Route 2B

Route 2B is a variation to Route 2A that avoids crossing USPS Property. Route 2B will cross PDIP-zoned land for less than 0.1 mile across the Lockridge Substation property. From MP 0.1 to 0.7 Route 2B will cross PDOP-zoned land on the undeveloped parcel owned by SDC Ashburn I, LLC, until reaching the tie-in location with Line #2188.

3.1.6 Conservation Easements

The Virginia Open-Space Land Act provides for the creation of open-space easements by public bodies as a means of preserving open space or significant natural, cultural, and recreational resources on public or private lands. Most easements created under the Act are held by the Virginia Outdoors Foundation (VOF), but any state agency is authorized to create and hold an open-space easement. The Virginia Conservation Easement Act similarly provides for the creation of conservation easements on public or private lands but under the auspices of charitable organizations (such as conservation trusts) rather than public agencies. In both cases, these easements are designed to preserve and protect open space or other resources in perpetuity. Easements negotiated with private landowners allow the lands to remain in private ownership but with protections imposed to limit or restrict land uses on the property. No conservation easements are within the study area.

Virginia Outdoors Foundation

The VOF leads Virginia in land conservation, protecting over 675,000 acres across the state. The VOF was created under the Virginia Open-Space Land Act, which provides for the creation of open-space easements by public bodies as a means of preserving open space or significant natural, cultural, and recreational resources on public or private lands. Most easements created under the Act are held by the VOF, but any state agency is authorized to create and hold an open-space easement. These easements are designed to preserve and protect open space or other resources in perpetuity. Easements negotiated with private landowners allow the lands to remain in private ownership but with protections imposed to limit or restrict land uses on the property (Virginia Outdoors Foundation 2015). There are currently no VOF easements that will be crossed by any of the routes.

Agricultural and Forestal Districts

The Virginia Agricultural and Forestal Districts (AFD) Act provides for the creation of conservation districts (Commonwealth of Virginia 1997). These districts are designed to conserve, protect, and encourage the development and improvement of a locality's agricultural and forested lands for the production of food and other products, while also conserving and protecting land as valued natural and ecological resources. These districts are voluntary agreements between landowners and the locality, and offer benefits to landowners when they agree to keep their land in its current use for between 4 and 10 years. A district must contain at least 200 acres. No AFDs will be crossed by any of the routes considered.

3.1.7 Other Conservation Lands

ERM obtained information on other conservation lands through review of a digital dataset obtained from the Virginia Department of Conservation and Recreation (VDCR) and from Loudoun County. The dataset identifies "lands of conservation and recreational interest" in Virginia, including federal, state, local, and privately-owned lands. There is a VDCR stream

conservation unit (SCU) encompassing the portion of Broad Run within the study area. Routes 2A and 2B will cross the SCU once. More information on the Broad Run SCU is provided in Section 3.2.3.

3.1.8 Transportation

Three public roads occur within the study area, all of which are roads maintained by VDOT; these include Lockridge Road, Prentice Drive, and Shellhorn Road (see Figure 2.0). In addition to these existing roads, there are planned extensions of Shellhorn Road and Prentice Drive.

3.1.8.1 Option 1

Route 1A

Beginning at the Lockridge Substation, Route 1A will cross and run parallel with the east side of Lockridge Road and cross Prentice Drive at the northwest corner of the Dulles Post Office parking lot. Route 1A will run parallel to the east side of the planned Prentice Drive Extension for about 0.16 mile until the road veers west and Route 1A continues north to the tap point with future Line #2214.

Route 1B

Beginning at the Lockridge Substation, Route 1B will cross and run parallel with the east side of Lockridge Road and cross Prentice Drive at the northwest corner of the Dulles Post Office parking lot. Route 1B will run parallel to the east side of the planned Prentice Drive Extension for about 0.16 mile until the road veers west and Route 1B continues north to the tap point with future Line #2214.

Route 1C

Beginning at the Lockridge Substation, Route 1C will cross and run parallel with the east side of Lockridge Road and cross Prentice Drive at the northwest corner of the Dulles Post Office parking lot. Route 1C will run parallel to the east and north sides of the planned Prentice Drive Extension for about 0.33 mile, until Route 1C heads north to the tap point with future Line #2214.

3.1.8.2 Option 2

Route 2A

Beginning at the Lockridge Substation, Route 2A will run along the east side of Lockridge Road over the Dominion Energy Virginia electric utility easement, crossing the Columbia Gas pipeline easement near the southwest corner of the Dulles Post Office parking lot. Route 2A then turns west, crossing the Dominion Energy Virginia electric utility easement and Lockridge Road and running parallel to the pipeline easement for 0.35 mile before reaching the tap point into Line #2188.

Route 2B

Route 2B will exit the Lockridge Substation and continue west, crossing the planned Shellhorn Road Extension then heading north and making a second crossing of the planned

Shellhorn Road Extension before turning west to follow the same route as Route 2A described above.

3.1.9 Airport Facilities

Transmission line towers have the potential to affect airspace in and around airports. In routing and building new overhead electric transmission lines, airports are an important consideration. The following is a summary of the airports in the vicinity of the Project area and the airspace regulations that could have an impact on the Project.

Airports Near the Project Area

ERM reviewed the Federal Aviation Administration's (FAA) website to identify public use airports, airports operated by a federal agency or the U.S. Department of Defense, airports or heliports with at least one FAA-approved instrument approach procedure, and public use or military airports under construction (FAA 2019). Based on this review, there are two airports, private airstrips, or heliports located within 10 nautical miles of the Project facilities (see Figure 3.1.8 in Appendix A). Table 3.1.9-1 lists the airport, heliport, or private airstrip name/owner in the vicinity of each transmission line section, including airport identification number, distance, and direction from the nearest Dominion Energy Virginia facility, type of use, and maximum runway length.

Federal Aviation Regulations

The FAA is responsible for overseeing air transportation in the United States. The FAA focuses on air transportation safety, including the enforcement of safety standards for aircraft manufacturing, operation, and maintenance. The FAA also manages air traffic in the United States and evaluates physical objects that may affect the safety of aeronautical operations through an obstruction evaluation. The prime objective of the FAA in conducting an obstruction evaluation is to ensure the safety of air navigation and the efficient utilization of navigable airspace by aircraft.

TABLE 3.1.9-1

Lockridge 230 kV Line Loop and Lockridge Substation Project
Airports, Heliports, and Private Airstrips Located in the Vicinity of the Project

Airport Name	Airport ID	Approximate Distance and Direction From Dominion Energy Virginia Facility (nautical miles)	Use	Maximum Runway Length (feet)
Washington-Dulles International Airport	IAD	1.7 S	Public	11,000
Leesburg Executive Airport	JYO	7.3 NW	Public	5,500

The regulations that govern objects that may affect navigable airspace are codified in 14 Code of Federal Regulations Part 77. On July 21, 2010, the FAA amended Part 77. Following are the major changes in the final rule:

1. The final rule provides for an FAA Determination of Hazard or Determination of No Hazard to become effective 40 days after the date of issuance.

2. The final rule stipulates that a Determination of No Hazard to air navigation will expire 18 months after the effective date of the determination, or on the date the proposed construction or alteration is abandoned. Also, the final rule specifies that a Determination of Hazard to Air Navigation does not expire.

3. The final rule expands the requirements for notice to be sent to the FAA for proposed construction or alteration of structures on or near private use airports that have an instrument approach procedure.

A summary of the final rule as it relates to the proposed Project is provided below.

Civil Airport Imaginary Surfaces

Civil airport imaginary surfaces have been established with relation to each airport and to each runway. The imaginary surfaces were developed to prevent existing or proposed objects from extending from the ground into navigable airspace. Following is a description of the civil imaginary surfaces:

- Horizontal surface: A horizontal plane 150 feet above the established airport elevation, the perimeter of which is constructed by swinging arcs of specified radii from the center of each end of the primary surface of each runway and connecting the adjacent arcs by lines tangent to those arcs.

- Conical surface: A surface extending outward and upward from the periphery of the horizontal surface at a slope of 20 to 1 for a horizontal distance of 4,000 feet.

