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File #: 171079

November 14, 2017

VIA HAND DELIVERY

Rosemary Chiavetta, Secretary
Pennsylvania Public Utility Commission
Commonwealth Keystone Building
400 North Street, 2nd Floor North
P.O. Box 3265
Harrisburg, PA 17105-3265

Re: Letter of Notification of PPL Electric Utilities Corporation, Filed Pursuant to 52 Pa. Code Chapter 57 Subchapter G, for Approval to Site and Construct 1.5 Miles of 230 kV Transmission Lines in Upper Allen Township and Lower Allen Township, Cumberland County, Pennsylvania to Interconnect the New West Shore 230-69 kV Substation to the Electric Grid
Docket No. A-2017-

Dear Secretary Chiavetta:

Enclosed for filing is the Letter of Notification of PPL Electric Utilities Corporation in the above-referenced proceeding. A CD containing a copy of the Letter of Notification and Attachments in Support of the Letter of Notification is also enclosed.

As indicated on the Certificate of Service, copies of the Letter of Notification are being served by certified mail, return receipt requested upon the involved governmental agencies, municipalities and property owners.

Subject to Commission approval, construction is scheduled to begin in February 2018 to support an in-service date of August 2019.

If you have any questions concerning this matter, please contact me at the address or telephone numbers provided above.

Respectfully submitted,

Christopher T. Wright

CTW/jl
Enclosures

cc: Certificate of Service
Office of Consumer Advocate
Office of Small Business Advocate
Bureau of Investigation & Enforcement
Robert F. Young
Paul T. Diskin
Yasmin Snowberger
Kimberly Hafner

BEFORE THE
PENNSYLVANIA PUBLIC UTILITY COMMISSION

Letter of Notification of PPL Electric Utilities Corporation, Filed Pursuant to 52 Pa. Code Chapter 57 Subchapter G, for Approval to Site and Construct 1.5 Miles of 230 kV Transmission Lines in Upper Allen Township and Lower Allen Township, Cumberland County, Pennsylvania to Interconnect the New West Shore 230-69 kV Substation to the Electric Grid	:	Docket No. A-2017-_____

LETTER OF NOTIFICATION

TO THE PENNSYLVANIA PUBLIC UTILITY COMMISSION:

PPL Electric Utilities Corporation ("PPL Electric") hereby files, pursuant to 52 Pa. Code § 57.72(d), this Letter of Notification to request approval from the Pennsylvania Public Utility Commission ("Commission") to site and construct approximately 1.5 miles of 230 kV transmission lines in Upper Allen Township and Lower Allen Township, Cumberland County, Pennsylvania (the "Project"). As explained below, the Project is necessary to interconnect the new West Shore 230-69 kV Substation to the electric grid. Subject to the Commission's approval, construction is scheduled to begin in February 2018 to support the in-service date of August 2019. In support thereof, PPL Electric states as follows:

I. INTRODUCTION

1. This Letter of Notification is filed by PPL Electric, a public utility that provides electric distribution, transmission, and provider of last resort services in Pennsylvania subject to the regulatory jurisdiction of the Commission.

2. PPL Electric's address is PPL Electric Utilities Corporation, Two North Ninth Street, Allentown, Pennsylvania 18101.

3. PPL Electric's attorneys are:

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PPL Electric's attorneys are authorized to receive all notices and communications regarding this Letter of Notification.

4. PPL Electric furnishes electric service to approximately 1.4 million customers throughout its certificated service territory, which includes all or portions of twenty-nine counties and encompasses approximately 10,000 square miles in eastern and central Pennsylvania. PPL Electric is a "public utility" and an "electric distribution company" as defined in Sections 102 and 2803 of the Pennsylvania Public Utility Code, 66 Pa.C.S. §§ 102, 2803.

5. PPL Electric owns approximately 5,000 miles of transmission lines operating at 69 kV (kilovolts) or higher, approximately 375 substations with a capacity of 10 MVA (megavolt amperes) or more, and approximately 43,000 miles of distribution lines operating at less than 69 kV.

6. This Letter of Notification includes the following accompanying attachments:

- Attachment 1 Necessity Statement.
- Attachment 2 Engineering Description.

- Attachment 3 Description of the Project Area.
- Attachment 4 PPL Electric Design Criteria and Safety Practices.

7. This Letter of Notification and accompanying Attachments, which are incorporated herein by reference, contain all the information required by 52 Pa. Code § 57.72(d)(4).

II. THE PROJECT

A. NEED FOR THE PROJECT

8. The existing West Shore 230-69 kV Substation is a part of both the bulk and non-bulk electric systems[1] serving customers throughout PPL Electric's service territory.

9. The West Shore Substation was originally built in the early 1960s as a 230-69 kV substation with 230 kV and 69 kV switchyards.[2] The 230 kV switchyard feeds two 230-69 kV transformers that "step down" the voltage from 230 kV to 69 kV and, in turn, feed the 69 kV switchyard.[3] The 69 kV switchyard feeds nine 69 kV transmission lines serving customers in

[1] The bulk electric system ("BES") includes transmission facilities operated at voltages of 100 kV or higher, and the non-bulk electric system ("non-BES") includes transmission facilities operated at voltages less than 100 kV.

[2] A switchyard is an interconnection that, unlike a step-up or step-down transformer, maintains voltage.

[3] The nation's electric system consists of three basic components: generation, transmission, and distribution. Generating plants typically produce electricity at a relatively low voltage. Transformers located adjacent to the generating plants increase or "step up" the voltage to transmission-level voltages such as 230 kV or 500 kV, depending on the size of the generating facility and the distance the electricity must travel for delivery to customers. After the voltage is "stepped up," the power is transmitted to substations, where the voltage level is sequentially "stepped down" for ultimate delivery into the distribution system.

Cumberland and York Counties,[4] with one of the nine 69 kV transmission lines dedicated to interconnecting one Independent Power Producer Combustion Turbine generation customer.

10. The aging 230 kV and 69 kV switchyards at the West Shore Substation, including the 230-69 kV transformers, do not meet modern design standards and have reached an age and condition such that the facilities must be replaced in order to continue providing safe and reliable service to customers.

11. Because the West Shore Substation is a component to the backbone of the bulk and non-bulk transmission power systems, the West Shore Substation cannot be decommissioned without replacement.

12. To address these issues and to ensure customers continue to receive safe and reliable service, PPL Electric plans to build a new West Shore 230-69 kV Substation on a 25-acre, Company-owned parcel immediately adjacent to the existing West Shore 230-69 kV Substation in Upper Allen Township, Cumberland County, Pennsylvania.

13. The existing West Shore Substation is not large enough to accommodate the new substation. Moreover, rebuilding the substation in place would result in a less reliable design and would result in significant outage risks to the bulk electric system during construction.

14. For these reasons, PPL Electric plans to build the new West Shore 230-69 kV Substation on the site located immediately adjacent to the existing West Shore Substation site.

15. The new 230 kV and 69 kV switchyards will be located primarily on the PPL Electric-owned 25-acre parcel that is adjacent to the existing West Shore Substation but will also extend partially onto the 19.3-acre parcel for the existing West Shore Substation.

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[4] Distribution transformers then further reduce the voltage from primary to secondary distribution levels for ultimate delivery to customers.

16. The location of the site for the new West Shore Substation 230 kV and 69 kV switchyards is ideal because it is located adjacent to the existing substation site and already crossed by the existing 230 kV transmission lines, which will minimize the amount of relocated transmission lines that need to be constructed to interconnect the new switchyards with the electric grid. In addition, the new substation will be located farther away from new residential development along Arcona Road.

17. The construction of the new, modern 230 kV and 69 kV switchyards will resolve all of the reliability concerns described above, meet all modern design requirements, and provide the region with the required electric power supply reinforcement.

18. The need for the proposed Project is further explained in Attachment 1 to this Letter of Notification.

B. THE PROPOSED PROJECT

19. In order to interconnect the new West Shore Substation with the electric grid, PPL Electric proposes to construct a total of approximately 1.5 miles of 230 kV transmission lines.

20. As explained in detail in Attachments 1 and 2 to this Letter of Notification, PPL Electric proposes to construct approximately 1.5 miles of new transmission line, which includes: (i) 0.7 miles of new 230 kV transmission lines; and (ii) 0.8 miles of temporary 230 kV transmission lines required to support construction.[5] These new transmission lines will be located entirely on the existing PPL Electric-owned West Shore Substation property, within existing rights-of-way, and on the PPL Electric-owned property for the new West Shore Substation. No additional right-of-way is required for these new transmission lines.

[5] The Project also includes the construction of 69 kV lines that will interconnect with the new 69 kV switchyard. PPL Electric does not need Commission approval to site and construct these 69 kV transmission lines because they have a design voltage less than 100 kV. *See* 52 Pa. Code §§ 57.1, 57.71.

21. Maps of the existing and proposed 230 kV configurations are provided as Figures 1-2 and 1-4 in Attachment 1 to this Letter of Notification. A one-line diagram of the existing system is provided as Figure 1-2 in Attachment 1 to this Letter of Notification. A one-line diagram of the proposed system is provided as Figure 1-3 in Attachment 1 to this Letter of Notification.

22. The approximately 1.5 miles of new 230 kV transmission lines will be supported by 19 new steel pole structures. Table 2-1 in Attachment 2 of this Letter of Notification provides the anticipated height of each new structure. Each new structure will be located entirely on the PPL Electric-owned existing West Shore Substation property, within existing rights-of-way, or on the PPL Electric-owned property for the new West Shore Substation.

23. All new poles for the proposed Project will be either self-supporting steel structures on drilled shaft, reinforced concrete foundations or direct embedded self-supporting steel structures. Typical structures are shown in Figures 2-1 and 2-2 in Attachment 2 to this Letter of Notification.

24. Each new 230 kV circuit will utilize three power conductors and two fiber optic ground wires. The power conductors will be 1590 kcmil,[6] 54/19 stranding, aluminum conductor steel reinforced ("ACSR"). The fiber optic ground wires will be 0.791-inch diameter optical ground wires ("OPGW").

25. After construction of the new West Shore Substation is finished, the Company will remove the 0.8 miles of temporary 230 kV transmission lines and their associated structures, which were built to support construction of the new substation.

