

Application, Appendix, DEQ Supplement, Direct Testimony and Exhibits of Virginia Electric and Power Company

Before the State Corporation Commission of Virginia

Lanexa-Northern Neck Line #224 230 kV Transmission Line Partial Rebuild Projects

Application No. 287

Case No. PUR-2018-00090

Filed: June 18, 2018

Volume 1 of 2

## COMMONWEALTH OF VIRGINIA BEFORE THE STATE CORPORATION COMMISSION

### APPLICATION OF

### VIRGINIA ELECTRIC AND POWER COMPANY

FOR APPROVAL AND CERTIFICATION OF ELECTRIC FACILITIES

# Lanexa-Northern Neck Line #224 230 kV Transmission Line Partial Rebuild Projects

Application No. 287

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Filed: June 18, 2018

Application

#### COMMONWEALTH OF VIRGINIA

#### STATE CORPORATION COMMISSION

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APPLICATION OF

#### VIRGINIA ELECTRIC AND POWER COMPANY

For approval and certification of electric transmission facilities: Lanexa-Northern Neck Line #224 230 kV transmission line partial rebuild projects Case No. PUR-2018-00090

#### APPLICATION OF VIRGINIA ELECTRIC AND POWER COMPANY FOR APPROVAL AND CERTIFICATION OF ELECTRIC FACILITIES: <u>LANEXA-NORTHERN NECK LINE #224 230 KV TRANSMISSION LINE</u> <u>PARTIAL REBUILD PROJECTS</u>

Pursuant to § 56-46.1 of the Code of Virginia ("Va. Code") and the Utility Facilities Act, Va. Code § 56-265.1 *et seq.*, Virginia Electric and Power Company ("Dominion Energy Virginia" or the "Company"), by counsel, files with the State Corporation Commission of Virginia (the "Commission") this application for approval and certification of electric facilities (the "Application"). In support of its Application, Dominion Energy Virginia respectfully shows as follows:

1. Dominion Energy Virginia is a public service corporation organized under the laws of the Commonwealth of Virginia furnishing electric service to the public within its Virginia service territory. The Company also furnishes electric service to the public in portions of North Carolina. Dominion Energy Virginia's electric system—consisting of facilities for the generation, transmission, and distribution of electric energy—is interconnected with the electric systems of neighboring utilities and is a part of the interconnected network of electric systems serving the continental United States. By reason of its operation in two states and its interconnections with other utilities, the Company is engaged in interstate commerce. 2. In order to perform its legal duty to furnish adequate and reliable electric service, Dominion Energy Virginia must, from time to time, replace existing transmission facilities or construct new transmission facilities in its system.

3. In this Application, in order to maintain the structural integrity and reliability of its transmission system in compliance with mandatory North American Electric Reliability Corporation ("NERC") Reliability Standards, Dominion Energy Virginia proposes to rebuild, entirely within existing right-of-way, four separate segments of its existing Lanexa-Northern Neck Line #224 230 kilovolt ("kV") transmission line in King and Queen, King William, and New Kent Counties based on the condition of the foundations and structures.

4. In the four separate segments, the Company proposes to: (i) remove and replace nine structures and foundations spanning the Pamunkey River and crossing adjacent tidal marshlands (the "Pamunkey River Rebuild"); (ii) remove and replace seven structures and foundations spanning the Mattaponi River and crossing adjacent tidal marshlands (the "Mattaponi River Rebuild"); (iii) remove and replace two double circuit COR-TEN<sup>®1</sup> lattice structures and two adjacent wood H-frame structures, which are currently carrying a single transmission circuit, and foundations on the existing 230 kV Line #224 crossing I-64 in New Kent County west of the intersection of I-64 and Route 3 (the "I-64 Rebuild"); and (iv) remove and replace one double circuit COR-TEN<sup>®</sup> lattice structure, which is currently carrying one transmission circuit for Line #224 and another for Line #2016, and foundation, with two double deadend 2-pole structures and foundations (the "Diascund Rebuild") (collectively, the Pamunkey River Rebuild, Mattaponi River

<sup>1</sup> Registered trademark of United States Steel Corporation.

Rebuild, I-64 Rebuild, and Diascund Rebuild are referred to as the "Line #224 Partial Rebuild Projects" or the "Rebuild Projects").

5. The proposed Line #224 Partial Rebuild Projects will replace aging infrastructure that is at the end of its service life in order to comply with the Company's mandatory transmission planning criteria, thereby enabling the Company to maintain the overall long-term reliability of its transmission system and to maintain the overall generating capabilities of the system. Specifically, the need for the proposed Rebuild Project is described in detail in Section I of the appendix ("Appendix") attached to this Application, and is as follows for each of the four segments:

- a. The purpose of the Pamunkey River Rebuild is to remove and replace six double circuit COR-TEN<sup>®</sup> lattice structures (Structures #224/228 #224/233), one tubular 3-pole steel structure (Structure #224/227), and two wood H-frame structures (Structures #224/226 and #224/234), which are currently carrying a single transmission circuit, and foundations spanning the Pamunkey River and crossing adjacent tidal marshlands due to the deteriorating condition of the COR-TEN<sup>®</sup> lattice structures' foundations. Severe concrete and steel deterioration has reduced the structural capacity of these foundations, jeopardizing the reliability of Line #224.
- b. The purpose of the Mattaponi Rebuild Project is to remove and replace three double circuit COR-TEN<sup>®</sup> lattice structures (Structures #224/182 #224/184), two tubular 3-pole steel structures (Structures #224/181 and #224/185), and two wood H-frame structures (Structures #224/180 and #224/186), which are currently carrying a single transmission circuit and a single distribution circuit, and foundations spanning the Mattaponi River and crossing adjacent tidal marshlands due to the

deteriorating condition of the COR-TEN<sup>®</sup> lattice structures' foundations. Severe concrete deterioration has reduced the structural capacity of these foundations, jeopardizing the reliability of the Line #224.

- c. The purpose of the I-64 Rebuild is to replace two double circuit COR-TEN<sup>®</sup> lattice structures (Structures #224/269 and #224/270), which are currently carrying a single transmission circuit, and foundations crossing I-64 in New Kent County west of the intersection of I-64 and Route 33 because of the corrosion of the COR-TEN® material, which results in loss of base steel from the structural members. This type of tower has inherent problems stemming from the effects of "pack-out."<sup>2</sup> These structures have experienced inherent corrosion and deterioration, requiring repairs, including replacement of tower members. In addition, the I-64 Rebuild will replace two wood H-frame structures (Structures #224/268 and #224/271) that are adjacent to the two COR-TEN<sup>®</sup> lattice structures carrying the conductor and shield wire across Interstate I-64 and would experience a change in load due to the displacement of the conductor as a result of replacing the two COR-TEN<sup>®</sup> lattice structures. As a result of the change in load, the two existing wood H-frames were determined to no longer be adequate and are being proposed for replacement as a part of the I-64 Rebuild.
- d. The purpose of the Diascund Rebuild is to replace one double circuit COR-TEN<sup>®</sup> lattice structure, which is currently carrying one transmission circuit for Line #224 and another for Line #2016, and foundation because of the corrosion of the COR-

<sup>&</sup>lt;sup>2</sup> The term "pack-out" describes deformation of tower joints caused by the in-place corrosion of the steel. This pack-out is known to cause member cracking and fastener failure due to the deformation resulting from the phenomenon.

TEN<sup>®</sup> material, which results in loss of base steel from the structural members. This type of tower has inherent problems stemming from the effects of "pack-out." The structure has experienced inherent corrosion and deterioration, requiring repairs, including replacement of tower members. The Company plans to replace one structure with two structures to minimize the overall scope of the work as conductor work would be required if the Diascund Rebuild proceeded as a one-forone structure replacement. Therefore, no conductor work is anticipated by replacing the existing structure with two structures.

6. The line length of the existing right-of-way to be used for the Line #224 Partial Rebuild Projects is broken down by each of the four segments and is as follows:

- a. The length of the existing right-of-way to be used for the Pamunkey River Rebuild is approximately 1.7 miles long from the northern side of Sweet Hall Road (SR 634) to the southern side of Old Sweet Hall Ferry Crossing (SR 624).
- b. The length of the existing right-of-way to be used for the Mattaponi River Rebuild is approximately 1.3 miles long from the eastern side of Court House Landing Road (SR 655) to the northern side of Wakema Road (SR 640).
- c. The length of the existing right-of-way to be used for the I-64 Rebuild is 0.5 mile
   long from the northern side of Stage Road (SR 632) to the eastern side of Good
   Hope Road (SR 627).
- d. The Diascund Rebuild will consist of replacing a single structure with two structures, Structure #224/297, 2016/6, located east of North Waterside Drive (SR 627), on the western bank of the Diascund Creek Reservoir.

7. The conceptual cost of the Line #224 Partial Rebuild Projects, which assumes completion by May 2021, is approximately \$30.7 million (2018 dollars). Approximately \$1.0 million of that total is for substation- and distribution-related costs.

8. Given the availability of existing right-of-way and the statutory preference given to the use of existing rights-of-way, and because additional costs and environmental impacts would be associated with the acquisition and construction of new right-of-way, the Company did not consider any alternate routes requiring new right-of-way for the Line #224 Partial Rebuild Projects. The impact of the proposed Rebuild Projects on scenic, environmental, and historical features is described in detail in Section III of the Appendix attached to this Application.

9. Based on consultations with the Virginia Department of Environmental Quality ("DEQ"), the Company has developed a supplement ("DEQ Supplement") containing information designed to facilitate review and analysis of the proposed facilities by the DEQ and other relevant agencies. The DEQ Supplement is attached to this Application.

10. Based on the Company's experience, the advice of consultants, and a review of published studies by experts in the field, the Company believes that there is no causal link to harmful health or safety effects from electric and magnetic fields generated by the Company's existing or proposed facilities. Section IV of the Appendix provides further details on Dominion Energy Virginia's consideration of the health aspects of electric and magnetic fields.

11. Section V of the Appendix provides a proposed route description for public notice purposes and a list of federal, state, and local agencies and officials that the Company has or will notify about the Application.

12. In addition to the information provided in the Appendix and the DEQ Supplement, this Application is supported by the prefiled direct testimony of Company Witnesses Robert B.

Smith; Sarah Rana; Furmose J. Gomez; W. Chase Bland; and John A. Mulligan filed with this Application.

WHEREFORE, Dominion Energy Virginia respectfully requests that the Commission:

(a) direct that notice of this Application be given as required by § 56-46.1 of the Code of Virginia;

(b) approve pursuant to § 56-46.1 of the Code of Virginia the construction of the Rebuild Projects or find the I-64 Rebuild and the Diascund Rebuild ordinary extensions or improvements in the usual course of business; and,

(c) grant a certificate of public convenience and necessity for the facilities under the Utility Facilities Act, § 56-265.1 *et seq.* of the Code of Virginia.

VIRGINIA ELECTRIC AND POWER COMPANY

By:

Counsel for Applicant

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Counsel for Applicant Virginia Electric and Power Company

June 18, 2018

Appendix

## COMMONWEALTH OF VIRGINIA BEFORE THE STATE CORPORATION COMMISSION

## APPLICATION OF

#### VIRGINIA ELECTRIC AND POWER COMPANY

## FOR APPROVAL AND CERTIFICATION OF ELECTRIC FACILITIES

# Lanexa-Northern Neck Line #224 230 kV Transmission Line Partial Rebuild Projects

Application No. 287

## Appendix

Containing Information in Response to "Guidelines for Transmission Line Applications Filed Under Title 56 of the Code of Virginia"

> Case No. PUR-2018-00090 Filed: June 18, 2018

## TABLE OF CONTENTS

Execu	itive Summary	i
I.	Necessity for the Proposed Projects	1
II.	Description of the Proposed Projects	. 133
III.	Impact of Line on Scenic, Environmental and Historic Features	. 223
IV.	Health Aspects of EMF	. 272
V.	Notice	. 284

#### **EXECUTIVE SUMMARY**

In order to maintain the structural integrity and reliability of its transmission system and perform needed maintenance on its existing facilities, Virginia Electric and Power Company ("Dominion Energy Virginia" or the "Company") proposes to rebuild, entirely within existing right-of-way, four separate segments of its existing Lanexa-Northern Neck Line #224 230 kilovolt ("kV") transmission line in King and Queen, King William, and New Kent Counties based on the condition of the foundations and structures. Line #224, originally built in 1967 pursuant to a certificate of public convenience and necessity ("CPCN") issued in Case No. 11655 on 120 feet of existing right-of-way, was constructed for 230 kV operation, but operated at 115 kV. In 1986, the Company contacted the Commission about converting the existing Lanexa-Northern Neck 115 kV line to 230 kV. On May 15, 1986, the State Corporation Commission of Virginia ("Commission") provided the Company with a memorandum, which concluded that the Company did not need approval to convert the line from 115 kV to 230 kV. Thereafter, the Company converted Line #224 to 230 kV operation. A copy of the May 15, 1986 Memorandum is included as <u>Attachment Executive Summary</u>.

In the four separate segments, the Company proposes to: (i) remove and replace nine structures and foundations spanning the Pamunkey River and crossing adjacent tidal marshlands (the "Pamunkey River Rebuild"); (ii) remove and replace seven structures and foundations spanning the Mattaponi River and crossing adjacent tidal marshlands (the "Mattaponi River Rebuild"); (iii) remove and replace two double circuit COR-TEN<sup>®1</sup> lattice structures and two adjacent wood H-frame structures, which are currently supporting a single transmission circuit, and foundations on the existing 230 kV Line #224 crossing Interstate 64 in New Kent County west of the intersection of I-64 and Route 3 (the "I-64 Rebuild"); and (iv) remove and replace one double circuit COR-TEN<sup>®</sup> lattice structure, which is currently supporting one transmission circuit for Line #224 and another for Line #2016, and foundation, with two double deadend ("DDE") 2-pole structures and foundations (the "Diascund Rebuild") (collectively, the Pamunkey River Rebuild, Mattaponi River Rebuild, I-64 Rebuild, and Diascund Rebuild are referred to as the "Line #224 Partial Rebuild Projects").

The in-service date for the Line #224 Partial Rebuild Projects is anticipated to be no later than May 2021. Construction is proposed to begin in April 2019. In order to meet the construction timeline outlined in Section I.H of the Appendix, the Company respectfully requests the Commission to enter a final order by January 15, 2019. The total estimated conceptual cost of the Line #224 Partial Rebuild Projects is approximately \$30.7 million (in 2018 dollars).

#### Pamunkey River Rebuild (Structures #224/226 - #224/234)<sup>2</sup>

The Pamunkey River Rebuild stretches approximately 1.7 miles through King William County and New Kent County on the existing 230 kV Line #224 that crosses the Pamunkey River approximately 6.5 miles west, northwest of West Point, Virginia.

<sup>&</sup>lt;sup>1</sup> Registered trademark of the United States Steel Corporation.

 $<sup>^2</sup>$  The Rebuild Projects include four separate segments on Line #224. Therefore, for clarity, the Company is referencing the structures that are to be replaced by their structure numbers. The format for the structure number is the first number is the transmission line number (i.e., Line #224) and the second number after the slash is the structure number.

The purpose of the Pamunkey River Rebuild is to remove and replace six double circuit COR-TEN<sup>®</sup> lattice structures (Structures #224/228 through #224/233), one tubular 3-pole steel structure (Structure #224/227), and two wood H-frame structures (Structures #224/226 and #224/234), which are currently supporting a single transmission circuit, and foundations spanning the Pamunkey River and crossing adjacent tidal marshlands due to the deteriorating condition of the COR-TEN<sup>®</sup> lattice structures' foundations. Severe concrete and steel deterioration has reduced the structural capacity of these foundations, jeopardizing the reliability of Line #224.