- Primary surface: A surface longitudinally centered on a runway. The primary surface extends 200 feet beyond the end of each runway. The elevation of any point on the primary surface is the same as the elevation of the nearest point on the runway centerline.

- Approach Surface: A surface longitudinally centered on the extended runway centerline and extending outward and upward from each end of the primary surface. An approach surface is applied to each end of each runway based upon the type of approach available or planned for that runway end (e.g., precision instrument approach, visual approach, etc.).

- Transitional Surface: These surfaces extend outward and upward at right angles to the runway centerline and the runway centerline extended at a slope of 7 to 1 from the sides of the primary surface and from the sides of the approach surfaces. Transitional surfaces for those portions of the precision approach surface that project through and beyond the limits of the conical surface extend a distance of 5,000 feet measured horizontally from the edge of the approach surface and at right angles to the runway centerline.

FAA Notice Requirements and Timing

Based on the runway categories and dimensional standards described above, a notice must be filed with the FAA if:

- Any construction or alteration is more than 200 feet above ground level at its site.

- Any construction or alteration exceeds an imaginary surface extending outward and upward at the following slope:

- 25 to 1 for a horizontal distance of 5,000 feet from the nearest point of the nearest landing and takeoff area of each heliport;
- 50 to 1 for a horizontal distance of 10,000 feet from the nearest point of the nearest runway that is no more than 3,200 feet in actual length; and
- 100 to 1 for a horizontal distance of 20,000 feet from the nearest point of the nearest runway that is more than 3,200 feet in actual length.

- If requested by the FAA.

Construction or alteration of any structure that meets the notification requirements set forth above must submit an FAA Form 7460-1, Notice of Proposed Construction or Alteration (Notice) to the FAA Regional office having jurisdiction over the area within which the construction or alteration will be located or submitted electronically via the FAA website. The information that needs to be provided with the Notice includes the coordinates, site elevation, and structure height above ground level for each pole/structure and the height of construction equipment, such as cranes.

Based on the current plans, the proposed transmission line structures will range in height from 90 to 115 feet tall along Option 1 and from 95 to 115 feet tall along the Option 2 right-of-way. It is anticipated that cranes will be used to install the structures. Based on current plans, the proposed Project will exceed the FAA notification thresholds described above at one airport. Table 3.1.9-2 identifies the airports that will require submitting a Notice to the FAA for the proposed facilities.

TABLE 3.1.9-2

Lockridge 230 kV Line Loop and Lockridge Substation Project
Project Section Where FAA Notification is Required

Nearest Airport	Airport ID	Approximate Distance and Direction From Dominion Energy Virginia Facility (nautical miles)	Use
Washington-Dulles International Airport	IAD	1.7 S	Public

State and Local Regulations

Commonwealth of Virginia Aviation Regulations

Section 5.1-25.1 of the Va. Code establishes that it is unlawful for a person to erect any structure which penetrates into or through any licensed airport's clear zone, approach zone, imaginary surface, obstruction clearance surface, obstruction clearance zone, or surface or zone as described in regulations of the Virginia Department of Aviation or the FAA, without first securing a permit for its erection from the Board of Aviation. However, it also states that this requirement does not apply to any structure to be erected in a county, city, or town which has an ordinance regulating the height of such structures to prevent the penetration of zones and surfaces provided for in Part 77 and Rule 19 of the Virginia Department of Aviation.

Local Airport Regulations

Va. Code Sections 15.2-2280, 15.2-2282, 15.2-2293, and 15.2-2294 give local jurisdictions the power to establish and regulate zoning districts, make airspace subject to their

zoning ordinance, and establish airport safety zoning. Following is a summary of the zoning regulations applicable to the airports listed in Table 3.1.9-1.

Loudoun County - Loudoun County has established restricted-use zones to regulate the use of property in the vicinity of Washington-Dulles International Airport. The Airport Impact Overlay District is a zoning overlay district administered by the Loudoun County Department of Building and Development. This district is established to acknowledge the unique land use impacts of airports, regulate the siting of noise sensitive uses, ensure that the heights of structures are compatible with airport operations, and complement FAA regulations regarding noise and height.

The Airport Impact Overlay District boundaries are based on the 60 decibels (dB) and 65 dB Loudness Day Night noise contours and a 1-mile buffer that extends beyond the 60 dB day-night average sound level contour for Washington-Dulles International Airport. The zones include all of the land lying beneath the approach surfaces, transitional surfaces, horizontal surfaces, and conical surfaces as they apply to this airport.

3.2 NATURAL RESOURCES

ERM utilized several desktop data sources to map wetlands and waterbodies within the alternative routes right-of-way corridors. These sources included USGS 7.5 minute series topographic quadrangle maps, NWI maps obtained from the U.S. Fish and Wildlife Service (FWS), soils data from the Natural Resources Conservation Service Web Soil Survey, recent aerial photography, and National Hydrography Dataset and Fairfax County stream layers. ERM did not conduct an onsite wetland delineation of wetlands or waterbodies within the study area.

ERM also utilized FWS (2019), VDCR Natural Heritage Program (NHP) (2019), and Virginia Department of Game and Inland Fisheries (VDGIF) (VDGIF, 2019) web services to conduct a preliminary review of areas of ecological significance and protected species in the five Project counties and then specific to Options A and B.

3.2.1 Wetlands

A quantification of the various wetlands types (identified in the Desktop Wetland Summary Report in Appendix D) crossed by each of the routes is provided in the Environmental Features Comparison Table included as Table 4-1. In addition, an overview map set illustrating the location of NWI wetlands is included on Figure 1 in Appendix D.

The majority of the wetlands potentially affected are located adjacent to, or contiguous with, rivers and streams and their tributaries that will be considered relatively permanent waters; therefore, a significant nexus to navigable waters is assumed. As such, they will be regulated by the U.S. Army Corps of Engineers (USACE) and VDEQ under Sections 404 and 401 of the Clean Water Act (CWA), respectively.

3.2.1.1 Option 1

Route 1A

Wetlands depicted in the proposed right-of-way are primarily Palustrine Emergent (PEM) and Palustrine Forested (PFO) wetlands associated with tributaries of the named National Hydrography Dataset (NHD)-mapped waterbody Broad Run. Notable wetland features include a

60-foot PFO crossing at MP 0.5 and two PEM wetlands crossed by the proposed Lockridge Substation footprint.

These wetlands are located adjacent to, or contiguous with, tributaries that would be considered relatively permanent waters; therefore, a significant nexus to navigable waters is assumed. As such, they would be regulated by the USACE and VDEQ under Sections 404 and 401 of the CWA, respectively.

Route 1B

Wetlands depicted in the proposed right-of-way are primarily PEM and PFO wetlands associated with tributaries of the named NHD-mapped waterbody Broad Run. Notable wetland features include a PFO wetland crossed two times between MP 0.5 and 0.6 with crossing distances of 160 and 175. Additionally, two PEM wetlands are crossed by the proposed Lockridge Substation footprint.

These wetlands are located adjacent to, or contiguous with, tributaries that would be considered relatively permanent waters; therefore, a significant nexus to navigable waters is assumed. As such, they would be regulated by the USACE and VDEQ under Sections 404 and 401 of the CWA, respectively.

Route 1C

Wetlands depicted in the proposed right-of-way are primarily PEM and PFO and Palustrine Scrub-shrub (PSS) wetlands associated with tributaries of the named NHD-mapped waterbody Broad Run. Notable wetland features include a 47-foot PFO wetland crossing at MP 0.5 and two PEM wetlands crossed by the proposed Lockridge Substation footprint.

These wetlands are located adjacent to, or contiguous with, tributaries that would be considered relatively permanent waters; therefore, a significant nexus to navigable waters is assumed. As such, they would be regulated by the USACE and VDEQ under Sections 404 and 401 of the CWA, respectively.

3.2.1.2 Option 2

Route 2A

Wetlands depicted in the proposed right-of-way are primarily PEM and PFO wetlands associated the named NHD-mapped waterbody Broad Run and its tributaries. Notable wetland features include a 72-foot PEM wetland crossing at MP 0.2, and a 110-foot PFO wetland crossing at MP 0.5. Additionally, two PEM wetlands are crossed by the proposed Lockridge Substation footprint.

