POST & SCHELL PC
ATTORNEYS AT LAW

17 North Second Street
12th Floor
Harrisburg, PA 17101-1601
717-731-1970 Main
717-731-1985 Main Fax
www.postschell.com

Christopher T. Wright

cwright@postschell.com
717-612-6013 Direct
717-731-1985 Direct Fax
File #: 165216

November 14, 2016

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 Reconstruct Approximately 4.5 Miles of Transmission Line in Allen Township, Northampton County, and North Whitehall Township, Lehigh County, Pennsylvania to Interconnect New Siegfried Substation 230 kV and 69 kV Switchyards to the Electric Grid - Docket No. A-2016-

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 2017 to support an in-service date of December 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 Reconstruct Approximately 4.5 Miles of Transmission Line in Allen Township, Northampton County, and North Whitehall Township, Lehigh County, Pennsylvania to Interconnect New Siegfried Substation 230 kV and 69 kV Switchyards to the Electric Grid	:	Docket No. A-2016-_____

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 reconstruct approximately 4.5 miles of 230 kV, 138 kV, and 138/69 kV transmission lines in Allen Township, Northampton County and North Whitehall Township, Lehigh County Pennsylvania (the "Project").[1] As explained below, the Project is necessary to interconnect the new Siegfried Substation 230 kV and 69 kV switchyards to the electric grid. Subject to the Commission's approval, construction is scheduled to begin in

[1] On August 11, 2016, the Commission granted PPL Electric a waiver from the requirements of a full siting application under 52 Pa Code §§ 57.72(a)-(c), and directed PPL Electric to submit a Letter of Notification for this Project. *See Petition of PPL Electric Utilities Corporation for Waiver of Certain Provisions of the Pennsylvania Public Utility Commission's Regulations at 52 Pa. Code § 57.71 et seq., for the Siting and Reconstruction of Approximately 4.7 Miles of Transmission Line in Allen Township, Northampton County, and North Whitehall Township, Lehigh County, Pennsylvania to Interconnect New Siegfried Substation 230 kV and 69 kV Switchyards to the Electric Grid*, Docket No. P-2016-2545583 (Order entered August 11, 2016).

February 2017 to support the in-service date of December 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:

Kimberly A. Klock (I.D. #89716)
PPL Services Corporation
Two North Ninth Street
Allentown, PA 18101
Voice: 610-774-5696
Fax: 610-774-6726
E-mail: kklock@pplweb.com

David B. MacGregor (I.D. # 28804)
Christopher T. Wright (I.D. # 203412)
Post & Schell, P.C.
17 North Second Street
12th Floor
Harrisburg, PA 17101-1601
Voice: 717-731-1970
Fax: 717-731-1985
E-mail: dmacgregor@postschell.com
E-mail: cwright@postschell.com

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 Siegfried Substation is one of the largest substations in the PPL Electric service area. The Siegfried Substation serves more than 160 MW of load in parts of Northampton, Lehigh and Carbon Counties, Pennsylvania. The Siegfried Substation is a critical part of both the bulk and non-bulk electric systems[2] serving customers throughout PPL Electric's service territory.

9. The Siegfried Substation was originally built in the early 1920s as a 230-69 kV substation, *i.e.*, with 230 kV and 69 kV switchyards.[3] The 230 kV switchyard feeds three 230-69 kV transformers that "step down" the voltage from 230 kV to 69 kV and, in turn, feed the

[2] 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.

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

69 kV switchyard.[4] The 69 kV switchyard feeds ten 69 kV transmission lines serving customers in Northampton, Lehigh and Carbon Counties.[5]

10. In the late 1970s, a 138 kV switchyard was installed at the Siegfried Substation site. The 230 kV switchyard at the Siegfried Substation feeds two 230-138 kV transformers that "step down" the voltage from 230 kV to 138 kV and, in turn, feed the 138 kV switchyard. The 138 kV switchyard supplies six 138 kV transmission lines that serve the region.

11. The aging equipment at the 230 kV and 69 kV switchyards, including the three 230-69 kV transformers, have reached the end of their useful life, do not meet modern design standards, and must be replaced to continue to provide safe and reliable service to customers.

12. Because the Siegfried Substation is a critical component to the backbone 230 kV bulk electric system under the functional control of PJM, the Siegfried Substation cannot be decommissioned.

13. To address these issues and to ensure customers continue to receive safe and reliable service, PPL Electric plans to build new, modern 230 kV and 69 kV switchyards at the Siegfried Substation. The existing 138 kV switchyard at the Siegfried Substation will remain in-place. However, the new 230 kV and 69 kV switchyards will be relocated to a new substation site.

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[4] 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.

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

14. The existing Siegfried Substation site is not large enough to accommodate the new modern 230 kV and 69 kV switchyards. Further, the existing Siegfried Substation was constructed on the side of a hill adjacent to the Lehigh River. As a result, rebuilding the 230 kV and 69 kV yards in-place would pose significant and costly construction challenges due to the transmission outages that would be required.

15. In addition, rebuilding the 230 kV and 69 kV switchyards in place would result in a less reliable design, compared to relocating the switchyards to a less restrictive location, and would result in significant outage risks to the bulk electric system during construction.

16. For these reasons, PPL Electric proposes to build new 230 kV and 69 kV switchyards on a site located immediately adjacent to the existing Siegfried Substation site.

17. The new 230 kV and 69 kV switchyards will be located approximately 500 feet east of the existing Siegfried Substation. The proposed site for the new 230 kV and 69 kV switchyards is approximately 62 acres.

18. The proposed site for the new 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 and 69 kV transmission lines, which will minimize the amount of new transmission lines that need to be constructed to interconnect the new switchyards with the electric grid. In addition, the proposed site is located on top of a hill, rather than on a slope, and farther away from the Lehigh River.

19. The construction of the new, modern 230 kV and 69 kV switchyards at the Siegfried Substation 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.

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

B. THE PROPOSED PROJECT

21. In order to interconnect the new Siegfried Substation 230 kV and 69 kV switchyards with the electric grid, PPL Electric proposes to construct or reconductor a total of approximately 4.5 miles of 230 kV, 138 kV, and 138/69 kV transmission lines.

22. As explained in detail in Attachments 1 and 2, PPL Electric proposes to construct approximately 4.0 miles of new transmission line, which includes: (i) 1.8 miles of new 230 kV transmission line; (ii) 1.4 miles of new 138 kV transmission line; and (iii) 0.8 miles of new 138/69 kV transmission line. These new transmission lines will be located entirely on the existing Siegfried Substation property and/or the property for the new Siegfried Substation 230 kV and 69 kV switchyard. No additional right-of-way is required for these new transmission lines.

23. As explained in detail in Attachments 1 and 2, PPL Electric also proposes to reconductor approximately 0.5 miles of existing transmission lines within the existing rights-of-way, which includes: (i) 0.4 miles of existing 230 kV transmission line; and (ii) 0.1 miles of existing 138 kV transmission line. The existing conductors will be replaced with new conductors using the existing tower structures. No new right-of-way or tower structures will be required to reconductor these segments of transmission line.

24. Maps of the existing and proposed 230 kV, 138 kV, and 138/69 kV configurations are provided as Figures 1-2 through 1-8 in Attachment 1 to this Letter of Notification. A one-line diagram of the existing system is provided as Figure 1-1 in Attachment 1 to this Letter of Notification. A one-line diagram of the proposed system and a map of the proposed Project are provided as Figures 1-9 and 1-10 in Attachment 1 to this Letter of Notification.

25. The approximately 4.0 miles of new transmission lines will be supported by 55 new tower structures. Table 2-1 in Attachment 2 of this Letter of Notification provides the anticipated height of each new tower structure. Each new tower structure will be located entirely on the existing Siegfried Substation property and/or the property for the new Siegfried Substation 230 kV and 69 kV switchyard.

26. All new tower structures for the proposed Project will be self-supporting steel structures on drilled shaft, reinforced concrete foundations. Typical structures are shown in Figures 2-1 through 2-6 in Attachment 2 to this Letter of Notification.

27. Each new 230 kV circuit will utilize three power conductors, one fiber optic ground wire, and one overhead ground wire. The power conductors will be 1590 kcmil[6] 45/7 stranding, aluminum conductor steel reinforced ("ACSR"). The fiber optic ground wire will be 0.752-inch diameter optical ground wires ("OPGW"). The overhead ground wire will be 3/8" Extra High Strength Steel.

28. Each 138 kV and 138/69 kV circuit will utilize three power conductors, and two fiber optic ground wires. The power conductors will be 556 kcmil, 24/7 stranding, ACSR. The fiber optic ground wires will be 0.567-inch diameter OPGW.

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

30. 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.

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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.

31. The total estimated cost of the new and reconductored transmission lines necessary to interconnect the new Siegfried Substation 230 kV and 69 kV switchyards to the electric grid is approximately $8 million.[7]

32. Subject to the Commission's approval, construction is scheduled to begin in February 2017 to support the in-service date of December 2019.

33. The proposed Project was presented before the PJM sub-regional RTEP committee for the mid-Atlantic zone on July 29, 2015, and is included in the RTEP as supplemental project number s0958.1.

III. HEALTH AND SAFETY

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

35. 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.

36. Consistent with its Magnetic Field Management Program, the proposed Project will utilize structures that have a ground clearance that is five feet higher than 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

[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 filed 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.

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

37. The Project will be constructed entirely within the existing Siegfried Substation property and/or the property for the new Siegfried Substation 230 kV and 69 kV switchyard, or within the existing rights-of-way.

38. The new 230 kV and 69 kV switchyards will be located approximately 500 feet east of the existing Siegfried Substation at the intersection of Cherryville Road and Spring Hill Road. The site for the new Siegfried Substation 230 kV and 69 kV switchyard is approximately 62 acres in size and consists of two adjacent parcels owned by PPL Electric.[8]

39. As explained in Attachment 3, the location of the site for the new Siegfried 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 and 69 kV transmission lines, which will minimize the amount of new transmission lines that need to be constructed to interconnect the new switchyards with the electric grid. In addition, the site is located on top of a hill, rather than on a slope, and farther away from the Lehigh River.

40. The approximately 4.0 miles of new 230 kV, 138 kV, and 138/69 kV transmission lines and supporting tower structures will be located entirely on the existing Siegfried Substation property and/or the property for the new Siegfried Substation 230 kV and 69 kV switchyard. No additional right-of-way is required for these new transmission lines.

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[8] The Northampton Borough Municipal Authority currently has an easement on the site for the new 230 kV and 69 kV switchyards. A copy of the Letter of Notification is being served on the Borough Municipal Authority.

41. The approximately 0.5 miles of existing transmission lines that will be reconductored will be located entirely within the existing rights-of-way. The existing rights-of-way are sufficient to accommodate the construction, operation, and maintenance of these reconductored transmission lines. Thus, no additional right-of-way is required to reconductor these transmission lines. Further, because the existing conductors will be replaced using the existing tower structures, no new tower structures will be required to reconductor these transmission lines.

42. 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 Siegfried Substation property and/or the property for the new Siegfried Substation 230 kV and 69 kV switchyard, or within the existing transmission right-of-way. Where practical, PPL Electric will use previously established access roads for construction to further reduce interference with existing land uses.

43. 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 complete the project, PPL Electric will apply its "*Specifications for Transmission Vegetation Management LA-79827*" to mitigate any impacts.

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

45. PPL Electric does not anticipate any interference with airport operations because of the distance from the Project area, the presence of existing electrical facilities in the Project area, and the similar height of the new/replacement tower structures compared to the existing

facilities. However, PPL Electric will file any required documentation with the Federal Aviation Administration and the Pennsylvania Department of Transportation, Bureau of Aviation.

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

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

48. The Project is located near three areas identified on the National Area Inventory.[9] However, as explained in Attachment 3, no significant impacts to these areas are anticipated given the distance from the Project and that the construction activities will occur entirely within the existing Siegfried Substation property and/or the property for the new Siegfried Substation 230 kV and 69 kV switchyard, or within the existing transmission right-of-way.

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

50. PPL Electric will coordinate with the Pennsylvania State Historic Preservation Office ("SHPO") regarding any potential impacts the proposed Project may have on cultural and archaeological resources.

51. One stream was delineated on the southeast corner of the Project. However, no work or construction activities will occur in this area as part of this Project.

52. No wetlands were identified within the Project area.

53. PPL Electric will obtain permits and other authorizations from the County Conservation District, Pennsylvania Department of Environmental Protection and the United States Army Corps of Engineers, as needed, and will comply with all of the terms and conditions placed on those permits or authorizations.

[9] 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.

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

55. 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 and Pennsylvania Fish and Boat Commission responded that there was no known impact to species under their jurisdiction, and no further review by their agency was required.

56. The Pennsylvania Game Commission noted the potential for impacts to osprey, a threatened species. Although only minimal tree clearing activities will be required for the Project, osprey habitat exists along the Lehigh River and ospreys have been known to create nests on top of transmission structures. PPL Electric will comply with the conditions of the Pennsylvania Game Commission to minimize potential impacts to ospreys.

57. The U.S. Fish and Wildlife Service noted that the proposed Project is located within the known range of the federally threatened Bog Turtle (*Clemmys muhlenbergii*). However, no wetlands were identified within the Project area. Further, PPL Electric obtained clearance from the U.S. Fish and Wildlife Service, which concluded that the proposed Project will not result in any anticipated impacts to bog turtles.

58. PPL Electric will continue to consult with the jurisdictional agencies regarding potential impacts to protected species. 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

59. PPL Electric has provided information regarding the Project to representatives of Allen Township, Northampton County, and North Whitehall Township, Lehigh County Pennsylvania. These entities have not objected to the proposed Project.

60. 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).

61. 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

62. PPL Electric is proceeding by means of a Letter of Notification, instead of a full Application, pursuant to the Commission's Order entered August 11, 2016. Therein, the Commission granted PPL Electric a waiver from the requirements of a full siting application, and directed PPL Electric to submit a Letter of Notification for this Project pursuant to 52 Pa. Code § 57.72(d). *See Petition of PPL Electric Utilities Corporation for Waiver of Certain Provisions of the Pennsylvania Public Utility Commission's Regulations at 52 Pa. Code § 57.71 et seq., for the Siting and Reconstruction of Approximately 4.7 Miles of Transmission Line in Allen Township, Northampton County, and North Whitehall Township, Lehigh County, Pennsylvania to Interconnect New Siegfried Substation 230 kV and 69 kV Switchyards to the Electric Grid*, Docket No. P-2016-2545583 (Order entered August 11, 2016).

63. 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 reconstruct approximately 4.5 miles of 230 kV, 138 kV, and 138/69 kV transmission lines in Allen Township, Northampton County and North Whitehall Township, Lehigh County Pennsylvania, as explained above and in the Attachments hereto.

