Division (BQAD), and the other engineering disciplines involved. Perform QA/QC on work processes and products.

2. Perform an office investigation. Review background geological information and maps, boring logs, project files and reports, environmental documents, and right-of-way plans to describe the soil/rock/hydrologic setting. Contact Federal and State agencies with access to soils and geologic data. Review previous geotechnical work performed in the vicinity of the structure.

3. Visit the site, interviewing local residents and engineers. Perform a detailed field reconnaissance and refine the soil/rock/hydrologic setting description.

4. Determine the important site characteristics and evaluate their impact on the proposed construction.

5. Develop a plan for core boring and testing, based on the requirements of Design Manual Part 4. Prepare a tabular summary of the proposed drilling following the format of Publication 222M.

6. Prepare the RSGER, presenting the information required in Design Manual Part 4, with the boring and testing plan as an appendix. Submit the report for approval.

Detail Task 2 - Preliminary Geotechnical Engineering Report

Department Details:

Update existing RSGER for a two span bridge to include the span arrangement revisions that was agreed at the Section 106 Consulting Parties meeting.

Task 8 - Preliminary ROW Activities

Objective:

2.6.1
This task includes the requirements as stipulated under Publication 14M, Design Manual Part 3.
2.6.1.1
This task involves the determination of legal right-of-way widths in accordance with the Publication 14M, Design Manual Part 3, and research of property owner records in County Deed Recorder's office.
2.6.1.2
This task is the preparation of individual property plats in accordance with Publication 14M, Design Manual Part 3.

Scope:

2.6.1
A preliminary right-of-way plan will be prepared for all Department projects where the construction activities require property acquisition beyond the footprint of existing Department of transportation property. The right-of-way plan shall be prepared in accordance with the requirements and contents as stipulated in Design Manual Part 3.

The right-of-way plan(s) is(are) subject to a plan check review by the District Right-of Way Unit, Chief of Surveys and the Central Office Bureau of Design, Field Liaison Engineer, Highway Quality Control Division. The plan and all supporting data shall be submitted to the District in advance of the scheduled plan check review meeting. The person(s) responsible for the plan preparation will attend the review meeting. Departments and comments stemming from the plan review shall be addressed and incorporated in the subsequent right-of-way plan submission.

The right-of-way plan will be prepared on mylar with appropriate Pennsylvania professional engineer and surveyor seals affixed.

Until NEPA clearance has been obtained, the Department may not perform final negotiations and acquisitions of property.

A right-of-way certificate is issued when the Department has adequately acquired right-of-way to allow project construction.

2.6.1.1

All public legal right-of-way and private right-of-way within the project area shall be determined from plans and documents recorded in the County Courthouse, or on file in the offices of: PennDOT District, Municipality and involved agency. Copies of all right-of-way record data will be obtained, where available, and included with the R/W plan submission to the District.

The existing public and private right-of-way corridors shall be delineated and labeled on the highway plans. A description of, and the establishment record data for right-of-way, shall be included in the project General Notes for all involved public highways. When recorded subdivision plans exhibit public right-of-way corridors, determinations must include whether the local municipality has, or has not, adopted them.

Property owner research is generally initiated by reviewing the tax maps and records at the County Tax Assessors' Office. Once the highway project location is identified on the tax map(s), the anticipated property involvement's can be listed by tax map and parcel numbers. With this information, the tax assessment files can be researched to provide: Owners name and address, Deed Book and Page Number, parcel area, list of property improvements, and the assessed value of the property. Copies of the tax maps and assessment records may be purchased for subsequent use by the designer, and inclusion as backup data to the R/W plan submissions.

Based on the obtained tax record information, the records in the Recorder of Deeds office shall be researched to verify, or update, the involved property(s) ownership, deed book and page number. Upon verification of property ownership, property investigation shall continue to ascertain if any exceptions, adverse conveyances, easement rights, sale agreements, or subdivision plans associated with property are recorded. When the property research reaches a point that exhibits the best available records available, copies of the involved deeds will be purchased from the Recorder of Deeds for plotting and project property matrix map compilation.

When metes and bounds descriptions of the deed are vague, or lacking information, prior chain of title deed descriptions shall be reviewed and copied when their descriptions provided better clarification for boundary plotting purposes. If overlaps, or gaps, result on the property matrix map due to deed metes and bounds descriptions plots, the District Right-of-Way Administrator should be notified of these conditions, and to solicit his/her direction in resolving these issues.
2.6.1.2
Individual property plats will be prepared for all parcels with takes on highway projects, unless otherwise directed by the District.

The property plat shall contain all information necessary to provide a clear understanding, by all parties, of the existing conditions and the highway's taking requirements for the parcel, in accordance with Design Manual Part 3, Guidelines and Stipulations.

The proposed highway affects on the individual property plat must be consistent with those shown on the highway right-of-way plan sheet, however, the showing of details and labels beyond the boundary lines of parcel shall be avoided when practical.

Detail Task 2 - Preliminary ROW Activities

Department Details:

Update the existing Preliminary ROW Plans to reflect the revisions to span arrangement and substructure locations that was agreeable to the Section 106 Consulting Parties.

Task 9 - Preliminary Type, Size and Location (TS&L)

Objective:

2.7.2
This task consists of the assembly of Type, Size and Location studies and development of recommendations for proposed structures within the project. Publication 15M, Design Manual Part 4 apply to this task.

Scope:

2.7.2
Review any previous studies or preliminary designs with respect to the selection of structure type, span

arrangements, horizontal and vertical clearances, design controls and type section. Coordinate with the District on the logical selection of span arrangements, types of piers, and structure types suitable at each location.

The preliminary structure designs will be performed at a stage when the highway alignment and profile are well defined. Review structure requirements with the District prior to Design Field View (Line and Grade) submission and approval.

The work elements are required for the successful completion of this task:
1. Develop a location plan showing the feature to be crossed or retained, design controls and regulated areas
2. Identify possible pier and abutment locations
3. Evaluate geotechnical conditions to identify potential foundation types
4. Recommend locations for structure foundation borings
5. Evaluate constructability, vertical and horizontal clearances and site constraint issues in determining the most suitable structure design for the particular location
6. Prepare cost estimates for alternative structure designs
7. Prepare justification for recommended alternative
8. Prepare transmittal letter, plans and report for TS&L submission

Detail Task 2 - Preliminary Type, Size and Location (TS&L)

Department Details:

Update the existing Preliminary Type, Size and Location plans to reflect span arrangement changes agreeable to the Section 106 Consulting Parties.

Task 10 - Safety Review/Audit

Objective:

2.8.7
This task consists of the time required for the Safety Review Committee to review the preliminary plans and the Project Design Criteria Report.
2.8.7.1
This task consists of the time required for the Safety Review Committee to prepare the safety review committee recommendations.
2.8.7.2
This task consists of preparing collision diagrams and the analysis used for developing alternatives to reduce crash rates.

Scope:

2.8.7
1. Conduct the safety review/audit as early in the design process as possible.
2. Identify all applicable items on the Safety Review Checklist (see Publication 10A, Design Manual Part 1A). Add any additional items based on engineering judgement and experience.
3. Detect safety deficiencies in the design.
4. Recommend safety enhancements.
5. Prepare the Safety Review Submission (two copies) at least two weeks before the design field view (if applicable). Include the following:
* Color coded plans
* Profiles
* Typical sections
* Project Design Criteria Report (see Design Manual 1A for details)

2.8.7.1
Prepare a memo concerning the following:

1. Approval/disapproval of safety features
2. Safety recommendations
3. Approval/rejection of Design Exceptions

2.8.7.2
1. Review and evaluate root causes of crashes at a given location or area along a highway.

2. Prepare collision diagrams (if applicable) in accordance with the Manual of Transportation Engineering Studies. Consider the following per PennDOT Publication 201 Engineering and Traffic Studies:
* Total number of crashes during last 5 years
* Number of crashes by type or causation factor
* Vehicle type involved
* Pedestrian involvement
* Type of traffic control present
* Roadway or intersection geometric
* Cause of crash
* Time of crash
* Environmental conditions

Detail Task 2 - Safety Review/Audit

Department Details:

Update the existing Safety Review / Audit submission to address the safety concerns in the revised project scope. The consultant will be expected to prepare a design exceptions request to address the substandard geometric conditions.

Task 13 - Design Field View

Objective:

2.4.10
This task consists of the development, submission and approval of the Design Field View submission.
2.4.10.1
This task consists of the assembly of the Design Field View submission. Reference Publication 10/10A, Design Manual Part 1/1A.
2.4.10.2
This task is the preparation of the design field view submission based on the selected alignments, attendance at the design field view, preparing meeting minutes and responding to District's comments.
2.4.10.4
This task consists of preparing a draft design exception report in accordance with Strike-off-Letter 430-93-40 and Publication 10A, Design Manual Part 1A.

Scope:

2.4.10
1. Conduct design field view at the end of the preliminary engineering and within several weeks of the Design Field View Submission.
2. Evaluate the proposed alternatives under field conditions.
3. Solicit comments from review agencies for further project development.
4. Determine the preferred alternative if applicable.

2.4.10.1
Upon receipt of NEPA Clearance/Design Approval, the drawings will be further refined and developed to prepare a submission for the Design Field View.

The submission will include the following:
1. Line and Grade
2. Alternate Interchange Schematics
3. Rough preliminary signing layout including the type of sign supports, paint markings, and other traffic control devices to determine if the project is operational and can be signed.
4. Typical sections
5. Structure locations
6. Approximate pavement depth
7. Mass diagrams of grading quantities
8. Draft of Soils and Geological Engineering Report and Profile.

9. Traffic Control Plan
10. Drainage and Preliminary Hydraulic studies
11. Service road justification
12. Utilities
13. Preliminary traffic signals plan
14. Comments from the District Safety Review Committee
15. Agreements with Cities and other Political Subdivisions
2.4.10.2
1. Secure design field view approval for the preferred alternative developed during preliminary engineering.
2. Obtain written approval from the agency of authority to advance to final design.
2.4.10.4
Prepare the Design Exception Submission after the approval of the proposed design exception(s) by the District Safety Review Committee. Include this report in the Design Field View Submission. Address the following items as applicable:

* Provide project identification information
* Describe proposed work, design criteria, include typical sections
* Provide traffic information
* Identify substandard design elements
* Provide cost information with and without design exception
* Provide justification for retention of the design exception
* Evaluate accident history
* Describe remediation
* Provide collision diagrams and/or accident cluster diagrams
* Compare accident rates to statewide averages
* Describe mitigation measures
* Describe date and type of future upgrades
* Describe advantages and disadvantages of meeting full criteria

Complete the "Design Exception Data Checklist" Design Manual 1A. Include the following in the submission:

* Project location map
* Scoping field view minutes
* Accident analysis with collision diagrams
* Letter of recommendation from Safety Review Committee
* Plan, profiles, cross sections, typical sections if not previously included in the Design Field View Submission
* Bridge sufficiency rating and letter from District Bridge Engineer (if applicable)
* Ramp design sheet (Publication 13M, Design Manual Part 2), if applicable
* Photographs of existing conditions, if applicable

Detail Task 2 - Design Field View

Department Details:

Update the existing Design Field View submission to match the revised project scope.

Attachments

No records found.

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pennsylvania DEPARTMENT OF TRANSPORTATION home site map help ECMS pennsylvania PA RYAN M. WHITTINGTON

SCOPE OF WORK DETAIL REPORT

Agreement: E00342 Project Specific Active

Name: Three (3) Bridge Replacements in Bucks County **Selection Process:** Normal

Initiating Org: Engineering District 6-0

Supplement: 2 **Normal** **Executed**

Description: add additional coordination efforts with PADEP and extend the time of completion for Part 1

Part: 1 **Cost Plus Fixed Fee** **Active**

Description: preliminary engineering, environmental studies, final design and consultation during construction for the replacement of two structures on Headquarters Rd, Tinicum Township in Bucks County.

PennDOT Project Manager: fullard, leanne e.

Phase: Preliminary Design

Task 1 - Project Management/Administration

Objective:

2.1.1
This task consists of the administrative effort required by principals, project manager, and involving personnel to complete the project on time, within budget, and provide a quality product.

Scope:

2.1.1
Project Management involves the planning, scheduling, organizing and controlling of resources to achieve specific objectives within established schedule, budget and quality standards. The Project Manager is responsible for but not limited to the tasks outlined in the Department Detail.

Detail Task 3 - Project Management/Administration

Department Details:

As per the standard scope.

Task 3 - Hydrologic and Hydraulic Report

Objective:

2.7.1
This task consists of the preparation of Hydrologic and Hydraulic reports for all bridges, culverts and longitudinal encroachments to size waterway openings properly and to satisfy permitting requirements. Publication 13M, Design Manual Part 2; Publication 15M, Design Manual Part 4; and PADEP Chapter 105 apply to this task.

Scope:

2.7.1
A separate Hydrologic and Hydraulic Report is required for each hydraulic structure. However, dual structures or structures located within the same hydraulic system should be combined into one report.

The following work elements are required for the successful completion of this task:

1. Gather existing information to be used in the development of the hydrologic and hydraulic analyses and in the preparation of the H&H Report.

2. Perform a hydrologic analysis of the watershed at each proposed crossing using one or more of the

Department approved methodologies. The use of a particular model shall be justified as valid for the situation in which it is being used. All assumptions and/or limitations of each model shall be clearly identified and referenced. Multiple hydrologic models are recommended to assist in validating the selected approach. An analysis of the flood history according to the guidelines contained in Design Manual Part 2 should also be considered.

3. Perform a hydraulic analysis for each proposed crossing including alternatives, if necessary, using one or more of the Department approved hydraulic models. The use of a particular model shall be justified as valid for the situation in which it is being used. All assumptions and/or limitations of each model shall be clearly identified and referenced. Where a Flood Insurance Study has been established by FEMA, the hydraulic data included in the study should be utilized to the maximum extent deemed appropriate. Each proposed alternative shall be modeled to assist in the justification for the selected alternative. The hydraulic model shall extend a sufficient distance upstream and downstream to adequately evaluate the potential impacts due to the proposed construction. The hydraulic model should be used to compare existing and proposed conditions with respect to water surface elevations and channel velocities for the design discharge rate(s), including the 500-year event for the scour evaluation and the "overtopping event" for the risk assessment.

4. Evaluate the scour potential at bridge abutments and piers in accordance with Design Manual Part 4. Evaluate the erosion potential at culvert outlets in accordance with HEC-14.

5. Evaluate the channel stability and design countermeasures, if needed.

6. Perform a risk assessment or analysis for each applicable waterway structure or encroachment alternative.

7. Evaluate the hydraulic impacts as a result of temporary encroachments and/or permanent bank protection, if applicable.

8. Prepare the Hydrologic and Hydraulic Report following the general outline described in Design Manual Part 2.

9. If applicable, prepare a Conditional Letter of Map Revision (CLOMR) in accordance with FEMA regulations. The scope of work for the preparation of the CLOMR is not included herein and should be developed prior to initiating the work.

Detail Task 3 - Hydrologic and Hydraulic Report

Department Details:

Evaluate two (2) TS&L aternatives and include the results in the Hydrologic and Hydraulic Report.

Task 5 - Public Involvement

Objective:

2.1.3

This task includes the attendance and preparation of informational materials to be viewed and/or distributed to the general public at public meetings. This task may also include the preparation of newsletters, public announcements and all other aspects of public involvement as outlined in Publication 295.

Scope:

2.1.3

1. Obtain approval from PMC to proceed with public involvement activities.

2. Prepare announcement for public meeting.

3. Prepare visual materials and/or flyers for general public meetings.

4. Attend all public meetings and address comments made at the meeting.

5. Prepare minutes to the meeting and submit to the Project Manager for review. Revise if necessary.

Detail Task 3 - Public Involvement

Department Details:

Assume two (2) additional consulting party meetings in Tinicum Township.

Task 6 - Line and Grade

Objective:

2.4.6
This task consists of the development of the horizontal and vertical geometry. Publication 13M, Design Manual Part 2 applies to this task

Scope:

2.4.6
Prior to developing the vertical and horizontal geometry, all environmental and property constraints will be identified. The engineer will have a comprehensive understanding of all of the constraints and will discuss these with the District prior to finalizing the geometry.

Secure sufficient field survey information to develop the final geometry. Develop all control points for the vertical and horizontal geometry. The engineer will analyze the compatibility and acceptability of the horizontal and vertical geometry.

The following work elements are required for the successful completion of this task:
1. Finalize horizontal and vertical geometry and submit plans in accordance with Publication 10A, Design Manual Part 1A.
2. Review for compliance with design criteria and environmental constraints.
3. Tabulate project control point coordinates (POT, PC, PT, and PI) for all roadways and channel relocations.
4. Apply the project traffic data to the design criteria to determine lane requirements, turning movements, and weaving movements.
5. Check final structure depths and adjust vertical alignment as necessary. If alternative structures are being utilized, use the worst case scenario.
6. Tabulate pavement grades and superelevation for development of cross sections.

Detail Task 3 - Line and Grade

Department Details:

Revise plans to include two (2) additional alternatives.

Task 8 - Preliminary ROW Activities

Objective:

2.6.1
This task includes the requirements as stipulated under Publication 14M, Design Manual Part 3.
2.6.1.1
This task involves the determination of legal right-of-way widths in accordance with the Publication 14M, Design Manual Part 3, and research of property owner records in County Deed Recorder's office.
2.6.1.2
This task is the preparation of individual property plats in accordance with Publication 14M, Design Manual Part 3.

Scope:

2.6.1
A preliminary right-of-way plan will be prepared for all Department projects where the construction activities require property acquisition beyond the footprint of existing Department of transportation property. The right-of-way plan shall be prepared in accordance with the requirements and contents as stipulated in Design Manual Part 3.

The right-of-way plan(s) is(are) subject to a plan check review by the District Right-of Way Unit, Chief of Surveys and the Central Office Bureau of Design, Field Liaison Engineer, Highway Quality Control Division. The plan and all supporting data shall be submitted to the District in advance of the scheduled plan check

review meeting. The person(s) responsible for the plan preparation will attend the review meeting. Departments and comments stemming from the plan review shall be addressed and incorporated in the subsequent right-of-way plan submission.

The right-of-way plan will be prepared on mylar with appropriate Pennsylvania professional engineer and surveyor seals affixed.

Until NEPA clearance has been obtained, the Department may not perform final negotiations and acquisitions of property.

A right-of-way certificate is issued when the Department has adequately acquired right-of-way to allow project construction.

2.6.1.1
All public legal right-of-way and private right-of-way within the project area shall be determined from plans and documents recorded in the County Courthouse, or on file in the offices of: PennDOT District, Municipality and involved agency. Copies of all right-of-way record data will be obtained, where available, and included with the R/W plan submission to the District.

The existing public and private right-of-way corridors shall be delineated and labeled on the highway plans. A description of, and the establishment record data for right-of-way, shall be included in the project General Notes for all involved public highways. When recorded subdivision plans exhibit public right-of-way corridors, determinations must include whether the local municipality has, or has not, adopted them.

Property owner research is generally initiated by reviewing the tax maps and records at the County Tax Assessors' Office. Once the highway project location is identified on the tax map(s), the anticipated property involvement's can be listed by tax map and parcel numbers. With this information, the tax assessment files can be researched to provide: Owners name and address, Deed Book and Page Number, parcel area, list of property improvements, and the assessed value of the property. Copies of the tax maps and assessment records may be purchased for subsequent use by the designer, and inclusion as backup data to the R/W plan submissions.

Based on the obtained tax record information, the records in the Recorder of Deeds office shall be researched to verify, or update, the involved property(s) ownership, deed book and page number. Upon verification of property ownership, property investigation shall continue to ascertain if any exceptions, adverse conveyances, easement rights, sale agreements, or subdivision plans associated with property are recorded. When the property research reaches a point that exhibits the best available records available, copies of the involved deeds will be purchased from the Recorder of Deeds for plotting and project property matrix map compilation.

When metes and bounds descriptions of the deed are vague, or lacking information, prior chain of title deed descriptions shall be reviewed and copied when their descriptions provided better clarification for boundary plotting purposes. If overlaps, or gaps, result on the property matrix map due to deed metes and bounds descriptions plots, the District Right-of-Way Administrator should be notified of these conditions, and to solicit his/her direction in resolving these issues.
2.6.1.2
Individual property plats will be prepared for all parcels with takes on highway projects, unless otherwise directed by the District.

The property plat shall contain all information necessary to provide a clear understanding, by all parties, of the existing conditions and the highway's taking requirements for the parcel, in accordance with Design Manual Part 3, Guidelines and Stipulations.

The proposed highway affects on the individual property plat must be consistent with those shown on the highway right-of-way plan sheet, however, the showing of details and labels beyond the boundary lines of parcel shall be avoided when practical.

Detail Task 3 - Preliminary ROW Activities

Department Details:
Investigate ROW impacts as part of the alternative study.

Task 9 - Preliminary Type, Size and Location (TS&L)

Objective:
2.7.2
This task consists of the assembly of Type, Size and Location studies and development of recommendations for proposed structures within the project. Publication 15M, Design Manual Part 4 apply to this task.

Scope:
2.7.2
Review any previous studies or preliminary designs with respect to the selection of structure type, span arrangements, horizontal and vertical clearances, design controls and type section. Coordinate with the District on the logical selection of span arrangements, types of piers, and structure types suitable at each location.

The preliminary structure designs will be performed at a stage when the highway alignment and profile are well defined. Review structure requirements with the District prior to Design Field View (Line and Grade) submission and approval.

The work elements are required for the successful completion of this task:
1. Develop a location plan showing the feature to be crossed or retained, design controls and regulated areas
2. Identify possible pier and abutment locations
3. Evaluate geotechnical conditions to identify potential foundation types
4. Recommend locations for structure foundation borings
5. Evaluate constructability, vertical and horizontal clearances and site constraint issues in determining the most suitable structure design for the particular location
6. Prepare cost estimates for alternative structure designs
7. Prepare justification for recommended alternative
8. Prepare transmittal letter, plans and report for TS&L submission

Detail Task 3 - Preliminary Type, Size and Location (TS&L)

Department Details:
Evaluate two (2) additional alternatives.

Attachments
No records found.

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TECHNICAL PROPOSAL DETAIL REPORT

Agreement: E00342 Project Specific Active

Name: Three (3) Bridge Replacements in Bucks County **Selection Process:** Normal

Initiating Org: Engineering District 6-0

Part: 5 **Specific Rate of Compensation** **Executed**

Description: Services during construction as they pertain to parts 1 and 3 of the agreement. **PennDOT Project Manager:** fullard, leanne e.

Phase: Services During Construction

Task 1 - Shop Drawing Review

Objective:

2.11.2
This task involves the coordination, review and approval of shop drawings submitted by the contractor in accordance with Publication 10/10A, Design Manual 1/1A.

Scope:

2.11.2
Review and approve shop drawings following the procedures in Design Manual Part 1A.

Detail Task 1 - Shop Drawing Review

Department Details:

Shop drawings review.

Approach:

Agreement: E00342

Part 005 - S.R. 1012, Section BRC - Construction Services

1.0 - Shop Drawing Review
2.11.2
Urban will coordinate, review, and approve shop drawings for the fabricated material submitted by the contractor. This work will be conducted in accordance with Publication 10A (Design Manual Part 1A) and other relevant publications such as Appendix B of Publication 15M (Design Manual Part 4). Fabricators' shop drawings will be reviewed for conformance with the contract drawings, specifications, and standards. Items such as geometry and principal dimensions of fabricated elements and components will be checked and proposed materials will be reviewed for conformance with required properties and characteristics. We will coordinate this work through assigned District personnel and will maintain contact and communication with the contractor and fabricators as required and authorized by the Department. We will establish and maintain a shop drawing log to track submissions by the contractor and various fabricators and suppliers. The log will provide the Department with a complementary means for maintaining project control by permitting ready access to an organized record of the status of submissions and approvals. Urban will assign individuals who are familiar with the type of construction involved with the shop drawing submissions and will comply with review turn-around schedules established for the project.

Task 2 - Construction Consultation

Objective:

2.11.3
This task is coordination with the contractor prior to issuance of the notice to proceed.

Scope:

2.11.3
Upon contract execution, issue a Notice-to-Proceed letter and coordinate the scheduling of a pre-construction meeting.

Detail Task 1 - Construction Consultation

Department Details:

Consultation during Construction

Approach:

2.0 - Construction Consultation
2.11.3
After execution of the construction contract, the District will issue the notice to proceed letter to the contractor. Urban will coordinate with the District and the contractor to schedule the pre-construction meeting. Urban will designate a project representative who will attend the pre-construction meeting. A team of individuals who are familiar with the design will also be designated as representatives and they will be available throughout construction to provide assistance for plan interpretation, trouble-shooting, and resolution of problems that may arise during the course of the work. Urban's project representative will maintain contact with the District's Resident Engineer to stay abreast of the progress of the construction in order to assist in identifying and averting potential difficulties and providing resolution in order to maintain the flow of work in the field.

Consultant Hierarchy

Business Partner	DBE Type	Supervising BP
Urban Engineers, Inc.	No	
Dawood Engineering, Inc.	Yes	Urban Engineers, Inc.

Attachments

No records found.

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TECHNICAL PROPOSAL DETAIL REPORT

Agreement: E00342 Project Specific **Active**

Name: Three (3) Bridge Replacements in Bucks County **Selection Process:** Normal
Initiating Org: Engineering District 6-0

Part: 3 **Cost Plus Fixed Fee** **Active**

Description: Final Design Services pertaining to the bridge replacement project with MPMS # 13716 and BMS #s 09101201000278 & 09101200202764.

PennDOT Project Manager: fullard, leanne e.

Phase: Final Design

Task 1 - Project Management/Administration

Objective:

2.1.1
This task consists of the administrative effort required by principals, project manager, and involving personnel to complete the project on time, within budget, and provide a quality product.

Scope:

2.1.1
Project Management involves the planning, scheduling, organizing and controlling of resources to achieve specific objectives within established schedule, budget and quality standards. The Project Manager is responsible for but not limited to the tasks outlined in the Department Detail.

Detail Task 1 - Project Management/Administration

Department Details:

2.1.1

1. Monitor design team performance and project development.
2. Control project costs.
3. Coordinate the flow of information concerning the project.

Approach:

Agreement: E00342

Part 003 - S.R. 1012, Section BRC - Final Design

1.0 - Project Management/Administration

2.1.1
Matthew C. Marquardt, PE, Urban's Project Manager, will be responsible for the coordination of project work tasks to keep design work on schedule and within budget. Accordingly, he will be responsible for the day to day management of design activities, liaison activities between PENNDOT and the Urban Team, coordination between individual disciplines at Urban, and our subconsultants A.D.Marble & Company and Dawood Engineering, Inc. No individual portion of the work will impede the overall Team's progress. Mr. Marquardt will be the single point of contact for project communication and will coordinate the flow of information concerning the project. His responsibilities will include conducting kick-off meetings, representing PENNDOT at public meetings, coordinating with outside agencies, reviewing the project for compliance with PENNDOT's QA/QC plan, controlling project costs and processing requests for project authorization and funding. He will promote an atmosphere of good public relations and customer satisfaction.

The Project Administrator (Principal-in-Charge) will handle the project administration and will represent

Urban on contractual matters. The project administrator for this assignment will be Joseph P. McAtee, PE, Executive Vice President of Urban Engineers, Inc. Mr. McAtee will have ultimate responsibility for the firm's performance and has the authority to commit additional resources, perform the overview functions, review staff performance, and participate in project reviews with PENNDOT. Project administration is considered by Urban to be part of our normal operating expenses, i.e., part of our overhead, and is not directly billable to a project.

This assignment will be performed in compliance with Urban's ISO 9001-certified procedures; Daniel J. Leinheiser, PE, will serve as Urban's QA/QC Officer. He will provide project oversight, monitor compliance with the schedule, review designs, identify potential problems, and see that the management of this project is consistent with Urban's quality standards

Mr. Marquardt will attend project meetings. Appropriate team members will be present on an as-needed or as-directed basis. It is our intent to have the required materials and personnel available at these meetings to facilitate the decision making process and preclude, to the greatest extent possible, the potential for any delays to the design schedule.

Urban will prepare and submit the agenda for each meeting to PENNDOT at least three (3) working days prior to the meeting to allow PENNDOT to have the appropriate personnel present for these meetings.

Minutes of each meeting will be prepared by Urban and e-mailed to PENNDOT within seven (7) working days after the meeting. A follow-up action item list clearly defining the follow-up task and identifying each party's responsibility will also be prepared by Urban.

Meetings will include but will not be limited to:

Project Status Meetings
Design Review Meetings

Urban will conduct in-house meetings with the design team and with the appropriate units of the Department on a regular basis or as needed. Meeting minutes will be distributed to the attendees and will be kept in the project file.

Mr. Marquardt will coordinate between individual disciplines at Urban, and our subconsultants, A.D.Marble & Company and Dawood Engineering, Inc., throughout the entire design phase of the project. This will include project correspondence, attendance at meetings, review of invoices and formal submissions.

Urban's ISO 9001 Certification demonstrates that we take extreme pride in quality. This certification is the definitive standard for quality systems in design/consulting firms. It verifies that Urban's quality management systems comply with the requirements of the International Organization for Standardization. Only a few engineering firms in the region have obtained this highly sought after distinction.

Upon Notice to Proceed, Urban's Quality Manual will be reviewed and a project-specific plan developed. This project's QA/QC will address the general issues of:
· What are the roles of the various team members?
· How will quality control be maintained throughout the project?
· Who will perform, check and approve each task?
· Who will maintain and monitor action items resulting from project meetings?

The ISO 9001 process will be initiated at the project kick-off meeting that will be attended by key team members, the QA/QC Officer, the head of the departments involved in the project and representatives from our subconsultant. PENNDOT's Project Manager, Lawrence Link, will also be asked to attend. At the meeting Mr. Marquardt will present his understanding of the assignment, the project schedule, the roles of the participants, and the resources that he is allocating to this work. Constructive input will be received from those in attendance. The kick-off meeting will detail project communications and quantify the expectations of the participants.

We will prepare cost estimates as part of the applicable Design Manual requirements (e.g., with the Design Field View and Preliminary and Final PS&E).

On a regular basis (i.e., monthly or as necessary), Urban will prepare a project status report which will address the current status of the project schedule and budget. Areas of concern such as delays in the project schedule or potential cost overruns will be noted.

We will coordinate contract issues, including any supplements, with PENNDOT's Project Manager. Upon execution of our agreement with PENNDOT, we will prepare an agreement with our subconsultants, A.D.Marble & Company and Dawood Engineering, Inc.

Task 2 - Cross Sections

Objective:

2.4.5
This task consists of preparing representative cross sections on all alignments considered in previous environmental studies at intervals such that approximate right-of-way limits can be defined. Earthwork calculations are included in this task.

Scope:

2.4.5
This task is the preparation of cross sections during preliminary engineering to assist in evaluating alternate alignments. It includes development of sections at critical locations to assess impacts on right-of-way limits, earthwork, existing structures, drainage controls, environmentally sensitive areas and other features that could be impacted by the alignment.

Following identification of the preferred alternate, the designer will prepare critical cross sections as part of the Design Field View Submission in accordance with Design Manual Part 1A.

Detail Task 1 - Cross Sections

Department Details:

Cross sections every 50 ft for roadway approaches.

Approach:

2.0 - Cross Sections
2.10.4
Urban will prepare final design cross sections at 50-foot intervals and at critical locations to adequately depict the design. Cross sections will be prepared in accordance to Design Manual Part 3, Section 2.7. Cross sections will be prepared and plotted at a scale of 1"=10' horizontally and vertically.

Match lines will be established throughout intersection areas to adequately depict the proposed construction and to facilitate the computation of earthwork quantities. A separate plan sheet(s) will also be prepared showing the layout of the matchlines for earthwork.

The cross sections will be developed so they can be utilized to check the adequacy of the proposed traffic control schemes and can also be used to take off quantities for each phase of traffic control.

The roadway cross sections will show the construction and survey baselines (if they differ), existing and proposed pavement sections, drainage and utilities, pavement base drains, superelevation transitions, and earthwork quantities. A cross section title sheet providing number of cross section sheets in the package, breakdown of each alignment with stations and related sheet numbers will also be provided.

Task 3 - Roadway

Objective:

2.10.2
This task includes survey, roadway, pavement and drainage design, plans, cross sections, soil profile, final design office meeting, draft special provisions and final design field view.
2.10.2.1
This task includes the design of roadway drainage items. Publication 13M, Design Manual Part 2 applies to this task.
2.10.2.2

This task is the preparation of the final pavement design.
2.10.2.3
This task includes the preparation of the final roadway plans and profiles in accordance with Publication 10A, Design Manual Part 1A.

Scope:

2.10.2
Needs completed.
2.10.2.1
One copy of the plan depicting the drainage design and the hydraulic design computations for roadway drainage structures shall be submitted to the appropriate District Office for review and comment by the Project Manager or designated drainage engineer. As directed by the District, one additional copy of the drainage submission shall be sent to Central Office, Bureau of Design for quality assurance review.

The following work elements are required for the successful completion of this task:

1. Develop a drainage design that provides the proper capacity, spacing, size and type of drainage facility (existing and proposed) for each drainage area, location, fill height, roadway type and environmental condition including all inlets, pipes, culverts, ditches and base drains.

2. Prepare hydraulic design computations using appropriate methodologies for all roadway drainage structures. Include energy grade line and hydraulic grade line computations for existing and proposed systems.

3. Develop alternate pipe designs as required with corresponding hydraulic computations for each alternate. Provide "For Information Only" quantities for each pipe type and alternate as well as minimum and maximum fill heights as required.

4. Verify that downstream drainage capacity is sufficient for the proposed design. Conform to local municipal storm water requirements, if a local storm water ordinance exists.

5. Show all existing and proposed drainage facilities on construction cross sections and profiles.

6. Prepare transmittal letter to include, plans showing drainage design and hydraulic design computations. Provide PE seal on all plans and computations.
2.10.2.2
Follow Publication 13M, Design Manual Part 2, which refers to Publication 242, Pavement Policy Manual for the preparation of final pavement design.
2.10.2.3
The submission will include the completion of the following work items:

1. Interchange Design

2. Intersection Design - Prepare pavement elevation plans to describe the horizontal and vertical geometry that cross sections cannot describe.