The majority of these wetlands are located adjacent to, or contiguous with, tributaries that will be considered relatively permanent waters; therefore, a significant nexus to navigable waters is assumed. As such, they will be regulated by the USACE and VDEQ under Sections 404 and 401 of the CWA, respectively.

Route 2B

Wetlands depicted in the proposed right-of-way for Route 2B are primarily PFO wetlands associated with tributaries of the named NHD-mapped waterbody Broad Run. Notable wetland features include a 90-foot PFO wetland at MP 0.2 and two PEM wetlands crossed by the proposed Lockridge Substation footprint.

The majority of these wetlands are located adjacent to, or contiguous with, tributaries that will be considered relatively permanent waters; therefore, a significant nexus to navigable waters is assumed. As such, they will be regulated by the USACE and VDEQ under Sections 404 and 401 of the CWA, respectively.

3.2.2 Waterbodies

ERM identified and mapped waterbodies in the study area using publicly-available GIS databases, USGS topographic maps (1:24,000), and recent digital aerial photography. The routes cross perennial and intermittent waterbodies (rivers, streams, tributaries). No navigable waterbodies will be crossed by any of the routes.

A general location map that illustrates waterbodies that are crossed by the various alternative routes is included as Figure 1 in Appendix D. Although these streams will not require a Rivers and Harbors Act Section 10 authorization, activities within and over subaqueous lands of Virginia require a permit from the Virginia Marine Resources Commission pursuant to Va. Code § 28.2-1205.

Routes 2A and 2B cross one perennial waterbody, Broad Run, for a crossing width of approximately 68 feet. Both routes also cross one intermittent waterbody.

3.2.2.1 Reservoirs, Ponds, and Other Waterbodies

In addition to wetland and waterbodies, open water features (e.g., reservoirs, ponds, and other waterbodies visible from review of NWI/NHD datasets and/or aerial imagery) are considered but no open water features are crossed by the alternative routes.

3.2.3 Areas of Ecological Significance

The initial VDCR NHP review identifies areas of ecological significance within the Project area. As described below, the dataset includes three components: Conservation Sites, SCUs, and General Location Areas for Natural Heritage Resources.

1. Conservation Sites identify a planning boundary delineating the NHP's best determination of the land and water area occupied by one or more natural heritage resources (exemplary natural communities and rare species) and are necessary to maintain ecological processes that will facilitate their long-term survival. The size and dimensions of a conservation site are based on the habitat requirements of the natural heritage resources present and the physical features of the surrounding landscape. Features taken into consideration include hydrology, slope, aspect, vegetation structure, current land uses, and potential threats from invasive species. Conservation sites do not necessarily preclude human activities, but a site's viability may be greatly influenced by human activities. Conservation sites may require ecological management, such as invasive species control or

water management, in order to maintain or enhance their viability. Each conservation site is given a biodiversity significance ranking based on rarity, quality, and number of natural heritage resources it contains.

2. SCUs identify stream reaches that contain aquatic natural heritage resources, including upstream and downstream buffers and tributaries associated with the reach. SCUs are given a biodiversity significance ranking based on the rarity, quality, and number of natural heritage resources they contain. SCUs can be used to identify land management needs, protection priorities, and potential conflicts with development activities.

3. General Location Areas for Natural Heritage Resources represent the approximate locations of documented natural heritage resource occurrences that were not incorporated into Conservation Sites, either because they are poor quality, their location was not precisely identified, or they have not been verified in over 20 years. These approximate locations, marked with a 1-mile-diameter circle, are included in the Screening Coverage because they indicate areas with relatively high potential for natural heritage resource occurrences to be documented. Depending on the apparent suitability of local habitat, VDCR may recommend biological surveys when reviewing projects that intersect these locations.

The VDCR reviewed Dominion Energy Virginia's proposed Project area on August 22, 2019 and identified one SCU in the Project area with natural heritage resources present:

- Broad Run – Route 670 SCU

The location of the SCU identified in the VDCR data is depicted on Figure 3.2.4 in Appendix A. Two protected species are associated with the SCU. The SCU and its associated resources are discussed below.

Broad Run – Route 670 SCU is a branching stream system located in Loudoun County with a biodiversity ranking of B5 (general biodiversity significance). The existing Columbia Gas pipeline corridor crosses the Broad Run – Route 670 SCU in the same location the proposed Route 2A crosses the waterway. Natural heritage resources of concern associated with this SCU are the yellow lance and the dwarf wedgemussel. The yellow lance has been documented in this SCU, while the dwarf wedgemussel is documented as having the potential to occur in the waterway. Further discussion and general information on protected species is available in Section 3.2.5. Broad Run – Route 670 SCU is depicted on Figure 3.2.4. Routes 2A and 2B will cross the SCU.

The VDCR data did not depict any State Natural Area Preserves, or state-listed plants or insects crossed by the routes.

3.2.4 Protected Species

To protect and recover imperiled species and the ecosystems they depend on, Congress passed the Endangered Species Act in 1973 (ESA), which states that threatened and endangered plant and animal species are of aesthetic, ecological, educational, historic, and scientific value to the United States, and protection of these species and their habitats is required. The ESA is administered by both the National Oceanic and Atmospheric Administration and the FWS. It protects fish, wildlife, plants, and invertebrates that are federally-listed as endangered or

threatened by prohibiting the "take" of these species and the interstate or international trade, including their parts and products, unless federally permitted.

Take is defined as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect or attempt to engage in any such conduct." A federally-endangered species is any species that is in danger of extinction throughout all or a significant portion of its range, with exceptions for certain insect pests. A federally-threatened species is any species that is likely to become endangered in the near future throughout all or a significant portion of its range.

Virginia has adopted separate acts for protecting animals and plants in the state. The Virginia ESA (Va. Code §§ 29.1-563 - 29.1-570) designates the VDGIF as the state agency with jurisdiction over state-listed endangered or threatened fish and wildlife. The Act authorizes the Board of the VDGIF to adopt the federal list of endangered and threatened species and to identify and protect state-listed wildlife. This act prohibits by regulation the taking, transportation, processing, sale, or offer for sale of those species.

Under the Endangered Plant and Insect Species Act (2 VAC 5-320-10), the taking or possession of endangered or threatened plant and insect species is prohibited. The VDCR represents the Virginia Department of Agriculture and Consumer Services, which is responsible for state-listed plants and insects, in providing comments regarding potential effects on state-listed plant and insect species.

ERM obtained query results from the VDCR's Natural Heritage Data Explorer (NHDE), VDGIF Fish and Wildlife Information Service (VaFWIS), and the FWS Information for Planning and Consultation System (IPaC) to identify federally- and state-listed species that may occur within the study area. Digital data were obtained from the VDCR NHDE to identify locations within the study area that potentially support protected species. Query results from FWS IPaC includes species that may occur in Loudoun County (FWS 2019). Query results from NHDE include species known to occur in the County and communities known to historically or currently contain protected species (VDCR 2019). Query results from VaFWIS include species known or likely to occur in the study area (VDGIF 2019).

The VDCR's element occurrence representations are mapped representations of plants, animals, and exemplary natural communities, which are tracked by the VDCR NHP due to their rarity. Each occurrence is represented by a polygon indicating its known location. The polygons are intended to indicate the full known aerial extent of the occurrence, modified to account for the locational uncertainty of the source data. The VDGIF's Species Observation (SppObs) dataset includes all verified species documentations maintained by VDGIF.

Twelve threatened and endangered species and one rare species were reviewed for potential of occurrence within the areas potentially crossed by the Project. A summary of the findings is provided in Sections 3.2.4.1 and 3.2.4.2 below. Documented locations of protected species are depicted on Figure 3.2.4 in Appendix A.

3.2.4.1 Federally and State-Listed Endangered and Threatened Species

Because the various queries that indicate potential or actual occurrences of protected species in the vicinity of the Project do not specify exact occurrence locations, a summary of the federally- and state-listed species documented in the vicinity of the Project, either within Loudoun County or the study area, is presented in Table 3.2.4-1. Rare species are summarized in Section 3.2.4.2.