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[6] kcmil stands for thousand circular mils. kcmil wire size is the equivalent cross sectional area in thousands of circular mils. A circular mil is the area of a circle with a diameter of one thousandth (0.001) of an inch.

26. An engineering description of the proposed new and temporary transmission lines is provided in Attachment 2 to this Letter of Notification.

27. This Project is necessary to enable PPL Electric to continue to provide reliable service now and into the future and, therefore, requests approval of the Commission to complete this Project.

28. The estimated cost to site, design, and construct the 230 kV transmission lines that are the subject of this filing is approximately $3 million.[7] The estimated cost for the whole Project, including the substation work and 69 kV lines, is approximately $32 million.

29. Subject to the Commission's approval, construction is scheduled to begin in February 2018 to support the in-service date of August 2019.

30. The proposed Project was presented before the PJM sub-regional RTEP committee for the mid-Atlantic zone on July 29, 2015. The Project was assigned PJM supplemental project number s0944.1.

III. HEALTH AND SAFETY

31. The proposed Project will not create any unreasonable risk of danger to public health or safety.

32. The Project will be designed, constructed, operated, and maintained in a manner that meets or surpasses all applicable National Electrical Safety Code ("NESC") minimum standards and all applicable legal requirements. Descriptions of PPL Electric's design criteria and safety practices are provided in Attachment 4 to this Letter of Notification.

[7] The estimated cost for the proposed Project is an order-of-magnitude estimate developed using averages of recent costs for similar projects and without an in-depth analysis of field investigation. The estimated cost is subject to change as the constructability of the Project, sequence of construction, and other factors that may affect cost are identified and analyzed as the Project progresses.

33. Consistent with its Magnetic Field Management Program, the proposed Project will utilize structures that have a ground clearance that meet or exceed the minimum ground to conductor clearances required by the NESC standards. In addition, where feasible, the double-circuit lines associated with this Project will be reverse phased. These measures will further reduce the potential for exposure to magnetic fields. A description of PPL Electric's Magnetic Field Management Program is provided in Attachment 2 to this Letter of Notification.

IV. DESCRIPTION OF THE PROJECT AREA

34. The Project will be constructed within the 19.3-acre parcel owned by PPL Electric for the existing West Shore Substation, existing rights-of-way, and the Company-owned 25-acre parcel immediately adjacent to the existing substation parcel.

35. The new 230 kV and 69 kV switchyards will be located in the central portion of the 25-acre parcel.

36. As explained in Attachment 3, the location of the site for the new West Shore Substation 230 kV and 69 kV switchyards is ideal because it is located adjacent to the existing substation site and already crossed by the existing 230 kV transmission lines, which will minimize the amount of relocated transmission lines that need to be constructed to interconnect the new switchyards with the electric grid. In addition, new substation will be located farther from new residential development along Arcona Road.

37. The approximately 0.7 miles of new 230 kV transmission lines, 0.8 miles of temporary 230 kV transmission lines, and supporting structures will be located entirely on the existing PPL Electric-owned West Shore Substation property, within existing rights-of-way, or on the PPL Electric-owned property for the new West Shore Substation 230 and 69 kV switchyards. No additional right-of-way is required for these new transmission lines.

38. As explained in Attachment 3 to this Letter of Notification, land use and environmental impacts are anticipated to be minimal because the Project will be constructed entirely within the existing West Shore Substation property, the property for the new West Shore Substation 230 kV and 69 kV switchyards, and the existing transmission rights-of-way.

39. The Project area has largely been cleared of vegetation. As a result, limited vegetation management will be required for this project. In areas where vegetation management is required to construct and maintain the project, PPL Electric will apply its "*Specifications for Transmission Vegetation Management LA-79827*" to minimize any potential impacts.

40. There is one cell tower located on the existing West Shore 230-69 kV Substation property. No impacts to the operation of the cell tower are anticipated; however, PPL Electric will coordinate with the cell tower owner during construction.

41. An existing Sunoco gas pipeline and the new Mariner East 2 pipeline are located along the northern boundary of the existing West Shore Substation site. Neither pipeline will be affected by the Project. PPL Electric will coordinate with Sunoco to avoid impacts during construction.

42. No other communication towers, pipelines, or other utilities will be affected by the proposed Project.

43. PPL Electric does not anticipate any interference with airport operations because of the distance from the Project area and the presence of existing electrical facilities in the Project area. However, PPL Electric will file any required documentation with the Federal Aviation Administration and the Pennsylvania Department of Transportation, Bureau of Aviation.

44. The Project area contains no state lands, national parks, or state parks.

45. Winding Hills East and West Park is located southwest of the substation property adjacent to the Norfolk Southern railway. The park is currently crossed by the existing Williams Grove – West Shore 230 kV and Brunner Island – Williams Grove 230 kV Transmission Line. As such, no incremental impacts to the park are anticipated.

46. The Project will not traverse or affect any unique geological or scenic areas.

47. The Project does not cross or traverse close to any areas identified on the National Area Inventory.[8] The project will not affect any other unique geological, scenic, or designated natural areas.

48. The Project will not affect any recreational areas or natural landmarks.

49. A response from the Pennsylvania State Historic Preservation Office ("SHPO") indicated that the Project will not impact archeological resources. It is anticipated that the Project will have minimal impacts above ground resources because the Project is being constructed on a parcel located adjacent to the existing substation that is presently crossed by existing 230 kV transmission lines. In addition, the new structures will be less than 20 feet taller in height than the existing structures.

50. No streams were identified in the Project area.

51. The proposed Project will span one wetland; however, it is anticipated that the Project will have no impacts on wetlands because the new structures will be located to avoid such impacts.

52. PPL Electric will obtain permits and other authorizations from the County Conservation District, Pennsylvania Department of Environmental Protection and the United

[8] The National Area Inventory includes information on the location of rare, threatened, and endangered species and the highest quality natural areas located within the County.

States Army Corps of Engineers, as needed, and will comply with all of the terms and conditions placed on those permits or authorizations.

53. PPL Electric will acquire any required soil erosion and sedimentation control permits and will comply with any conditions placed on those permits.

54. PPL Electric has consulted with state and federal agencies to obtain information regarding endangered and threatened species in close proximity to the Project. The Pennsylvania Department of Conservation and Natural Resources, Pennsylvania Fish and Boat Commission, Pennsylvania Game Commission, and U.S. Fish and Wildlife Service all responded that there was no known impact to species under their jurisdiction, and no further review by their agency was required.

55. Cumberland County is located within the known range of the federally threatened Bog Turtle (*Clemmys muhlenbergii*). PPL Electric retained a qualified bog turtle surveyor to conduct Phase I Bog Turtle surveys. The survey did not identify any potential bog turtle habitat in the wetland located within the Project area. Further, the U.S. Fish and Wildlife Service indicated that no impacts to federally listed species under its jurisdiction are known or likely to occur in the Project area.

56. PPL Electric will continue to consult with the jurisdictional agencies regarding potential impacts to protected species, as necessary. PPL Electric will obtain all approvals and permits necessary for the construction of the Project and will comply with any conditions placed on those permits.

V. NOTICE

57. PPL Electric has provided information regarding the Project to representatives of Upper Allen Township and Lower Allen Township, Cumberland County, Pennsylvania. These entities have not objected to the proposed Project.

58. Copies of this Letter of Notification will be served on the governmental agencies, municipalities, and other public entities agencies in accordance with 52 Pa. Code § 57.72(d)(3).

59. Copies of this Letter of Notification will be served on the owners of land subject to the right-of-way and easement in accordance with 52 Pa. Code § 57.72(d)(3).

VI. LETTER OF NOTIFICATION

60. Pursuant to the Commission's regulations at 52 Pa. Code § 57.72(d)(1)(vi), PPL Electric is proceeding by means of a Letter of Notification, instead of a full Application, because the 230 kV transmission lines to be constructed have a proposed route of two miles or less.

61. This Letter of Notification is filed on the date set forth below. As provided in 52 Pa. Code § 57.72(d)(5), the Commission will review and, by order, approve or disapprove this Letter of Notification. If the Commission approves this Letter of Notification, the proposed Project will be constructed as proposed herein without the formal application process set forth at 52 Pa. Code §§ 57.71, *et seq.*

VII. CONCLUSION

WHEREFORE, PPL Electric Utilities Corporation respectfully requests Pennsylvania Public Utility Commission approval to site and construct approximately 1.5 miles of 230 kV transmission lines in Upper Allen Township and Lower Allen Township, Cumberland County, Pennsylvania, as explained above and in the Attachments hereto.

Respectfully submitted,

Kimberly A. Klock (I.D. #89716)
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Date: November 14, 2017

Attorneys for PPL Electric Utilities Corporation

VERIFICATION

I, STEPHANIE R. RAYMOND, being the VICE PRESIDENT-TRANSMISSION AND SUBSTATIONS at PPL Electric Utilities Corporation, hereby state that the facts above set forth are true and correct to the best of my knowledge, information and belief and that I expect PPL Electric Utilities Corporation to be able to prove the same at a hearing held in this matter. I understand that the statements herein are made subject to the penalties of 18 Pa.C.S. § 4904 relating to unsworn falsification to authorities.

Date: 11/13/17

Before the
Pennsylvania Public Utility Commission

WEST SHORE 230-69 kV SUBSTATION RELOCATION PROJECT

ATTACHMENTS IN SUPPORT OF THE
Letter of Notification

Application Docket No._____

Submitted by: PPL Electric Utilities Corporation

ATTACHMENT 1

WEST SHORE 230-69 kV SUBSTATION RELOCATION PROJECT
NECESSITY STATEMENT

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ATTACHMENT 1

WEST SHORE 230-69 kV SUBSTATION RELOCATION PROJECT
NECESSITY STATEMENT

A. INTRODUCTION

PPL Electric Utilities Corporation ("PPL Electric") is requesting Pennsylvania Public Utility Commission ("PUC" or the "Commission") approval for the construction of approximately 1.5 miles of 230 kV transmission lines in Upper Allen Township and Lower Allen Township, Cumberland County, Pennsylvania (the "Project"). As explained below, the 230 kV and 69 kV switchyards located within the existing West Shore 230-69 kV Substation ("West Shore Substation") have reached an age and condition that the facilities must be replaced in order to ensure safe and reliable service to electric customers in Cumberland and York counties. As a result, PPL Electric plans to construct new 230 kV and 69 kV switchyards adjacent to the existing West Shore Substation. PPL Electric herein seeks Commission approval for the construction of the transmission lines necessary to interconnect the new West Shore Substation to the electric grid.