3. Airport Clearances - Review Part 77 of the Federal Aviation Regulations and adjust the design accordingly when the project is within 2 (3.2 km) miles of an operating airport. If the project is within 2 (3.2 km) miles of an operating airport, an Airport Clearance Submission to the FAA is required.

Prepare all the following work elements:
(Note: Plans listed below are highway design plans only and do not include also plans.)

1. Title sheet
2. Index/General Note Sheet
3. Typical Section Sheet (Location Map and General Notes)
4. Summary of Quantities Sheets
5. Tabulation of Quantities Sheets
6. Detail Plan Sheets
7. Profile Sheets

8. Contour, Grading, and Drainage Plans
9. Landscaping Plans
10. Cross Sections
11. Special Detail Sheets
12. Required Forms, Special Provisions and Estimates

Detail Task 1 - Roadway

Department Details:

Roadway plans for the approachews to the bridges. Including but not limited to drainage and pavement design.

Approach:

3.0 - Roadway
2.10.2
Work under this task will consist of finalizing the roadway design items and construction plans for the PS&E submission. Final design of the roadway items will follow the requirements of Design Manual Part 2M. Plan preparation will be in accordance with Design Manual Part 3M.

Plans will be prepared using English units. Detail roadway plans will be prepared at scales of 1" = 25'. Larger scale drawings will be prepared as necessary to clarify design details and clearly show intent.

2.10.2.1
Urban will develop a final drainage design that provides the proper capacity, spacing, size and type of drainage facility (existing and proposed) for each drainage area, location, fill height, roadway type and environmental condition including inlets, pipes, culverts, ditches and base drains. Urban will develop the final drainage design using the criteria contained in PENNDOT Design Manual Part 2M, Chapter 10 and FHWA's "Urban Drainage Design Manual, Circular No. 22." Urban will utilize drainage software compatible with Micro-Station as part of this effort.

Urban will prepare hydraulic design computations using appropriate methodologies for roadway drainage structures. Energy grade line and hydraulic grade line computations for existing and proposed systems will be included.

Urban will develop alternate pipe designs as required with corresponding hydraulic computations for each alternate. "For Information Only" quantities for each pipe type and alternate as well as minimum and maximum fill heights as required will be provided.

Urban will check that downstream drainage capacity of existing structures is sufficient for the proposed design. The proposed drainage system will conform to local municipal storm water requirements, if a local storm water ordinance exists.

Existing and proposed drainage facilities will be provided on construction cross sections and profiles.

Urban will submit one copy of the plan depicting the drainage design and the hydraulic design computations for roadway drainage structures to the District Office for review and comment by the Project Manager or designated drainage engineer. As directed by the District, Urban will send one additional copy of the drainage submission to Central Office, Bureau of Design for quality assurance review.

A professional engineer's seal will be provided on the final plans and computations.

2.10.2.2
Urban will prepare the pavement designs in accordance with Publication 13M, Design Manual Part 2, and Publication 242, Pavement Policy Manual for the preparation of final pavement design. The detailed pavement designs will be developed using AASHTO DARWin 3.1 software.

Where necessary, soil samples of the roadway subgrade will be taken to establish the resilient moduli for use in the pavement design analyses. The extent of sampling required will be coordinated with the District Pavement Engineer prior to undertaking the work. It is anticipated that CBR testing of soil samples will be completed and the CBR values will be used to provide the resilient moduli values for the pavement design,

as per SOL 465-0206 dated 12/17/2002.

The types and depths of existing pavement courses as noted in the District records (RMS, straight-line diagrams, plans, etc.) will be checked for conformity through field investigations.

Pavement types and depths will be coordinated with the District Pavement Engineer.

2.10.2.3
Work under this task will consist of the preparation and finalization of roadway design items and construction plans not addressed in preliminary design, but are necessary and essential to provide a PS&E package.

Urban will finalize the horizontal and vertical alignments as approved in the Design Field View. It includes such items as the calculation of curve data, superelevation rates and transitions, pavement, median and shoulder transitions; etc.

Field survey information obtained under Section 8.0- Supplemental Surveys, will be used to establish the final horizontal geometry at the intersection areas and at the tie-in limits of the project and to finalize the profiles developed during the Design Field View.

If necessary, Urban will prepare pavement elevation plans to depict the horizontal and vertical geometry that is not described in the cross sections.

Urban will prepare the final design of roadway items in accordance with the requirements of Design Manual Part 2M, Highway Design; plan preparation will be in accordance with Design Manual Part 3M, Highway Plans Presentation.

Detailed roadway plan and profile sheets will be prepared at scales of 1"=25' horizontal and 1"=5' vertical. Larger scale drawings will be prepared as necessary to clarify design details and clearly show intent.

The following roadway plans will be developed:
1. Title sheet
2. Index/General Note Sheet
3. Typical Section Sheet
4. Summary of Quantities Sheets
5. Tabulation of Quantities Sheets
6. Detail Plan Sheets
7. Profile Sheets
8. Contour, Grading, and drainage Plans
9. Landscaping Plans
10. Cross Sections
11. Special Detail Sheets
10. Required Forms, Special Provisions and Estimates

Final Design Office Meeting
Urban will submit 90% plans and specifications for review by the District and Central Office. The submission will include:
Typical Sections
Pavement Designs
Hydraulic Computations
The RSGER and any addenda
The Final Traffic Control Plan
The Erosion and Sedimentation Control Plan
Final Lighting Plans
Final Signing Plans
Final Traffic Signal Plans
Special Provisions

Urban will attend this meeting and respond to comments on the project designs and specifications. At the completion of the meeting Urban will address the comments received and provide revisions to the Plans and

Specifications as required.

Task 4 - Final Right-of-Way Plan

Objective:

2.10.5
This task includes all work necessary to prepare the final R/W plan in accordance with Publication 14M, Design Manual Part 3.

Scope:

2.10.5
Right-of-Way Plans, when specified in the project scope of work, will be the basis for determining all property damages which are involved in the construction requirements of a highway project. They will also serve as the legal record of the location, the extent, and the character of any acquisition of Right-of-Way, Permanent Easements, and Temporary Easements by the Commonwealth.

The Right of Way Plan presentation format will be as specified in the project scope of work. The Right-of-Way Plan format could be either, or a combination of the following:

A. Standard Right-of-Way Plan - For the authorization of acquisition of both total take and partial take property, for both Free Access and Limited Access highways.

B. Final Plan - Reestablishes and/or authorizes the GAP Plan right-of-way, if necessary, and establishes right-of-way and authorizes acquisition of property requirements that were not included under the GAP Plan.

C. Combination Plan - This plan combines both the Right-of-Way and Construction requirements on the drawings. This plan shall be acceptable only for small Federal Aid and 100% state-financed projects involving few properties with no relocation problems.

D. Simplified Right-of-Way Plan - This plan is a simple one (1) or two (2) sheet Right-of-Way Plan, applicable to small projects, where construction is primarily within existing legal right-of-way where only a few properties are involved and the area of taking is minor.

The following are general tasks and their description for Right-of-Way Plan preparation:
1. Current Property Owner Record Research
2. Deed Plotting
3. Composite Deed Plot Matrix Map
4. Property Owner Name
5. Parcel Numbers
6. Right-of-Way Plan Preparation

The following are the basic requirements comprising Right-of-Way Plan preparations:
1. Title Sheet
2. Index Sheet
3. Location Map, General Notes, Etc., Sheets
4. Typical Sections
5. Summary of Project Coordinates
6. Summary of Required Right-of-Way Line Coordinates
7. Detail Plan Sheets
8. Profile Sheets
9. Property Plats
10. Right-of-Way Plan Revisions

Detail Task 1 - Final Right-of-Way Plan

Department Details:

Preparation of final RoW plans in accordance with established procedures and in colaboration with the District's RoW unit.

Approach:

4.0 - Final Right-of-Way Plan
2.10.5
Upon approval of the Preliminary right-of-way plans, Urban will prepare Final right-of-way plans, at a scale of 1" = 25' for properties affected by the required right-of-way acquisition. Plan preparation will be in accordance with Design Manual Part 3M and will include review comments received from our preliminary right-of-way activities.

Right-of-way plans will consist of a Title Sheet, Index Map, General Notes Sheet, Typical Sections, Plan and Profile Sheets, and Plats and Tabulation Sheets.

Deed information will be plotted on the Final right-of-way plans including the area of temporary and permanent takes and remaining areas will be calculated. In addition, topography, property lines, legal and required right-of-way lines, existing utilities, relocated utilities, easements, and takes will be shown. Property plats will be prepared for parcels involved in a take, whether total or partial. The plan and plats will show buildings, structures and shrubbery that may affect property value. Title sheet information, general and utility notes, and a location plan will also be included. Affected utilities on private properties will be shown. Plats may be processed individually, and they must be prepared with details showing the impact of construction on the property without reference to the construction plans.

Urban will check the plans for consistency with the construction plans. Within 30 days prior to the final right-of-way plan submission, Urban will check the Bucks County Courthouse and Tax Office records to confirm the current property owners. Deeds, including deed book page and other related information, will be obtained for adjacent properties if different than in preliminary design. We will verify current owner names and reissue Intent-to-Enter letters.

Urban will submit three full size sets of plans to the District for Final right-of-way plan check. A signed plan Certification Form will accompany the right-of-way submission along with copies of tax maps, deeds, adverses, development plans, utility easements and other information that was used to develop the right-of-way plans. Copies of the Final right-of-way plans will be forwarded to the District Utility Unit and, after District approval, to affected utility companies.

Task 5 - Final Geotechnical Engineering Report

Objective:

2.5.3
This task is the preparation of the Final Geotechnical Engineering Report in accordance with Publication 10A, Design Manual Part 1A.

Scope:

2.5.3
This task consists of the development of the Final Geotechnical Engineering Report (GER) presenting final geotechnical design and construction recommendations for the project, along with supporting documentation, based on the subsurface conditions determined from the Final Design roadway investigations and any previous project geotechnical investigations. It also includes preparation of geotechnical reports for Structure TS&L Submissions (Reconnaissance Soils and Geological Engineering Reports) and Structure Foundation Submissions (Geotechnical Engineering Reports for Structures). Previous geotechnical investigations may include: Phase I Preliminary Design GER (prepared during EIS Step 4), Phase II Preliminary Design GER (prepared during EIS Step 5 or EA alternatives analysis), and Pre-Final Design GER (prepared for the Design Field View Submission).

The following work elements are required for the successful completion of this task:

1. Coordinate the geotechnical effort in Final Design. Coordinate with the District Geotechnical Engineer (DGE), BOCM Chief Geotechnical Engineer (CGE), District Bridge Engineer (DBE), BOD Bridge Quality Assurance Division (BQAD), and other disciplines involved in design. Attend meetings necessary for the design process. Perform QA/QC on all subtasks and deliverables.

2. Perform an office investigation. Review background geological information and maps, boring logs, project files and reports, environmental documents, and R/W plans to describe the soil/rock/hydrologic setting.

3. Visit the site, interviewing local residents and engineers. Perform a detailed field reconnaissance and refine the soil/rock/hydrologic setting description.

4. Prepare the Problem Statement and Draft Exploration Plan (PSDEP) for the project in accordance with Publication 293. Determine the field and laboratory investigation needs. Assemble a soil/rock boring and testing plan, water/soil-sediment sampling and testing plan, a field instrument plan and a geophysical investigation plan based on project needs.

5. Prepare a Reconnaissance Soils and Geological Engineering Report (RSGER) for each TS&L submission, in accordance with Publication 15M, Design Manual Part 4.

6. Perform the soil/rock boring investigation. Notify the affected public. Locate the borings in the field. Assemble, advertise, award and administer the test boring contract in accordance with Publication 222M.

7. Administer the soil/rock testing program. Perform the water/soil sediment sampling and testing.

8. Collect readings and present reduced data from field instruments. Perform the geophysical investigation.

9. Perform analysis and design associated with embankment and cut slope construction, storm water management facilities, culverts and conduits, retaining structures, bridges, other structures, pavements, unsuitable materials, special geotechnical treatments, benching and transition zones, and geotechnical instrumentation for construction control. Develop recommendations for use by the design team and special provisions and details for construction.

10. Prepare a Geotechnical Engineering Report for foundations at each structure in accordance with Design Manual Part 4.

11. Prepare the GER for Final Design, presenting the recommendations and providing supporting documentation and following the outline in Publication 293. Prepare the "Subsurface Profile" in accordance with the requirements of Publication 14M, Design Manual Part 3. Submit both a draft (95%) and a final (100%) version of the GER to the DGE and CGE.

12. Review the plans, specifications and estimates for construction of the project, to verify proper implementation of the geotechnical recommendations and incorporation of the special provisions and details.

Detail Task 1 - Final Geotechnical Engineering Report

Department Details:

2.5.3

Borings must be performed by an approved drilling contractor. Installation of field instrumentation may be included with that contract. The engineer should review the environmental documents to determine if a Health and Safety Plan (HASP) is required as part of the drilling contract. The District should alert the engineer if other environmental constraints potentially could impact field operations.

Maintenance and protection of traffic for the drilling program should be in accordance with Publication 203M. The District should determine if a formal Traffic Control Plan (TCP) is required, if it is necessary to notify the affected public prior to performing the work, or any other special requirements are necessary.

The amount of boring in the drilling contract often varies from that assumed during earlier phases of design. The District should verify the adequacy of committed funds prior to approval of the contract.

Laboratory soil testing must be performed by an AMRL-accredited facility, and should not be a part of the drilling subcontract.

Emphasis is on modifications to geotechnical roadway recommendations resulting from changes during final design, implementation of design guidance, and finalization of special provisions and details for construction.

The Soil Profile is an appendix to this report.

Approach:

5.0 - Final Geotechnical Engineering Report
DAWOOD agrees with the Scope of Work as discussed in the Work Breakdown Structure except for the tasks related to preparing a formal Geotechnical Engineering Report for Final Design (FGER) and the preparation of a RSGER. Because no PGER is anticipated it follows that a FGER would not be required. The RSGER will be completed in Part 001. DAWOOD's understanding is that this task is primarily the assembling, advertising, awarding and administering a test boring contract for the proposed replacement structure.

For proposal purposes, it is anticipated that 20 borings (2 structure and 4 roadway borings at the Delaware Canal proposed box culvert structure and 8 structure and 6 roadway borings at Tinicum Creek) totaling 460 lineal feet (30 and 35 lineal feet per boring at Tinicum and Delaware Canal respectively and 15 feet per roadway boring) will be drilled for these proposed structures. In conjunction with this task, DAWOOD will obtain two bag samples from each structure to perform CBR testing for the pavement design.

Laboratory testing will include but may not be limited to the following:
4 Classification & Moisture Content Tests 2 Direct Shear Tests
2 Consolidation Test 4 Compaction and 4 CBR Tests
3 Corrosion Series (pH, resistivity, sulfate & chloride content)

Task 6 - Traffic Control Plan

Objective:

2.10.14
This task is the development of the final traffic control plan. Publication 14M, Design Manual 3; the MUTCD and Publication 203M apply to this task.

Scope:

2.10.14
Phasing schemes, sign messages, and approximate locations of signs and traffic control devices should be approved at the Design Field View stage, prior to the development of the final plans.

The Traffic Control Plan will be a stand-alone plan and will include the following:
- Title sheet with general notes, location map, and pay item quantities,
- Tabulation of Traffic Control Devices,
- Typical-sections
- Narrative describing each stage and phase by stating the work to be performed and the traffic control to be implemented
- General plan layout
- Temporary road plan, typical-section and profile (if necessary)
- Temporary signal plan (if necessary)
- Temporary Highway Lighting (if necessary)
- Special Sign Details (if necessary)

The plan will also include, but will not be limited to, sign messages, sign sizes, general sign locations, tapers lengths, barricades, channelizing devices, impact attenuators, temporary pavement markings, temporary roadway locations, temporary highway lighting locations, detours, portable changeable message signs, and arrow boards. Detail of temporary roads cross-section and profile will be included as well as other details as appropriate.

If detours are necessary, the detour route(s) will be identified and driven to determine general safety issues and restrictions. State roads requiring a detour will utilize other State owned roadways. If detour routes formed from State owned roads are found to be unacceptable because of length or other reasons, then agreements between the State and municipalities will need to be developed to utilize local roadways. This scope does not include support activities needed to develop agreements between the State and municipalities.

In locations where pedestrian movements are prominent, either safe passage or restrictions will be

addressed. Scope associated with construction temporary pedestrian structures and signals will be included in either the Amendments to the Standard Scope of Work or the Detailed Project Approach.

Provide temporary highway lighting for limited access crossovers and at locations as directed by the District. Contact the Highway Lighting Unit in Harrisburg for design requirements. Submit the lighting design to the Highway Lighting Unit for approval prior to the release of the Traffic Control Plans to the District for PS&E Development.

This scope of work does not provide for a temporary traffic signal plan. If the implementation of the traffic control plan impacts a signalized intersection such that a temporary signal design is necessitated, the temporary signal plan will be incorporated into the traffic control plan. However, the scope of work for the temporary signal design will be provided in the Detailed Project Approach or in the Amendments to the Standard Scope of Work.

Specifications will include the description of the construction staging and phasing. Special provisions will also be written for traffic control devices outside the scope of the specifications included in the Publication 408M.

If required for boring and drilling work associated with geotechnical studies, the subconsultant will develop traffic control plans. Details of the design for these plans will be provided in the Detailed Project Approach.

Detail Task 1 - Traffic Control Plan

Department Details:

The following items may require an amendment to the standard statement of work.
- Any commitments, phasing schemes, and work limitations that have been approved during the design field view process.
- Plan presentation preferences including showing sign pictorially
- Any restrictions associated with the reduction of lanes, stoppages of traffic, or use of one lane-two way alternating traffic.
- Preferences for removal of pavement markings.
- Details for anticipated temporary traffic signal designs, pedestrian requirements, and local access requirements.

Approach:

6.0 - Traffic Control Plan
2.10.14
Urban will prepare final traffic control plans along with a narrative describing the sequence of construction for work areas encompassed by this project. The final traffic control plans will be based on the concepts developed during the preliminary design phase under Part 001, Task 11-Preliminary Maintenance and Protection of Traffic and comments received at the Design Field View review meeting.

Final traffic control plans will be developed at an appropriate scale for each stage and sub-stage of construction. The plans will show the work being performed under each stage as well as the work that has already been prepared in previous stages. Required traffic control devices, signs, temporary pavement markings and a narrative describing each stage of construction will be incorporated into the plans. Typical sections will be included to show the staging of work required to perform construction. Phasing schemes, sign messages, and approximate locations of signs and traffic control devices should be approved at the Design Field View stage prior to the development of the final plans.

Urban recommends that the final traffic control plans be prepared as "ALSO" sheets in the final PS&E submission.

Tabulation sheets indicating the quantities required for each item in each stage will be prepared. Special provisions for traffic control will be prepared and incorporated into the project special provisions. Dawood will develop traffic control plans for the boring and drilling work associated with geotechnical studies, if required.

Task 7 - Final Type, Size & Location (TS&L) Report

Objective:

2.7.3
This task consists of the assembly of Type, Size and Location studies and development of recommendations for proposed structures within the project. Publication 15M, Design Manual Part 4 apply to this task.

Scope:

2.7.3
Review any previous studies or preliminary designs with respect to the selection of structure type, span arrangements, horizontal and vertical clearances, design controls and typical section. Coordinate with the District on the logical selection of span arrangements, types of piers, and structure types suitable at each location.

The preliminary structure designs will be performed at a stage when the highway alignment and profile are well defined. Review structure requirements with the District prior to Design Field View (Line and Grade) submission and approval.

The following work elements are required for the successful completion of this task:
1. Develop a location plan showing the feature to be crossed or retained, design controls and regulated areas
2. Identify possible pier and abutment locations
3. Evaluate geotechnical conditions to identify potential foundation types
4. Recommend locations for structure foundation borings
5. Evaluate constructibility, vertical and horizontal clearances and site constraint issues in determining the most suitable structure design for the particular location
6. Prepare cost estimates for alternative structure designs
7. Prepare justification for recommended alternative
8. Prepare transmittal letter, plans and report for TS&L Submission

Detail Task 1 - Final Type, Size & Location (TS&L) Report

Department Details:

- Number of Bridges, Culverts, Retaining Walls, Sound Walls, etc. in the project
- Number of alternatives to be studied for each structure

Approach:

7.0 - Final Type, Size & Location (TS&L) Report
2.7.3
Upon review of the preliminary TS&L Report by the District, Urban will assemble the Final Type, Size and Location study and develop recommendations for the proposed Headquarters Road structures in accordance with Publication 15M, Design Manual Part 4. We will review any previous studies or preliminary designs with respect to the selection of structure type, span arrangements, horizontal and vertical clearances, design controls and typical section. We will coordinate with the District on the logical selection of span arrangements, types of piers, and structure types suitable at each location.

The preliminary structure designs will be performed at a stage when the highway alignment and profile are well defined. Structure requirements will be reviewed with the District prior to Design Field View (Line and Grade) submission and approval.

The following work elements will be completed in order to develop cost effective, constructable, aesthetically pleasing and structurally sound structure replacements:

1. Development of a location plan showing the feature to be crossed or retained, design controls and regulated areas.
2. Identification of possible pier and abutment locations.
3. Evaluation of geotechnical conditions to identify potential foundation types.
4. Recommendation of locations for structure foundation borings.
5. Evaluation of constructability, vertical and horizontal clearances and site constraint issues in determining the most suitable structure designs for the particular locations.
6. Preparation of cost estimates for alternative structure designs.
7. Preparation of justification for recommended alternatives.

8. Preparation of transmittal letter, plans and report for TS&L Submissions

Task 8 - Final Structure Foundation Report

Objective:

2.5.5
This task includes all items necessary to prepare the Final Structure Foundation Report in accordance with Publication 15M, Design Manual Part 4.

Scope:

2.5.5
This task consists of the development of a Final Structure Foundation Report for each structure in the project. The report presents recommendations for design and construction of the structure foundations, and provides geotechnical data in support of the recommendations.

The following work elements are required for completion of this task:

1. Coordinate the effort with the District Geotechnical Engineer (DGE), District Bridge Engineer, BOD Bridge Quality Assurance Division (BQAD), and the other engineering disciplines involved. Perform QA/QC on work processes and products.

2. Perform an office investigation, reviewing available geotechnical reports for the project including the Reconnaissance Soils and Geological Engineering Report (RSGER) for the specific structure. Review the Preliminary Foundation Report. Obtain the record copy of the engineers logs for the borings drilled for the structure.

3. Perform the soil, rock, and water testing required to allow analysis of foundation conditions. Tabulate the results of the testing.

4. Perform analyses to determine the preferred foundation for the structure, and document the rationale for the preference. Include cost comparisons for foundation alternatives. Prepare a tabular summary of the site conditions and foundation recommendations at each substructure location.

5. Identify and address special site conditions through appropriate design. Develop foundation notes, construction details, and special provisions as warranted.

6. Prepare plotted boring log sheets for the core borings used in foundation analysis and design.

7. Prepare the Final Foundation Report for the structure, presenting the information required in Design Manual Part 4, with the tabular summary of foundation recommendations, foundation notes, construction details, special provisions, and plotted boring log sheets appended. Submit the report, with the other documentation required by Design Manual Part 4, for approval.

8. Prepare quality assurance (QA) form for foundations.

Detail Task 1 - Final Structure Foundation Report

Department Details:

2.5.5

Structure Boring Task must be completed prior to this task, unless the District determines sufficient information is available from the RSGER to determine the structure foundation.

Subsurface profiles and cross sections are required in complex conditions and when requested by the District.

The plotted structure boring log sheets become part of the structure plans after approval.

Approach:

8.0 - Final Structure Foundation Report

DAWOOD agrees with the Scope of Work as discussed in the Work Breakdown Structure and will prepare a separate foundation recommendation report for each structure in accordance with Design Manual Part 1A, Chapter 7, Section 12 and Design Manual Part 4, Volume 1, Part A, Chapter 1.9.4. The LRFD foundation recommendations will include but not be limited to a determination of soil\rock design parameters (friction angle, unit weight, subgrade modulus, etc.), resistance factors and a cost comparison study for alternate foundations. DAWOOD will prepare the QA Form for foundations and URBAN will prepare the formal Foundation Submission Letter.

Task 9 - Final Structure Plans

Objective:

2.10.13
This task is the development of the final structure plans.

Scope:

2.10.13
1. Complete final engineering design(s) for structures on the project based upon the approved type, size and location (TS&L) plans and approved foundation recommendations. Prepare design calculations, construction documents and QA/QC forms in accordance with the Department's Design Manuals as amended by current strike-off letters.

2. Provide pay items and special provisions for design alternate bidding.

3. Provide plan details and special provisions as required for support of excavation and for construction phasing.

4. Provide special provisions for items not covered by Department specifications. Obtain current standard special provisions list from District and utilize standard special provisions whenever possible. Write project specific special provisions, if needed.

5. Prepare cost estimate for each structure based upon estimated quantities and historical data for similar structures in the project region. Consider access, phasing, and relative difficulty of construction in establishing unit prices.

6. Make a pre-final submission to the Department of completed plans, special provisions, quantity estimates, cost estimates, QA/QC forms and computations.

7. Revise the previously submitted documents as required to address the Department's comments thereon. Document responses to comments in writing.

8. Submit the final plans, special provisions, quantity estimates, cost estimates, QA/QC forms and computations properly signed and sealed and in the form described in Publication 15M, Design Manual Part 4.

Detail Task 1 - Final Structure Plans

Department Details:

2.10.13

The following elements should be included as applicable:
- Seismic design requirements
- Construction phasing
- Additional review submissions or progress submissions
- Restrictions on permitted alternates
- Special considerations such as historic or environmentally sensitive sites which may impact design and construction
- Co-ordination of highway and structural design if not all being performed by same consultant.

Approach:

9.0 - Final Structure Plans
2.10.13

Upon approval of the TS&L submission, Urban will commence development of the final structure plan. The following tasks will be completed during the final design phase:

1. Complete of final engineering design(s) for structures on the project based upon the approved type, size and location (TS&L) plans and approved foundation recommendations. Preparation of design calculations, construction documents and QA/QC forms in accordance with the Department's Design Manuals as amended by current strike-off letters.

2. Provide pay items and special provisions for design alternate bidding.

3. Provide plan details and special provisions as required for support of excavation and for construction phasing.

4. Provide special provisions for items not covered by Department specifications. Obtain current standard special provisions list from District and utilize standard special provisions whenever possible. Write project specific special provisions, if needed.

5. Prepare cost estimates for each structure based upon estimated quantities and historical data for similar structures in the project region. Consider access, phasing, and relative difficulty of construction in establishing unit prices.

6. Provide a pre-final submission to the Department of completed plans, special provisions, quantity estimates, cost estimates, QA/QC forms and computations.

7. Revise the previously submitted documents as required to address the Department's comments thereon. Document responses to comments in writing.

8. Submit the final plans, special provisions, quantity estimates, cost estimates, QA/QC forms and computations properly signed and sealed and in the form described in Publication 15M, Design Manual Part 4.

Where applicable, the final design will incorporate construction phasing, additional review submissions or progress submissions, restrictions on permitted alternates, and special historic and environmental considerations which may impact design and construction.

For the purpose of this proposal, it is assumed that the proposed Delaware Canal structure will be a proprietary type such as Conspan. If the results of the preliminary engineering phase of the project indicate that a non-proprietary type of culvert or a beam bridge will be recommended, then additional effort beyond the scope of this proposal will be required to complete the final design phase of the project.

Task 10 - Erosion and Sedimentation Control Plan / NPDES Permit

Objective:

2.10.25
This task is the development of the Erosion & Sedimentation Control Plan and submission of the NPDES Permit Application.

Scope:

2.10.25
The Erosion and Sediment Pollution Control Plans and supporting documentation shall be submitted to the applicable Engineering District for review and approval. Upon acceptance of the plans by the District, the submission will be forwarded to the County Conservation District for review and approval.

The following work elements are required for the successful completion of this task:

1. Develop Erosion and Sedimentation Control Plans to include:
- cover sheet
- location map
- topography of the area including watershed areas and watercourses receiving runoff from the project
- proposed alterations to the area

- limits of the project
- the location of all temporary and permanent erosion and sediment pollution control measures and facilities
- all pertinent erosion control and construction details

2. Develop a narrative report describing the project and indicating the purpose, the engineering assumptions, the specifications, and the calculations for erosion control measures and facilities. The narrative shall include a schedule of installation and removal of temporary and permanent erosion control measures and facilities as they relate to the various earthmoving operations and a maintenance program for each type of temporary and permanent erosion control measure and facility.

3. Provide detailed instructions relating to the sequence of construction on the plan and in the narrative. Include staging, sequencing and scheduling of earthmoving activities and installation and removal of erosion and sediment pollution control measures and facilities as required.

4. Provide a detailed description in the narrative report of all soil types located within the project limits including each soil type, depth, slope and resistance to erosion. The soil boundaries and a summary table of the soil types and limitations should also be included on the plans.

5. Provide all applicable construction schedules, maintenance programs (including the removal and disposal of accumulated soil materials).

6. Prepare transmittal letter, plans and narrative report for submission to the County Conservation District. If necessary, on large projects meet with the County Conservation District prior to submission to discuss submission requirements and review conceptual plan.

7. For projects exceeding 5 acres of earth disturbance or impacting High Quality/Exceptional Value (HQ/EV) waterways, prepare a Notice of Intent (NOI) Application for an NPDES Storm Water Permit and a Preparedness, Prevention and Contingency (PPC) Plan (see below). The PPC plan should also be incorporated into the narrative report and the plans.

8. Address all applicable comments from the County Conservation District and/or PADEP and re-submit the revised package for approval.

The following tasks are required for the preparation of the NPDES permit application:

1. Develop an NPDES boundary map that includes the following information: limits of disturbance, highway alignment, cut & fill limits, ROW lines, contours, stations, location identifiers and, the permit boundary.

2. Complete the NPDES Permit Application. The application package will consist of the following items: Act 14 Notification, PNDI Form, location map, NPDES Application Form, Cultural Resources Notice (if involves a Special Protection Watershed), General Information Form (if project involves a Special Protection Watershed or an Individual NPDES Application), and the Erosion and Sediment Pollution Control Plan.

3. Submit NPDES Permit Application package to PennDOT for review. Revise as necessary. Obtain PennDOT's notarized signature on the application and make the designated amount of copies to submit to the County Conservation District and, if applicable, the PADEP.

4. Schedule review meetings with the agencies prior to submitting the NPDES permit package to expedite the permitting process.

5. Submit permit package to the Conservation District/PADEP.

Detail Task 1 - Erosion and Sedimentation Control Plan / NPDES Permit

Department Details:

2.10.25

The following items may require an adjustment to the amount of time it takes to complete this task:
- Applicable watershed information pertaining to special protection watersheds
- Erosion and Sediment Control Plans for off-site borrow or disposal areas

- Evidence of compliance with other permitting or regulatory requirements

Approach:

10.0 - Erosion and Sedimentation Control Plan / NPDES Permit
2.10.25
Urban will develop a conceptual Erosion and Sedimentation Control Plan in accordance with PENNDOT Design Manual Part 2 and the Pennsylvania Department of Environmental Protection (PADEP) Title 25 PA Code Chapter 102. The detailed requirements of Chapter 102 are contained in the EROSION AND SEDIMENTATION CONTROL PROGRAM MANUAL (March 2000). The conceptual Erosion and Sedimentation Control Plan will be submitted to the Bucks County Conservation District for review. If necessary, representatives from PENNDOT District 6-0, and Urban will attend a review meeting with the Bucks County Conservation District to discuss the submitted conceptual plan.

The conceptual Erosion and Sedimentation Control Plan will be prepared from base mapping and will include proposed erosion and sedimentation control facilities for the project. Draft standard worksheets for temporary and permanent erosion control measures and facilities will also be prepared.

Upon completion of 30% level drawings and plans, Urban will begin the permitting process. Based upon the limited amount of anticipated earth disturbance and new work, it is anticipated that the project will meet the qualifications for use of a Statewide General Permit. A pre-application meeting will be held with the Bucks County Conservation District. The design concepts will include recommended erosion and sedimentation controls, and the required Erosion and Sedimentation (E&S) Control Plan Narrative. At this point, we will also begin the required Act 14, Act 67/68 and Act 537 Notification process. Compliance with the notification requirements of these three Acts is necessary prior to approval of the NPDES permit.

At the 60% level, the required E&S Control Plan Sheets along with the actual permit documents will be completed and submitted to the Bucks County Conservation District for approval. The permit application will include required calculations and worksheets documenting the project's compliance with current standards.

Task 11 - Final Plan Checks

Objective:

2.10.28
This task is the time required to attend/perform all final plan checks.

Scope:

2.10.28
The Final Plan Check is performed by representatives of: Bureau of Design - Field Liaison Engineer, District Engineer/Administrator, and Consultant.

The Field Liaison Engineer is in charge of the Final Plan Check and prepares a Plan Review Report on any items which are not correct a the time of the Final Plan Check.

The District Engineer/Administrator provides qualified personnel to perform all required design review; prepares Form 407, Form D-444D and a list of Structural Special Provisions, and notifies the Field Liaison Engineer when the plans will be ready for the Final Plan Check.

The Consultant is required to have the plans adequately checked prior to the Final Plan Check, and will have the Project Engineer and adequate design personnel to make any required corrections, present at the Final Plan Check. It is expected that all required corrections will be made by the Consultant prior to leaving the Final Plan Check.

Detail Task 1 - Final Plan Checks

Department Details:

Submission of final plans to check for completeness and accuracy in accordance with DM.

Approach:

11.0 - Final Plan Checks

2.10.28

Urban will coordinate the scheduling of the Final Plan Check with representatives of the Bureau of Design Field Liaison Engineer and the District Administrator.

Urban will have the plans adequately checked prior to the Final Plan Check, and will have the Project Engineer and adequate design personnel to make any required corrections, present at the Final Plan Check. We will make required corrections prior to leaving the Final Plan Check.

Urban will submit plans for Final Plan Check and Final Design Office Meeting concurrently.

Task 12 - Assemble Final Project Documents for Contract Management

Objective:

2.10.29
This task is the preparation of the PS&E submission to District contract management.
2.10.29.16
This task is the time required to let the project in the District Office.
2.10.29.2
This task is to prepare the final pre-bid construction schedule/special provisions.
2.10.29.6
This task is the preparation of the engineer's estimate.
2.10.29.7
This task is the preparation of the final construction schedule.
2.10.29.9
This task consists of the final items of work quality assurance review.