The Pamunkey River Rebuild will meet an immediate operational need by replacing aging transmission facilities. Specifically, the Pamunkey River Rebuild provides the benefit of removing or replacing aging transmission facilities spanning the Pamunkey River and crossing adjacent tidal marshlands that are reaching the end of their service lives.<sup>3</sup> The foundations of the one structure in the river (Structure #224/228) and the four structures in the surrounding marshland (Structures #224/229 through #224/232) have critical structural deficiencies that are impractical to repair due to safety concerns. A secondary driver for the replacement of these five structures is that they consist of COR-TEN<sup>®</sup> steel that are also approaching the end of their service lives. The Company employed a third party company, Quanta Technology, to evaluate the condition of its COR-TEN<sup>®</sup> structures. Quanta provided a report (the "2016 Quanta Report") indicating the need to rebuild the COR-TEN<sup>®</sup> structures on Line #224.

The remaining four structures, two towers and two deadend poles, are being replaced to facilitate the new conductor installation for the Pamunkey River Rebuild and to maintain the integrity of the remaining line which consists of wood poles.

The Company will also replace the single 1109 ACAR conductor with bundled 768 ACSS conductor and plans to install an idle 230 kV circuit for future use. It is prudent to install a future 230 kV circuit at the time of installation based on the location being a river crossing.

The total estimated conceptual cost of the Pamunkey River Rebuild is approximately \$13.9 million (in 2018 dollars).

#### Mattaponi River Rebuild (Structures #224/180 - #224/186)

The Mattaponi River Rebuild stretches approximately 1.3 miles through King William County and King and Queen County on the existing 230 kV Line #224 that crosses the Mattaponi River approximately 9.6 miles northwest of West Point, Virginia.

The purpose of the Mattaponi River Rebuild is to remove and replace three double circuit COR-TEN<sup>®</sup> lattice structures (Structures #224/182 - #224/184), two tubular 3-pole steel structures (Structures #224/181 and #224/185), and two wood H-frame structures (Structures #224/180 and #224/186), which are currently supporting a single transmission circuit and a single distribution circuit, and foundations spanning the Mattaponi River and crossing adjacent tidal marshlands due

<sup>&</sup>lt;sup>3</sup> All of the Line #224 Partial Rebuild Projects are based on facilities reaching the end of their service lives but are not based on the Company's assessment in accordance Section C.2.9 of the Company's Planning Criteria for electric transmission infrastructure approaching its end of life. Facilities that reach their end of life pursuant to Section C.2.9 of the Company's Planning Criteria undergo an analysis with the regional transmission operator, PJM Interconnection LLC ("PJM"). Because the Rebuild Projects are viewed as needed maintenance, PJM was not required to approve the Rebuild Projects. See also fn. 10.

to the deteriorating condition of the COR-TEN<sup>®</sup> lattice structures' foundations. Severe concrete deterioration has reduced the structural capacity of these foundations, jeopardizing the reliability of the Line #224.

The Mattaponi River Rebuild will meet an immediate operational need by replacing aging transmission facilities. Specifically, the Mattaponi River Rebuild provides the benefit of removing or replacing aging transmission facilities spanning the Mattaponi River and crossing adjacent tidal marshlands that are reaching the end of their service lives. The foundations of the three structures in the surrounding marshland (Structures #224/182 through #224/184) have critical structural deficiencies that are impractical to repair due to safety concerns. A secondary driver for the replacement of these three structures is that they consist of COR-TEN<sup>®</sup> steel that are also approaching the end of their service lives. The Company employed Quanta Technology to evaluate the condition of its COR-TEN<sup>®</sup> structures, and the 2016 Quanta Report indicates the need to rebuild the COR-TEN<sup>®</sup> structures on Line #224.

The remaining four structures, two towers and two deadend poles, are being replaced to facilitate the new conductor installation for the Mattaponi River Rebuild and to maintain the integrity of the remaining line which consists of wood poles.

The Company will also replace the single 1109 ACAR conductor with bundled 768 ACSS conductor. The Company will also replace the 34.5 kV distribution circuit.

During the Mattaponi River Rebuild, the 34.5 kV river crossing will be unavailable for approximately six months. The Company plans to utilize a 230 kV/34.5 kV temporary mobile substation to provide service to the customers on the north side of the Mattaponi River. The temporary mobile substation will be located on a Company-owned site within the 230 kV right-of-way.

The total estimated conceptual cost of the Mattaponi River Rebuild is approximately \$12.5 million (in 2018 dollars).

#### <u>I-64 Rebuild (Structures #224/268 - #224/271)</u>

Pursuant to § 56-265.2 of the Code of Virginia ("Va. Code"), the Company is required to obtain a CPCN from the Commission to construct facilities unless the project qualifies as an ordinary extension or improvement in the usual course of business. To the extent that the Commission finds that the I-64 Rebuild requires a CPCN, the Company is including the I-64 Rebuild as part of its Application and in this Appendix.

The I-64 Rebuild stretches for approximately 0.5 mile in New Kent County on the existing 230 kV Line #224.

The purpose of the I-64 Rebuild is to replace two double circuit COR-TEN<sup>®</sup> lattice structures (Structures #224/269 and #224/270), which are currently supporting a single transmission circuit, and foundations crossing I-64 in New Kent County west of the intersection of I-64 and Route 33 because of the corrosion of the COR-TEN<sup>®</sup> material, which results in loss of base steel from the structural members. This type of tower has inherent problems stemming from the effects of "pack-

out."<sup>4</sup> These structures have experienced inherent corrosion and deterioration, requiring repairs, including replacement of tower members. In addition, the I-64 Rebuild will replace two wood H-frame structures (Structures #224/268 and #224/271) that are adjacent to the two COR-TEN<sup>®</sup> lattice structures carrying the conductor and shield wire across Interstate I-64 that would experience a change in load as a result of replacing the two COR-TEN<sup>®</sup> lattice structures. As a result of the change in load, the two existing wood H-frames were determined to no longer be adequate and are being proposed for replacement as a part of the I-64 Rebuild.

The primary driver of the I-64 Rebuild is the deterioration of the COR-TEN<sup>®</sup> structures that are approaching the end of their service lives. The Company employed Quanta Technology to evaluate the condition of its COR-TEN<sup>®</sup> structures, and the 2016 Quanta Report indicates the need to rebuild the COR-TEN<sup>®</sup> structures on Line #224. Because the Company will require outage windows for the Pamunkey River Rebuild and Mattaponi River Rebuild, the Company believes it is prudent to utilize these outages to perform the work for the I-64 Rebuild.

The total estimated conceptual cost of the I-64 Rebuild is approximately \$2.3 million (in 2018 dollars).

#### Diascund Rebuild (Structure # 224/297, 2016/6)

To the extent that the Commission finds that the Diascund Rebuild requires a CPCN, the Company is including the Diascund Rebuild as part of its Application and in this Appendix.

The Diascund Rebuild is located in New Kent County on the existing 230 kV Line #224.

The purpose of the Diascund Rebuild is to replace one double circuit COR-TEN<sup>®</sup> lattice structure, which is currently supporting one transmission circuit for Line #224 and another for Line #2016, and foundation because of the corrosion of the COR-TEN<sup>®</sup> material, which results in loss of base steel from the structural members. This type of tower has inherent problems stemming from the effects of "pack-out." The structure has experienced inherent corrosion and deterioration, requiring repairs, including replacement of tower members. The Company plans to replace one structure with two structures to minimize the overall scope of the work as conductor work would be required if the Diascund Rebuild proceeded as a one-for-one structure replacement. Therefore, no conductor work is anticipated by replacing the existing structure with two structures.

The primary driver of the Diascund Rebuild is the deterioration of the COR-TEN<sup>®</sup> structure that is approaching the end of its service life. The Company employed Quanta Technology to evaluate the condition of its COR-TEN<sup>®</sup> structures, and the 2016 Quanta Report indicates the need to rebuild the COR-TEN<sup>®</sup> structures on Line #224. Because the Company will require outage windows for the Pamunkey River Rebuild and Mattaponi River Rebuild, the Company believes it is prudent to utilize these outages to perform the work for the Diascund Rebuild.

The total estimated conceptual cost of the Diascund I-64 Rebuild is approximately \$2.0 million (in 2018 dollars).

<sup>&</sup>lt;sup>4</sup> The term "pack-out" describes deformation of tower joints caused by the in-place corrosion of the steel. This pack-out is known to cause member cracking and fastener failure due to the deformation resulting from the phenomenon.

Attachment Executive Summary

HOTED MAY 1 9 1986 R.L.W.

#### MEMORANDUM

TO :	Mr. Richard Weaver	FILE:	V-11-20-21-100
FROM:	Guy T. Tripp, III	DATE :	May 15, 1986

#### Lanexa-Northern Neck Conversion

You have told me that the Company plans to convert the existing Lanexa-Northern Neck 115kv line to 230kv. The line was constructed for 230kv operation, though it has been operated at 115kv, so the only physical change necessary for this conversion will be replacement of some equipment in each of the substations. The substations are located in the Company's assigned service territory.

You have asked if any State Corporation Commission approval is required for this work. No such approval is required.

You may recall that the State Corporation Commission ruled last January that a 500kv - 138kv stepdown substation proposed by Potomac Edison Company did not require Commission approval because it was an ordinary extension or improvement of the utility's facilities within the territory in which it is authorized to operate. In view of this Commission decision involving construction of a new substation, you can proceed without Commission approval to simply change some equipment in existing substations.

GTT, III/jj

A. State the primary justification for the proposed project (for example, the most critical contingency violation including the first year and season in which the violation occurs). In addition, identify each transmission planning standard(s) (of the Applicant, regional transmission organization ("RTO"), or North American Electric Reliability Corporation) projected to be violated absent construction of the facility.

Response:

Not applicable. The need for the Line #224 Partial Rebuild Projects is not driven by critical contingency violations, or projected violations of any transmission planning standards. See Section I.B for the primary justifications for the Line #224 Partial Rebuild Projects.<sup>4</sup>

<sup>&</sup>lt;sup>4</sup> The Company did not consider demand-side management resources as part of this Application because the Rebuild Projects are driven by the condition of certain foundations and structures.

B. [1] Detail the engineering justifications for the proposed project (for example, provide narrative to support whether the proposed project is necessary to upgrade or replace an existing facility, to significantly increase system reliability, to connect a new generating station to the Applicant's system, etc.).
[2] Describe any known future project(s), including but not limited to generation, transmission, delivery point or retail customer projects, that require the proposed project to be constructed. [3] Verify that the planning studies used to justify the need for the proposed project considered all other generation and transmission facilities impacting the affected load area, including generation and transmission facilities that have not yet been placed into service. [4] Provide a list of those facilities that are not yet in service.

#### Response: **Pamunkey River Rebuild**

#### [1] Engineering Justification for Project

In order to maintain the structural integrity and reliability of its transmission system and perform needed maintenance on its existing facilities, the Company proposes to rebuild, entirely within existing right-of-way, approximately 1.7 miles of existing double circuit 230 kV transmission line through King William County and New Kent County, which crosses the Pamunkey River approximately 6.5 miles west-northwest of West Point, Virginia. <u>Attachment I.G.1</u> contains a map of the Company's existing transmission system in this area, including the Company's existing Line #224.

The Pamunkey River Rebuild will remove and replace six double circuit COR-TEN<sup>®</sup> lattice structures (Structures #224/228 through #224/233), one tubular 3-pole steel structure (Structure #224/227), and two wood H-frame structures (Structures #224/226 and #224/234), which are currently supporting a single transmission circuit, and foundations<sup>6</sup> spanning the Pamunkey River and crossing adjacent tidal marshlands due to the deteriorating condition of the COR-TEN<sup>®</sup> lattice structures' foundations. Severe concrete and steel deterioration has reduced the structural capacity of these foundations, jeopardizing the reliability of Line #224.

The Pamunkey River Rebuild will meet an immediate operational need by replacing aging transmission facilities. Specifically, the Pamunkey River Rebuild provides the benefit of removing or replacing aging transmission facilities spanning the Pamunkey River and crossing adjacent tidal marshlands that are reaching the end of their service lives. The foundations of the one structure in the river (Structure #224/228) and the four structures in the surrounding marshland

<sup>&</sup>lt;sup>6</sup> The Company plans to replace the foundations for five of the six COR-TEN<sup>®</sup> lattice structures and reuse the foundations for the new tower at Structure #224/233 unless a more detailed field investigation of the current foundation conditions dictates new foundations are required at Structure #224/233. Tubular 3-pole steel structure and wood H-frame structures are typically direct embedded in the ground and therefore are not likely to have separate foundations. However, the three structures of these types will be rebuilt with foundations as part of the Pamunkey River Rebuild.

(Structures #224/229 through #224/232) have critical structural deficiencies that are impractical to repair due to safety concerns.

<u>Attachment I.L.1</u> contains a 2014 foundation inspection report from Crofton Industries ("Crofton") on the Pamunkey River Crossing line section, illustrating the extensive deterioration of the foundations that consist of steel H-piles with concrete caps at Structures #224/228 through #224/232.

The Crofton inspection report indicates that a number of steel H-piles are structurally compromised.

Similar to the original foundations on the Nansemond River Crossing prior to their replacement as a result of Commission approval in Case No. PUE-2016-00003 ("Nansemond River Rebuild"), the concrete cap portion on many of the Pamunkey River Rebuild foundations exhibit significant deterioration, including horizontal and vertical cracking of the concrete cap. The significant concrete deterioration at the lower portion of the cap constitutes an identified threat to the integrity of the foundation system because this is the zone of load transfer between the steel H-piles and the concrete cap. In addition, the Company considers it impractical and a safety hazard to attempt to repair deteriorated foundations of this type with the deficiencies outlined in this inspection report.

At these five structure locations (Structures #224/228 through #224/232), new foundations would be installed to have a service life that closely matches the proposed new towers.

A secondary driver for the replacement of these five structures is that they consist of COR-TEN<sup>®</sup> steel that are also approaching the end of their service lives.<sup>7</sup> The Company employed Quanta Technology to evaluate the condition of its COR-TEN<sup>®</sup> structures, and the 2016 Quanta Report indicates the need to rebuild the COR-TEN<sup>®</sup> structures on Line #224.

The remaining four structures, two towers and two deadend poles, are being replaced to facilitate the new conductor installation for the Pamunkey River Rebuild and to maintain the integrity of the remaining line which consists of wood poles.

The Company will also replace the single 1109 ACAR conductor with bundled 768 ACSS conductor and plans to install an idle 230 kV circuit for future use. It is prudent to install a future 230 kV circuit at the time of installation based on the location being a river crossing.

#### [2] <u>Known Future Projects</u>

There are no known future projects that require the Pamunkey River Rebuild to be constructed. This project is required due to the condition of the foundations and the

<sup>&</sup>lt;sup>7</sup> Because Structure #224/233 is also a COR-TEN<sup>®</sup> lattice structure, it is prudent to replace this structure as part of the Pamunkey River Rebuild.

structures as described in Section I.B.1 as it relates to the Pamunkey River Rebuild. See also fn. 10.

#### [3] <u>Planning Studies</u>

Not applicable. The need for the Pamunkey River Rebuild is based on the condition of the foundations and the structures as described in Section I.B.1 as it relates to the Pamunkey River Rebuild. Planning studies were not used to justify the need for the Pamunkey River Rebuild.