The estimated cost to site, design, and construct the transmission lines that are the subject of this filing is approximately $3 million.[1] The estimated cost for the whole Project, including the substation work, is approximately $32 million. Subject to the Commission's approval, construction is scheduled to begin in February 2018 to support an in-service date of August 2019. A one-line diagram and map of the existing system are provided as Figures 1-1 and 1-2, respectively.

B. SYSTEM PLANNING PROCESS AND GUIDELINES

The nation's interconnected transmission grid serves as the backbone for the safe and reliable delivery of large amounts of electricity from generating stations over substantial distances to customers served by transmission and local distribution systems. It is critically important that this

[1] The estimated cost for the proposed West Shore Substation Project is an order-of-magnitude estimate developed using averages of recent costs for similar projects and without an in-depth analysis or field investigation. The estimated cost is subject to change as the constructability of the Project, sequence of construction, and other factors that may affect the cost are identified and analyzed as the Project progresses.

interconnected transmission system (transmission grid) be planned and designed to be highly reliable so that reliable electric service can be provided under peak and all loading conditions and when certain elements of the system are out of service (system contingencies) due to planned or unplanned outages.

System Planning is the process that assures that the transmission system can supply electricity to all customer loads in a manner that is reliable and economical. This System Planning process assures that both the Bulk Electric System (BES)[2] and non-Bulk Electric System (non-BES)[3] are planned and constructed so that:

- They are able to accommodate forecasted system flows during summer and winter peak load;
- They can adequately serve each customer's need with regard to capacity, voltage and reliability for all load levels throughout the daily load cycle;
- They can sustain probable contingencies and disturbances with minimal customer service interruptions; and
- They are in conformance with North American Electric Reliability Corporation (NERC), PJM Interconnection, LLC ("PJM"), and the Transmission Owner's reliability criteria for all normal and emergency operating conditions.

PJM is a FERC-approved Regional Transmission Organization (RTO) charged with ensuring the reliability of the electric transmission system under its functional control (100 kV and above), and coordinating the movement of electricity in all or parts of thirteen states and the District of Columbia, including most of Pennsylvania. In order to ensure reliable transmission service, PJM prepares an annual Regional Transmission Expansion Plan (RTEP)[4] to identify system

[2] Bulk Electric System (BES) – Includes transmission facilities operated at voltages of 100 kV or higher.
[3] Non-Bulk Electrical System (non-BES) – Includes transmission facilities operated at voltages less than 100 kV.
[4] PJM's RTEP process is currently set forth in Schedule 6 of PJM's Amended and Restated Operating Agreement ("Schedule 6"). Schedule 6 governs the process by which PJM's members rely on PJM to prepare an annual regional plan for the enhancement and expansion of the transmission facilities to ensure long-term, reliable electric service consistent with established reliability criteria. In addition, Schedule 6 addresses the procedures used to develop the RTEP, the review and approval process for the RTEP, the obligation of transmission owners to build transmission upgrades included in the RTEP, and the process by which interregional transmission upgrades will be developed.

reinforcements that are required to, among other things, meet the NERC Reliability Standards, PJM reliability planning criteria, and Transmission Owner reliability criteria.

PJM conducts RTEP studies in conjunction with its Transmission Owners and applies NERC, regional, and Transmission Owner reliability criteria to specific conditions on the transmission system. PJM's RTEP is an annual process that encompasses a comprehensive series of detailed analyses to ensure power continues to flow reliably to customers under stringent reliability criteria set by NERC. PJM's manual 14B[5] outlines the RTEP process and reliability criteria used for this process. As mentioned in manual 14B, every year PJM performs various reliability tests such as baseline thermal, baseline voltage, load deliverability, generation deliverability and baseline stability to ensure safe reliable of operation of electric grid.

When the studies show an inability of the transmission system to meet specific reliability criteria under these conditions, PJM opens an RTEP Window in accordance with FERC Order 1000[6] to identify the optimal solution to resolve the criteria violation.

PPL Electric, as a Transmission Owner and member of PJM, undertakes an independent analysis of both its BES transmission facilities, and its non-BES transmission facilities in concert with the PJM RTEP process. PPL Electric identifies all conditions where the future system does not meet the NERC criteria, PJM reliability criteria, or PPL Electric Transmission Owner criteria. In this way, PPL Electric actively participates in the PJM RTEP process, and through this participation PPL Electric provides results of its independent studies to PJM for consideration and inclusion in the PJM RTEP.

Alternatives that can mitigate violations to the reliability criteria are developed and analyzed to ensure that the PPL Electric transmission system meets the reliability criteria. Estimated costs and lead times to implement the reinforcements are prepared. PPL Electric then proposes solutions to PJM through an RTEP window. If the project is awarded to PPL Electric, it then becomes a baseline RTEP project.

[5] PJM Manual 14B is available at http://www.pjm.com/~/media/documents/manuals/m14b.ashx
[6] http://www.ferc.gov/industries/electric/indus-act/trans-plan.asp

PPL Electric's Transmission Owner criteria address thermal, voltage, short circuit, and stability limits specific to the PPL Electric zone and also ensure compliance with NERC and PJM reliability criteria. These criteria ensure adequate and appropriate levels of electric service to PPL Electric customers in accordance with good utility practices. In addition to these criteria, PPL Electric plans the system according to its own Transmission System Development Standards.

PJM has developed the PJM Protection Standards as set forth in the PJM Manual 7[7]. The PJM Protection Standards establish the minimum design standards and requirements for the protection systems associated with the bulk power facilities within PJM. This manual is intended to provide design specification for new protection system installations. In accordance with the manual, all new projects approved after January 1, 2012 are required to conform to these design standards. As a transmission owner in the PJM service territory, PPL Electric is required to follow the PJM Protection Standards.

In addition to NERC, PJM, and Transmission Owner criteria-based projects, PPL Electric also initiates projects based on the Transmission System Development Standards. These projects address local load growth, provide load restoration flexibility, and replace poor performing transmission assets in order to provide an advanced level of reliability on the local system.

PPL Electric has developed an Asset Optimization Strategy that is incorporated into the Transmission System Development Standards. A significant portion of the system infrastructure is either approaching the end of or has exceeded its expected or useful life. The Asset Optimization Strategy was developed to systematically identify and modernize these aging facilities. The measures used to identify and prioritize the equipment and lines that qualify for this work includes, but is not limited to: age, condition, operational issues, maintainability of the equipment, criticality of the equipment or line, line loading, and circuit performance. Once equipment has been identified and assessed under the above measures, it will be put into the Capital Budget for replacement under the Asset Optimization Strategy.

[7] PJM Manual 7 is available at http://www.pjm.com/-/media/documents/manuals/m07.ashx

Projects created to support PPL Electric's Transmission System Development Standards are presented to PJM stakeholders at either a Transmission Expansion Advisory Committee (TEAC) or Sub-Regional RTEP meeting and are assigned a Supplemental project number in the RTEP. PJM incorporates these projects into the power flow model which they use to perform various reliability analyses for the RTEP.

C. DEFINITION OF THE PROBLEM

The West Shore 230-69 kV Substation was originally built in the early 1960s as a 230-69 kV substation with 230 kV and 69 kV switchyards[8]. The 230 kV switchyard feeds two 230-69 kV transformers that step down the voltage from 230 kV to 69 kV and feed the 69 kV switchyard.[9] The 69 kV switchyard feeds nine 69 kV transmission lines serving customers in Cumberland and York counties,[10] with one of the nine 69 kV transmission lines dedicated to interconnecting one Independent Power Producer Combustion Turbine generation customer.

Following the construction of the previously-approved Williams Grove Substation Project,[11] three 230 kV transmission lines will remain interconnected to the existing West Shore Substation: Williams Grove – West Shore 230 kV Transmission Line; West Shore – Steelton 230 kV Transmission Line; and Brunner Island – West Shore 230 kV Transmission Line. A fourth 230 kV line, Brunner Island – Williams Grove 230 kV Transmission Line, will bypass the West Shore Substation as part of the previously-approved Williams Grove Substation Project.

PPL Electric has determined that the aging 230 kV and 69 kV switchyards at the West Shore Substation, including the 230-69 kV transformers, do not meet the modern design standards and

[8] A switchyard is an interconnection that, unlike a step-up or step-down transformer, maintains voltage.

[9] The nation's electric system is comprised of three basic components: generation, transmission, and distribution. Generating plants typically produce electricity at a relatively low voltage. Transformers located adjacent to the generating plants increase or "step up" the voltage to transmission-level voltages such as 230 kV or 500 kV, depending on the size of the generating facility and the distance the electricity must travel for delivery to customers. After the voltage is "stepped up," the power is transmitted to substations, where the voltage level is sequentially "stepped down" for ultimate delivery into the distribution system.

[10] Distribution transformers then further reduce the voltage from primary to secondary distribution levels for ultimate delivery to customers.

[11] *See Letter of Notification of PPL Electric Utilities Corporation, Filed Pursuant of 52 Pa. Code Chapter 57 Subchapter G, for Approval for Williams Grove 230 kV Connecting Lines Project in Upper Allen Township located in Cumberland County, Pennsylvania*, Docket No. A-2017-2611742 (approved August 31, 2017).

have reached an age and condition that the facilities must be replaced in order to provide safe and reliable service to customers. The West Shore Substation is a component to the backbone of bulk and non-bulk transmission power systems and, therefore, the substation cannot be decommissioned without replacement.

D. PROPOSED PROJECT

To address these issues and to ensure customers continue to receive safe and reliable service, PPL Electric plans to build a new 230-69 kV substation adjacent to the existing West Shore 230-69 kV Substation in Upper Allen Township in Cumberland County, Pennsylvania. The existing West Shore Substation property is not large enough to accommodate the new 230-69 kV substation. In addition, rebuilding the substation in place would result in a less reliable design, and would result in significant outage risks to the bulk electric system during construction. For these reasons, PPL Electric proposes to build a new 230-69 kV substation on a PPL Electric owned property located immediately adjacent to the existing West Shore Substation property.