Scope:

2.10.29
Before any attempt is made to develop and submit a proposal, it is very important to obtain all required documents, contract drawings, design estimates and supporting data. Supporting documents such as environmental clearances and re-evaluations, funding authorizations, PMC approvals, DEP and Corps of Engineer permits, utility and right-of-way clearances, agreements and related administrative requirements must be resolved. Missing supporting documents complicate the PS&E process, and may affect project advancement to letting.

Assemble all available information on the project from the designers, such as plans or sketches, permits, non-standard special provisions, agreements, construction trainee requirements, Utility Form D-419 clearance and right-of-way certification.

Contract proposals should appear as uniform as possible on a State-wide basis to assist prospective bidders as well as Department personnel who use the proposal. All proposals are to be prepared by utilizing the Contract Management System (CMS) automated bid proposal development software, in accordance with the principles in the current "CMS Users Manual."

Assemble project documents in accordance with requirements of Publication 51M, "Contract Proposal Preparation Guide."

2.10.29.16
All bids received in accordance with the terms of the proposal shall be publicly opened at the time, date and place indicated. A secured depository is to be established. A bid opening official and designated employee of the Contract Management Section will be authorized to open the depository. Bids will be read and documented and the apparent low bid announced.
2.10.29.2
Provide provisions, requirements, or directions applying to the project, as set forth in the proposal, that are not contained in Publication 408M or its supplements. Generally, the design engineer will submit draft special provisions to be reviewed, finalized and incorporated into the Bid proposal by Contract Management.
2.10.29.6
Prepare a detailed estimate, which will be used to verify funding requirements and to determine acceptability of bids, and submit with the PS&E to Contract Management.
2.10.29.7

Prepare Form D476 & D476A, or CPM schedule, for construction of the project.
2.10.29.9
Identify and prepare form work as it relates to items that will require subsequent QA involvement.

Detail Task 1 - Assemble Final Project Documents for Contract Management

Department Details:

Compile and submit PS&E package.

Approach:

12.0 - Assemble Final Project Documents for Contract Management

2.10.29
Urban will complete the preparation of the PS&E submission to District contract management. This project will be let using the Engineering & Construction Management System (ECSM). Urban will enter the required plans, estimate, specifications and supporting documentation into ECMS.

The Pre-Bid package will be prepared in accordance with Publication 51M, Contract Proposal Preparation Guide.

2.10.29.2
Urban will provide provisions, requirements, or directions applying to the project, as set forth in the proposal, that are not contained in Publication 408M or its supplements. Urban will submit draft special provisions to be reviewed, finalized and incorporated into the Bid proposal by Contract Management.

Urban will submit plans to the District Construction Unit for review and comment prior to submission of PS&E to Contract Management.

Urban will prepare, check, and deliver the final PS&E package following applicable sections of Publication 51, "Contract Proposal Preparation Guide." This package will incorporate comments made during the final plans check and will include the following:

Roadway Construction Plans
Structural Plans
Erosion Control Plans
Traffic Control Plans
Pavement Marking & Signing Plans
Cross Sections
Special Provisions
Form D-407, Construction Cost Estimate (Federal Break)
Form D-476, Distribution of Contract Time
Form D412-A, Earthwork Calculations
Design Computations

Urban will follow the PS&E submission checklist as assembled by PENNDOT's Contract Management Unit. A justification will be provided for lump sum items as well as backup for major unit prices.

Urban will assist PENNDOT's Project Manager to assemble the Bid Proposal with the following contract proposal components:
1. Title Page
2.Project Description
3.Project Schedule in calendar days
4.List of Special Provisions, Attachments and Supplemental Specifications, Structure Drawings, Purchasable Items - tabulated as they apply to the job
5. Schedule of Prices - Items Numbers tabulated with related prequalification work classification codes, Approximate Quantity, Item and contractor's Unit Price Bid and Item Total
6. Bid Submission Forms - applicable bid submission forms identified and inserted into the contract document
7. Component Item Schedule - providing for lump sum pay items
8. Bidder Signature Pages - standard signature pages for single bidder and second and third party joint

venture bids
9. Notice to Bidder
10. Special Provisions
11.Index to the special provisions, schedule of prices and bid component schedule.
12. Attachments - assembled contract attachments as indicated in Publication 51.

2.10.29.6
Urban will prepare a detailed estimate, which will be used to verify funding requirements and to determine acceptability of bids, and submit with the PS&E to Contract Management.

2.10.29.7
Urban will prepare Form D476 & D476A, or CPM schedule, for construction of the project.

Upon assembly of the bid proposal at the District, Urban will enter into ECMS all pertinent project information (i.e., Project identification numbers, special provisions, pay items, quantities, estimate, etc.)

2.10.29.9
Urban will identify and prepare form work as it relates to items that will require subsequent QA involvement

Urban will assemble the items involved with the PS&E task into a Package Document identified by the project CMS number and forward it to the Bureau of Design. The Engineering Data Center will be notified to change the project status from design to let.

The PS&E will be reviewed for completeness. The following items will be performed and verified before a project is advertised for bid:

-Contract Management Data Entry and Proofing
-Contract Management Review
-Programming
-Contract Management Compilation and notice to Bureau of Design
-Bureau of Design Proposal Production
-Contract Management Clearance Check
-Bureau of Design Distribution For and Review of Proposal
-Wage Rates
-Bureau of Design and District/Consultant Revisions
-FHWA Review and Authorization

Urban will prepare the advertisement forms in CMS and transmit the forms to Central Office Contract Management with the PS&E. Advertisement forms will indicate:

-Project identification
-Description of work
-Bid deposit location and time and bid opening location and time
-Location where plans and proposal will be available for review

If a pre-bid meeting is requested by the District, Urban will provide pertinent information that is to be included in the proposal advertisement. We will coordinate pre-bid meeting activity with the District Construction Unit in accordance with standard Department procedures.

Urban will prepare and distribute addenda that are necessary to make changes to the contract documents after the bidders have secured plans and proposals in accordance with Publication 51M.

2.10.29.16
The Department will complete these tasks.

Upon identifying the actual letting date, Urban will enter the date into MPMS.

Consultant Hierarchy

Business Partner	DBE Type	Supervising BP

Urban Engineers, Inc.	No	
A.D. Marble & Company	Yes	Urban Engineers, Inc.
Dawood Engineering, Inc.	Yes	Urban Engineers, Inc.

Attachments

No records found.

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Release: 25.2
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TECHNICAL PROPOSAL DETAIL REPORT

Agreement: E00342 Project Specific Active

Name: Three (3) Bridge Replacements in Bucks County **Selection Process:** Normal

Initiating Org: Engineering District 6-0

Part: 1 **Cost Plus Fixed Fee** **Active**

Description: preliminary engineering, environmental studies, final design and consultation during construction for the replacement of two structures on Headquarters Rd, Tinicum Township in Bucks County.

PennDOT Project Manager: fullard, leanne e.

Phase: Preliminary Design

Task 1 - Project Management/Administration

Objective:

2.1.1
This task consists of the administrative effort required by principals, project manager, and involving personnel to complete the project on time, within budget, and provide a quality product.

Scope:

2.1.1
Project Management involves the planning, scheduling, organizing and controlling of resources to achieve specific objectives within established schedule, budget and quality standards. The Project Manager is responsible for but not limited to the tasks outlined in the Department Detail.

Detail Task 1 - Project Management/Administration

Department Details:

2.1.1

1. Monitor design team performance and project development.
2. Control project costs.
3. Coordinate the flow of information concerning the project.

Approach:

Agreement: E00342

Part 001 - S.R. 1012, Section BRC - Preliminary Engineering

1.0 - Project Management/Administration

2.1.1
Matthew C. Marquardt, PE, Urban's Project Manager, will be responsible for the coordination of project work tasks to keep design work on schedule and within budget. Accordingly, he will be responsible for the day to day management of design activities, liaison activities between PENNDOT and the Urban Team, coordination between individual disciplines at Urban, and our subconsultants A.D.Marble & Company and Dawood Engineering, Inc. No individual portion of the work will impede the overall Team's progress. Mr. Marquardt will be the single point of contact for project communication and will coordinate the flow of information concerning the project. His responsibilities will include conducting kick-off meetings, representing PENNDOT at public meetings, coordinating with outside agencies, reviewing the project for compliance with PENNDOT's QA/QC plan, controlling project costs and processing requests for project authorization and funding. He will promote an atmosphere of good public relations and customer satisfaction.

The Project Administrator (Principal-in-Charge) will handle the project administration and will represent Urban on contractual matters. The project administrator for this assignment will be Joseph P. McAtee, PE, Executive Vice President of Urban Engineers, Inc. Mr. McAtee will have ultimate responsibility for the firm's performance and has the authority to commit additional resources, perform the overview functions, review staff performance, and participate in project reviews with PENNDOT. Project administration is considered by Urban to be part of our normal operating expenses, i.e., part of our overhead, and is not directly billable to a project.

This assignment will be performed in compliance with Urban's ISO 9001-certified procedures; Daniel J. Leinheiser, PE, will serve as Urban's QA/QC Officer. He will provide project oversight, monitor compliance with the schedule, review designs, identify potential problems, and see that the management of this project is consistent with Urban's quality standards

The QA/QC process will be initiated at the project kick-off meeting which will be attended by key team members, the QA/QC Officer, the head of the departments involved in the project, and the representatives of Urban's subconsultants. PENNDOT's Project Manager, Javier Salgueiro, will also be asked to attend. At the meeting Mr. Marquardt will present his understanding of the assignment, the project schedule, the roles of the participants, and the resources that he is allocating to this work. Constructive input will be received from those in attendance. The kick-off meeting will detail project communications and quantify the expectations of the participants.

Mr. Marquardt will attend project meetings. Appropriate team members will be present on an as-needed or as-directed basis. It is our intent to have the required materials and personnel available at these meetings to facilitate the decision making process and preclude, to the greatest extent possible, the potential for any delays to the design schedule.

Urban will prepare and submit the agenda for each meeting to PENNDOT at least three (3) working days prior to the meeting to allow PENNDOT to have the appropriate personnel present for these meetings.

Minutes of each meeting will be prepared by Urban and e-mailed to PENNDOT within seven (7) working days after the meeting. A follow-up action item list clearly defining the follow-up task and identifying each party's responsibility will also be prepared by Urban.

Meetings will include but will not be limited to:

Project Status Meetings
Design Review Meetings
Kick-off Meeting
Public Meetings
Township Meetings

Urban will conduct in-house meetings with the design team and with the appropriate units of the Department on a regular basis or as needed. Meeting minutes will be distributed to the attendees and will be kept in the project file.

Mr. Marquardt will coordinate between individual disciplines at Urban, and our subconsultants, A.D.Marble & Company and Dawood Engineering, Inc., throughout the entire design phase of the project. This will include project correspondence, attendance at meetings, review of invoices and formal submissions.

Urban's ISO 9001 Certification demonstrates that we take extreme pride in quality. This certification is the definitive standard for quality systems in design/consulting firms. It verifies that Urban's quality management systems comply with the requirements of the International Organization for Standardization. Only a few engineering firms in the region have obtained this highly sought after distinction.

Upon Notice to Proceed, Urban's Quality Manual will be reviewed and a project-specific plan developed. This project's QA/QC will address the general issues of:
What are the roles of the various team members?
How will quality control be maintained throughout the project?

Who will perform, check and approve each task?
Who will maintain and monitor action items resulting from project meetings?

The ISO 9001 process will be initiated at the project kick-off meeting that will be attended by key team members, the QA/QC Officer, the head of the departments involved in the project and representatives from our subconsultant. PENNDOT's Project Manager, Javier Salgueiro, will also be asked to attend. At the meeting Mr. Marquardt will present his understanding of the assignment, the project schedule, the roles of the participants, and the resources that he is allocating to this work. Constructive input will be received from those in attendance. The kick-off meeting will detail project communications and quantify the expectations of the participants.

We will prepare cost estimates as part of the applicable Design Manual requirements (e.g., with the Design Field View and Preliminary and Final PS&E).

Mr. Marquardt will communicate the project objectives to the Design Team. He will define the team members' roles and delegate decision-making authority to various technical experts at Urban and our subconsultants, A.D.Marble & Company and Dawood Engineering, Inc.

On a regular basis (i.e., monthly or as necessary), Urban will prepare a project status report which will address the current status of the project schedule and budget. Areas of concern such as delays in the project schedule or potential cost overruns will be noted.

We will coordinate contract issues, including any supplements, with PENNDOT's Project Manager. Upon execution of our agreement with PENNDOT, we will prepare an agreement with our subconsultants, A.D.Marble & Company and Dawood Engineering, Inc.

Project Management/Administration efforts associated with preliminary work tasks for Part 001 will be continued in Part 003, Final Design.

Task 2 - Surveys

Objective:

2.4.1
This task consists of providing the survey requirements associated with specific PennDOT projects designated for studies, reports, design and construction. Publication 122M applies to this task.

Scope:

2.4.1
Surveys may consist of either; Conventional or Three- Dimensional Data Collection, or a combination, as directed by the District.

Base mapping must be supplemented with conventional survey applications.

The following subtasks are considered survey requirements, relative to the existing topography within specific project boundaries.

1. County Tax Records investigation(s) to obtain names and addresses of involved property owners.
2. Issue a "Notice of Intent to Enter" letter (Form 983) to each property owner by certified mail.
3. Obtain published horizontal and vertical control data for specific project use.
4. Prior to initiating surveys, develop a Traffic Control Plan for implementation during surveys within existing highways and streets.
5. Establish horizontal and vertical control relative to referenced monumentation.
6. Establish the preliminary mainline horizontal alignment in the field.
7. Obtain profiles and cross sections along each of the project's established roadways, baselines, and centerlines.
8. Field edit mapping topography, including the type, size, location, and elevation of existing storm drain and utility facilities; and evident property corners.
9. Establish existing stream baseline and obtain stream profile and cross sections.
10. Establish existing railroad baseline, tied to the centerline, and obtain railroad profile and cross sections, subject to the railroad's inspector and protection requirements.

11. Perform existing bridge structure surveys including type, size, location and pertinent elevation data.
12. Perform Map Accuracy Tests to verify spatial accuracy.
13. Flag horizontal alignment prior to the Design Field View.
14. Stakeout the approved Baselines and Centerlines.
15. Stakeout the Core Boring Hole locations.
16. Establish and record final Benchmarks and References for construction stakeout.
17. Set monumentation points on the Legal Right-of-Way Lines.
18. Field Survey Notebook compilations, numbering and content indexing.

Detail Task 1 - Surveys

Department Details:

2.4.1

The following items may require an adjustment to the length of time it takes to complete this task.

* Excessive distance from the project to achieve tie-ins to establish vertical and horizontal control points.
* Unusual traffic control requirements needed to perform field survey work.
* Hostile denial of entry by property owner(s) to allow surveys to e performed.
* Special equipment and/or crafts required for waterway and tunnel surveys.
* Sight line clearing of dense vegetation for surveys
* Traverse line establishment for inaccessible area surveys.

Approach:

2.0 - Surveys
DAWOOD agrees with the Scope of Work as discussed in the Work Breakdown Structure and will assist URBAN in fulfilling all of the survey work required for this project.

DAWOOD forces will complete conventional surveys with permanent reference markers. DAWOOD will provide complete field surveys for the following:
SR 1012 over Delaware Canal: along the existing SR 1012 alignment a distance of 500 feet east and west of the structure. Roadway cross sections will be provided at 50-foot intervals. DAWOOD will set a minimum one benchmark on one side of each structure on permanent objects outside of the construction limits. DAWOOD will be responsible for checking and plotting all survey data. DAWOOD will be responsible for any surveys necessary to support H & H studies. As part of the survey support for H & H studies, DAWOOD will complete stream cross sections at 50-foot intervals a length equal to 500 feet upstream and downstream of the structure. The width of the stream cross sections will vary as necessary to provide adequate information for the H&H studies.
SR 1012 over Tinicum Creek: along the existing SR 1012 alignment a distance of 500 feet west of the existing western abutment and 300 feet along the existing SR 1012 alignment east of the bridge and 300 feet along the Sheephole Road alignment. Roadway cross sections will be provided at 50-foot intervals. DAWOOD will set a minimum one benchmark on one side of each structure on permanent objects outside of the construction limits. DAWOOD will be responsible for checking and plotting all survey data. DAWOOD will be responsible for any surveys necessary to support H & H studies. As part of the survey support for H & H studies, DAWOOD will complete stream cross sections at 50-foot intervals a length equal to 500 feet upstream and downstream of the structure. The width of the stream cross sections will vary as necessary to provide adequate information for the H & H studies.

All surveys will be completed in accordance with current design manuals, Pub. 122 and all applicable Strike-Off-Letters. DAWOOD will be responsible for checking and plotting all survey data. DAWOOD will be responsible for courthouse deed research, and preparation and sending letters of intent to enter to all involved parties prior to the start of field surveys. The survey will be collected using English units of measure on an assumed datum.

DAWOOD will provide URBAN with a digital base map that includes all the field survey information such as topography, drainage, utilities and survey centerline for their use in preparing the preliminary design plans.

Task 3 - Hydrologic and Hydraulic Report

Objective:

2.7.1
This task consists of the preparation of Hydrologic and Hydraulic reports for all bridges, culverts and longitudinal encroachments to size waterway openings properly and to satisfy permitting requirements. Publication 13M, Design Manual Part 2; Publication 15M, Design Manual Part 4; and PADEP Chapter 105 apply to this task.

Scope:

2.7.1
A separate Hydrologic and Hydraulic Report is required for each hydraulic structure. However, dual structures or structures located within the same hydraulic system should be combined into one report.

The following work elements are required for the successful completion of this task:

1. Gather existing information to be used in the development of the hydrologic and hydraulic analyses and in the preparation of the H&H Report.

2. Perform a hydrologic analysis of the watershed at each proposed crossing using one or more of the Department approved methodologies. The use of a particular model shall be justified as valid for the situation in which it is being used. All assumptions and/or limitations of each model shall be clearly identified and referenced. Multiple hydrologic models are recommended to assist in validating the selected approach. An analysis of the flood history according to the guidelines contained in Design Manual Part 2 should also be considered.

3. Perform a hydraulic analysis for each proposed crossing including alternatives, if necessary, using one or more of the Department approved hydraulic models. The use of a particular model shall be justified as valid for the situation in which it is being used. All assumptions and/or limitations of each model shall be clearly identified and referenced. Where a Flood Insurance Study has been established by FEMA, the hydraulic data included in the study should be utilized to the maximum extent deemed appropriate. Each proposed alternative shall be modeled to assist in the justification for the selected alternative. The hydraulic model shall extend a sufficient distance upstream and downstream to adequately evaluate the potential impacts due to the proposed construction. The hydraulic model should be used to compare existing and proposed conditions with respect to water surface elevations and channel velocities for the design discharge rate(s), including the 500-year event for the scour evaluation and the "overtopping event" for the risk assessment.

4. Evaluate the scour potential at bridge abutments and piers in accordance with Design Manual Part 4. Evaluate the erosion potential at culvert outlets in accordance with HEC-14.

5. Evaluate the channel stability and design countermeasures, if needed.

6. Perform a risk assessment or analysis for each applicable waterway structure or encroachment alternative.

7. Evaluate the hydraulic impacts as a result of temporary encroachments and/or permanent bank protection, if applicable.

8. Prepare the Hydrologic and Hydraulic Report following the general outline described in Design Manual Part 2.

9. If applicable, prepare a Conditional Letter of Map Revision (CLOMR) in accordance with FEMA regulations. The scope of work for the preparation of the CLOMR is not included herein and should be developed prior to initiating the work.

Detail Task 1 - Hydrologic and Hydraulic Report

Department Details:

2.7.1 Develop an H&H report in accordance with established PENNDOT guidelines.

The following items may require an adjustment to the length of time it takes to complete this task.

* Involvement with the federal and state resource agencies.
* Involvements with Municipal Officials and Local\Public Interest
* Involvement with the regional River Basin Commissions.
* Involvement with FEMA, relative to existing floodway data.

Approach:

3.0 - Hydrologic and Hydraulic Report
2.7.1
Urban will prepare a separate hydrologic and hydraulic report for each hydraulic structure.

Preparation of the hydrologic and hydraulic report will require performance of the following:

1. Gathering of existing information to be used in the development of the hydrologic and hydraulic analyses and in the preparation of the H&H Report.

2. Preparation of a hydrologic analysis of the watershed at each proposed crossing using one or more of the Department approved methodologies. The use of a particular model will be justified as valid for the situation in which it is being used. Assumptions and/or limitations of each model will be clearly identified and referenced. Multiple hydrologic models will be utilized to assist in validating the selected approach. An analysis of the flood history according to the guidelines contained in Design Manual Part 2 will also be considered.

3. Performance of a hydraulic analysis for each proposed crossing including alternatives, if necessary, using one or more of the Department approved hydraulic models. The use of a particular model will be justified as valid for the situation in which it is being used. Assumptions and/or limitations of each model will be clearly identified and referenced. Where a Flood Insurance Study has been established by FEMA, the hydraulic data included in the study will be utilized to the maximum extent deemed appropriate. Each proposed alternative will be modeled to assist in the justification for the selected alternative. The hydraulic model will extend a sufficient distance upstream and downstream to adequately evaluate the potential impacts due to the proposed construction. The hydraulic model will be used to compare existing and proposed conditions with respect to water surface elevations and channel velocities for the design discharge rate(s), including the 500-year event for the scour evaluation and the "overtopping event" for the risk assessment.

4. Evaluation of the scour potential at bridge abutments and piers will be performed in accordance with Design Manual Part 4. Evaluation of the erosion potential at culvert outlets will be performed in accordance with HEC-14.

5. Evaluation of the channel stability and design countermeasures, if needed.

6. Performance of a risk assessment or analysis for each applicable waterway structure or encroachment alternative.

7. Evaluation of the hydraulic impacts as a result of temporary encroachments and/or permanent bank protection, if applicable.

8. Preparation of the hydrologic and hydraulic report following the general outline described in Design Manual Part 2.

9. If applicable, preparation of a Conditional Letter of Map Revision (CLOMR) in accordance with FEMA regulations. The scope of work for the preparation of the CLOMR is not included herein and will be developed prior to initiating the work.

A.D. Marble & Company will assist Urban Engineers, Inc. with completing the PADEP Chapter 105 Water Obstruction and Encroachment Permit/USACOE Section 404 Permit Application. A.D. Marble & Company will prepare a wetland delineation and identification report and Environmental Assessment (EA) Form with attachments and supporting documentation. Theses documents will be submitted to Urban Engineers, Inc. for insertion into the Joint Permit Application. If necessary, A.D. Marble & Company will participate in the pre-application meeting.

The PADEP EA Form (Form 3930-DM-WM0017A 11/01) will be prepared in accordance with the May 15,

1999, Title 25, Chapter 105 Dam Safety and Waterway Management-Rules and Regulations and will be completed in its entirety. A function and values assessment will be prepared for the wetlands. Information to be provided to the PADEP regarding streams includes water quality and aquatic ecology data. All information relative to streams will be obtained from existing data. The aquatic habitat analysis will include detailed functions and value assessment based on best professional judgment. As part of this research, A.D. Marble & Company will conduct the required agency coordination for threatened and endangered species.

All work will be completed in accordance with PENNDOT design manuals and current laws, ordinances, and policies of federal, state and local governments. This includes PADEP, Pennsylvania Fish & Boat Commission (PAF&BC), Pennsylvania Historic Museum Commission (PHMC), U.S. Army Corps of Engineers (USACOE), Federal Emergency Management Agency (FEMA), and the Bucks County Conservation District. All completed work and files containing all of the permit application package material will be transferred to the District electronically, and may be required for use in the online JPA/H&H system. If requested, two draft and five final copies of the EA Form will be prepared for the Joint Permit Application.

Task 4 - Level 2 CE

Objective:

2.3.3
This task consists of the assembly and approval of the Level 2 Categorical Exclusion

Scope:

2.3.3
Complete Part A and B, of the Categorical Exclusion Evaluation (CEE) form (Publication 294), which includes: Additional narrative will be included, as appropriate. Supplemental information will be attached to the CEE form or placed in the technical file, as appropriate.

Conduct secondary document research and review, and project site walkovers in order to complete an environmental evaluation.

Determine the level of Public and Agency Involvement required. Work items for Public Involvement have been defined in task 2.1.6.

Determine the need for permits required for all project resultant temporary and permanent actions. Work items for permit activities are defined under other work tasks.

Determine what if any supporting documents are required for the CEE. Work items to complete these supporting documents are defined under other work tasks.

Specify and define mitigation measures for impacted environmental issues listed under Section A, Environmental Evaluation Areas, listed above. Provide the general description and the location of any resources within or adjacent to the project work limits that are to be avoided during construction. Also provide measures to mitigate impacts to resources that can not be avoided.

Sheet C-2 will also require completion.

Submit the completed CEE form and pertinent supporting documents for review, concurrence, and approval to the District Office (Step 4 of the CE Process). If necessary, the consultant will revise the CEE form and or supporting documentation as directed. The District will submit the CEE to the Bureau of Design and FHWA for approval.

Detail Task 1 - Level 2 CE

Department Details:

As part of the Environmental Documentation ralated work, the following subtasks will be performed.
1/ Wetland Studies. If wetlands are present, must perform a Phase I bog turtle habitat evaluation
2/ Streams and Waterways
3/ Threatened and Endangered Species
4/ National Historic Landmark
5/ Cultural Resource Early Coordination

6/ Archaeology/Geomorphology. It is assumed that any testing within each study area won't exceed 1/2 acre in size. Floodplain settings with these areas will be archaeologically tested using the PHMC's recommended interval of four one-meter square test units per acre. All test units will be examined by the project geomorphologist.

7/ Historic Structures
8/ Resolution of Adverse Effects

Approach:

A.D. Marble & Company will collect and synthesize environmental data in order to complete a Level 2 Categorical Exclusion Evaluation (CEE) for the project. This evaluation will be prepared in accordance with the revised PennDOT Publication 294, Categorical Exclusion Evaluation Handbook, December 1999. The CEE document will be prepared using PennDOT's CE/EA Expert System and will be submitted to PennDOT District 6-0 for review and comment. If requested by PennDOT District 6-0, A.D. Marble & Company will prepare two draft and four final hard copies of the CEE Form as part of this project.

Additional Environmental Studies. In addition to preparing the Level 2 CEE Document as part of these projects, background research and an initial field reconnaissance identified other environmental resources located within and adjacent to the project study areas. These resources along with any associated environmental and cultural documents are described below and will be described in the CEE Document. The Urban Engineers Team anticipates these tasks will be necessary to obtain environmental clearance for this project. As a result of a Scope Clarification Meeting that occurred at the office of PennDOT Engineering District 6-0 on Friday, March 26, 2004, PennDOT District 6-0 concurred with the proposed approach and necessary level of work.

A.D, Marble & Company anticipates that Section 4(f) Resources, natural resources, and cultural resources will be the key environmental issues associated with these projects.

Section 4(f) Evaluation. Section 4(f) permits the use of publicly-owned parks, recreational areas, wildlife or waterfowl refuges, or any significant historic sites for transportation use only when it has been determined that there is no feasible and prudent alternative to such use, and the project includes all possible planning to minimize harm to the property resulting from such use. Several existing and/or potential Section 4(f) resources are located within the study areas of the S.R. 1012, Section BRC (Headquarters Road) bridge replacement projects. These resources include historic sites and public state park land.

Both study areas are located in historic districts and the need to acquire right-of-way for these projects may result in the "use" of a Section 4(f) resource. Headquarters Road over Tinicum Creek is located within the National Register-listed Ridge Valley Rural Historic District and Headquarters Road over the Delaware Canal is located within the National Register-listed Delaware Canal Historic District, which has also been designated the Delaware Canal National Historic Landmark (NHL). Background research revealed that the bridge over the Delaware Canal is not a contributing element to the Delaware Canal NHL, nor is it eligible for listing as an individual element on the National Register of Historic Places. However, the bridge is centrally located within the limits of the Delaware Canal NHL. The bridge over Tinicum Creek was surveyed as part of the PennDOT Historic Bridge Survey and has been determined to be not eligible for listing in the National Register of Historic Places. In addition, the survey revealed that the bridge over Tinicum Creek is not a contributing element of the Ridge Valley Rural Historic District. However, background research revealed that the bridge carrying Headquarters road over Tinicum Creek is specifically mentioned in the National Register nomination as a contributing element to the historic district. This discrepancy will have to be clarified early in the project development process. In addition to the known Section 4(f) resources, there are three structures of 50 years of age or older located in the vicinity of the bridge carrying Headquaters Road over the Delaware Canal. If they are surveyed and determined to be eligible for listing in the National Register, a Section 4(f) Evaluation may be warranted.

With regards to park land, a portion of the Delaware Canal Pennsylvania State Park is located within the project study area along the eastern side of the Delaware Canal. If the proposed project results in the "use" of this park, a Section 4(f) Evaluation will be warranted. Close coordination with the Pennsylvania Department of Conservation and Natural Resources (DCNR) and the National Park Service (NPS) will be required for this project.

A Section 4(f) Evaluation will be prepared in accordance with Section 4(f) US DOT Act of 1966, Section 138

of the Federal-Aid Highway Act of 1968 and PennDOT Publication 349, Section 4(f) Handbook (March 1998).

The Section 4(f) Evaluation will evaluate alternatives developed by the project team and will incorporate information and coordination with local authorities. The alternative analysis section will include detailed design plans depicting each alternative impact on each of the Section 4(f) resources. If there are no feasible and prudent alternatives to avoid the use of Section 4(f) resources, mitigation measures will be developed. This report will document that there are no feasible or prudent alternatives to the use of Section 4(f) resources for this project.

The Section 4(f) Evaluation will include the following sections: an introduction describing the proposed action; the project purpose and need; identification and description of the Section 4(f) resources; alternative analysis for each resource; measures to minimize harm to each resource; coordination with agencies; and, in the Final document, a conclusion. Alternatives that include context-sensitive design will be included in the evaluation.

Two copies of Section 4(f) Evaluation Report will be included as an attachment to the draft CEE Form and will be submitted for review and comment. Ten final copies will be provided after the comments are incorporated.

State Parkland. A portion of the Delaware Canal Pennsylvania State Park is located within the project study area along the eastern side of the Delaware Canal. DCNR maintains a trail that travels through the park. Close coordination with DCNR will be maintained to avoid and/or to minimize impacts to the park.

Wetlands and Watercourses. As mentioned above, the bridges located within the project study area carry Headquarters Road over two separate waterways; Tinicum Creek and the Delaware Canal. The Delaware Canal exists and flows in a southerly direction and parallels the Delaware River. According to the Pennsylvania Department of Environmental Protection (PADEP) Chapter 93 Water Quality Standards, the portion of the Delaware River adjacent to the study area is designated as a Warm Water Fishery (WWF) and Migratory Fish route (MF). As a branch of the main stem of the Delaware River, it is assumed that the portion of the Delaware Canal contained within the study area has the same classification. As a secondary tributary to the Delaware River, Tinicum Creek exists and flows in a northwest to southeast direction within the project study area. According to the PADEP Chapter 93 Water Quality Standards, the portion of Tinicum Creek located within the project study area is designated as a Cold Water Fishery (CWF). A.D. Marble & Company anticipates that a Joint Permit (Section 105/404) Application will be required for both of the bridge replacements.

A review of the U.S. Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI) mapping for the study area associated with Tinicum Creek indicates that there are no wetlands present; however, recent field observations indicate that there may be wetlands located along the eastern edge of Tinicum Creek. The NWI mapping for the study area associated with the Delaware Canal indicates that there is one palustrine open water wetland located in the vicinity of the northeastern quadrant of the study area. A recent field view verified the presence of this wetland as well as a potential wetland area located within the southeastern quadrant of the study area. According to the Soil Survey of Bucks and Philadelphia Counties, statewide hydric soils were identified within the project study areas. The presence of hydric soils increases the potential for wetland areas within and adjacent to the project study areas.

It is anticipated that a wetland identification, delineation, and functional assessment will be needed to identify the presence or absence of wetlands within the study areas. A Wetland Identification, Delineation, and Function Assessment Report will be prepared based on secondary information and field data. The report will meet all requirements for submission to the USACOE for approval of the wetland boundaries. However, if no wetlands are identified within the boundaries of the proposed impact area, information supporting the finding will be presented to PennDOT District 6-0 in the form of a letter. If required, A.D. Marble & Company will also coordinate a field view with the USACOE and PADEP to obtain a jurisdictional determination of the wetland boundaries.

Threatened and Endangered Species. Due to the location of the project study areas being located within the historical range of the bog turtle (Clemmys muhlenbergii), coordination with Pennsylvania Fish and Boat Commission (PFBC) and US Fish and Wildlife Service (USFWS) will be necessary. If wetlands are identified

within the project study area, a Phase I Bog Turtle Habitat survey will be conducted by our certified bog turtle specialist. However, preliminary field observations within the study areas suggest that suitable bog turtle habitat does not exist within the project study area.

In addition, A.D. Marble & Company will request database searches from the Pennsylvania Natural Diversity Inventory (PNDI), PFBC, Pennsylvania Game Commission (PGC), and USFWS regarding other threatened and endangered species within the project area. If it is found that any species potentially occur within the project study area, the information on their location, as well as their critical habitat elements will be utilized in the evaluation of the project. A.D. Marble & Company will attend all necessary agency field view and coordination meetings.

Cultural Resources. As mentioned above, both bridges are located in historic districts. Headquarters Road over Tinicum Creek is located within the National Register-listed Ridge Valley Rural Historic District and Headquarters Road over the Delaware Canal is located within the National Register-listed Delaware Canal Historic District, which has also been designated the Delaware Canal National Historic Landmark (NHL). Background research revealed that the bridge over the Delaware Canal is not a contributing element to the Delaware Canal NHL, nor is it eligible for listing as an individual element on the National Register of Historic Places. However, the bridge is centrally located within the limits of the Delaware Canal NHL. The bridge over Tinicum Creek was surveyed as part of the PennDOT Historic Bridge Survey and has been determined to be not eligible for listing in the National Register of Historic Places. In addition, the survey revealed that the bridge over Tinicum Creek is not a contributing element of the Ridge Valley Rural Historic District. However, background research revealed that this bridgeis specifically mentioned in the National Register nomination as a contributing element to the historic district. This discrepancy will have to be clarified early in the project development process. In addition to the bridges, there are three structures 50 years or age or older located within the Delaware Canal study area. These resources are on the west side of the canal, adjacent to the project area. It is anticipated that these resources will be surveyed as part of this project. With regards to the Headquarters Road over Tinicum Creek study area, it is anticipated that no new resources will be surveyed or evaluated as part of this project.

