Methodology for the 2022 Masonry Arch Bridge Reevaluation

Introduction

The PennDOT Historic Bridge Inventory and Evaluation, one of the earliest comprehensive inventories of historic highway bridges in the country when it was completed in 2001, identified bridges that meet the criteria for National Register of Historic Places (National Register) listing. This inventory considered all masonry arch bridges included in the 2001 survey and in PennDOT's Bridge Management System (BMS2)[1] built before 1957[2]. There has been a significant loss of historic bridges in the intervening 21 years. The Historic Bridge Inventory and Evaluation, begun in 1996 and completed in 2001, identified 514 masonry arch bridges[3]. By 2022, the population dropped to 383 masonry arch bridges, a 25% loss.[4] In consideration of this loss, PennDOT, in consultation with the Pennsylvania State Historic Preservation Office (SHPO), is now updating that inventory and evaluation with a focus on masonry arch bridges. The purpose of this document is to provide the methodological approach for recommendations of National Register eligibility made under the 2022 masonry arch bridge inventory update.

The methodology is based on continuing the approach outlined in a *Historic Context for Common Bridge Types in Pennsylvania* (1998) and the *Pennsylvania Historic Bridge Inventory and Evaluation* (A.G. Lichtenstein, 1999) with some updates and/or revisions based on recent scholarship. Several historic bridge surveys have been completed since 2001, most notably Indiana (2009) and Maryland (2011). These and other useful publications, including NCHRP's *A Context for Common Historic Bridge Types* (2005), were consulted in the refinement of the methodology. The methodology is also based on the 2017 metal truss bridge inventory update[5] which developed a point system for a consistent and replicable approach to determine the eligibility of a bridge regardless of its type, materials, features, or age. The 2022 masonry arch bridge reevaluation adapts the point system outlined in the metal truss bridge reevaluation to assess eligibility of the masonry arch population.

As part of the update effort, bridges were only evaluated for National Register significance under Criterion C for engineering significance or relative to having high artistic merit. Population loss numbers were examined to understand rarity across the state and in regions (PennDOT engineering districts were utilized as representing a region[6]). In addition, evaluation criteria were developed for each type (Appendix A). A point-based system based on the 2017 metal truss bridge reevaluation, provides a consistent and replicable approach to determining the eligibility of a bridge, regardless of its type, materials, features, or age.

Bridges determined not eligible for the National Register during the inventory update lack integrity due to alterations; are part of a remaining population that includes earlier and more complete examples; or

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[1] PennDOT's Bridge Management System or "BMS2" is a database used by PennDOT and FHWA that stores, updates, and reports on the physical and operating characteristics of road related structures in Pennsylvania, with bridges being the largest category of structures. BMS2 provides information such as location, features carried/crossed, owner, maintenance responsibility, posting status, structural capacity, load rating, inspection condition information, underwater inspection information and proposed/completed maintenance items. The database is updated daily.

[2] This includes bridge less than 20 ft.

[3] This includes 51 bridges that were not part of the 2001 survey but were part of the 2023 survey.

[4] Many of these bridges are locally owned and their removal may not have been federally funded.

[5] https://www.paprojectpath.org/docs/default-source/penndot-crm---general-documents/hmtb-survey-update-methodology-12-21-17.pdf?sfvrsn=6

[6] PennDOT divides the Commonwealth into eleven Engineering Districts (Districts 1-6, 8-12) which are responsible for the state maintained transportation network in that region.

are late examples of designs which do not possess engineering significance in Pennsylvania. Of the 383 remaining masonry arch bridges, 251 bridges are recommended not individually eligible after the bridge inventory update[7].

Masonry arch bridges recommended to be National Register eligible or listed during this 2022 inventory update include 129 masonry arch bridges[8]. A total of 41 masonry arch bridges were elevated as National Register eligible.

One hundred thirty-one (135) masonry arch bridges were identified as eligible or listed in the National Register during the 2001 statewide inventory. The 2022 reevaluation found that only 98 of these bridges remained (a 28% loss in the eligible/listed population). The 2022 reevaluation identified 39 bridges to be elevated to the National Register, bringing the number of eligible and listed bridges to a total of 129. This number reflects the removal of 14 previously eligible bridges that are recommended not eligible as they did not receive sufficient points to remain eligible by the 2022 reevaluation.

The eligibility recommendations for the 39 additional bridges identified through this 2022 update as meeting National Register criteria will be sent to the PennDOT engineering districts, and the FHWA, for input prior to being finalized. It is possible that the final list will be different from the recommendations included in this document.

Research

In preparation for this inventory update, background research included an examination of the following sources and consultation with the following people:

- PennDOT's *Historic Context for Common Bridge Types in Pennsylvania* (1998)
- PennDOT's *Pennsylvania Historic Bridge Inventory and Evaluation* (1999)
- NCHRP's *A Context for Common Historic Bridge Types* (2005)
- Indiana *Historic Bridge Inventory: Volume* I: National Register Eligibility Results (2009)
- *Historic Highway Bridges in Maryland: 1631-1960, Historic Context Report* (1995)
- *A Survey of Masonry and Concrete Arch Bridges in Virginia* (2000)
- Mike Cuddy, Historic Bridge Engineer, Transystems
- PennDOT Historic Bridge Survey database (2001)
- PennDOT Bridge Management System (BMS2)
- PA SHPO files related to bridges, including survey records, Historic American Engineering Record forms, nominations for National Register listing, and determinations of eligibility
- Historic Bridges website www.historicbridges.org
- Bridge Hunters website www.bridgehunter.com
- Bridges & Tunnels of Allegheny County and Pittsburgh, PA website www.pghbridges.com
  Allegheny Stone: Stone Arch Bridges in Allegheny County
  http://www.pghbridges.com/tours/tour_allegstone/tourframe_allegstone.htm
- Bridge Mapper www.bridgemapper.com
- Google Maps/Google Earth

[7] An additional 2 bridges (SHPO Resource # 2004RE01397 and 2004RE04217) are undetermined. These bridges were damaged during Hurricane Ida and it was determined that they could not be evaluated until repairs were made to the bridges.

[8] This includes 48 listed bridges

A list of all masonry arch bridges from the 2001 Statewide Historic Bridge Inventory and BMS2 was compiled, and an effort was undertaken by SHPO staff to reconcile the data. The data reconciliation effort consisted of:

- Identifying extant and demolished bridges
- Verifying Bridge Key numbers,[9] Bridge Management System (BMS) identification numbers[10] and SHPO Resource #'s
- Linking bridges with current photo documentation from online resources such as: HistoricBridges.org, bridgehunter.com, pghbridges.com, bridgemapper.com, BMS2 inspection photos, and/or Google Maps or Earth

The *Historic Context for Common Bridge Types in Pennsylvania* (1998) provides the framework to understand the significant broad patterns of roadway transportation development and bridge design and construction in Pennsylvania. The understanding of relevant themes that emerged from the context study shaped the methodology for evaluating the National Register significance of bridges as part of this update for metal truss bridges. The *Pennsylvania Historic Bridge Inventory and Evaluation* (1999) and National Register eligibility evaluation justifications from the accompanying database were consulted in the development of the methodology for the 2022 masonry arch bridge inventory and evaluation update.