The proposed new West Shore Substation Project will provide the region with the required electric power supply reinforcement and will meet all NERC and PJM criteria. This will help ensure continuous and reliable service to PPL Electric customers and the BES transmission system.

In order to interconnect the new West Shore Substation with the existing transmission lines, PPL Electric proposes to construct new 230 kV and 69 kV transmission lines.[12] This Project will require the construction of approximately 0.7 miles of new 230 kV transmission lines and construction of approximately 0.8 miles of temporary 230 kV transmission lines. All the transmission line construction will be within the existing rights of way or PPL Electric property. Further descriptions of these new 230 kV transmission lines needed to interconnect the new West Shore Substation are provided below.

[12] Because PPL Electric does not need Commission approval to site, construct, or relocate transmission lines with a design voltage of less than 100 kV (per 52 Pa. Code § 57.71), these new 69 kV transmission lines are not the subject of this filing seeking Commission approval of the siting and construction of the Project.

As explained above, upon completion of the previously-approved Williams Grove Substation Project (Docket No. A-2017-2611742), the following three 230 kV lines will remain interconnected with the existing West Shore 230-69 kV Substation: (i) West Shore – Steelton 230 kV single-circuit; (ii) Brunner Island – West Shore 230 kV single-circuit; and (iii) Williams Grove – West Shore 230 kV single-circuit. Each of these 230 kV transmission lines will be removed from the existing switchyards and re-terminated at the new 230 kV switchyards to be located adjacent to the existing West Shore Substation site. To do so, PPL Electric proposes to construct short segments of new 230 kV transmission lines from the existing lines to the new switchyards.

In addition, three temporary 230 kV tie lines between the existing 230 kV switchyard and the new 230 kV switchyard will be constructed to avoid outages during the construction phase. Upon completion of the Project, these temporary lines will be removed.

Finally, as part of this Project, PPL Electric proposes to re-route a small segment of the Brunner Island – Williams Grove 230 kV Transmission Line. As part of the previously-approved Williams Grove Project, the Brunner Island –Williams Grove 230 kV Transmission Line is to be disconnected from and bypass the West Shore Substation. The work on this segment of the Brunner Island –Williams Grove 230 kV Transmission Line has not started and is not scheduled to begin until 2nd quarter of 2018. Currently, the route for the Brunner Island –Williams Grove 230 kV Transmission Line bypass segment traverses the site for the new 230-69 kV substation owned by PPL Electric. In order to accommodate the new 230-69 kV substation, PPL Electric proposes to shift a small segment of the route for the Brunner Island –Williams Grove 230 kV Transmission Line from the middle of the PPL Electric-owned property and closer to the edge of the property. Although the Brunner Island – Williams Grove 230 kV Transmission Line bypass segment was included in the Williams Grove Project filing, PPL Electric proposes to shift the alignment in order to accommodate the new 230-69 kV substation. Therefore, the shifted alignment for the Brunner Island – Williams Grove 230 kV Transmission Line has been included in this filing.

In total, PPL Electric proposes to construct approximately 1.5 miles of new 230 kV transmission lines, including the temporary 230 kV tie line and the reroute of the Brunner Island –Williams

Grove 230 kV Transmission Line. Table 1-1 shows the total lengths of each new, temporary, and rerouted 230 kV transmission line to be constructed as part of this Project.

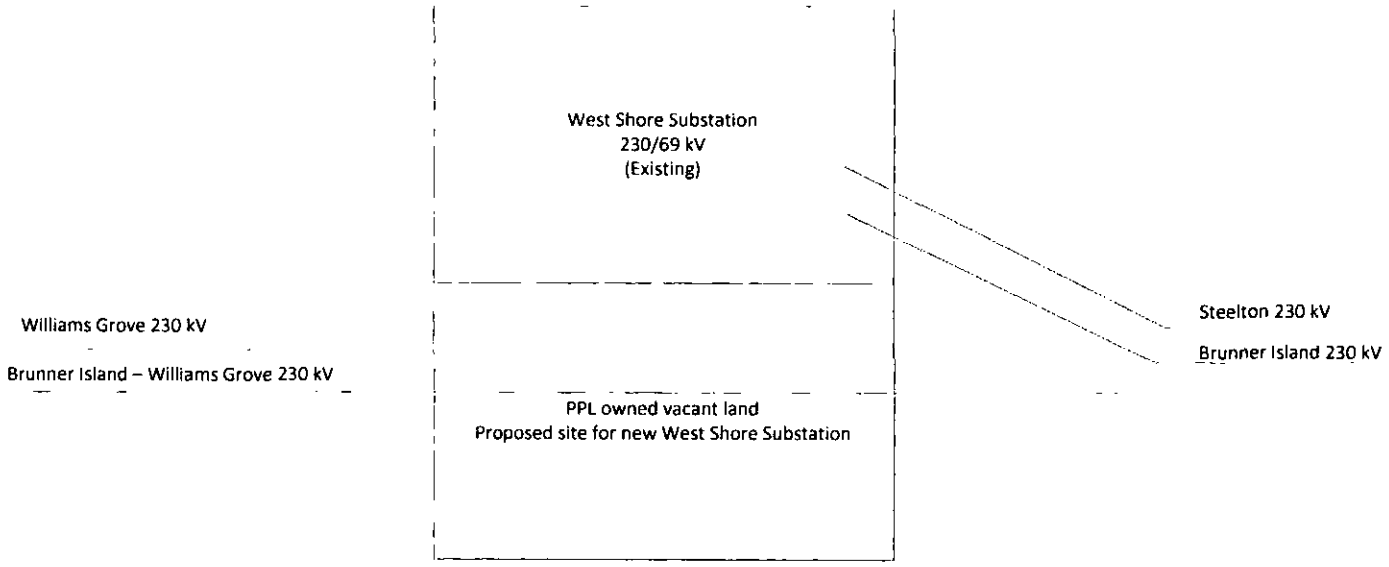
TABLE 1-1. NEW 230 kV	
Transmission Circuit	**Length (miles)**
Williams Grove – West Shore 230 kV single-circuit	0.13
Brunner Island – West Shore 230 kV single-circuit	0.12
West Shore - Steelton 230 kV single-circuit	0.13
Brunner Island – Williams Grove 230 kV single-circuit	0.28
Three West Shore Substation Temporary 230 kV Tie single-circuits	0.77
230 kV Total (miles)	**1.5[1]**

[1] Total does not add due to rounding

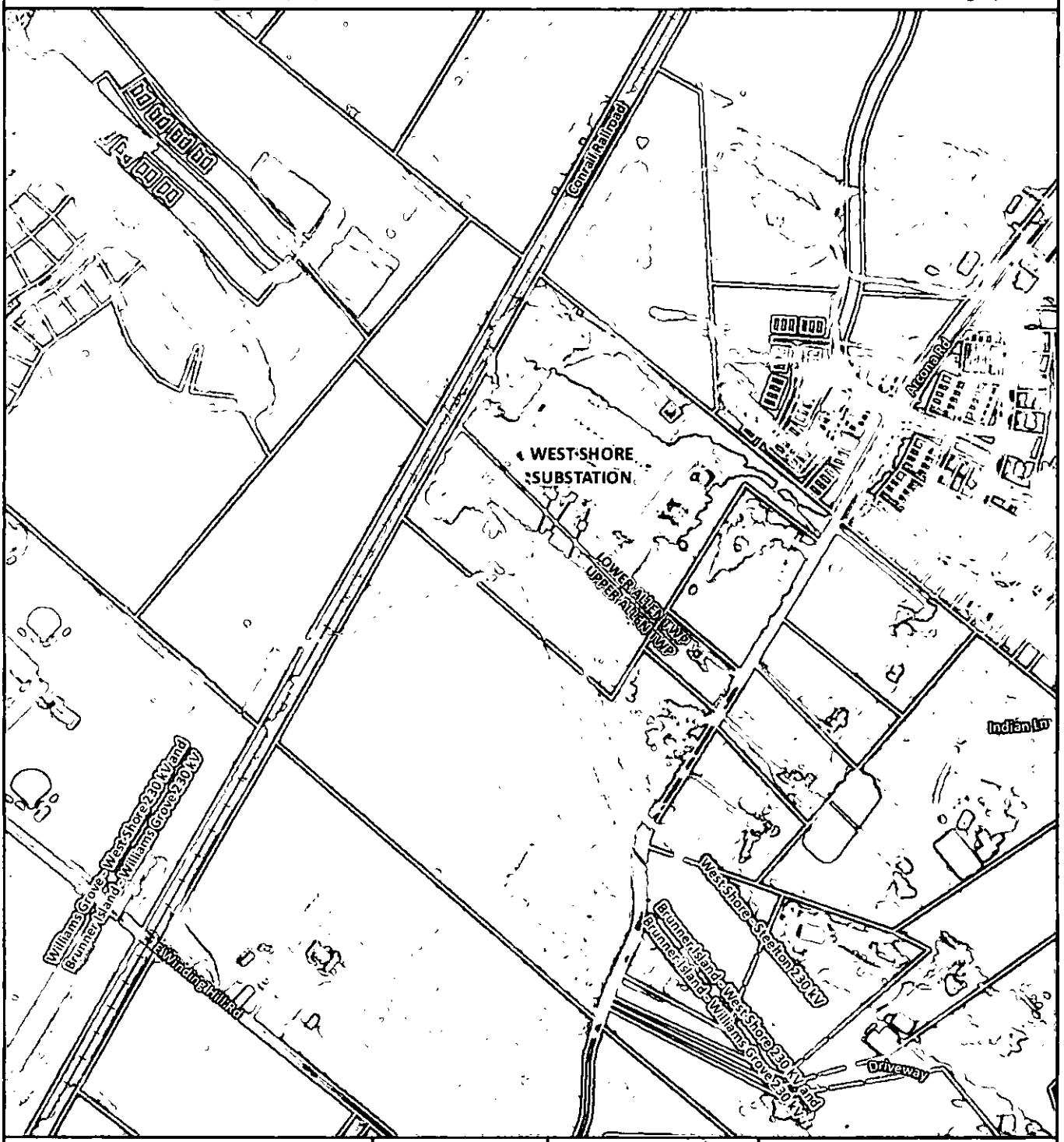
All new 230 kV transmission lines and associated structures will be located entirely on PPL Electric-owned property or existing PPL Electric right of way. A one-line diagram of the proposed system and a map of the proposed Project are provided as Figures 1-3 and 1-4, respectively.