#### [4] Facilities List

Not applicable.

#### Mattaponi River Rebuild

#### [1] Engineering Justification for Project

In order to maintain the structural integrity and reliability of its transmission system and perform needed maintenance on its existing facilities, the Company proposes to rebuild, entirely within existing right-of-way, approximately 1.3 miles of existing double circuit 230 kV transmission line through King William County and King and Queen County, which crosses the Mattaponi River approximately 9.6 miles northwest of West Point, Virginia. <u>Attachment I.G.1</u> contains a map of the Company's existing transmission system in this area, including the Company's existing Line #224.

The Mattaponi River Rebuild will remove and replace three double circuit COR-TEN<sup>®</sup> lattice structures (Structures #224/182 through #224/184), two tubular 3-pole steel structures (Structures #224/181 and #224/185), and two wood H-frame structures (Structures #224/180 and #224/186), which are currently supporting a single transmission circuit and a single distribution circuit, and foundations<sup>8</sup> spanning the Mattaponi River and crossing adjacent tidal marshlands due to the deteriorating condition of the COR-TEN<sup>®</sup> lattice structures' foundations. Severe concrete deterioration has reduced the structural capacity of these foundations, jeopardizing the reliability of the Line #224.

The Mattaponi River Rebuild will meet an immediate operational need by replacing aging transmission facilities. Specifically, the Mattaponi River Rebuild provides the benefit of removing or replacing aging transmission facilities spanning the Mattaponi River and crossing adjacent tidal marshlands that are reaching the end of their service lives. The foundations of the three structures in the surrounding marshland (Structures #224/182 through #224/184) have critical structural deficiencies that are impractical to repair due to safety concerns.

<sup>&</sup>lt;sup>8</sup> Tubular 3-pole steel structures and wood H-frame structures are typically direct embedded in the ground and therefore are not likely to have separate foundations. However, the four structures of these types will be rebuilt with foundations as part of the Mattaponi River Rebuild.

<u>Attachment I.L.2</u> contains a 2014 foundation inspection report from Crofton for the structures for the Mattaponi River Rebuild, illustrating the extensive deterioration of the concrete caps that are a part of the foundations that consist of steel H-piles with concrete caps at Structures #224/182 through #224/184.

Structures #224/182 and #224/184 are currently located in marsh areas. Structure #224/183 is located partially in the Mattaponi River with two foundations in the marsh and two foundations in the River.

The inspection report indicates that the concrete cap portion on the majority of foundations is significantly deteriorated with many wide cracks. Similar to the Nansemond River Rebuild and the Pamunkey River Rebuild, the significant concrete deterioration at the lower portion of the cap constitutes an identified threat to the integrity of the foundation system because this is the zone of load transfer between the steel H-piles and the concrete cap. Therefore, the Company considers it impractical and a safety hazard to attempt to repair deteriorated foundations of this type with the deficiencies outlined in this inspection report.

At these three structure locations (Structures #224/182 through #224/184), new foundations would be installed to have a service life that closely matches the proposed new towers.

A secondary driver for the replacement of these three structures is that they consist of COR-TEN<sup>®</sup> steel that are also approaching the end of their service lives. The Company employed Quanta Technology to evaluate the condition of its COR-TEN<sup>®</sup> structures, and the 2016 Quanta Report indicates the need to rebuild the COR-TEN<sup>®</sup> structures on Line #224.

The remaining four structures, two towers and two deadend poles, are being replaced to facilitate the new conductor installation for the Mattaponi River Rebuild and to maintain the integrity of the remaining line which consists of wood poles.

The Company will also replace the single 1109 ACAR conductor with bundled 768 ACSS conductor. The Company will also replace the 34.5 kV distribution circuit.

During the Mattaponi River Rebuild, the 34.5 kV river crossing will be unavailable for approximately six months. The Company plans to utilize a 230 kV/34.5 kV temporary mobile substation to provide service to the customers on the north side of the Mattaponi River. The temporary mobile substation will be located on a Company-owned site within the 230 kV right-of-way.

#### [2] Known Future Projects

There are no known future projects that require the Mattaponi River Rebuild to be constructed. This project is required due to the condition of the foundations and the structures as described in Section I.B.1 as it relates to the Mattaponi River Rebuild. See also fn. 10.

#### [3] <u>Planning Studies</u>

The need for the Mattaponi River Rebuild is based on the condition of the foundations and the structures as described in Section I.B.1 as it relates to the Mattaponi River Rebuild. Planning studies were not used to justify the need for the Mattaponi River Rebuild.

#### [4] Facilities List

Not applicable.

#### I-64 Rebuild

#### [1] Engineering Justification for Project

In order to maintain the structural integrity and reliability of its transmission system and perform needed maintenance on its existing facilities, the Company proposes to replace two double circuit COR-TEN® lattice structures (Structures #224/269 and #224/270), which are currently supporting a single transmission circuit, and foundations crossing I-64 in New Kent County west of the intersection of I-64 and Route 33 because of the corrosion of the COR-TEN® material, which results in loss of base steel from the structural members. This type of tower has inherent problems stemming from the effects of "pack-out." These structures have experienced inherent corrosion and deterioration, requiring repairs, including replacement of tower members. In addition, the I-64 Rebuild will replace two wood H-frame structures (Structures #224/268 and #224/271) that are adjacent to the two COR-TEN<sup>®</sup> lattice structures carrying the conductor and shield wire across Interstate I-64 that would experience a change in load as a result of replacing the two COR-TEN<sup>®</sup> lattice structures. As a result of the change in load, the two existing wood H-frames were determined to no longer be adequate and are being proposed for replacement as a part of the I-64 Rebuild. The I-64 Rebuild stretches for approximately 0.5 mile in New Kent County on the existing 230 kV Line #224. Attachment I.G.1 contains a map of the Company's existing transmission system in this area, including the Company's existing Line #224.

The primary driver of the I-64 Rebuild is the deterioration of the COR-TEN<sup>®</sup> structures that are approaching the end of their service lives. The Company employed Quanta Technology to evaluate the condition of its COR-TEN<sup>®</sup> structures, and the 2016 Quanta Report indicates the need to rebuild the COR-TEN<sup>®</sup> structures on Line #224. Because the Company will require outage windows for the Pamunkey River Rebuild and Mattaponi River Rebuild, the Company believes it is prudent to utilize these outages to perform the work for the I-64 Rebuild.

#### [2] <u>Known Future Projects</u>

There are no known future projects that require the I-64 Rebuild to be constructed. This project is required due to the condition of the structures as described in Section I.B.1 as it relates to the I-64 Rebuild. See also fn. 10.

#### [3] <u>Planning Studies</u>

The need for the I-64 Rebuild is based on the condition of the structures. Planning studies were not used to justify the need for the I-64 Rebuild.

#### [4] Facilities List

Not applicable.

#### **Diascund Rebuild**

#### [1] Engineering Justification for Project

In order to maintain the structural integrity and reliability of its transmission system and perform needed maintenance on its existing facilities, the Company proposes to replace one double circuit COR-TEN<sup>®</sup> lattice structure, which is currently supporting one transmission circuit for Line #224 and another for Line #2016, and foundation because of the corrosion of the COR-TEN® material, which results in loss of base steel from the structural members. This type of tower has inherent problems stemming from the effects of "pack-out." The structure has experienced inherent corrosion and deterioration, requiring repairs, including replacement of tower members. The Company plans to replace one structure with two structures to minimize the overall scope of the work as conductor work would be required if the Diascund Rebuild proceeded as a one-for-one structure replacement. Therefore, no conductor work is anticipated by replacing the existing structure with two structures. The Diascund Rebuild is located in New Kent County on the existing 230 kV Line #224. Attachment I.G.1 contains a map of the Company's existing transmission system in this area, including the Company's existing Line #224.

The primary driver of the Diascund Rebuild is the deterioration of the COR-TEN<sup>®</sup> structure that is approaching the end of its service life. The Company employed Quanta Technology to evaluate the condition of its COR-TEN<sup>®</sup> structures, and the 2016 Quanta Report indicates the need to rebuild the COR-TEN<sup>®</sup> structures on Line #224. Because the Company will require outage windows for the Pamunkey River Rebuild and Mattaponi River Rebuild, the Company believes it is prudent to utilize these outages to perform the work for the Diascund Rebuild.

#### [2] Known Future Projects

There are no known future projects that require the Diascund Rebuild to be constructed. This project is required due to the condition of the structure to be replaced as described in Section I.B.1 as it relates to the Diascund Rebuild. See also fn. 10.

#### [3] Planning Studies

The need for the Diascund Rebuild is based on the condition of the structure to be replaced. Planning studies were not used to justify the need for the Diascund Rebuild.

#### [4] Facilities List

Not applicable.

C. Describe the present system and detail how the proposed project will effectively satisfy present and projected future electrical load demand requirements. Provide pertinent load growth data (at least five years of historical summer and winter peak demands and ten years of projected summer and winter peak loads where applicable). Provide all assumptions inherent within the projected data and describe why the existing system cannot adequately serve the needs of the Applicant (if that is the case). Indicate the date by which the existing system is projected to be inadequate.

Response:

<u>Attachment I.G.1</u> contains a map of the Company's existing transmission system in this area, including the Company's existing Line #224. Lanexa-Northern Neck Line #224 is part of the Company's 230 kV network and interconnects at the Northern Neck Substation with the Company's 48 megawatt ("MW") Northern Neck Power Station generation facility. Line #224 is one of the two primary 230 kV sources to deliver power reliably to Northern Neck area customers and is an important source to the 115 kV Northern Neck-Harmony Village Line #65. Line #224 also provides direct delivery to the customers served out of Dunnsville Substation, which serves over 7,500 customers, including approximately 4,650 Rappahannock Electric Cooperative customers.

The table in <u>Attachment I.C.1</u> provides historical summer and winter peak loads of the Northern Neck area from 2008 to 2017. The table in <u>Attachment I.C.2</u> represents the Company's forecasted summer and winter peaks based on actual loads and the PJM 2018 Load Forecast and demonstrates the continued growth that is expected to occur. Over the period from 2018 to 2027, the summer peak electrical demand of the Northern Neck area is projected to grow from 508 MW to 555 MW, an increase of 9.3% and the winter peak electrical demand is projected to grow from 631 MW to 725 MW, an increase of 16.5%. Notwithstanding this growth, the Line #224 Partial Rebuild Projects are to address the physical condition of the existing facilities and not to address the regional load and load growth forecasts.

For an explanation of the need for the Line #224 Partial Rebuild Projects see Section I.B.

# Northern Neck Area Load Data (Historical):

## Summer Peak Load History

Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Load (MW)	457	431	471	501	475	449	470	466	482	490

## Winter Peak Load History

Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Load (MW)	572	579	594	599	533	582	697	783	623	637

## Northern Neck Area Load Data (Forecast):

## Summer Peak Load Forecast

Year	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Load (MW)	508	510	509	514	520	527	534	541	547	555

## Winter Peak Load Forecast

Year	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Load (MW)	631	647	651	658	668	679	690	700	713	725

D. If power flow modeling indicates that the existing system is, or will at some future time be, inadequate under certain contingency situations, provide a list of all these contingencies and the associated violations. Describe the critical contingencies including the affected elements and the year and season when the violation(s) is first noted in the planning studies. Provide the applicable computer screenshots of single-line diagrams from power flow simulations depicting the circuits and substations experiencing thermal overloads and voltage violations during the critical contingencies described above.

Response: Not applicable for the Line #224 Partial Rebuild Projects.

E. Describe the feasible project alternatives, if any, considered for meeting the identified need including any associated studies conducted by the Applicant or analysis provided to the RTO. Explain why each alternative was rejected.

Response: Not applicable for the Line #224 Partial Rebuild Projects.

- F. Describe any lines or facilities that will be removed, replaced, or taken out of service upon completion of the proposed project, including the number of circuits and normal and emergency ratings of the facilities.
- Response: The Line #224 Partial Rebuild Projects include the removal or replacement of existing facilities on existing Lines #224 as described below. There will be no lines permanently taken out of service as part of the proposed Rebuild Projects.

With the Rebuild Projects, the capacity of the Line #224 will not change. The summer normal and emergency rating for Line #224 is 386 MVA. The winter normal and emergency rating for Line #224 is 542 MVA.

#### Pamunkey River Rebuild

See Section II.B.5 for a list of structures being replaced.

The Pamunkey River Rebuild is a structure-for-structure replacement (Structures #224/226 through #224/234) in generally the same vicinity of the existing structures. However, Structure #224/228 is currently located in the Pamunkey River, and as part of the Pamunkey River Rebuild, this structure will be removed from the river and the new structure will be installed in the surrounding marsh.

#### Mattaponi River Rebuild

See Section II.B.5 for a list of structures being replaced.

The Mattaponi River Rebuild is a structure-for-structure replacement (Structures #224/180 through #224/186) in generally the same vicinity of the existing structures. However, two of the four foundations for Structure #224/183 are currently in the Mattaponi River, and when the structure is replaced none of the foundations will be in the River.

#### I-64 Rebuild

See Section II.B.5 for a list of structures being replaced.

The I-64 Rebuild is a structure-for-structure replacement (Structures #224/268 through #224/271) in generally the same vicinity of the existing structures.

#### **Diascund Rebuild**

See Section II.B.5 for a list of structures being replaced.

Structure #224/297, 2016/6 is currently a double circuit tower that will be replaced with two monopole structures as part of the Diascund Rebuild. This replacement will avoid conductor work that would otherwise be needed.

G. Provide a system map, in color and of suitable scale, showing the location and voltage of the Applicant's transmission lines, substations, generating facilities, etc., that would affect or be affected by the new transmission line and are relevant to the necessity for the proposed line. Clearly label on this map all points referenced in the necessity statement.

Response: See <u>Attachment I.G.1</u>.



# H. Provide the desired in-service date of the proposed project and the estimated construction time.

Response: 7

The desired in-service date for the Line #224 Partial Rebuild Projects is expected to be May 2021.

Accordingly, to support this estimated in-service date, the Company respectfully requests the Commission to enter a final order by January 15, 2019, in order for the Company to procure necessary materials prior to the start of construction in April 2019. To achieve this in-service date, the Company has begun engineering and permitting efforts.

#### **Estimated Construction Time**<sup>9</sup>

Pamunkey River Rebuild	June 2019 – May 2020	(12 months)
Mattaponi River Rebuild	June 2020 – May 2021	(12 months)
I-64 Rebuild	June 2020 – October 2020	(5 months)
Diascund Rebuild	April 2019 – July 2019	(4 months)

<sup>9</sup> The estimated construction timeline is preliminary and subject to change.

I. Provide the estimated total cost of the project as well as total transmissionrelated costs and total substation-related costs. Provide the total estimated cost for each feasible alternative considered. Identify and describe the cost classification (e.g. "conceptual cost," "detailed cost," etc.) for each cost provided.

#### Response: Pamunkey River Rebuild

The total estimated conceptual cost of the Pamunkey River Rebuild is approximately \$13.9 million (in 2018 dollars), all of which is for transmission-related work.

#### Mattaponi River Rebuild

The total estimated conceptual cost of the Mattaponi River Rebuild is approximately \$12.5 million (in 2018 dollars), which includes the following:

- Approximately \$11.5 million for transmission-related work; and
- Approximately \$1.0 million for substation- and distribution-related work.

#### I-64 Rebuild

The total estimated conceptual cost of the I-64 Rebuild is approximately \$2.3 million (in 2018 dollars), all of which is for transmission-related work.