Information sources on bridge alterations consulted in assessing the integrity of these bridges included: the 2001 Statewide Historic Bridge Inventory and Evaluation, recent photographs available on relevant bridge websites (e.g.historicbridges.org, bridgehunter.com, pghbridges.com, Google maps), and PennDOT's bridge inspection files and photographs.[11]

Approach

The 2022 revaluation of masonry arch bridges is based on the 2017 reevaluation of National Register eligibility for metal truss bridges and was carried out by a committee that included staff from both PennDOT and the Pennsylvania SHPO[12]. In meetings, bridges were individually examined within their relevant context (as well as within the regional and statewide populations) using established National Register registration requirements. Questions requiring further research were tabled for review and revisited in subsequent committee meetings.

An examination of the (2001) Statewide Historic Bridge Inventory revealed inconsistencies in National Register eligibility evaluations and an inconsistent level of detail regarding character defining features. For example, the inventory provided more detailed information for early bridges, calling out design features or characteristics. Other bridges with the same characteristics would be described as "common technology" or "not among the earliest" with little descriptive information beyond "no innovative and distinctive features." The inconsistencies and lack of consistent information on character defining

[9] Bridge Key or BK numbers refer to the bridge structure itself and are a second structure reference number established by PennDOT for the Bridge Management System 2 (BMS2) database to provide each bridge structure with a unique identification number that will not change for the life of the bridge.

[10] Bridge Management System (BMS) identification numbers or BMS numbers are a 14-digit structure identification number assigned to each bridge location and may be subject to change.

[11] In a few cases, site visits were made by PennDOT staff to collect updated information on integrity

[12] PennDOT staff included Kara Russell and Kris Thompson. SHPO staff included Barbara Frederick, Tyra Guyton, and Elizabeth Rairigh.

features of previously evaluated bridges made it difficult to formulate a consistent approach for the revaluation effort.

For some bridge designs the previous approach to evaluation was determined to be no longer viable. For example, in the 2001 inventory those bridges with minor alterations were determined not eligible because "earlier and longer examples of the same design are common throughout the state"; only the most complete examples were considered significant. For some designs, only a few early or complete examples remain in 2022. In addition, the previous inventory did not reevaluate National Register eligibility of preexisting determinations of eligibility (DOEs). This included state owned bridges listed in the National Register in 1988 following the 1983-1986 inventory. These earlier determinations often neglected to include any information on engineering significance or notable features.

After developing an understanding of the shortcomings of the 2001 inventory and reviewing more recent inventories from other states, the team revaluating the metal truss bridge population decided on a points-based system to produce a more consistent application of the National Register Criteria for Evaluation. The point system awards points to all bridges with distinctive characteristics, special features, or innovations, as well as early and rare bridges and subtracts points for loss of distinctive characteristics and features. The system is similar to that used in the evaluation of the state of Indiana's historic bridge population (2009). The point system provides a consistent and replicable approach to determining the eligibility of a bridge, regardless of its type design, materials, features, or age and was meant to be applied to other bridge designs.

Like the metal truss bridge reevaluation, the revaluation of National Register eligibility for masonry arch bridges recorded in PennDOT's BMS2 was carried out by a committee that included staff of the agencies of PennDOT (Kara Russell and Kris Thompson) and the Pennsylvania SHPO (Barbara Frederick, Tyra Guyton, and Elizabeth Rairigh). The point system was applied to all masonry arch bridges in BMS built before 1957[13]. Previously determined eligible and listed bridges helped guide which distinctive characteristics, special features and important innovations were awarded points. masonry arch bridges that were previously not evaluated for individual significance due to their status as contributing to a historic district were evaluated for individual significance under Criterion C.

The masonry arch bridge reevaluation is based on the application of National Register Criterion C. Although these bridges may be eligible for the National Register under any of the National Register criteria, only Criterion C was considered for this reevaluation. Assessment of significance under National Register Criterion A was not undertaken but notes were made when a need for evaluation of potential historic significance under Criterion A was identified. It was not practical or feasible to evaluate bridges for associative value under Criterion A or B as part of this effort. Criterion A assessments, including contributing status to historic districts, will be ongoing, and generally undertaken on a case-by-case basis during future Section 106 project reviews. In most cases, bridges will not be individually eligible under Criterion A but may be contributing components of historic districts or historic sites.

Like any resource evaluation, the significance of a historic bridge is best judged and explained when the bridge is evaluated within its historic context, in this case the context emphasizes engineering significance. Consideration was also given to the work of important bridge builders. An understanding of the historic context for bridges in Pennsylvania informed the development of the point system used to evaluate each bridge type. The point-based system includes three steps:

1) Establish significance
2) Assess integrity

[13] That are larger than 20 ft

3) Determine eligibility

More detail on the points-based system is provided below and in Appendix A

Recent Loss of the Masonry Arch Bridge Population

The reassessment of National Register eligibility considers the loss of masonry arch bridges both regionally and statewide since the conclusion of the statewide inventory in 2001. The 2022 reevaluation identified 514 bridges through a search of the 2001 statewide bridge survey, BMS2 and PA SHARE records. This includes 61 bridges that were not included in the earlier study. The 2022 reevaluation found that only 383 masonry bridges remained, a population loss of 25%. Table 1 summarizes the loss of historic masonry arch bridges.

Table 1. Summary of Masonry Arch Bridge Population Loss between 2001 and 2022

	Extant		
Date Range	**2001 Population**	**2022 Population**	**% Loss**
	514	383	25

Recent Loss of the National Register Eligible or Listed Masonry Arch Bridge Population

The statewide historic bridge inventory update identified 514 masonry arch bridges. Prior to the 2022 reevaluation, 135 of those 514 bridges were considered eligible for, or listed in, the National Register of Historic Places. This included bridges that were determined eligible after 2001 as part of the Section 106 review process.[14]

National Register eligible or listed masonry arch bridges remain extant in lesser percentages than the overall population of masonry arch bridges with 27% loss. Table 4 summarizes the loss of National Register eligible masonry arch bridges. Thirty-Severn (37) of the masonry arch eligible or listed bridges have been lost since 2001 for a 27% decrease in the population (from 135 to 98).

Some general assumptions can be made from the pattern of masonry arch bridge loss. Bridges that are at the greatest risk for demolition are older and narrower bridges. Bridges that are retained and rehabilitated as part of the transportation system are generally younger and wider bridges.

Table 2: Summary of National Register Eligible Masonry Arch Bridge Loss by 2022

	NR Eligible Bridges		
Date Range	**2001 Population**	**2022 Population***	**% Loss**
Total of All Bridges	135	98	27
*This number includes bridges determined individually eligible by the previous bridge inventory and through the Section 106 review process but does not include bridges recommended eligible through the 2022 reevaluation.			

Regional Population of Masonry Arch Bridges

[14] Bridges determined to be contributing components of a National Register eligible historic district but not individually eligible are not included in this number.

The population of masonry arch bridges was analyzed at the regional level to determine which regions had experienced the greatest loss since the previous bridge inventory, the earliest remaining bridges in a region, and regional distribution of bridge types. Each of the 11 PennDOT engineering districts was considered a region for the purposes of this evaluation. The largest concentration of masonry arch bridges is found in district regions 5, 6, and 8. The district regions 1, 2, and 10 has lost the least number of masonry arch bridges with a 0% loss. However, there regions also had the least number of masonry arch bridges overall, with districts 1 and 10 have 4 bridges and district 2 having 1 bridge.