The database queries identified three federally-listed species: northern long-eared bat (*Myotis septentrionalis*), dwarf wedgemussel (*Alasmidonta heterodon*), and yellow lance (*Elliptio lanceolata*). According to the review each of these species has potential to occur in Loudoun County. The VDGIF operates a *Northern Long-eared Bat (NLEB) Winter Habitat and Roost Trees* online mapping system, which shows general locations of known NLEB hibernacula and roost trees. A review of this system did not show a hibernaculum or roost tree in Loudoun County. Dwarf wedgemussel and yellow lance have potential to occur in perennial waterbodies.

The database queries identified 12 state-listed species (which includes the three federally listed species described above) that may occur or are known to occur in the study area. The VDGIF operates a *Little Brown Bat and Tri-colored Bat Winter Habitat and Roosts Application* online mapping system, which shows general locations of known little brown bat and tri-colored bat hibernacula and roost trees. A review of this system did not show a hibernaculum or roost tree in Loudoun County. The VDCR search results indicated that yellow lampmussel and dwarf wedgemussel are known to occur or predicted to occur in Broad Run, which is crossed by Route 2A and Route 2B. The yellow lampmussel is not legally protected by the Commonwealth of Virginia.

TABLE 3.2.4-1

Lockridge 230 kV Line Loop and Lockridge Substation Project
Federal- and State-Listed Species Occurrence in the Project Area

Common Name	Scientific Name	Federal Status	State Status	Global Rank	Habitat	Potential Route Occurrence	Source
FEDERALLY-LISTED SPECIES							
Mammals							
Northern long-eared bat	*Myotis septentrionalis*	LT	LT	G4	Generally associated with old-growth or late successional interior forests. Partially dead or decaying trees are used for breeding, summer day roosting, and foraging. Hibernation occurs primarily in caves, mines, and tunnels.	All	IPaC VaFWIS
Invertebrates							
Dwarf wedgemussel	*Alasmidonta heterodon*	LE	LE	G1	Deep quick running water on cobble, fine gravel, or on firm silt or sandy bottoms.	2A	IPaC VaFWIS NHDE
Yellow lance	*Elliptio lanceolata*	LT	None	G3G4	Main channels of drainages and streams as small as one meter across with clean, coarse, medium-sized sand or gravel substrate.	2A	VaFWIS
STATE-LISTED SPECIES							
Mammals							
Little brown bat	*Myotis lucifugus*	None	LE	G3	Roosts in caves, buildings, rocks, trees, under bridges, and in mines and tunnels. Found in all forested regions of the state.	All	VaFWIS
						All	IPaC VaFWIS
Tri-colored bat	*Perimyotis subflavus*	None	LE	G3	Typically roost in trees near forest edges during summer. Hibernate deep in caves or mines in areas with warm, stable temperatures during winter.	All	VaFWIS
Invertebrates							
Appalachian grizzled skipper	*Pyrgus centaureae Wyandot*	None	LT	G5	Semi-open slopes with sparse herbaceous vegetation and exposed rock or soil.	All	VaFWIS
Brook floater	*Alasmidonta varicosa*	None	LE	G3	Creeks and small rivers, found among rocks in gravel substrates and in sandy shoals, flowing-water habitats only.	2A	VaFWIS
						2A	IPaC VaFWIS NHDE
Green floater	*Lasmigona subviridis*	None	LT	G3	Small to medium streams in quiet pools and eddies with gravel and sand substrates.	2A	NHDE VaFWIS
Birds							
Henslow's sparrow	*Ammodramus henslowii*	None	LT	G4	Open grasslands with few or no woody plants and tall dense grasses and litter layer.	All	VaFWIS
Loggerhead shrike	*Lanius ludovicianus*	None	LT	G4	Open country with scattered shrubs and trees or other tall structures for perching.	All	NHDE VaFWIS

TABLE 3.2.4-1

Lockridge 230 kV Line Loop and Lockridge Substation Project
Federal- and State-Listed Species Occurrence in the Project Area

Common Name	Scientific Name	Federal Status	State Status	Global Rank	Habitat	Potential Route Occurrence	Source
Peregrine falcon	*Falco peregrinus*	None	LT	G4	Tall structures, such as powerline poles, buildings, and rock ledges, in generally open landscapes.	All	VaFWIS
Reptiles							
Wood turtle	*Glyptemys insculpta*	None	LT	G3	Forested floodplains, fields, wet meadows, and farmland with a perennial stream nearby.	All	NHDE VaFWIS

Federal/State Status:
LE Listed as endangered.
LT Listed as threatened.
PT Proposed as threatened.
SOC Species of Concern.
Global Rank:
G1 Critically Imperiled: At very high risk of extinction due to extreme rarity (often five or fewer populations), very steep declines, or other factors.
G2 Imperiled: At high risk of extinction due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors.
G3 Vulnerable: At moderate risk of extinction due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors.
G4 Apparently Secure: Uncommon but not rare; some cause for long-term concern due to declines or other factors.
G5 Secure: Common; widespread, and abundant.
Source:
IPaC U.S. Fish and Wildlife Service Information for Planning and Consultation
NHDE Virginia Department of Conservation and Recreation Natural Heritage Data Explorer
VaFWIS Virginia Department of Game and Inland Fisheries Virginia Fish and Wildlife Information System

Bald Eagle Management

The bald eagle (*Haliaeetus leucocephalus*) is no longer federally listed under the ESA, but it is a state-listed threatened species in Virginia under the Virginia ESA and is protected under Va. Code § 29.1-521 and VDGIF regulations (4 VAC 15-30-10). The bald eagle is also protected under the federal Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act. The "Management of Bald Eagle Nests, Concentration Areas, and Communal Roosts in Virginia: A Guide for Landowners," issued by the VDGIF, provides management practices for avoiding the take of bald eagles and outlines restrictions on construction activities within defined management zones. Proposed activities that have the potential to affect bald eagles are evaluated by the VDGIF on a case-by-case basis (VDGIF 2012).

To obtain the most current eagle nest data, ERM reviewed the Center for Conservation Biology (CCB) website (CCB 2019), which provides information about the Virginia bald eagle population, including the results of the CCB's annual eagle nest survey. According to the CCB database, there is one known bald eagle nest within 5 miles of the study area, and it is located approximately 1,350 feet northeast of Route 1B along Broad Run. Nest LD 1901 was documented to be occupied in 2019. None of the routes are within the 660-foot management buffer for the nest.

3.2.4.2 Species of Concern and Other Documented Occurrences

A summary of the results of the VDCR review are included in Table 3.2.4-2. Species of Concern typically are not afforded the same level of protection as federally- and state-listed endangered and threatened species. NatureServe, an international network of Natural Heritage Programs, assigns a Global Rank based on rarity and conservation status. Species ranked "G1" (global rank 1/critically imperiled) or "G2" (global rank 2/imperiled) are most at risk.

The VDCR conducted an official review of the Project on August 22, 2019. As part of this review, the VDCR concluded that the Project as proposed will not affect any documented state-listed plants or insects, and does not cross any State Natural Area Preserves under VDCR's jurisdiction. The VDCR noted that, as described above, Broad Run is located in the Project study area and has the potential to contain the federally- and state-listed dwarf wedgemussel and the yellow lampmussel, which is does not have a protected status in the Commonwealth of Virginia.