Respectfully submitted,

Kimberly A. Klock (I.D. #89716)
PPL Services Corporation
Two North Ninth Street
Allentown, PA 18101
Voice: 610-774-5696
Fax: 610-774-6726
E-mail: kklock@pplweb.com

David B. MacGregor (I.D. # 28804)
Christopher T. Wright (I.D. # 203412)
Post & Schell, P.C.
17 North Second Street, 12th Floor
Harrisburg, PA 17101-1601
Voice: 717-731-1970
Fax: 717-731-1985
E-mail: dmacgregor@postschell.com
E-mail: cwright@postschell.com

Attorneys for PPL Electric Utilities Corporation

Date: November 14, 2016

Before the
Pennsylvania Public Utility Commission

SIEGFRIED 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
SIEGFRIED 230-69 kV SUBSTATION RELOCATION PROJECT
NECESSITY STATEMENT

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ATTACHMENT 1
SIEGFRIED 230 KV/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 4.5 miles of 230 kV, 138 kV, and 138/69 kV transmission lines in Allen Township, Northampton County and North Whitehall Township, Lehigh County Pennsylvania (the "Project"). As explained below, the 230 kV and 69 kV switchyards located within the existing Siegfried 230-138-69 kV Substation ("Siegfried 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 Northampton, Lehigh and Carbon Counties. As a result, PPL Electric plans to construct new 230 kV and 69 kV switchyards adjacent to the existing Siegfried Substation. PPL Electric herein seeks Commission approval for the construction of the transmission lines necessary to interconnect the new Siegfried Substation 230 kV and 69 kV switchyards to the electric grid.

The estimated cost to site, design, and construct the Project is approximately $8 million[1]. Subject to the Commission's approval, construction is scheduled to begin in February 2017 to support an in-service date of December 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 interconnected transmission system (transmission grid) be planned and designed to be highly

[1] The estimated cost for the proposed Siegfried 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.

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

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[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.

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.

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

[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

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/committees-groups/committees/pc/20140109/20140109-item-03-manual-7.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 existing Siegfried 230-138-69 kV Substation is one of the largest substations in the PPL Electric service area. The Siegfried 230-69 kV Substation serves more than 160 MW of load and approximately 26,000 customers in parts of Northampton, Lehigh and Carbon counties, Pennsylvania. The Siegfried Substation is a critical part of both the bulk and non-bulk electric systems[8] serving customers throughout PPL Electric's service territory.

The substation was originally built in the early 1920s as a 230-69 kV substation, *i.e.*, with 230 kV and 69 kV switchyards.[9]. The 230 kV switchyard feeds three 230-69 kV transformers that "step down" the voltage from 230 kV to 69 kV and, in turn, feed the 69 kV switchyard.[10] The 69 kV switchyard feeds ten 69 kV transmission lines serving customers in Northampton, Lehigh and Carbon Counties.[11] In the late 1970s, a 138 kV switchyard was installed at the Siegfried Substation site. The 230 kV switchyard at the Siegfried Substation feeds two 230-138 kV transformers that "step down" the voltage from 230 kV to 138 kV and, in turn, feed the 138 kV switchyard. The 138 kV switchyard supplies six 138 kV transmission lines that serve the region.

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[8] 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.

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

[10] 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.

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

PPL Electric has determined that the aging equipment at the 230 kV and 69 kV switchyards, including the 230-69 kV transformers, do not meet the modern design standards and have reached an age and condition that the facilities must be replaced in order to provide safe and reliable service to customers. The Siegfried Substation is a critical 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 new, modern 230 kV and 69 kV switchyards on a site located immediately adjacent to the existing Siegfried Substation site in Allen Township; Northampton County, Pennsylvania. The existing 138 kV switchyard at the Siegfried Substation will remain in-place. The existing Siegfried Substation site is not large enough to accommodate the new modern 230 kV and 69 kV switchyards. Further, the existing Siegfried Substation was constructed on the side of a hill adjacent to the Lehigh River. As a result, rebuilding the 230 kV and 69 kV yards in-place would pose significant and costly construction challenges while trying to minimize transmission outages that would be required. In addition, rebuilding the 230 kV and 69 kV switchyards in place would result in a less reliable design compared to relocating the switchyards to a less restrictive location, and would result in significant outage risks to the bulk electric system during construction. For these reasons, PPL Electric plans to build new 230 kV and 69 kV switchyards on a site located immediately adjacent to the existing Siegfried Substation site.

In addition, the 230-69 kV Transformers #1, #2, and #3 will be upgraded from 85 MVA to 170 MVA rated transformer units in the new Siegfried 230-69 kV Substation. The upgrade will double the transformer capacity of the 69 kV system at the Siegfried 230-69 kV Substation. The proposed Siegfried Substation Project will provide the region with the required electric power supply reinforcement and will meet all NERC, PJM, and PPL Electric RP&P. This will help ensure continuous and reliable service to PPL Electric customers and the BES transmission system. In order to interconnect the new Siegfried Substation 230 kV and 69 kV switchyards

with the grid, PPL Electric proposes to construct or reconductor a total of approximately 4.5 miles of 230 kV, 138 kV and 138/69 kV transmission lines. Specifically, this project will require the construction of approximately 4.0 miles of new transmission lines at the substation site, and the reconductoring of approximately 0.5 miles of existing transmission lines within the existing rights-of-way.

1. 230 kV Transmission Lines

The following 230 kV circuits currently are interconnected with the existing 230 kV switchyard at the Siegfried Substation: (i) Siegfried – Frackville 230 kV single-circuit; (ii) Siegfried – East Palmerton #3 230 kV single-circuit; (iii) Siegfried – Harwood 230 kV single-circuit; (iv) Siegfried – Martins Creek #1 230 kV single-circuit; and (v) Siegfried – Martins Creek #2 230 kV single-circuit. A map of the existing 230 kV configuration is provided as Figure 1-3.

Each of these 230 kV transmission lines will be removed from the existing 230 kV switchyard and re-terminated into the planned new 230 kV switchyard located adjacent to the existing Siegfried 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 230 kV switchyard.

In addition, two new transmission lines, the Siegfried Transformer #4 and Siegfried Transformer #5 230 kV transmission lines, will be constructed to interconnect the new 230 kV switchyard with the existing 138 kV switchyard that will remain in place. Also, a new temporary 230 kV tie line 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 230 kV re-routes to the new substation, this temporary line will be removed.

In total, PPL Electric proposes to construct approximately 1.8 miles of new 230 kV transmission lines, including the temporary 230 kV tie line. Table 1-1 shows the total lengths of each new 230 kV transmission line to be constructed as part of this project.

TABLE 1-1. NEW 230 kV

Transmission Circuit	Length (feet)
Siegfried – East Palmerton #3 230 kV single-circuit	1,250
Siegfried – Frackville 230 kV single-circuit	2,025

Siegfried – Harwood 230 kV single-circuit	1,225
Siegfried – Martins Creek #1 230 kV single-circuit	700
Siegfried – Martins Creek #2 230 kV single-circuit	925
Siegfried Transformer #4 230 kV single-circuit	1,050
Siegfried Transformer #5 230 kV single-circuit	1,150
Siegfried Substation Temporary 230 kV Tie single-circuit	975
230 kV Total (feet)	**9,300**
230 kV Total (miles)	**1.8**

All new 230 kV transmission lines and associated structures will be located entirely on the property for the new Siegfried Substation 230 kV and 69 kV switchyards.

PPL Electric also proposes to reconductor approximately 0.4 miles of certain existing 230 kV transmission lines in place to connect the new deadend structure located on the new Siegfried Substation property. Table 1-2 below shows the total lengths of each segment of 230 kV transmission line to be reconductored as part of this project.

TABLE 1-2. RECONDUCTORED 230 kV	
Transmission Circuit	**Length (feet)**
Siegfried – Frackville 230 kV single-circuit	1,300
Martins Creek – Siegfried #2 230 kV single-circuit	850
230 kV Total (feet)	**2,150**
230 kV Total (miles)	**0.4**

No additional rights-of-way or new structures will be required to reconductor these 230 kV transmission lines outside of the substation property.

In total, PPL Electric proposes to construct approximately 1.8 miles of new 230 kV transmission line located entirely on the substation site, and to reconductor approximately 0.4 miles of existing 230 kV transmission lines within the existing rights-of-way. A map of the proposed 230 kV configuration is provided as Figure 1-4.

2. 138 kV Transmission Lines

Currently, there are two 138 kV double circuits, the Siegfried – Allentown #1 & #2 and Siegfried – Jackson #1 & #2 138 kV Transmission Lines, that traverse the site for the new Siegfried

Substation 230 kV and 69 kV switchyards. A map of the existing 138 kV configuration is provided as Figure 1-5.

In order to accommodate the construction and location of the new 230 kV and 69 kV switchyards, these 138 kV circuits will need to be re-routed around the new switchyards and tied back into the existing 138 kV switchyard that will remain in place. To do so, PPL Electric proposes to construct approximately 1.4 miles of new 138 kV transmission lines. Table 1-3 shows the total lengths of each new 138 kV transmission circuit to be constructed as part of this project.

TABLE 1-3. NEW 138 kV	
Transmission Circuit	**Length (feet)**
Siegfried – Allentown #1 & #2 138 kV double-circuit	3,175
Siegfried – Jackson #1 & #2 138 kV double-circuit	4,025
138 kV Total (feet)	**7,200**
138 kV Total (miles)	**1.4**

All new 138 kV transmission lines and associated structures will be located entirely on the existing Siegfried Substation property and the property for the new Siegfried Substation 230 kV and 69 kV switchyards.

PPL Electric also proposes to reconductor approximately 0.1 miles of the existing Siegfried – Jackson #1 & #2 138 kV Transmission Line in place to connect to the new deadend structure located on the new Siegfried Substation property. Table 1-4 shows the total length of the of 138 kV transmission line to be reconductored as part of this project.

TABLE 1-4. RECONDUCTORED 138 kV	
Transmission Circuit	**Length (feet)**
Siegfried – Jackson #1 & #2 138 kV double-circuit	625
138 kV Total (feet)	**625**
138 kV Total (miles)	**0.1**

No additional rights-of-way or new structures will be required to reconductor these 138 kV transmission lines.

In total, PPL Electric proposes to construct approximately 1.4 miles of new 138 kV transmission line located entirely on the substation site, and to reconductor approximately 0.1 miles of existing 138 kV transmission lines within the existing rights-of-way. A map of the proposed 138 kV configuration is provided as Figure 1-6.

3. 138/69 kV Transmission Lines

Currently, there are a total of ten 69 kV transmission lines that terminate into the existing 69 kV switchyard at the Siegfried Substation. Each of these 69 kV transmission lines will be removed from the existing 69 kV switchyard and re-terminated into the planned new 69 kV switchyard located adjacent to the existing Siegfried Substation site.

Because PPL Electric does not need Commission approval to site, construct, or relocate transmission lines with a design voltage of less than 100 kV, 52 Pa. Code § 57.71, the 69 kV transmission lines are not the subject of this filing seeking Commission approval of the siting and construction of the Project. However, PPL Electric proposes to rebuild certain existing 69 kV transmission lines for future 138 kV operation (138/69 kV) and, therefore, the Company is seeking Commission approval of the siting and construction of these 138/69 kV lines as part of this Project.

Currently, the following 69 kV transmission lines terminate into the existing 69 kV switchyard: (i) the Siegfried – East Palmerton #1 69 kV single circuit; (ii) the Siegfried – East Palmerton #2 69 kV single circuit; (iii) the Hauto – Siegfried #1 69 kV single circuit; and (iv) the Hauto – Siegfried #4 69 kV single circuit. In addition, the existing double-circuit Siegfried – South Whitehall 138/69 kV Transmission Line, which presently operates at 69 kV but is designed for future 138 kV operation, terminates into the existing 69 kV switchyard. A map of the current 69 kV and 138/69 kV circuits is provided as Figure 1-7.

Each of these 69 kV and 138/69 kV transmission lines will be removed from the existing 69 kV switchyard and re-terminated into the planned new 69 kV switchyard located adjacent to the

existing Siegfried Substation site. To do so, PPL Electric proposes to construct short segments of new 69 kV transmission lines from the existing lines to the new 69 kV switchyard.

PPL Electric proposes to rebuild the four single-circuit 69 kV lines into a double-circuit 138/69 kV transmission line, which will be named the Siegfried – Hauto #1 & #2 138/69 kV Transmission Line. The new double-circuit Siegfried – Hauto #1 & #2 138/69 kV Transmission Line will be interconnected with the new Siegfried Substation 69 kV switchyard by construction of approximately 0.4 miles of new 138/69 kV transmission line located entirely on the Siegfried Substation property and the site for the planned new 230 kV and 69 kV switchyards.

To interconnect this existing 138/69 kV transmission line with the new Siegfried Substation 69 kV switchyard, PPL Electric proposes to construct approximately 0.4 miles of new 138/69 kV transmission line entirely on the existing Siegfried Substation property and the site for the planned new 230 kV and 69 kV switchyards. Upon completion, this 138/69 kV circuit will be renamed the Siegfried – Mickleys #1 & #2 138/69 kV Transmission Line.

Table 1-5 shows the total length of the 138/69 kV transmission line to be constructed as part of this project.

TABLE 1-5. NEW 138/69 kV

Transmission Circuit	Length (feet)
Siegfried – Hauto #1 & #2 138/69 kV (currently called Hauto – Siegfried #1 & #4 69 kV and Siegfried – East Palmerton #1 & #2 69 kV)	2,250
Siegfried – Mickleys #1 and #2 138/69 kV (currently called Siegfried – South Whitehall)[12]	2,350
138/69 kV Total (feet)	**4,600**
138/69 kV Total (miles)	**0.8**

No additional rights-of-way will be required to construct these 138/69 kV transmission lines. Rather, these new segments of 138/69 kV transmission lines and associated structures/towers

[12] The Siegfried – South Whitehall 138/69 kV Transmission Line is presently designed for future 138 kV operation, but currently operated at 69 kV. PPL Electric intends to rename the line to Siegfried – Mickleys in order to conform to PPL transmission line naming standards.

will be located entirely on the existing Siegfried Substation property and the site for the planned new 230 kV and 69 kV switchyards. In total, PPL Electric proposes to construct approximately 0.8 miles of new 138/69 kV transmission line located entirely on the substation site. A map of the proposed 138/69 configuration is provided as Figure 1-8.