Table 3. Masonry Arch District Population of Bridges, 2001 and 2022

	PennDOT District											
	1	**2**	**3**	**4**	**5**	**6**	**8**	**9**	**10**	**11**	**12**	**Total**
2001 Population	4	1	19	38	96	215	63	11	4	44	19	496
2022 Population	4	1	9	26	67	169	51	8	4	33	11	365
% Loss	0	0	53	32	30	21	19	27	0	25	42	25

National Register Significance—Criterion C

Masonry arch bridges may be eligible for the National Register under Criterion C in the areas of engineering and/or architecture for their age, technological significance, as the work of a master, or for aesthetics. As per PennDOT's *Pennsylvania Historic Bridge Inventory and Evaluation* (1999)

> Criterion C . . . addresses bridges that meet at least one of the following characteristics: they embody distinctive characteristics of a type, period, or method of construction; they are the work of a master; they possess high artistic value. . . The criterion affords recognition of the evolution of bridge types and bridge building technology over time, as well as the importance of the engineer/engineering firm who designed a bridge and the fabricator/contractor who erected it. Architectonic and aesthetic bridges, bridges with unusual construction details or rare surviving examples of a type that was significant in the development of a bridge technology . . . can be eligible under Criterion C.
>
> Common types will be evaluated to identify which examples are technologically significant. Priority will be placed on identifying examples that mark the introduction of a particular technology, illustrate engineering advances within a technology, and/or have distinguishing details. This often means that significant examples are the earlier, longer, or more complicated bridges. Evaluation of common bridge types and designs will be done at a regional and statewide basis to ensure the most significant examples are identified.

As explained above, the team evaluating the masonry arch bridge population decided on a points-based system to foster a consistent application of the National Register Criteria for Evaluation. The point system awards points to bridges with distinctive characteristics, special features, or innovations as well as early and rare bridges.

Bridges were awarded points for items under the following categories which correspond with the requirements of National Register Criterion C:

- Distinctive characteristics of type, period, or method of construction
- A variation, evolution, and/or transition of a type that reflects an important phase in bridge construction
- High artistic value

- Work of a master/builder

Distinctive characteristics of a type, period, and method of construction

Early examples of a bridge usually represent the pioneering period for a bridge type and are becoming increasingly rare, therefore all bridges built before 1800 were awarded points. The previous bridge inventory methodology and context provided a date range that was considered early for each bridge type, however, in consideration of the loss in population especially of the earliest bridges, the earliest examples in the state population (built before 1850) were award additional points. The earliest bridge in each PennDOT district was also award points for earliest example in the region. This allowed for the earliest bridges that represent the pioneering period to accumulate enough points to be eligible.

Increasingly **rare** bridge types important in the development of concrete arch bridge technology were awarded points. As outlined in the 1999 methodology, "Unique, rare, or infrequent surviving types . . . are also evaluated as having engineering significance under Criterion C . . . the unique, rare or infrequent criterion will be evaluated on a county and statewide basis." The 2022 update examined rarity based on the remaining statewide and engineering district populations. The statewide population identified brick arches as an **uncommon and distinctive type** of arch bridge and awarded points to these bridges. Regional rarity was defined as 3 or fewer remaining examples of a bridge type and design in an engineering district.

There are no **early standard plans** from the State Highway Department for masonry arch bridges.

Variation, evolution, or transition that reflects an important phase in bridge construction.

Points were awarded to features or innovations that illustrate an **important change, transition, or experimentation in technology within the remaining bridge population**. This refers to notable design details related to engineering innovations or variations or refinements within a type including achievement of exceptional bridge span and overall length. Points were awarded to bridges with exceptional span length and bridges with exceptional overall length in the statewide population. Bridge length was not considered on a regional/district level. Exceptional lengths were sometimes noted in the 2001 Statewide Historic Bridge Inventory and these numbers were used to guide the assessment of exceptional technological achievement. Bridges were compared and where a noticeable difference in size was recognized between bridges, a baseline was set, and points given to bridges that exceeded the baseline. Bridges also received points corresponding to the number of spans in the bridge, so bridges with more spans received more points.

Bridges with **important special features or innovations** reflect innovations by engineers, designers, fabricators, or builders, compared to common designs and features for a type. These innovations include bridges built on a skew of any degree, as skewed masonry arch bridges are more difficult to construct. Offsetting arch ribs, more commonly found on brick arch bridges, are a **highly important and unusual** variation that shows a difficult method of construction employed to provide a skew in an arch bridge (Bridge Key # 38391, Resource # 1986RE00351). Another idiosyncratic feature seen in masonry arch bridges is a dressed and tooled sandstone intrados made to look like long bricks as seen in Bridge Key # 1708 (Resource # 2004RE08370)

Points were also awarded for bridges that show **outstanding technological achievement** and include bridges that exhibit multiple example of innovations and special features. For example, Bridge Key # 15204 (Resource # 1986RE00790) receives points for outstanding technological achievement because it is both a multiple span bridge with a skew design.

Possesses High Artistic Values

Indiana *Historic Bridge Inventory: Volume* I: National Register Eligibility Results notes that most masonry bridges display some aesthetic treatment in the use of dressed stone, ornamental coursing, or bonding patterns. Most bridges evaluated in the 2023 evaluation of Pennsylvania's masonry arch bridges have outstanding ornamentation, style, or architectural treatments that could be considered "high artistic value" as outlined under National Register Criterion C. The bridges showing multiple ornamentation ranging from coursed and/or dressed stone, belt courses, voussoir, keystones, buttresses, crenelated parapets, stepped parapets, bullnosed piers, bridge plaques, and WPA carvings. Therefore, all masonry bridges received points for outstanding ornamentation. Bridges where these features have been lost or obscured, did not receive points for artistic value.

Work of a Master

Bridges were evaluated as the work of a master if they were documented as attributable to specific engineers, designers, fabricators, or builders of national recognition, or Pennsylvania-based individuals or firms that designed and built bridges within the state and whose work is distinguishable. Often, these were the engineers, designers, fabricators, or builders that were prolific bridge builders in the state. Bridges built by out-of-state builders without national recognition were not considered to be the work of a master unless unusual evidence suggests otherwise. All bridges attributable to a master through distinguishing design features were awarded points. Work of a master was considered important in conjunction with other features, such as a high artistic value or unusual features or innovations. Therefore, to meet the point threshold for significance, "work of a master" bridges had to receive points for other characteristics as well.

Following is a list of builders that were identified in the previous bridge inventory as significant as either a major bridge builder in Pennsylvania or a region or as a significant innovator in bridge construction in the nation. They represent the most prolific bridge builders in the state as identified in the previous bridge inventory.

Table 4. Notable Masonry Arch Bridge Builders

Bridge Company	**Significance (Information from previous bridge study)**
Nathan R. Rambo	Chester County bridge engineer who served from 1899 to 1922 and favored masonry arch bridges
Silas Harry	An early 19th-Century master mason who is noteworthy for his stone arch bridges in Franklin County.
J.A. Morris and Theophilus P. Chandler	Chandler was an architect credited with design of BR Key # 15204 (Resource # 1986RE00790) built by Morris. The bridge was designed to simulate ancient bridges with pedestrian refuges
Works Progress Administration (WPA)	WPA was a federally funded work relief program. Among many other projects, it provided funding to state and local highway departments to pay laborers used on many highway and bridge improvements from about 1935 to 1941 often building distinctive masonry arch bridges.