It is anticipated that a combined Historic Structures Survey/Determination of Eligibility Report will be prepared to document the survey work and recommend the boundaries of any eligible resource associated with the Headquarters Road over Delaware Canal Project. Three draft and five final copies of the Historic Structures Survey/Determination of Eligibility Report will be prepared.

It has been determined that both project study areas are located within historic districts. A.D. Marble & Company will prepare a Determination of Effect Report to determine the effect of the project on the existing historic districts and any additional resources that are determined to be eligible for listing in the National Register. A.D. Marble & Company will identify the qualifying characteristics for the resources, apply the Criteria of Adverse Effects (36 CFR 800.5(a)(1); compare the project characteristics with the examples of adverse effects specified at 36 CRF 800.5(a)(2), and then present the results of the application of the Criteria of Adverse Effects. Five draft and five final copies of the Determination of Effect Report will be prepared for each project. If it is determined that a project will result in an adverse effect to a resource, A.D. Marble & Company will prepare a Memorandum of Agreement.

As both bridges are located within historic districts, a context sensitive approach will be required during these projects. Rehabilitation options should be designed in keeping with the Secretary of the Interior's Standards and Guidelines. If it is determined that a restoration or rehabilitation option is not feasible, any new design must be sensitive to the surroundings and character of the district and its associated setting. Any proposed new design must take into consideration the scale of the crossing, the type of bridge currently in this location, and the rural setting, while still working within the design criteria. The design should be minimalistic to ensure that the bridge fits within this sensitive cultural setting, while still providing a safe transportation facility.

Regarding archaeology, the project study area associated with the Delaware Canal generally has a high potential for historic archaeological resources. In addition, the presence of documented Pre-contact Period remains on the floodplain north and east of the bridge suggests that the project area exhibits the potential for Pre-contact Period archaeological resources. With regards to the project study area associated with Tinicum Creek, documented archaeological sites are located within the Ridge Valley Rural Historic District just north of the proposed study area. These sites consist of a Pre-contact Period rock shelter (36Bu048) situated on a

steeply sloping hillside overlooking Beaver Creek and a historic farmstead site along Bunker Hill Road. Furthermore, the area of the proposed bridge replacement lies directly upstream from the confluence of Tinicum Creek and a small, unnamed stream. This type of topographical setting generally has a high potential for archaeological resources, both Pre-contact Period and Historic Period.

The Phase I Archaeological Survey for each project will begin with background research. Background research will be conducted to develop an understanding of the local history and prehistory of the APE and surrounding region. Sources for the research will include the Bucks County Historical Society, local township historical societies, and the State Historic Preservation Office in Harrisburg. Historic and contemporary atlases and maps; published secondary sources at several repositories; the archaeological (P.A.S.S.) and historic site files will be collected. In addition, vocational and professional historians and archaeologists familiar with the project vicinity may be consulted as necessary. The file examination will include survey forms, survey maps, countywide surveys and other reports. Additional information will be garnered from field reconnaissance and review of files at local historic preservation organizations and planning departments.

For the purposes of this proposal, it is assumed that any testing within an area will not exceed one-half acre in size. Floodplain settings with these areas will be archaeologically tested using the Pennsylvania Historic Museum Commission's (PHMC's) recommended interval of four one-meter square test units per acre. All test units will be examined by the project geomorphologist. The geomorphological analysis will determine the depth of Holocene deposits and reconstruct the depositional environment that they represent. Up to two one-meter square test units will be excavated for each Phase I Archaeological Survey. All upland areas within the archaeological APE will be tested using shovel test pits (STP) to be excavated 10-meter intervals. If potentially significant artifacts are encountered in these STPs, additional STPs will be excavated to better define the limits of the deposits. A maximum of 20 STPs are anticipated for the Delaware Canal project and a maximum of 30 STPs are anticipated for the Tinicum Creek projectas part. However, this assumption may change as the project develops and coordination undertaken with the project team. All excavated soils will be screened through 0.25-inch hardware cloth. Each test unit and shovel test pit will be recorded for its stratigraphy and location. All identified cultural features will be mapped and photographed according to Bureau of Historic Places (BHP) guidelines.

All artifacts will be processed, inventoried, catalogued, and analyzed. The analyses will consider all potential sites within the project study limits. All of the necessary laboratory analysis will conform to the current PHMC Guidelines. A maximum of 200 artifacts are anticipated for each project.

A Phase I Archaeological Survey Report will be prepared upon the completion of the geomorphological and archaeological fieldwork and laboratory analysis. The report will contain the methodology used, research assumptions, a review of the site background research findings, the results of the field survey, and an analysis of all data collected. The report will contain all maps, photographs, and graphics necessary to illustrate the findings. Also included will be a bibliography, a catalog of artifacts recovered, the geomorphologist's report and the qualifications of the preparers.

Four copies of the draft Phase I Archaeological Survey Report will be submitted to PennDOT for review and comment (these copies will have digital photographs). After all the comments have been incorporated, six final copies will be submitted for distribution to the appropriate review agencies (one copy with original photographs).

Agricultural Lands. During preliminary field observations, active farmland was observed on the northeastern quadrant of the study area associated with the Delaware Canal. However no direct impacts to the active agricultural lands are anticipated as part of this project. Although no active farmlands were identified within the study area associated with Tinicum Creek, preliminary field observations showed the existence of stables and fenced in pasture land on the western side of Tinicum Creek. After the limits of work for the project are defined, additional investigations may be warranted depending on the extent of the project study area. In addition, prime farmland soils are located within the project study area. Due to the presence of soils that have a soil capability class rating of I, II, or III within the project study area, it is anticipated that a FPPA form will be completed according to federal farmland protection regulations.

Environmental Assessment Form. A.D. Marble & Company will assist Urban Engineers, Inc. with completing the PADEP Chapter 105 Water Obstruction and Encroachment Permit/USACOE Section 404 Permit Application. A.D. Marble & Company will prepare a wetland delineation and identification report and

Environmental Assessment (EA) Form with attachments and supporting documentation for each project. These documents will be submitted to Urban Engineers, Inc. for insertion into the Joint Permit Application. If necessary, A.D. Marble & Company will participate in the pre-application meeting.

The PADEP EA Form (Form 3930-DM-WM0017A 11/01) will be prepared in accordance with the May 15, 1999, Title 25, Chapter 105 Dam Safety and Waterway Management-Rules and Regulations and will be completed in its entirety. Information to be provided to the PADEP regarding streams includes water quality and aquatic ecology data. All information relative to streams will be obtained from existing data. The aquatic habitat analysis will include detailed functions and value assessment based on best professional judgment. As part of this research, A.D. Marble & Company will conduct the required agency coordination for threatened and endangered species.

All work will be completed in accordance with PennDOT design manuals and current laws, ordinances, and policies of federal, state and local governments. This includes PADEP, PAF&BC, Pennsylvania Historic Museum Commission (PHMC), USACOE, Federal Emergency Management Agency (FEMA), and the Bucks County Conservation District. All completed work and files containing all of the permit application package material will be transferred to the District electronically, and may be required for use in the online JPA/H&H system. If requested, two draft and five final copies of the EA Form will be prepared for the Joint Permit Application.

Urban will prepare the Chapter 105-404 permit application for both the bridge over Tinicum Creek and the structure over the Delaware Canal.

Task 5 - Public Involvement

Objective:

2.1.3
This task includes the attendance and preparation of informational materials to be viewed and/or distributed to the general public at public meetings. This task may also include the preparation of newsletters, public announcements and all other aspects of public involvement as outlined in Publication 295.

Scope:

2.1.3
1. Obtain approval from PMC to proceed with public involvement activities.

2. Prepare announcement for public meeting.

3. Prepare visual materials and/or flyers for general public meetings.

4. Attend all public meetings and address comments made at the meeting.

5. Prepare minutes to the meeting and submit to the Project Manager for review. Revise if necessary.

Detail Task 1 - Public Involvement

Department Details:

Attend to public concerns and listen to the their suggestions, incorporating them into the projectsolutions whenever feasible.
Implement an open minded attitude paying special attention to Contest Sensitive solutions to solve problems.

Approach:

5.0 - Public Involvement
2.1.3
Two public meetings, one for each project, and two meetings with the Tinicum Township Manager are anticipated as part of this project during the preliminary design phase. The District will obtain approval from PMC to conduct the Public Meeting. The Urban Team will be responsible for arrangements including: notification, announcements, setup, exhibits and displays, cleanup, audio-visual equipment arrangements, recording comments, minutes, responding to comments, etc. Urban anticipates preparing a structure rendering for each structure for use at the public meetings. The public involvement effort will be conducted in accordance with PENNDOT Publication 295, "Public Involvement Handbook."

A.D. Marble & Company will assist Urban in preparing materials for the public meeting and will assist Urban in conducting the meeting and in disseminating information regarding the purpose and need for the project. A.D. Marble & Company will present the results of the environmental studies and will have up to two representatives available to answer questions regarding these findings. The public involvement for the project will be conducted in accordance with PENNDOT's Public Involvement Handbook, Publication 295 (September 1995).

The public is anticipated to play an integral role in the review of the project plans as they relate to all sensitive environmental constraints. Specifically, public involvement will be critical in the Section 106 clearance process, as there are two historic districts listing in the National Register. The solicitation of agency and public input at coordination meetings will be critical for the timely completion of the project.

Task 6 - Line and Grade

Objective:

2.4.6
This task consists of the development of the horizontal and vertical geometry. Publication 13M, Design Manual Part 2 applies to this task

Scope:

2.4.6
Prior to developing the vertical and horizontal geometry, all environmental and property constraints will be identified. The engineer will have a comprehensive understanding of all of the constraints and will discuss these with the District prior to finalizing the geometry.

Secure sufficient field survey information to develop the final geometry. Develop all control points for the vertical and horizontal geometry. The engineer will analyze the compatibility and acceptability of the horizontal and vertical geometry.

The following work elements are required for the successful completion of this task:
1. Finalize horizontal and vertical geometry and submit plans in accordance with Publication 10A, Design Manual Part 1A.
2. Review for compliance with design criteria and environmental constraints.
3. Tabulate project control point coordinates (POT, PC, PT, and PI) for all roadways and channel relocations.
4. Apply the project traffic data to the design criteria to determine lane requirements, turning movements, and weaving movements.
5. Check final structure depths and adjust vertical alignment as necessary. If alternative structures are being utilized, use the worst case scenario.
6. Tabulate pavement grades and superelevation for development of cross sections.

Detail Task 1 - Line and Grade

Department Details:

- Airport clearance if an airport is within a 2 mile radius
- The Department may want to combine the line and grade with the typical section submission

Approach:

6.0 - Line and Grade
2.4.6
After identifying environmental and property constraints, Urban will develop the horizontal and vertical geometry in accordance with Publication 13M, Design Manual 2 and the Standard Operating Procedure (SOP) for Line, Grade, and Typical Section, as contained in Strike-off Letter (SOL) 432-01-06 and will be included in the Design Field View submission. Final structure depths will be checked and adjustments to the vertical alignment will be made if necessary. Horizontal and vertical curve data, sight distances, super-elevation rates, transitions, and vertical clearances will be shown. Project control point coordinates for roadways will be tabulated and shown. Once vertical and horizontal geometry is set, the preliminary plan and profile drawings will be prepared.

Task 7 - Preliminary Geotechnical Engineering Report

Objective:

2.5.2
This task is the preparation of a Geotechnical Engineering Report for Pre-Final Design in accordance with Publication 10A, Design Manual Part 1A and Publication 293.
2.5.2.1
This task is the preparation of a Reconnaissance Soils and Geological Engineering Report in accordance with Publication 15M, Design Manual Part 4.

Scope:

2.5.2
The following work elements are required for the successful completion of this task:

1. Coordinate the effort with the District Geotechnical Engineer (DGE) and the other engineering disciplines involved. Perform QA/QC on work processes and products.

2. Perform analysis and design associated with embankment and cut slope construction, stormwater management facilities, drainage conduits, pavements, unsuitable materials, special geotechnical treatments, benching and transition zones, and geotechnical instrumentation for construction control.

3. Develop recommendations for use by the design team, and draft special provisions and details for construction.

4. Identify the anticipated scope of geotechnical investigations required during Final Design.

5. Prepare the GER for Pre-Final Design, presenting the recommendations and providing supporting documentation. Follow the outline in Publication 293, including a summary of the structure-related geotechnical investigations and reports for the project. Submit both a draft (95%) and a final (100%) version of the GER to the DGE.

6. Gather the information and materials necessary to assemble a preliminary soil profile plan. Obtain plan and profile sheets for the alignment from the design team. Obtain approval of the proposed graphics layout, scales and symbology.

7. Prepare the preliminary soil profile cover sheet and index sheet. Develop graphic logs of the borings. Prepare the profile sheets, showing the graphic boring logs and test results. Assemble the cover, index and profile sheets and submit a half-size copy as an appendix to the GER.

2.5.2.1
The following work elements are required for completion of this task:

1. Coordinate the effort with the District Geotechnical Engineer (DGE), District Bridge Engineer, BOD Bridge Quality Assurance Division (BQAD), and the other engineering disciplines involved. Perform QA/QC on work processes and products.

2. Perform an office investigation. Review background geological information and maps, boring logs, project files and reports, environmental documents, and right-of-way plans to describe the soil/rock/hydrologic setting. Contact Federal and State agencies with access to soils and geologic data. Review previous geotechnical work performed in the vicinity of the structure.

3. Visit the site, interviewing local residents and engineers. Perform a detailed field reconnaissance and refine the soil/rock/hydrologic setting description.

4. Determine the important site characteristics and evaluate their impact on the proposed construction.

5. Develop a plan for core boring and testing, based on the requirements of Design Manual Part 4. Prepare a tabular summary of the proposed drilling following the format of Publication 222M.

6. Prepare the RSGER, presenting the information required in Design Manual Part 4, with the boring and testing plan as an appendix. Submit the report for approval.

Detail Task 1 - Preliminary Geotechnical Engineering Report

Department Details:

2.5.2

This task should be performed in conjunction with the other tasks under the "Geotechnical" task.

Emphasis in the preliminary (pre-final) phase is on developing roadway-related geotechnical recommendations, and providing guidance to allow design finalization.

The RSGER is a required part of the TS&L submission for each structure on the project.

Preliminary structure core borings may be performed prior to the RSGER if roadway borings are taken or if the complexity of structure or site conditions warrant.

Approach:

7.0 - Preliminary Geotechnical Engineering Report
Geology
Both project sites are underlain by the Brunswick Formation (TRB) of the Triassic Period. The formation consists typically of reddish brown shale, mudstone, and siltstone. Green and brown shale beds occur. The formation is moderately resistant to weathering. It is moderately weathered to a moderate depth. The overlying mantle is moderately thick. The formation forms undulating hills of low relief. Natural slopes are moderately steep and stable.

Excavation is moderately easy in the weathered zone, but difficult in unweathered rock. A moderate to fast drilling rate is expected, except when adjacent to diabase, where the rock is harder, and the drilling rate is slow. Cut-slope stability is fair to poor. Landslides occur where cut slopes are steep and rocks dip toward the cut. Foundation stability is good. Rock should be excavated to sound material. Good drainage is necessary.

Soils
Soils mapped at the Delaware Canal site are described as the Pope loam and Doylestown silt loam. The Pope series consists of deep, well drained, nearly level soils found on flood plains and terraces. The Doylestown series consists of deep, poorly drained, nearly level soils found on broad upland flats although it is listed as hydric. Bedrock is typically encountered at depths of 4 to 7 feet below the ground surface and the reported depth of the seasonal water table is 0.5 to greater than 3 feet below the ground surface. Reported limitations include the potential for flooding and frost heave. The risk for corrosion for uncoated steel and concrete is high for Doylestown soils.

Soils mapped at the Tinicum Creek site are described as the Rowland silt loam. The Rowland series consists of deep, moderately well drained to somewhat poorly drained, nearly level soils found on flood plains. Bedrock is typically encountered at depths of 3.5 to 6 feet below the ground surface and the reported depth of the seasonal water table is 1 to 2 feet below the ground surface. Reported limitations include the potential for flooding.

DAWOOD agrees with the Scope of Work as discussed in the Work Breakdown Structure except for the tasks related to preparing a formal Geotechnical Engineering Report for Pre-Final Design (PGER). DAWOOD's understanding is that a Reconnaissance Soils and Geological Engineering Report (RSGER) not a PGER will be required for the task. Because there are bridge replacement projects and probably will not have significant roadway approach work, we do not anticipate that a PGER submission will be necessary as evidenced by the minimal number of roadway borings anticipated. DAWOOD will still provide preliminary geotechnical recommendations for proposed slopes, pavement design, drainage and other roadway construction items but as a Design Memorandum rather than a PGER.

Task 8 - Preliminary ROW Activities

Objective:

2.6.1
This task includes the requirements as stipulated under Publication 14M, Design Manual Part 3.
2.6.1.1
This task involves the determination of legal right-of-way widths in accordance with the Publication 14M,

Design Manual Part 3, and research of property owner records in County Deed Recorder's office.
2.6.1.2
This task is the preparation of individual property plats in accordance with Publication 14M, Design Manual Part 3.

Scope:

2.6.1
A preliminary right-of-way plan will be prepared for all Department projects where the construction activities require property acquisition beyond the footprint of existing Department of transportation property. The right-of-way plan shall be prepared in accordance with the requirements and contents as stipulated in Design Manual Part 3.

The right-of-way plan(s) is(are) subject to a plan check review by the District Right-of Way Unit, Chief of Surveys and the Central Office Bureau of Design, Field Liaison Engineer, Highway Quality Control Division. The plan and all supporting data shall be submitted to the District in advance of the scheduled plan check review meeting. The person(s) responsible for the plan preparation will attend the review meeting. Departments and comments stemming from the plan review shall be addressed and incorporated in the subsequent right-of-way plan submission.

The right-of-way plan will be prepared on mylar with appropriate Pennsylvania professional engineer and surveyor seals affixed.

Until NEPA clearance has been obtained, the Department may not perform final negotiations and acquisitions of property.

A right-of-way certificate is issued when the Department has adequately acquired right-of-way to allow project construction.

2.6.1.1
All public legal right-of-way and private right-of-way within the project area shall be determined from plans and documents recorded in the County Courthouse, or on file in the offices of: PennDOT District, Municipality and involved agency. Copies of all right-of-way record data will be obtained, where available, and included with the R/W plan submission to the District.

The existing public and private right-of-way corridors shall be delineated and labeled on the highway plans. A description of, and the establishment record data for right-of-way, shall be included in the project General Notes for all involved public highways. When recorded subdivision plans exhibit public right-of-way corridors, determinations must include whether the local municipality has, or has not, adopted them.

Property owner research is generally initiated by reviewing the tax maps and records at the County Tax Assessors' Office. Once the highway project location is identified on the tax map(s), the anticipated property involvement's can be listed by tax map and parcel numbers. With this information, the tax assessment files can be researched to provide: Owners name and address, Deed Book and Page Number, parcel area, list of property improvements, and the assessed value of the property. Copies of the tax maps and assessment records may be purchased for subsequent use by the designer, and inclusion as backup data to the R/W plan submissions.

Based on the obtained tax record information, the records in the Recorder of Deeds office shall be researched to verify, or update, the involved property(s) ownership, deed book and page number. Upon verification of property ownership, property investigation shall continue to ascertain if any exceptions, adverse conveyances, easement rights, sale agreements, or subdivision plans associated with property are recorded. When the property research reaches a point that exhibits the best available records available, copies of the involved deeds will be purchased from the Recorder of Deeds for plotting and project property matrix map compilation.

When metes and bounds descriptions of the deed are vague, or lacking information, prior chain of title deed descriptions shall be reviewed and copied when their descriptions provided better clarification for boundary plotting purposes. If overlaps, or gaps, result on the property matrix map due to deed metes and bounds descriptions plots, the District Right-of-Way Administrator should be notified of these conditions, and to

solicit his/her direction in resolving these issues.
2.6.1.2
Individual property plats will be prepared for all parcels with takes on highway projects, unless otherwise directed by the District.

The property plat shall contain all information necessary to provide a clear understanding, by all parties, of the existing conditions and the highway's taking requirements for the parcel, in accordance with Design Manual Part 3, Guidelines and Stipulations.

The proposed highway affects on the individual property plat must be consistent with those shown on the highway right-of-way plan sheet, however, the showing of details and labels beyond the boundary lines of parcel shall be avoided when practical.

Detail Task 1 - Preliminary ROW Activities

Department Details:

Not to develop any special requirements beyond the standard Scope of Work for Right-of-Way Plan preparations. The situations will be specific to only certain projects, as required and directed by District.

Approach:

8.0- Preliminary ROW Activities
2.6.1
Urban will prepare preliminary right-of-way plans at a scale of 1" = 25' in accordance with the requirements in Design Manual Part 3.

2.6.1.1
Urban will research and obtain copies of tax maps and deeds for affected and adjacent property owners in the project area from the Bucks County Recorder of Deeds. Using this material, Urban will develop a mosaic of affected and adjacent properties. Urban will also obtain and compile a listing of current property owners along with their addresses.

The location of legal right-of-way lines will be shown from existing plans of record and from a review of development plans for dedicated right of way if any exist. Any property that was offered for dedication will be researched to determine whether the plans were recorded.

The preliminary right-of-way plans will be developed considering alternate types of right-of-way and/or easements to minimize property damages where appropriate. In establishing parcel numbers for the right-of-way plans, we will take into consideration unity of use and/or contiguous parcels for properties with more than one deed. If necessary, we will discuss unity of use issues with the District and/or the Department's Office of Chief Counsel. The preliminary right-of-way plans will show existing and proposed rights-of-way and easements, confirmed house and curb lines, property lines, and ownership. Existing utility lines, topography, structures, foliage, and any improvements that might influence the value of a take will be included. Sufficient cross sections will be developed to establish preliminary required right-of-way, including temporary locations for construction staging areas and erosion and sedimentation control. A list identifying the owners of potentially affected properties will be prepared.

Property lines and right-of-way information will be reviewed throughout the design process so that potential involvement with any design option can be quantified. Once the final alternative has been developed, required right-of-way from each property will be computed. This information will be submitted to the Department for the purpose of estimating right-of-way costs.

A copy of the preliminary right-of-way plans will be submitted to the District Utility Unit for its use. After notice by the Department, the plans will be submitted to the utility companies.

The preliminary right-of-way package will consist of a title sheet, index maps, general notes sheet, typical sections, profiles, plans, and plats. Two copies of the tax maps will be included. This will be submitted for District review following the Design Field View submission approval.

2.6.1.2
Urban will prepare individual property plats for parcels with takes in accordance with Design Manual Part 3 -

Highway Plans Presentation. The property plat will contain information necessary to provide a clear understanding of the existing conditions and the highways taking requirements for the parcel.

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Task 9 - Preliminary Type, Size and Location (TS&L)

Objective:

2.7.2
This task consists of the assembly of Type, Size and Location studies and development of recommendations for proposed structures within the project. Publication 15M, Design Manual Part 4 apply to this task.

Scope:

2.7.2
Review any previous studies or preliminary designs with respect to the selection of structure type, span arrangements, horizontal and vertical clearances, design controls and type section. Coordinate with the District on the logical selection of span arrangements, types of piers, and structure types suitable at each location.

The preliminary structure designs will be performed at a stage when the highway alignment and profile are well defined. Review structure requirements with the District prior to Design Field View (Line and Grade) submission and approval.

The work elements are required for the successful completion of this task:
1. Develop a location plan showing the feature to be crossed or retained, design controls and regulated areas
2. Identify possible pier and abutment locations
3. Evaluate geotechnical conditions to identify potential foundation types
4. Recommend locations for structure foundation borings
5. Evaluate constructability, vertical and horizontal clearances and site constraint issues in determining the most suitable structure design for the particular location
6. Prepare cost estimates for alternative structure designs
7. Prepare justification for recommended alternative
8. Prepare transmittal letter, plans and report for TS&L submission

Detail Task 1 - Preliminary Type, Size and Location (TS&L)

Department Details:

Develop preliminary TS&L submission.

Approach:

9.0 - Preliminary Type, Size & Location (TS&L)
2.7.2
Urban will assemble the Type, Size and Location studies and develop preliminary recommendations for the proposed Headquarters Road structures in accordance with Publication 15M, Design Manual Part 4.

Urban will review any previous studies or preliminary designs with respect to the selection of structure type, span arrangements, horizontal and vertical clearances, design controls and typical section. We will coordinate with the District on the logical selection of span arrangements, types of piers, and structure types suitable at each location. The preliminary structure designs will be performed at a stage when the highway alignment and profile are well defined. Urban will review structure requirements with the District prior to the Design Field View (Line and Grade) submission and approval.

The following work elements will be completed in order to develop cost effective, constructable, aesthetically pleasing and structurally sound replacements:

1. Development of a location plan showing the feature to be crossed or retained, design controls and regulated areas
2. Identification of possible pier and abutment locations.

3. Evaluation of geotechnical conditions to identify potential foundation types.
4. Preparation of recommendation of locations for structure foundation borings.
5. Evaluation of constructability, vertical and horizontal clearances and site constraint issues in determining the most suitable structure design for the particular location
6. Preparation of cost estimates for alternative structure designs
7. Preparation of a justification for the recommended alternative
8. Preparation of transmittal letter, plans and report for the TS&L submission

It is assumed that a proprietary system, such as Conspan, will be used for the structure over the Delaware Canal. However, different alternatives will be evaluated for the preparation of the TS&L report.

For the Tinicum Creek structure, Urban will prepare three alternative replacement concepts to be presented to Tinicum Township offiicials in order to get their concurrence on the direction to proceed. These three alternatives will only be developed to a conceptual stage and Urban will not include any detailed design. Upon meeting with the Township and PENNDOT and receiving concurrence, Urban will proceed with the more detailed preliminary design development for the one preferred alternative. If more detailed design information is required for more than one alternative, additional effort beyond the scope of this proposal will be required to complete the preliminary engineering phase of this assignment.

Task 10 - Safety Review/Audit

Objective:

2.8.7
This task consists of the time required for the Safety Review Committee to review the preliminary plans and the Project Design Criteria Report.
2.8.7.1
This task consists of the time required for the Safety Review Committee to prepare the safety review committee recommendations.
2.8.7.2
This task consists of preparing collision diagrams and the analysis used for developing alternatives to reduce crash rates.

Scope:

2.8.7
1. Conduct the safety review/audit as early in the design process as possible.
2. Identify all applicable items on the Safety Review Checklist (see Publication 10A, Design Manual Part 1A). Add any additional items based on engineering judgement and experience.
3. Detect safety deficiencies in the design.
4. Recommend safety enhancements.
5. Prepare the Safety Review Submission (two copies) at least two weeks before the design field view (if applicable). Include the following:
* Color coded plans
* Profiles
* Typical sections
* Project Design Criteria Report (see Design Manual 1A for details)

2.8.7.1
Prepare a memo concerning the following:

1. Approval/disapproval of safety features
2. Safety recommendations
3. Approval/rejection of Design Exceptions
2.8.7.2
1. Review and evaluate root causes of crashes at a given location or area along a highway.

2. Prepare collision diagrams (if applicable) in accordance with the Manual of Transportation Engineering Studies. Consider the following per PennDOT Publication 201 Engineering and Traffic Studies:
* Total number of crashes during last 5 years
* Number of crashes by type or causation factor
* Vehicle type involved

* Pedestrian involvement
* Type of traffic control present
* Roadway or intersection geometric
* Cause of crash
* Time of crash
* Environmental conditions

Detail Task 1 - Safety Review/Audit

Department Details:

Prepare and submit Safety Review for approval.

Approach:

10.0 - Safety Review / Audit
2.8.7
A Safety Audit will also be provided during the preliminary design phase for this project. Urban will work with District 6 to establish a Safety Audit Team and will work with team members to conduct an effective safety audit. Safety concerns will be identified using a series of checklists, field views and office meetings. Specific recommendations for safety features to be included in the design will be developed through a team effort and detailed in the written audit report. This report will be confidential.

Urban will prepare a Safety Review submission in accordance with Design Manual Part 1A, Appendix E. The submission will be provided at least 4 weeks prior to the Design Field View date. This submission will include:

1. Color-coded plans
2. Roadway and structure profiles
3. Typical Sections
4. Project Design Criteria Report

The Project Design Criteria Report will include descriptions and displays for existing roadway and structure safety features and proposed improvements included in the designs. This report will summarize:

1. Existing design deficiencies
2. Design exception requests
3. Crash histories for the previous three years
4. Traffic data including AADT, Truck %, and directional DHV.
5. Traffic control concepts.

2.8.7.1
Urban will seek to avoid the use of design exceptions. If design exceptions are necessary, Urban will work with the District to obtain the necessary approvals by the District Safety Review Committee. Following approval, Urban will prepare the Design Exception Justification Report for inclusion with the Design Field View submission. Urban will also prepare and submit the Design Exception Data Checklist from Design Manual Part 1A. We will follow the procedures outlined in Appendix F of Design Manual Part 1A.

2.8.7.2
Urban will review and evaluate root causes of crashes at a given location or area along the highway. If applicable, Urban will prepare collision diagrams in accordance with the Manual of Transportation Engineering Studies. The following items will be considered as per Publication 201 Engineering and Traffic Studies:

Total number of crashes during last 5 years
Number of crashed by type or causation factor
Vehicle type involved
Pedestrian involvement
Type of traffic control present
Roadway or intersection geometric
Cause of crash
Time of crash

Environmental conditions

Task 11 - Preliminary Maintenance and Protection of Traffic

Objective:

2.8.2
This task consists of developing preliminary maintenance and protection of traffic plans in accordance with Publication 14M, Design Manual Part 3, the Manual on Uniform Traffic Control Devices and Publication 203M, Work Zone Traffic Control to maintain safe and efficient traffic operations through the construction work zone.

Scope:

2.8.2
Prepare a preliminary Maintenance and Protection of Traffic plan for anticipated work areas involving existing roads. The plans will include a conceptual sequence of operations and identify the type of traffic control needed for each roadway impacted by the anticipated work zones.

Plans will be developed at an appropriate scale.

Drawings will show the work areas and note the traffic control requirements for each area.

A conceptual sequence of operations will be developed identifying the anticipated phases and stages of work necessary to control traffic during hours of construction and at all other times during construction. Illustration of traffic control signs and devices, temporary pavement markings, temporary roads, detours, and other necessary details will not be developed.

The plans will include a title sheet with index map and general notes, and a listing of anticipated traffic control devices without quantities. The plan will also include the sequence of operations and plans sheets depicting the work areas.

Detail Task 1 - Preliminary Maintenance and Protection of Traffic

Department Details:

Preliminary submission of Plans for Maintenance and Protection of Traffic.

Approach:

11.0 - Preliminary Maintenance and Protection of Traffic
2.8.2
Urban will develop a maintenance and protection of traffic scheme for the project area assuming that detours will be utilized. The scheme will take into account the need to allow the contractor access to the work area. The conceptual detour routes will be coordinated with PENNDOT District 6-0 Traffic Unit.

Once the concept had been approved, it will be developed into a Preliminary Detour Plan and Narrative showing the intended detour route, anticipated duration of construction, signing, placement and types of barriers, and work hour restrictions. The plan will be prepared in accordance with PENNDOT Publication 203M (Work Zone Traffic Control); PENNDOT Design Manual 3, Chapter 4; the SOP for Traffic Control Plan as contained in SOL 432-00-07; and the Manual on Uniform Traffic Control Devices (MUTCD).

Urban recommends preparing the preliminary detour plans as also plans included in the Design Field View submission.

Task 12 - Utilities

Objective:

2.9.1
This task involves project specific work requirements in accordance with Publication 16M, Design Manual Part 5.
2.9.1.1
This task is the verification of existing aerial, surface and underground utility locations.
2.9.1.5

This task is the coordination requirements with utilities from the time of official project notification contact up to the time of contract bid proposal preparation, including Form D-419.

Scope:

2.9.1
PADOT projects which involve public utilities must include all necessary provisions for the safety and protection of both existing and any required relocation of utilities.

Subsequent to the preparation of the existing utility location plan for the project, the plan will be submitted to each of the involved utility company for their verification of the type, size and location of the facility.

Coordination efforts will be maintained with the utility throughout the project design process to allow amicable solutions for known and potential utility/highway project conflicts.

When directed, utility relocation engineering, either by the project design consultant, or by others, shall be incorporated into the project construction contract documents.

When circumstances require, the design consultant shall provide all information and prepare application forms necessary to secure agreements and permits associated with the utility on the project, in accordance with policies and procedures outlined in Design Manual Part 5.

Once the involvements for each utility has been defined for the project, the utility clearance Form D-419 will be prepared to indicate the nature and the work, the days required to perform the work, work to be performed: prior, or concurrent, or restrictive of the highway work. This information shall be included in the contract bid proposal packages and will also serve as a tool for the development of the projects construction schedule.

2.9.1.1
It is the responsibility of the designer to prepare project base mapping showing all existing utility facilities.

Aerial and surface utility data may be obtained by either aerial photography and/or conventional survey.

Underground utility data may be obtained from utility owner as-built plans and maps and/or test pits or non-destructive probe methods.

The existing utility location plan compilation will include the appropriate label and number, as applicable, for each facility. For all existing underground utility installation, the locations will be supplemented with profiles and/or cross sections.

Once the utility location plan is compiled, the designer will submit copies of the plan to each utility owner on the project with a formal request for their verification of the facilities data depicted.

The designer will incorporate all revisions, additions, or deletions resulting from the verification comments received from the owners.
2.9.1.5
Coordination with public utility company representatives shall be maintained throughout the project design duration. Utility coordination begins with the issuance of the project notification letter to the utilities and ends when all utility involvement issues have been adequately settled to allow project construction.