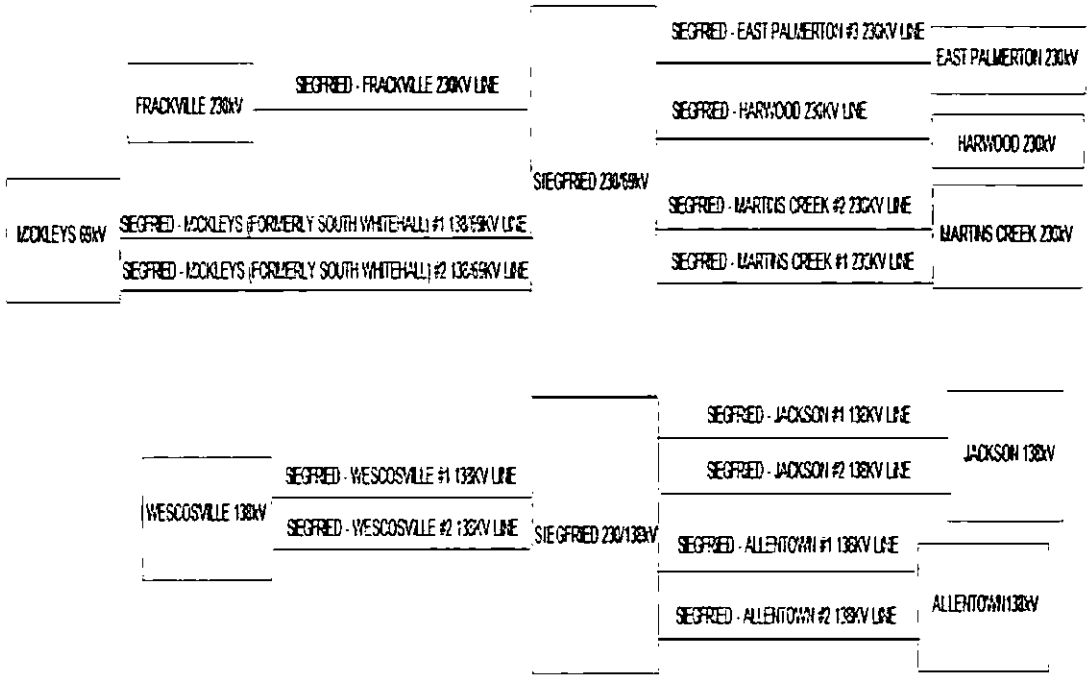
4. Summary

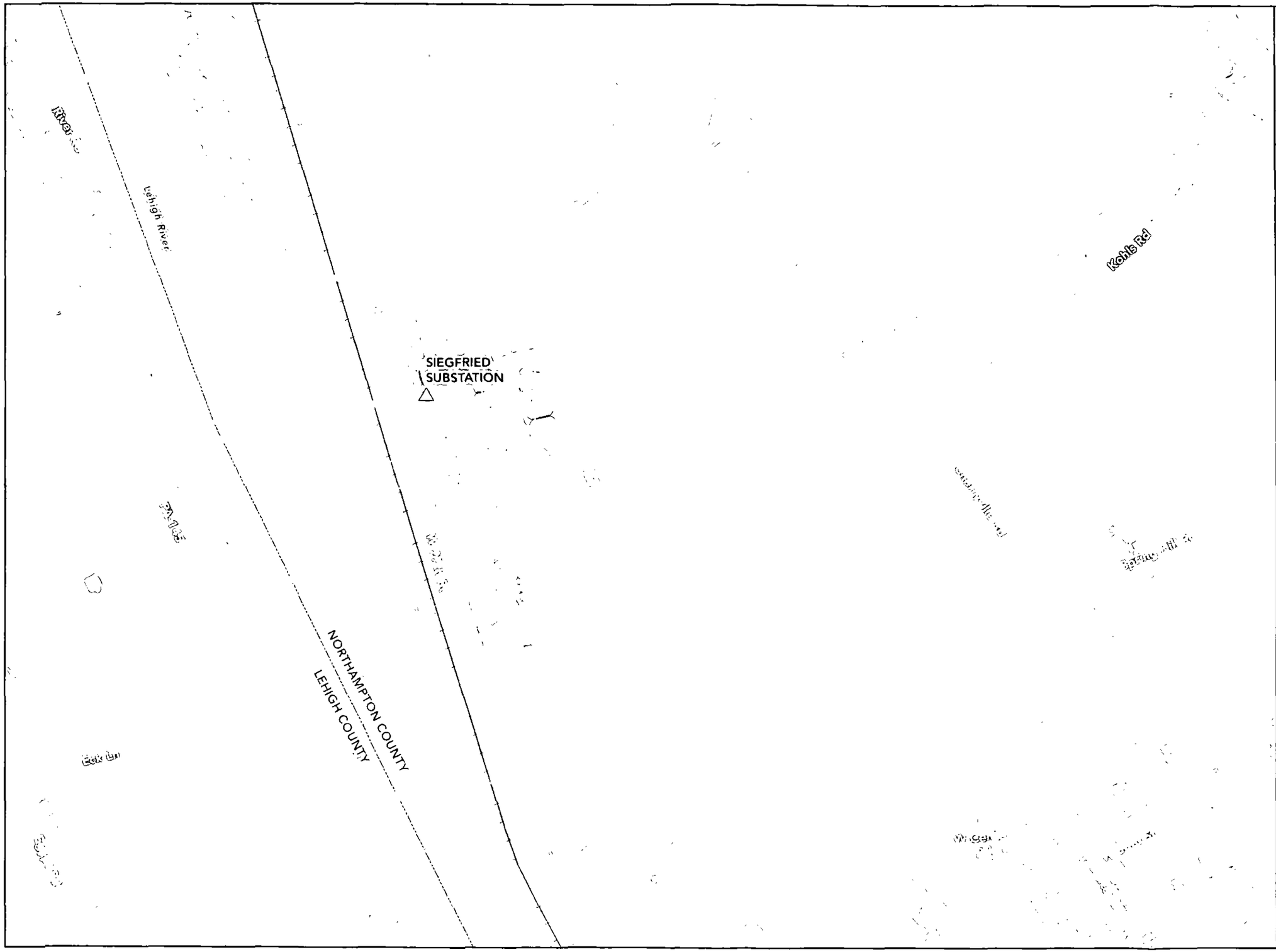
In order to interconnect the planned new Siegfried Substation 230 kV and 69 kV switchyards with the electric grid, PPL Electric proposes to construct approximately 4.0 miles of new transmission line, which includes: (i) 1.8 miles of new 230 kV transmission line; (ii) 1.4 miles of new 138 kV transmission line; and (iii) 0.8 miles of new 138/69 kV transmission line. All new transmission line and supporting tower structures will be located entirely on the existing Siegfried Substation property and/or the property for the new Siegfried Substation 230 kV and 69 kV switchyard.

PPL Electric also proposes to reconductor approximately 0.5 miles of existing transmission lines within the existing rights-of-way, which includes: (i) 0.4 miles of existing 230 kV transmission line; and (ii) 0.1 miles of existing 138 kV transmission line. No additional rights-of-way or new structures will be required to reconductor these transmission lines. A one-line diagram of the proposed system and a map of the proposed Project are provided as Figures 1-9 and 1-10, respectively. An engineering description of the new and rebuilt 230 kV and 138/69 kV transmission lines is provided in Attachment 2.

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 Siegfried Project was assigned supplemental project number s0958.1.

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





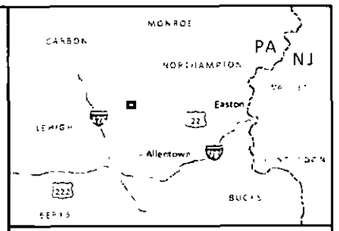


Figure 1-2
Existing Facilities

- Substation

Existing Transmission

- 500kV
- 230kV
- 138kV
- 138/69kV
- Railroad
- Parcel
- County
- Stream
- Floodplain

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Louis Berger

Coordinate System:
NAD 1983 State Plane Pennsylvania South
Datum: North American 1983

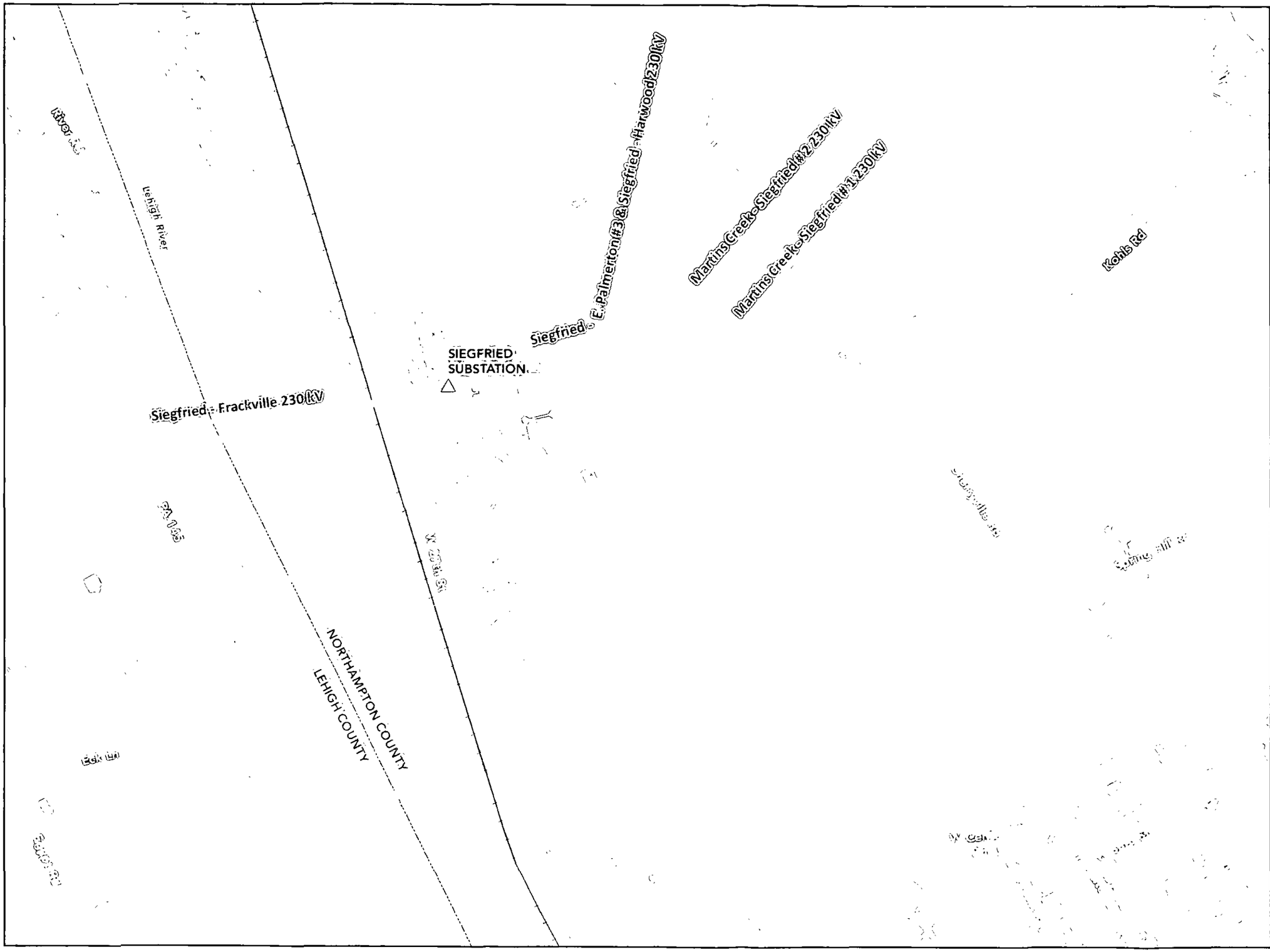

Figure 1-3
Existing Facilities - 230 kV Transmission

△ Substation

Existing Transmission

230kV

Railroad

Parcel

County

Stream

Floodplain

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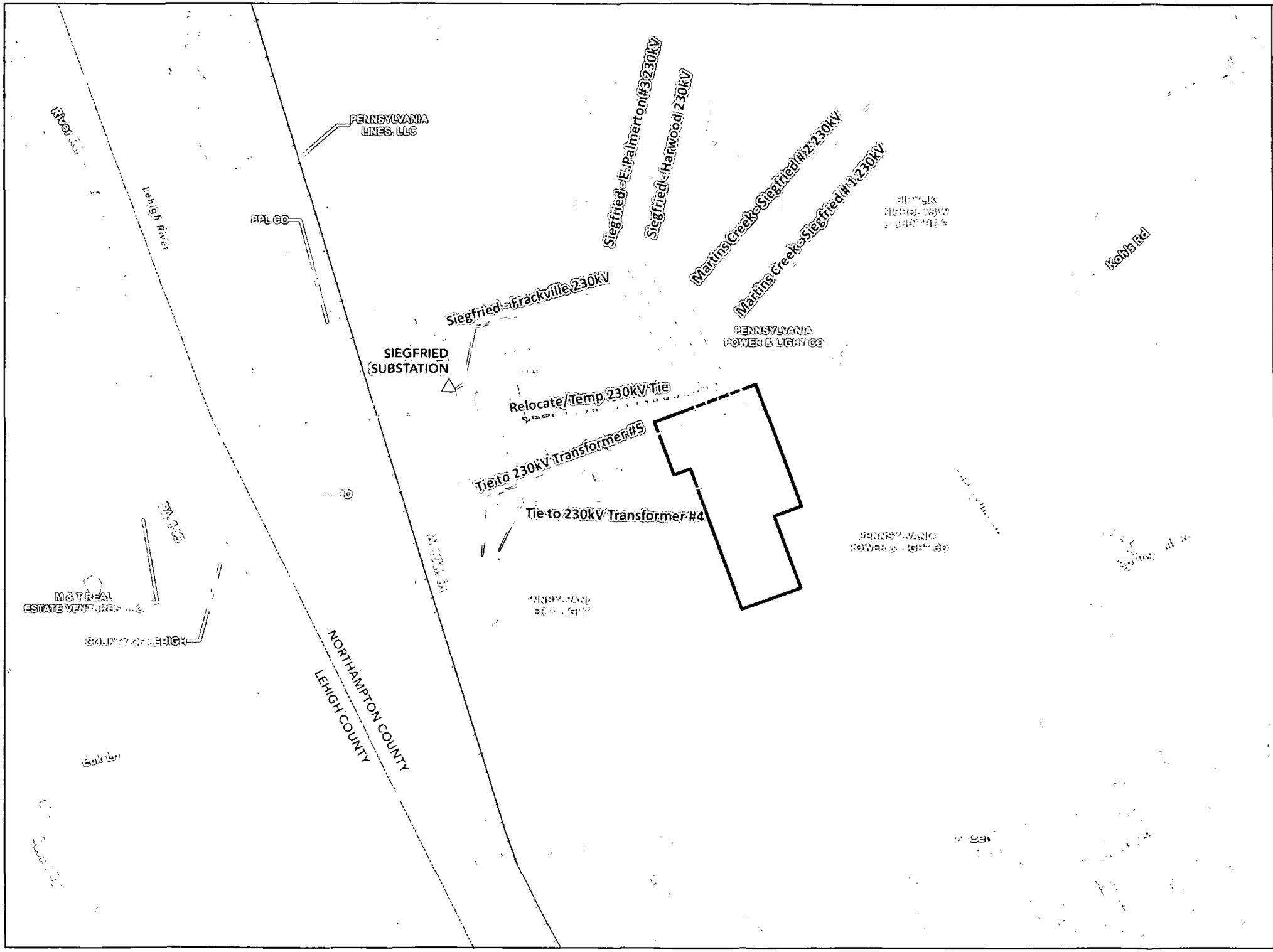
Louis Berger

Coordinate System:
NAD 1983 State Plane Pennsylvania South
Datum: North American 1983



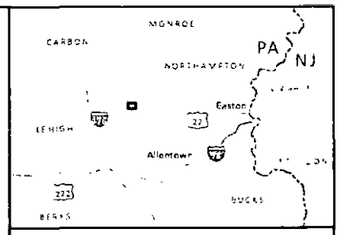


Figure 1-4
Proposed Facilities - 230 kV Transmission

- Substation

Proposed Connections

- Proposed 230kV Connection
- Temporary 230kV Connection

Existing Transmission

- 230kV
- Transmission to be Removed
- Railroad
- Parcel
- Proposed Substation Fenceline
- Proposed Substation Parcel
- County
- Stream
- Floodplain