#### **Diascund Rebuild**

The total estimated conceptual cost of the Diascund Rebuild is approximately \$2.0 million (in 2018 dollars), all of which is for transmission-related work.

#### Line #224 Partial Rebuild Projects

The total estimated conceptual cost of the Line #224 Partial Rebuild Projects is approximately \$30.7 million (in 2018 dollars).
## I. NECESSITY FOR THE PROPOSED PROJECT

J. If the proposed project has been approved by the RTO, provide the line number, regional transmission expansion plan number, cost responsibility assignments, and cost allocation methodology. State whether the proposed project is considered to be a baseline or supplemental project.

Response: Not applicable because the Line #224 Partial Rebuild Projects are not required to be approved by the regional transmission operator, PJM.<sup>10</sup>

<sup>&</sup>lt;sup>10</sup> Dominion Energy Virginia is in the preliminary stages of evaluating a new project to rebuild the remainder of Line #224 due to the condition of the wood pole structures. This future project would fall under Section C.2.9 of the Company's Planning Criteria to address electric transmission infrastructure approaching its end of life. The Company's Transmission Planning Criteria can be found in Exhibit A of the Company's Facility Interconnection Requirements document, available online at <u>https://www.dominionenergy.com/library/domcom/media/large-business/selling-power-to-dominion-energy/parallel-generation-and-interconnection/facility-connection-</u>

<sup>&</sup>lt;u>requirements.pdf</u>. This future project will be submitted to the PJM Regional Transmission Expansion Plan process for approval once the internal evaluation is completed which is expected to be around the fourth quarter of 2018. A tentative in-service target date for the project would be December 2023. These dates are preliminary and subject to change. See also fn. 3.

## I. NECESSITY FOR THE PROPOSED PROJECT

- K. If the need for the proposed project is due in part to reliability issues and the proposed project is a rebuild of an existing transmission line(s), provide five years of outage history for the line(s), including for each outage the cause, duration and number of customers affected. Include a summary of the average annual number and duration of outages. Provide the average annual number and duration of outages on all Applicant circuits of the same voltage, as well as the total number of such circuits. In addition to outage history, provide five years of maintenance history on the line(s) to be rebuilt including a description of the work performed as well as the cost to complete the maintenance. Describe any system work already undertaken to address this outage history.
- Response: The need for the Rebuild Projects is not driven by outage history, but rather by the condition of the foundations and structures nearing the end of their service lives. See Section I.B.

## I. NECESSITY FOR THE PROPOSED PROJECT

L. If the need for the proposed project is due in part to deterioration of structures and associated equipment, provide representative photographs and inspection records detailing their condition.

## Response: Pamunkey River Rebuild

See <u>Attachment I.L.1</u>.

## Mattaponi River Rebuild

See Attachment I.L.2.

### I-64 Rebuild and Diascund Rebuild

The 2016 Quanta Report, discussed in Section I.B, details the condition of the deteriorating structures.

Attachment I.L.1 Page 1 of 70

Page 1 of 70 Page 1 of 70 Page 1 of 70 Page 1 of 70 Page 1 of 70

### T/L No. 224 Strs. No. 53-58, 182-184, 228-232 T/L 224

## LANEXA-NORTHERN NECK

#### RAPPAHANNOCK RIVER CROSSING MATTAPONI RIVER CROSSING PAMUNKEY RIVER CROSSING

## **INSPECTION FINDINGS**

### Introduction

Towers within the Line 224 inspection requirements this year run from the Rappahannock River to the North, Crossing the Pamunkey and Mattaponi Rivers to the south. The final report for Line 224 will indicate several towers that require further investigation and rehabilitation efforts.

### **Overall Summary**

Rappahannock River Crossing: Strs. 53-58

The structures crossing the Rappahannock River near Tappahannock, VA seemed to have stabilized with the recent repairs however Tower 58 onshore to the south (neither previously inspected nor rehabilitated) exhibits 100% loss of section to structural steel pile flanges beneath the concrete cap.

### Mattaponi River Crossing: Strs. 182-184

These structures exhibit minor loss of steel section but heavy cracking and efflorescence at the concrete caps.

### Pamunkey River Crossing: Strs. 228-232

These structures exhibit some of the same concrete cap degradation indicated above in addition to loss of steel section to the supporting piles beneath. Towers 228 through 231 all exhibit 100% loss of steel section to structural steel pile flanges.

### Recommendations

Near immediate rehabilitation efforts are recommended for towers 58 and 228 through 231. It is apparent that each of these structures requires structural rehabilitation and protection of the structural members from further corrosion.

Further investigation is recommended for structures 182-184 that exhibit extensive cracking to the concrete foundation caps.

Attachment I.L.1 Page 2 of 70

## **Rappahannock River Crossing**



Mattaponi River Crossing



## **Pamunkey River Crossing**



## LEVEL I FOUNDATION INSPECTION FORM

Attachment I.L.1 Page 3 of 70

SITE CONDITIONS MA WATER DEPTH 57"	KSH OPE	NXATER	FRESH/SAXT	WATER	TIDAL <u>10:10</u>	(Record Time)
FOUNDATION COMPOSI	ΓΙΟΝ					
WOOD	STEEL	CON	CRETE	STEEL PI CON	ILE SUPPORTED	
	<u>Y</u>					
NUMBER OF SUPPORT PILES	PER FOUNDAT	ION	3			
PILE ENCAPSULATIONS	YES	NO	ТҮРЕ			
TOWER PHOTOGRAPH	(INCLUD	E IN FINAL RE	PORT)			



**OVERALL CONDITION OF FOUNDATION** GOOD FAIR POOR NOTES:

SEVERE CORROSION ON 11 OF 12 PILES. KNIFE EDGING BOTH BELOW THE CAP AND DOWN AT OR NEAR THE WATERLINE. KNIFE EDGING IS UP TO 11" LONG AND 7/8" DEEP INTO THE FLANGE.

## LEVEL I FOUNDATION INSPECTION FORM

Attachment I.L.1 Page 4 of 70

# FOUNDATION DESCRIPTION: 3 STEEL H PILES UNDER A CONCRETE CAP

FOUNDAT	TION EVALU	JATIONS						
				FOUNDA	ATION 1:			
	LOSS OF SEC	CTION/PILE	RUNNING	RUST/PILE	IMPACT DA	MAGE/PILE	ENCAPSULA	TION/PILE
	NONE	ABCD	NONE	ABCD	NONE	ABGD	MISSING	ABCD
	MINOR	ABCD	MINOR	ABCD	MINOR	ABCD	CRACKED	ABCD
	MODERATE	ABCD	MODERATE	ABED	MODERATE	ABCD	OVERALL	
	SEVERE	ABCD	SEVERE	ABCD	SEVERE	ABCD	LENGTH	
COMMENTS								
72" CAP TO	MUD LINE. 34	" WATER DE	PTH.	10-01-0				and the second second
1 A, B AND	C PILES ALL H	AVE KNIFE	EDGING. B PI	LE 10"LONG	AND 7/8"D 19	BELOW CA	P THEN 1"H	x 1/8D 69" BELOW CAP
				FOUNDA	ATION 2:			
	LOSS OF SEC	CTION/PILE	RUNNING	RUST/PILE	IMPACT DA	MAGE/PILE	ENCAPSULA	TION/PILE
	NONE	ABCD	NONE	ABCD	NONE	ABCD	MISSING	ABCD
	MINOR	ABCD	MINOR	ABCD	MINOR	ABCD	CRACKED	ABCD
	MODERATE	ABCD	MODERATE	ABCD	MODERATE	ABCD	OVERALI	
	SEVERE	ABCD	SEVERE	ABCD	SEVERE	ABCD	LENGTH	
COMMENTS								
99" CAP TO	MUD LINE. 57	" WATER DE	PTH.					
2 B PILE KN	IIFE EDGING, E	BEGINNING	19" FROM CA	P. 11" LONG	AND UP TO	1 3/4" DEEP I	NTO THE FLA	NGE.
				FOUNDA	ATION 3:			
	LOSS OF SEC	CTION/PILE	RUNNING	RUST/PILE	IMPACT DA	MAGE/PILE	ENCAPSULA	TION/PILE
	NONE	ABCD	NONE	ABCD	NONE	ABOD	MISSING	ABCD
	MINOR	ABCD	MINOR	ABCD	MINOR	ABCD	CRACKED	ABCD
	MODERATE	A 🖁 C D	MODERATE	📣 🖥 🌀 D	MODERATE	ABCD	OVERALL	
	SEVERE	ABGD	SEVERE	ABCD	SEVERE	ABCD	LENGTH	
COMMENTS			1. 2. 2. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1.		Section 1		1911	
90" CAP TO	MUD LINE. 46	" WATER DE	EPTH.	<u> </u>				
				FOUNDA	ATION 4:			
	LOSS OF SEC	CTION/PILE	RUNNING	RUST/PILE	IMPACT DA	MAGE/PILE	ENCAPSULA	TION/PILE
	NONE	ABCD	NONE	ABCD	NONE	\land 🖥 🖗 D	MISSING	ABCD
	MINOR	ABCD	MINOR	ABCD	MINOR	ABCD	CRACKED	ABCD
	MODERATE	ABCD	MODERATE	A B C D	MODERATE	ABCD	OVERALL	시 가는 것 같아. 신
	SEVERE	\land 🗟 🧯 D	SEVERE	ABCD	SEVERE	ABCD	LENGTH	
COMMENTS		-6-1-16		1.1-12				
71" CAP TO	MUD LINE. 26	" WATER DE	EPTH.					
4 B PILE HA	S KNIFE EDGI	NG BEGINN	ING 21" FROM	I CAP. 11" LO	ONG AND UP	TO 5/8" THE	N 66" FROM C	AP TO 66.5". 70" ML
			ENCA	PSULATIO	N DIMENSI	ONS		
	FOUNDATION	1-DISTANCES **FROM	FOUNDATION	2-DISTANCES **FROM	FOUNDATION	3-DISTANCES **FROM	FOUNDATION	4-DISTANCES **FROM
		MUDLINE		MUDLINE		MUDLINE	A 1	MUDLINE
PILE	A D		A		A		A	
	В		В		B		В	
			U	a sector	ן ען		U	

Attachment I.L.1 Page 5 of 70

### STEEL H-PILE INSPECTION PAMUNKEY RIVER

#### DATE INSPECTED 9-14-2014

TOWER NO.	<b>FOUNDATION</b>		<u>RECORI</u>	DED MEASU	MEASUREMENTS			
224/228	<u>&amp; PILE NO.</u>	<u>NDT</u>	MEASURE!	MENT	<b><u>ENT</u> <u>DISTANCE FROM CAP</u></b>			
		N1	N2	N3	N1	N2	N3	
	1A							
	1B	0.575	0.615	0.585	43"	43"	43"	
	1C							
	1D							
	2A							
	2B							
	2C	0.565	0.610	0.630	52"	52"	52"	
	2D							
	3A	0.560	0.610	0.645	50"	50"	50"	
	3B							
	3C							
	3D							
	4A							
	4B	0.595	0.610	0.615	50"	50"	50"	
	4C							
	4D							

#### <u>COMMENTS:</u>

1 A PILE KNIFE EDGING, BEGINNING 26" FROM CAP 5" LONG AND UP TO 1/8"DEEP INTO THE FLANGE.

1 B PILE KNIFE EDGING. BEGINNING 19" FROM CAP 10" LONG x 7/8" DEEP THEN KNIFE EDGING 69" FROM CAP 1"L x 1/16"D 1 C PILE KNIFE EDGING. BEGINNING 18" FROM CAP 10" LONG x 1/4" DEEP.

2 A PILE KNIFE EDGING. BEGINNING 19" FROM CAP 1" LONG x 1/1/6" DEEP

2 B PILE KNIFE EDGING. BEGINNING 20" FROM CAP 11" LONG x 3/16" DEEP THEN KNIFE EDGING 72" FROM CAP 4"L x 1/8"D 2 C PILE KNIFE EDGING. BEGINNING 20" FROM CAP 11" LONG x 1/4" DEEP

3 A PILE KNIFE EDGING. BEGINNING 23" FROM CAP 4" LONG x 1/16" DEEP. THEN KNIFE EDGING 69" FROM CAP 4"L x 1/8"D

3 B PILE FLANGE STILL 3/16" WIDE AT WORST

3 C PILE KNIFE EDGING. BEGINNING 20" FROM CAP 9" LONG x 1/4" DEEP

4 A PILE KNIFE EDGING. BEGINNING 22" FROM CAP 7" LONG x 1/4" DEEP 4 B PILE KNIFE EDGING. BEGINNING 20" FROM CAP 9" LONG x 3/8" DEEP 4 C PILE KNIFE EDGING. BEGINNING 24" FROM CAP 5" LONG x 3/8" DEEP

NDT MEASUREMENTS WERE TAKEN NEAR THE WATERLINE.



## <u>CONCRETE FOUNDATION INSPECTION</u> <u>CHECKLIST</u> <u>STR. # 224/228 LEG # 1</u>

- 1.) GENERAL CONDITION OF THE CONCRETE FOUNDATION:
  - ✓ GOOD
  - SATISFACTORY
  - POOR

FND. TO BE SOUNDED TO DETERMINE VOIDS, LAMINATIONS, SOUNDNESS, ETC.

- 2.) SURFACE DEFECTS:
  - SPALLING / SCALING
  - POPOUTS
  - $\checkmark$  **CRACKS**  $\leq 1/16$ " WIDE
  - **CRACKS**  $\geq$  1/16" TO  $\frac{1}{4}$ " WIDE
  - SHRINKAGE CRACKS
  - EFFLORESCENCE
  - **EVIDENCE OF ALKALI AGGREGRATE REACTION**
  - **EXPOSED REINFORCEMENT / CORROSION**
  - **VISIBLE DAMAGE**

3.) COMMENTS:

RUNNING RUST

MINOR HAIRLINE MAP CRACKING.

**INSPECTED BY: MATT TRAHAN** 

DATE:	9_14_2014
- DALES	3-14-2014

## <u>CONCRETE FOUNDATION INSPECTION</u> <u>CHECKLIST</u> <u>STR. # 224/228 LEG # 2</u>

- 1.) GENERAL CONDITION OF THE CONCRETE FOUNDATION:
  - GOOD
  - ✓ SATISFACTORY
  - **POOR**

FND. TO BE SOUNDED TO DETERMINE VOIDS, LAMINATIONS, SOUNDNESS, ETC.

- 2.) SURFACE DEFECTS:
  - SPALLING / SCALING
  - POPOUTS
  - ✓ CRACKS  $\leq 1/16$ " WIDE
  - **CRACKS**  $\geq 1/16$ " TO  $\frac{1}{4}$ " WIDE
  - SHRINKAGE CRACKS
  - EFFLORESCENCE
  - **EVIDENCE OF ALKALI AGGREGRATE REACTION**
  - **EXPOSED REINFORCEMENT / CORROSION**
  - **VISIBLE DAMAGE**
- 3.) COMMENTS:

RUNNING RUST

HONEYCOMBING ON BOTTOM SOUTH AND EAST EDGES UP TO 16" TOWARDS SOUTH BOTTOM CENTER NEAR C PILE. SOUTH WEST CORNER SPALL 5"H x 8"W x 3"D SOUTH EAST EDGE 11" UP FROM BOTTOM. SPALL 4"H x 4"W x 1/2"D

INSPECTED BY: MATT TRAHAN

## <u>CONCRETE FOUNDATION INSPECTION</u> <u>CHECKLIST</u> <u>STR. # 224/228 LEG # 3</u>

- 1.) GENERAL CONDITION OF THE CONCRETE FOUNDATION:
  - GOOD
  - SATISFACTORY
  - POOR

FND. TO BE SOUNDED TO DETERMINE VOIDS, LAMINATIONS, SOUNDNESS, ETC.