National Register Significance Assessment (Appendix A)

A matrix to assess significance was developed for each bridge type (Appendix A). Accordingly, those bridges with more points represent the earliest bridges with distinctive characteristics, special features, and important innovations. Any bridge that received 13 or more points was determined to have significance and was advanced for an assessment of integrity.

National Register Integrity Assessment (Appendix B)

National Register eligibility is a combination of significance and integrity. Integrity is the ability of a resource to convey its significance. In accordance with National Register Criterion C, integrity is directly related to whether a bridge retains sufficient integrity of materials, design and workmanship- those aspects of integrity that allow a structure to convey its physical features as well as characterize the type, period, or method of construction. In the points-based system of eligibility assessment, points were deducted for those bridges that have lost integrity of materials, design, and workmanship.

In assessing retention of integrity, consideration was given to the following factors:

- extent of change to historic character (appearance from the period of significance)
- importance of character defining features
- continued ability of bridge to convey historic significance (engineering function)
- visibility of the alteration to the public
- craftsmanship

Integrity loss was divided into 8 categories, as outlined in more detail in Appendix B:

Level 0 integrity loss involves replacement in kind of character defining features and ornamentation in accordance with the Secretary of the Interior's (SOI) Standards as well as alterations or additions that are reversible and meant for temporary strengthening such as the placement of gabion baskets to shore up spandrel walls. Replacement in kind refers to replacement of deteriorated features with new features that match the old in design, color, texture, and other visual qualities and, where possible, material. Bridges receive no deduction of points with these minor replacements and alterations.

Level 1 integrity loss involves replacement of character defining features and ornamentation not in kind but in character and the limited application of coating or patching that covers decorative features or ornamentation including limited repointing of masonry arch bridges that is not in kind. Level 1 integrity loss also covers the protection from scour by the addition of new concrete aprons that are too large for the size and scale of the bridge. Replacement in character refers to the replacement of a deteriorated feature with a new feature that is similar, but not identical, in size, material, detailing, and is visually compatible and does not detract from the overall historic appearance. If a bridge had one issue of integrity loss under this category, then a total of 1 point was deducted from its overall score. Multiple issues of integrity loss under this category moved it to a Level 2.

Level 2 integrity loss involves replacement of character defining features and ornamentation not in kind, reconstruction that is in kind but not in character, addition of for liners with grouting, and removal of secondary character defining features and ornamentation without replacement such as lighting details and decorative medallions and brackets. If a bridge had one issue of integrity loss under this category, then a total of 2 points were deducted from its overall score. Multiple issues of integrity loss under this category moved it to a Level 3.

Level 3 integrity loss involves additions and alterations to character defining features not in accordance with the SOI Standards such as removal of parapets without a replacement, minor widening that does not obscure construction method, application of coatings that obscure spandrel walls and arch rings or parapet and large areas of stone loss. If a bridge has one issue of integrity loss under this category, then

a total of 3 points was deducted from its overall score. Multiple issues of integrity loss under this category moved it to a Level 4.

Level 4 integrity loss involves replacement, additions, and alterations to character defining features not in accordance with the SOI Standards such as replacement or fill of parapet or stone walls with concrete, addition of concrete buttress and parging intrados. Level 4 integrity loss also involves poor execution of rehabilitation such as replacement stone that does not match original stone, or stone larid in different patterns, mortar joints that are different size or the addition of concrete bullnose piers. If a bridge has one issue of integrity loss under this category, then a total of 5 points was deducted from its overall score. Multiple issues of integrity loss under this category moved it to a Level 5.

Level 5 integrity loss involves additions and alterations not in accordance with the SOI Standards such as the replacement of stone parapet of masonry arch bridge with form liners replicating stone, realignment using a slab that protrudes from the spandrel wall, or the application of a coating that completely obscures a masonry arch bridge. If a bridge has one issue of integrity loss under this category, then a total of 7 points was deducted from its overall score. Multiple issues of integrity loss under this category moved it to a Level 6.

Level 6 integrity loss involves strengthening not in accordance with the SOI Standards including backfilling arches that cover part of the spandrel walls and most of the interior of the arch. If a bridge has one issue of integrity loss under this category, then a total of -10 points was deducted from its overall score.

Level 7 integrity loss involves any widening of a masonry arch bridge by another bridge type in which any portion of the spandrel wall or parapet is removed or not visible. If a bridge has an issue of integrity loss under this category, then a total of 15 points was deducted from its overall score.

The 1999 methodology from the Statewide Historic Bridge Inventory states, “When a resource type or detail becomes so infrequent or rare that losing one or two examples will mean that it is no longer represented in the bridge population, then the integrity question is secondary to recognizing the worthiness of preserving a disappearing bridge type or design.” The point system recognizes a lower threshold for integrity is sometimes acceptable for bridges that are extraordinarily rare. More points are awarded to rare bridges which allows for more points to be deducted for integrity loss while still staying within the point range for eligibility. Therefore, bridge types with few other extant examples are justified in accepting a greater degree of alteration or fewer remaining physical features to convey the engineering significance of the type.

Recommendations of National Register Eligibility

Following the significance and integrity assessments, a bridge received a total point value. Bridges that met the established point threshold (13 points) were recommended eligible for the National Register or recommended to remain National Register eligible if previously determined eligible. Those bridges that did not meet the threshold were recommended not eligible except for bridges that were previously listed in the National Register. These bridges remain listed regardless of points. See Appendix C for a significance statement for each elevated bridge and the associated rationale for the eligibility recommendation. See Appendix D for a significance statement and the associated rationale for each bridge that remains eligible. See Appendix E for a list of previously determined eligible bridges that will be recommended not eligible as a result of this reevaluation. Table 5 summarizes all the bridges that are recommended eligible or recommended to remain National Register eligible.

Table 5: Summary of National Register Eligible Bridges as a result of the 2022 Reevaluation

	Population of Eligible Bridges by District											
Date Range	**1**	**2**	**3**	**4**	**5**	**6**	**8**	**9**	**10**	**11**	**12**	**Total**
1697-1935	1	0	0	1	3	92	19	2	2	8	1	129

Recommendations

This document outlines the methodology for the development of eligibility recommendations for the 2022 historic masonry arch bridge update. It is possible that new or additional information on significance or integrity may become known about a bridge, such as at the time of a project. This information may warrant reconsideration of eligibility. For example, an alteration that was not apparent through available records or photographs may be identified as affecting the ability of a bridge to convey its significance. The bridge should then undergo reevaluation through application of the points-based system used in the current assessment, outlined in Appendix A of this document.

The methodology that was developed for the 2017 metal truss bridge inventory update and adapted for the 2022 masonry arch bridge inventory update provides a consistent and replicable approach to determining the eligibility of a bridge, regardless of its design, materials, features, or age. This methodology has been replicated for other bridge types and designs. The 2017 amendment to the Federal Aide Programmatic Agreement between FHWA, PennDOT and the SHPO establishes a process by which the signatories to the agreement will consult at least every 10 years to determine if conditions have changed that would require updating the list of National Register eligible bridges. Future bridge updates should be completed using the methodology outlined in these documents.