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Coordinate System:
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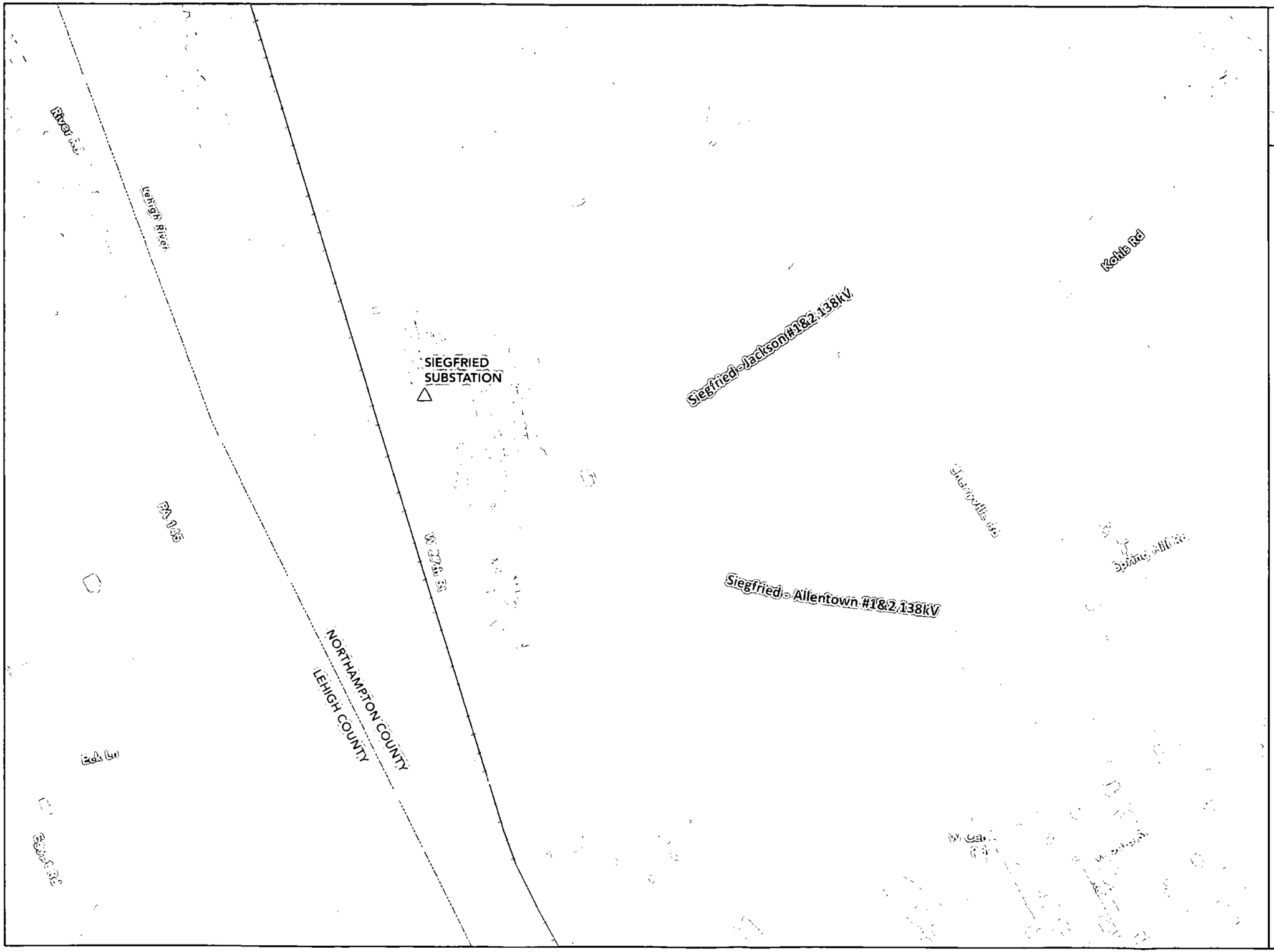

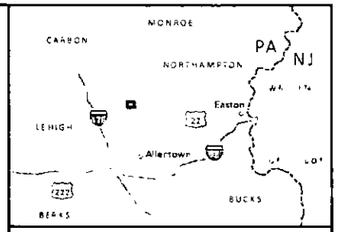

Figure 1-5
Existing Facilities -
138 kV Transmission

△ Substation

Existing Transmission

138kV

Railroad

Parcel

County

Stream

Floodplain

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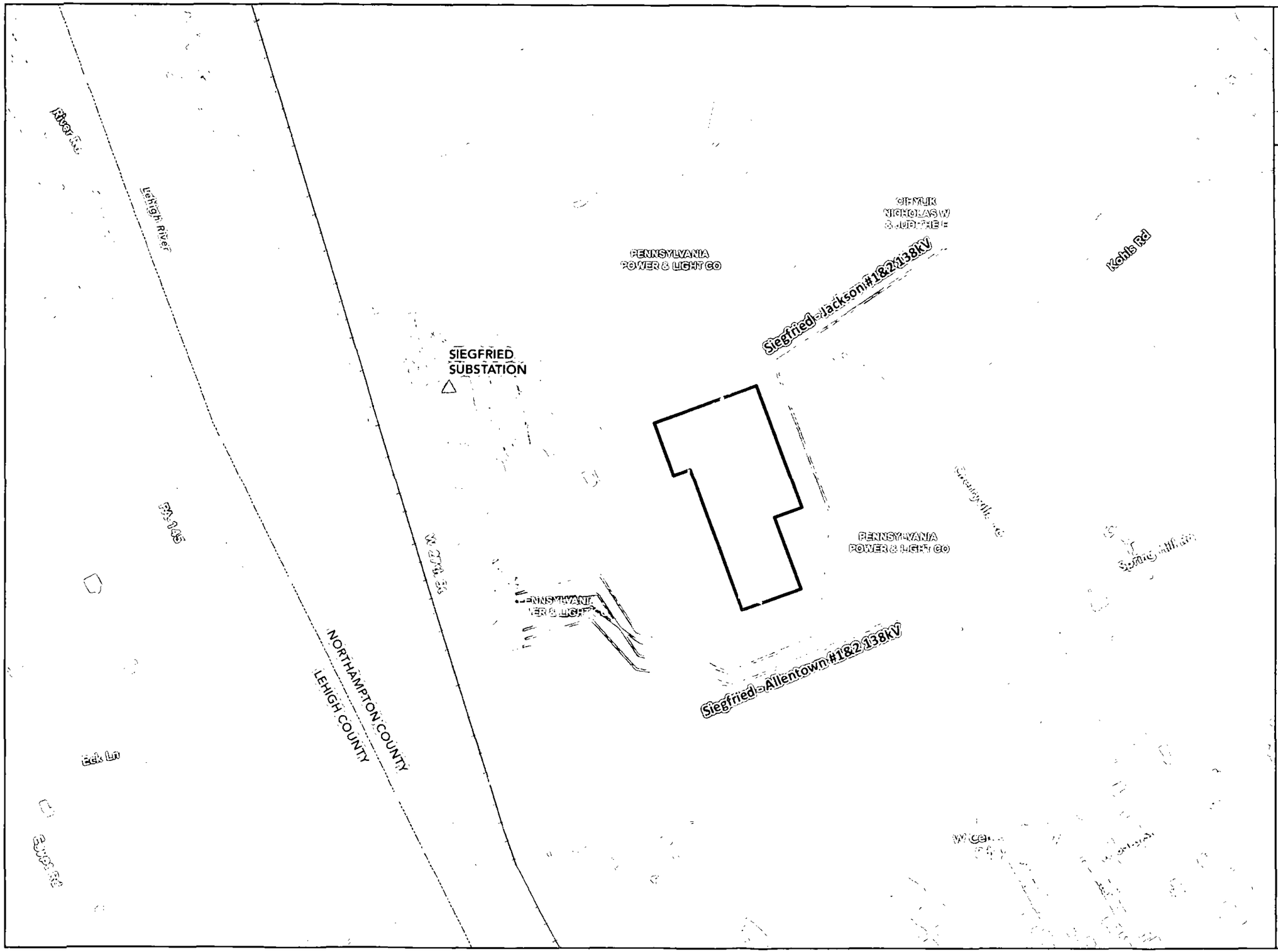
Louis Berger

Coordinate System:
NAD 1983 State Plane Pennsylvania South
Datum: North American 1983



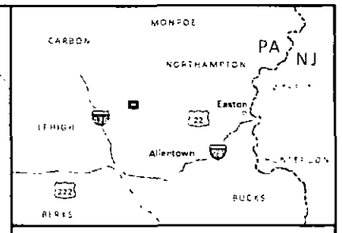


Figure 1-6
Proposed Facilities - 138 kV Transmission

- Substation

Proposed Connections

- Proposed 138kV Connection

Existing Transmission

- 138kV
- Transmission to be Removed
- Parcel
- Railroad
- Proposed Substation Fenceline
- Proposed Substation Parcel
- County
- Stream
- Floodplain

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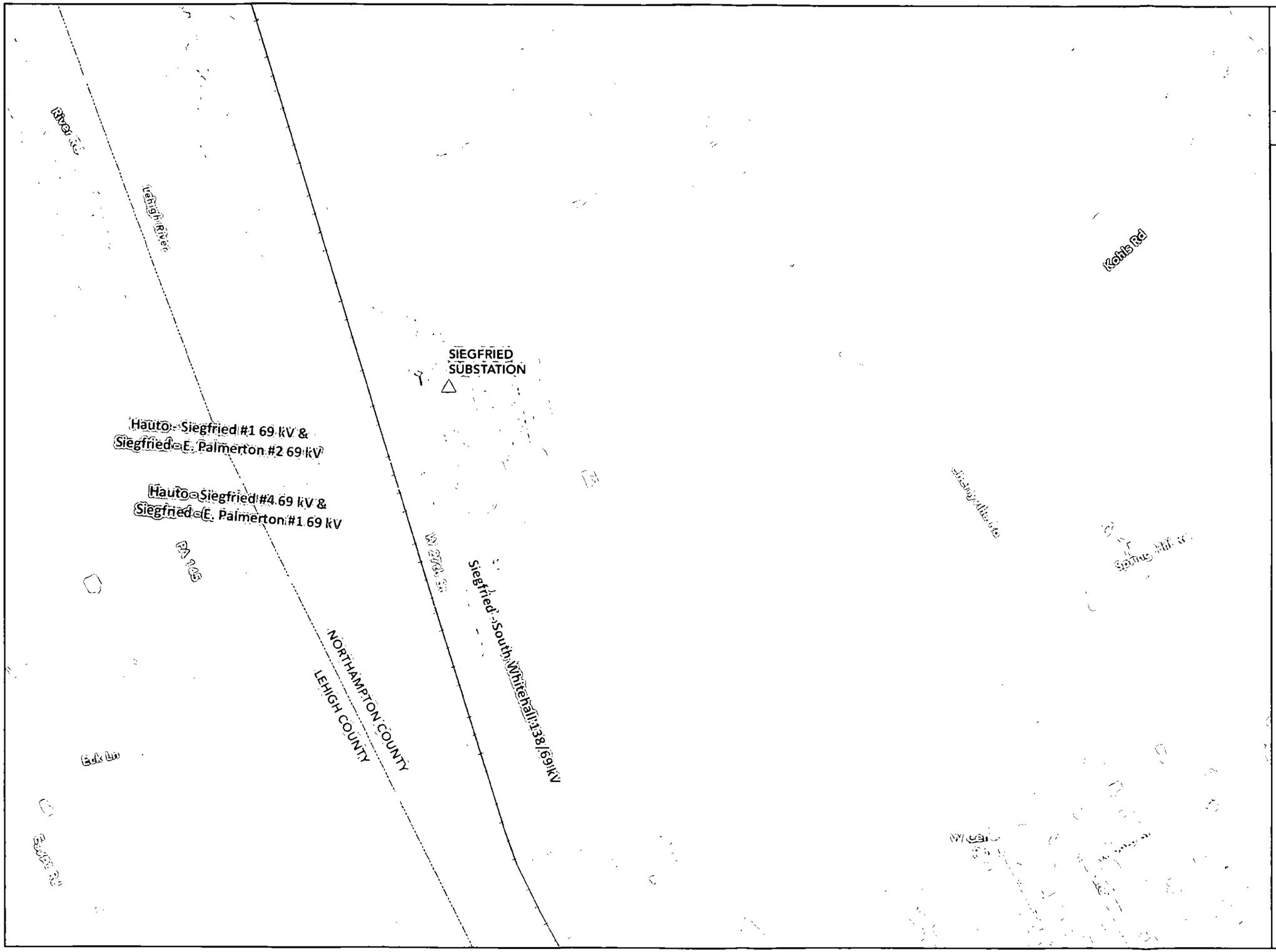
Louis Berger

Coordinate System:
NAD 1983 State Plane Pennsylvania South
Datum: North American 1983



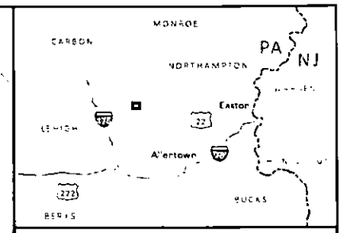


Figure 1-7
Existing Facilities -
138/69 kV Transmission

△ Substation

Existing Transmission

Existing 69 kV
(Future 138 kV)