TABLE 3.2.4-2

Lockridge 230 kV Line Loop and Lockridge Substation Project
Virginia Department of Conservation and Recreation Official Review Results:
Species with the Potential to Occur in the Project Area

Common Name	Scientific Name	Federal Status	State Status	Global Rank	Habitat	Source
Invertebrates						
Dwarf wedgemussel	*Alasmidonta heterodon*	LE	LE	G1	Deep quick running water on cobble, fine gravel, or on firm silt or sandy bottoms.	IPaC VaFWIS VDCR
Yellow lampmussel	*Lampsilis cariosa*	None	None	G3G4	Large streams and rivers, found in sand and gravel with good current, and small creeks and ponds.	VDCR

Federal/State Status:
LE Listed as endangered.
Global Rank:
G1 Critically Imperiled: At very high risk of extinction due to extreme rarity (often five or fewer populations), very steep declines, or other factors.
G2 Imperiled: At high risk of extinction due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors.
G3 Vulnerable: At moderate risk of extinction due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors.
G4 Apparently Secure: Uncommon but not rare; some cause for long-term concern due to declines or other factors.
G5 Secure: Common; widespread, and abundant.
Source:
VDCR Virginia Department of Conservation and Recreation Official Review

3.2.5 Vegetation

Local Vegetation Characteristics

The vegetation of the Northern Piedmont has been severely altered by clearing as part of ongoing agricultural and silvicultural practices occurring since European settlement. Prior to the effects of European settlement, the vegetation was influenced by the practices of Native Americans. Writings from early explorers indicate that parts of the Piedmont were once open, savanna-like woodlands and grasslands. Native Americans' practices included burning the forests to drive game and keep the understory of forests clear for hunting. More recently, forests in this area have undergone a cycle of clearing, farming, and regenerating. The fallow farmlands, if left

unattended, undergo a successional regeneration process that generally results in a prevalence of early successional trees such as Virginia pine (*Pinus virginiana*) and tulip-poplar (*Liriodendron tulipifera*), which ultimately matures into oak-hickory forest (Flemming 2004).

The effects of man's influence on the landscape for centuries has resulted in a patchwork of secondary forests, pastures, and agricultural fields. The vegetation of the remaining forests occurring throughout the Project area is now a predominant mix of pine (*Pinus* sp.) and hardwoods, likely including hickories (*Carya* sp.) and oaks (*Quercus* sp.). ERM reviewed publicly available Forest Conservation Model data prepared by the VDCR to assess the value of forest resources crossed by the Project. The area of forested habitat through which the routes pass is ranked by the VDCR as 'Average', with pockets of 'Moderate' conservation value. Furthermore, the forested area is ranked as C4: Moderate for ecological core value (on a scale of C1 for outstanding value to C5 for general value). Overall, the habitat through which the routes pass are not designated as high ranking areas for conservation planning by the VDCR.

ERM reviewed the alternative routes using Google Earth aerial imagery from April 2018 to assess vegetative cover in the study area. Descriptions of the vegetation communities crossed by the alternative routes are provided below.

3.2.5.1 Option 1

Route 1A

Route 1A crosses a mixture of forested, commercial, and open land. Approximately 1,950 feet of the route is within land that has been previously disturbed from development or the installation of utilities and roadways. The remaining approximately 1,320 feet is comprised of forested or open land. From north to south, the route crosses forested land before turning south to follow the Lockridge Road right-of-way for 1,260 feet. The route then turns east and crosses through 250 feet of open land before terminating at the proposed Lockridge Substation location.

Route 1B

Route 1B crosses a mixture of forested, commercial, and open land. Approximately 1,950 feet of the route is within land that has been previously disturbed from development or the installation of utilities and roadways. The remaining approximately 1,440 feet is comprised of forested or open land. From north to south, the route crosses forested land before turning south to follow the Lockridge Road right-of-way for 1,260 feet. The route then turns east and crosses through 250 feet of open land before terminating at the proposed Lockridge Substation location.

Route 1C

Route 1C crosses a mixture of forested, commercial, and open land. Approximately 1,950 feet of the route is within land that has been previously disturbed from development or the installation of utilities and roadways. The remaining approximately 1,660 feet is comprised of forested or open land. From north to south, the route crosses forested land and an existing utility easement before turning south to follow the Lockridge Road right-of-way for 1,260 feet. The route then turns east and crosses through 250 feet of open land before terminating at the proposed Lockridge Substation location.

3.2.5.2 Option 2

Route 2A

Route 2A crosses a mixture of forested land, utility and pipeline easements, and open land. Approximately 2,300 feet of the route is within land that has been previously disturbed from development (e.g., road right of way, utility easement). The remaining 1,180 feet is comprised of forested or open land. The route crosses approximately 850 feet of forested land, a utility easement, and a tributary to Broad Run, before turning east. Once the route turns east, it follows the existing Columbia Gas right-of-way for 1,860 feet and crosses Broad Run, before crossing Lockridge Road and turning south for 510 feet, following the road right-of-way. From there, the route turns east through open land for 250 feet before terminating at the proposed Lockridge Substation location.

Route 2B

Route 2B crosses a mixture of forested land, utility and pipeline easements, and open land. Approximately 1,500 feet of the route is within land that has been previously disturbed from development (e.g., road right of way, utility easement). The remaining 1,740 feet is comprised of forested or open land. The route crosses approximately 840 feet of forested land, a utility easement, and a tributary to Broad Run, before turning east. Once the route turns east, it follows the existing Columbia Gas right-of-way for 1,450 feet and crosses Broad Run, before turning south then east through about 815 feet of forested before crossing through 100 feet of utility easement/open land before terminating at the proposed Lockridge Substation location.

3.3 VISUAL CONDITIONS

ERM identified visually-sensitive areas through review of recent digital aerial photography and site visits. These were defined as areas where an electric transmission line or tree-cleared right-of-way for the overhead route will be out of character with the surrounding visual characteristics of the landscape or individual sites possessing unique scenic qualities or viewsheds. Examples of visually-sensitive areas include residential or recreational areas; historic landscapes or districts; open space; natural features; and individual sites, such as historic sites or buildings.

Life Time Athletic represents the only visually-sensitive feature in the Study Area. The facility is located in the northeastern section of the study area and is situated to the east of the northern portions of Option 1, Routes 1A, 1B, and 1C. In addition to a gym, the athletic facility also includes a large outdoor pool complex located on the west side of the building.

3.3.1 Option 1

Route 1A, 1B, and 1C cross primarily developed areas, commercial/industrial land, and existing road rights-of-way. The routes will require removal of trees along undeveloped parcels between MP 0.3 and 0.6. Visual impacts from these routes will be anticipated to existing and planned developments in this area due to tree removal and the placement of transmission structures in this area. In particular, the construction of either Routes 1A, 1B, or 1C will have varying visual impacts on the Life Time Athletic pool complex.

3.3.2 Option 2

Route 2A will cross a wooded, undeveloped portion of the USPS property before turning west to follow the Columbia Gas pipeline easement across the SDC Ashburn Property. The route will require the removal of trees along from MP 0.1 to 0.5, which includes a crossing of Broad Run. At MP 0.5, Route 2A turns north and will require additional tree clearing along the proposed right-of-way. Although the route will require significant tree clearing, including clearing adjacent to Broad Run, the Project NOVA conceptual plan indicates that approximately 0.25 mile of this crossing will include a proposed building envelope that will be cleared upon development of the site.

Route 2B would cross a forested portion of the of the SDC Ashburn LLC property, then follow the Columbia Gas pipeline easement. The route will require the removal of trees along from MP 0.1 to 0.5, which includes a crossing of Broad Run. At MP 0.5, Route 2B turns north and will require additional tree clearing along the proposed right-of-way. Similar to Route 2A, Route 2B will require significant tree clearing, including clearing adjacent to Broad Run; however, the Project NOVA conceptual plan indicates that approximately 0.3 mile of this crossing will include a proposed building envelopes (located on the north and south sides of the Shellhorn Road Extension) that will be cleared upon development of the site.

Areas with potentially visually-sensitive features subject to tree removal include the perpendicular crossing of Broad Run and the Broad Run Stream Valley Linear Park trail that is planned to be located on the west bank of the Broad Run.