- 2.) SURFACE DEFECTS:
  - SPALLING / SCALING
  - POPOUTS
  - $\checkmark$  CRACKS  $\leq 1/16$ " WIDE
  - **CRACKS**  $\geq 1/16$ " TO  $\frac{1}{4}$ " WIDE
  - SHRINKAGE CRACKS
  - EFFLORESCENCE
  - **EVIDENCE OF ALKALI AGGREGRATE REACTION**
  - **EXPOSED REINFORCEMENT / CORROSION**
  - VISIBLE DAMAGE

3.) COMMENTS:

RL	JNI	VING	RUS	T -

MINOR HAIRLINE MAP CRACKING

INSPECTED BY: MATT TRAHAN

DATE:	9-14-2014
DATE:	0-14-2014

## <u>CONCRETE FOUNDATION INSPECTION</u> <u>CHECKLIST</u> <u>STR. # 224/228 LEG # 4</u>

- 1.) GENERAL CONDITION OF THE CONCRETE FOUNDATION:
  - GOOD

| ↓ .'

- SATISFACTORY
- **POOR**

FND. TO BE SOUNDED TO DETERMINE VOIDS, LAMINATIONS, SOUNDNESS, ETC.

- 2.) SURFACE DEFECTS:
  - SPALLING / SCALING
  - **POPOUTS**
  - $\checkmark$  **CRACKS** ≤ 1/16" WIDE
  - **CRACKS**  $\geq 1/16$ " TO  $\frac{1}{4}$ " WIDE
  - SHRINKAGE CRACKS
  - EFFLORESCENCE
  - **EVIDENCE OF ALKALI AGGREGRATE REACTION**
  - **EXPOSED REINFORCEMENT / CORROSION**
  - VISIBLE DAMAGE

3.) COMMENTS:

RUNNING RUST

2 HAIRLINE CRACKS EAST FACE

INSPECTED BY: MATT TRAHAN

DATE: 9-14-2014

Attachment I.L.1 Page 10 of 70

## STRUCTURE INVESTIGATION PHOTOGRAPHIC LOG T/L No. 224 Structure No. 228





Attachment I.L.1 Page 11 of 70

## STRUCTURE INVESTIGATION PHOTOGRAPHIC LOG T/L No. 224 Structure No. 228



**FOUNDATION 1** 







**FOUNDATION 1** 







**FOUNDATION 2** 







**FOUNDATION 2** 







**FOUNDATION 3** 







**FOUNDATION 3** 





Attachment I.L.1 Page 17 of 70

STRUCTURE INVESTIGATION PHOTOGRAPHIC LOG T/L No. 224 Structure No. 228



**FOUNDATION 4** 





LEVEL I FOUNDATION INSPECTION FORM Attachment I.L.1 Page 18 of 70

TOWER LINE/STRUCTURE #: 224/	229	DATE OF INSPECTION:	9-18-2014
SITE CONDITIONS MASSH C WATER DEPTH <u>34"</u>	PPEN WATER FRE	SH/SAXT WATER TIDAL	9:50 (Record Time)
FOUNDATION COMPOSITION			
WOOD STEEL	CONCRETE	STEEL PILE SUPPO CONCRETE CA	DRTED AP
FOUNDATION INVENTORY			
NUMBER OF FOUNDATIONS 4			
NUMBER OF SUPPORT PILES PER FOUND	DATION 3		
PILE ENCAPSULATIONS YE	s No	ТҮРЕ	
		,	
OVERALL CONDITION OF FOUNDATION	GOOD FAIF	POOR	
2 B KNIFE EDGING 11" LONG AND 1 3/4" DEE	P, BEGINNING 19" FROI	I CAP. 30" ABOVE THE MUD LIN	E.
4 B KNIFE EDGING 11" LONG AND 5/8" DEEF	P, BEGINNING 21" FROM	CAP. STARTS AT MUDLINE AND	GOES UP 11"

OTHER PILES ONLY SHOW MODERATE CORROSION.

## LEVEL I FOUNDATION INSPECTION FORM

## FOUNDATION DESCRIPTION: 3 STEEL H PILES UNDER A CONCRETE CAP

OUNDAT	TION EVALU	JATIONS			54-1-13-12			
				FOUND	ATION 1:			
	LOSS OF SEC	CTION/PILE	RUNNING	RUST/PILE	IMPACT DA	MAGE/PILE	ENCAPSULA	TION/PILE
	NONE	ABCD	NONE	ABCD	NONE	ABGD	MISSING	ABCD
	MINOR	ABCD	MINOR	ABCD	MINOR	ABCD	CRACKED	ABCD
	MODERATE	ABCD	MODERATE	科 🗟 🖲 D	MODERATE	ABCD	OVERALL	
	SEVERE	ABCD	SEVERE	ABCD	SEVERE	ABCD	LENGTH	÷
OMMENTS	1 7 2 13							N 25
8" CAP TO	MUD LINE. 32	" WATER DE	PTH.	1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1	and set of	in the state	-1	
				FOUND	ATION 2:			
	LOSS OF SEC	CTION/PILE	RUNNING	RUST/PILE	IMPACT DA	MAGE/PILE	ENCAPSULA	TION/PILE
	NONE	ABCD	NONE	ABCD	NONE	ABCD	MISSING	ABCD
	MINOR	ABCD	MINOR	ABCD	MINOR	ABCD	CRACKED	ABCD
	MODERATE	AB@D	MODERATE	ABCD	MODERATE	ABCD	OVERALL	
	SEVERE	ABCD	SEVERE	ABCD	SEVERE	ABCD	LENGTH	
OMMENTS				10 - 2				-
0" CAP TO	MUD LINE. 34	" WATER DE	EPTH.					
B PILE KN	IFE EDGING, E	BEGINNING	19" FROM CA	P. 11" LONG	AND UP TO	1 3/4" DEEP I	NTO THE FLA	NGE.
				FOUND	ATION 3:			
	LOSS OF SEC	CTION/PILE	RUNNING	RUST/PILE	IMPACT DA	MAGE/PILE	ENCAPSULA	TION/PILE
	NONE	ABCD	NONE	ABCD	NONE	ADOD	MISSING	ABCD
	MINOR	ABCD	MINOR	ABCD	MINOR	ABCD	CRACKED	ABCD
	MODERATE	\land 🖁 🌀 D	MODERATE	\land 🖥 🌀 D	MODERATE	ABCD	OVERALL	200
	SEVERE	ABCD	SEVERE	ABCD	SEVERE	ABCD	LENGTH	- 30
OMMENTS								
1" CAP TO	MUD LINE. 16	" WATER DE	EPTH.					
				FOUND				
			DUMMINIC	FOUND/	ATION 4:		ENICA DOLULA	
	LUSS OF SEC		RUNNING	RUSI/PILE	INPACT DA	MAGE/PILE	ENCAPSULA	A D C D
	NONE	ABCD	NONE	ABCD	NONE	ABCD	MISSING	ABCD
	MINOR	ABCD	MINOR	ABCD	MINOR	ABCD	CRACKED	ABCD
	MODERATE	ABCD	WIDDERATE	ABCD	MODERATE	ABCD	OVERALL	
	SEVERE	AUCD	SEVERE	ABCD	SEVERE	ABCD	LENGTH	
			отц					
			ING 21" EDOM	1 CAD 11"1		TO 5/8" DEE		
D FILE HA	S KINIFE EDGI	ING BEGININ				ONS	F INTO THE I	LANGE.
	FOUNDATION	1 DISTANCES	ENCA	2 DISTANCES			FOUNDATION	A DISTANCES
	FOUNDATION	**FROM	FOUNDATION	2-DISTANCES **FROM	FOUNDATION	**FROM	FOUNDATION	**FROM
	FROM CAP	MUDLINE	FROM CAP	MUDLINE	FROM CAP	MUDLINE	FROM CAP	MUDLINE
PILE	А		А		А		A	
	В		В		В		В	1
				the second s	1			
	С	- 6 - 2	С	Sec. 8	С		C	

DATE INSPECTED

#### **STEEL H-PILE INSPECTION** PAMUNKEY RIVER

#### 9-18-2014 **RECORDED MEASUREMENTS** TOWER NO. **FOUNDATION DISTANCE FROM CAP** & PILE NO. **NDT MEASUREMENT** 224/229 N1 N3 N2 N3 N1 N2 1A 28" 28" 28" 1B 0.490 SCALE 0.555 1C1D 2A 22" 22" 22" 2B 0.570 0.545 0.255 2C2D 3A 0.345 0.605 0.495 22" 22" 22" 3B 3C 3D 4A 0.490 SCALE 24" 24" 24" 4B 0.165 4C 4D COMMENTS:

2 B PILE KNIFE EDGING, BEGINNING 19" FROM CAP. 11" LONG AND UP TO 1 3/4" DEEP INTO THE FLANGE.

2 A PILE AND C PILE HAVE ONLY MODERATE SCALE.

1 A, B AND C PILES SHOW ONLY MODERATE SCALE.

3 A, B AND C PILES SHOW ONLY MODERATE SCALE.

4 A PILE AND C PILE SHOW ONLY MODERATE SCALE.

4 B PILE HAS KNIFE EDGING BEGINNING 21" FROM CAP. 11" LONG AND UP TO 5/8" DEEP INTO THE FLANGE.



41

## <u>CONCRETE FOUNDATION INSPECTION</u> <u>CHECKLIST</u> <u>STR. # 224/229 LEG # 1</u>

- 1.) GENERAL CONDITION OF THE CONCRETE FOUNDATION:
  - GOOD

- **✓** SATISFACTORY
- POOR

FND. TO BE SOUNDED TO DETERMINE VOIDS, LAMINATIONS, SOUNDNESS, ETC.

- 2.) SURFACE DEFECTS:
  - SPALLING / SCALING
  - **POPOUTS**
  - ✓ CRACKS  $\leq 1/16$ " WIDE
  - **CRACKS**  $\geq 1/16$ " TO  $\frac{1}{4}$ " WIDE
  - SHRINKAGE CRACKS
  - **EFFLORESCENCE**
  - **EVIDENCE OF ALKALI AGGREGRATE REACTION**
  - **EXPOSED REINFORCEMENT / CORROSION**
  - ✓ VISIBLE DAMAGE

**3.)** COMMENTS:

RUNNING RUST. SPALL ON BOTTOM FROM C PILE TO A PILE 12"L x 5"W x 3/4"D WITH EXPOSED REBAR 12"LONG.

INSPECTED BY: MATT TRAHAN DATE: 9-18-2014

42

## <u>CONCRETE FOUNDATION INSPECTION</u> <u>CHECKLIST</u> <u>STR. # 224/229 LEG # 2</u>

- 1.) GENERAL CONDITION OF THE CONCRETE FOUNDATION:
  - GOOD
  - SATISFACTORY
  - POOR

FND. TO BE SOUNDED TO DETERMINE VOIDS, LAMINATIONS, SOUNDNESS, ETC.

- 2.) SURFACE DEFECTS:
  - SPALLING / SCALING
  - **POPOUTS**
  - $|\checkmark|$  CRACKS  $\leq 1/16$ " WIDE
  - **CRACKS**  $\geq 1/16$ " TO  $\frac{1}{4}$ " WIDE
  - SHRINKAGE CRACKS
  - EFFLORESCENCE
  - **EVIDENCE OF ALKALI AGGREGRATE REACTION**
  - **EXPOSED REINFORCEMENT / CORROSION**
  - VISIBLE DAMAGE

**3.)** COMMENTS:

RUNNING RUST.				· · · · · · · · · · · · · · · · · · ·
		· · · · · · · · · · · · · · · · · · ·		
<b>INSPECTED BY: MATT</b>	TRAHAN	DATE:	9-18-	2014

## <u>CONCRETE FOUNDATION INSPECTION</u> <u>CHECKLIST</u> <u>STR. # 224/229 LEG # 3</u>

	1.)	GENERAL	<b>CONDITION C</b>	)F THE	CONCRETE	FOUNDATION
--	-----	---------	--------------------	--------	----------	------------

- GOOD
- SATISFACTORY
- POOR

FND. TO BE SOUNDED TO DETERMINE VOIDS, LAMINATIONS, SOUNDNESS, ETC.

- 2.) SURFACE DEFECTS:
  - SPALLING / SCALING
  - POPOUTS
  - $\checkmark$  CRACKS ≤ 1/16" WIDE
  - **CRACKS**  $\geq 1/16$ " TO  $\frac{1}{4}$ " WIDE
  - SHRINKAGE CRACKS
  - EFFLORESCENCE
  - **EVIDENCE OF ALKALI AGGREGRATE REACTION**
  - **EXPOSED REINFORCEMENT / CORROSION**
  - VISIBLE DAMAGE

3.) COMMENTS:

RUNNING RUST	
--------------	--

INSPECTED BY: MATT TRAHAN DATE: 9-18-2014

44

## <u>CONCRETE FOUNDATION INSPECTION</u> <u>CHECKLIST</u> <u>STR. # 224/229 LEG # 4</u>

- 1.) GENERAL CONDITION OF THE CONCRETE FOUNDATION:
  - ✓ GOOD
  - **SATISFACTORY**
  - **POOR**

FND. TO BE SOUNDED TO DETERMINE VOIDS, LAMINATIONS, SOUNDNESS, ETC.

- 2.) SURFACE DEFECTS:
  - SPALLING / SCALING
  - **POPOUTS**
  - **CRACKS**  $\leq 1/16$ " WIDE
  - **CRACKS**  $\geq 1/16$ " TO  $\frac{1}{4}$ " WIDE
  - SHRINKAGE CRACKS
  - EFFLORESCENCE
  - **EVIDENCE OF ALKALI AGGREGRATE REACTION**
  - **EXPOSED REINFORCEMENT / CORROSION**
  - VISIBLE DAMAGE

3.) COMMENTS:

RUNNING RUST.	<u> </u>		
INSPECTED BY: MATT	TRAHAN	DATE:	9-18-2014

45







**FOUNDATION 1** 







**FOUNDATION 1** 







**FOUNDATION 2** 







**FOUNDATION 2** 







**FOUNDATION 3** 







**FOUNDATION 3** 







**FOUNDATION 4** 







**FOUNDATION 4** 




#### LEVEL I FOUNDATION INSPECTION FORM

Attachment I.L.1 Page 34 of 70

TOWER LINE/STRUCTURE #:	224/230	DATE OF INSPECTION:_	9-26-2014
SITE CONDITIONS MASSH WATER DEPTH 87"	OPEN WATER FRESH/	SAKT WATER TIDAL <u>1</u>	2:40 (Record Time)
FOUNDATION COMPOSITION			
WOOD S	TEEL CONCRETE	STEEL PILE SUPPOR CONCRETE CAR	RTED
FOUNDATION INVENTORY			
NUMBER OF FOUNDATIONS	4		
NUMBER OF SUPPORT PILES PER	FOUNDATION 3		
PILE ENCAPSULATIONS	YES 🙀 TYI	2Е	
TOWER PHOTOGRAPH	(INCLUDE IN FINAL REPORT)		
OVERALL CONDITION OF FOUND	DATION GOOD FAIR	PXQR	

SEVERE CORROSION ON PILE 2 A. KNIFE EDGING 4" LONG AND 1" DEEP, 54" BELOW THE CAP. 19" ABOVE THE MUDLINE. OTHER PILES ONLY SHOW MODERATE CORROSION.