This Project is necessary to enable PPL Electric to continue to provide reliable service now and into the future and therefore requests approval of the Commission to complete this Project. The Project resolves all of the reliability concerns described above, and was presented before the PJM sub-regional RTEP committee for the mid-Atlantic zone on July 29, 2015. The West Shore Project was assigned PJM supplemental project number s0944.1.

Figure 1-1. One-Line Diagram of Existing System



Note: The existing transmission alignments for the Williams Grove - West Shore and Brunner Island - Williams Grove 230 kV lines are based on the alignments proposed in the Williams Grove Substation LON and therefore do not match aerial imagery.



Existing 230 kV Transmission Line
Parcel Boundary
Railroad
Municipality Boundary

Data Sources:
NAIP (2015), ESRI (2014)
Cumberland County (2017)

Coordinate System:
State Plane PA South
NAD 83

October 09, 2017

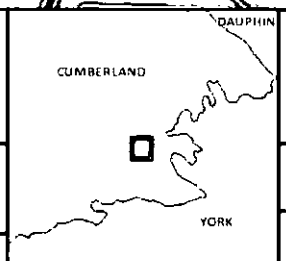


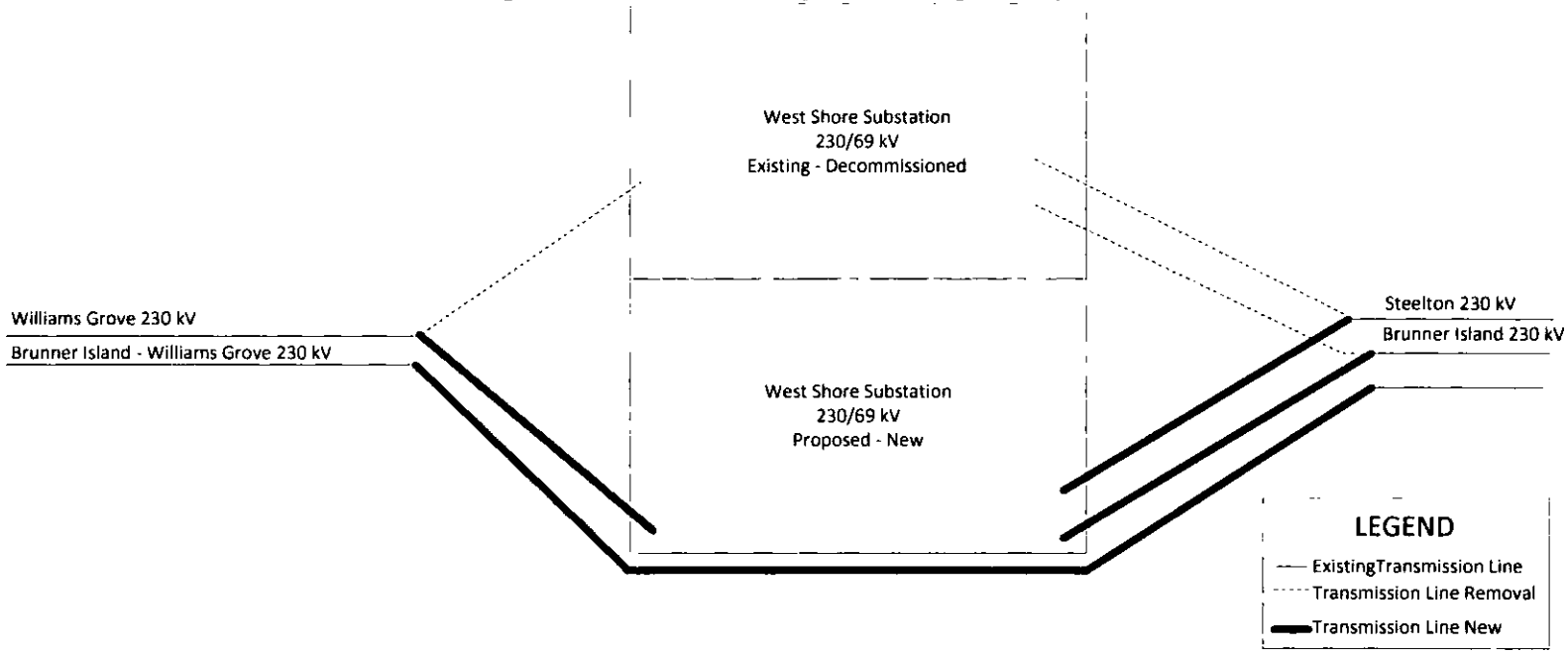
Figure 1-2
Existing Facilities
West Shore Substation Project

ppl
Louis Berger

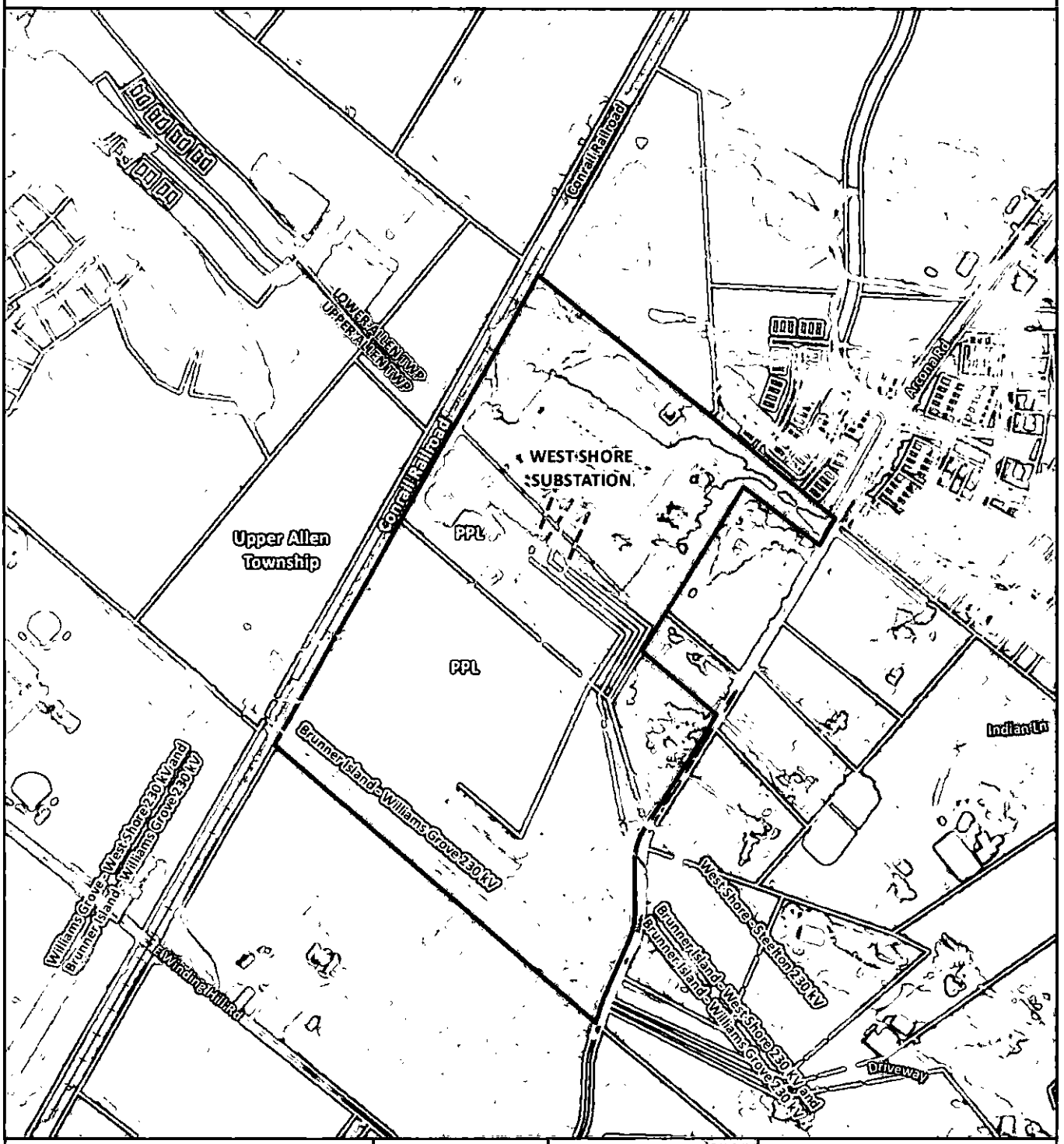
0 300 600 Feet

N

Figure 1-3. One-Line Diagram of Proposed System



Note: The existing transmission alignments for the Williams Grove - West Shore and Brunner Island - Williams Grove 230 kV lines are based on the alignments proposed in the Williams Grove Substation LON and therefore do not match aerial imagery.



- Proposed 230 kV Transmission Line
- Existing 230 kV Transmission Line
- 230 kV Transmission Line to be Removed
- Temporary 230 kV
- Proposed Substation Parcel
- Parcel Boundary
- Railroad
- Municipality Boundary

Data Sources:
NAIP (2015), ESRI (2014)
Cumberland County (2017)

Coordinate System:
State Plane PA South NAD 83

November 03, 2017

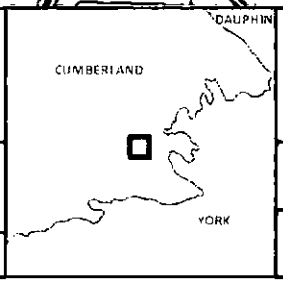


Figure 1-4
Proposed Facilities
West Shore Substation Project

ppl Louis Berger

0 300 600 Feet

N

ATTACHMENT 2

WEST SHORE 230-69 KV SUBSTATION RELOCATION PROJECT
ENGINEERING DESCRIPTION

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ATTACHMENT 2

WEST SHORE 230-69 KV SUBSTATION RELOCATION PROJECT
ENGINEERING DESCRIPTION

A. INTRODUCTION

As explained in Attachment 1, PPL Electric Utilities Corporation ("PPL Electric") seeks Pennsylvania Public Utility Commission ("PUC" or the "Commission") approval to construct approximately 1.5 miles of 230 kV transmission lines necessary to interconnect the new West Shore Substation 230 kV and 69 kV switchyards to the electric grid (the "Project"). Specifically, PPL Electric proposes to construct approximately 0.7 miles of new 230 kV transmission lines. Additionally, PPL Electric proposes to construct approximately 0.8 miles of temporary 230 kV transmission lines required to support construction. This attachment provides an engineering description of the new transmission lines necessary to interconnect the new West Shore Substation 230 kV and 69 kV switchyards to the electric grid.