3.4 CULTURAL RESOURCES

Dutton + Associates, LLC (D+A) conducted an analysis of potential cultural resource impacts for the alternative routes under consideration in accordance with the Virginia Department of Historic Resources (VDHR) 2008 *Guidelines for Assessing Impacts of Proposed Electric Transmission Lines and Associated Facilities on Historic Resources in the Commonwealth of Virginia* (January 2008) *(Guidelines)* and *Commonwealth of Virginia State Corporation Commission Division of Public Utility Regulation Guidelines for Transmission Line Applications Filed Under Title 56 of the Code of Virginia* (August 2017). For the pre-application analysis of cultural resources, D+A considered National Historic Landmark (NHL) properties located within a 1.5-mile radius of the centerline; NRHP-listed properties, NHLs, battlefields, and historic landscapes within a 1.0-mile radius of the centerline; NRHP-eligible and -listed properties, NHLs, battlefields, and historic landscapes within a 0.5-mile radius of the centerline; and all of the above qualifying architectural resources as well as archaeological sites located within the right-of-way for each alternative route. Information on the resources in each tier was collected from the Virginia Cultural Resource Information System (V-CRIS). D+A also collected information on battlefields surveyed and assessed by the National Park Service's American Battlefield Protection Program (ABPP) (National Parks Service, 2009). In their focus on nationally significant Civil War battlefields, the ABPP identifies the historic extent of the battle (study area), the areas of fighting on the battlefield (core area located within the study area), and potential National Register boundaries. Mapping of those ABPP boundaries in the form of ArcGIS shape files was reviewed as part of the analysis of potential cultural resource impacts. In addition to those resources, Dominion Energy Virginia is considering potential effects to VDHR easements.

The only considered historic resource that could be affected by alternative routes being reviewed is Broad Run Ford and Ox Road (053-6416), an NRHP-eligible resource located within 0.5 mile of the alternative. The Broad Run Ford is approximately 415 feet north of the nearest

portion of Option 1, which has three alternative routes, and 2,100 feet north of the nearest point of Option 2, which has two alternative routes. No previously recorded archaeological sites are in the area of potential direct impacts for any of the alternative routes under consideration.

Many cultural resources in the vicinity of the Project have not been assessed for NRHP eligibility, and therefore are not included in the pre-application analysis, per VDHR *Guidelines*. Until they have been assessed and a determination made by VDHR, they should be considered potentially eligible for listing in the NRHP. Likewise, there may be as-yet unreported historic and archaeological resources that may ultimately be affected by the proposed undertaking. Any such resources will be addressed during the full cultural resource survey to be conducted following SCC approval of a Project alternative route.

Along with the records review carried out for the four tiers defined by VDHR, D+A conducted field assessments of resource 053-6416 to characterize the nature of potential viewshed impacts that will result from each Project alternative route in accordance with the VDHR *Guidelines*. Digital photographs of the resource and views toward the proposed transmission line alternative routes were taken.

The I Stage I Pre-Application Analysis of Cultural Resources report prepared by D+A is provided in Appendix E.

3.4.1 Archaeological Sites

Crossings of archaeological sites were considered a constraint in this study due to the potential for an electric transmission line to impact archaeological deposits in these areas (for example, due to transmission structure placement, tree clearing or heavy equipment usage within a site). There are no known archaeological sites in the right-of-way proposed for each alternative route.

3.4.2 Historic Resources and Architectural Sites

This section presents information on known resources in the vicinity of each project alternative according to VDHR's tiered study area model. Each alternative under consideration has the potential to affect one architectural resource. The location of the resource in relation to each alternative route is depicted in Figure 3.4.2. Tables 3.4.2-1 through 3.4.2-5 list the considered resource pertinent to each alternative route. Note that no ABPP study area, core area, or potential NRHP boundaries for battlefields are within the relevant tiers for the various options.

The considered resource that lies within the VDHR tiers for Option 1, Route 1A is presented in Table 3.4.2-1. It was subjected to field reconnaissance and a preliminary assessment of effects. The results of that assessment are summarized in Section 4.0.

TABLE 3.4.2-1

Lockridge 230 kV Line Loop and Lockridge Substation Project
Historic Resources in VDHR Tiers for Option 1, Route 1A

Buffer (miles)	Considered Resources	Resource Number	Description
1.0 to 1.5	National Historic Landmarks	–	
0.5 to 1.0	National Register Properties (Listed)	–	
0.0 to 0.5	National Register Properties (Listed)	–	
	National Register – eligible	053-6416	Broad Run Ford and Ox Road
0.0	National Register Properties (Listed)	–	

TABLE 3.4.2-1

Lockridge 230 kV Line Loop and Lockridge Substation Project
Historic Resources in VDHR Tiers for Option 1, Route 1A

Buffer (miles)	Considered Resources	Resource Number	Description
(within right-of-way)	National Register – eligible	–	

The considered resource that lies within the VDHR tiers for Option 1, Route 1B is presented in Table 3.4.2-2. The resource was subjected to field reconnaissance and a preliminary assessment of effects. The results of that assessment are summarized in Section 4.0.

TABLE 3.4.2-2

Lockridge 230 kV Line Loop and Lockridge Substation Project
Historic Resources in VDHR Tiers for Option 1, Route 1B

Buffer (miles)	Considered Resources	Resource Number	Description
1.0 to 1.5	National Historic Landmarks	–	
0.5 to 1.0	National Register Properties (Listed)	–	
0.0 to 0.5	National Register Properties (Listed)	–	
	National Register – eligible	053-6416	Broad Run Ford and Ox Road
0.0 (within right-of-way)	National Register Properties (Listed)	–	
	National Register – eligible	–	

The considered resource that lies within the VDHR tiers for Option 1, Route 1C is presented in Table 3.4.2-3. The resource was subjected to field reconnaissance and a preliminary assessment of effects. The results of that assessment are summarized in Section 4.0.

TABLE 3.4.2-3

Lockridge 230 kV Line Loop and Lockridge Substation Project
Historic Resources in VDHR Tiers for Option 1, Route 1C

Buffer (miles)	Considered Resources	Resource Number	Description
1.0 to 1.5	National Historic Landmarks	–	
0.5 to 1.0	National Register Properties (Listed)	–	
0.0 to 0.5	National Register Properties (Listed)	–	
	National Register – eligible	053-6416	Broad Run Ford and Ox Road
0.0 (within right-of-way)	National Register Properties (Listed)	–	
	National Register – eligible	–	

The considered resource that lies within the VDHR tiers for Option 2, Route 2A is presented in Table 3.4.2-4. The resource was subjected to field reconnaissance and a preliminary assessment of effects. The results of that assessment are summarized in Section 4.0.

TABLE 3.4.2-4

Lockridge 230 kV Line Loop and Lockridge Substation Project
Historic Resources in VDHR Tiers for Option 2, Route 2A

Buffer (miles)	Considered Resources	Resource Number	Description
1.0 to 1.5	National Historic Landmarks	–	
0.5 to 1.0	National Register Properties (Listed)	–	
0.0 to 0.5	National Register Properties (Listed)	–	
	National Register – eligible	053-6416	Broad Run Ford and Ox Road
0.0 (within right-of-way)	National Register Properties (Listed)	–	
	National Register – eligible	–	

The considered resource that lies within the VDHR tiers for Overhead Option 2, Route 2B is presented in Table 3.4.2-5. The resource was subjected to field reconnaissance and a preliminary assessment of effects. The results of that assessment are summarized in Section 4.0.

TABLE 3.4.2-5

Lockridge 230 kV Line Loop and Lockridge Substation Project
Historic Resources in VDHR Tiers for Option 2, Route 2B

Buffer (miles)	Considered Resources	Resource Number	Description
1.0 to 1.5	National Historic Landmarks	–	
0.5 to 1.0	National Register Properties (Listed)	–	
0.0 to 0.5	National Register Properties (Listed)	–	
	National Register – eligible	053-6416	Broad Run Ford and Ox Road
0.0 (within right-of-way)	National Register Properties (Listed)	–	
	National Register – eligible	–	

3.4.3 Summary of Existing Survey Data Performed Under Section 106 or Section 110 of the National Historic Preservation Act

Some portions of the proposed Project alternative routes have been subject to previous cultural resource survey coverage. Research indicates that 26 prior Phase I cultural resource surveys have been conducted within 1 mile of the Project study area, including seven that overlap portions of the Project area or individual alternative routes. Because many segments of proposed alternative routes are concurrent with others, many previous surveys have covered portions of multiple routes. The previous surveys relevant to the proposed alternative routes are indicated in Table 3.4.3-1. The majority of the surveys were for transportation-related projects and private development tracts.