Railroad

Parcel

County

Stream

Floodplain

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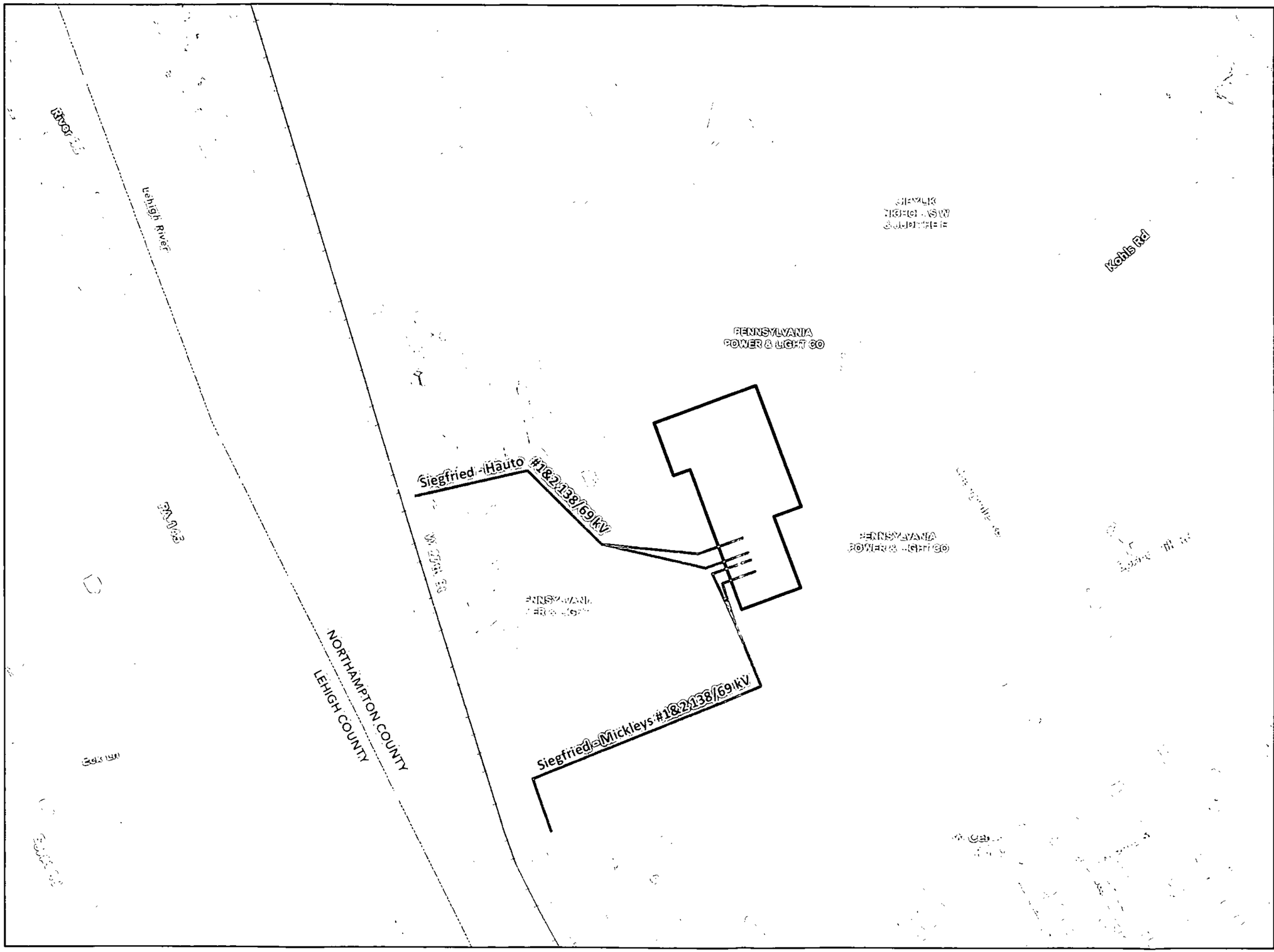
Louis Berger

Coordinate System:
NAD 1983 State Plane Pennsylvania South
Datum: North American 1983



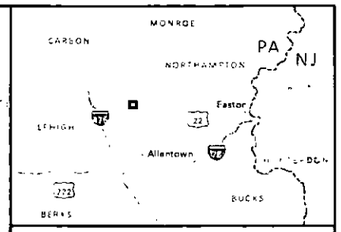


Figure 1-8
Proposed Facilities - 138/69 kV Transmission

Proposed Connections

- Proposed 138/69kV Connection

Existing Transmission

- 138kV
- Transmission to be Removed
- Railroad
- Parcel
- Proposed Substation Fenceline
- Proposed Substation Parcel
- County
- Stream
- Floodplain

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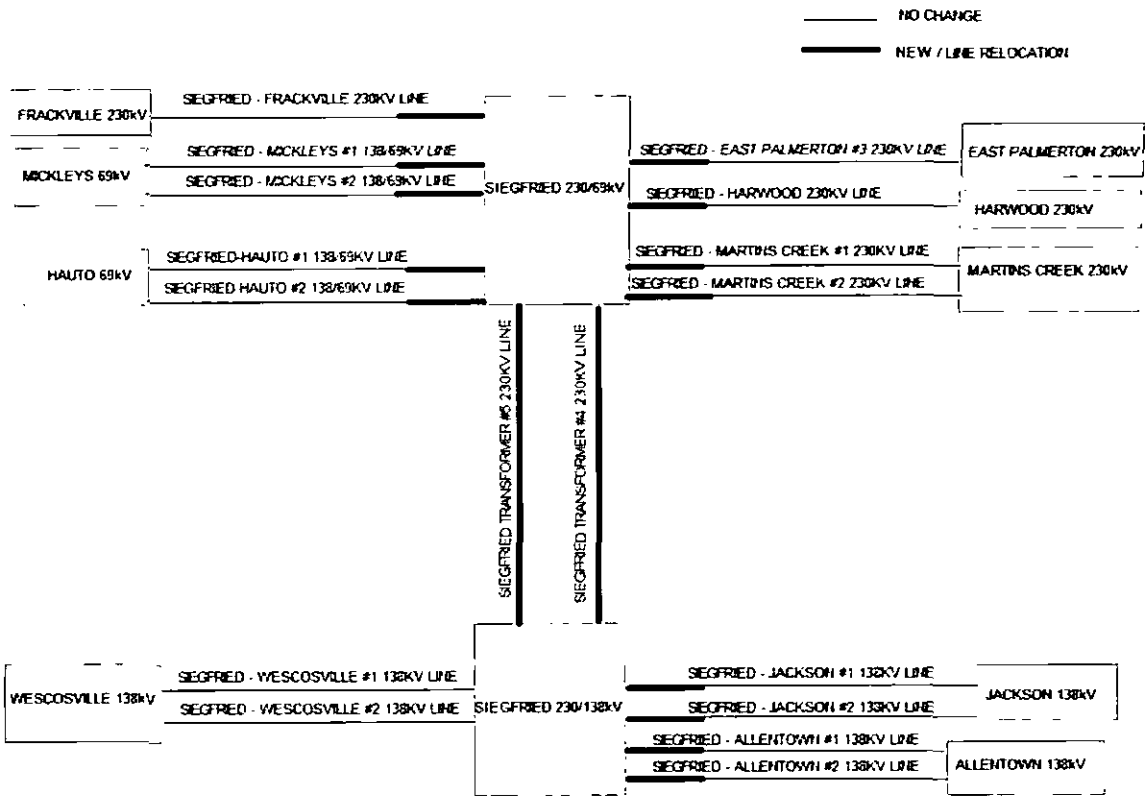
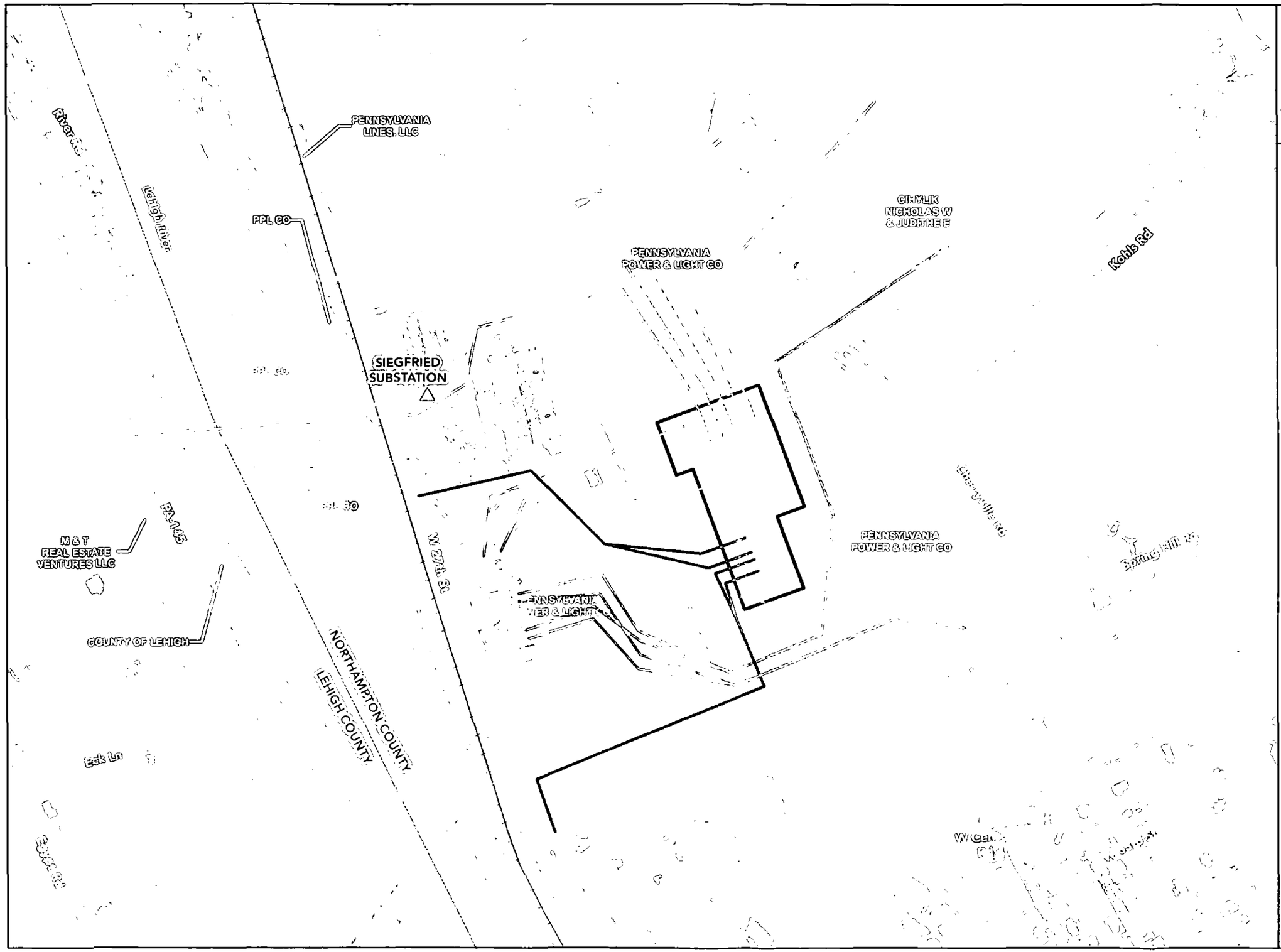
Coordinate System:
NAD 1983 State Plane Pennsylvania South
Datum: North American 1983

Figure 1-9. One-Line Diagram of Proposed System





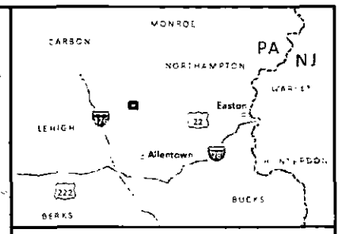


Figure 1-10
Proposed Facilities

△ Substation

Proposed Connections

- Proposed 230kV Connection
- Proposed 138kV Connection
- Proposed 138/69kV Connection

Existing Transmission

- 500kV
- 230kV
- 138kV
- Transmission to be Removed
- Parcel
- Railroad
- Proposed Substation Fenceline
- Proposed Substation Parcel
- County
- Stream
- Floodplain

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Louis Berger

Coordinate System:
NAD 1983 State Plane Pennsylvania South
Datum: North American 1983

ATTACHMENT 2

SIEGFRIED 230-69 KV SUBSTATION RELOCATION PROJECT
ENGINEERING DESCRIPTION

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ATTACHMENT 2

SIEGFRIED 230-69KV 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 4.5 miles of 230 kV, 138 kV, and 138/69 kV transmission lines necessary to interconnect the new Siegfried Substation 230 kV and 69 kV switchyards to the electric grid (the "Project"). Specifically, PPL Electric proposes to construct approximately 4.0 miles of new transmission line, which includes: (i) 1.8 miles of new 230 kV transmission line; (ii) 1.4 miles of new 138 kV transmission line; and (iii) 0.8 miles of new 138/69 kV transmission line. PPL Electric also proposes to reconductor approximately 0.5 miles of existing transmission lines within the existing rights-of-way, which includes: (i) 0.4 miles of existing 230 kV transmission line; and (ii) 0.1 miles of existing 138 kV transmission line. This attachment provides an engineering description of the new and reconductored transmission lines necessary to interconnect the new Siegfried Substation 230 kV and 69 kV switchyards to the electric grid.

B. DESCRIPTION OF PROPOSED LINE

As explained in Attachment 1, the approximately 4.0 miles of new 230 kV, 138 kV, and 138/69 kV transmission lines will be located entirely on the existing Siegfried Substation property and/or the property for the new Siegfried Substation 230 kV and 69 kV switchyard. The approximately 0.5 miles of reconductored 230 kV and 138 kV transmission lines will be located entirely within the existing rights-of-way. No additional rights-of-way are required for the Project.

The approximately 4.0 miles of new transmission lines will be supported by new pole structures located entirely on the existing Siegfried Substation property and/or the property for the new Siegfried Substation 230 kV and 69 kV switchyard. The approximately 0.5 miles of

reconductored transmission lines will use the existing structures. No new rights-of-way or structures will be required to reconductor these segments of transmission line.

Table 2-1 identifies the number of structures and anticipated structure height for each transmission line that will be rebuilt as part of this Project. All new poles for the proposed Project will be self-supporting steel structures on drilled shaft, reinforced concrete foundations. Typical structures are shown in Figures 2-1 through 2-6.

TABLE 2-1. NEW TRANSMISSION LINE CONSTRUCTION

Transmission Circuits[1]	Estimated No. of New Structures	Anticipated Structure Height Range (feet)
Siegfried – Frackville 230 kV single-circuit	6	120 - 170
Siegfried – East Palmerton #3 230 kV single-circuit	3	115 - 130
Siegfried – Harwood 230 kV single-circuit	3	110 - 130
Siegfried – Martins Creek #1 230 kV single-circuit	3	90 - 130
Siegfried – Martins Creek #2 230 kV single-circuit	2	110 - 135
Siegfried Transformer #4 230 kV single-circuit	3	70 - 140
Siegfried Transformer #5 230 kV single-circuit	3	70 - 145
Siegfried Substation Temporary 230 kV Tie single-circuit	1	130
Siegfried 230kV Future Substation Structures	2	160
Siegfried – Jackson #1 & #2 138 kV double-circuit	6	80 - 160
Siegfried – Jackson #1 138 kV single-circuit	2	135 - 150
Siegfried – Jackson #2 138 kV single-circuit	2	100 - 110
Siegfried – Allentown #1 & #2 138 kV double-circuit	3	80 - 175
Siegfried – Allentown #1 138 kV single-circuit	2	85 - 95
Siegfried – Allentown #2 138 kV single-circuit	2	80 - 100
Siegfried – Mickleys #1 & #2 138/69 kV double-circuit	5	90
Siegfried – Mickleys #1 138/69 kV single-circuit	1	100
Siegfried – Mickleys #2 138/69 kV single-circuit	1	100
Siegfried – Hauto #1 & #2 138/69 kV double-circuit	3	85 - 130
Siegfried – Hauto #1 138/69 kV single-circuit	1	140
Siegfried – Hauto #2 138/69 kV single-circuit	1	150
Total Number of New Structures Needed (excluding temporary structures)	**55**	

[1] The Siegfried – Jackson #1 & #2 138 kV Transmission Line, the Siegfried – Allentown #1 & #2 138 kV Transmission Line, the Siegfried – Mickleys #1 & #2 138/69 kV Transmission Line, and the Siegfried – Hauto #1 & #2 138/69 kV Transmission Line are double-circuit lines until a point on the proposed substation property where they split into single-circuit lines to connect to the substation.