The requirements for utility coordination include, but may not be limited to, the following:

1. Initial contact by project notification letter.
2. Document and distribute all meeting minutes, correspondence, memorandums and telephone conversations regarding project related utility issues.
3. Formally solicit copies of existing facility location record information for underground installations from the utility company.
4. Subsequent to preparing the existing utility location plan, submit plan copies to each company and request their verification, or revision, of the type, size, and location of their facilities.
5. Transmit Form D4181X with supporting information to each utility and request their intent for bridge

occupancy on the project structure(s).
6. Schedule and conduct an initial project utility meeting to explain the project improvement goals, schedules, and targeted utility clearance dates.
7. Provide authorizations to perform utility relocation engineering and estimates, when formally requested by the utility company and approved by the Department.
8. Invite utility representatives to the project Design Field View meeting. Solicit utility company input relative to project design/utility conflicts, and potential need for substitute right-of-way corridors for utility relocations.
9. Transmit copies of project preliminary design plans, profile and cross sections to the utility companies for their relocation engineering design, cost estimate and reimbursement agreement application package preparation.
10. Keep utility companies informed of all design changes made during the final right-of-way plan and final construction plan preparations which could impact existing or planned utility facilities.
11. Incorporate utility relocation, abandonment and removal information onto the roadway construction plans, based on plans and information received from the utility company.
12. Schedule and conduct a utility meeting to review the proposed utility route matrix, and to resolve any outstanding design, conflict or schedule problem issues.
13. Incorporate utility work to be performed by the PADOT contractor into the project construction package.
14. Obtain utility working day schedules and complete form D-419, Utility Clearance.
15. Complete and execute all utility related permits.
16. Solicit utility representative attendance at the pre-bid, pre-construction, and all construction status meetings.

Detail Task 1 - Utilities

Department Details:

Coordination and Location of Utilities.

Approach:

12.0 - Utilities
2.9.1
Urban will coordinate with the utilities, in accordance with Publication 16M, Design Manual Part 5 and PA Act 287 (PA One Call).

2.9.1.1
Urban will coordinate utility related information during the design of this project. Initial contact with the utilities will be via One Call system, at which time we will request maps of underground facilities.

Once the plans are received from the utilities, their facilities will be plotted on the base plans. The utility information will include labels and numbers for each facility. For existing underground utility installations, the locations will be supplemented with profiles and cross sections. The base plans will then be distributed to the utilities for their verification of the Type, Size & Location of the facilities shown. Revisions, additions, or deletions resulting from the verification comments will be incorporated in the base plans.

Urban will comply with the provisions of Act 287 and the PA One Call system. Initial contact with the utilities will be via the PA One Call system, at which time plans of the underground facilities will be requested. Urban will contact Bucks County and the District Utility Unit to identify utilities in the project area that may not be separately referenced with the PA One Call system. Such utilities will then be contacted and plans of the area showing underground facilities will be requested.

The PA One Call telephone number and PA One Call serial number will be delineated on the project's right-of-way plans as well as the construction plans. Urban will check the utility serial numbers at least nine to 10 days prior to the actual final PS&E submission.

Urban will prepare a master Existing Utility Location Plan using the project topography as a base the construction plan sheets. Proposed relocations will be shown along with the status of the original facility such as abandoned in place, removed by company, or removed by the contractor.

Subsequent to developing and checking the existing utility location plan, Urban will investigate the proposed design for potential utility impacts and prepare a preliminary impact assessment study and report. The impact assessment will indicate the location and nature of the conflicts. The assessment report will include

preliminary cost comparisons, conclusions, and recommendations for the relocation of the utility facility versus possible project design modifications to allow the facility to remain in its existing location. Urban will submit the report to the Department for review, approval, and/or conflict resolution decision.

2.9.1.5
Urban will coordinate with the utility company representatives throughout the duration of this project. Urban will compare its list of addresses and contacts with the list maintained by District 6-0.

PENNDOT's addresses will be used for subsequent contacts and correspondence. Close contact will be maintained with the utility companies during the preliminary phase so that potential conflicts and right-of-way requirements for utilities requiring relocation can be determined and resolved as early as possible. Urban will obtain information during this phase relative to restrictions that the utilities may have regarding construction in proximity to their facilities.

Coordination efforts under this task will consist of the following:
1.Urban will begin its coordination with the utilities by issuing them a project notification letter.

2.Urban will provide PENNDOT copies of correspondence, memorandums, meeting minutes, and telephone conversation reports with utilities.

3.Urban will request, from the utilities, copies of existing facility location record information for underground installations. This information will be used to prepare the Utility Location Plan.

4.Urban will distribute this plan to the utilities for their verification of the Type, Size & Location of the facilities shown. Revisions, additions or deletions resulting from the verification comments will be incorporated in the base plans.

5.Urban will transmit Form D4181X, (bridge occupancy forms) to each utility and request their intent for bridge occupancy.

6.Early in the project, Urban will hold a utility coordination meeting with representatives of the involved utilities and PENNDOT's Utility Unit. At this meeting, Urban will explain the project's improvement goals, design schedule, and targeted utility clearance dates.

7.Upon approval by the Department, Urban will coordinate utility relocation efforts with each utility company impacted by the project.

8.Urban will invite utility representatives to the project Design Field View meeting in order to solicit utility company input relative to project design/utility conflicts, and potential need for substitute right-of-way corridors for utility relocations.

Task 13 - Design Field View

Objective:

2.4.10
This task consists of the development, submission and approval of the Design Field View submission.
2.4.10.1
This task consists of the assembly of the Design Field View submission. Reference Publication 10/10A, Design Manual Part 1/1A.
2.4.10.2
This task is the preparation of the design field view submission based on the selected alignments, attendance at the design field view, preparing meeting minutes and responding to District's comments.
2.4.10.4
This task consists of preparing a draft design exception report in accordance with Strike-off-Letter 430-93-40 and Publication 10A, Design Manual Part 1A.

Scope:

2.4.10
1. Conduct design field view at the end of the preliminary engineering and within several weeks of the Design Field View Submission.

2. Evaluate the proposed alternatives under field conditions.
3. Solicit comments from review agencies for further project development.
4. Determine the preferred alternative if applicable.

2.4.10.1
Upon receipt of NEPA Clearance/Design Approval, the drawings will be further refined and developed to prepare a submission for the Design Field View.

The submission will include the following:
1. Line and Grade
2. Alternate Interchange Schematics
3. Rough preliminary signing layout including the type of sign supports, paint markings, and other traffic control devices to determine if the project is operational and can be signed.
4. Typical sections
5. Structure locations
6. Approximate pavement depth
7. Mass diagrams of grading quantities
8. Draft of Soils and Geological Engineering Report and Profile.
9. Traffic Control Plan
10. Drainage and Preliminary Hydraulic studies
11. Service road justification
12. Utilities
13. Preliminary traffic signals plan
14. Comments from the District Safety Review Committee
15. Agreements with Cities and other Political Subdivisions
2.4.10.2
1. Secure design field view approval for the preferred alternative developed during preliminary engineering.
2. Obtain written approval from the agency of authority to advance to final design.
2.4.10.4
Prepare the Design Exception Submission after the approval of the proposed design exception(s) by the District Safety Review Committee. Include this report in the Design Field View Submission. Address the following items as applicable:

* Provide project identification information
* Describe proposed work, design criteria, include typical sections
* Provide traffic information
* Identify substandard design elements
* Provide cost information with and without design exception
* Provide justification for retention of the design exception
* Evaluate accident history
* Describe remediation
* Provide collision diagrams and/or accident cluster diagrams
* Compare accident rates to statewide averages
* Describe mitigation measures
* Describe date and type of future upgrades
* Describe advantages and disadvantages of meeting full criteria

Complete the "Design Exception Data Checklist" Design Manual 1A. Include the following in the submission:

* Project location map
* Scoping field view minutes
* Accident analysis with collision diagrams
* Letter of recommendation from Safety Review Committee
* Plan, profiles, cross sections, typical sections if not previously included in the Design Field View Submission
* Bridge sufficiency rating and letter from District Bridge Engineer (if applicable)
* Ramp design sheet (Publication 13M, Design Manual Part 2), if applicable
* Photographs of existing conditions, if applicable

Detail Task 1 - Design Field View

Department Details:

Develop the Design Field View package in accordance with DM.

Approach:

13.0 - Design Field View
2.4.10
Urban will conduct a Design Field View at the end of the preliminary engineering and within several weeks of the Design Field View Submission to evaluate the proposed alternatives under field conditions and determine the preferred rehabilitation program. Comments will be solicited from the review agencies in order to advance project development. Minutes of the field view will be distributed to the Department within 10 working days. At this point, we anticipate the Department and FHWA will complete its review and issue a preliminary design approval for the final design of the preferred improvement scheme.

2.4.10.1
A Design Field View Submission will be prepared in accordance with Publication 10M, Design Manual Part 1A- Highway Procedures; Publication 13, Design Manual Part 2M- Highway Design; Publication 14, Design Manual Part 3M- Plans and Presentation; and the SOP for Design Field Views as contained in SOL 432-01-01. The plans will be prepared at a scale of 1"=25', using English Units. Copies of the Design Field View Plans will be submitted to the utility companies located within the project limits.

The Design Field View submission for the preferred alignment will include the following:
· Line and grade
· Preliminary signing and pavement marking layout
· Typical sections
· Approximate pavement depth
· Mass diagrams of grading quantities
· Preliminary traffic control plan
· Drainage Studies
· Preliminary drainage and preliminary hydraulic studies
· Utilities
· Preliminary traffic signals plan
· Comments from the District Safety Review Committee
· Agreements with cities and other political subdivisions
· Preliminary construction schedules
· Preliminary construction costs

Urban will attend and prepare the materials required for the Design Field View. Subsequent to the meeting, Urban will prepare and distribute meeting minutes and will respond to comments made during PENNDOT'S Design Field View.

2.4.10.2
Urban will work with the District to secure Federal Highway Administration Design Field View approval for the preferred rehabilitation scheme developed during preliminary engineering. Once written approval from the Department has been received, Urban will advance into final design (Part 003 of this agreement).

2.4.10.4
Urban will seek to avoid the use of design exceptions. If design exceptions are necessary, Urban will work with the District to obtain the necessary approvals by the District Safety Review Committee. Following approval, Urban will prepare the Design Exception Justification Report for inclusion with the Design Field View submission. Urban will also prepare and submit the Design Exception Data Checklist from Design Manual Part 1A. We will follow the procedures outlined in the SOP for Design Exceptions Request as contained in SOL 432-00-07.

Urban will develop the conceptual Erosion and Sedimentation Control Plan in accordance with PENNDOT Design Manual Part 2, the SOP for Erosion and Sedimentation Control Plan as contained in SOL 432-01-01, and the Pennsylvania Department of Environmental Protection (PADEP) Title 25 PA Code Chapter 102. The detailed requirements of Chapter 102 are contained in the Erosion and Sedimentation Control Program Manual (March 2000). The conceptual Erosion and Sedimentation Control Plan will be submitted to the

Bucks County Conservation District for review. If necessary, representatives from PENNDOT District 6-0, and Urban will attend a review meeting with the Bucks County Conservation District to discuss the submitted conceptual plan.

The conceptual Erosion and Sedimentation Control Plan will be prepared from base mapping provided by Urban and will include proposed erosion and sedimentation control facilities for the preferred alternative. This will include preliminary sizing of the sediment controls and right-of-way requirements. Draft standard worksheets for temporary and permanent erosion control measures and facilities will also be prepared.

Consultant Hierarchy

Business Partner	DBE Type	Supervising BP
Urban Engineers, Inc.	No	
A.D. Marble & Company	Yes	Urban Engineers, Inc.
Dawood Engineering, Inc.	Yes	Urban Engineers, Inc.

Attachments

Project Approach.doc

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TECHNICAL PROPOSAL DETAIL REPORT

Agreement: E00342 Project Specific Active

Name: Three (3) Bridge Replacements in Bucks County **Selection Process:** Normal

Initiating Org: Engineering District 6-0

Supplement: 1 **Normal** **Executed**

Description: provide for, under Part 1, additional work and services for the preliminary design of S.R. 1012, Sec. BRC due to changes to the roadway geometry and intersection configuration and modifications to the TS&L

Part: 1 **Cost Plus Fixed Fee** **Active**

Description: preliminary engineering, environmental studies, final design and consultation during construction for the replacement of two structures on Headquarters Rd, Tinicum Township in Bucks County.

PennDOT Project Manager: fullard, leanne e.

Phase: Preliminary Design

Task 1 - Project Management/Administration

Objective:

2.1.1
This task consists of the administrative effort required by principals, project manager, and involving personnel to complete the project on time, within budget, and provide a quality product.

Scope:

2.1.1
Project Management involves the planning, scheduling, organizing and controlling of resources to achieve specific objectives within established schedule, budget and quality standards. The Project Manager is responsible for but not limited to the tasks outlined in the Department Detail.

Detail Task 2 - Project Management/Administration

Department Details:

In addition to the presently scoped project management tasks, consultant will create and update an Open Plan schedule on a monthly basis.

Approach:

Additional Project Management effort will be necessary to manage the additional work outlined in this supplemental request.

Since the inception of this project, the Department has mandated the development of a design schedule for all projects using Open Plan software. The original scope of work did not include Open Plan monthly updates. This additional effort involves monthly updates through PennDOT's WelcomHome website. Coordination with the Department's Design Manager regarding the project's design schedule will also be required.

Task 2 - Surveys

Objective:

2.4.1
This task consists of providing the survey requirements associated with specific PennDOT projects designated for studies, reports, design and construction. Publication 122M applies to this task.

Scope:

2.4.1
Surveys may consist of either; Conventional or Three- Dimensional Data Collection, or a combination, as directed by the District.

Base mapping must be supplemented with conventional survey applications.

The following subtasks are considered survey requirements, relative to the existing topography within specific project boundaries.

1. County Tax Records investigation(s) to obtain names and addresses of involved property owners.
2. Issue a "Notice of Intent to Enter" letter (Form 983) to each property owner by certified mail.
3. Obtain published horizontal and vertical control data for specific project use.
4. Prior to initiating surveys, develop a Traffic Control Plan for implementation during surveys within existing highways and streets.
5. Establish horizontal and vertical control relative to referenced monumentation.
6. Establish the preliminary mainline horizontal alignment in the field.
7. Obtain profiles and cross sections along each of the project's established roadways, baselines, and centerlines.
8. Field edit mapping topography, including the type, size, location, and elevation of existing storm drain and utility facilities; and evident property corners.
9. Establish existing stream baseline and obtain stream profile and cross sections.
10. Establish existing railroad baseline, tied to the centerline, and obtain railroad profile and cross sections, subject to the railroad's inspector and protection requirements.
11. Perform existing bridge structure surveys including type, size, location and pertinent elevation data.
12. Perform Map Accuracy Tests to verify spatial accuracy.
13. Flag horizontal alignment prior to the Design Field View.
14. Stakeout the approved Baselines and Centerlines.
15. Stakeout the Core Boring Hole locations.
16. Establish and record final Benchmarks and References for construction stakeout.
17. Set monumentation points on the Legal Right-of-Way Lines.
18. Field Survey Notebook compilations, numbering and content indexing.

Detail Task 2 - Surveys

Department Details:

Update the existing survey information to reflect the topography changes at the Headquarters Road intersection with Sheep Hole Road in Tinicum Township.

Approach:

In 2009, Tinicum Township altered the rock slope along Sheep Hole Road in order to widen the existing intersection. Additional survey data collection by our sub-consultant Dawood Engineering, Inc. will be performed to update the existing topography. As a result, Urban will be required to merge this data with the original survey information and update all topographic plans.

Task 3 - Hydrologic and Hydraulic Report

Objective:

2.7.1
This task consists of the preparation of Hydrologic and Hydraulic reports for all bridges, culverts and longitudinal encroachments to size waterway openings properly and to satisfy permitting requirements. Publication 13M, Design Manual Part 2; Publication 15M, Design Manual Part 4; and PADEP Chapter 105 apply to this task.

Scope:

2.7.1
A separate Hydrologic and Hydraulic Report is required for each hydraulic structure. However, dual structures or structures located within the same hydraulic system should be combined into one report.

The following work elements are required for the successful completion of this task:

1. Gather existing information to be used in the development of the hydrologic and hydraulic analyses and in

the preparation of the H&H Report.

2. Perform a hydrologic analysis of the watershed at each proposed crossing using one or more of the Department approved methodologies. The use of a particular model shall be justified as valid for the situation in which it is being used. All assumptions and/or limitations of each model shall be clearly identified and referenced. Multiple hydrologic models are recommended to assist in validating the selected approach. An analysis of the flood history according to the guidelines contained in Design Manual Part 2 should also be considered.

3. Perform a hydraulic analysis for each proposed crossing including alternatives, if necessary, using one or more of the Department approved hydraulic models. The use of a particular model shall be justified as valid for the situation in which it is being used. All assumptions and/or limitations of each model shall be clearly identified and referenced. Where a Flood Insurance Study has been established by FEMA, the hydraulic data included in the study should be utilized to the maximum extent deemed appropriate. Each proposed alternative shall be modeled to assist in the justification for the selected alternative. The hydraulic model shall extend a sufficient distance upstream and downstream to adequately evaluate the potential impacts due to the proposed construction. The hydraulic model should be used to compare existing and proposed conditions with respect to water surface elevations and channel velocities for the design discharge rate(s), including the 500-year event for the scour evaluation and the "overtopping event" for the risk assessment.

4. Evaluate the scour potential at bridge abutments and piers in accordance with Design Manual Part 4. Evaluate the erosion potential at culvert outlets in accordance with HEC-14.

5. Evaluate the channel stability and design countermeasures, if needed.

6. Perform a risk assessment or analysis for each applicable waterway structure or encroachment alternative.

7. Evaluate the hydraulic impacts as a result of temporary encroachments and/or permanent bank protection, if applicable.

8. Prepare the Hydrologic and Hydraulic Report following the general outline described in Design Manual Part 2.

9. If applicable, prepare a Conditional Letter of Map Revision (CLOMR) in accordance with FEMA regulations. The scope of work for the preparation of the CLOMR is not included herein and should be developed prior to initiating the work.

Detail Task 2 - Hydrologic and Hydraulic Report

Department Details:

Revise Hydrologic and Hydraulic Report to incorporate revisions to PennDOT Drainage Design Manual and the bridge span arrangement that was agreed upon at the Section 106 Consulting Party meeting.

Approach:

Due to the modifications to the span arrangement, bridge dimensions and substructure locations that resulted from coordination with Tinicum Township and the Section 106 consulting party, the hydrologic and hydraulic study will need to be revised and resubmitted.

Since the original submission of the H&H Report (first submitted in 2005), several changes have been issued regarding the design guidance and criteria used in the development of this report. This includes a new PennDOT Drainage Manual (Publication 584) and modifications to Design Manual, Part 2, Chapter 10. Also, a new version of HEC-RAS software will be utilized for the revised analyses.

Task 4 - Level 2 CE

Objective:

2.3.3
This task consists of the assembly and approval of the Level 2 Categorical Exclusion

Scope:

2.3.3
Complete Part A and B, of the Categorical Exclusion Evaluation (CEE) form (Publication 294), which includes: Additional narrative will be included, as appropriate. Supplemental information will be attached to the CEE form or placed in the technical file, as appropriate.

Conduct secondary document research and review, and project site walkovers in order to complete an environmental evaluation.

Determine the level of Public and Agency Involvement required. Work items for Public Involvement have been defined in task 2.1.6.

Determine the need for permits required for all project resultant temporary and permanent actions. Work items for permit activities are defined under other work tasks.

Determine what if any supporting documents are required for the CEE. Work items to complete these supporting documents are defined under other work tasks.

Specify and define mitigation measures for impacted environmental issues listed under Section A, Environmental Evaluation Areas, listed above. Provide the general description and the location of any resources within or adjacent to the project work limits that are to be avoided during construction. Also provide measures to mitigate impacts to resources that can not be avoided.

Sheet C-2 will also require completion.

Submit the completed CEE form and pertinent supporting documents for review, concurrence, and approval to the District Office (Step 4 of the CE Process). If necessary, the consultant will revise the CEE form and or supporting documentation as directed. The District will submit the CEE to the Bureau of Design and FHWA for approval.

Detail Task 2 - Level 2 CE

Department Details:

Revise and resubmit CE to address adverse affects of replacing the bridge that has been identified as a contributing element to the Ridge Valley Rural Historic District by the US Department of the Interior.

Approach:

This task will be performed in conjunction with our subconsultant, AD Marble & Company.

Portions of the previous work involved with the preparation of the Level 2 CE are null and void as a result of the change in project scope. The sub-tasks which are affected include the evaluation of the existing historically significant structure and resolution of the adverse effects. Additional effort will also be involved since this bridge was classified as a contributing element to the Ridge Valley Rural Historic District by the U.S. Department of the Interior (April 28, 2006).

Task 5 - Public Involvement

Objective:

2.1.3
This task includes the attendance and preparation of informational materials to be viewed and/or distributed to the general public at public meetings. This task may also include the preparation of newsletters, public announcements and all other aspects of public involvement as outlined in Publication 295.

Scope:

2.1.3
1. Obtain approval from PMC to proceed with public involvement activities.

2. Prepare announcement for public meeting.

3. Prepare visual materials and/or flyers for general public meetings.

4. Attend all public meetings and address comments made at the meeting.

5. Prepare minutes to the meeting and submit to the Project Manager for review. Revise if necessary.

Detail Task 2 - Public Involvement

Department Details:

Hold additional meetings with 106 Consulting Parties and local emergency officials to mitigate the adverse affect of replacing the bridge and to coordinate bridge and roadway widths necessary for the use of emergency vehicles..

Approach:

Due to the high level of local interest in this project and its historic significance, additional effort is expected for public involvement. This task involves attendance at public meetings and preparation of design graphics and public announcements to be viewed by the general public.

Additional meetings with the municipality, Section 106 consulting parties and PennDOT's representatives are anticipated due to the high level of local interest in this assignment.

As part of the coordination with the Section 106 consulting parties, the preparation of approximately 10 display boards is anticipated. These boards will show existing and proposed conditions, as well as architectural renderings.

Coordination with local emergency management officials will be required to determine the suitable roadway dimensions for use in the AutoTurn analysis at the intersection with Sheep Hole Road.

Two additional public meetings are anticipated to coordinate with Tinicum Township, local residents and Section 106 Consulting Parties.

Additional meetings with Township officials, PennDOT, and the Design Manager are expected prior to each public meeting in order to discuss the project specifics.

Task 6 - Line and Grade

Objective:

2.4.6
This task consists of the development of the horizontal and vertical geometry. Publication 13M, Design Manual Part 2 applies to this task

Scope:

2.4.6
Prior to developing the vertical and horizontal geometry, all environmental and property constraints will be identified. The engineer will have a comprehensive understanding of all of the constraints and will discuss these with the District prior to finalizing the geometry.

Secure sufficient field survey information to develop the final geometry. Develop all control points for the vertical and horizontal geometry. The engineer will analyze the compatibility and acceptability of the horizontal and vertical geometry.

The following work elements are required for the successful completion of this task:
1. Finalize horizontal and vertical geometry and submit plans in accordance with Publication 10A, Design Manual Part 1A.
2. Review for compliance with design criteria and environmental constraints.
3. Tabulate project control point coordinates (POT, PC, PT, and PI) for all roadways and channel relocations.
4. Apply the project traffic data to the design criteria to determine lane requirements, turning movements, and weaving movements.
5. Check final structure depths and adjust vertical alignment as necessary. If alternative structures are being utilized, use the worst case scenario.
6. Tabulate pavement grades and superelevation for development of cross sections.

Detail Task 2 - Line and Grade

Department Details:

Update existing Line and Grade information to reflect horizontal and vertical geometry changes to the intersection between Sheep Hole Road and Headquarters Road in Tinicum Township.

Approach:

As a result of the changes to the approach roadway geometry and intersection configuration at Sheep Hole Road, the project's line and grade will need to be re-established. Modifications to the previously set horizontal and vertical geometry will be required. The modified geometry will require close evaluation using AutoTurn software to determine the ideal roadway dimensions and the revised sight distance will be determined.

Task 7 - Preliminary Geotechnical Engineering Report

Objective:

2.5.2
This task is the preparation of a Geotechnical Engineering Report for Pre-Final Design in accordance with Publication 10A, Design Manual Part 1A and Publication 293.
2.5.2.1
This task is the preparation of a Reconnaissance Soils and Geological Engineering Report in accordance with Publication 15M, Design Manual Part 4.

Scope:

2.5.2
The following work elements are required for the successful completion of this task:

1. Coordinate the effort with the District Geotechnical Engineer (DGE) and the other engineering disciplines involved. Perform QA/QC on work processes and products.

2. Perform analysis and design associated with embankment and cut slope construction, stormwater management facilities, drainage conduits, pavements, unsuitable materials, special geotechnical treatments, benching and transition zones, and geotechnical instrumentation for construction control.

3. Develop recommendations for use by the design team, and draft special provisions and details for construction.

4. Identify the anticipated scope of geotechnical investigations required during Final Design.

5. Prepare the GER for Pre-Final Design, presenting the recommendations and providing supporting documentation. Follow the outline in Publication 293, including a summary of the structure-related geotechnical investigations and reports for the project. Submit both a draft (95%) and a final (100%) version of the GER to the DGE.

6. Gather the information and materials necessary to assemble a preliminary soil profile plan. Obtain plan and profile sheets for the alignment from the design team. Obtain approval of the proposed graphics layout, scales and symbology.

7. Prepare the preliminary soil profile cover sheet and index sheet. Develop graphic logs of the borings. Prepare the profile sheets, showing the graphic boring logs and test results. Assemble the cover, index and profile sheets and submit a half-size copy as an appendix to the GER.

2.5.2.1
The following work elements are required for completion of this task:

1. Coordinate the effort with the District Geotechnical Engineer (DGE), District Bridge Engineer, BOD Bridge Quality Assurance Division (BQAD), and the other engineering disciplines involved. Perform QA/QC on work processes and products.

2. Perform an office investigation. Review background geological information and maps, boring logs, project

files and reports, environmental documents, and right-of-way plans to describe the soil/rock/hydrologic setting. Contact Federal and State agencies with access to soils and geologic data. Review previous geotechnical work performed in the vicinity of the structure.

3. Visit the site, interviewing local residents and engineers. Perform a detailed field reconnaissance and refine the soil/rock/hydrologic setting description.

4. Determine the important site characteristics and evaluate their impact on the proposed construction.

5. Develop a plan for core boring and testing, based on the requirements of Design Manual Part 4. Prepare a tabular summary of the proposed drilling following the format of Publication 222M.

6. Prepare the RSGER, presenting the information required in Design Manual Part 4, with the boring and testing plan as an appendix. Submit the report for approval.

Detail Task 2 - Preliminary Geotechnical Engineering Report

Department Details:

Update existing RSGER for a two span bridge to include the span arrangement revisions that was agreed at the Section 106 Consulting Parties meeting.

Approach:

The previously prepared Geotechnical Engineering Report will require modifications as a result of the revised substructure locations and dimensions. The initially submitted foundation report was prepared for a two-span bridge.

Coordination with the geotechnical sub-consultant (Dawood), the District Geotechnical Engineer and District Bridge Engineer will be required to determine the amount of previously gathered geotechnical information that can be reused for this modified layout.

Task 8 - Preliminary ROW Activities

Objective:

2.6.1
This task includes the requirements as stipulated under Publication 14M, Design Manual Part 3.
2.6.1.1
This task involves the determination of legal right-of-way widths in accordance with the Publication 14M, Design Manual Part 3, and research of property owner records in County Deed Recorder's office.
2.6.1.2
This task is the preparation of individual property plats in accordance with Publication 14M, Design Manual Part 3.

Scope:

2.6.1
A preliminary right-of-way plan will be prepared for all Department projects where the construction activities require property acquisition beyond the footprint of existing Department of transportation property. The right-of-way plan shall be prepared in accordance with the requirements and contents as stipulated in Design Manual Part 3.

The right-of-way plan(s) is(are) subject to a plan check review by the District Right-of Way Unit, Chief of Surveys and the Central Office Bureau of Design, Field Liaison Engineer, Highway Quality Control Division. The plan and all supporting data shall be submitted to the District in advance of the scheduled plan check review meeting. The person(s) responsible for the plan preparation will attend the review meeting. Departments and comments stemming from the plan review shall be addressed and incorporated in the subsequent right-of-way plan submission.

The right-of-way plan will be prepared on mylar with appropriate Pennsylvania professional engineer and surveyor seals affixed.

Until NEPA clearance has been obtained, the Department may not perform final negotiations and acquisitions of property.

A right-of-way certificate is issued when the Department has adequately acquired right-of-way to allow project construction.

2.6.1.1
All public legal right-of-way and private right-of-way within the project area shall be determined from plans and documents recorded in the County Courthouse, or on file in the offices of: PennDOT District, Municipality and involved agency. Copies of all right-of-way record data will be obtained, where available, and included with the R/W plan submission to the District.

The existing public and private right-of-way corridors shall be delineated and labeled on the highway plans. A description of, and the establishment record data for right-of-way, shall be included in the project General Notes for all involved public highways. When recorded subdivision plans exhibit public right-of-way corridors, determinations must include whether the local municipality has, or has not, adopted them.

Property owner research is generally initiated by reviewing the tax maps and records at the County Tax Assessors' Office. Once the highway project location is identified on the tax map(s), the anticipated property involvement's can be listed by tax map and parcel numbers. With this information, the tax assessment files can be researched to provide: Owners name and address, Deed Book and Page Number, parcel area, list of property improvements, and the assessed value of the property. Copies of the tax maps and assessment records may be purchased for subsequent use by the designer, and inclusion as backup data to the R/W plan submissions.

Based on the obtained tax record information, the records in the Recorder of Deeds office shall be researched to verify, or update, the involved property(s) ownership, deed book and page number. Upon verification of property ownership, property investigation shall continue to ascertain if any exceptions, adverse conveyances, easement rights, sale agreements, or subdivision plans associated with property are recorded. When the property research reaches a point that exhibits the best available records available, copies of the involved deeds will be purchased from the Recorder of Deeds for plotting and project property matrix map compilation.

When metes and bounds descriptions of the deed are vague, or lacking information, prior chain of title deed descriptions shall be reviewed and copied when their descriptions provided better clarification for boundary plotting purposes. If overlaps, or gaps, result on the property matrix map due to deed metes and bounds descriptions plots, the District Right-of-Way Administrator should be notified of these conditions, and to solicit his/her direction in resolving these issues.
2.6.1.2
Individual property plats will be prepared for all parcels with takes on highway projects, unless otherwise directed by the District.

The property plat shall contain all information necessary to provide a clear understanding, by all parties, of the existing conditions and the highway's taking requirements for the parcel, in accordance with Design Manual Part 3, Guidelines and Stipulations.

The proposed highway affects on the individual property plat must be consistent with those shown on the highway right-of-way plan sheet, however, the showing of details and labels beyond the boundary lines of parcel shall be avoided when practical.

Detail Task 2 - Preliminary ROW Activities

Department Details:

Update the existing Preliminary ROW Plans to reflect the revisions to span arrangement and substructure locations that was agreeable to the Section 106 Consulting Parties.

Approach:

The determination of legal right-of-way widths in accordance with Publication 14M and Design Manual - Part 3 will be required as a result of the change in bridge configuration and abutment locations. An updated right-of-way package consisting of a title sheet, index maps, general notes sheet, typical sections, profiles, plans and plats will be prepared and submitted to the District following the Design Field View submission.

Task 9 - Preliminary Type, Size and Location (TS&L)

Objective:

2.7.2
This task consists of the assembly of Type, Size and Location studies and development of recommendations for proposed structures within the project. Publication 15M, Design Manual Part 4 apply to this task.

Scope:

2.7.2
Review any previous studies or preliminary designs with respect to the selection of structure type, span arrangements, horizontal and vertical clearances, design controls and type section. Coordinate with the District on the logical selection of span arrangements, types of piers, and structure types suitable at each location.

The preliminary structure designs will be performed at a stage when the highway alignment and profile are well defined. Review structure requirements with the District prior to Design Field View (Line and Grade) submission and approval.

The work elements are required for the successful completion of this task:
1. Develop a location plan showing the feature to be crossed or retained, design controls and regulated areas
2. Identify possible pier and abutment locations
3. Evaluate geotechnical conditions to identify potential foundation types
4. Recommend locations for structure foundation borings
5. Evaluate constructability, vertical and horizontal clearances and site constraint issues in determining the most suitable structure design for the particular location
6. Prepare cost estimates for alternative structure designs
7. Prepare justification for recommended alternative
8. Prepare transmittal letter, plans and report for TS&L submission

Detail Task 2 - Preliminary Type, Size and Location (TS&L)

Department Details:

Update the existing Preliminary Type, Size and Location plans to reflect span arrangement changes agreeable to the Section 106 Consulting Parties.

Approach:

The preliminary Type Size and Location study will require modification as a result of changes to the structure dimensions and location. The structure's span configuration and geometry will be dictated by input provided by the Township and Section 106 consulting parties.

Per direction from the project's design manager, the TS&L process will require a streamlined submission. A Bridge Pro-Team meeting will be held to discuss structure options. Given the project geometry and previous coordination with the Section 106 consulting parties, it is assumed that only one feasible superstructure type will be identified in the TS&L submission (P/S concrete spread box beams).

Task 10 - Safety Review/Audit

Objective:

2.8.7
This task consists of the time required for the Safety Review Committee to review the preliminary plans and the Project Design Criteria Report.
2.8.7.1
This task consists of the time required for the Safety Review Committee to prepare the safety review committee recommendations.
2.8.7.2
This task consists of preparing collision diagrams and the analysis used for developing alternatives to reduce crash rates.

Scope:

2.8.7
1. Conduct the safety review/audit as early in the design process as possible.
2. Identify all applicable items on the Safety Review Checklist (see Publication 10A, Design Manual Part 1A). Add any additional items based on engineering judgement and experience.
3. Detect safety deficiencies in the design.
4. Recommend safety enhancements.
5. Prepare the Safety Review Submission (two copies) at least two weeks before the design field view (if applicable). Include the following:
* Color coded plans
* Profiles
* Typical sections
* Project Design Criteria Report (see Design Manual 1A for details)

2.8.7.1
Prepare a memo concerning the following:

1. Approval/disapproval of safety features
2. Safety recommendations
3. Approval/rejection of Design Exceptions
2.8.7.2
1. Review and evaluate root causes of crashes at a given location or area along a highway.