TABLE 3.4.3-1

Lockridge 230 kV Line Loop and Lockridge Substation Project
Cultural Resource Surveys Covering Portions of the Alternative Routes

VDHR Survey #	Title	Author	Date
FX-108	Cultural Resource Inventory and Phase I Archaeological Survey of Route 28 (Sully Rd.) from I-66 to Route 7, Fairfax and Loudoun Counties, Virginia	Presnell Associates, Inc.	1987
LD-047	Report on Phase I Cultural Resources Survey for the USPS Dulles Facility, Loudoun County, VA	WAPORA, Inc.	1989
LD-053	Historic and Archaeological Survey Report Washington Dulles International Airport, Loudoun and Fairfax Counties, VA.	Parsons Engineering Science (Parsons/Parson Management Consultants)	1989
LD-171	Phase I Archaeological Survey of the Proposed Broad Run Technology Park Development (SPEX 2004-0027), Sterling, Loudoun County, Virginia	Ottery Group	2005
LD-177	Phase I Archeological Investigations of the Ca. 29 Acre Cockerille Farm Property, Loudoun County, Virginia	Thunderbird Archaeological Associates (Thunderbird Research Corp.)	2004
LD-332	Phase I Cultural Resources Survey of the Approximately 350-Acre DuPont-Fabros Development Tract, Loudoun County, Virginia	Circa-Cultural Resource Management , LLC	2011
LD-498	Report on the Cultural Resources Survey: Dulles Toll Road Extension Alignment P	WAPORA	1988

3.5 GEOLOGICAL CONSTRAINTS

The Project area is located within the Piedmont geologic province, which is characterized by strongly weathered bedrock due to the humid climate, thick overlying soils and saprolite (weathered bedrock), and rolling topography that becomes more pronounced closer to the Blue Ridge mountains to the west. In general, the Piedmont province consists of several complex geologic terranes where faults separate rock units with differing igneous and metamorphic histories. Based on the Geologic Map of Virginia, the Project area is located within a Mesozoic basin formed during the opening of the Atlantic Ocean. Within this Mesozoic basin, Triassic shales and siltstones that were deposited between approximately 225 and 190 million years ago and were subsequently intruded by fine-grained igneous dikes comprise the bedrock beneath the Project area (Virginia Division of Geology and Mineral Resources 1993; William and Mary Department of Geology 2019).

3.5.1 Mineral Resources

ERM reviewed publicly-available Virginia Department of Mines, Minerals, and Energy (2019) datasets, USGS topographic quadrangles, and recent (2019) digital aerial photographs to

identify mineral resources in the Project area. Based on the review, no active mineral resources were identified within 0.25 mile of the Lockridge Substation or any of the routes considered. The closest active quarry is located 2.5 miles southeast of the Lockridge Substation at the intersection of Route 606 and Route 636 near Herndon.

3.6 ENGINEERING CONSTRAINTS

No significant engineering constraints were identified along Routes 1A, 1B, 1C, 2A, and 2B.

3.7 EXISTING AND PLANNED CORRIDORS WITHIN THE PROJECT AREA

ERM identified existing and planned corridors within the Project area through review of recent digital aerial photography, the Loudoun County 2019 General Plan (Loudoun County, 2019), the Loudoun County 2019 Countywide Transportation Plan (Loudoun County 2019a), meetings with Loudoun County DTCI, and various publicly-available data layers. Existing corridors within the study area that were identified consist of existing electric transmission and pipeline facilities, electric distribution lines, utility easements, and major road corridors. These existing corridors are described below. The existing corridors were identified for the purpose of assessing their potential use as routing or collocation opportunities in the portions of the Project area where new or different rights-of-way will be required. These existing corridors are described below.

3.7.1 Electric Transmission Corridors

Existing electrical transmission or distribution facilities are found within the Project area, but none that are suitable for collocation purposes. Rather, the proposed double circuit 230 kV line loop will tap into either of the two existing 230 kV transmission lines within the study area in order to connect with Lockridge Substation. Option 1 will involve tapping an existing 230 kV line (future Line #2214) at a proposed junction site located 0.2 mile east of the Roundtable Substation. Option 2 will involve tapping an existing 230 kV line (Line #2188) at the proposed junction site, located 0.3 mile east of the Shellhorn Substation. Figure 3.7 shows the locations of the existing transmission corridors in relation to the proposed routes.

3.7.2 Electric Distribution Corridors

A Dominion Energy Virginia overhead and underground electric distribution line right-of-way extends along Lockridge Road from the northwest corner of the proposed substation to the tap point with future Line #2214 on the north side of the study area. The line runs parallel and adjacent to the east side of Lockridge Road and continues north parallel and adjacent to the east side of the planned Prentice Road Extension, parallel with the western boundary of the Life Time Athletic facility.

3.7.3 Pipeline Corridors

Columbia Gas maintains an 80-foot-wide easement containing a natural gas pipeline that runs east to west through the study area and parallel to the north side of the proposed Shellhorn Road Extension. Columbia Gas has informed Dominion Energy Virginia that they will allow a proposed transmission right-of-way to overlap their easement provided that no structures will be built with the pipeline easement.

3.7.4 Major Road Corridors

There are no existing major corridors located within the study area. However, due to significant planned data center development, there are two major road projects planned within the study area that will serve as major east-west connectors. As discussed in Section 3.1.4, the Shellhorn Road Extension project and the Prentice Drive Extension project are scheduled for construction by 2023 and will each require bridges spanning Broad Run and 120-foot rights-of-way (Loudoun County 2019a).

4.0 RESOURCES AFFECTED

Environmental conditions along each of the alternative routes were identified, mapped, and reviewed, as discussed in Section 3.0. Refer to Table 3-1 for a list of environmental features considered during the evaluation process. To further evaluate and consider the environmental advantages and disadvantages of each alternative route, the environmental features potentially affected by these alternative routes were quantified for comparison purposes. A quantified environmental features comparison table for the five routes considered is presented in Table 4-1. The locations of all alternative routes are described in Section 2.1. A discussion and comparison of each route's environmental advantages and disadvantages is presented below.

4.1 LAND USE

4.1.1 Land Ownership/Land Use

4.1.1.1 Option 1

Route 1A

Construction of Route 1A will cross a total of 0.62 mile of land affecting 10.71 acres of right-of-way, of which 1.30 acres will be shared right-of-way (overlapping portions of existing rights-of-way). Of the six parcels crossed, five will be privately owned and one will be federally owned.

Land use along the Route 1A right-of-way consists of 2.60 acres of forest/tree covered property, 2.82 acres identified as turf grass, 3.89 acres identified as pasture land and 1.41 acres of paved/impervious.

Route 1B

Construction of Route 1B will cross a total of 0.64 mile of land affecting 10.97 acres of right-of-way, of which 1.30 acres will be shared right-of-way. Of the six parcels crossed, five will be privately owned and one will be federally owned.

Land use along the Route 1B right-of-way consists of 2.69 acres of forest/tree covered property, 2.86 acres identified as turf grass, 3.89 acres identified as pasture land and 1.53 acres of paved/impervious.

Route 1C

Construction of Route 1C will cross a total of 0.68 mile of land affecting 11.49 acres of right-of-way, of which 1.30 acres will be shared right-of-way. Of the six parcels crossed, five will be privately owned and one will be federally owned.

Land use along the Route 1C right-of-way consists of 3.27 acres of forest/tree covered property, 2.88 acres identified as turf grass, and 3.89 acres identified as pasture land. Approximately 1.41 acres are identified as paved/impervious land and 0.05 acre is identified as wetland.

4.1.1.2 Option 2

Route 2A

Construction of Route 2A will cross a total of 0.66 mile of land affecting 11.24 acres of right-of-way, of which, 2.37 acres will be shared right-of-way. Of the four parcels crossed, three will be privately owned and one parcel will be federally owned.

Land use along the Route 2A right-of-way consists of 3.96 acres of forest/tree covered property, 2.98 acres identified as turf grass, and 3.89 acres identified as pasture land. Approximately 0.26 acre is identified as paved/impervious land and 0.16 acre is identified as hydro (stream/open water).

Route 2B

Construction of Route 2B will cross a total of 0.65 mile of land affecting 11.15 acres of right-of-way, of which 1.68 acres will be shared right-of-way. Of the three parcels crossed, all will be privately owned.