Each 230 kV circuit will utilize three power conductors, one fiber optic ground wire, and one overhead ground wire. The power conductors will be 1590 kcmil[2], 45/7 stranding, aluminum conductor steel reinforced ("ACSR"). The fiber optic ground wire will be 0.752-inch diameter optical ground wires ("OPGW"). The overhead ground wire will be 3/8" Extra High Strength Steel ("EHSS").

Each 138 kV and 138/69 kV circuit will utilize three power conductors and two fiber optic ground wires. The power conductors will be 556 kcmil, 24/7 stranding, ACSR. The fiber optic ground wires will be 0.567-inch diameter OPGW.

The proposed lines will be designed to comply with National Electrical Safety Code ("NESC") standards. The minimum conductor-to-ground clearance will be 32 feet for the 230 kV transmission lines and 30 feet for the 138 kV and 138/69 kV transmission lines. The design minimum conductor clearances and conductor thermal ratings for the proposed 230 kV, 138 kV and 138/69 kV lines are shown in Tables 2-2 through 2-5. 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[3]

Condition	Transmission Single-Circuit Design Clearance-to-Ground
Heavy Ice (1.5" Ice at 0°C ambient temperature for 1590)	32 feet
Predicted extreme thermal load (125°C conductor temperature)	32 feet
Predicted blowout (6 lbs., 16°C, ambient temperature)	32 feet

TABLE 2-3. DESIGN FOR MINIMUM CONDUCTOR CLEARANCES FOR 556 KCMIL24/7 STRAND ACSR[4]

Condition	Transmission Single-Circuit and Double-Circuit Design Clearance-to-Ground
Heavy Ice (1" Ice at 0°C ambient temperature for 556)	30 feet

[2] 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.

[3] 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. DESIGN FOR MINIMUM CONDUCTOR CLEARANCES FOR 556 KCMIL24/7 STRAND ACSR[4]	
Condition	**Transmission Single-Circuit and Double-Circuit Design Clearance-to-Ground**
Predicted extreme thermal load (125°C conductor temperature)	30 feet
Predicted blowout (6 lbs., 16°C, ambient temperature)	30 feet

TABLE 2-4. 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	1626
Winter Normal	10	0	1873
Summer Emergency	35	2.533	2013
Winter Emergency	10	2.533	2267

TABLE 2-5. CONDUCTOR THERMAL RATING 556 KCMIL 24/7 STRAND ACSR 125°C MAXIMUM			
Condition	**Ambient Temperature (°C)**	**Wind Speed (Ft./sec)**	**Ampacity (Amps)**
Summer Normal	35	0	806
Winter Normal	10	0	929
Summer Emergency	35	2.533	1054
Winter Emergency	10	2.533	1187

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 five feet 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 Double-Circuit 138 kV Tangent Structure