2. Prepare collision diagrams (if applicable) in accordance with the Manual of Transportation Engineering Studies. Consider the following per PennDOT Publication 201 Engineering and Traffic Studies:
* Total number of crashes during last 5 years
* Number of crashes by type or causation factor
* Vehicle type involved
* Pedestrian involvement
* Type of traffic control present
* Roadway or intersection geometric
* Cause of crash
* Time of crash
* Environmental conditions

Detail Task 2 - Safety Review/Audit

Department Details:

Update the existing Safety Review / Audit submission to address the safety concerns in the revised project scope. The consultant will be expected to prepare a design exceptions request to address the substandard geometric conditions.

Approach:

The previously prepared and submitted Safety Review Submission will require a complete update as a result of the revised project scope and geometry. It is expected that design exceptions will be required as a result of the substandard geometric conditions. Following the approval of the Safety Review Submission, Urban will prepare and submit the Design Exception Data Checklist from Design Manual – Part 1A.

Task 13 - Design Field View

Objective:

2.4.10
This task consists of the development, submission and approval of the Design Field View submission.
2.4.10.1
This task consists of the assembly of the Design Field View submission. Reference Publication 10/10A, Design Manual Part 1/1A.
2.4.10.2
This task is the preparation of the design field view submission based on the selected alignments, attendance at the design field view, preparing meeting minutes and responding to District's comments.
2.4.10.4
This task consists of preparing a draft design exception report in accordance with Strike-off-Letter 430-93-40

and Publication 10A, Design Manual Part 1A.

Scope:

2.4.10
1. Conduct design field view at the end of the preliminary engineering and within several weeks of the Design Field View Submission.
2. Evaluate the proposed alternatives under field conditions.
3. Solicit comments from review agencies for further project development.
4. Determine the preferred alternative if applicable.

2.4.10.1
Upon receipt of NEPA Clearance/Design Approval, the drawings will be further refined and developed to prepare a submission for the Design Field View.

The submission will include the following:
1. Line and Grade
2. Alternate Interchange Schematics
3. Rough preliminary signing layout including the type of sign supports, paint markings, and other traffic control devices to determine if the project is operational and can be signed.
4. Typical sections
5. Structure locations
6. Approximate pavement depth
7. Mass diagrams of grading quantities
8. Draft of Soils and Geological Engineering Report and Profile.
9. Traffic Control Plan
10. Drainage and Preliminary Hydraulic studies
11. Service road justification
12. Utilities
13. Preliminary traffic signals plan
14. Comments from the District Safety Review Committee
15. Agreements with Cities and other Political Subdivisions
2.4.10.2
1. Secure design field view approval for the preferred alternative developed during preliminary engineering.
2. Obtain written approval from the agency of authority to advance to final design.
2.4.10.4
Prepare the Design Exception Submission after the approval of the proposed design exception(s) by the District Safety Review Committee. Include this report in the Design Field View Submission. Address the following items as applicable:

* Provide project identification information
* Describe proposed work, design criteria, include typical sections
* Provide traffic information
* Identify substandard design elements
* Provide cost information with and without design exception
* Provide justification for retention of the design exception
* Evaluate accident history
* Describe remediation
* Provide collision diagrams and/or accident cluster diagrams
* Compare accident rates to statewide averages
* Describe mitigation measures
* Describe date and type of future upgrades
* Describe advantages and disadvantages of meeting full criteria

Complete the "Design Exception Data Checklist" Design Manual 1A. Include the following in the submission:

* Project location map
* Scoping field view minutes
* Accident analysis with collision diagrams
* Letter of recommendation from Safety Review Committee

* Plan, profiles, cross sections, typical sections if not previously included in the Design Field View Submission
* Bridge sufficiency rating and letter from District Bridge Engineer (if applicable)
* Ramp design sheet (Publication 13M, Design Manual Part 2), if applicable
* Photographs of existing conditions, if applicable

Detail Task 2 - Design Field View

Department Details:

Update the existing Design Field View submission to match the revised project scope.

Approach:

The Design Field View submission will require modifications as a result of changes to the project's scope and geometry.

Consultant Hierarchy

Business Partner	DBE Type	Supervising BP
Urban Engineers, Inc.	No	
A.D. Marble & Company	No	Urban Engineers, Inc.

Attachments

No records found.

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Session size: 0.1k

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Wed Jul 17 10:29:47 EDT 2013
Official ECMS Date/Time

TECHNICAL PROPOSAL REPORT

Agreement: E00342 Project Specific **Active**

Name: Three (3) Bridge Replacements in Bucks County **Selection Process:** Normal
Initiating Org: Engineering District 6-0

Supplement: 2 Normal **Executed**

Description: add additional coordination efforts with PADEP and extend the time of completion for Part 1

Part 1 - S.R. 1012-BRC

Description

preliminary engineering, environmental studies, final design and consultation during construction for the replacement of two structures on Headquarters Rd, Tinicum Township in Bucks County.

Task 1 - Project Management/Administration

Objective:

2.1.1
This task consists of the administrative effort required by principals, project manager, and involving personnel to complete the project on time, within budget, and provide a quality product.

Scope:

2.1.1
Project Management involves the planning, scheduling, organizing and controlling of resources to achieve specific objectives within established schedule, budget and quality standards. The Project Manager is responsible for but not limited to the tasks outlined in the Department Detail.

Detail Task 3 - Project Management/Administration

Department Details:

As per the standard scope.

Approach:

An agency coordination meeting was held on December 15, 2011 to debrief several individuals from permitting agencies on the history and status of the Headquarters Road Bridge in Tinicum Township, Bucks County. These agencies included the US Army Corps of Engineers (USACE), the Pennsylvania Department of Environmental Protection (PADEP), the Pennsylvania Historical and Museum Commission (PHMC), and the National Park Service (NPS).

The PADEP expressed an interest in viewing additional span configurations and bridge arrangements which were not previously prepared or agreed upon due to the Section 106 consultation efforts to preserve the historic context of the existing bridge (i.e., maintain similar bridge geometry features and aesthetics). Also, an alteration in the footprint of the proposed bridge was requested to address stream meandering which has occurred since the construction of the original foundations in 1812. To accommodate the requests of the PADEP and US Army Corps of Engineers, Urban was directed to perform the following tasks which are beyond the original scope of work:

• Evaluate the hydraulics of the currently proposed three-span, two-lane structure using a revised bridge location to address meandering.
• Evaluate the hydraulics of a two-span, two-lane structure to eliminate one of the piers in the channel.
• Evaluate the hydraulics of a one-span, two-lane structure to eliminate all piers in the channel.
• Evaluate the hydraulics of the one, two, and three-span structure configurations using the originally proposed geometry, and serve as a baseline for comparison with the other options.

Also, due to the high level of interest in this project from several stakeholders, Public Involvement efforts

on this assignment have been extensive. Previously estimated public outreach efforts had been underestimated due to additional coordination efforts required and agency coordination meetings that were not previously anticipated. Additional meetings with the municipality, Section 106 consulting parties, permitting agencies, and PennDOT's representatives are anticipated due to the high level of local interest in this assignment.

As a result of these changes in scope, Urban will be required to expend additional man-hours beyond those shown in our original proposal to revisit and complete the preliminary design work for this project.

An additional supplemental proposal will be required to complete the final design tasks, and will be submitted at a later date.

Additional Project Management effort will be necessary to manage the additional work outlined in this supplemental proposal request.

Task 3 - Hydrologic and Hydraulic Report

Objective:

2.7.1
This task consists of the preparation of Hydrologic and Hydraulic reports for all bridges, culverts and longitudinal encroachments to size waterway openings properly and to satisfy permitting requirements. Publication 13M, Design Manual Part 2; Publication 15M, Design Manual Part 4; and PADEP Chapter 105 apply to this task.

Scope:

2.7.1
A separate Hydrologic and Hydraulic Report is required for each hydraulic structure. However, dual structures or structures located within the same hydraulic system should be combined into one report.

The following work elements are required for the successful completion of this task:

1. Gather existing information to be used in the development of the hydrologic and hydraulic analyses and in the preparation of the H&H Report.

2. Perform a hydrologic analysis of the watershed at each proposed crossing using one or more of the Department approved methodologies. The use of a particular model shall be justified as valid for the situation in which it is being used. All assumptions and/or limitations of each model shall be clearly identified and referenced. Multiple hydrologic models are recommended to assist in validating the selected approach. An analysis of the flood history according to the guidelines contained in Design Manual Part 2 should also be considered.

3. Perform a hydraulic analysis for each proposed crossing including alternatives, if necessary, using one or more of the Department approved hydraulic models. The use of a particular model shall be justified as valid for the situation in which it is being used. All assumptions and/or limitations of each model shall be clearly identified and referenced. Where a Flood Insurance Study has been established by FEMA, the hydraulic data included in the study should be utilized to the maximum extent deemed appropriate. Each proposed alternative shall be modeled to assist in the justification for the selected alternative. The hydraulic model shall extend a sufficient distance upstream and downstream to adequately evaluate the potential impacts due to the proposed construction. The hydraulic model should be used to compare existing and proposed conditions with respect to water surface elevations and channel velocities for the design discharge rate(s), including the 500-year event for the scour evaluation and the "overtopping event" for the risk assessment.

4. Evaluate the scour potential at bridge abutments and piers in accordance with Design Manual Part 4. Evaluate the erosion potential at culvert outlets in accordance with HEC-14.

5. Evaluate the channel stability and design countermeasures, if needed.

6. Perform a risk assessment or analysis for each applicable waterway structure or encroachment

alternative.

7. Evaluate the hydraulic impacts as a result of temporary encroachments and/or permanent bank protection, if applicable.

8. Prepare the Hydrologic and Hydraulic Report following the general outline described in Design Manual Part 2.

9. If applicable, prepare a Conditional Letter of Map Revision (CLOMR) in accordance with FEMA regulations. The scope of work for the preparation of the CLOMR is not included herein and should be developed prior to initiating the work.

Detail Task 3 - Hydrologic and Hydraulic Report

Department Details:

Evaluate two (2) TS&L aternatives and include the results in the Hydrologic and Hydraulic Report.

Approach:

To accommodate the requests presented by the PADEP to modify the span configuration and bridge footprint, additional hydrologic and hydraulic studies will be needed. This includes shifting the existing bridge location approximately 15-ft to 30-ft to address stream meandering, and the evaluation of two additional bridge span configurations (1-span and 2-span bridges), each requiring a different HEC-RAS model.

Task 5 - Public Involvement

Objective:

2.1.3
This task includes the attendance and preparation of informational materials to be viewed and/or distributed to the general public at public meetings. This task may also include the preparation of newsletters, public announcements and all other aspects of public involvement as outlined in Publication 295.

Scope:

2.1.3
1. Obtain approval from PMC to proceed with public involvement activities.

2. Prepare announcement for public meeting.

3. Prepare visual materials and/or flyers for general public meetings.

4. Attend all public meetings and address comments made at the meeting.

5. Prepare minutes to the meeting and submit to the Project Manager for review. Revise if necessary.

Detail Task 3 - Public Involvement

Department Details:

Assume two (2) additional consulting party meetings in Tinicum Township.

Approach:

Due to the high level of interest in this project from several stakeholders, Public Involvement efforts have been extensive. Previously estimated public outreach efforts had been underestimated due to additional coordination efforts required and agency coordination meetings that were not anticipated.

Additional meetings with the municipality, Section 106 consulting parties, permitting agencies, and PennDOT's representatives are anticipated due to the high level of local interest in this assignment.

As part of the continued coordination with the Section 106 consulting parties, the preparation of approximately 10 display boards is anticipated. Previously prepared display boards will require extensive

updates to show the latest proposed conditions and any updates that result from coordination with the PADEP.

Two additional public meeting is anticipated to coordinate with Tinicum Township, local residents and Section 106 Consulting Parties.

Task 6 - Line and Grade

Objective:

2.4.6
This task consists of the development of the horizontal and vertical geometry. Publication 13M, Design Manual Part 2 applies to this task

Scope:

2.4.6
Prior to developing the vertical and horizontal geometry, all environmental and property constraints will be identified. The engineer will have a comprehensive understanding of all of the constraints and will discuss these with the District prior to finalizing the geometry.

Secure sufficient field survey information to develop the final geometry. Develop all control points for the vertical and horizontal geometry. The engineer will analyze the compatibility and acceptability of the horizontal and vertical geometry.

The following work elements are required for the successful completion of this task:
1. Finalize horizontal and vertical geometry and submit plans in accordance with Publication 10A, Design Manual Part 1A.
2. Review for compliance with design criteria and environmental constraints.
3. Tabulate project control point coordinates (POT, PC, PT, and PI) for all roadways and channel relocations.
4. Apply the project traffic data to the design criteria to determine lane requirements, turning movements, and weaving movements.
5. Check final structure depths and adjust vertical alignment as necessary. If alternative structures are being utilized, use the worst case scenario.
6. Tabulate pavement grades and superelevation for development of cross sections.

Detail Task 3 - Line and Grade

Department Details:

Revise plans to include two (2) additional alternatives.

Approach:

Due to feedback received from the PADEP, adjustments to the proposed bridge location and profile will require additional adjustments to the project's horizontal and vertical geometry. The modified geometry will need to be evaluated using AutoTurn software to determine the required roadway dimensions and the revised sight distance.

Task 8 - Preliminary ROW Activities

Objective:

2.6.1
This task includes the requirements as stipulated under Publication 14M, Design Manual Part 3.
2.6.1.1
This task involves the determination of legal right-of-way widths in accordance with the Publication 14M, Design Manual Part 3, and research of property owner records in County Deed Recorder's office.
2.6.1.2
This task is the preparation of individual property plats in accordance with Publication 14M, Design Manual Part 3.

Scope:

2.6.1

A preliminary right-of-way plan will be prepared for all Department projects where the construction activities require property acquisition beyond the footprint of existing Department of transportation property. The right-of-way plan shall be prepared in accordance with the requirements and contents as stipulated in Design Manual Part 3.

The right-of-way plan(s) is(are) subject to a plan check review by the District Right-of Way Unit, Chief of Surveys and the Central Office Bureau of Design, Field Liaison Engineer, Highway Quality Control Division. The plan and all supporting data shall be submitted to the District in advance of the scheduled plan check review meeting. The person(s) responsible for the plan preparation will attend the review meeting. Departments and comments stemming from the plan review shall be addressed and incorporated in the subsequent right-of-way plan submission.

The right-of-way plan will be prepared on mylar with appropriate Pennsylvania professional engineer and surveyor seals affixed.

Until NEPA clearance has been obtained, the Department may not perform final negotiations and acquisitions of property.

A right-of-way certificate is issued when the Department has adequately acquired right-of-way to allow project construction.

2.6.1.1
All public legal right-of-way and private right-of-way within the project area shall be determined from plans and documents recorded in the County Courthouse, or on file in the offices of: PennDOT District, Municipality and involved agency. Copies of all right-of-way record data will be obtained, where available, and included with the R/W plan submission to the District.

The existing public and private right-of-way corridors shall be delineated and labeled on the highway plans. A description of, and the establishment record data for right-of-way, shall be included in the project General Notes for all involved public highways. When recorded subdivision plans exhibit public right-of-way corridors, determinations must include whether the local municipality has, or has not, adopted them.

Property owner research is generally initiated by reviewing the tax maps and records at the County Tax Assessors' Office. Once the highway project location is identified on the tax map(s), the anticipated property involvement's can be listed by tax map and parcel numbers. With this information, the tax assessment files can be researched to provide: Owners name and address, Deed Book and Page Number, parcel area, list of property improvements, and the assessed value of the property. Copies of the tax maps and assessment records may be purchased for subsequent use by the designer, and inclusion as backup data to the R/W plan submissions.

Based on the obtained tax record information, the records in the Recorder of Deeds office shall be researched to verify, or update, the involved property(s) ownership, deed book and page number. Upon verification of property ownership, property investigation shall continue to ascertain if any exceptions, adverse conveyances, easement rights, sale agreements, or subdivision plans associated with property are recorded. When the property research reaches a point that exhibits the best available records available, copies of the involved deeds will be purchased from the Recorder of Deeds for plotting and project property matrix map compilation.

When metes and bounds descriptions of the deed are vague, or lacking information, prior chain of title deed descriptions shall be reviewed and copied when their descriptions provided better clarification for boundary plotting purposes. If overlaps, or gaps, result on the property matrix map due to deed metes and bounds descriptions plots, the District Right-of-Way Administrator should be notified of these conditions, and to solicit his/her direction in resolving these issues.
2.6.1.2
Individual property plats will be prepared for all parcels with takes on highway projects, unless otherwise directed by the District.

The property plat shall contain all information necessary to provide a clear understanding, by all parties, of the existing conditions and the highway's taking requirements for the parcel, in accordance with Design Manual Part 3, Guidelines and Stipulations.

The proposed highway affects on the individual property plat must be consistent with those shown on the highway right-of-way plan sheet, however, the showing of details and labels beyond the boundary lines of parcel shall be avoided when practical.

Detail Task 3 - Preliminary ROW Activities

Department Details:

Investigate ROW impacts as part of the alternative study.

Approach:

The shifting of the proposed bridge will result in new impacts to the existing right-of-way at the project site. This will involve temporary impacts and additional slope easements on the Ottsville side of the bridge.

Task 9 - Preliminary Type, Size and Location (TS&L)

Objective:

2.7.2
This task consists of the assembly of Type, Size and Location studies and development of recommendations for proposed structures within the project. Publication 15M, Design Manual Part 4 apply to this task.

Scope:

2.7.2
Review any previous studies or preliminary designs with respect to the selection of structure type, span arrangements, horizontal and vertical clearances, design controls and type section. Coordinate with the District on the logical selection of span arrangements, types of piers, and structure types suitable at each location.

The preliminary structure designs will be performed at a stage when the highway alignment and profile are well defined. Review structure requirements with the District prior to Design Field View (Line and Grade) submission and approval.

The work elements are required for the successful completion of this task:
1. Develop a location plan showing the feature to be crossed or retained, design controls and regulated areas
2. Identify possible pier and abutment locations
3. Evaluate geotechnical conditions to identify potential foundation types
4. Recommend locations for structure foundation borings
5. Evaluate constructability, vertical and horizontal clearances and site constraint issues in determining the most suitable structure design for the particular location
6. Prepare cost estimates for alternative structure designs
7. Prepare justification for recommended alternative
8. Prepare transmittal letter, plans and report for TS&L submission

Detail Task 3 - Preliminary Type, Size and Location (TS&L)

Department Details:

Evaluate two (2) additional alternatives.

Approach:

Previously, it was assumed that only one feasible bridge configuration would be identified in the TS&L submission due to the request of project stakeholders to preserve the existing structure's aesthetics. This involved a P/S concrete spread box beam bridge. A streamlined TS&L submission was recommended for this project.

The work prepared previously for the Type Size and Location study will require significant modifications as

a result of requested modifications to the structure's dimensions and location. Several different bridge configurations will be prepared, and then coordinated with the H&H analysis. This will include evaluation of a one-span bridge, a two-span bridge, and the previously prepared three-span bridge with a lowered profile and a shifted bridge location to address stream meandering.

Additional superstructure types will need to be evaluated to accommodate the additional span configurations that are required. Cost comparisons of each structure will be required to determine the cost implications of each bridge arrangement.

Consultant Hierarchy

Business Partner	DBE Type	Supervising BP
Urban Engineers, Inc.	No	

Attachments

No records found.

You are currently logged in as **Ryan M. Whittington**.

Release: 25.2
Session size: 0.1k

Wed Jul 17 10:30:26 EDT 2013
Official ECMS Date/Time

Purpose and Need
Headquarters Road (SR 1012) over Tinicum Creek
Tinicum Township, Bucks County

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, public utilities and emergency services of the surrounding area. The Headquarters Road Bridge is composed of a concrete encased steel I-beam superstructure (1919) that is supported by masonry abutments and piers (1812).

Due to a hole found in the bridge deck during a routine inspection, the bridge was closed to the public on March 2nd, 2011. The most recent inspection, performed in October of 2012, determined that the overall condition of the bridge is serious and that the structure, in its current state, is structurally deficient. Prior to the closure of the Geigel Hill Road Bridge in 2002, the Headquarters Road structure accommodated approximately 900 vehicles per day (2001 PennDOT Traffic Count). Prior to its closure in 2011, an average of 631 vehicles per day used the Headquarters Road Bridge (2008 PennDOT Traffic Count).

The existing masonry substructure exhibits multiple areas of stone displacement and advanced streambed erosion which has exposed the structure's foundation. The retaining walls which lie in the Northwest, Northeast and Southeast quadrants of the structure show signs of settlement and base slippage with some areas of wall displaced as much as 12" with localized collapse. Sediment deposition at the bridge coupled with the movement of the stream over time has caused the western most abutment to encroach into the stream channel causing a scour hazard. To temporarily alleviate concerns of the substructure deteriorating further, grout bags were installed to address immediate scour concerns and shotcrete repairs were made to areas of damaged masonry.

The superstructure is severely deteriorated with the majority of the concrete façade cracked and spalled which has exposed the steel stringers. Exposed steel stringers exhibit extensive section loss which has reduced their load carrying capacity and the concrete deck exhibits full-depth longitudinal cracking and spalling as well as several large holes which have been covered by steel plates.

In addition to the severely deteriorated state of the structure the existing bridge has a curb to curb width of 16' allowing only one lane of traffic to pass at any given time. A turning movement analysis showed that a single unit vehicle (30' in length) making a left hand turn onto the bridge from Headquarters Road will impact the bridge. The structure therefore cannot accommodate Tinicum Township's largest fire response vehicle, a 41.5 ft ladder truck. Lastly, the sight distance and horizontal curve radius of the western approach to the Headquarters Road bridge does not meet PennDOT safety criteria.

In order to address the above issues, the needs for the project include:

- The bridge is structurally deficient
- The bridge is functionally obsolete
- The retaining walls exhibit failure
- Due to the existing structure's geometry and limited roadway width, it cannot safely and effectively accommodate current and future traffic needs including emergency response vehicles
- Heavy scour exists along the western abutment resulting in the exposure of the bridge foundations and an increase in the structures vulnerability to further deterioration

A.D. MARBLE & COMPANY
Environmental, Cultural & Engineering Services

375 East Elm Street
Suite 101
Conshohocken, PA 19428
Tel. 484.533.2500
Fax 484.533.2599

July 9, 2013

Ed Rodgers
Delaware Riverkeeper Network
925 Canal Street
7th Floor
Bristol, PA 19007

REFERENCE: Headquarters Road (S.R. 1012, Section BRC) Bridge over Tinicum Creek Tinicum Township, Bucks County, PA (MPMS 13716)

Dear Section 106 Consulting Party Meeting Attendee:

Attached you will find the meeting minutes from the June 17, 2013 Section 106 Consulting Party Meeting. If you have any comments to these minutes, please respond to Colleen Meiswich via telephone at 484-533-2552 or cmeiswich@admarble.com by July 23, 2013.

If you have any project-related questions, please contact Ryan Whittington, PennDOT Consultant Project Manager, at (610) 205-6871, or the PennDOT District 6-0 Cultural Resources Professional, Monica Harrower, at (610) 205-6709. Thank you for your participation in this project.

Sincerely,

Colleen K. Meiswich

Colleen K. Meiswich
Sr. Project Manager/Environmental Planner

cc: Jonathan Crum, FHWA
Barbara Frederick, PHMC
Monica Harrower, PennDOT District 6-0
Ryan Whittington, PennDOT Consultant Project Manager

MEMORANDUM OF MEETING

DATE OF MEETING: June 17, 2013

LOCATION: Quakertown Public Library, Quakertown, PA

REGARDING: Headquarters Road Bridge over Tinicum Creek
S.R. 1012, Section BRC
Tinicum Township, Bucks County, Pennsylvania
Section 106 Consulting Party Meeting No. 4

ATTENDEES: Sign-in sheet is attached to the minutes.

Introductions

Ryan Whittington of HNTB, Consultant Project Manager for PennDOT, began the meeting by noting that the purpose of this Section 106 Consulting Party meeting was to provide clarity on where the project currently stands, provide the new consulting parties with details on the core issues surrounding the project, and to provide an overview of the Section 106 review for the project. He introduced Dr. Brenda Mitchell who would be serving as the facilitator for the meeting.

Ground Rules

Dr. Mitchell introduced herself to the attendees and thanked everyone for coming. She explained to those in attendance at the meeting that PennDOT has hired her as a non-partial party facilitator to help move the process and not to make decisions. She continued, stating that she is solely interested in how the process of consulting party involvement can be improved moving forward. She noted that candid conversations were welcome. She also informed the audience that additional meetings would occur in the future, and the purpose of this meeting was for information sharing and not decision making. Dr. Mitchell referenced two easel pads at the front of the room and noted that these easel pads were for use during the meeting. One would contain "parking lot" information, which was described as topics that come up that may not be relevant to the Section 106 process. The other easel pad would be used for possible agenda items for the next meeting. Dr. Mitchell noted that the next meeting would occur the week of September 17th; the timing and location of the meeting was to be determined. She indicated that attendees would have an opportunity to ask questions at the end of each section of the agenda. Dr. Mitchell then introduced Kenda Gardner, PennDOT Deputy Chief Counsel.

Ms. Gardner, PennDOT Deputy Chief Counsel, informed the attendees that the meeting was not allowed to be recorded. Still pictures were permitted. Meeting minutes would be prepared and distributed to all attendees who would be provided an opportunity to comment on the minutes. Dr. Mitchell indicated that meeting minutes would be provided within 3 weeks of the meeting. Mr. Whittington noted that two documents would be

prepared for the attendees: the meeting minutes summarizing the discussion during the meeting and a comment response document which would collect comments received after the meeting and provide PennDOT's response to those comments. The comment response document would also serve as a document to answer any questions that were not able to be answered during the meeting.

Dr. Mitchell referenced the guidelines/ground rules each attendee received prior to the meeting. She asked attendees to review and refresh themselves with the ground rules. The ground rules are not set in stone and changes can be made with the agreement of the consulting parties, FHWA, and PennDOT at any meeting.

A discussion ensued regarding why the meeting could not be recorded if all of the consulting parties in attendance were in agreement and wanted it to be recorded. Ms. Gardner referenced Pennsylvania wiretapping laws. She also noted that this is a Section 106 Consulting Party meeting and not a general public meeting. A meeting attendee asked why the public was allowed to attend the meeting if it was a consulting party meeting. Mr. Whittington clarified stating that members of the public who were interested in attending were allowed to attend the meeting and observe. Ms. Gardner indicated that aside from the law, some people may not feel comfortable talking and voicing their opinion if the meeting is recorded. She indicated that she would look into this issue further.

A member of local government, Nick Forte, noted that during meetings, some things are misquoted and a recording allows an established record to be set. He also noted that if you're being recorded, it commits you to what you said.

Ms. Gardner will research how the wiretapping law comes into play with the Section 106 process. Some attendees voiced concern that they wanted the entire presentation recorded to get a true recording of the meeting instead of simply the technical presentation and the meeting minutes. Ms. Gardner indicated that in the past, PennDOT requested that no recordings occur and that meeting minutes serve the purpose of recording the discussions which take place during the meeting. An attendee asked what would happen if the meeting is recorded; they expressed that they do not believe PennDOT would do anything if someone were to record the meeting and offered to give his name and address. Ms. Gardner indicated that PennDOT is trying to value everyone's rights and some people may not want to be recorded; she restated that the PowerPoint presentation and meeting minutes would be distributed to all attendees and that the attendees would have an opportunity to comment on the meeting minutes. An attendee asked who was preparing the minutes. The minutes were being recorded by hand by A.D. Marble & Company representatives (Russ Stevenson and Colleen Meiswich) and Urban Engineers representatives (Mike McAtee and Matthew Marquardt).

Kitty Henderson, representing the Historic Bridge Foundation, had joined the meeting via a conference call and noted that she was having difficulty hearing the speakers at the meeting. It was explained to the consulting parties that Ms. Henderson was joining the

meeting from Texas. A member of the meeting asked how PennDOT prevents her from recording the meeting.

Damon Aherne, representing the Tincium Creek Watershed Association, noted that he has been a consulting party for the project since its start and that in the past he has been extremely dissatisfied with the way the meeting minutes were prepared and if the meeting is not recorded, than the consulting parties will not have a true record to comment on. He noted that the ground rules did not say that recordings would be prohibited and that at least two attendees were planning on recording the meeting to share with those parties who were unable to attend. Ms. Gardner reiterated that she will speak with other members of PennDOT legal counsel to get a ruling on this issue and will have an answer prior to the next consulting party meeting. Maya Van Rossum of the Delaware Riverkeeper Network said that the consulting parties in attendance object to the lack of permission to record the meeting and asked for a show of hands to determine if the consulting parties were ok with being recorded. A total of 27 attendees raised their hands in favor of the meeting being recorded; no objections to the recording from consulting parties was received. However, some consulting parties in attendance did not raise their hands. Ms. Gardner indicated that she inquired with another attorney at PennDOT about this recording issue on another project and his response was that it was not permitted and that she would follow up with him to obtain the reasoning and the specific law which prohibited it. Mr. Whittington explained that 30 minutes had been spent discussing the issue of videotaping and that there is still a lot of important material to cover during the meeting. He indicated that PennDOT would look into the issue of videotaping prior to the next meeting and have an answer for the consulting parties as to why it is prohibited. Mr. Aherne proposed that the meeting adjourn until the issue of videotaping is resolved. Dr. Mitchell noted that the purpose of the meeting is to share information with the consulting parties and if he or others would like to leave the meeting then they are free to do so, otherwise the meeting would continue with the planned agenda. She noted that videotaping will be revisited and addressed for the next meeting. An attendee asked that it be noted specifically in the minutes that they objected to the restriction on recording of the meeting. Dr. Mitchell asked that if anyone has additional ground rules or would like to revise the ground rules for the next meeting to email the proposed changes in advance to Mr. Whittington or Monica Harrower.

An attendee asked if they could be advised in writing of any other restrictions or legal prohibitions that would be in effect during this and future consulting party meetings. It was requested that PennDOT tell the consulting parties in advance what restrictions/prohibitions would be in effect for future meetings. Damon Ahene noted that he wanted to go ahead and record the meeting and would give his name and number be subject to whatever penalties may ensue.

FHWA Role

Dr. Mitchell introduced Jonathan Crum of the Federal Highway Administration (FHWA) to review FHWA's involvement with the project. Mr. Crum addressed FHWA's role in the transportation project development process. Mr. Crum explained that the project is comprised of 80% Federal funds and 20% State funds. FHWA provides oversight and

since Federal funding is involved, there are laws, regulations, and Executive Orders that must be adhered to. Previously, the project was funded entirely by State funds and the Army Corps of Engineers was the lead federal agency. FHWA ensures that the National Environmental Policy Act (NEPA) is followed and that the cultural and environmental impacts of the project are properly documented. Mr. Crum noted that the "NEPA umbrella" is a common reference since it deals with balancing numerous concerns, in this case a historic district, exceptional value stream, etc. with the needs of the project.

Project Purpose and Need

Mr. Crum then described the intent of a project's Purpose and Need Statement. The statement is not something that is simply put together; instead, it is developed during the transportation planning process. It identifies the problems (or 'needs') associated with the project. The 'Purpose' is a brief, general statement about how to address those problems. The Purpose and Need statement is not meant to present various alternatives, but instead helps to drive decision-making to satisfy the problems/needs. Mr. Crum asked the attendees to let him know if anyone had any questions about the Purpose and Need Statement that was developed for this project. No questions were raised about the explanation of the Purpose and Need Statement by any attendees at this time in the meeting. Mr. Crum introduced Mr. Whittington to read the statement which had been prepared for the project.

Mr. Whittington read an abbreviated version of the project Purpose and Need Statement and referred the attendees to the handouts they received in the mail prior to and at the meeting which contains the full statement. The following was read at the meeting:

- 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, public utilities and emergency services of the surrounding area. The Headquarters Road Bridge is composed of a concrete encased steel I-beam superstructure (1919) that is supported by masonry abutments and piers (1812).
- In order to address issues noted in the Purpose and Need Statement, the needs for the project include:
    - The bridge is structurally deficient
    - The bridge is functionally obsolete
    - The retaining walls exhibit failure
    - Due to the existing structure's geometry and limited roadway width, it cannot safely and effectively accommodate current and future traffic needs including emergency response vehicles
    - Heavy scour exists along the western abutment resulting in the exposure of the bridge foundations and an increase in the structures vulnerability to further deterioration

Mr. Whittington asked if there were any questions about the Purpose and Need statement. With no questions from the attendees, Dr. Mitchell introduced Monica Harrower to present the Section 106 process.

Section 106 Review

Monica Harrower introduced herself as the Cultural Resources Professional responsible for above ground historic resources in PennDOT District 6-0, which represents five counties in Southeast Pennsylvania. She indicated that she and Cathy Spohn (the District 6-0 Archaeologist) are responsible for Cultural Resource Reviews in District 6-0. She began a presentation on Section 106 which is summarized below.

- Section 106 of the National Historic Preservation Act of 1966 (NHPA) requires Federal agencies to take into account the effects of their undertakings on historic properties. The historic preservation review process mandated by Section 106 is outlined in 36 CFR Part 800.
- According to 36 CFR Part 800.16(y), an undertaking is defined as "a project, activity, or program funded in whole or in part under the direct or indirect jurisdiction of a Federal agency, including those carried out by or on behalf of a Federal agency; those carried out with Federal financial assistance; and those requiring a Federal permit, license or approval." In Pennsylvania, PennDOT acts as an agent for the Federal Highway Administration. For most PennDOT projects, FHWA is the lead Federal agency. In some cases, when a project is 100% state funded and a US Army Corps of Engineers (USACE) permit is required, USACE is the lead Federal agency.
- The regulations define the Area of Potential Effect (APE) as the "geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist. The area of potential effects is influenced by the scale and nature of the undertaking and may be different for different kind of effects caused by the undertaking."
- PennDOT is responsible for determining the APE. This determination may be made in consultation with the State Historic Preservation Officer (SHPO) or Tribal Historic Preservation Officer (THPO). In Pennsylvania, the SHPO is the Pennsylvania Historical and Museum Commission (PHMC).
- The SHPO, THPO, the Federal applicant or agency and representatives of local governments have consultative roles in the section 106 process.
- In addition, certain individuals and organizations with a demonstrated interest in the undertaking may participate as consulting parties. Demonstrated interest may include legal or economic relation to the undertaking or affected properties, or concern with the undertaking's effects on historic properties.
- For example, consulting parties may be municipalities, property owners, business owners, or local historical societies. Those in attendance at this meeting are considered consulting parties since they met the appropriate criteria and had completed a form indicating they wanted to be consulting parties for this project.
- A historic property is defined as "any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places maintained by the Secretary of the Interior."
- In evaluating the eligibility of historic properties, a number of criteria must hold true. The first is the property is generally at least 50 years of age or older. Criteria of significance is then determined. A property may fit into one of the following:

Criterion A – associated with events or trends; Criterion B – associated with persons; Criterion C – associated with architecture or engineering; Criterion D – associated with information potential. The property must also possess integrity. There are seven aspects of integrity: location; design; setting; materials; workmanship; feeling; and association.