#### LEVEL I FOUNDATION INSPECTION FORM

#### FOUNDATION DESCRIPTION: 3 STEEL H PILES UNDER A CONCRETE CAP

OUNDAT	TION EVALU	ATIONS	1.7.1		1.1.1			
				FOUNDA	ATION 1:			
	LOSS OF SEC	CTION/PILE	RUNNING	RUST/PILE	IMPACT DA	MAGE/PILE	ENCAPSULA	TION/PILE
	NONE	ABCD	NONE	ABCD	NONE	ABGD	MISSING	ABCD
	MINOR	ABCD	MINOR	ABCD	MINOR	ABCD	CRACKED	ABCD
	MODERATE	ABCD	MODERATE		MODERATE	ABCD	OVERALL	C.Y. Mark
	SEVERE	ABCD	SEVERE	ABCD	SEVERE	ABCD	LENGTH	Alter one
COMMENTS	ing which							No. M. C.
" CAP TO N	UD LINE. 3" V	VATER DEP	TH.	ant plan		1. S. S. S. S.		
			BURNING	FOUNDA	ATION 2:		ENGA DOLULA	
	LOSS OF SEC	TION/PILE	RUNNING	RUST/PILE	IMPACT DA	MAGE/PILE	ENCAPSULA	TION/PILE
	NONE	ABCD	NONE	ABCD	NONE	ABCD	MISSING	ABCD
	MINOR	ABCD	MINOR	ABCD	MINOR	ABCD	CRACKED	ABCD
	MODERATE	ABCD	MODERATE	ABED	MODERATE	ABCD	OVERALL	a strengt
	SEVERE	ARCD	SEVERE	ARCD	SEVERE	ARCD	LENGTH	
			ртн					
	IFE EDGING	BEGINNING	54" FROM CAI	P. 4" LONG	AND UP TO 1	DEEP INTO	THE FLANGE	
				FOUNDA	ATION 3:			
	LOSS OF SEC	TION/PILE	RUNNING	RUST/PILE	IMPACT DA	MAGE/PILE	ENCAPSULA	TION/PILE
	NONE	ABCD	NONE	ABCD	NONE	ADOD	MISSING	ABCD
	MINOR	ABCD	MINOR	ABCD	MINOR	ABCD	CRACKED	ABCD
	MODERATE	ABGD	MODERATE	ABGD	MODERATE	ABCD	OVERALL	
	SEVERE	ABCD	SEVERE	ABCD	SEVERE	ABCD	LENGTH	31 -
COMMENTS								
91" CAP TO	MUD LINE. 87	WATER DE	EPTH.			N N S K		
				FOUND	ATION 4:			
	LOSS OF SEC	CTION/PILE	RUNNING	RUST/PILE	IMPACT DA	MAGE/PILE	ENCAPSULA	TION/PILE
	NONE	ABCD	NONE	ABCD	NONE	\land 🖥 🖗 D	MISSING	ABCD
	MINOR	ABCD	MINOR	ABCD	MINOR	ABCD	CRACKED	ABCD
	MODERATE	\land 🗟 🖗 D	MODERATE	ABCD	MODERATE	ABCD	OVERALL	
	SEVERE	ABCD	SEVERE	ABCD	SEVERE	ABCD	LENGTH	<u></u>
COMMENTS				<u></u>				1.2 - 64-
CAP TO N	NUD LINE. 3" V	VATER DEP	IH.				12 12 12	
			ENCA			ONS		
	FOUNDATION	1-DISTANCES	FOUNDATION	2-DISTANCES	FOUNDATION	3-DISTANCES	FOUNDATION	A-DISTANCES
	FOONDATION	**FROM	FOUNDATION	**FROM	FOUNDATION	**FROM	FOONDATION	**FROM
	FROM CAP	MUDLINE	FROM CAP	MUDLINE	FROM CAP	MUDLINE	FROM CAP	MUDLINE
PILE	А		А		А		A	
	В		В		В		В	
	С		С	A	С	· · · ·	C	1
	D I		D				D	

Attachment I.L.1 Page 36 of 70

#### STEEL H-PILE INSPECTION PAMUNKEY RIVER

#### DATE INSPECTED 9-26-2014

TOWER NO.	<b>FOUNDATION</b>		<b>RECORI</b>	DED MEASU	JREMENTS		
224/230	<u>&amp; PILE NO.</u>	<u>NDT</u>	MEASURE	MENT	DISTA	NCE FROM	I CAP
		N1	N2	N3	N1	N2	N3
	1A	0.590	0.595	0.585	5"	5"	5"
	1B						
	1C	<u> </u>					
	1D -						
	2A		· · ·				
	2B						
	2C	0.585	0.610	0.620	4"	4"	4"
•	2D						
	3A						
	3B						
	3C	0.625	0.610	0.595	5"	5"	5"
	3D						
	4A	·					
	4B	0.585	0.590	0.575	3"	3"	3"
	4C	•					
	4D		*				
COMMENTS:							
2 A PILE KNIFE EDGING, BE	GINNING 54" FROM	CAP. 4" LONG	AND UP TO 1" I	DEEP INTO THE	FLANGE.		2
2 A PILE AND C PILE SHOW	ONLY MODERATE S	CALE.					
1 A, B AND C PILES SHOW C	ONLY MODERATE SC	ALE.				· · · ·	
3 A, B AND C PILES SHOW (	ONLY MODERATE SC	ALE.					
4 A, B AND C PILES SHOW (	ONLY MODERATE SC	ALE.					





#### <u>CONCRETE FOUNDATION INSPECTION</u> <u>CHECKLIST</u> <u>STR. # 224/230 LEG # 1</u>

- 1.) GENERAL CONDITION OF THE CONCRETE FOUNDATION:
  - GOOD
  - **SATISFACTORY**
  - POOR

FND. TO BE SOUNDED TO DETERMINE VOIDS, LAMINATIONS, SOUNDNESS, ETC.

- 2.) SURFACE DEFECTS:
  - SPALLING / SCALING
  - POPOUTS
  - ✓ CRACKS  $\leq 1/16$ " WIDE
  - **CRACKS**  $\geq$  1/16" TO  $\frac{1}{4}$ " WIDE
  - SHRINKAGE CRACKS
  - **EFFLORESCENCE**
  - **EVIDENCE OF ALKALI AGGREGRATE REACTION**
  - **EXPOSED REINFORCEMENT / CORROSION**
  - **VISIBLE DAMAGE**
- **3.)** COMMENTS:

RUNNING RUST.

SOUTH EAST CORNER SPALL 2"T x 4"W x 1/2"D SOUTH FACE 1/16" HORIZONTAL CRACK 5" BELOW TOP OF CAP. HAIRLINE MAP CRACKING WITH EFFLORESCENCE

INSPECTED BY: CURTIS WADE

DATE: 9-26-2014

#### <u>CONCRETE FOUNDATION INSPECTION</u> <u>CHECKLIST</u> <u>STR. # 224/230 LEG # 2</u>

- 1.) GENERAL CONDITION OF THE CONCRETE FOUNDATION:
  - GOOD
  - **SATISFACTORY**
  - POOR

FND. TO BE SOUNDED TO DETERMINE VOIDS, LAMINATIONS, SOUNDNESS, ETC.

- 2.) SURFACE DEFECTS:
  - SPALLING / SCALING
  - **POPOUTS**
  - $|\checkmark|$  CRACKS  $\leq 1/16$ " WIDE
  - $\checkmark$  CRACKS ≥ 1/16" TO ¼" WIDE
  - SHRINKAGE CRACKS
  - **EFFLORESCENCE** 
    - **EVIDENCE OF ALKALI AGGREGRATE REACTION**
    - **EXPOSED REINFORCEMENT / CORROSION**
  - VISIBLE DAMAGE
- 3.) COMMENTS:

RUNNING RUST.

NORTH EAST CORNER SPALL 7"W x 5"H x 1.5"D

1/16" TO 1/8" CRACKS AND 1/16" MAP CRACKING WITH EFFLORESCENCE

INSPECTED BY: CURTIS WADE

**DATE:** 9-26-2014

#### <u>CONCRETE FOUNDATION INSPECTION</u> <u>CHECKLIST</u> <u>STR. # 224/230 LEG # 3</u>

- 1.) GENERAL CONDITION OF THE CONCRETE FOUNDATION:
  - GOOD

Ŀ

- SATISFACTORY
- POOR

FND. TO BE SOUNDED TO DETERMINE VOIDS, LAMINATIONS, SOUNDNESS, ETC.

- 2.) SURFACE DEFECTS:
  - SPALLING / SCALING
  - POPOUTS
  - $\checkmark$  CRACKS ≤ 1/16" WIDE
  - $\checkmark$  CRACKS ≥ 1/16" TO ¼" WIDE
  - SHRINKAGE CRACKS
  - **EFFLORESCENCE**
  - **EVIDENCE OF ALKALI AGGREGRATE REACTION**
  - EXPOSED REINFORCEMENT / CORROSION
  - VISIBLE DAMAGE

3.) COMMENTS:

RUNNING RUST

1/16" TO 1/8" CRACKS AND 1/16" MAP CRACKING WITH EFFLORESCENCE

INSPECTED BY: CURTIS WADE

DATE.	0.26.2014
DALE:	9-20-2014

#### <u>CONCRETE FOUNDATION INSPECTION</u> <u>CHECKLIST</u> <u>STR. # 224/230 LEG # 4</u>

- 1.) GENERAL CONDITION OF THE CONCRETE FOUNDATION:
  - GOOD
  - ✓ SATISFACTORY
  - POOR

FND. TO BE SOUNDED TO DETERMINE VOIDS, LAMINATIONS, SOUNDNESS, ETC.

- 2.) SURFACE DEFECTS:
  - SPALLING / SCALING
  - **POPOUTS**
  - $\checkmark$  CRACKS  $\leq 1/16$ " WIDE
  - **CRACKS**  $\geq 1/16$ " TO  $\frac{1}{4}$ " WIDE
  - SHRINKAGE CRACKS
  - **EFFLORESCENCE**
  - **EVIDENCE OF ALKALI AGGREGRATE REACTION**
  - EXPOSED REINFORCEMENT / CORROSION
  - **VISIBLE DAMAGE**

3.) COMMENTS:

RUNNING RUST.

1/16" CRACKS AND HAIRLINE MAP CRACKING WITH EFFLORESCENCE SOUTH FACE SPALL 2"W x 1"H x 1/2"D

INSPECTED BY: CURTIS WADE

DATE: 9-26-2014

Attachment I.L.1 Page 41 of 70

STRUCTURE INVESTIGATION PHOTOGRAPHIC LOG T/L No. 224 Structure No. 230







**FOUNDATION 1** 







**FOUNDATION 2** 





Attachment I.L.1 Page 44 of 70

STRUCTURE INVESTIGATION PHOTOGRAPHIC LOG T/L No. 224 Structure No. 230



**FOUNDATION 3** 





Attachment I.L.1 Page 45 of 70

STRUCTURE INVESTIGATION PHOTOGRAPHIC LOG T/L No. 224 Structure No. 230



**FOUNDATION 4** 





#### LEVEL I FOUNDATION INSPECTION FORM

Attachment I.L.1 Page 46 of 70

SITE CONDITIONS MARSH WATER DEPTH 29"	OPEN WATER	FRESH/SAXT	WATER TIDAL 1	2:30 (Record Time)
FOUNDATION COMPOSITION	N			
WOOD S	STEEL C	ONCRETE	STEEL PILE SUPPOR CONCRETE CAP	TED
FOUNDATION INVENTORY				
NUMBER OF FOUNDATIONS	4			
NUMBER OF SUPPORT PILES PEF	RFOUNDATION	3		
PILE ENCAPSULATIONS	YES NQ	TYPE	and the second	
		i KEI OKT)		
				AN A

OTHER PILES ONLY SHOW MODERATE CORROSION.

#### LEVEL I FOUNDATION INSPECTION FORM

#### FOUNDATION DESCRIPTION: 3 STEEL H PILES UNDER A CONCRETE CAP

FOUNDATION EVALUATIONS

				FOUNDA	ATION 1:			
	LOSS OF SEC	TION/PILE	<b>RUNNING I</b>	RUST/PILE	IMPACT DA	MAGE/PILE	ENCAPSULA	TION/PILE
	NONE	ABCD	NONE	ABCD	NONE	\land 🖥 🌀 D	MISSING	ABCD
	MINOR	ABCD	MINOR	ABCD	MINOR	ABCD	CRACKED	ABCD
	MODERATE	A B 🖲 D	MODERATE	科 🗟 🤅 D	MODERATE	ABCD	OVERALL	
	SEVERE	ABCD	SEVERE	ABCD	SEVERE	ABCD	LENGTH	
COMMENTS								
32" CAP TO	MUD LINE. 24	" WATER DE	PTH.	Par V			the states	a Section and
1 B PILE KN	IFE EDGING, E	BEGINNING	33" FROM CAP	P. 3" LONG	AND UP TO 1/	4" DEEP INT	O THE FLANG	GE. 1" BELOW N
				FOUNDA	ATION 2:			
	LOSS OF SEC	CTION/PILE	<b>RUNNING</b>	RUST/PILE	IMPACT DA	MAGE/PILE	ENCAPSULA	TION/PILE
	NONE	ABCD	NONE	ABCD	NONE	A B @ D	MISSING	ABCD
	MINOR	ABCD	MINOR	ABCD	MINOR	ABCD	CRACKED	ABCD
	MODERATE	ABCD	MODERATE	ABCD	MODERATE	ABCD	OVERALL	
	SEVERE	ABCD	SEVERE	ABCD	SEVERE	ABCD	LENGTH	
COMMENTS								
28" CAP TO	MUD LINE. 17	" WATER DE	PTH.		he start it i			
	and the second							
				FOUND	ATION 3:			
	LOSS OF SEC	CTION/PILE	RUNNING	RUST/PILE	IMPACT DA	MAGE/PILE	ENCAPSULA	TION/PILE
	NONE	ABCD	NONE	ABCD	NONE	ABCD	MISSING	ABCD
	MINOR	ABCD	MINOR	ABCD	MINOR	ABCD	CRACKED	ABCD
	MODERATE	\land 🖥 🌀 D	MODERATE	\land 🖥 🌀 D	MODERATE	ABCD	OVERALL	
	SEVERE	ABCD	SEVERE	ABCD	SEVERE	ABCD	LENGTH	
COMMENTS					and the second			
40" CAP TO	MUD LINE. 29	" WATER DE	EPTH.					
	-			FOUND				
			DUNNING		INADACT DA		ENCADELILA	
	LUSS OF SEL		NONE	ARCD	NONE		ENCAPSULA	ARCD
	MINOR	ABCD	MINOP	ABCD	MINOP	ABCD	CRACKED	ABCD
	MODEPATE		MODEPATE		MODERATE	ABCD		ADED
	CE\/EDF	ARCD	CEVEDE	ARCD	CE\/EDE	ABCD	UVERALL	
COMMENTS	JEVERE	ADCD	JEVERE	ADCD	JEVENE	ADCD	LENGTH	
	MUDLINE 4"		ртн					
	WOD LINE. 4	WW TER DEI	111.					
			FNCA	PSUI ATIO		ONS		
	FOUNDATION	1-DISTANCES	FOUNDATION	2-DISTANCES	FOUNDATION	3-DISTANCES	FOUNDATION	4-DISTANCES
	FROM CAR	**FROM	FROM CAR	**FROM	EDONA CAR	**FROM	FROM CAR	**FROM
	FROM CAP	MUDLINE	FROM CAP	MUDLINE	FROM CAP	MUDLINE	FROIVI CAP	MUDLINE
PILE	А		A		A		А	
	В		В		В		В	
	С		С		C		С	
			D		ID I	1.	D	

Attachment I.L.1 Page 48 of 70

DATE INSPECTED

#### **STEEL H-PILE INSPECTION**

PAMUNKEY RIVER

#### 9-18-2014 TOWER NO. **FOUNDATION RECORDED MEASUREMENTS** & PILE NO. **NDT MEASUREMENT DISTANCE FROM CAP** 224/231 **N**1 N2 N3 N1 N2 N3 1A 33" 33" 1B0.595 0.610 0.470 33" 1C1D 2A 0.570 30" 30" 30" 2B0.585 0.580 2C2D 3A 33" 33" 0.565 0.570 0.575 33" 3**B** 3C 3D 14" 14" 14" 0.530 0.595 0.550 4A 4B 4C 4D COMMENTS:

SEVERE CORROSION ON PILE 1 B. KNIFE EDGING 3" LONG AND 1/4"" DEEP, 33" BELOW THE CAP. 1" BELOW THE MUD LINE

1 A PILE AND C PILE SHOW ONLY MODERATE SCALE.

2 A, B AND C PILES SHOW ONLY MODERATE SCALE.

3 A, B AND C PILES SHOW ONLY MODERATE SCALE.

4 A, B AND C PILES SHOW ONLY MODERATE SCALE.



#### <u>CONCRETE FOUNDATION INSPECTION</u> <u>CHECKLIST</u> <u>STR. # 224/231 LEG # 1</u>

- 1.) GENERAL CONDITION OF THE CONCRETE FOUNDATION:
  - GOOD
  - ✓ SATISFACTORY
  - POOR

FND. TO BE SOUNDED TO DETERMINE VOIDS, LAMINATIONS, SOUNDNESS, ETC.