B. DESCRIPTION OF PROPOSED LINE

The new segments of 230 kV transmission lines will be supported by 19 new steel pole structures. The structures will be located entirely on the existing West Shore Substation property, within existing rights of way and the property for the new West Shore Substation 230 kV and 69 kV switchyards. No additional rights of way are required for the Project.

Table 2-1 identifies the number of structures and anticipated structure height for each segment of transmission line that will be built as part of this Project. All new poles for the proposed Project will be either self-supporting steel structures on drilled shaft, reinforced concrete foundations or direct embedded self-supporting steel structures. Typical structures are shown in Figures 2-1 and 2-2.

TABLE 2-1. NEW TRANSMISSION LINE CONSTRUCTION		
Transmission Circuits[1]	**Estimated No. of New Structures**	**Anticipated Structure Height Range (feet)**
West Shore – Steelton 230 kV single-circuit	2	125
Brunner Island – West Shore 230 kV single-circuit	1	135
Brunner Island – Williams Grove 230 kV single-circuit	3	120 - 135
Williams Grove – West Shore 230 kV single-circuit	2	105 - 120
Temporary 230 kV Transmission Structures[2]	11	100 - 110
Total Number of New Structures Needed (including temporary structures)	**19**	

Each 230 kV circuit will utilize three power conductors and two fiber optic ground wires. The power conductors will be 1590 kcmil[3], 54/19 stranding, aluminum conductor steel reinforced ("ACSR"). The fiber optic ground wire will be 0.791-inch diameter optical ground wires ("OPGW").

The proposed lines will be designed to comply with National Electrical Safety Code ("NESC") standards. The minimum conductor-to-ground clearance will be 33 feet. The design minimum conductor clearances and conductor thermal ratings for the proposed 230 kV lines are shown in Tables 2-2 and 2-3. Design specifications and safety rules practiced by PPL Electric are included in Attachment 4.

TABLE 2-2. DESIGN FOR MINIMUM CONDUCTOR CLEARANCES FOR 1590 KCMIL 45/7 STRAND ACSR[4]	
Condition	**Transmission Single-Circuit Design Clearance-to-Ground**
Heavy Ice (1.5" Ice at 0°C ambient temperature for 1590)	33 feet
Predicted extreme thermal load (125°C conductor temperature)	33 feet
Predicted blowout (6 lbs., 16°C, ambient temperature)	33 feet

[1] The West Shore – Harrisburg #1 & #2 138/69 kV Transmission Line is a double-circuit line until a point on the proposed substation property where they split into single-circuit lines to connect to the substation.

[2] Upon completion of Project, these temporary structures will be removed.

[3] A kcmil wire size is the equivalent cross sectional area in thousands of circular mils. A circular mil is the area of a circle with a diameter of one thousandth (0.001) of an inch.

[4] Clearances based on an initial maximum tension of 6,000-20,000 pounds for the 1590 conductor and 5,000 to 9,000 pounds for the 556 conductor at 0.5 inch ice, 0°F, 4# wind and maximum ruling span of 200-1,250 feet.

TABLE 2-3. CONDUCTOR THERMAL RATING 1590 KCMIL 45/7 STRAND ACSR 125°C MAXIMUM			
Condition	**Ambient Temperature (°C)**	**Wind Speed (Ft./sec)**	**Ampacity (Amps)**
Summer Normal	35	0	1671
Winter Normal	10	0	1925
Summer Emergency	35	2.533	2063
Winter Emergency	10	2.533	2323

C. MAGNETIC FIELD MANAGEMENT

PPL Electric's Magnetic Field Management Program is applied to new and reconstructed transmission line projects. The company does not believe that the current scientific evidence demonstrates that magnetic fields cause any adverse health effects or pose a health or safety danger to the public. Nevertheless, PPL Electric has determined, as a matter of policy, to design its new and rebuilt transmission lines to reduce magnetic fields when that can be done at low or no cost and consistent with functional requirements. PPL Electric's Magnetic Field Management Program has been developed to implement that policy decision. To reduce magnetic field exposures, the program generally prescribes the use of a line design that provides higher ground clearance than NESC standards and reverse phasing of new double-circuit lines where it is feasible to do so at low or no cost.

The Project will be designed with structures that have a ground clearance that is 5 feet higher than NESC standards and the double-circuit portions of the Project will use reverse phasing where feasible. These measures will reduce the potential for exposure to magnetic fields.

Figure 2-1. Typical Single-Circuit 230 kV Deadend Structure

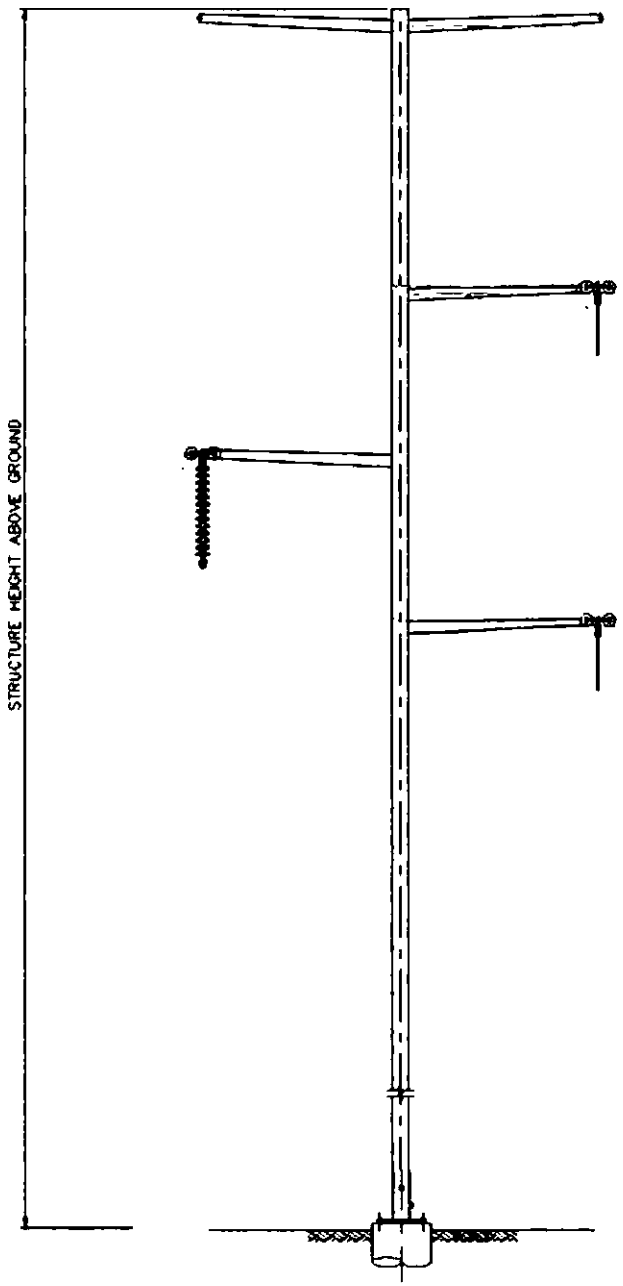
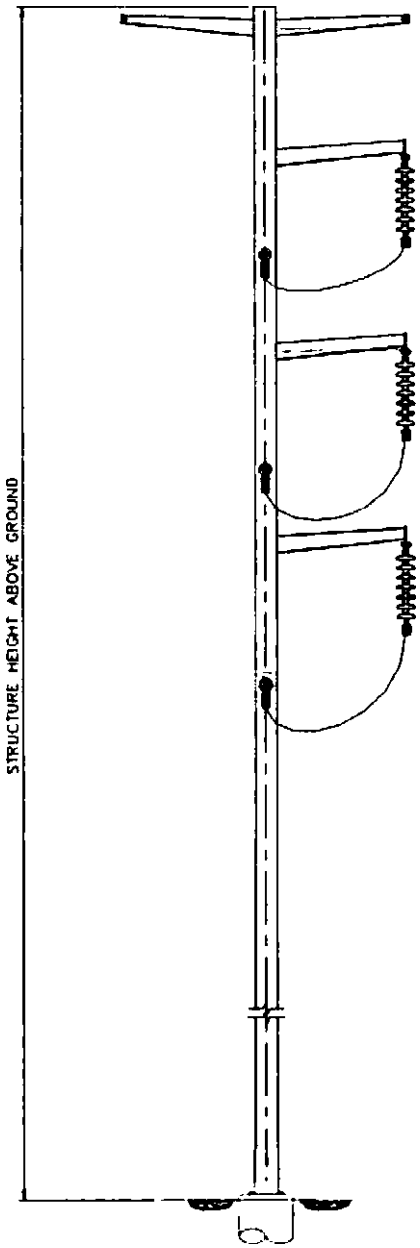


Figure 2-2. Typical Single-Circuit 230 kV Deadend Structure



ATTACHMENT 3

WEST SHORE 230-69 KV SUBSTATION RELOCATION PROJECT
DESCRIPTION OF THE PROJECT AREA

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ATTACHMENT 3

WEST SHORE 230-69 KV SUBSTATION RELOCATION PROJECT
DESCRIPTION OF THE PROJECT AREA

A. INTRODUCTION

As explained in Attachment 1, PPL Electric Utilities Corporation ("PPL Electric") seeks Pennsylvania Public Utility Commission ("PUC" or the "Commission") approval to construct approximately 1.5 miles of 230 kV transmission lines necessary to interconnect the new West Shore Substation to the electric grid (the "Project"). This attachment provides a description of the Project area.