Appendix A: CRITERION C POINT APPLICATION FOR SIGNIFICANCE FOR MASONRY ARCH BRIDGES

Category	Item	Bridge type and design	Points to assign
Distinctive characteristics of type, period, or method of construction	Built before a specified year	Bridges built 1800	7
	Method of construction	None	7
	Distinctive type and/or uncommon type OR Only known example in the state	Brick Arches are a distinctive and uncommon type	7
	Early example in the state	Built before 1850	7
	Early standard plan in the state	None	3
	Earliest example in a PennDOT district	Earliest example in each district	4
	Rare in a PennDOT district	Three or fewer examples within the PennDOT district	3
Variation, evolution, and/or transition of a type	Exceptional length of main span	65 Feet or greater span length	3
	Exceptional length overall	120 Feet or greater for bridge length	3

	Number of spans	Defined for each bridge	1/span
	Special features/innovations – important or unusual	Defined for each bridge type and design	3
	Special features/innovations – highly important or unusual	Defined for each bridge type and design	4
	Outstanding technological achievement	Defined for each bridge type and design	7
High artistic value	Selected ornamentation, notable but isolated	Single decorative feature	3
	Outstanding ornamentation or architectural treatment in overall design	Highly artistic or decorative	6
Work of a master	Prolific or important designer/builder/engineer		3

APPENDIX B CRITERION C POINT APPLICATION FOR INTEGRITY[15]

The chart below is used to evaluate the integrity of multiple bridge types (concrete arches, slabs, girders and masonry arches) and examples provided may not be applicable to the masonry arch bridges.

Level 0 Integrity Loss	Replacement in kind	Replacement in kind[16] of primary and/or secondary character defining features and ornamentation such as: • Parapet, balustrade • Decorative features: lighting, brackets, medallions	-0
	Alterations/Additions	Application of coating/patching that does not cover ornamentation or with in kind replacement of ornamentation: • Scoring of spandrel wall or arch • Rustication	-0
		Temporary Strengthening such as: • Placement of gabion baskets or other structure to shore up spandrel walls in masonry arch bridges • Addition of steel rods, tie anchors and/or plywood in masonry arch bridges unless it will be detrimental to material or workmanship	-0
		Addition of metal railing on top of parapet of masonry arch bridge that is reversible	-0
Level 1 Integrity Loss	Replacement not in kind	Replacement of character defining features and ornamentation not in kind but in character[1,2]such as: • Replacement of paneled parapets with solid parapet • Replacement of historic lighting with modern lighting that replicates historic feel • Replacement of the parapet on a masonry stone arch bridge that is in kind by not in character	-1
	Alterations/Additions	Limited repointing of masonry arch bridges that is not in kind	-1
		Loss of small section of capstone in masonry arch bride	-1

[15] Adopted from the Concrete Arch Bridge reevaluation and used for the concrete slab and concrete girder bridge reevaluation. Note that some features and examples may pertain to other bridge types and not masonry arch bridges.

[16] In kind replacement refers to Secretary of the Interior's Standards for Rehabilitation, Standard 6: Where the severity of deterioration requires replacement of a distinctive feature, the new feature shall match the old in design, color, texture, and other visual qualities and, where possible, materials. Replacement of missing features shall be substantiated by documentary, physical, or pictorial evidence. In character replacement is differentiated by being similar in size, material, detailing, and is visually compatible and does not detract from the overall historic appearance.

		Limited application of patch coating that covers decorative features or ornamentation	-1
		• Large areas of spalling or loss of material (See level 3 Loss for spalling that results in the loss of ornamentation such as paneling detail)[17]	-1
		• Minor parging of spandrel walls of a masonry arch bridge that does not cover arch ring (voussoir) or barrel arch (intrados)	-1
		Attachment of pipes to spandrel walls	
		Protection from scour by the addition of new concrete aprons that are large for size and scale of bridge.	-1 -1
Level 2 Integrity Loss	Replacement not in kind	Replacement of character defining features and ornamentation not in kind such as:	-2
		• Replacement of paneled parapets with solid parapet	
		Reconstruction of parts of masonry arch bridge that is in kind but not in character	-2
	Alterations/Additions	Replacement of small section of masonry arch bridge with concrete	-2
		Addition of arch form liner with grouting in masonry arch bridge or parging of intrados	-2
		Large areas of repointing of masonry arch bridges that is not in kind	-2
		Removal of secondary character defining features and ornamentation such as:	-2
		• Lighting • Brackets	
	Two or more examples from the Level 1 Integrity loss category		-2
Level 3 Integrity Loss	Alterations/Additions	Removal of character defining features such as:	-3
		• parapet (without addition of new parapet or guide rails)	
		Application/addition of ornamentation not in character such as:	-3
		• Non-historic scoring pattern	
		Functional and Safety Improvements not in accordance with the SOI Standards	-3
		• Minor widening that does not obscure construction method (arch and spandrel wall are still visible	-3
		• Application of coating that obscures ornamentation (Spalling that results in the	-3

[17] Spalling that removes ornamentation was added for the concrete girder evaluation.

		loss of ornamentation such as paneling detail)[17] or application of coating on large areas on masonry arch bridges that obscure spandrel walls and arch ring or parapets • Large areas of stone loss on masonry stone arch bridge	-3
	Two or more examples from the Level 2 Integrity loss category		-3
Level 4 Integrity Loss	Replacement not in kind	Inappropriate replacement of parapet that is not in character such as: • Replacement of balustrade with solid parapet • Alteration of parapets by infilling balustrade with concrete • Replacement of stone parapet of masonry arch bridge with concrete (see level 5 integrity loss if a form liner is used to replicate stone)	-5
		Replacement of stone with concrete in walls of masonry arch bridge or addition of concrete buttress	-5
		Poor execution of rehabilitation of masonry arch bridge such as: • Stone does not match original stone, stone is laid in a different pattern, or mortar joints are of different size, addition of concrete bullnose piers	-5
	Additions/Alterations	Strengthening not in accordance with the SOI Standards: • Strengthening of spandrel walls through application of tie rods that are visually prominent (except for masonry arch bridges with temporary tie rods)	-5
		Functional and Safety Improvement not in accordance with the SOI Standards • Major widening that doubles the size of the deck or more without obscuring the original construction method (arch and spandrel walls are visible) • Attachment of guide rails to the spandrel wall • Parging intrados of brick arch bridge	-5
	Two or more examples from the Level 3 Integrity loss category		-5
Level 5 Integrity Loss	Replacement not in kind	Replacement of stone parapet of masonry arch bridge with form liner replicating stone	-7
	Additions/Alterations	Functional and Safety Improvement not in accordance with the SOI Standards • Any widening that either doubles the size of the deck or obscures the original	-7

		construction method (arch and spandrel walls are not visible • Realignment using a slab that protrudes from the spandrel wall of a stone arch • Application of coating that obscures outstanding ornamentation or masonry arch bridge that has been completely coated	
	Two or more examples from the Level 4 Integrity loss category		-7
Level 6 Integrity Loss	Additions/Alterations	Strengthening not in accordance with the SOI • Removal of concrete support structures and replacement with metal • Enclosing open spandrel with concrete • Backfilling masonry arch that covers part of spandrel walls and most of the interior of arch	-10
	Two or more examples from the Level 5 Integrity loss category		-10
Level 7 Integrity Loss	Additions/Alterations	Functional and Safety Improvement not in accordance with the SOI Standards • Any widening by another bridge type in masonry arch bridge is which any portion of the spandrel wall or parapet is removed or not visible	-15