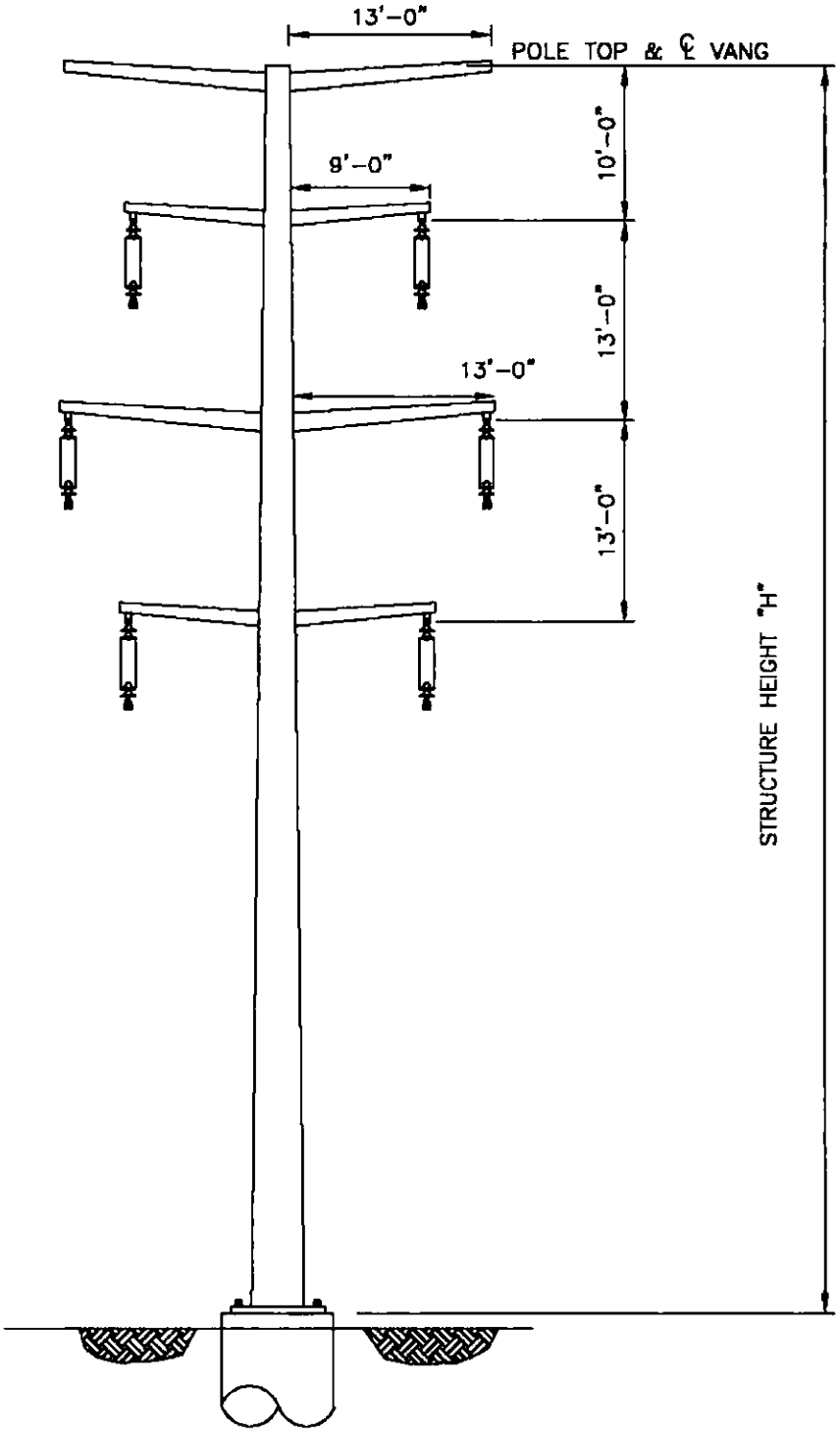


Figure 2-2. Typical Single-Circuit 138 kV Deadend Suspension

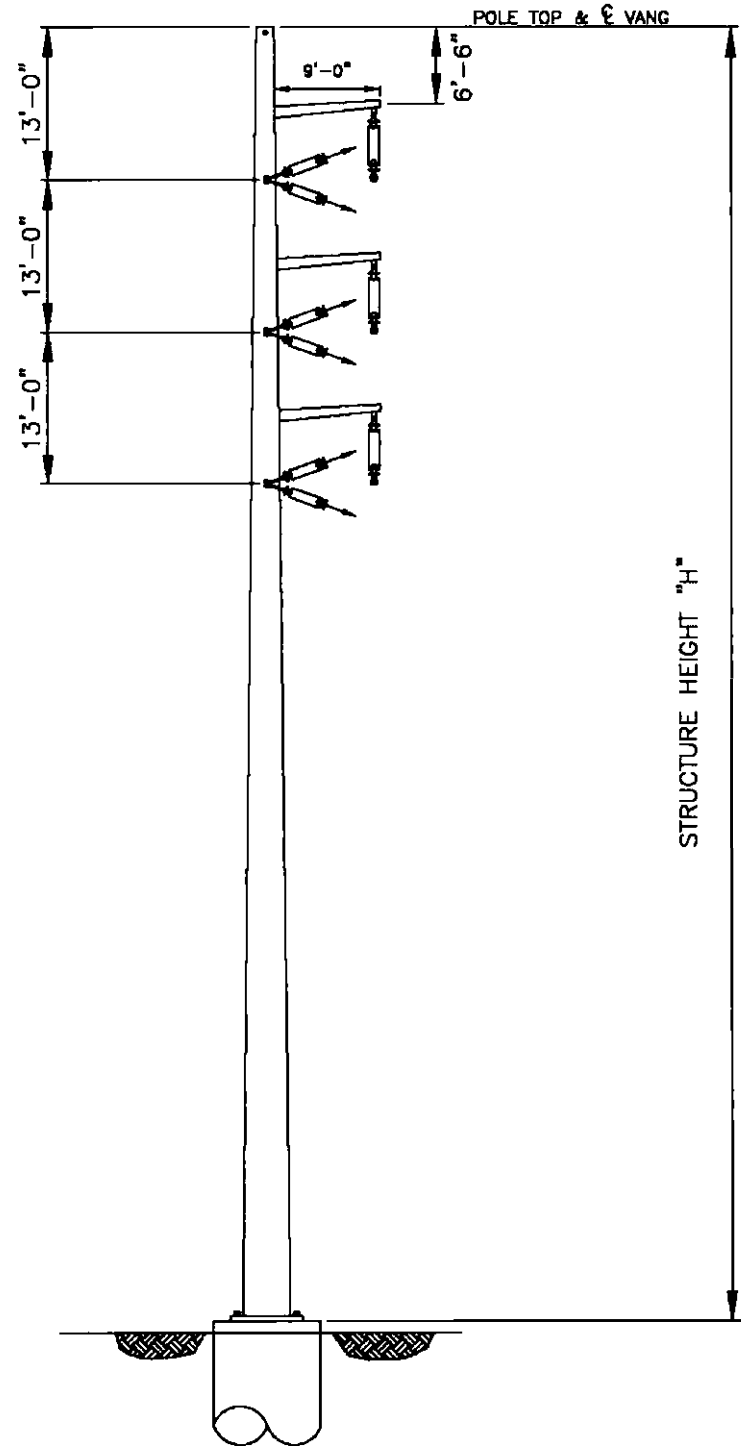


Figure 2-3. Typical Double-Circuit 138 kV Vertical Deadend Structure

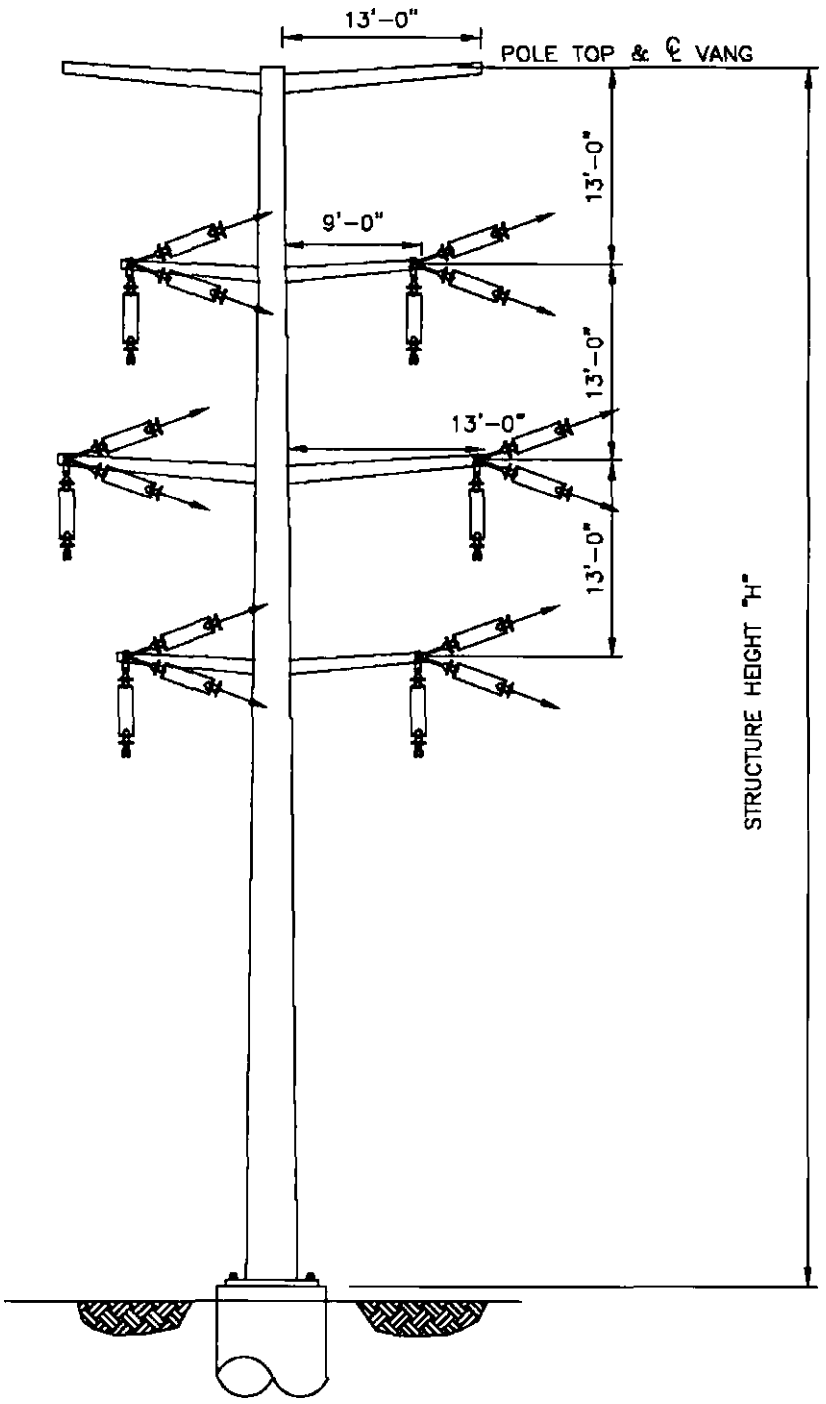


Figure 2-4. Typical Single-Circuit 230 kV Tangent Suspension

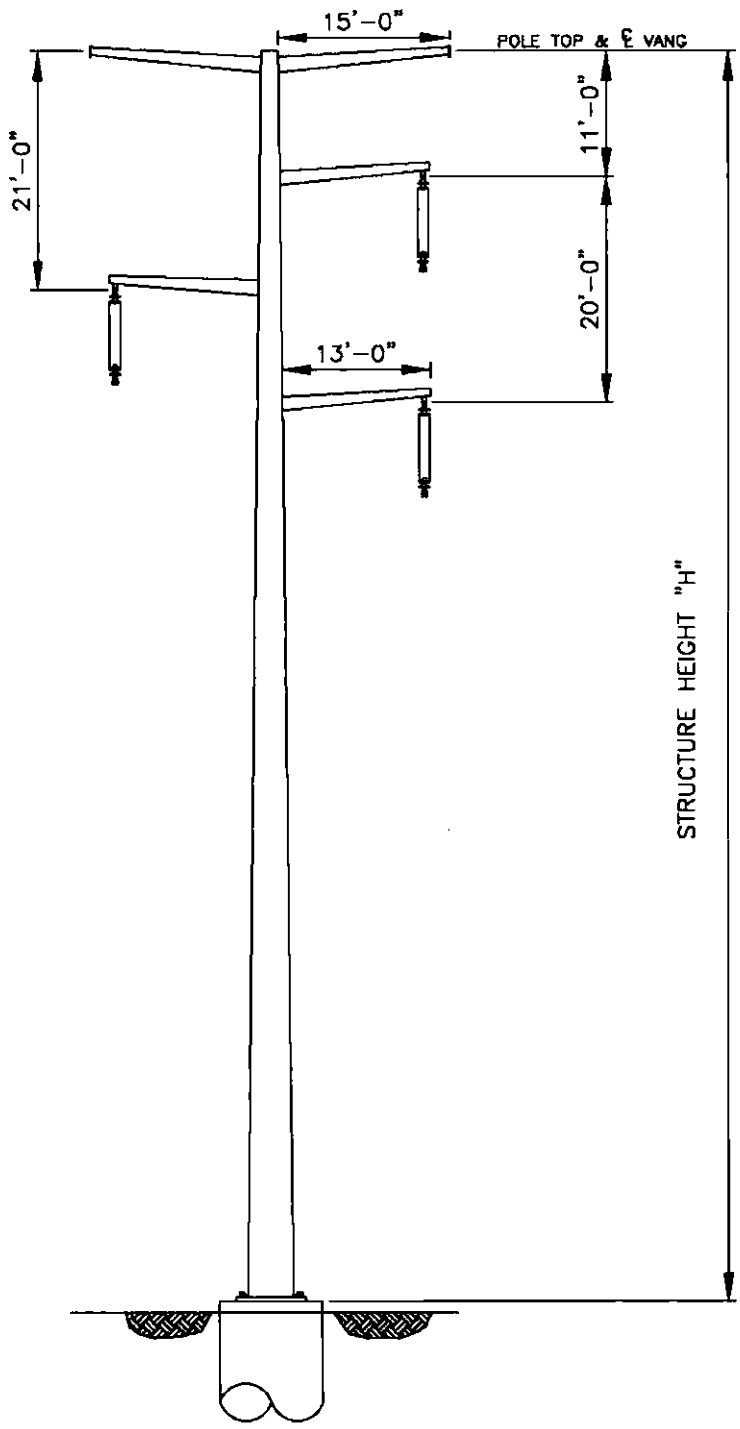


Figure 2-5. Typical Single-Circuit 230 kV Deadend Structure

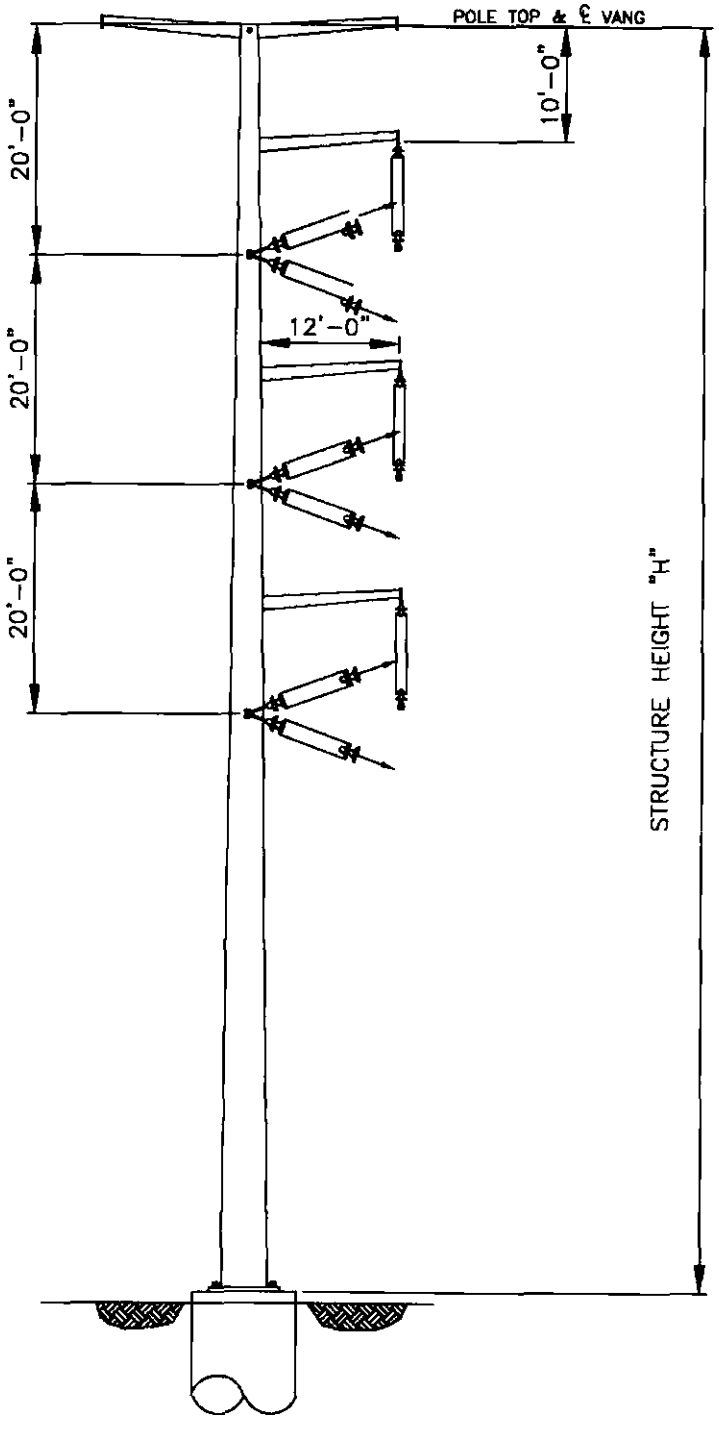
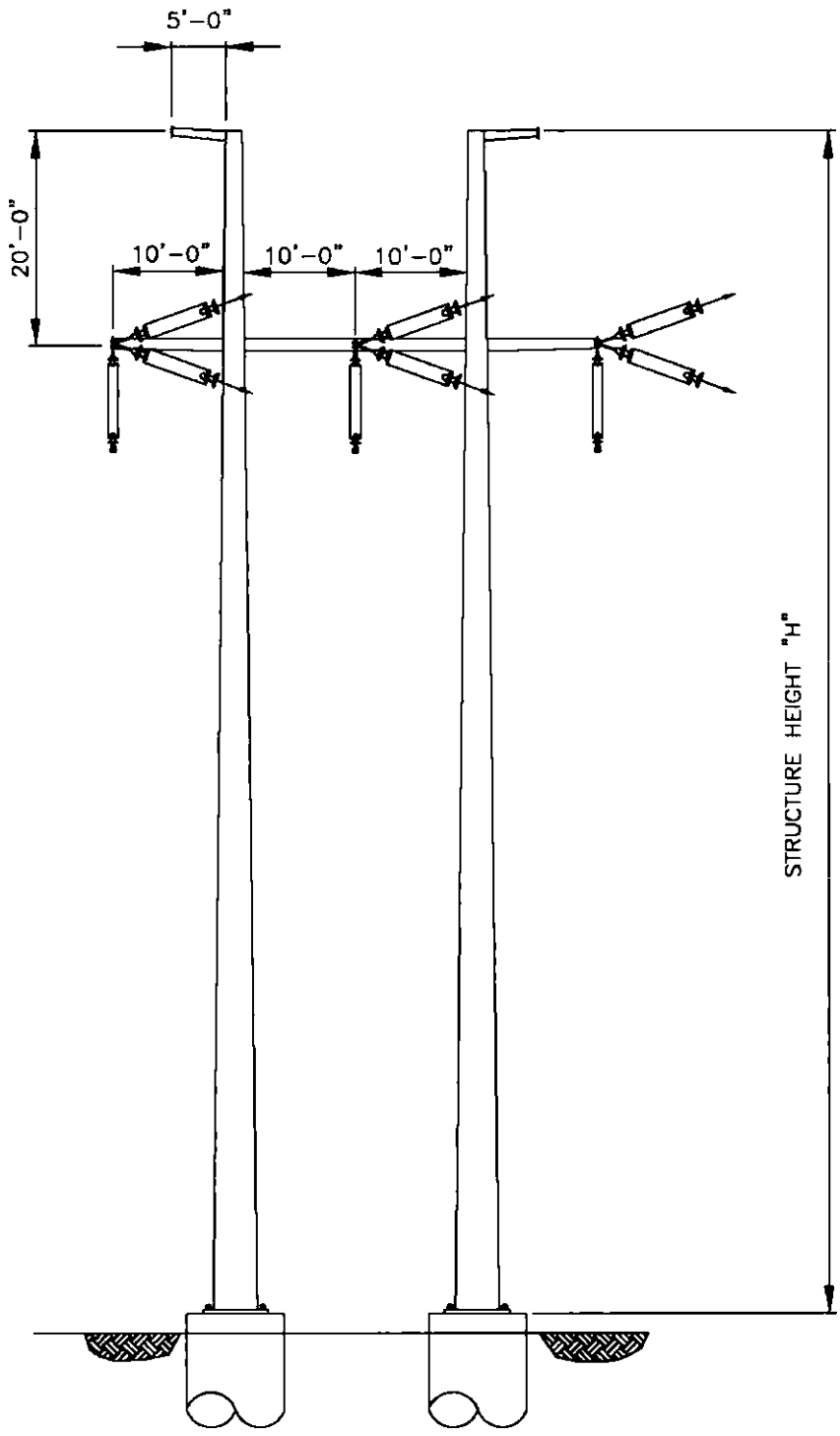


Figure 2-6. Typical Single-Circuit 230 kV H-Frame Structure



ATTACHMENT 3

SIEGFRIED 230-69 KV SUBSTATION RELOCATION PROJECT
DESCRIPTION OF THE PROJECT AREA

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ATTACHMENT 3

SIEGFRIED 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 4.5 miles of 230 kV, 138 kV, and 138/69 kV transmission lines necessary to interconnect the new Siegfried Substation 230 kV and 69 kV switchyards to the electric grid (the "Project"). Specifically, PPL Electric proposes to construct approximately 4.0 miles of new transmission line, which includes: (i) 1.8 miles of new 230 kV transmission line; (ii) 1.4 miles of new 138 kV transmission line; and (iii) 0.9 miles of new 138/69 kV transmission line. PPL Electric also proposes to reconductor approximately 0.5 miles of existing transmission lines within the existing rights-of-way, which includes: (i) 0.4 miles of existing 230 kV transmission line; and (ii) 0.1 miles of existing 138 kV transmission line. This attachment provides a description of the Project area.

The Project is primarily located at the intersection of Cherryville and Spring Hill Roads in Allen Township, Northampton County, Pennsylvania. Approximately 660 feet of the Project is located in North Whitehall Township, Lehigh County, Pennsylvania. PPL Electric has discussed the proposed Project with representatives from Lehigh and Northampton counties and Allen and North Whitehall townships, which had no objection to the Project.

B. PROJECT AREA

As described in Attachment 1, the approximately 4.0 miles of new 230 kV, 138 kV, and 138/69 kV transmission lines will be located entirely on the existing Siegfried Substation property and/or the property for the new Siegfried Substation 230 kV and 69 kV switchyard. The approximately 0.5 miles of reconductored 230 kV and 138 kV transmission lines will be located entirely within the existing rights-of-way. No additional rights-of-way are required for the Project.

Tables 1-1 through Table 1-5 in Attachment 1 identify the total length of each transmission line that must be either constructed or reconductored in order to connect to the new Siegfried Substation 230 kV and 69 kV switchyards. Figure 1-2 in Attachment 1 depicts the existing transmission facilities and Figure 1-10 in Attachment 1 depicts the proposed transmission facilities.

1. Proposed Siegfried 230-69 kV Substation

As explained in Attachment 1, PPL Electric plans to build new 230 kV and 69 kV switchyards on a site located immediately adjacent to the existing Siegfried Substation site. The new 230 kV and 69 kV switchyards will be located approximately 500 feet east of the existing Siegfried Substation at the intersection of Cherryville Road and Spring Hill Road. The site for the new Siegfried Substation 230 kV and 69 kV switchyard is approximately 62 acres in size and consists of two adjacent parcels owned by PPL Electric.[1]

The location of the site for the new Siegfried 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 and 69 kV transmission lines, which will minimize the amount of new transmission lines that need to be constructed to interconnect the new switchyards with the electric grid. In addition, the site is located on top of a hill, rather than on a slope, and farther away from the Lehigh River.

The footprint of the new 230 kV and 69 kV switchyard will be located in the central portion of the property along the western parcel boundary. As a result, the new 230 kV and 69 kV switchyard will be set back from both adjacent roadways (Cherryville Road and Spring Hill Road). The site for the new Siegfried Substation 230 kV and 69 kV switchyard is generally flat. The site is also cleared of tall-growing vegetation, which minimizes environmental impacts. Unlike the existing Siegfried 230-138-69 kV Substation site, the site for the new Siegfried Substation 230 kV and 69 kV switchyard is not adjacent to the 100-year floodplain.

[1] The Northampton Borough Municipal Authority currently has an easement on the site for the new 230 kV and 69 kV switchyards. A copy of the Letter of Notification is being served on the Borough Municipal Authority.

The areas to the north and east of the Project site generally consist of agricultural or forested property and are sparsely populated, with limited commercial and residential development along Cherryville Road. Residential development is located south of Spring Hill Road. Residential development in this area presently borders the existing Siegfried 230-138-69 kV Substation south of Cherryville Road. To the west, the Project site is bordered by the existing Siegfried 230-138-69 kV Substation, a railway and the Lehigh River.

Any other potential location for the new 230 kV and 69 kV switchyards would require long transmission lines and additional property and right-of-way acquisition, which would result in greater impacts to the natural and built environment. Potential sites to the north would require longer 230 kV lines and the majority of the transmission lines would need to cross under the existing Susquehanna – Wescosville 500 kV Transmission Line. Any potential sites directly north of the existing substation along the Lehigh River would also be adjacent to the 100-year floodplain. Potential sites further east of the Project site would be more constrained by residential development and would result in longer transmission lines and new transmission right-of-way. There is insufficient space to develop the new substation south of the Site due to the presence of residential development. To the west, any potential sites would have to be located on the opposite side of the Lehigh River and the majority of the existing transmission lines would need to span the river in order to connect to the new substation.

Based on the foregoing, 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 4.0 miles of new transmission line, which includes: (i) 1.8 miles of new 230 kV transmission line; (ii) 1.4 miles of new 138 kV transmission line; and (iii) 0.9 miles of new 138/69 kV transmission line. The approximately 4.0 miles of new 230 kV, 138 kV, and 138/69 kV transmission lines and supporting pole structures will be located entirely on the existing Siegfried Substation property and/or the property for the new Siegfried Substation 230 kV and 69 kV switchyard. No additional right-of-way is required for these new transmission lines.

As explained in Attachment 1, PPL Electric also proposes to reconductor approximately 0.5 miles of existing transmission lines within the existing rights-of-way, which includes: (i) 0.4 miles of existing 230 kV transmission line; and (ii) 0.1 miles of existing 138 kV transmission line. The existing conductors will be be replaced with new conductors using the existing tower structures. No new right-of-way or tower structures will be required to reconductor these transmission lines.