- The regulations define effect as "alteration to the characteristic of a historic property qualifying it for inclusion in or eligibility for the National Register."
- If an undertaking has an effect, then we apply the criteria of adverse effect. An adverse effect is determined when the effect "alters, directly or indirectly the characteristics of a historic property that qualify the property for inclusion in the National Register in a manner that would diminish the integrity of the property's location, design, setting, material, workmanship, feeling, or association."
- There are three possible findings of effect: 1) No Historic Properties Affected: There are no historic properties present or if the undertaking will have no effect upon the historic properties present in the APE, 2) No Adverse Effect: The project will affect the historic property but the project's impacts do not meet the criteria of adverse effect, and 3) Adverse Effect: When historic properties will be adversely affected, Section 106 review usually ends with a legally binding agreement that establishes how the Federal agency will avoid, minimize, or mitigate the adverse effect.
- Project Path was developed between PennDOT and Preservation Pennsylvania. When you log into the website (www.paprojectpath.org), you can search for the project via State Route, MPMS, or various other methods. It is a searchable database available for the public. An individual can sign up to the website based on your interests. You will then receive email updates on projects associated with your interest. Ms. Harrower encouraged all attendees to visit the website.
- Ms. Harrower indicated that since this is an older project, PennDOT is developing a summary document regarding the Section 106 process. This will be provided to PHMC and to the consulting parties; it identifies what has happened to date in regard to the Section 106 process.

Question: A question was asked as to when the consulting parties can expect the Section 106 document and when a complete copy of the record will be provided to the consulting parties.
Comment: Ms. Van Rossum indicated that she would like copies of all traffic counts. The experts hired by the Delaware Riverkeeper Network do not have enough information to review the decision PennDOT has developed. She also indicated that three weeks is not enough time for their experts to review the material
Answer: Mr. Whittington indicated that there are many new consulting parties identified since the previous meetings. Urban Engineers, Inc. (Urban) has evaluated the existing structure and have prepared a presentation for the attendees. PennDOT will provide the traffic count data to consulting parties after the meeting. He indicated he wanted to get all of the new consulting parties up to speed with where the project stands, and to get all attendees to a common level of understanding regarding where the project stands at this point. He explained that there will be two documents prepared after the meeting, meeting minutes and a comment response document. The meeting minutes will be sent out within

three weeks after the meeting and the comment response document will be issued at a later date, sometime after all comments have been received. *[Subsequent to the meeting, on June 21, the following traffic data was provided to all of the meeting attendees and the consulting parties who were unable to make the meeting via mail: PennDOT Traffic Monitoring Data (2001 and 2008) and DVRPC Travel Monitoring Data (2002, 2003, and 2008).]*

Comment: It was emphasized that the consulting parties want hard copies, dates, and conditions of when measurements were made and when data was collected.
Answer: Mr. Whittington responded stating that additional information will be provided before the September meeting. By mid-to-late July, the Section 106 document will be sent to the consulting parties. The consulting parties will have an opportunity to review and respond to the document. *[The above-referenced Section 106 document will be provided to all of the meeting attendees and the consulting parties who were unable to make the meeting during the week of July 15.]*

Question: Barbara Frederick (SHPO) asked how will the history of the project be distributed and how will the information in the document be presented?
Answer: Ms. Harrower indicated it can be emailed, mailed and put on Project Path. She mentioned that the document will be a step by step summary of the Section 106 process for the Headquarters Road project and would provide a retracing of the events, meetings, and decisions that have occurred up to this point.

Comment: Mr. Aherne suggested that the current meeting be postponed until the Fall when PennDOT has the documents together and distributed to the consulting parties.

Comment: Bruce Wallace, a Tinicum Township resident, noted that there were a number of assertions given in the project Purpose and Need which were unsupported and not based on factual information the consulting parties had access to. He asked where did these assertions come from?
Answer: Mr. Whittington explained that the traffic count data mentioned in the Purpose and Need statement came from PennDOT and DVRPC counts and that the information pertaining to the existing condition of the bridge came from Urban Engineers report from 2006. He noted the Urban report was distributed previously to the original consulting parties, and it will be distributed again to new consulting parties.

Question: Vincent Dotti, a Tinicum Township Supervisor, asked what the scientific and engineering basis is to the project Purpose and Need and why the consulting parties have not been given these studies previously.
Answer: Mr. McAtee noted that 2006 Inspection Report was used as the basis for evaluation of the existing bridge and its suitability for reuse, and that this report was provided to the original consulting parties. Additional hard copies were brought to this meeting for distribution, and electronic copies would be provided. Mr. Whittington explained that traffic count information is available to the public on DVRPC's website. *[Subsequent to the meeting, on June 21, Urban's 2006 Existing Condition Evaluation Report and PennDOT Traffic Monitoring Data (2001 and 2008) and DVRPC Travel*

Monitoring Data (2002, 2003, and 2008) was provided to all of the meeting attendees and the consulting parties who were unable to make the meeting via mail.]

Comment: There are disputes about whether core borings were collected in the project area and specifically if they were done on the bridge.
Answer: Mr. McAtee of Urban noted that there were no core borings done on the bridge. A foundation report was prepared earlier in the project, which involved soil / rock borings. But borings through the existing stone masonry was not performed because it was potentially destructive to the existing masonry and foundations. He went on to explain that Urban Engineers conducted there evaluation of the bridge based on non-destructive inspection methods.

Comment: It was noted that the consulting parties wanted the 2007-2011 traffic counts and the 2001-2006 data as well as the turning radius study performed for the project. *[Subsequent to the meeting, on June 21, the following traffic data was provided to all of the meeting attendees and the consulting parties who were unable to make the meeting via mail: PennDOT Traffic Monitoring Data (2001 and 2008) and DVRPC Travel Monitoring Data (2002, 2003, and 2008).]*

Question: Ms. Van Rossum asked if a file review at PennDOT's offices would be possible in order to review the entire public record of the project including all emails and documents associated with PennDOT's decisions. As a consulting party, she would like to request to review the records by July 1 and be given 60 days to provide comments on the project file. They requested that an extension be granted if needed. [At this point of the meeting, an easel board entitled "Information Needed" was created.]
Answer: Dr. Mitchell asked Ms. Van Rossum which files she would like to review, since "all project files" is a bit vague. She asked what Ms. Van Rossum meant by "all files".
Ms. Van Rossum responded stating that she wants to see everything since there are documents that they may not agree with. They would like to see everything that they are entitled to see in a timely fashion.

Question: Kathryn Auerbach, a consultant for the Delaware Riverkeeper, asked if there is any recourse to how the Purpose and Need is written.
Answer: Dr. Mitchell responded that any comments on the Purpose and Need should be provided to Ryan Whittington. All comments regarding the Purpose and Need will be considered, but the determination to revise the Purpose and Need is FHWA's decision. She mentioned that comment cards were provided at the start of the meeting to ensure that all of their concerns and comments were taken into account. Ms. Meiswich indicated there are extra comment cards available and showed the attendees where the comment card collection box was located.

Russ Stevenson of AD Marble & Company continued with the PowerPoint presentation and identified the historic properties in the APE and updated the status of Archaeology.

- Ridge Valley Historic District – The Ridge Valley Historic District (District) was listed on the National Register of Historic Places (National Register) on July 24,

1992, under Criterion A in the area of agriculture as an example of farming in a small stream valley in Bucks County. It is also listed under Criterion C in the area of architecture as it contains representative examples of rural vernacular architecture in southeast Pennsylvania that date to the late-eighteenth through early twentieth century. The character-defining features of the District are the modest farms (including their concentration of rural vernacular dwellings and associated outbuildings) along Tinicum Creek and its tributaries, the rolling topography, and its fields, meadows, wetlands, and woodland that provide a setting to the buildings, structures, and sites that comprise the District. The District contains a total of 77 resources: 67 are contributing and 10 are non-contributing.

- Headquarters Road Bridge (Bridge No. 286) – The Headquarters Road bridge (Bridge) is a three-span, 80'-long, 16' wide curb-to-curb (18' wide out-to-out), concrete encased steel stringer bridge that is supported on an stone substructure. The substructure, consisting of stone piers and abutments, was constructed in 1812, while the existing superstructure was constructed in 1919. The bridge is identified as a contributing element to the District. The bridge was determined to be not individually eligible for the National Register in 1997 as part of the Pennsylvania Historic Bridge Inventory (BMS# 09-1012-0020-2764). The inventory notes the bridge is not technologically noteworthy.
- Status of Archaeology – A Phase IA Archaeological Letter Report was prepared by A.D. Marble & Company in July of 2005 and submitted to PHMC for review and concurrence. The report recommended no further archaeological investigations were needed due to no potential for significant archaeological resources within the project's Area of Potential Effects. PHMC responded by letter dated September 8, 2005 concurring with the recommendation that no further work is necessary as "project activities should have no effect on significant archaeological resources."

Comment: Ms. Auerbach stated that the bridge was determined not individually eligible based on incorrect data and that new data has been found which shows that the historic district is also significant for transportation. She submitted information regarding this was submitted to PHMC, but it has not yet been responded to.
Comment: Ms. Frederick indicated that the information was been received by PHMC, but as far as she knew no formal response has been provided to date.
Comment: an attendee noted that the project purpose and need should be revised to reflect the correct structure date. 1812 should be used instead of 1919.

Comment: Ms. Auerbach noted that the bridge's stone piers and abutments are some of the oldest in the region dating to 1812. Ms. Auerbach read the finding of the Keeper of the National Register of Historic Places. She stated that the Keeper emphatically stated the bridge is historically significant in the context of the development of the township, regional transportation, and the operation of local mills, and is of engineering significance both for its ealy 19th century construction and its sensitive modernization in 1919. The bridge retains sufficient historic integrity to continue to contribute to the Ridge Valley Rural Historic District.

Comment: Mr. Aherne asked why the consultant did not add/utilize the information Ms. Auerbach provided to PHMC. Dr. Mitchell asked R. Stevenson to comment.
Answer: Mr. Stevenson indicated, at PennDOT's direction, he would work with them to update any necessary information.
Answer: Dr. Mitchell asked Ms. Auerbach to provide Ryan Whittington with the updated form and additional documentation she was referencing.

Comment: Mr. Wallace noted that the stone piers originally were spanned by timber beams, which is important to get on the record as this is a significant reason that this structure is unique and potentially significant on state if not a national level.

Comment: Ms. van Rossum provided a document prepared by Rob Reynolds regarding the history of the Headquarter's Road Bridge.

Ms. Harrower continued with the Section 106 PowerPoint presentation with a slide referencing Section 106 Consulting Party coordination. Ms. Harrower noted that all attendees were provided with a table which indicated which individuals/organizations were contacted to be consulting parties. The responses of the individuals/organizations are also provided in the table. The table is up-to-date as of June 12, 2013.

History of the Project

Mr. McAtee began the engineering discussion and referenced a PowerPoint presentation, which is attached to the meeting minutes. Mr. McAtee stated that he has been involved with this project since 2006.

- The foundations (piers and abutments) were constructed in 1812 and are built of stone masonry. The Oscar Martin 1919 plans are the only as-built plans available. The superstructure was replaced in 1919; concrete-encased steel stringers were part of the replacement.
- The existing bridge geometry was provided. Bridge width is 16-ft curb-to-curb; 18-ft out-to-out. The abutment length is 19-ft. The pier length is 21.5-ft. There are three equal spans each measuring 26 ft±.
- The superstructure conditions were reviewed. The pipe railing was removed in 1991. The concrete deck is in extremely poor condition, as demonstrated by the large holes located throughout the slab. A 2011 PennDOT inspection revealed holes in the deck have expanded. This led PennDOT to close the bridge to traffic. The stringers are experiencing delaminated concrete encasement and heavy section loss. The concrete encasement has fallen into the streambed. A full superstructure replacement is warranted.
- A review of the substructure conditions was provided. A 2006 inspection of the structure revealed that walls were constructed without batter (near vertical).
    - *Comment*: Ms. Auerbach objected that the walls were constructed plumb.
    - *Answer*: Mr. McAtee indicated he would provide more information regarding that later in the presentation.
- The walls are exhibiting vertical lower masonry courses (consisting of large dressed stone), and failure of the upper courses (sloping rubble masonry).

Similarly, the upper rubble masonry portions of the piers exhibit distortion and bulging. The lower portions of the piers are generally intact, but the upper portions exhibited movement.

- The composition of the rubble masonry piers and a diagram was provided in the PowerPoint. The piers are not full of stone. There is fill material between the rubble stone in the mortar bed. According to non-destructive probing conducted by Urban, the fill material consists of clay, earth and cinder. The material for the grouted joints likely originally consisted of limestone grout or a clay/gravel mixture.
    - *Question*: Doug Bond, a consultant for the Delaware Riverkeeper, asked if any testing was done to determine the makeup of the piers?
    - *Answer*: Mr. McAtee responded stating that probing was conducted, but no coring. Dowels measuring 40 inches in length were used as a nondestructive testing method. The main concern with testing was displacing stone.
    - *Question*: Mr. Bond asked what was found with the probing. Can this information be provided to the Riverkeeper?
    - *Question*: Another attendee asked how was this information was recorded?
    - *Answer*: Clay and dirt was found. A trip to the bridge in February 2013 provided supporting information as to the composition of the piers. The 2013 trip produced a photo log which has been incorporated into the PowerPoint presentation. The purpose of the site visit was to revisit the project area and to confirm the previous findings since a number of years have passed since the original inspection.
- The stone masonry is laid out in a broken random pattern. Course rubble masonry is filled with limestone mortar.
    - *Question*: An attendee asked if this was done to the piers or abutments?
    - *Answer*: Mr. McAtee noted that it was seen in the piers. The slides for the Power Point presentation will be provided to all attendees. *[Subsequent to the meeting, on June 21, the PowerPoint presentation was provided to all of the meeting attendees and the consulting parties who were unable to make the meeting via mail.]*
- The mortar joints are the weakest link of the stone masonry walls. A discussion of the mortar joints occurred. He continued, stating that with a masonry structure routine maintenance is required to prevent moisture penetration and deterioration including yearly maintenance and maintenance after every major storm event.
    - *Question*: Mr. Aherne asked who is responsible for maintenance? The Delaware River Joint Toll Bridge Commission (DRJTBC) inspects and repoints their bridges every year or after flood events.
    - *Answer*: Mr. McAtee responded stating that PennDOT conducts priority repairs after each biennial inspection (every two years, per NBIS standards) although with the Headquarters Road structure inspection began to occur yearly. He explained that the DRJTBC maintains about 20 bridges, some of which consist of masonry piers similar to the Headquarters Road Bridge.

- *Question*: Mr. Aherne continued stating that PennDOT's lack of proper maintenance and general disregard for the bridge over the years has caused this failure. He explained that he regularly sees DRJTBC performing maintenance of their masonry structures and asked why it is PennDOT cannot maintain this structure if the DRJTBC has no problems with maintenance.
- Answer: Mr. McAtee said that one reason could be the number of bridges each organization maintains. While the DRJTBC is responsible for 20 structures, PennDOT has over 24,000 bridges state-wide, including 6,000 bridges in the District 6-0 region alone, and does not have the maintenance resources required to perform the kind of maintenance which is performed by DRJTBC.
- *Question*: Ms. Van Rossum stated that previous Right to Know Requests to PennDOT have gone unanswered which sought to obtain maintenance records. Can PennDOT's maintenance reports be made available?
- *Answer*: Mr. Whittington stated that he will look into this with PennDOT. *[The above-referenced maintenance reports will be provided to all of the meeting attendees and the consulting parties who were unable to make the meeting during the week of July 15.]*

- New fissures were repaired with spray-applied concrete known as shotcrete or gunnite. Mr. McAtee noted that cement mortars and shotcrete can trap moisture and act as a vapor barrier; this reduces porosity. Water infiltration can cause heaving and freeze-thaw damage due to the expansion of water when freezing. Mr. McAtee noted an example of this phenomenon: when water freezes in pipes, it expands and exerts a pressure that can be as high as 50,000 psi, which is enough to burst steel pipes. The compressive strength of concrete was noted to be 4,000 psi. This pressure may be a cause of the localized pier and abutment distortion.
- Ashlar or large, dressed stone is typically less subjected to deterioration and is easier to rehabilitate due to the reduced number of joints and larger member sizes. Incompatible mortars (with increased compressive strength) could lead to cracking of stones and the strength of the mortar being affected.
- The common causes of deterioration are failed mortar joints; moisture penetration, frost heaving/bulging/movement; displaced stones; and cracking/crushing of stone courses. The image shown on the PowerPoint shows that 17 inches into the stone was able to be penetrated.
    - *Question*: Mr. Bond asked if any testing was done on the mortar and the mortar which was used to repair the structure?
    - *Answer*: Mr. McAtee responded saying that no samples were taken. It is assumed that the original joints consisted of limestone grout; however, many previous repairs have been added to fill voids and displaced stones, which appear to have cement grouts. In addition, we can't confirm if the mortar is actually the existing mortar or if it was from a previous repair.

    - *Question*: Mr. Bond asked what was the percentage of cracked stone?
    - *Answer*: Mr. McAtee noted that the NBIS inspection report lists approximate areas and does not specifically state percentages. It is

difficult to confirm at this time because of the application of shotcrete to cover previous defect.

- *Question*: Ms. Van Rossum asked if the NBIS inspection reports be provided?
- *Answer*: Mr. McAtee responded stating that some inspection reports are not allowed to be disseminated.

- *Comment*: Mr. Aherne stated that due to a perceived intentional lack of maintenance, the bridge is now in its current condition. This must be PennDOT's intentional policy.
- *Answer*: Mr. McAtee explained that the necessary maintenance staff and resources are not available to PennDOT because they are responsible for over 24,000 bridges state-wide. After every biennial inspection, Priority 1 repairs are conducted based upon the inspection report's recommendations. Crews are sent to those bridges in most need to implement repairs. However, defects and deterioration occur in between inspection intervals, which may lead to accelerated deterioration until repairs are implemented.

- *Comment*: An attendee stated that temporary maintenance was conducted on the bridge. Are those inspections and records of maintenance repairs available? The cause of deterioration appears to be from lack of maintenance and the application of shotcrete. Are we here because of lack of maintenance? Maintenance is cheaper than replacement.

- *Question*: Ms. Van Rossum asked if there are records of maintenance activities at PennDOT? The Riverkeeper's sent a Right-to-Know request to PennDOT and information was never provided.
- *Answer*: Mr. Whittington responded saying that inspection reports may be provided if requested but that sensitive information would be redacted from the reports.
- *Question*: An attendee asked why reports had to be redacted; isn't it all public information; what is PennDOT trying to hide?
- *Answer*: Mr. Whittington said he did not have an official answer but indicated that redaction was most likely performed for security reasons. He will get in touch with PennDOT's Right-to-Know department to see where the Riverkeeper's request stands and reach out to the District Bridge Unit to obtain redacted inspection reports. *[Maintenance reports and inspection reports will be provided to all of the meeting attendees and the consulting parties who were unable to make the meeting during the week of July 15.]*

- *Comment*: Mr. Wallace noted that the first option should be to save the bridge. The cheapest alternative would be continued maintenance. The DRJTBC's bridges were cited again.

- *Comment*: Ms. Auerbach noted that there is a Memorandum of Understanding between PennDOT and PHMC regarding state funded maintenance projects. PennDOT is responsible for maintenance of their bridges. Dr. Mitchell asked Ms. Auerbach to send the document she was referencing to Mr. Whittington so that PennDOT could best respond to her concern.
- *Comment*: Ms. Frederick from PHMC noted that state funded projects fall under the state history code. Some projects can be exempted. Specific maintenance records should be tracked.
- *Comment*: Mr. Whittington noted that there are records on maintenance and he would look into making those records available to the consulting parties.
- *Comment*: Dr. Mitchell asked that any consulting party who has documentation specific to the bridge to share it with Ryan Whittington.

- Mr. McAtee continued with the presentation. The 1919 Bridge Reconstruction plans were included on the PowerPoint. The plans show the absence of the buttress on the northwest wingwall. The buttress was added later to address sliding failure. The plans show that generally, the substructure units are near vertical. Prior to heavy live loading and freeze/thaw heaving and distortion, the joints may have been more regularly maintained. The original plans also show the stream channel running through Span 1 only. Significant stream meandering & channel instability exists currently. The limits of the normal stream flow have shifted approximately 15 feet to the west banks. The majority of the flow now passes through the westernmost span. This may have contributed to the scouring at the west abutment.
  - *Question*: Ms. Van Rossum asked if the recommendations include evaluating upstream runoff? She asked if PennDOT was going to use natural channel analysis?
  - *Answer*: Mr. McAtee answered stating that the project is currently in preliminary design. When the project enters final design after the type, size and location of the structure was determined, coordination would occur with State and Federal regulatory agencies for waterway permits. It is at this point that runoff would be evaluated as well as stream stabilization if that is to be considered.

  - *Comment*: Mr. Wallace stated that the consulting parties were told that no decisions have been made. This should be considered now.
  - *Answer*: Mr. Whittington responded saying that the purpose of the meeting was to review Urban Engineers evaluation of the structure and its suitability for rehabilitation and that there is still a lot of information which will be presented by Mr. McAtee.

  - *Question*: An attendee asked about the lane configuration of the bridge.
  - *Answer*: Mr. McAtee explained that the Township was given the option of a one-lane structure if they then maintained it. The township supervisors

voted for a two-lane bridge on March 15, 2011. Urban's presentation is providing information regarding how we (Urban Engineers) came to our recommendations for PennDOT.

- *Question*: Mr. Aherne asked if stormwater runoff was looked at as well as flow volumes. He went on to explain that there were new antidegredation requirements as which need to be met by PennDOT and that Tinicum Township had also adopted an Act 167 plan which would need to be followed.
- *Comment*: Matt Marquardt from Urban Engineers stated that the Township should be looking at plans or making changes to their local stormwater ordinances and stormwater management plans. Stormwater management is the Township's responsibility.
- *Comment*: Mr. Aherne continued stating that the County has an Act 167 plan called the Delaware River North Plan. The Township has adopted this as a standalone document. He stated that the plan triggered the antidegredation requirements which PennDOT must follow.
- *Answer*: Mr. McAtee explained that after the project is constructed, Post Construction Stormwater Management features will be designed and implemented. PennDOT is required to do this on all projects.
- *Answer*: Ms. Gardner confirmed that PennDOT is required to design projects consistent with the stormwater standards included in the approved Act 167 plan.
- *Comment*: Mr. Aherne stated that it is the Act 167 which triggers anti-degradation.
- *Answer*: Ms. Gardner repeated that PennDOT will comply with its policy.

- Mr. McAtee continued with the presentation. The scour conditions were detailed. There are scour holes at both piers and in the western abutment. Plans were shown in the PowerPoint to illustrate the scour conditions. Grout bags were placed as temporary countermeasures to hold the streambed. The design scour depth according to hydraulic analysis is 4 ft in depth. The original piers were not designed to support the scour depth determined by current design standards.
- The conditions of the northwest wingwall were depicted in the PowerPoint. Measurements were taken along the wall, and the wall was 80 degrees, or 10 degrees off of vertical. This is typically consistent with foundation failure due to global stability and base sliding. During an inspection conducted in February 2013, Urban found that the wall collapsed along the step cracking identified in previous inspections. A photo included in the PowerPoint shows how the wall is out-of-plumb. The 2005 photographs show missing stone, missing joint material, crushed stone, and debonding between the stone and mortar. New steps cracks were apparent in 2013. In February 2013, crushed corner stones were apparent which are located are under the beams that support the superstructure. The presence of crushed stones and through cracks in main members raises red flags for structural engineers. These conditions add significant doubt to the structure's suitability for rehabilitation.

- The southwest wingwall exhibits loss of stone and crushed stone.
- The west pier is in the worst condition of the entire substructure. The upstream face of the wall undulates. In 2005, large fissures had developed. Bulging to 4 inches was noted; this was as a result of moisture and freeze/thaw. In February 2013, a dowel was penetrated into the pier approximately 16 to 17 inches without hitting any obstructions. A 24 inch rebar went all the way into the pier. The pier is filled with a soil and clay fill material. August 2006 photographs showed crushed stone and areas where shotcrete was used.
- Images of the eastern pier were shown on the PowerPoint. In 2005, displaced stone and missing mortar was evident. In 2006, a 40 inch dowel was penetrated into the pier in its entirety without hitting any obstructions. It appeared to contain a clay/cinder fill. In 2013, the downstream side exhibited small fissures.
- The northeast wingwall is out-of-plumb, and a localized collapse occurred as a result of vehicular impacts. Larger trucks are hitting the wall.
    - *Question*: Mr. Aherne asked why do you assume it is larger trucks that caused the collapse of the northeast wingwall? He noted that he had never seen trucks on the bridge.
    - *Answer*: Tim Cashman, a Tinicum Township resident, noted that when the bridge was still opened, impacts to the bridge occurred from school buses. He was concerned about safety at the bridge.
    - *Response*: Mr. McAtee noted that a turning radius study was completed which addressed the turning radius of the Ottsville Fire company truck. In speaking with the Ottsville Fire Chief, Doug Skelton, he must do a K-turn to make the turn on to Sheep Hole Road, or else the truck hits the wall.

    - *Comment*: Mr. Cashman continued saying that he knows school buses used the bridge when it was open because his daughter rode on one that did and came home saying that the bus hit the bridge again. He said he was here for the kids because this bridge is dangerous and needs to be replaced. Mr. Cashman indicated that he has pictures of school buses and other trucks utilizing the bridge.

    - *Comment*: An attendee stated that moving trucks and lowboys also hit the wall.
    - *Comment*: Mr. Wallace stated that the concrete barrier made the bridge narrower and caused the impacts to occur.
    - *Comment*: Mr. Cashman noted that the metal guiderail was breaking down and asked why did they put a concrete barrier up? He continued saying that is was because they had to protect it somehow, they couldn't just leave it. School buses use the bridge.
    - *Comment*: Michael Smith, of the Tinicum Creek Watershed Associated said that this was not the case. He said it was done because someone was getting paid.
    - *Comment*: An attendee noted that the stone wingwall likely fell into the creek because of the guide rail. Then, the concrete Jersey barrier was installed.

- *Comment*: An attendee noted that PennDOT added structural weight by the addition of the concrete barrier which caused the stone wall to fall into the stream.
- *Comment*: An attendee noted that they think a PennDOT truck hit the wall.
- *Answer*: Mr. McAtee stated that the guide rail was not attached to the stone masonry. He indicated that the bridge was so narrow that any kind of truck could hit the barrier.

Mr. McAtee continued with his presentation.

- The southeast wingwall's rubble masonry is in poor condition. A portion of the wall has collapsed into the creek. A steel beam guiderail is now in place.
- Mr. McAtee noted that AASHTO's 2008 Guidelines for Historic Bridge Rehabilitation and Replacement provide guidelines to for bridge rehabilitation and replacement. The purpose of the guidelines is to define when a bridge can be made adequate, and when it cannot. AASHTO recognizes that some deficiencies or site limitations are so severe that a bridge cannot be retained in service. There are three key aspects of adequacy that, when balanced with environmental issues, can serve as thresholds defining when rehabilitation of historic bridges is feasible and prudent, and when it is not: 1) Superstructure and substructure condition, including scour and waterway adequacy 2) Geometry and safety, and 3) Load-carrying capacity.
- AASHTO's Guidelines on Structural Adequacy has been added since Urban Engineers' 2006 structure condition report. Mr. McAtee noted that PennDOT follows AASHTO's guidelines, as they are the national agency responsible for policy-making in the field of transportation.
    - *Comment*: An attendee stated that PennDOT may have other standards.
    - *Answer*: Mr. McAtee explained that Urban Engineers used AASHTO's standards in their evaluation of the structures ability to be rehabilitated

    - *Question*: An attendee asked if we are confident that PennDOT has adopted AASHTO's guidelines?
    - *Answer*: Mr. McAtee said that yes, AASHTO guidelines are our definition for the project.

    - *Question*: An attendee asked when PennDOT attached the guide rail, did they attach it to the stone?
    - *Answer*: Mr. McAtee noted that the guide rail was not attached to the stone, but rather the concrete deck and pilasters.

    - *Comment*: The attendee stated that they may not agree with that.

    - *Answer*: Mr. McAtee noted in 2006 and present day, there is nothing attached to the stone.

- *Comment*: An attendee from the public stated that this is a biased proposal. You are not redesigning the bridge but you are using AASHTO's guidelines? You are not stating any other course of action, other than from AASHTO, on how to reconstruct the bridge as opposed to other designs. How to hydrologically improve the 1812 design? Is there anything in the Section 106 protocol that requires you to use AASHTO guidelines or other design concepts?
- *Answer*: Mr. McAtee noted that, the AASHTO guidelines provide different options, step by step, which are being outlined in the presentation and that if he could continue with his presentation he could explain this step by step process.
- *Comment*: An attendee asked the group to please allow him to finish his presentation

- Mr. McAtee continued with the presentation regarding structural adequacy. Superstructure replacement is a must in this case. Improving load carrying capacity of the substructure is the issue. Engineering judgment was utilized when assessing the conditions of the substructure. Urban's recommendations were reviewed by PennDOT's bridge engineering staff. Issues involving the suitability for substructure rehabilitation were discussed. This includes the following: evidence of bulging and sliding in the walls; repairs could result in further damage to walls, and as a result, widespread reconstruction would be likely due to multiple areas of localized collapse; and previous repairs have not arrested the current structural deficiencies and are only considered temporary repairs. The substructure is not anchored into bedrock, considering the design scour depth based on hydraulic evaluation is 4 to 5 feet. A modern bridge would provide a deeper foundation that is properly notched into the weathered bedrock and set below the design to prevent scour depth.
    - *Comment*: Mr. Aherne stated that PennDOT's maintenance plan has guaranteed the bridge's deterioration and that it is through intentionally destructive maintenance that the bridge has arrived at its condition today. He indicated that he would not let Mr. McAtee finish his presentation.
    - *Answer*: Mr. McAtee indicated that while certainly the repairs caused other problems, without the temporary repairs the unrepaired areas would have fallen apart and the bridge would be in worse condition today than it is currently.

Mr. McAtee continued with his presentation.

- Rehabilitation would not address seismic vulnerability. The substructure should have ductility. The actual load carrying capacity of the stone masonry walls, abutments and piers is unknown due to non-homogeneous materials. Although seismic activity is not common in this area, it must be considered in design, especially considering the strong seismic event that occurred in 2011. A stone masonry wall can not provide the required ductility to resist seismic forces transferred from the superstructure.

- Waterway adequacy was presented. A photograph showed the debris that collects on the upstream side of the bridge due to the short spans and reduced hydraulic opening. During the 2006 inspection, a sizeable scour hole was found at the northwest abutment. The water flows into the buttress and northwest wingwall before it channelizes under the bridge. The bridge is not currently sized or located properly for the flows it experiences.
- Roadway geometry and safety requirements were presented. Safety issues at the site include the following: inadequate sight distance; excessive approach grades; inadequate horizontal curve radius; substandard single lane bridge width (16-ft width provided; 18-ft required); and insufficient space for turning movements at east end. A turning radius study was conducted when the option of a one-lane bridge was being discussed. The Township widened Sheep Hole Road in 2009 to improve the turning radius; however, according to Urban's analysis, this widening needed to be widened about 5 feet more than it was. Doug Skelton of the Ottsville Fire Department provided the dimensions of the largest fire truck, Ladder 49, and other apparatus used.
    - *Comment*: An attendee stated that they need more information on this and the curves.
    - *Answer*: Mr. McAtee responded saying that this can be provided. The main problem is the Sheep Hole Road to Headquarters Road turn.
- Mr. McAtee noted that AASHTO states that "For a bridge to continue in use, it must be geometrically (functionally) adequate and safe." The bridge has insufficient turning radius on east side at Sheep Hole Road for emergency vehicles (impacts to wing walls); insufficient sight distances; insufficient horizontal curve lengths; and insufficient clearance to fixed objects within clear zone. Therefore, Urban concluded that the bridge has insufficient geometric & safety adequacy.
- Mr. McAtee discussed AASHTO's Guidelines for assessing a structure's load carrying capacity. The exact capacity of existing stone masonry piers and abutments is not known. Evidence of localized bulging, sliding, stone crushing and displacement may be attributed to overloading. It was noted that the foundations were constructed in 1812 and the superstructure replaced in 1919. Current live load standards (PHL-93) includes a HS-20 (72,000 lb 3-axle truck), which is consistent with information provided by the Fire Company. This supporting data can be provided to the consulting parties. Therefore, Urban concluded that the bridge has Insufficient Structural Capacity.
- It should be noted that PowerPoint slides 72 to 76 were reviewed but not in detail due to time constraints.
- It is Urban Engineers' professional opinion that the bridge is unlikely to have rehabilitation potential. The substructure is no longer performing as intended. Years of deterioration and repairs have altered the structure's original character. Rehabilitation would require extensive reconstruction and would not improve existing deficiencies (geometric, scour, substructure vulnerability).
    - *Comment*: The Delaware Riverkeeper's consultant has reviewed Urban Engineers' report. A request was made that the Riverkeeper's consultant present his findings and recommendations at the next meeting.

- *Question*: An attendee asked to see the 2005 photos and asked about getting to records.
- *Question*: Another attendee asked what other reports were available for them to view?
- *Answer*: Mr. McAtee noted that Urban's 2006 report includes photos from 2005; a February 2013 photo log was prepared and will be distributed; NBIS inspection reports, last conducted in 2012 were also prepared. *[Subsequent to the meeting, on June 21, Urban's 2006 report and February 2013 photo log were provided to all of the meeting attendees and the consulting parties who were unable to make the meeting via mail. Inspection reports and maintenance records will be provided by the week of July 15.]*

- *Comment*: An attendee asked what programs were used to do the analysis and stated that reference stations should have been used.