Appendix C Bridges Elevated to Eligible Under Criterion C

County	District	Bridge Key#	BMS#	SHPO Resource #	Significance
Allegheny	11	1708	02301100100295	2004RE00054	• Dressed/tooled sandstone intrados and arch ring • High artistic value – outstanding ornamentation
Allegheny	11	2438	02730100003084	2004RE04583	• Exceptional overall length • Multiple spans • High artistic value -outstanding ornamentation
Allegheny	11	2439	02730100003085	2007RE00395	• Exceptional overall length • Multiple spans • High artistic value – outstanding ornamentation
Berks	05	47971	06710200000007	1995RE41683	• Early example of the type in the state • High artistic value – outstanding ornamentation
Bucks	06	6997	09031300620111	2004RE04864	• Brick Construction • Multiple spans • High artistic value – outstanding ornamentation
Bucks	06	40485	09722800700000	2002RE02841	• Multiple spans • Skewed • High artistic value – outstanding ornamentation
Bucks	06	44368	09740100100000	2024RE01274	• Brick construction • Multiple spans • High artistic value – outstanding ornamentation
Bucks	06	6887	09011301203181	1983RE00650	• Multiple spans • High artistic value – outstanding ornamentation
Bucks	06	7029	09041302301569	2024RE01082	• Brick construction • High artistic value – outstanding ornamentation
Bucks	06	7111	09100401100478	1983RE02507	• Multiple spans • Skewed • High artistic value – outstanding ornamentation
Bucks	06	7375	09400900260000	2004RE11203	• Multiple spans • High artistic value – outstanding ornamentation
Bucks	06	7484	09700900300286	2004RE00327	• Early example of the type in the state • Multiple spans • High artistic value – outstanding ornamentation
Bucks	06	7511	9700903570293	2004RE04869	• Multiple spans • High artistic value – outstanding ornamentation
Chester	06	10040	15008204420734	1976RE00295	• Exceptional span length • Multiple spans • High artistic value – outstanding ornamentation
Chester	06	10038	15008205522189	2004RE08058	• Multiple spans • High artistic value – outstanding ornamentation

County	District	Bridge Key#	BMS#	SHPO Resource #	Significance
Cumberland	08	14099	21721305383815	2004RE10655	• Multiple spans • High artistic value – outstanding ornamentation
Delaware	06	15208	23104600400126	2004RE08447	• Early example of the type in the state • High artistic value – outstanding ornamentation
Delaware	06	15284	23202600803034	1983RE02400	• Brick construction • High artistic value – outstanding ornamentation
Fayette	12	16654	26020100201415	2004RE00799	• Skewed • High artistic value – outstanding ornamentation
Franklin	08	17694	28720903283128	2024RE01273	• Early example of the type in the state • Multiple spans • High artistic value – outstanding ornamentation
Lehigh	05	23462	39720607199004	2004RE11676	• Early example of the type in the state • Multiple spans • Skewed • High artistic value – outstanding ornamentation
Lehigh	05	23465	39720607209018	2004RE11675	• Exceptional overall length • Multiple spans • High artistic value – outstanding ornamentation
Lehigh	05	23499	39730100000114	2004RE05486	• Early example of the type in the state • Multiple spans • High artistic value – outstanding ornamentation
Lehigh	05	23503	39730100009001	2004RE04074	• Early example of the type in the state • Multiple spans • Skewed • High artistic value – outstanding ornamentation
Monroe	05	26945	45101700200630	2004RE10282	• Exceptional span length • Exceptional overall length • High artistic value – outstanding ornamentation
Monroe	05	27120	45721306460001	2004RE01147	• Multiple spans • Skewed • High artistic value – outstanding ornamentation
Monroe	05	27127	45721606330001	2004RE11805	• Multiple spans • High artistic value – outstanding ornamentation
Montgomery	06	27578	46104400441098	2001RE02247	• Brick construction • Multiple spans • High artistic value – outstanding ornamentation
Montgomery	06	27744	46303400100445	2004RE02761	• Brick construction • High artistic value – outstanding ornamentation
Montgomery	06	27885	46704600600098	1998RE01519	• Multiple spans • High artistic value – outstanding ornamentation
Montgomery	06	27903	46704601500224	2004RE07246	• Multiple spans • Skewed • High artistic value – outstanding ornamentation

County	District	Bridge Key#	BMS#	SHPO Resource #	Significance
Montgomery	06	27952	46704606600168	2004RE02752	• Exceptional overall length • Multiple spans • High artistic value – outstanding ornamentation
Montgomery	06	27958	46704607000151	2004RE10344	• Early example of the type in the state • Exceptional overall length • Multiple spans • High artistic value – outstanding ornamentation
Montgomery	06	27928	46704609000073	2004RE02761	• Exceptional span length • Exceptional overall length • Multiple spans • High artistic value – outstanding ornamentation
Montgomery	06	42287	46720600100400	2024RE01276	• Multiple spans • High artistic value – outstanding ornamentation
Northampton	05	Not in BMS2	Not in BMS2	1990RE00271	• Built before 1800 • Early example of the type in the state • Earliest example in District 5 • Multiple spans • High artistic value – outstanding ornamentation
Northampton	05	Not in BMS2	Not in BMS2	1995RE31947	• Early example of the type in the state • High artistic value – outstanding ornamentation
Philadelphia	06	38930	67300701300967	2017RE01441	• Exceptional span length • Exceptional overall length • Multiple span • High artistic value – outstanding ornamentation
Philadelphia	06	38927	67300700802048	2017RE00657	• Exceptional span length • Multiple spans • High artistic value – outstanding ornamentation
Philadelphia	06	39072	67401100101067	2004RE01083	• Brick construction • Exceptional span length • High artistic value – outstanding ornamentation
Philadelphia	06	39230	67730101500703	2004RE01331	• Brick construction • Exceptional span length • Exceptional overall length • Skewed • Offset arch ribs • High artistic value – outstanding ornamentation
Philadelphia	06	39233	67730101600355	2004RE01330	• Brick construction • Skewed • High artistic value – outstanding ornamentation
Philadelphia	06	Not in BMS2	67730101800704	2004RE05822	• Brick construction • Skewed • Offset arch ribs • High artistic value – outstanding ornamentation
Philadelphia	06	39263	67730103000345	2004RE05814	• Brick construction • Skewed • High artistic value – outstanding ornamentation

County	District	Bridge Key#	BMS#	SHPO Resource #	Significance
Pike	04	29879	51039000600000	2004RE02974	• Skewed • High artistic value – outstanding ornamentation
Union	03	33620	59740221220091	2004RE11049	• Brick construction • High artistic value – outstanding ornamentation
Washington	12	35054	62301100501340	This is part of a RR historic district 2003RE02918 Not in PA SHARE individually	• Brick construction • Skewed • High artistic value – outstanding ornamentation