- 2.) SURFACE DEFECTS:
  - SPALLING / SCALING
  - POPOUTS
  - ✓ CRACKS  $\leq 1/16$ " WIDE
  - ✓ CRACKS  $\geq 1/16$ " TO ¼" WIDE
  - SHRINKAGE CRACKS
  - **EFFLORESCENCE**
  - **EVIDENCE OF ALKALI AGGREGRATE REACTION**
  - **EXPOSED REINFORCEMENT / CORROSION**
  - VISIBLE DAMAGE
- 3.) COMMENTS:

RUNNING RUST.

NORTH FACE SPALL 3"H x 3"W x 1 1/2"D WITH 1/8" CRACK RADIATING UPWARDS

1/16" MAP CRACKING WITH EFFLORESCENCE

INSPECTED BY: MATT TRAHAN

**DATE:** 9-18-2014

#### <u>CONCRETE FOUNDATION INSPECTION</u> <u>CHECKLIST</u> <u>STR. # 224/231 LEG # 2</u>

- 1.) GENERAL CONDITION OF THE CONCRETE FOUNDATION:
  - GOOD

*\* .'

- SATISFACTORY
- **POOR**

FND. TO BE SOUNDED TO DETERMINE VOIDS, LAMINATIONS, SOUNDNESS, ETC.

- 2.) SURFACE DEFECTS:
  - SPALLING / SCALING
  - POPOUTS
  - **CRACKS**  $\leq 1/16$ " WIDE
  - $\checkmark$  CRACKS ≥ 1/16" TO ¼" WIDE
  - SHRINKAGE CRACKS
  - **EFFLORESCENCE** 
    - **EVIDENCE OF ALKALI AGGREGRATE REACTION**
  - **EXPOSED REINFORCEMENT / CORROSION**
  - VISIBLE DAMAGE
- 3.) COMMENTS:

RUNNING RUST.

SPALL WITH EXPOSED REBAR, BOTTOM OF CAP NEXT TO B PILE. 16"L x 6.5"W x 2"D 1/16" TO 1/8" CRACKS AND 1/16" MAP CRACKING WITH EFFLORESCENCE.

**INSPECTED BY: MATT TRAHAN** 

DATE: 9-18-2014

#### <u>CONCRETE FOUNDATION INSPECTION</u> <u>CHECKLIST</u> <u>STR. # 224/231 LEG # 3</u>

- 1.) GENERAL CONDITION OF THE CONCRETE FOUNDATION:
  - GOOD

- SATISFACTORY
- **POOR**

FND. TO BE SOUNDED TO DETERMINE VOIDS, LAMINATIONS, SOUNDNESS, ETC.

- 2.) SURFACE DEFECTS:
  - SPALLING / SCALING
  - **POPOUTS**
  - $|\checkmark|$  CRACKS  $\leq 1/16$ " WIDE
  - $\checkmark$  CRACKS  $\geq 1/16$ " TO  $\frac{1}{4}$ " WIDE
  - SHRINKAGE CRACKS
  - **EFFLORESCENCE**
  - **EVIDENCE OF ALKALI AGGREGRATE REACTION**
  - EXPOSED REINFORCEMENT / CORROSION
  - VISIBLE DAMAGE
- 3.) COMMENTS:

RUNNING RUST

1/4" CRACK, MIDDLE OF BASE SOUTH FACE, GOES INTO 1/8" HORIZONTAL CRACK 1/16" TO 1/8" CRACKS AND 1/16" MAP CRACKING WITH EFFLORESCENCE.

INSPECTED BY: MATT TRAHAN

**DATE:** 9-18-2014

72

#### <u>CONCRETE FOUNDATION INSPECTION</u> <u>CHECKLIST</u> <u>STR. # 224/231 LEG # 4</u>

- 1.) GENERAL CONDITION OF THE CONCRETE FOUNDATION:
  - GOOD

Ŀŗ

- **✓** SATISFACTORY
- POOR

FND. TO BE SOUNDED TO DETERMINE VOIDS, LAMINATIONS, SOUNDNESS, ETC.

- 2.) SURFACE DEFECTS:
  - SPALLING / SCALING
  - POPOUTS
  - **CRACKS**  $\leq 1/16$ " WIDE
  - $\checkmark$  CRACKS  $\geq 1/16$ " TO  $\frac{1}{4}$ " WIDE
  - SHRINKAGE CRACKS
  - **EFFLORESCENCE**
  - **EVIDENCE OF ALKALI AGGREGRATE REACTION**
  - **EXPOSED REINFORCEMENT / CORROSION**
  - VISIBLE DAMAGE
- 3.) COMMENTS:

RUNNING RUST.

1/16" TO 1/8" CRACKS AND HAIRLINE MAP CRACKING WITH EFFLORESCENCE

INSPECTED BY: MATT TRAHAN

DATE	9-18-2014	
	0-10-2014	

73





Attachment I.L.1 Page 54 of 70

STRUCTURE INVESTIGATION PHOTOGRAPHIC LOG T/L No. 224 Structure No. 231



**FOUNDATION 1** 







**FOUNDATION 2** 







**FOUNDATION 3** 







### **FOUNDATION 4**





#### LEVEL I FOUNDATION INSPECTION FORM

Attachment I.L.1 Page 58 of 70

TOWER LINE/STRUCTURE #:	224/232		DATE OF INS	PECTION:	9-18-2014
SITE CONDITIONS MARSH	I OPEN WATE	ER FRESH/SA	XT WATER	TIDAL 11:3	0
WATER DEPTH 35"					(Record Time)
	N				
		CONCRETE	STEEL D		D
WOOD .	JILL	CONCRETE	CON	NCRETE CAP	D
FOUNDATION INVENTORY			A	-	
NUMBER OF FOUNDATIONS	4				
NUMBER OF SUPPORT PILES PE	R FOUNDATION	3			
PILE ENCAPSULATIONS	YES	түре			
TOWER PHOTOGRAPH	(INCLUDE IN FIN	AL REPORT)			



OVERALL CONDITION OF FOUNDATION GOOD FOR POOR NOTES:

#### LEVEL I FOUNDATION INSPECTION FORM

### FOUNDATION DESCRIPTION: 3 STEEL H PILES UNDER A CONCRETE CAP

			FOUND	ATION 1:			
LOSS OF SEC	TION/PILE	<b>RUNNING</b>	RUST/PILE	IMPACT DA	MAGE/PILE	ENCAPSULA	TION/PILE
NONE	ABCD	NONE	ABCD	NONE	\land 🖥 🌀 D	MISSING	ABCD
MINOR	ABCD	MINOR	ABCD	MINOR	ABCD	CRACKED	ABCD
MODERATE		MODERATE	科 🗟 🖲 D	MODERATE	ABCD	OVERALL	
SEVERE	ABCD	SEVERE	ABCD	SEVERE	ABCD	LENGTH	
MUD LINE. 13	WATER DE	PTH.	3				
			FOUND	ATION 2:			
LOSS OF SEC	TION/PILE	RUNNING	RUST/PILE	IMPACT DA	MAGE/PILE	ENCAPSULA	TION/PILE
NONE	ABCD	NONE	ABCD	NONE	ABCD	MISSING	ABCD
MINOR	ABCD	MINOR	ABCD	MINOR	ABCD	CRACKED	ABCD
MODERATE	ABCD	MODERATE	ABCD	MODERATE	ABCD	OVERALL	
SEVERE	ABCD	SEVERE	ABCD	SEVERE	ABCD	LENGTH	
MUD LINE. 6"	WATER DEF	PTH.	6-1-1-1-1-				a top it in
1000 07 07		BUILDING	FOUND	ATION 3:		FRICADOLU	TION /511 5
LOSS OF SEC	TION/PILE	RUNNING	RUST/PILE	IMPACT DA	MAGE/PILE	ENCAPSULA	TION/PILE
NONE	ABCD	NONE	ABCD	NONE	ABCD	MISSING	ABCD
MINOR	ABCD	MINOR	ABCD	MINOR	ABCD	CRACKED	ABCD
MODERATE	ABCD	MODERATE	A 8 6 D	MODERATE	ABCD	OVERALL	
SEVERE	ABCD	SEVERE	ABCD	SEVERE	ABCD	LENGTH	
SEVENE							
		DTU	11.1	-			
MUD LINE. 35	" WATER DE	PTH.					
MUD LINE. 35	" WATER DE	PTH.	FOUND	ATION 4:			
MUD LINE. 35	" WATER DE	PTH.	FOUND/ RUST/PILE	ATION 4: IMPACT DA	MAGE/PILE	ENCAPSULA	TION/PILE
MUD LINE. 35 LOSS OF SEC	WATER DE	RUNNING NONE	FOUND/ RUST/PILE A B C D	ATION 4: IMPACT DA NONE	MAGE/PILE	<b>ENCAPSULA</b> MISSING	TION/PILE A B C D
MUD LINE. 35 LOSS OF SEC NONE MINOR	WATER DE	RUNNING NONE MINOR	FOUND/ RUST/PILE A B C D A B C D	ATION 4: IMPACT DA NONE MINOR	MAGE/PILE	ENCAPSULA MISSING CRACKED	TION/PILE A B C D A B C D
MUD LINE. 35 LOSS OF SEC NONE MINOR MODERATE	WATER DE	PTH. RUNNING NONE MINOR MODERATE	FOUND/ RUST/PILE A B C D A B C D A B C D	ATION 4: IMPACT DA NONE MINOR MODERATE	MAGE/PILE ABCD ABCD ABCD	ENCAPSULA MISSING CRACKED OVERALL	TION/PILE A B C D A B C D
MUD LINE. 35 LOSS OF SEC NONE MINOR MODERATE SEVERE	WATER DE	RUNNING NONE MINOR MODERATE SEVERE	FOUNDA RUST/PILE A B C D A B C D A B C D A B C D	ATION 4: IMPACT DA NONE MINOR MODERATE SEVERE	MAGE/PILE A B C D A B C D A B C D A B C D A B C D	ENCAPSULA MISSING CRACKED OVERALL LENGTH	TION/PILE A B C D A B C D
MUD LINE. 35 LOSS OF SEC NONE MINOR MODERATE SEVERE	WATER DE	RUNNING NONE MINOR MODERATE SEVERE	FOUND/ RUST/PILE A B C D A B C D A B C D A B C D	ATION 4: IMPACT DA NONE MINOR MODERATE SEVERE	MAGE/PILE A B C D A B C D A B C D A B C D	ENCAPSULA MISSING CRACKED OVERALL LENGTH	TION/PILE A B C D A B C D
MUD LINE. 35 LOSS OF SEC NONE MINOR MODERATE SEVERE MUD LINE. 24	WATER DE	RUNNING NONE MINOR MODERATE SEVERE	FOUNDA RUST/PILE A B C D A B C D A B C D A B C D	ATION 4: IMPACT DA NONE MINOR MODERATE SEVERE	MAGE/PILE A B C D A B C D A B C D A B C D A B C D	ENCAPSULA MISSING CRACKED OVERALL LENGTH	TION/PILE A B C D A B C D
MUD LINE. 35 LOSS OF SEC NONE MINOR MODERATE SEVERE MUD LINE. 24	WATER DE	RUNNING NONE MINOR MODERATE SEVERE	FOUND/ RUST/PILE A B C D A B C D A B C D A B C D	ATION 4: IMPACT DA NONE MINOR MODERATE SEVERE	MAGE/PILE A B C D A B C D A B C D A B C D A B C D	ENCAPSULA MISSING CRACKED OVERALL LENGTH	TION/PILE A B C D A B C D
MUD LINE. 35 LOSS OF SEC NONE MINOR MODERATE SEVERE MUD LINE. 24	WATER DE	RUNNING NONE MINOR MODERATE SEVERE PTH.	FOUNDA RUST/PILE A B C D A B C D A B C D A B C D	ATION 4: IMPACT DA NONE MINOR MODERATE SEVERE	MAGE/PILE A B C D A B C D A B C D A B C D A B C D	ENCAPSULA MISSING CRACKED OVERALL LENGTH	TION/PILE A B C D A B C D
MUD LINE. 35 LOSS OF SEC NONE MINOR MODERATE SEVERE MUD LINE. 24 FOUNDATION	"WATER DE A B C D A B C D A B C D A B C D A B C D "WATER DE	RUNNING I NONE MINOR MODERATE SEVERE PTH. ENCA FOUNDATION	FOUND/ RUST/PILE A B C D A B C D A B C D A B C D PSULATIO 2-DISTANCES	ATION 4: IMPACT DA NONE MINOR MODERATE SEVERE N DIMENSIO	MAGE/PILE A B C D A B C D 3-DISTANCES	ENCAPSULA MISSING CRACKED OVERALL LENGTH	TION/PILE A B C D A B C D
MUD LINE. 35 LOSS OF SEC NONE MINOR MODERATE SEVERE MUD LINE. 24 FOUNDATION FROM CAP	"WATER DE CTION/PILE A B C D A B C D A B C D A B C D "WATER DE	PTH. RUNNING NONE MINOR MODERATE SEVERE PTH. ENCA FOUNDATION FROM CAP	FOUNDA RUST/PILE A B C D A B C D A B C D A B C D PSULATIO 2-DISTANCES **FROM	ATION 4: IMPACT DA NONE MINOR MODERATE SEVERE N DIMENSIO FOUNDATION FROM CAP	MAGE/PILE A B C D A B C D A B C D A B C D A B C D Sources **FROM	ENCAPSULA MISSING CRACKED OVERALL LENGTH	TION/PILE A B C D A B C D 4-DISTANCES **FROM
MUD LINE. 35 LOSS OF SEC NONE MINOR MODERATE SEVERE MUD LINE. 24 FOUNDATION FROM CAP	"WATER DE CTION/PILE A B C D A B C D A B C D A B C D "WATER DE 1-DISTANCES **FROM MUDLINE	PTH. RUNNING NONE MINOR MODERATE SEVERE PTH. ENCA FOUNDATION FROM CAP	FOUNDA RUST/PILE A B C D A B C D A B C D A B C D PSULATIO 2-DISTANCES **FROM MUDLINE	ATION 4: IMPACT DA NONE MINOR MODERATE SEVERE N DIMENSION FOUNDATION FROM CAP	MAGE/PILE A B C D A B C D A B C D A B C D A B C D Sources **FROM MUDLINE	ENCAPSULA MISSING CRACKED OVERALL LENGTH	TION/PILE A B C D A B C D 4-DISTANCES **FROM MUDLINE
MUD LINE. 35 LOSS OF SEC NONE MINOR MODERATE SEVERE MUD LINE. 24 FOUNDATION FROM CAP	"WATER DE A B C D A B C D A B C D A B C D A B C D "WATER DE 1-DISTANCES **FROM MUDLINE	PTH.  RUNNING NONE MINOR MODERATE SEVERE  PTH.  FOUNDATION FROM CAP A B	FOUNDA RUST/PILE A B C D A B C D A B C D A B C D PSULATIO 2-DISTANCES **FROM MUDLINE	ATION 4: IMPACT DA NONE MINOR MODERATE SEVERE N DIMENSIO FOUNDATION FROM CAP	MAGE/PILE A B C D A B C D A B C D A B C D A B C D S S-DISTANCES **FROM MUDLINE	ENCAPSULA MISSING CRACKED OVERALL LENGTH FOUNDATION FROM CAP	TION/PILE A B C D A B C D 4-DISTANCES **FROM MUDLINE
MUD LINE. 35 LOSS OF SEC NONE MINOR MODERATE SEVERE MUD LINE. 24 FOUNDATION FROM CAP	"WATER DE A B C D A B C D A B C D A B C D A B C D T WATER DE	PTH.  RUNNING NONE MINOR MODERATE SEVERE  PTH.  FOUNDATION FROM CAP A B C	FOUND/ RUST/PILE A B C D A B C D A B C D A B C D PSULATIO 2-DISTANCES **FROM MUDLINE	ATION 4: IMPACT DA NONE MINOR MODERATE SEVERE N DIMENSIO FOUNDATION FROM CAP	MAGE/PILE A B C D A B C D 3-DISTANCES **FROM MUDLINE	ENCAPSULA MISSING CRACKED OVERALL LENGTH FOUNDATION FROM CAP A B	TION/PILE A B C D A B C D 4-DISTANCES **FROM MUDLINE
	LOSS OF SEC NONE MINOR MODERATE SEVERE MUD LINE. 13 LOSS OF SEC NONE MINOR MODERATE SEVERE MUD LINE. 6" LOSS OF SEC NONE MINOR MODERATE	LOSS OF SECTION/PILE NONE A B C D MINOR A B C D MODERATE A C D SEVERE A B C D MUD LINE. 13" WATER DE LOSS OF SECTION/PILE NONE A B C D MINOR A B C D MODERATE A B C D MUD LINE. 6" WATER DEF LOSS OF SECTION/PILE NONE A B C D MINOR A B C D	LOSS OF SECTION/PILE RUNNING F NONE A B C D NONE MINOR A B C D MINOR MODERATE A C D MODERATE SEVERE A B C D SEVERE MUD LINE. 13" WATER DEPTH. LOSS OF SECTION/PILE RUNNING F NONE A B C D NONE MINOR A B C D MINOR MODERATE A C D SEVERE MUD LINE. 6" WATER DEPTH. LOSS OF SECTION/PILE RUNNING F NONE A B C D SEVERE MUD LINE. 6" WATER DEPTH.	LOSS OF SECTION/PILE RUNNING RUST/PILE NONE A B C D NONE A B C D MINOR A B C D MINOR A B C D MODERATE A C D MODERATE A C D SEVERE A B C D SEVERE A B C D MUD LINE. 13" WATER DEPTH. MUD LINE. 13" WATER DEPTH.	HOUNDATION 1:         LOSS OF SECTION/PILE       RUNNING RUST/PILE       IMPACT DA         NONE       A B C D       NONE       A B C D       NONE         MINOR       A B C D       MINOR       A B C D       MINOR         MODERATE       A B C D       MODERATE       A B C D       MODERATE         SEVERE       A B C D       MODERATE       A B C D       MODERATE         MUD LINE.       13" WATER DEPTH.       IMPACT DA         MUD LINE.       13" WATER DEPTH.       IMPACT DA         NONE       A B C D       NONE       A B C D       NONE         MINOR       A B C D       NONE       A B C D       NONE         MINOR       A B C D       NONE       A B C D       NONE         MINOR       A B C D       MINOR       A B C D       MINOR         MODERATE       A B C D       MODERATE       A B C D       MODERATE         MUD LINE.       6" WATER DEPTH.       IMPACT DA       SEVERE       MODERATE       SEVERE         MUD LINE.       6" D       NONE       A B C D       NONE       NONE       SEVERE         MUD LINE.       6" C D       NONE       A B C D       NONE       MODERATE       MODERATE	HOUNDATION 1:         LOSS OF SECTION/PILE       RUNNING RUST/PILE       IMPACT DAMAGE/PILE         NONE       A B C D       NONE       A B C D       NONE       A B C D         MINOR       A B C D       MINOR       A B C D       MINOR       A B C D         MODERATE       A B C D       MODERATE       A B C D       MODERATE       A B C D         SEVERE       A B C D       SEVERE       A B C D       MODERATE       A B C D         MUD LINE.       13" WATER DEPTH.       IMPACT DAMAGE/PILE       IMPACT DAMAGE/PILE         NONE       A B C D       NONE       A B C D       NONE         MUD LINE.       13" WATER DEPTH.       IMPACT DAMAGE/PILE         NONE       A B C D       NONE       A B C D       NONE         MINOR       A B C D       NONE       A B C D       NONE       A B C D         MODERATE       A B C D       MINOR       A B C D       MINOR       A B C D         MODERATE       A B C D       MODERATE       A B C D       MODERATE       A B C D         MODERATE       A B C D       SEVERE       A B C D       SEVERE       A B C D         MUD LINE. 6" WATER DEPTH.       IMPACT DAMAGE/PILE       IMPACT DAMAGE/PILE <td>HOUNDATION 1:         LOSS OF SECTION/PILE       RUNNING RUST/PILE       IMPACT DAMAGE/PILE       ENCAPSULA         NONE       A B C D       NONE       A B C D       MISSING         MINOR       A B C D       MINOR       A B C D       MISSING         MINOR       A B C D       MINOR       A B C D       MISSING         MODERATE       A B C D       MODERATE       A B C D       OVERALL         SEVERE       A B C D       SEVERE       A B C D       OVERALL         MUD LINE.       13" WATER DEPTH.       EOUNDATION 2:       Impact DAMAGE/PILE       ENCAPSULA         NONE       A B C D       NONE       A B C D       NONE       A B C D       MISSING         MINOR       A B C D       NONE       A B C D       NONE       A B C D       MISSING         MINOR       A B C D       NONE       A B C D       MINOR       A B C D       OVERALL         MODERATE       A B C D       MINOR       A B C D       MINOR       A B C D       OVERALL         SEVERE       A B C D       MODERATE       A B C D       OVERALL       LENGTH         MUD LINE.       6" WATER DEPTH.       E       E       OVERALL       LENGTH         &lt;</td>	HOUNDATION 1:         LOSS OF SECTION/PILE       RUNNING RUST/PILE       IMPACT DAMAGE/PILE       ENCAPSULA         NONE       A B C D       NONE       A B C D       MISSING         MINOR       A B C D       MINOR       A B C D       MISSING         MINOR       A B C D       MINOR       A B C D       MISSING         MODERATE       A B C D       MODERATE       A B C D       OVERALL         SEVERE       A B C D       SEVERE       A B C D       OVERALL         MUD LINE.       13" WATER DEPTH.       EOUNDATION 2:       Impact DAMAGE/PILE       ENCAPSULA         NONE       A B C D       NONE       A B C D       NONE       A B C D       MISSING         MINOR       A B C D       NONE       A B C D       NONE       A B C D       MISSING         MINOR       A B C D       NONE       A B C D       MINOR       A B C D       OVERALL         MODERATE       A B C D       MINOR       A B C D       MINOR       A B C D       OVERALL         SEVERE       A B C D       MODERATE       A B C D       OVERALL       LENGTH         MUD LINE.       6" WATER DEPTH.       E       E       OVERALL       LENGTH         <

## STEEL H-PILE INSPECTION PAMUNKEY RIVER

# DATE INSPECTED 9-18-2014

TOWER NO.	<b>FOUNDATION</b>		RECOR	DED MEAS	UREMENTS		
224/232	<u>&amp; PILE NO.</u>	NDT	MEASURE	MENT	DIST	ANCE FROM	I CAP
		N1	N2	N3	N1	N2	N3
	1A	0.565	0.585	0.600	20"	20"	20"
	1B						
	1C	· · ·					
	1D .						а 1.
	2A						
	2B	0.535	0.575	0.540	15"	15"	15"
	2C						
	2D					-	
	3A						
	3B						
	3C	0.575	0.590	0.605	45"	45"	45"
	3D						
	4A	0.580	0.575	0.590	36"	36"	36"
	4B						
	4C						
	4D						
COMMENTS:							
NDT READINGS TAKEN	<b>3 INCHES BELOW MUDL</b>	INE.					
1 A, B AND C PILES SH	OW ONLY MODERATE SC	ALE.					
2 A, B AND C PILES SH	OW ONLY MODERATE SC	ALE.					
3 A, B AND C PILES SH	OW ONLY MODERATE SC	ALE.					
4 A, B AND C PILES SH	OW ONLY MODERATE SC	ALE.					
					1.		



81

#### <u>CONCRETE FOUNDATION INSPECTION</u> <u>CHECKLIST</u> <u>STR. # 224/232 LEG # 1</u>

- 1.) GENERAL CONDITION OF THE CONCRETE FOUNDATION:
  - GOOD

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- SATISFACTORY
- **POOR**

FND. TO BE SOUNDED TO DETERMINE VOIDS, LAMINATIONS, SOUNDNESS, ETC.

- 2.) SURFACE DEFECTS:
  - SPALLING / SCALING
  - **POPOUTS**
  - $\checkmark$  CRACKS ≤ 1/16" WIDE
  - $\checkmark$  CRACKS  $\geq 1/16$ " TO  $\frac{1}{4}$ " WIDE
  - SHRINKAGE CRACKS
  - **EFFLORESCENCE**
  - **EVIDENCE OF ALKALI AGGREGRATE REACTION**
  - **EXPOSED REINFORCEMENT / CORROSION**
  - VISIBLE DAMAGE
- 3.) COMMENTS:

Rl	JNN	ING	RUS	Т.

1/16" TO 1/8" MAP CRACKING WITH EFFLORESCENCE

INSPECTED BY: MATT TRAHAN

**DATE:** 9-18-2014

82

#### <u>CONCRETE FOUNDATION INSPECTION</u> <u>CHECKLIST</u> <u>STR. # 224/232 LEG # 2</u>

- 1.) GENERAL CONDITION OF THE CONCRETE FOUNDATION:
  - GOOD
  - SATISFACTORY
  - ✓ POOR

FND. TO BE SOUNDED TO DETERMINE VOIDS, LAMINATIONS, SOUNDNESS, ETC.

- 2.) SURFACE DEFECTS:
  - SPALLING / SCALING
  - POPOUTS
  - $\checkmark$  **CRACKS**  $\leq 1/16$ " WIDE
  - $\checkmark$  CRACKS  $\geq 1/16$ " TO  $\frac{1}{4}$ " WIDE
  - SHRINKAGE CRACKS
  - **EFFLORESCENCE**
  - **EVIDENCE OF ALKALI AGGREGRATE REACTION**
  - EXPOSED REINFORCEMENT / CORROSION
  - VISIBLE DAMAGE
- 3.) COMMENTS:

RUNNING RUST.

SPALL MIDDLE OF BASE OF SOUTH FACE. 4"W x 1.25"H x 3"D WITH 1/4" CRACK RADIATING UPWARDS.

1/16" TO 1/8" CRACKS AND 1/16" MAP CRACKING WITH EFFLORESCENCE.

INSPECTED BY: MATT TRAHAN

DATE: 9-18-2014

#### <u>CONCRETE FOUNDATION INSPECTION</u> <u>CHECKLIST</u> <u>STR. # 224/232 LEG # 3</u>

- 1.) GENERAL CONDITION OF THE CONCRETE FOUNDATION:
  - GOOD

[\_\_\_.

- SATISFACTORY
- **POOR**

FND. TO BE SOUNDED TO DETERMINE VOIDS, LAMINATIONS, SOUNDNESS, ETC.

- 2.) SURFACE DEFECTS:
  - SPALLING / SCALING
  - **POPOUTS**
  - ✓ **CRACKS**  $\leq 1/16$ " WIDE
  - $\checkmark$  CRACKS ≥ 1/16" TO ¼" WIDE
  - SHRINKAGE CRACKS
  - **EFFLORESCENCE**
  - **EVIDENCE OF ALKALI AGGREGRATE REACTION**
  - **EXPOSED REINFORCEMENT / CORROSION**
  - VISIBLE DAMAGE
- 3.) COMMENTS:

RUNNING RUST

1/16" TO 1/8" CRACKS AND 1/16" MAP CRACKING WITH EFFLORESCENCE.

INSPECTED BY: MATT TRAHAN

**DATE:** 9-18-2014

84

#### **CONCRETE FOUNDATION INSPECTION** CHECKLIST STR. # 224/232 LEG # 4

1.)	GENERAL CONDITION OF THE CONCRETE FOUNDATION:
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- GOOD
- SATISFACTORY
- $\checkmark$ POOR

FND. TO BE SOUNDED TO DETERMINE VOIDS, LAMINATIONS, SOUNDNESS, ETC.

- 2.) SURFACE DEFECTS:
  - SPALLING/SCALING
  - **POPOUTS**
  - CRACKS ≤ 1/16" WIDE
  - CRACKS ≥ 1/16" TO ¼" WIDE  $\checkmark$
  - SHRINKAGE CRACKS
  - EFFLORESCENCE  $\checkmark$
  - **EVIDENCE OF ALKALI AGGREGRATE REACTION**
  - **EXPOSED REINFORCEMENT / CORROSION**
  - VISIBLE DAMAGE

3.) **COMMENTS:** 

RUNNING RUST.

1/16" TO 1/8" CRACKS AND 1/16" MAP CRACKING WITH EFFLORESCENCE

INSPECTED BY: MATT TRAHAN

DATE: 9-18-2014

Attachment I.L.1 Page 65 of 70

## STRUCTURE INVESTIGATION PHOTOGRAPHIC LOG T/L No. 224 Structure No. 232







**FOUNDATION 1** 







**FOUNDATION 2** 







**FOUNDATION 2** 







**FOUNDATION 3** 




## STRUCTURE INVESTIGATION PHOTOGRAPHIC LOG T/L No. 224 Structure No. 232



**FOUNDATION 4** 



**FOUNDATION 4** 