The Project is located along Arcona Road just north of the intersection with East Winding Hill Road in Lower Allen and Upper Allen townships, Cumberland County, Pennsylvania. PPL Electric has discussed the proposed Project with representatives from Cumberland County, Lower Allen and Upper Allen townships, which had no objection to the Project.

B. PROJECT AREA

As described in Attachments 1 and 2, the approximately 1.5 miles of new 230 kV transmission lines will be constructed entirely on the existing West Shore Substation property, existing PPL Electric right of way, and the property for the new West Shore Substation 230 kV and 69 kV switchyard. No additional rights of way are required for the Project.

Table 1-2 and Table 1-2 in Attachment 1 identify the total length of each transmission line that must be either constructed or relocated in order to connect to the new West Shore Substation 230 kV and 69 kV switchyards. Figure 1-2 in Attachment 1 depicts the existing transmission facilities and Figure 1-4 in Attachment 1 depicts the proposed transmission facilities.

1. Proposed West Shore 230-69 kV Substation

As explained in Attachment 1, PPL Electric plans to build new 230 kV and 69 kV switchyards adjacent to the existing West Shore Substation. The new 230 kV and 69 kV switchyards will primarily be located on a PPL Electric-owned 25-acre parcel that is adjacent to the existing West Shore Substation, and will also extend partially onto the existing 19.3-acre substation parcel.

The location of the site for the new West Shore Substation 230 kV and 69 kV switchyard is ideal because it is located adjacent to the existing substation site and already crossed by the existing 230 kV transmission lines, which will minimize the amount of relocated transmission lines that need to be constructed to interconnect the new switchyards with the electric grid. In addition, the new substation will be located further from new residential development located along Arcona Road.

The footprint of the new 230 kV and 69 kV switchyard will be located in the central portion of the 25-acre parcel. As a result, the new 230 kV and 69 kV switchyard will be set back from both Arcona Road and nearby Norfolk Southern railway. The site for the new West Shore Substation 230 kV and 69 kV switchyard is generally flat. The site is also mostly cleared of tall-growing vegetation and minimal tree clearing is anticipated.

The West Shore Substation is located in an area that has experienced significant development in recent years (see Figures 1-2 and 1-4). New dense residential development is located adjacent to the existing West Shore Substation parcel to the north and also west of the existing Norfolk Southern railway that borders the substation. Limited commercial and residential development borders the substation to the east. The proposed substation is bordered by an agricultural property to the south that is partially forested. Winding Hills East and West Park is located southwest of the substation property adjacent to the railway. The park is currently crossed by the existing Williams Grove – West Shore 230 kV and Brunner Island – Williams Grove 230 kV Transmission Line.

Any other potential location for the new 230 kV and 69 kV switchyards would require longer transmission lines and additional property and right of way acquisition, which would result in greater impacts to the natural and built environment. Potential sites north of the Project site are constrained by newly constructed residential development and the Pennsylvania Turnpike. To the east, potential sites are constrained by existing and new commercial and residential development along Arcona and Lisburn roads. Potential sites located further south of the Project site are constrained by existing residential development located along Arcona and East Winding Hill roads. To the west, potential sites are constrained by the adjacent Norfolk Southern railway, Winding Hills East and West Park, and new residential development.

Based on the foregoing information, PPL Electric determined that the site for the new 230 kV and 69 kV switchyards is the ideal location for the new substation.

2. Transmission Line Right of Way

As explained in Attachment 1, PPL Electric proposes to construct approximately 1.5 miles of transmission line, which includes: approximately 0.7 mile of 230 kV transmission line and approximately 0.8 miles of temporary 230 kV transmission lines needed in order to accommodate the new substation equipment. No additional right of way is required for these new or temporary transmission lines.

The approximately 0.7 miles of 230 kV transmission lines will be constructed entirely within the existing 230 kV right of way and the new West Shore Substation property. The Williams Grove – West Shore 230 kV Transmission Line and the Brunner Island – Williams Grove 230 kV Transmission Line will both require a crossing of the Norfolk Southern railway. PPL Electric will obtain a new license agreement with Norfolk Southern for these aerial crossings. Minimal tree clearing will be required within the southeastern portion of the substation parcel to accommodate the relocated 230 kV transmission lines.

The approximately 0.8 miles of temporary 230 kV transmission lines will be located entirely within the new and existing substation property. Minimal tree clearing will be required to

accommodate these lines. The temporary lines will be removed once the new 230 kV lines are in service.

C. ENVIRONMENTAL ASSESSMENT

The Project area consists of two parcels owned by PPL Electric. The northern parcel consists of approximately 19.3 acres and is currently used by PPL Electric for the existing West Shore 230-69 kV Substation. The southern portion of the Project area consists of approximately 25 acres and was recently acquired by PPL Electric. The land use on this portion of the site was previously used for agricultural purposes.

Land use impacts are anticipated to be minimal because the Project will be located entirely on the existing West Shore Substation property, the property for the new West Shore Substation, and within existing transmission line rights of way. Further, land use impacts to the surrounding area are anticipated to be minimal because the new West Shore Substation 230 kV and 69 kV switchyard will be located adjacent to the existing West Shore 230-69 kV Substation and the presence of several existing transmission lines in the area.

Residential development borders the Project area on all directions. Locating the new substation on the adjacent property south of the existing substation increases the distance from the most concentrated area of residential development, which is located north of the existing substation. All construction will occur within the existing West Shore Substation property, the property for the new West Shore Substation 230 kV and 69 kV switchyard, and within the existing transmission right of way.

There is one cell tower located on the existing West Shore 230-69 kV Substation property. No impacts to the operation of the cell tower are anticipated; however, PPL Electric will coordinate with the cell tower owner during construction. An existing Sunoco gas pipeline and the new Mariner East 2 pipeline are located along the northern boundary of the existing West Shore Substation site. Neither pipeline will be affected by the Project. PPL Electric will coordinate with Sunoco to avoid impacts during construction. No other communication towers, pipelines, or other utilities will be affected by the proposed Project.

The closest airport, the Capital City Airport, is located approximately 5.2 miles east of the Project. The Capital City Airport is classified as a public airport by the Pennsylvania Department of Transportation ("PennDOT") Bureau of Aviation. PPL Electric does not anticipate any interference with airport operations due to the distance the substation is from the airport and because the Project is located in an area where there are existing electrical facilities. However, PPL Electric will file any required documentation with both the Federal Aviation Administration and the Pennsylvania Department of Transportation Bureau of Aviation.

PPL Electric conducted a review of the online Pennsylvania State Historic Preservation Office ("SHPO") Bureau for Historic Preservation ("BHP") Cultural Resources Geographic Information System ("CRGIS") database to determine if National Register of Historic Places ("NRHP")-listed or eligible historic properties are located in the Project vicinity. Based on this review, 12 architectural resources were identified within 1 mile of the Project. Two eligible resources (Harrison Farm and the Pennsylvania Turnpike Philadelphia [Eastern] Extension Carlisle to Valley Forge) are located within 0.5 mile of the Project area. No listed architectural resources were identified within 1 mile of the Project area. No previously identified archaeological resources are located within 0.5 mile of the Project area.

PPL Electric submitted a letter to the SHPO on September 22, 2017. The SHPO response dated October 12, 2017 indicates that the Project will not affect any archeological resources. The response indicated that there may be impacts to aboveground resources if any proposed transmission structures will increase in height above 20 feet compared to the existing structures. None of the proposed structures will increase by more than 20 feet. Therefore, no impacts are anticipated. PPL Electric will continue to consult with the SHPO to avoid impacts to cultural resources.

A National Area Inventory ("NAI") has been prepared by The Nature Conservancy in association with the Pennsylvania Natural Heritage Program ("PNHP") for Cumberland County (2005). The NAI includes information on the location of rare, threatened, and endangered species and the highest quality natural areas located within the County. The Project does not

cross or traverse close to any NAI areas. The Project will not affect any other unique geological, scenic or designated natural areas.

PPL Electric has retained a consultant to identify and delineate all wetlands and watercourses within the Project area. The proposed Project will span one wetland. However, it is anticipated the Project and proposed substation upgrades will have no impacts on wetlands because the new tower structures will be located to avoid impacts to wetlands. No streams were identified within the Project Area. Based on preliminary design, the Project will not require any permits from the U.S. Army Corps of Engineers (USACE) or the Pennsylvania Department of Environmental Protection (PADEP) under the Chapter 105 program. Should this change during detailed design, PPL Electric will obtain all required permits and will fully comply with any conditions on those permits. PPL Electric will also consult with the Cumberland County Conservation District, prepare any required soil erosion and sedimentation control plans, and obtain National Pollutant Discharge Elimination System (NPDES) permits, if required, and comply with any conditions placed on those permits.

PPL Electric conducted an online Pennsylvania Natural Diversity Inventory (PNDI) review on December 7, 2015[1]. Based on this review, the Pennsylvania Fish and Boat Commission (PFBC), the Pennsylvania Department of Conservation and Natural Resources (DCNR), the Pennsylvania Game Commission (PGC) and the U.S. Fish and Wildlife Service (USFWS) all reported that the Project will not impact any threatened or endangered species, or special concern species and resources located within the Project area. However, Cumberland County is located within the range of the federally threatened bog turtle (*Clemmys muhlenbergii*). PPL Electric retained a qualified bog turtle surveyor to conduct Phase I Bog Turtle surveys. The survey did not identify any potential bog turtle habitat in the wetland located within the Project Area. PPL Electric submitted a report to the USFWS on December 6, 2016. USFWS' January 9, 2017 response indicated that no federally listed species under their jurisdiction are known or likely to occur in the Project Area. Therefore, no further consultation with USFWS is required for this Project.

[1] PNDI Receipt No. 20151207541554

D. VEGETATION MANAGEMENT

The Project will be located entirely within the existing West Shore Substation property, the property for the new West Shore Substation 230 kV and 69 kV switchyard, and the existing transmission right of way. The existing West Shore Substation property and existing transmission rights of way have largely been cleared of vegetation as part of PPL Electric's standard vegetation management practices. The site for the new West Shore Substation 230 kV and 69 kV switchyard is located in an agricultural area that is primarily cleared of trees. Minimal vegetation clearing is anticipated to construct the transmission lines necessary to interconnect the new West Shore Substation 230 kV and 69 kV switchyard to the electric grid. In areas where vegetation management is required to construct and maintain the Project, PPL Electric will apply its "Specifications for Transmission Vegetation Management LA-79827" to minimize any potential impacts.