- *Comment*: An attendee noted that there was a hydraulic report prepared for PADEP in 2012. The alternatives did not follow anti-degradation policy.
- *Answer*: Mr. McAtee noted that the meeting was intended to address hydrology but are out of time. It will be discussed at the next meeting.

- *Comment*: An attendee asked that for the next meeting an H&H expert be at the meeting.
- *Comment*: Mr. Aherne asked to review anti-degradation policy in regards to the bridge for the next meeting.
- *Answer*: Mr. Whittington responded saying that while anti-degradation is not a Section 106 issue if there is a concern surrounding it, the topic can be placed on the "parking lot" issues board for discussion at another time.
- *Comment*: Mr. Aherne responded stating that if anti-degradation ties your hands with the design then it is a Section 106 issue and should be discussed.

- *Comment*: A consulting party inquired about the flood gauges used for the H&H study.

- *Answer*: Mr. McAtee noted that a draft H&H report was prepared to assess the existing hydraulics and compare them to models for several bridge replacement scenarios.
- *Comment*: It was noted that this discussion will be tabled until a future meeting considering it does not apply to the Section 106 process.

- *Comment:* Mr. Wallace commented that PennDOT has looked at the bridge bureaucratically without assessing its historic significance. He feels that rehabilitation is not being addressed, and only replacement is being considered.

- *Answer:* Mr. McAtee stated that Urban used their experience and engineering judgment, including guidance from AASHTO's Rehabilitation and Replacement standards, to assess if rehabilitation was feasible and prudent. Considering the cost and effort to maintain a bridge with a stone masonry substructure and PennDOT's limited maintenance resources, rehabilitation was not deemed prudent.
- *Comment:* Mr. Whittington thanked everyone for attending and stated that the library was closing and so the meeting had to come to an end.
- *Comment*: Mr. Wallace stated that in regards to the geometry related to AASHTO, they have a provision that if there is a local road that is safe and has no history of problems, that the bridge is adequate if it has no history of safety issues. If you are making recommendations you could find that the geometry is ok and falls into the category of rehabilitation. The substructure carried full loads until the 1960s.
- *Answer*: Dr. Mitchell responded asking if the attendee could please add that to the comment cards so your comments can be captured. Mr. McAtee added that there is a documented safety history, as there have been at least 10 accidents at the project site since 2001.
- *Comment:* Mr. Wallace continued stating that the purpose and need for the project is invalid as it does not consider rehabilitation and has language which specifically precludes it. It also does not include preservation of this historic structure as a purpose of the project. PennDOT has presented information which has not been made available to consulting parties and therefore a decision cannot be made regarding the structures rehabilitation. The consulting parties need time to review the new information presented.
- *Comment:* Mr. Whittington apologized but said that the meeting had to come to an end since the Quakertown Library was closing.

Dr. Mitchell asked that all outstanding issues be added to the comment cards and agenda items for the next meeting.

- *Question*: When/where will the next meeting be?
- *Answer*: Mr. Whittington responded asking the consulting parties to please send us your recommendations for the next meeting location. It must meet the following criteria: adequate free parking, ADA accessibility, internet access, phone access, A/V capabilities, and adequate meeting space for a large group.
- *Comment*: An attendee stated that they think an all day meeting, with a lunch break, is required.

Dr. Mitchell called the meeting to a close at 8:55 pm. She indicated that she wanted to respect the library since they close at 9pm.

It is believed that the above represents an accurate description of the major events that transpired at this meeting. Your notification of any errors or omissions is essential, as the foregoing is intended to be part of the project record. If you have any comments to these

minutes, please respond to Colleen Meiswich at 484-533-2552 or cmeiswich@admarble.com by July 23, 2013.

Reported by,
A.D. Marble & Company

Colleen K. Meiswich

Colleen Meiswich
Sr. Project Manager

Enclosures:
Sign-in sheet
Easel Pad notes

As noted in the meeting minutes the following materials have been provided to the consulting parties via letter and CD dated June 21, 2013:

- 2001 PennDOT Traffic Monitoring Data
- 2008 PennDOT Traffic Monitoring Data
- 2002 DVRPC Travel Monitoring Data
- 2003 DVRPC Travel Monitoring Data
- 2008 DVRPC Travel Monitoring Data
- November 2006 Existing Structure Condition Evaluation Report, prepared by Urban Engineers
- February 2013 Photo Log, prepared by Urban Engineers
- June 17, 2013 Section 106 Consulting Parties PowerPoint Presentation

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Headquarters Road over Tinicum Creek Bridge Project

Sign-In Sheet

Section 106 Consulting Party Meeting | June 17, 2013 | 6:00 p.m. to 8:00 p.m.

NAME *Please Print*	ORGANIZATION	ADDRESS *Street, City, State*	EMAIL ADDRESS	Request PDF of Meeting Minutes [X]
Bruce Wallace		84 Sheephole Rd Ottsville PA	bwallace@epix.net	[X]
Vincent J. Dotti	Tinicum Township	24 Stover Park Rd, Pipersville 18947	vdotti@tinicumbucks.org	[✓]
Matthew Marquardt	Urban Engineers	530 Walnut St.	mcmarquardt@urbanengineers.com	[✓]
Peter Glascott	Tinicum Township	5 Quail Lane	peter.glascott@sanofi.com	[✓]
GRAHAM PLACE	TINICUM TWNSHP	505 HEADQUARTERS	GP@GRAHAMPLACE.COM	[✓]
Holly Krupp	Tinicum	81 McCann Dr	holly.krupp@ge.com	[✓]
Theresa Schroder	Consulting Party	Box 20 Erwinna PA		[ ]
Chris Hackley		33 McCann Dr. Ottsville, Pa.	AHackley6@gmail.net	[X]

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Headquarters Road over Tinicum Creek Bridge Project

Sign-In Sheet

Section 106 Consulting Party Meeting | June 17, 2013 | 6:00 p.m. to 8:00 p.m.

NAME *Please Print*	ORGANIZATION	ADDRESS *Street, City, State*	EMAIL ADDRESS	Request PDF of Meeting Minutes
NORMAN MACARTHUR		P.O. BOX 107, ERWINNA PA	normbill@epix.net	☒
MIKE CUDDY	TRANSYSTEMS	1717 ARCH ST. PHILA, PA SUITE 700	mjcuddy@transystems.com	☐
Mark Stout	Consultant to Del. Riverkeeper	~~[illegible]~~ 144 Hillborn Drive Newtown PA 18940	mark@mlstoutconsulting.com	☑
Amy Glascott	Tinicum Twp.	5 Quail Lane Ottsville, PA 18942		☐
Jill Keller	Tinicum Conservancy	74 Stagecoach Rd Pipersville PA 18947	habitat@epix.net	☑
				☐
				☐
				☐
				☐

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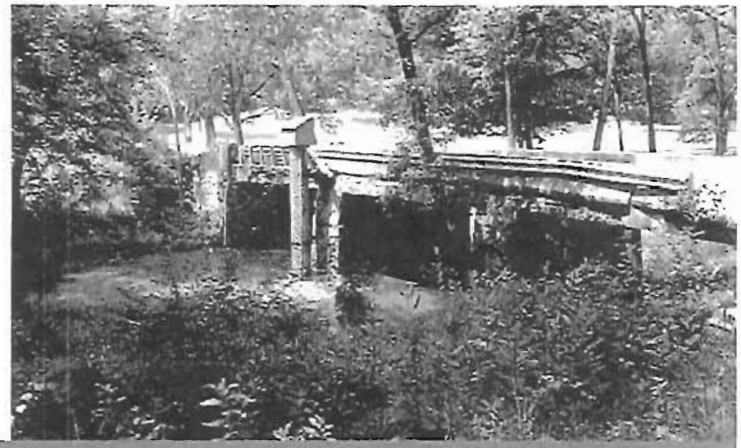

Headquarters Road over Tinicum Creek Bridge Project

Sign-In Sheet

Section 106 Consulting Party Meeting | June 17, 2013 | 6:00 p.m. to 8:00 p.m.

NAME *Please Print*	ORGANIZATION	ADDRESS *Street, City, State*	EMAIL ADDRESS	Request PDF of Meeting Minutes
Ryan Whittington	PennDOT (HNTB)	7000 Geerdes Blvd., King of Prussia, PA 19406	c-rwhittington@pa.gov	X
N R. VEZAGA	"	"	C-NVEZAGA@PA.GOV	
Christina Vlot	PA DEP	2 E. Main St. Norristown PA 19401	cvlot@pa.gov	✓
monica Harrower	PennDOT	7000 Geerdes Blvd. KOP 19038	mharrower@pa.gov	
Dan Green		622 Headquarters Rd Telford	danielgreendse@epix.net	✓
STEVE SZYMANEK	RESIDENT	28 McCANN DR	STEVESZYMANEK@LIVE.COM	✓
NEIL KYDE		15 THANKHAVEN RD TINICUM		✓
Tim Cashman	6 Quail Lane		TPCashman@yahoo	✓
Stacey Mulholland	Congressman Patrick O'Lilly			

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Headquarters Road over Tinicum Creek Bridge Project

Sign-In Sheet

Section 106 Consulting Party Meeting | June 17, 2013 | 6:00 p.m. to 8:00 p.m.

NAME *Please Print*	ORGANIZATION	ADDRESS *Street, City, State*	EMAIL ADDRESS	Request PDF of Meeting Minutes [X]
Todd Schaible	USACE	100 Penn Sq. E., Phila., PA 19107		
Ashley Sciarrotta	State Rep. Quinn	1032 N. Easton Rd, Doylestown	asciarrotta@pahouse.com	✓
Kenda A Gardner	PennDOT			✓
Keith Highlands	PennDOT			✓
John Salerno		649 Headquarters Rd Ottsville, PA 18942	info@dh jsalerno@icloud.com	✓
Barbar Frederick	PHMC-BHP	Harrisburg PA	bafredenic@pa.gov	✓
Chuck Barsoz	Nat'l Park Serv	200 Chestnut St Philly PA 19106	charles_barsoz@nps.gov	✓
Linda McNeill	Tinicum	163 Municipal Rd Pipersville	lmcneill@tinicumbucks.org	

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Headquarters Road over Tinicum Creek Bridge Project

Sign-In Sheet

Section 106 Consulting Party Meeting | June 17, 2013 | 6:00 p.m. to 8:00 p.m.

NAME *Please Print*	ORGANIZATION	ADDRESS *Street, City, State*	EMAIL ADDRESS	Request PDF of Meeting Minutes
Maya van Rossum	Delaware Riverkeeper Network			☒
Douglas E. Bond	"	"	" (M&A) dbond@mcmse.com	☒
El Rogo	PNN			☐
Nicholas Paton	Delaware Riverkeeper Network	"		☒
Nikki Munnichbach	USACE		nicole.c.munnichbach@usace.army.mil	☐
Diane Smith	Rep Quinn	1832 Northampton Road	DLSmithe@PAHouseGop.com	☒
Mike McAtee	Urban Engineers, Inc.	530 Walnut St 19106	mjmcatee@urbanengineers.com	☐
Russ Stevenson	A.D. Marble & Company	375 E. Elm St., Suite 101, Conshohocken, PA	rstevenson@admarble.com	☐
Colleen Meiswich	A.D. Marble & Company	"	cmeiswich@admarble.com	☐

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Headquarters Road over Tinicum Creek Bridge Project

Sign-In Sheet

Section 106 Consulting Party Meeting | June 17, 2013 | 6:00 p.m. to 8:00 p.m.

NAME *Please Print*	ORGANIZATION	ADDRESS *Street, City, State*	EMAIL ADDRESS	Request PDF of Meeting Minutes [X]
Jesse Salaman	Resident	325 Headquarters Rd Erwinna, PA	usalaman@epix.net	☐
VLADIMIR SALAMUN	"	"	"	☐
Michael A. Smidt	PRESIDENT	Tinicum CREEK WATERSHED ASSN. P.O. Box 400 Ottsville PA 18942	mandp@michaelandpaula.com	☐
BOYCE BUDD	RESIDENT	160 GEIGEL HILL RD. ERWINNA, PA 18920	boycebudd3030@gmail.com	☐
KEVIN JOY	"	PO BOX 527 SOUDERTON, PA 18963	KJoy@comcast.net	☐
Robert Stanfield	"	29 Ridge Ln 18947	stanfieldr@eclipse.net	☐

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Headquarters Road over Tinicum Creek Bridge Project

Sign-In Sheet

Section 106 Consulting Party Meeting | June 17, 2013 | 6:00 p.m. to 8:00 p.m.

NAME *Please Print*	ORGANIZATION	ADDRESS *Street, City, State*	EMAIL ADDRESS	Request PDF of Meeting Minutes
Marion M. Kyde	Tinicum Township	15 Toekhauer Rd	—	☐
Damon Aikens			DAMON@EPIX.NET	☒
Joan Ramage Macdonald		280 Headquarters Rd Erwinna	ramage@lehigh.edu	☒
Brian Murphy	Tin. Hist. Comm	8 Minnawanca Rd	thebarnguy@aol.com	☒
Nick Forte		Tinicum Twp		☐
June Rothkopf		Tinicum Twp.		☐
Fernande Morgan		Tinicum Twp		☐
Kathi Auerbach	Riverkeeper	Po Box 39 Erwinna	Kauerbach@frontiernet.net	☒

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Headquarters Road over Tinicum Creek Bridge Project

Sign-In Sheet

Section 106 Consulting Party Meeting | June 17, 2013 | 6:00 p.m. to 8:00 p.m.

NAME Please Print	ORGANIZATION	ADDRESS Street, City, State	EMAIL ADDRESS	Request PDF of Meeting Minutes
KURT IMHOF	SEN. BOB CASEY	2000 MARKET ST. STE 1870 PHILA. PA 19103	KURT_IMHOF@CASEY.SENATE.GOV	[X]
APRIL GREEN	PROPERTY OWNER	622 HEADQUARTERS RD OTTSVILLE 18942	danielgreendds@epix.net	[X]
Amleto Pucci	Resident	P.O Box 78 Ringing, PA 18920	amletopucci@ptd.net	[X]
				[ ]
				[ ]
				[ ]
				[ ]
				[ ]
				[ ]

June 17, 2013 Consulting Party Meeting

Items noted on the Easel Pads

Agenda:

- Would like to videotape next meeting for the public record
- Revisit purpose and need statement
- Presentation by all public's experts at 2 meetings to allow enough time. And other follow-ups to dialogue on these presentations
- Riverkeeper Consultant Presentation
- Hydraulic calculations used for examining alternatives was not clearly presented. Data was important and possible incorrect assumptions made.
- Schedule time to hear from the consulting parties. There are a lot of issues that need to be heard.
- Get Kathryn Auerbach on the agenda. She is an extremely knowledgeable bridge expert.

Parking Lot:

- Address indiscriminate PennDOT policies to replace one lane bridges with two lane bridge (historic/EV Stream/Safety perspectives)

Information Needed:

- Copies of all records, documents, data, reports, memos, letters, emails, correspondence, pictures, graphs and/or any or all documents created for, received about, in reference to or otherwise in the possession of the agencies about this project.
- To receive and review everything in the project file. 60 days to receive and comment upon them and opportunity for additional review and comment as needed without prejudice
- Revisit purpose and need
- Updated historic form
- Right-to-know requirements

Headquarters Bridge (S.R 1012) Rehabilitation

McMullan & Associates Consulting Engineers
for the Delaware River Keeper Network

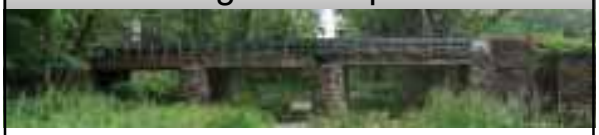
1

Stone Masonry Rehabilitation Projects

- Bridge of the C&O over Catoctin Creek NPS *built in1832; Rehabilitated 2010, Maryland*
- Bridge of the C&O over the Monocacy River *built in 1832; Rehabilitated 2001 NPS, Maryland*
- Snickersville Turnpike Hibbs Bridge *built circa 1850; Rehabilitated 2001, Virginia*
- Lock 2E of the Morris Canal *built in 1840; Rehabilitated 2011, New Jersey*
- Burnside Bridge; *built circa 1850, current, Maryland*
- Lock One of the M&E Canal *built 1845*; *rehabilitated 2013 OHS, Ohio*
- Bridge at Lock 19 over C&O canal *built 1831; rehabilitation planned for 2014 NPS*

2

Bridge Description



- Superstructure
  - 75 Feet Long
  - 16 feet clear roadway
  - Three Spans of about 25 feet each
  - Concrete Deck on Steel Stringers
- Substructure
  - 2 Stone Masonry Piers
  - 2 Stone Masonry Abutments with Wingwalls

3

Bridge History

- Constructed in 1812
  - Wood Deck and Timber Stringers
  - Stone Masonry Piers and Abutments
- Reconstructed 1919
  - Concrete Deck and Steel Stringers replaced wood
  - Stone Masonry Piers and Abutments remained
  - No major repairs to masonry indicated
- Stone masonry buttress West Side added after 1919

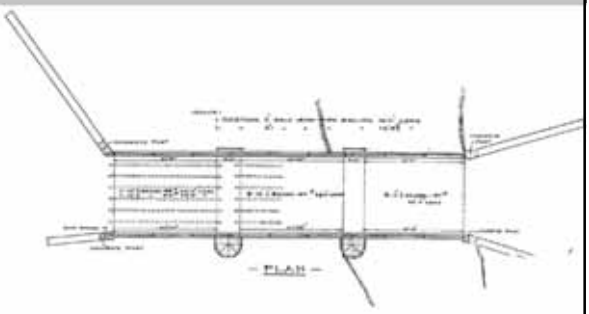
4

Bridge History – Last 15 years

- Determined to be a contributing property to the National Register for Historic Places for the Ridge Valley Rural Historic District – Rehabilitation must be considered
- Bridge width was reduced to 10 feet when Jersey barriers were added
- Bridge Load Rating 2004 -19 tons, 2010 -10 tons.
- Bridge Closed to Traffic 2011

5

Current Conditions vs 1919 Bridge Plans



6

Shotcrete Repairs

Shotcrete was applied prior to the 2004 NBIS inspection

Deterioration of pointing mortar, Date unknown

7

2004 NBIS vs Today

Photo from 2004 NBIS Inspection Report

2004 NBIS Report for the East Pier

"…several cracked stones; far face at beams 1 and 2 10 S.F. x1' outward movement, slight bulge with several crushed stones;….."

2004 Bridge Load Posting: 19 tons

Conclusion: Piers with cracked stones, bulges, and crushed stones can still carry significant load

8

Existing Concrete Apron at W. Abutment

[Prior to grout bag placement]

9

Grout Bags placed

10

Mortar remnants in West pier

11

Test Corings

12

Test Core Findings

- Near the Base
  - Face stones 17-20 wide
  - Lime mortar between the stones
  - Interior fill large stones
- Near the Top
  - Face stones 4-19 inches wide
  - Interior fill
  - Small stones, sand, clay and lime

13

Existing Pier Cross Section (from Corings)

14

Summary Current Conditions

- Superstructure
  - Beams and deck need replacement
- Substructure
  - Stone Masonry Piers and Abutments retain their original stones and shape but require repair
  - Wing-walls need to be partially or wholly reconstructed
  - Grout bags have been undermined and need to be repaired

15

Is Rehabilitation Possible? –YES!!

- Face stones carry majority of the load - Compressive stresses are low (about 60-70 psi)
- The stone masonry has lasted 200 years – Time proven material
- Can be repaired using conventional stone masonry repair techniques
  (ref: PennDOT Stone Arch Bridge Manual)

16

Standards for Rehabilitation

- As a contributing resource to the Historic District, Headquarters Bridge should be rehabilitated using the Secretary's Standards for rehabilitation of historic structures
- Retain and preserve the key features of the existing Bridge that convey cultural or architectural values by repairing the stone masonry abutments and piers
- Maintain the appearance of the existing bridge by constructing a new superstructure using similar materials, spans, and width

17

Stone Masonry Rehabilitation Techniques

- Stone Replacement Repairs (Dutchman)
- Stone Restoration mortars (Jahn material)
- Partial Disassemble and Reconstruct
- Pointing (Filling Mortar Joints)
- Grouting (low or high pressure)
- Pinning
- Cracked Stone Repair by Injection

18

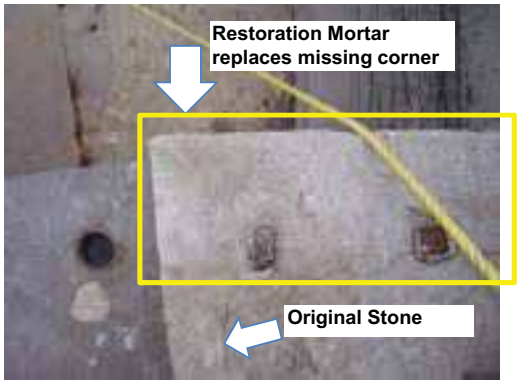
Dutchman Repairs

Preparation for Dutchman Repair of Wall Stone

Completed Dutchman Repair of Wall Stone

19

Stone Restoration Repair Mortar (Jahn)



20

Partially Disassemble and Reconstruct

Wing-wall prior to reconstruction

Wing-wall Rebuilt using original stones

21

Pointing of Stone Masonry Wall

22

Grout filling of Cavities and Holes

23

PennDOT Stone Masonry Resources

24

Headquarters Rehabilitation Work

- Substructure
  - Repair the Piers and Abutments by pointing, grouting, and partially reconstructing
  - Install new concrete distribution caps on top of each element
  - Upgrade the existing grout bag scour protection
  - Partially or wholly reconstruct all four stone masonry wing-walls using salvaged stones.

25

West Abutment

26

West Pier

27

East Pier

28

East Abutment

29

Wingwalls

30

Scour Protection

31

Scour Protection

- Work needed in either Rehabilitation or Replacement
- Consider Channel Protection
- Consider restoring flow through the middle span in an environmentally acceptable manner

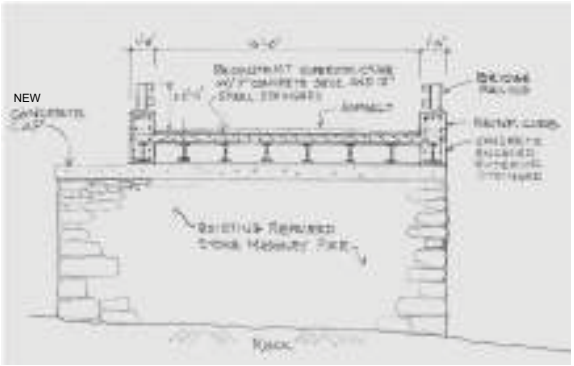
32

Rehabilitation Work Items cont'd

- Superstructure
  - Remove existing concrete deck and steel stringers
  - Construct new steel stringers to bear on the concrete pier cap
  - Construct a new reinforced concrete deck
  - Loading to be AASHTO HS-20 (72,000 lbs)
  - 1919 Bridge width to remain unchanged
  - Bridge railing to follow PennDOT Standards

33

Rehabilitated Cross Section



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Why Rehabilitate?

- A rehabilitated headquarters bridge will continue to protect the Historic Value of the District
- The time required to rehabilitate the headquarters bridge will be substantially less than a new structure.
- The cost of construction of the rehabilitated bridge is significantly less costly than Replacement
- Follows Secretary's Standards for Historic and PennDOT Stone Arch Bridge Manual
- Minimal impact to the Environment compared to Replacement Bridge

35

Stone Masonry Maintenance

Before Construction
- Choosing the correct mortar for Rehabilitation
- Qualified Masonry Contractor for Rehabilitation

After Construction
- Clearing Vegetation
- Maintaining deck water resistance

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Headquarters Bridge Rehabilitation

Rehabilitation of this Bridge can be accomplished without causing an adverse effect on its historic characteristics. It would restore a safe 200 year old crossing of Tinicum Creek for many years to come. A speedy resolution is needed to help the residents of Bucks County.

McMullan & Associates

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Tinicum Township and the Headquarters Road Bridge: Planning the Future

Mark L. Stout, PhD
Patricia A. Ott, PE
for the Delaware Riverkeeper
2 April 2014

STARTING POINT

PennDOT's Smart Transportation Guidebook

1. Tailor solutions to the context:

Roadways should respect the character of the community, and its current and planned land uses.

PennDOT's Smart Transportation Guidebook

3. Plan all projects in collaboration with the community:

The collaboration between state and community involves the integration of land use planning with transportation planning, and a focus on the overall transportation network rather than a single roadway.

PLANNING CONTEXT

Delaware Valley Regional Planning Commission 2040 plan

- Policy: limit suburban expansion into rural communities
- Tinicum: Rural Resource land, parts of 4 Conservation Focus Areas

Bucks County Comprehensive Plan

- 4 Conservation Landscapes partly in Tinicum
- Mostly Natural Resource/Conservation Area
- 7 Greenways in open space plan

Tinicum Twp Comprehensive Plan

Tinicum Township
Bucks County, Pa

- 1993 Plan: "Preserve and enhance the traditional character of Tinicum Township, particularly its heritage of buildings and landscapes with their natural beauty and rural quality."
- New plan under development……

Tinicum Twp Open Space Plan

"TO PRESERVE THE QUALITY OF LIFE ENJOYED BY CURRENT AND FUTURE TINICUM RESIDENTS, including irreplaceable natural resources, biolog diversity, clean, safe drinking water important agricultural soils, hi rural atmosphere, and a stable tax base, by maximizing permanent open space. These interconnected resources, once lost to development, can never be recovered"

Township policies discourage inappropriate growth

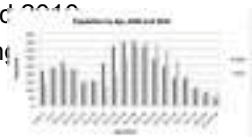
- Land use and zoning ordinances discourage growth in preservation areas, target growth for Ottsville and villages
- More than 1/3 of Tinicum already preserved as open space

Ridge Valley Rural Historic District

- The rural heart of Tinicum Township

No population increase expected

- Tinicum actually lost population between 2000 and
- Population is aging little in-migration
- One projection (DVRPC) shows growth – which we believe is incorrect – but even that is around Ottsville, with little impact east of Route 611



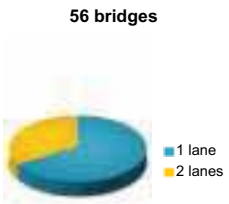
THE ROADWAY NETWORK

Country roads

- Narrow, winding roads

- Gravel roads (protected by ordinance)
- Fords

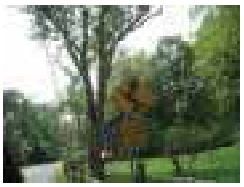
One-lane bridges



- Two-thirds of the 56 bridges in Tinicum Township are one-lane bridges
- Half of PennDOT's bridges (14 of 28) are one-lane bridges!

Winding, hilly roads

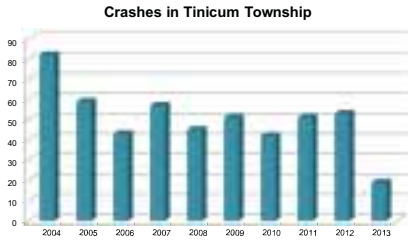
- Much of township has winding, hilly roads with limited "sight distance"
- Including approaches to Headquarters Rd Bridge (which won't be fixed by proposed project)



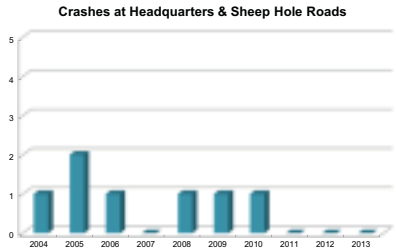
Low traffic counts

SAFETY

Crashes in Tinicum trending down



Crash history at bridge sparse



CONCLUSIONS

Tinicum Twp: A "Rural Conservation Zone"

A delineated "context area" characterized by:

- Very rural land use, with extensive open space and very limited development,
- High-value scenic, recreational, and rural historical and cultural resources,
- Assigned high priority for open space preservation and greenbelt-type functions in regional and local plans, and
- A rural roadway network unsuited to support extensive development.

Locally Preferred Alternative: One-lane bridge

A one-lane bridge on the current footprint is the alternative most consistent with the current and proposed roadway network serving the Tinicum Township Rural Conservation Zone and should be the Locally Preferred Alternative.

Planning the Future

Needed: Genuine collaborative state/local planning, integrating land use planning and transportation planning, for the future of the Tinicum Township Rural Conservation Zone

Concerned Citizen Comments: Increased Danger, Misleading PennDOT Plans

Joan Ramage Macdonald, Ph.D.
Headquarters Road concerned resident
Consulting party
Associate Professor, Lehigh University
Mother of 2 young children

Main Points

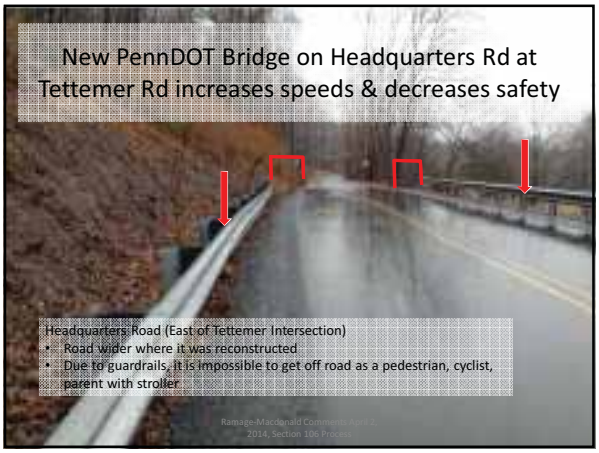
- Pedestrian danger increased at recent bridge replacements on Headquarters Rd.
- Emergency Vehicle Access Planning, Adequate communication with emergency responders necessary
- PennDOT needs to listen to community, follow regulations and restrictions, and if plans that respect the environment and community are shown/approved, they need to be followed (this has not been consistent in past)

Safety and Environment

- Two recent bridges were replaced on Headquarters Road, one at Cafferty Road and one at Tettemer Road.
  - New bridges caused the road to be straighter and wider
  - The traffic is faster
  - There is no place to get off the road due to walls and guardrails
  - Environmental guidelines to protect exceptional quality stream were not followed

Source: Google Maps View of Tettemer/Headquarters Intersection

20 feet



PennDOT Bridge on Headquarters Road at Tettemer Road does not promote access or efficiency for emergency vehicles

From Minutes of Tinicum Township Supervisors' Meeting July 16, 2012

"PennDOT agreed with the Township's position that a fire truck cannot make the right hand turn with the new realignment of the bridge"

New PennDOT Bridge on Headquarters Road at Tettemer Road does not promote access or efficiency for emergency vehicles

From Minutes of Tinicum Township Supervisors' Meeting July 16, 2012

"fire and delivery trucks could make the turn prior to the realignment and he (Pearson) did not understand why that was not considered in the new design."

"currently, a car could not make the right hand turn without drifting into the opposing lane."

Tinicum Supervisors' Meeting Minutes 09-04-12

Intersection Realignment proposed by PennDOT for Tettemer and Headquarters Road:

Fountain said that he had evaluated the intersection and determined that the intersection was not

"Fountain said that he had evaluated the intersection and determined that the intersection was not constructed as it had been designed."

Tinicum Supervisors' Meeting Minutes 09-04-12

Tinicum Supervisors' Meeting Minutes 09-04-12

Delaware Valley Volunteer Fire Chief, Chris Chevalier said that the fire trucks couldn't turn onto Tettemer and had to back up to make the turn. V. Dotti said that snow would decrease accessibility. Chevalier said that a truck coming from the Township Building will have a clear shot, but trucks coming

The Fire chief said that "his biggest concern was oncoming traffic and the safety of others. He said that drivers would see the big red truck and lights but speed still posed an issue."

back up to make the turn."

"… the turning radius was 10 feet on the plan but only 4 feet as built."

G. Pearson said that Tom Fountain would write a letter to PennDOT with his findings about the Tettemer Road intersection and that the Manager and Vince Dotti could add information on the overall issues with the Headquarters Road bridge projects.

PennDOT Bridge on Headquarters Road at Tettemer Road severely estricts access for emergency vehicles

Panoramic View from Cafferty Road Showing length of bridge construction on Headquarters

Note the **massive walls** on both sides of the road, decorated on the exteriors that almost nobody sees.

Safety issues hold here too – there is no way to get out of the way of a speeding car, and visibility is poor on the curve.

Bottom line: PennDOT built an unnecessarily massive structure was built that did not match designs presented to public, decreasing safety, impinging on the stream, and closing the road for a very long time.

Ramage-Macdonald Comments April 2, 2014, Section 106 Process

Source: Google Maps View of Cafferty/Headquarters Intersection

No way to evaluate impact of bridge replacement because we have no idea what this bridge replacement would really look like. The design they've shown is preliminary. The "proposed bridge" design in the Cafferty Road bridge case was preliminary too. At Sheephole Road, the actual conditions are at least as complex as they were at Cafferty.

The final Cafferty Road bridge unquestionably had a **massive and overwhelmingly negative effect** on the character of the road and the stream beside it. No one could have known this from the harmless "proposed bridge" design PennDot circulated for approvals. Everyone needs to remember that's what we're looking at now, another preliminary design.

Only in this case, there's a **significant national resource, the historic district and the wild and scenic rive at stake**. There is simply no way to know the impact of this proposal at this stage, but if we've learned

Ramage-Macdonald Comments April 2, 2014, Section 106 Process

How These Comments are Pertinent to the Headquarters Bridge over Tinicum Creek at Sheephole Road

- Widening the bridge will increase traffic speeds and therefore decrease safety on the road and bridge
- Widening the bridge may not increase access for emergency vehicles. There is prior evidence that emergency vehicle access has not been a PennDOT priority.
- Protections for exceptional value waterways (Tinicum Creek and tributaries) need to be respected
- Preliminary designs may not adquately portray ultimate bridge, so it is critical that the community remain involved. I strongly request that PennDOT keep the community needs in mind during all planning phases
- **Opening a single lane bridge that preserves and restores the historic bridge and neighborhood character is consistent with emergency vehicle access, public safety, and an environment conducive to cyclists, strollers, and pedestrians while not preventing vehicle access.**

Ramage-Macdonald Comments April 2, 2014, Section 106 Process