Appendix D Bridges That Will Remain Eligible or Listed Under Criterion C

County	District	Bridge Key#	BMS#	SHPO Resource #	Significance
Adams	08	173	01100501700000	1986RE00825	• Multiple spans • High artistic value – outstanding ornamentation
Adams	08	458	01721604283056	1974RE00072	• Brick construction • High artistic value – outstanding ornamentation
Allegheny	08	848	02006502111387	1983RE00920	• Dressed/tooled sandstone intrados and arch ring • High artistic value – outstanding ornamentation
Allegheny	08	1724	02301500402094	1986RE00001	• High artistic value – outstanding ornamentation Dressed/tooled sandstone intrados and arch ring
Allegheny	11	2420	02730100003048	2007RE01252	• Exceptional span length • Exceptional overall length • Multiple spans • High artistic value – outstanding ornamentation
Allegheny	11	2582	02742700002814	1991RE00090	• Multiple spans • High artistic value – outstanding ornamentation
Beaver	11	3845	04710500004054	2004RE00155	• Brick construction • High artistic value – outstanding ornamentation
Berks	05	4983	06101700103534	1983RE01309	• Early example of the type in the state • Multiple spans • High artistic value – outstanding ornamentation

County	District	Bridge Key#	BMS#	SHPO Resource #	Significance
Bucks[18]	06	7103	09100301400084	1986RE01041	• Multiple spans • High artistic value – outstanding ornamentation
Bucks	06	7289	09205200120000	1986RE01052	• Built before 1800 • Early example of the type in the state • Multiple spans • High artistic value – outstanding ornamentation
Bucks	06	7472	09410101000378	1983RE02374	• Built before 1800 • Early example of the type in the state • Multiple spans • High artistic value – outstanding ornamentation
Bucks	06	7480	09700900100222	2004RE03382	• Early example of the type in the state • Multiple spans • High artistic value – outstanding ornamentation
Bucks	06	7481	09700900200223	2004RE03380	• Early example of the type in the state • Multiple spans • High artistic value – outstanding ornamentation
Bucks	06	7525	09700903750305	2000RE00767	• Multiple spans • High artistic value – outstanding ornamentation
Bucks	06	7562	09700904330234	2007RE01267	• Exceptional overall length • Multiple spans • High artistic value – outstanding ornamentation
Bucks	06	7346	09720400100348	1986RE00005	• Exceptional overall length • Multiple spans • High artistic value – outstanding ornamentation
Carbon	05	9136	13740604260001	2004RE08266	• Multiple spans • High artistic value – outstanding ornamentation
Chester	06	10033	15005201400784	1986RE00107	• Exceptional overall length • Multiple spans • High artistic value – outstanding ornamentation
Chester	06	10086	15016201700194	1985RE00001	• Early example of the type in the state • Exceptional span length • Exceptional overall length • Multiple spans • High artistic value – outstanding ornamentation
Chester	06	10285	15092604400400	1986RE00100	• High artistic value – outstanding ornamentation
Chester	06	10308	15100500500000	2004RE01944	• Brick construction • Skewed • High artistic value – outstanding ornamentation
Chester	06	10584	15400300100198	1986RE00356	• Exceptional overall length • Multiple span • High artistic value – outstanding ornamentation

[18] Bridge 7103 (1986RE01041) was previously determined eligible as contributing to the NR listed Carversville Historic District. It is determined to be not individually eligible.

County	District	Bridge Key#	BMS#	SHPO Resource #	Significance
Chester	06	10595	15400600601771	1986RE00515	• Brick construction • Multiple spans • High artistic value – outstanding ornamentation
Chester	06	10606	15401500203422	1986RE00789	• Multiple spans • High artistic value – outstanding ornamentation
Chester	06	10631	15403900200000	1986RE00914	• Brick construction • High artistic value – outstanding ornamentation
Chester	06	10635	15701500100325	2004RE09707	• Exceptional overall length • Multiple spans • High artistic value – outstanding ornamentation
Chester	06	10672	15701503770143	2004RE06876	• Multiple spans • High artistic value – outstanding ornamentation
Chester	06	10698	15701504570131	2004RE08319	• Brick Construction • Multiple spans • High artistic value – outstanding ornamentation
Chester	06	10705	15701504880222	2004RE11129	• Brick construction • Multiple spans • High artistic value – outstanding ornamentation
Chester	06	10723	15701505510207	2004RE03585	• Early example of the type in the state • Multiple spans • High artistic value – outstanding ornamentation
Dauphin	08	14291	22014700401898	1986RE00654	• Multiple spans • High artistic value – outstanding ornamentation
Dauphin	08	14440	22101700301070	1988RE00044	• High artistic value – outstanding ornamentation
Dauphin	08	14576	22400203401988	1986RE01053	• Exceptional overall length • Multiple spans • High artistic value – outstanding ornamentation
Dauphin	08	14689	22721103043023	1994RE00451	• Early example of the type in the state • Earliest in District 8 • Multiple spans • High artistic value – outstanding ornamentation
Delaware	06	14823	23000302402055	2004RE02104	• Partial brick construction • Multiple spans • High artistic value – outstanding ornamentation
Delaware	06	15204	23103400603474	1986RE00790	• Multiple spans • Skewed • High artistic value – outstanding ornamentation
Franklin	08	17649	28720903283128	2024RE01273	• Early example of the type in the state • Multiple spans • High artistic value – outstanding ornamentation
Franklin	08	17554	28301201100616	1988RE00804	• Multiple spans • High artistic value – outstanding ornamentation

County	District	Bridge Key#	BMS#	SHPO Resource #	Significance
Franklin	08	17571	28400401700272	1986RE00516	• Early example of the type in the state • Multiple spans • High artistic value – outstanding ornamentation
Franklin	08	17609	28401800620000	1986RE00006	• Early example of the type in the state • Multiple spans • High artistic value – outstanding ornamentation
Franklin	08	17610	28401800700000	1986RE00656	• Early example of the type in the state • Multiple spans • High artistic value – outstanding ornamentation
Franklin	08	17685	28720805623115	2004RE05324	• Early example of the type in the state • Multiple spans • High artistic value – outstanding ornamentation
Franklin	08	17570	28720840043116	2004RE11445	• Early example of the type in the state • Multiple Spans • High artistic value – outstanding ornamentation
Indiana	10	19278	32200800101410	1986RE00101	• High artistic value – outstanding ornamentation
Indiana	10	19512	32722206050054	2004RE03827	• Earliest in District 10 • Multiple Spans • Skewed • Dressed/tooled sandstone intrados and arch ring • High artistic value – outstanding ornamentation
Lancaster	08	22038	36723006731102	2004RE11831	• Multiple span • High artistic value – outstanding ornamentation
Lebanon	08	22921	38740230004001	2004RE02582	• Brick construction • High artistic value – outstanding ornamentation
Lebanon	06	38904	67300300401878	2004RE04382	• Exceptional span length • Skewed • High artistic value – outstanding ornamentation
Luzerne	04	24062	40200400701976	1986RE00785	• High artistic value – outstanding ornamentation
Montgomery	06	27322	46015202302106	1986RE00007	• Early example of the type in the state • Multiple spans • High artistic value – outstanding ornamentation
Montgomery	06	27402	46032000400852	1986RE00651	• Built before 1800 • Early example of the type in the state • High artistic value – outstanding ornamentation
Montgomery	06	27533	46100400901445	1986RE00918	• Multiple spans • High artistic value – outstanding ornamentation
Montgomery	06	27556	46102300500606	1986RE00009	• Multiple spans • High artistic value – outstanding ornamentation
Montgomery	06	27564	46103000100181	1986RE00791	• Multiple spans • High artistic value – outstanding ornamentation