ATTACHMENT 4

WEST SHORE 230-69 KV SUBSTATION RELOCATION PROJECT
PPL ELECTRIC DESIGN CRITERIA AND SAFETY PRACTICES

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ATTACHMENT 4

WEST SHORE 230-69 KV SUBSTATION RELOCATION PROJECT
PPL ELECTRIC DESIGN CRITERIA AND SAFETY PRACTICES

A. DESIGN CONSIDERATIONS

PPL Electric's new and rebuilt transmission lines will be designed according to, and generally exceed, all NESC minimum standards. The NESC is a set of rules to safeguard people during the installation, operation, and maintenance of electric power lines. The NESC contains the basic provisions considered necessary for the safety of employees and the public. Although it is not intended as a design specification, its provisions establish minimum design requirements. PPL Electric has developed design specifications and safety rules which meet or surpass all requirements specified by the NESC.

The NESC includes loading requirements and clearances for the design, construction, and operation of power lines. The "loads" on conductors and supporting structures are the mechanical forces that develop from the weight of the conductors, the weight of ice on the conductors, plus wind pressure on the conductors and supporting structures. Loading requirements are the loads on the conductors and structures that are anticipated assuming certain ice and wind conditions. Loading requirements always contain "safety factors" to allow for unknown or unanticipated contingencies. The clearances and loading requirements contained in the NESC are designed to maintain public safety. PPL Electric transmission line design standards meet or surpass the NESC clearances and loading requirements.

For example, the NESC specifies strength and loading rules based on three different "grades of construction" for conductors and supporting structures:

- Grade B – This grade of construction provides the highest margin of safety and is required when the pole supports spans that cross limited access highways, railroads, and waterways.
- Grade C – This grade of construction is most common and provides a basic margin of safety. It is often utilized for the typical power and joint-use distribution pole.
- Grade N – This is the lowest grade of construction and is most often used for emergency and temporary construction.

PPL Electric designs all of its transmission lines for Grade B construction. The use of Grade B design and construction translates to higher levels of structural reliability and safety to withstand the environmental conditions of ice and/or wind loading, which provides a higher margin of safety.

Another example is the design parameters utilized to account for ice and wind loadings on the wires and structure. The conductor sags and tensions along with the structure loading used in line designs are the result of various ice and wind combinations. PPL Electric's transmission lines are designed to exceed NESC requirements by accounting for additional load cases with various ice and wind loading conditions not required by NESC. This means that PPL Electric lines are designed to operate safely and reliably during extreme inclement weather even more severe than assumed by the NESC. In addition, where practicable, PPL Electric transmission lines are designed with more clearance to the ground than required by the NESC. The tables below compare PPL Electric's general conductor to ground design and the NESC minimum ground clearances for lines of various voltages.

TABLE 4-1. 69 kV VERTICAL CLEARANCE TO GROUND

Surface Underneath Conductors	NESC Standard Clearance	PPL Conductor Clearances
Roads, streets, alleys	19.2 Ft.	30 Ft.
Other land traversed by vehicles (such as cultivated field, forest, etc.)	19.2 Ft.	30 Ft.
Spaces accessible to pedestrians only	15.2 Ft.	30 Ft.
Railroad tracks	27.2 Ft.	31.5 Ft.

TABLE 4-2. 138 kV VERTICAL CLEARANCE TO GROUND

Surface Underneath Conductors	NESC Standard Clearance	PPL Conductor Clearances
Roads, streets, alleys	20.6 Ft.	31 Ft.
Other land traversed by vehicles (such as cultivated field, forest, etc.)	20.6 Ft.	31 Ft.
Spaces accessible to pedestrians only	16.6 Ft.	31 Ft.
Railroad tracks	28.6 Ft.	35 Ft.

TABLE 4-3. 230 kV VERTICAL CLEARANCE TO GROUND		
Surface Underneath Conductors	**NESC Standard Clearance**	**PPL Conductor Clearances**
Roads, streets, alleys	22.4 Ft.	33 Ft.
Other land traversed by vehicles (such as cultivated field, forest, etc.)	22.4 Ft.	33 Ft.
Spaces accessible to pedestrians only	18.4 Ft.	33 Ft.
Railroad tracks	30.4 Ft.	35 Ft.

TABLE 4-4. 500 kV VERTICAL CLEARANCE TO GROUND		
Surface Underneath Conductors	**NESC Standard Clearance**	**PPL Conductor Clearances**
Roads, streets, alleys	28.4 Ft.	40 Ft.
Other land traversed by vehicles (such as cultivated field, forest, etc.)	28.4 Ft.	40 Ft.
Spaces accessible to pedestrians only	24.4 Ft.	40 Ft.
Railroad tracks	36.4 Ft.	53 Ft.

A relay protection system is also used on PPL Electric's transmission lines to protect the public safety, as well as the equipment on the transmission system. Relay protection is installed for all transmission lines to automatically de-energize the line in the unlikely event that the line or supporting structure fails and the line contacts the ground.

B. PERIODIC MAINTENANCE PROGRAM ON ALL TRANSMISSION LINES

To ensure continued public safety and integrity of service, a periodic maintenance and inspection program is implemented for every transmission line. The program is administered through the use of helicopter patrols, with supplemental foot patrols as needed. Helicopter patrols are performed on all lines on a predetermined frequency, depending on voltage level. The two-man helicopter crew flies parallel and above the line so that the observer can look for signs of line damage or deterioration and

observe clearances between vegetation and conductors. The observations are included in a report that is forwarded to the appropriate department for corrective action.

C. PERSONNEL SAFETY RULES

Overall PPL Electric designs and constructs projects with high regards to both public and employee safety, and follows or exceeds all codes and requirements. The following are a few, but not all, of the PPL Electric safety rules that demonstrate the Company's dedication to employee and contractor safety:

- Work procedures have been developed to allow work to be performed on energized facilities in a safe manner. When lines or apparatus are removed from service to be worked on, the Energy Control Process system is applied. This system provides that a red tag must be physically placed on the control handle of the de-energized equipment.
- The red tag may be removed only after proper authorization to energize the equipment.
- Various other tags are used for limited operations and informational purposes.
- Employees or contractors will not apply or remove a tag or change the status of tagged equipment unless authorized.
- Temporary safety grounds are used on de-energized facilities for employee lineman safety during maintenance, construction, or reconstruction work. Safety grounds are wires connecting the de-energized facility to an electrical ground. If the facility should be energized, the safety grounds will divert the current directly to ground and reduce the likelihood of personal injury.
- Before applying grounds, a test is done to confirm that the line is de-energized. The voltage test device is checked before and after use to assure reliability.
- Poles or structures are inspected and examined for structural integrity before climbing. If there is any reason to believe that a pole is unsafe, it is stabilized before work is performed. Appropriate safety gear in the form of body belts, safety straps, hard hats, gloves, etc., is worn by linemen during line work activity.

D. MAGNETIC FIELD MANAGEMENT PLAN

PPL Electric's Magnetic Field Management Program is applied to new and reconstructed transmission line projects. In order to lower magnetic field exposures, the program generally prescribes the use of a line design that provides ground clearances higher than the minimum NESC ground clearance and reverse phasing of new double circuit lines where it is feasible to do so at low or no cost. The implementation of additional modifications to reduce magnetic field levels, are considered, provided those modifications can be made at low or no cost and will not interfere with the operation of the line.

CERTIFICATE OF SERVICE

I hereby certify that a true and correct copy of the foregoing **Letter of Notification** has been served upon the following persons, in the manner indicated, in accordance with the requirements of 52 Pa. Code § 1.54 (relating to service by a participant).

VIA CERTIFIED MAIL - RETURN RECEIPT REQUESTED

PA State Historic Preservation Office
Bureau for Historic Preservation
Commonwealth Keystone Building
400 North Street, 2nd Floor
Harrisburg, PA 17120-0053
Attn: Mr. Douglas C. McLearen, Chief

PA Department of Transportation
Honorable Leslie S. Richards, Secretary
c/o Office of Chief Counsel
Commonwealth Keystone Building
400 North Street, 9th Floor
Harrisburg, PA 17120
Attn: Jason Sharp, Acting Chief Counsel

PA Department of Environmental Protection
P.O. Box 2063
Market Street State Office Building
Harrisburg, PA 17105-2063
Attn: Office of Field Operations

Cumberland County Planning Department
310 Allen Road - Suite 101
Carlisle, PA 17013
Attn: Mr. Kirk Stoner, AICP

Cumberland County
Board of Commissioners
1 Courthouse Square
2nd Floor, Suite 200
Carlisle, PA 17013
Attn: Mr. Vincent T. DiFilippo
Commissioner, Chairman

Upper Allen Township
Planning Commission
100 Gettysburg Pike
Mechanicsburg, PA 17055
Attn: Mr. Wayne Willey, Chairman

Upper Allen Township
100 Gettysburg Pike
Mechanicsburg, PA 17055
Attn: Mr. Lou Fazekas,
Township Manager

Upper Allen Township
Board of Commissioners
100 Gettysburg Pike
Mechanicsburg, PA 17055
Attn: Mr. Kenneth M. Martin, President

Lower Allen Township
Planning Commission
2233 Gettysburg Road
Camp Hill, PA 17011
Attn: Mr. Brett McCreary, Chairman

Lower Allen Township
2233 Gettysburg Road
Camp Hill, PA 17011
Attn: Mr. Thomas Vernau, Jr.
Township Manager

Lower Allen Township
Board of Commissioners
2233 Gettysburg Road
Camp Hill, PA 17011
Attn: Mr. H. Edward Black, President

Date: November 14, 2017

Christopher T. Wright

First Class Mail

POST & SCHELL PC
ATTORNEYS AT LAW

Post & Schell, P.C.
17 North Second Street
12th Floor
Harrisburg, PA 17101-1601

171079

To: Rosemary Chiavetta, Secretary
Pennsylvania Public Utility Commission
Commonwealth Keystone Building
400 North Street, 2nd Floor North
P.O. Box 3265
Harrisburg, PA 17105-3265