Approximately 1,300 feet of the Siegfried – Frackville 230 kV Transmission Line, 850 feet of the Martins Creek – Siegfried #1 230 kV Transmission Line, and approximately 625 feet of the Siegfried – Jackson #1 and #2 138 kV Transmission Line will be reconductored outside of the existing and proposed substation properties. As shown in Figure 1-3, the reconductored portion of the Siegfried – Frackville 230 kV Transmission Line begins just east of the railway and aerially spans the Lehigh River. The existing right-of-way for the Martins Creek – Siegfried #1 230 kV Transmission Line and Siegfried – Jackson #1 and #2 138 kV Transmission Line begin at the edge of the new Siegfried Substation 230 kV and 69 kV property and traverse a short distance of agricultural property used as pasture. The existing rights-of-way are sufficient to accommodate the construction, operation, and maintenance of these reconductored transmission lines. No additional right-of-way is required to reconductor these transmission lines.

C. ENVIRONMENTAL ASSESSMENT

Approximately 18 acres located on the north of the Project site currently are used by PPL Electric as a permanent laydown and staging area for all projects across the service region. The remaining 44 acres located south of the Project site were recently acquired by PPL Electric and were previously being used by the prior owner for agricultural purposes.

Land use impacts are anticipated to be minimal because the Project will be located entirely on the existing Siegfried Substation property and/or the property for the new Siegfried Substation 230 kV and 69 kV switchyard, or within existing transmission line rights-of-way. Further, land use impacts to the surrounding area are anticipated to be minimal because the new Siegfried

Substation 230 kV and 69 kV switchyard will be located adjacent to the existing Siegfried 230-138-69 kV Substation and the presence of several existing transmission lines in the area.

Residential development is located south of the Project site along Spring Hill Road. To minimize any potential impacts to this development, the new Siegfried Substation 230 kV and 69 kV switchyard will be offset from the road and located near the center of the property. All construction will occur within the existing Siegfried Substation property and/or the property for the new Siegfried Substation 230 kV and 69 kV switchyard, or within the existing transmission right-of-way.

The Northampton Assembly of God Church is located south of the Project site and the church property is crossed by the existing double-circuit Siegfried – Allentown #1 and #2 138 kV Transmission Line. As part of the Project, PPL Electric proposes to construct approximately 0.6 miles of new 138 kV transmission line to reroute the Siegfried – Allentown #1 and #2 138 kV Transmission Line around the new 230 kV and 69 kV switchyards. However, this new transmission line segment will be located entirely on the existing Siegfried Substation property and the property for the new Siegfried Substation 230 kV and 69 kV switchyards. No work will occur within the church property.

No nearby communication towers, pipelines, or other utilities will be affected by the proposed Project. The closest airport, the Lehigh Valley International Airport, is located approximately 5.6 miles southeast of the Project. The Lehigh Valley International 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, the existing Martins Creek – Siegfried 230 kV Transmission Line, which is an existing transmission line that connects to the Siegfried 230-138-69 kV Substation, is identified as an eligible resource. No other previously identified architectural resources are located within the Project area. One listed architectural resource is located within 0.5 mile of the Project site and one listed and two eligible resources (one of which is the Martins Creek – Siegfried 230 kV line) are located 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 August 22, 2016. In a response dated September 20, 2016, the SHPO indicated that Phase I archeological surveys should be conducted. The SHPO September response indicated that additional information is needed to assess potential impacts to historic architectural resources. PPL Electric will continue to consult with the SHPO to avoid impacts to cultural resources. However, it is anticipated that the Project will have minimal impacts to cultural and archeological resources because the new structures will be placed in close proximity to the existing tower structures.

A National Area Inventory ("NAI") has been prepared by The Nature Conservancy in association with the Pennsylvania Natural Heritage Program ("PNHP") for Lehigh and Northampton Counties (2013). The NAI includes information on the location of rare, threatened, and endangered species and the highest quality natural areas located within the County. Components of the Project are located approximately 0.2 mile east as well as 400 feet north of the Clearview Road Riverbank NAI area. Clearview Road Riverbank is a narrow riparian zone located on the west side of the Lehigh River which provides habitat for several plant species of concern. However, none of the new or reconductored lines cross the Clearview Road Riverbank NAI and no construction activities will take place in the Clearview Road Riverbank NAI area. Accordingly, no impacts to the Clearview Road Riverbank NAI are anticipated from this Project. The Project is also located approximately 300 feet south/southeast of the Laurys Station Floodplain NAI. The Laurys Station Floodplain is a forested floodplain adjacent to a section of the Lehigh River which provides suitable nesting habitat for osprey (*Pandion haliaetus)*, a

Pennsylvania threatened species. As described below, PPL Electric will consult with the Pennsylvania Game Commission ("PGC") regarding potential impacts to osprey. The Hokendauqua Creek South NAI area contains riparian and aquatic habitats for two species of concern, and is located approximately 0.5 mile east of the Project. Due to the distance of the Project from this NAI area, no impacts are anticipated. Construction will occur entirely within the existing Siegfried Substation property and/or the property for the new Siegfried Substation 230 kV and 69 kV switchyard, or within the existing transmission right-of-way. Therefore, no significant impacts to these NAI areas are anticipated. 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. One stream was delineated within the southeast corner of the Project area. However, no work or construction activities will occur in this area. The reconductored Siegfried – Frackville 230 kV Transmission Line will aerially cross the Lehigh River within the existing right-of-way. No direct impacts to the Lehigh River are anticipated. However, because the transmission alignment will shift approximately 60 feet, PPL Electric will obtain a General Permit 5 from the Pennsylvania Department of Environmental Protection ("DEP") for the river crossing. PPL Electric will avoid impacts to streams to the maximum extent practical. PPL Electric will obtain all necessary permits from the DEP and the United States Army Corps of Engineers and will comply with all of the terms and conditions placed on those permits. PPL Electric will also consult with the Lehigh County and the Northampton County Conservation Districts to prepare any required soil erosion and sedimentation control plans, and obtain National Pollutant Discharge Elimination System ("NPDES") permits and comply with any conditions placed on those permits.

PPL Electric conducted an online Pennsylvania Natural Diversity Inventory ("PNDI") review on December 16, 2015[2]. Based on this review, the Pennsylvania Fish and Boat Commission ("PFBC") reported that the Project will not impact any threatened or endangered species, or special concern species and resources located within the Project area. The Pennsylvania

[2] PNDI Receipt No. 20151216542653

Department of Conservation and Natural Resources ("DCNR") indicated that further review is required for potential impacts to Baltic rush (*Juncus articus var. littoralis*), a Pennsylvania threatened plant species. However, the August 5, 2016 DCNR response indicated that no impact is anticipated for the Project.

The PGC reported that further review is required for potential impacts to osprey. Some tree clearing will be required within the existing rights-of-way and the existing Siegfried 230-138-69 kV Substation property. Only a small portion of the site for the new 230 kV and 69 kV switchyard contains trees. Therefore, it is unlikely that the site would provide habitat to a population of osprey. However, osprey habitat exists along the Lehigh River and ospreys have been known to create nests on top of transmission structures. PPL Electric will comply with the conditions of the PGC to minimize potential impacts to ospreys.

The United States Fish and Wildlife Service ("USFWS") search also indicated that further review is required. Lehigh and Northampton counties are located within the range of the federally endangered bog turtle (*Clemmys muhlenbergii*). No wetlands were identified within the Project area. Therefore, no Phase I bog turtle surveys will be required. PPL Electric obtained clearance from the USFWS, which concluded that the proposed Project will not result in any anticipated impacts to bog turtles.

D. VEGETATION MANAGEMENT

The Project will be located entirely within the existing Siegfried Substation property, the property for the new Siegfried Substation 230 kV and 69 kV switchyard, and the existing transmission right-of-way. The existing Siegfried 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 Siegfried Substation 230 kV and 69 kV switchyard is located in an agricultural area that is almost entirely cleared of trees. Minimal vegetation clearing is anticipated to construct the transmission lines necessary to interconnect the new Siegfried 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

SIEGFRIED 230-69 KV SUBSTATION RELOCATION PROJECT
PPL DESIGN CRITERIA AND SAFETY PRACTICES

The National Electrical Safety Code (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 Utilities Corporation (PPL Electric) has developed design specifications and safety rules which meet or surpass all requirements specified by the NESC.

Engineering Design Criteria and Parameters

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 were developed to ensure public safety and welfare.

PPL Electric transmission line design standards meet or surpass the NESC standards. For example, the relative order of grades of construction for conductors and supporting structures is B, C, and N; Grade B being the highest. According to the NESC standards, construction Grades B, C, or N may be used for transmission lines (except at crossings of railroad tracks and limited access highways where Grade B construction is specified). However, PPL Electric designs all of its transmission lines for Grade B construction. The use of Grade B design and construction specifies enhancements such as larger-minimum crossarm dimensions, larger-minimum conductor size, and increased safety factors.

Another example is the design parameters utilized to account for ice and wind loadings on the overhead ground wire (OHGW) and power conductors. The NESC standard ice and wind design magnitudes for the PPL territory are 0.5 inch thickness of radial ice combined with four pounds per square foot horizontal wind pressure (equivalent to 40-mile per hour wind velocity). The conductor sags and tensions used in line designs are the result of various ice and wind combinations, depending on the elevation at the line location and line design voltage. The conductor sags and tensions used in the design of all PPL transmission lines are at least 0.5-inch ice combined with eight pounds wind pressure (equivalent to 57 miles per hour wind velocity). This means that PPL Electric lines are designed to operate safely and reliably during inclement weather even more severe than assumed by the NESC. In addition, PPL Electric transmission lines are designed with more clearance to the ground than required by the NESC. The tables below compare PPL Electric and NESC ground clearances for lines of various voltages.

138 kV

Vertical Clearance to Ground Surface Underneath Conductors	NESC Standard	PPL Design
Roads, streets, alleys	21 Ft.	30 Ft.
Other land traversed by vehicles (such as cultivated field, forest, etc.)	21 Ft.	30 Ft.
Spaces accessible to pedestrians only	17 Ft.	30 Ft.
Railroad tracks	31 Ft.	35 Ft.

230 kV

Vertical Clearance to Ground Surface Underneath Conductors	NESC Standard	PPL Design
Roads, streets, alleys	23 Ft.	32 Ft.
Other land traversed by vehicles (such as cultivated field, forest, etc.)	23 Ft.	32 Ft.
Spaces accessible to pedestrians only	19 Ft.	32 Ft.
Railroad tracks	31 Ft.	36 Ft.

500 kV

Vertical Clearance to Ground Surface Underneath Conductors	NESC Standard	PPL Design
Roads, streets, alleys	28 Ft.	53 Ft.
Other land traversed by vehicles (such as cultivated field, forest, etc.)	28 Ft.	53 Ft.
Spaces accessible to pedestrians only	24 Ft.	53 Ft.
Railroad tracks	38 Ft.	53 Ft.

A relay protection system is used to protect the public safety and welfare as well as equipment and 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.

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 and structure climbing patrols. A number of helicopter patrols are performed on all lines annually. The two-man helicopter crew flies parallel, to the left,

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.

Foot and structure climbing patrol programs for a transmission line begin approximately three to five years after the line is energized, unless a helicopter patrol reports a need for earlier action. The frequency of foot patrols varies from once every year to once every several years depending on line type and age.

An assigned foot patroller checks right-of-way conditions, including access roads, bridges, pole washouts, tower footers, vegetation height and clearance to conductors, pole and tower deterioration and, with the use of binoculars, insulators, and condition of hardware. Identified problems are included in a report that is forwarded to the appropriate department for corrective action.

A scheduled line outage is required to perform an overhead patrol because of "hands-on" inspection of hardware. Overhead patrols are conducted on a schedule determined by line age, operating record, and observed general condition. The necessary repairs are also done during the inspection outage.

Personnel Safety Rules

The following are a few of the PPL safety rules that demonstrate the Company's concern for employee 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 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 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. The conductor size and attachment clamps of temporary safety grounds must be capable of conducting anticipated fault currents. Rubber gloves, rubber sleeves, and additional rubber protective equipment are used as required when applying or removing temporary safety grounds to or from the lines or apparatus to be grounded. An approved nonconductive working stick of sufficient length to allow workers to maintain the following required minimum clearances is used to test that the line has been de-energized and to apply temporary safety grounds:

Voltage-kV	Minimum Clearance
138	3'-7"
230	5'-3"
500	11'-3"

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. When ground pins are used to establish proper ground points, they are driven to a depth of not less than four feet as near vertical as possible.

- 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.

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: 11/10/17

SRaymond

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

Pennsylvania Historical and
Museum Commission
Bureau for Historic Preservation
Commonwealth Keystone Building
400 North Street, 2nd Floor
Harrisburg, PA 17120-0053
Attn: Douglas C. McLearen, Chief

Pennsylvania Department of Transportation
Honorable Leslie S. Richards, Secretary
c/o Office of Chief Counsel
Commonwealth Keystone Building
400 North Street, 8th Floor
Harrisburg, PA 17120
Attn: William J. Cressler

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

Lehigh Valley Planning Commission
961 Marcon Boulevard, Suite 310
Allentown, PA 18109
Attn: Becky A. Bradley, AICP

Northampton County Council
Northampton County Courthouse
669 Washington Street
Easton, PA 18042
Attn: Philip D. Lauer, Esquire
Council Solicitor

Allen Township Planning Commission
961 Marcon Boulevard, Suite 310
Allentown, PA 18109
Attn: W. Eugene Clater, Chairman

Allen Township
4714 Indian Trail Road
Northampton, PA 18067
Attn: Ilene Eckhart, Township Manager

Allen Township Board of Supervisors
4714 Indian Trail Road
Northampton, PA 18067
Attn: Bruce Frack, Chairman

Northampton Borough Municipal Authority
1 Clear Springs Drive
Northampton, PA 18067
Attn: Stephen J. Kerbacher, General Manager

Lehigh County
General Services Department
17 South Seventh Street
Allentown, PA 18101
Attn: Richard D. Molchany, Director

Lehigh County Board of Commissioners
Lehigh County Government Center
17 South Seventh Street
Allentown, PA 18101
Attn: Brad Osborne, Chair

North Whithall Township Planning
Commission
3256 Levans Road
Coplay, PA 18037
Attn: Brian Horwith, Chairman

North Whitehall Township
3256 Levans Road
Coplay, PA 18037
Attn: Jeff Bartlett, Township Manager

North Whitehall Township
Board of Supervisors
3256 Levans Road
Coplay, PA 18037
Attn: Ronald J. Heintzelman, Chairman

Cihylik Farms
3960 Cherryville Road
Northampton, PA 18067

Pennsylvania Lines, LLC
110 Franklin Road
Roanoke, VA 24042

M&T Real Estate Ventures, LLC
3029 College Heights Blvd
Allentown, PA 18101

PPL Electric Utilities Corporation
Two North Ninth Street
Allentown, PA 18101

Date: November 14, 2016

Christopher T. Wright