County	District	Bridge Key#	BMS#	SHPO Resource #	Significance
Montgomery	06	27588	46200100200000	1986RE00657	• Early example of the type in the state • Multiple spans • High artistic value – outstanding ornamentation
Montgomery	06	27596	46200900800708	1986RE00358	• Early example of the type in the state • Multiple spans • High artistic value – outstanding ornamentation
Montgomery	06	27695	46300600301333	1983RE00158	• Multiple spans • High artistic value – outstanding ornamentation
Montgomery	06	28226	46302000601260	2004RE08712	• Multiple spans • Skewed • High artistic value – outstanding ornamentation
Montgomery	06	27826	46402300320439	1986RE00008	• Multiple spans • High artistic value – outstanding ornamentation
Montgomery	06	27842	46403100900279	1986RE00658	• Built before 1800 • Early example of the type in the state • Exceptional span length • Exceptional overall length • Multiple spans • High artistic value – outstanding ornamentation
Montgomery	06	27971	46704608200142	1970RE00027	• Built before 1800 • Early example of the type in the state • Exceptional overall length • Multiple spans • High artistic value – outstanding ornamentation
Montgomery	06	27972	46704608300252	2004RE10343	• Multiple spans • High artistic value – outstanding ornamentation
Montgomery	06	27976	46704608800101	2007RE01242	• Multiple spans • High artistic value – outstanding ornamentation
Northampton	05	28737	48201900200788	2007RE01246	• Multiple spans • High artistic value – outstanding ornamentation
Northampton	05	28707	48200300300749	1986RE00919	• Multiple spans • High artistic value – outstanding ornamentation
Northampton	05	28828	48720705119149	2004RE10373	• Early example of the type in the state • Multiple spans • High artistic value – outstanding ornamentation
Perry	08	29507	50003404102142	1986RE00920	• Multiple spans • High artistic value – outstanding ornamentation
Philadelphia	06	38391	67001301001190	1986RE00351	• Brick construction • Skewed • Offset arch ribs • High artistic value – outstanding ornamentation
Philadelphia	06	38724	67100200500272	1986RE00792	• Multiple spans • High artistic value – outstanding ornamentation
Philadelphia	06	38951	67300901000120	1986RE00518	• Multiple spans • High artistic value – outstanding ornamentation

County	District	Bridge Key#	BMS#	SHPO Resource #	Significance
Philadelphia	06	39144	67730100400120	2004RE11896	• Early example of the type in the state • High artistic value – outstanding ornamentation
Philadelphia	06	39218	67730101200340	2004RE10502	• Early example of the type in the state • Multiple spans • High artistic value – outstanding ornamentation
Philadelphia	06	38406	67001302602285	1986RE00517	• Built before 1800 • Early example of the type in the state • Earliest in District 6 • Multiple spans • High artistic value – outstanding ornamentation
Schuylkill	05	30908	53721404489073	2004RE12203	• Multiple spans • High artistic value – outstanding ornamentation
Somerset	09	31781	55403300200000	1986RE00352	• High artistic value – outstanding ornamentation
Somerset	09	31885	55721906263050	2004RE00100	• Dressed/tooled sandstone intrados and arch ring • High artistic value – outstanding ornamentation
Venango	01	33772	60100401200000	1986RE01051	• Earliest in District 1 • High artistic value – outstanding ornamentation
York	08	38117	66720809553258	1985RE00750	• Exceptional overall length • Multiple spans • High artistic value – outstanding ornamentation
York	08	37981	66401600202668	1986RE00787	• Exceptional span length • High artistic value – outstanding ornamentation

APPENDIX E BRIDGES THAT ARE RECOMMENDED NOT ELIGBILE (DEMOTED) UNDER CRITERION C

County	District	Bridge Key#	BMS#	SHPO Resource #
Adams	08	321	01301400700000	2007RE01472
Bucks	06	7573	09700904490001	2004RE00407
Bucks	06	7394	09402100500000	1983RE02366
Carbon	05	9119	13720405200001	1997RE01937
Chester	06	10721	15701505400241	2004RE11382
Clarion	10	11170	16721903100214	2004RE06890
Lehigh	05	23429	39710200000080	2004RE08529
Luzerne	04	24413	40721705046002	2004RE07066
Luzerne	04	24428	40722303796603	1988RE00645
Monroe	05	27119	45721305390002	2023RE07520
Montgomery	06	27978	46704609000073	2007RE01653
Schuylkill	05	30897	53721304750135	2004RE02689
Somerset	09	31359	55016003401364	2007RE01054
Washington	12	35037	62300500100840	2004RE00340
York	08	38187	66722009743202	2004RE09657

APPENDIX F STONE ARCH BRIDGE POINT SYSTEM

Category	Item	Masonry Arch Bridge	Points to Assign
1. Distinctive characteristics of type, period, or method of construction	A. Built before specified year	Built before 1800	7
	B. Method of Construction	None	7
	C. Distinctive type and/or uncommon type or only known example in the state	Brick Arches are a distinctive and uncommon type	7
	D. Early example in the state	Built before 1850	7
	E. Early standard plan in the state	None	3
	F. Earliest example in PennDOT district	Earliest example in each district	4
	G. Rare – PennDOT Dist. (≤ 3 bridges)	Rare in Dist. 2	3
2. Variation, evolution, and/or transition of a type	A. Exceptional length – main span	65 feet or greater	3
	B. Exceptional length – overall	120 feet or greater	3
	C. Number of spans	Each span receives 1 point	1 per span
	D. Special feature/ innovations - important or unusual	Skews represent a distinctive construction method to address engineering challenges Multiple spans	4
	E. Special feature/ innovations – highly important or unusual	Offsetting arch ribs is a rare variation and difficult method of construction, employed to provide a skew in an arch bridge, Dressed and tooled sandstone intrados made to look like long bricks (See BR Key # 1708)	4
	F. Outstanding technological achievement	Two or more examples of 2C and/or 2D above	7
3. High artistic value	A. Selected ornamentation	One example of ornamentation to include coursed and/or dressed stone, belt course, buttresses, crenelated parapet, step up parapets, bullnosed pier, bridge plaque, (Bridges that are completely rebuilt, and original details are lost, or bridges that are widened and original detail is lost or obscured do not receive points) Note – all bridge receive these points unless ornamentation is obscured by widening or rehab.	3
	B. Two or more examples of ornamentation or architectural treatment in overall design	Two of more examples from 3A above, WPA carvings (Bridges that are completely rebuilt, and original details are lost, or bridges that are widened and original detail is lost or obscured do not receive points) Note – all bridge receive these points unless ornamentation is obscured by widening or rehab.	6
4. Work of a Master	A. Prolific or Important Designer/Builder/Engineer	WPA, J.A. Morris and Theophilus P. Chandler, Silas Harry, Nathan R. Rambo	3