Land use along the Route 2B right-of-way consists of 5.01 acres of forest/tree covered property, 1.98 acres identified as turf grass, and 3.85 acres identified as pasture land. Approximately 0.15 acre is identified as paved/impervious land and 0.16 acre is identified as hydro (stream/open water).

TABLE 4.1-1

Lockridge 230 kV Line Loop and Lockridge Substation Project
Environmental Features Comparison Table for 100-foot-wide Overhead Right-of-Way

		Option 1			Option 2	
Environmental Features	Unit	1A	1B	1C	2A	2B
Route						
Centerline Length	Miles	0.62	0.64	0.68	0.66	0.65
New Right-of-Way Area[1]	Acres	10.71	10.97	11.49	11.24	11.15
Shared Right-of-Way Area[2]	Acres	1.30	1.30	1.30	2.37	1.68
Land Use Features / Constraints						
Existing Road Crossings	Number	1	1	1	1	1
Planned Road Crossings[3]	Number	0	0	0	0	1
Water and Sanitation Easement Crossings	Number	1	1	2	3	3
Parcels Crossed by ROW (total)	Number	6	6	6	4	3
Private	Number	5	5	5	3	0
Federal	Number	1	1	1	1	0
Federal Land Crossed (USPS)	Miles	0.23	0.23	0.23	0.09	0.00
Private Land Crossed	Miles					
Scenic Creek Valley Buffer crossed[4]	Acres	0.0	0.0	0.0	0.83	0.83
Planned Developments Crossed	Number	2	2	2	3	3
Zoning						
Planned Development-Office Park (PDOP)	Miles	0.18	0.20	0.24	0.48	0.57
Planned Development-Industrial Park (PDIP)	Miles	0.20	0.20	0.20	0.07	0.06
Planned Development-General Industrial (PDGI)	Miles	0.24	0.24	0.24	0.10	0.00
Planned Development-Research and Development Park (PDRDP)	Miles	0.00	0.00	0.00	0.02	0.02
Dwellings Within 500 Feet of Centerline	Number	0	0	0	0	0
Dwellings Within 250 Feet of Centerline	Number	0	0	0	0	0
Dwellings Within 100 Feet of Centerline	Number	0	0	0	0	0
Dwellings Within Right-of-Way	Number	0	0	0	0	0
Commercial Buildings Within Right-of-Way	Number	0	0	0	0	0
Existing Land Use/Land Cover[5]						
Forest	Acres	1.30	0.89	1.74	2.46	4.02
Turf Grass	Acres	2.82	2.86	2.88	2.98	1.98
Tree	Acres	1.30	1.80	1.53	1.50	0.99
Impervious	Acres	1.41	1.53	1.41	0.26	0.15
Pasture	Acres	3.89	3.89	3.89	3.89	3.85
Hydro	Acres	0.00	0.00	0.00	0.16	0.16
NWI/Other	Acres	0.00	0.00	0.05	0.00	0.00
Environmental Features						
Waterbody Crossings (NHD, Total)	Number	0	0	0	2[6]	2[6]
Perennial	Number	0	0	0	1[6]	1[6]

TABLE 4.1-1

Lockridge 230 kV Line Loop and Lockridge Substation Project
Environmental Features Comparison Table for 100-foot-wide Overhead Right-of-Way

		Option 1			Option 2	
Environmental Features	Unit	1A	1B	1C	2A	2B
Intermittent	Number	0	0	0	1	1
Wetlands Crossed by Right-of-Way Total	Acres	0.98	1.46	0.95	1.40	1.43
Palustrine Forested Wetlands	Acres	0.15	0.63	0.11	0.22	0.22
Palustrine Emergent Wetlands	Acres	0.83	0.83	0.83	1.18	1.21
Palustrine Shrub Scrub Wetlands	Acres	0.00	0.00	0.01	0.00	0.00
100-year Floodplain Crossed	Acres	1.19	1.66	1.47	3.50	3.50
Forested Land Crossed	Acres	2.86	2.77	3.35	3.99	4.78
Areas of Ecological Significance Crossed (SCUs)[6]	Number	0	0	0	1	1
Bald Eagle Nests Within 330 Feet (Center for Biology, 2019 data)[7]	Number	0	0	0	0	0
Bald Eagle Nests Within 660 Feet (Center for Conservation Biology, 2019 data)	Number	0	0	0	0	0
Cultural Resources Constraints						
Archaeology (VDHR)						
Archaeological Sites Within Right-of-Way	number	0	0	0	0	0
Architectural Resources (VDHR)						
Architectural Resources Within Right-of-Way (Battlefields listed below)	number	0	0	0	0	0
National Register-Eligible and -Listed Properties, Battlefields, Historic Landscapes, and National Historic Landmarks within 0.5 mile	number	1	1	1	1	1
National Register-Listed Properties, Battlefields, Historic Landscapes, and National Historic Landmarks between 0.5 and 1.0 mile	number	0	0	0	0	0
National Historic Landmarks between 1.0 and 1.5 miles	number	0	0	0	0	0
Historic Districts (VDHR) Crossed	miles					
	number	0	0	0	0	0
NRHP-Listed Battlefield (VDHR) Crossed	number	0	0	0	0	0
NRHP-Eligible Battlefield (VDHR) Crossed	number	0	0	0	0	0
Easements (VDHR) Crossed	number	0	0	0	0	0
Historic High Sensitivity Areas (PWC only)	number	0	0	0	0	0
Prehistoric Sensitivity Areas (PWC only)	number	0	0	0	0	0
Battlefields (National Park Service ABPP)	number	0	0	0	0	0
Collocation Opportunities						

TABLE 4.1-1

Lockridge 230 kV Line Loop and Lockridge Substation Project
Environmental Features Comparison Table for 100-foot-wide Overhead Right-of-Way

		Option 1			Option 2	
Environmental Features	Unit	1A	1B	1C	2A	2B
Total Collocation[8]	Miles	0.40	0.47	0.44	0.43	0.27
Columbia Gas Pipeline	Miles	0.00	0.00	0.00	0.35	0.27
Overhead/Underground Distribution Line Easement[9]	Miles	0.40	0.47	0.40	0.08	0.00
Sanitary Sewer Easement	Miles	0.00	0.00	0.04	0.00	0.00
Road Corridor (Lockridge Road)	Miles	0.34	0.34	0.34	0.10	0.00

1 Each route will require new right-of-way easements for their entire length. This number represents the total right-of-way required for each route and includes 3.82 acres required for the proposed Lockridge Substation

2 Shared right-of-way represents the portions of the routes that overlap the rights-of-way of other utilities and roads. However, it should be noted that these overlapping areas will still require new easements. This represents a subset of the New Right-of-Way acres.

3 Per Loudoun County Road Plans.

4 Calculations based on approximate building envelopes and Scenic Creek Valley Buffer shown on Project NOVA Zoning Ordinance Modification Site Plan (ZMOD-2019-0005).

5 Virginia Statewide Land Cover Dataset (2016)

6 Routes 2A and 2B cross Broad Run 670 Stream Conservation Unit (SCU) once. The crossing number indicates the number SCUs crossed rather than the number of crossings of a single SCU.

7 According to the CCB database, there is one known bald eagle nest within five miles of the study area, and it is located approximately 1,000 feet northeast of Alternative Route 1B along Broad Run. Nest LD 1901 was documented to be occupied in 2019.

8 In certain cases, routes are collocated with multiple, parallel features (e.g., Lockridge Road and Dominion Energy Virginia electric distribution line easement) along a particular segment of a route. In these cases, only the longest parallel feature is included in the Total Collocation; therefore, the Total Collocation listed for a route may be lower than the total of the individual feature entries listed below it.

9 Collocation opportunity with overlapping Dominion Energy Virginia electric distribution line right-of-way.

4.1.2 Recreational Use

4.1.2.1 Option 1

Route 1A

Route 1A will cross the southwest corner of the Life Time Athletic property, affecting approximately 0.30 acre. Route 1A will be within 100 feet of the Life Time Athletic outdoor swimming pool area.

Route 1B

Route 1B will cross the southwest corner of the Life Time Athletic property, affecting approximately 0.30 acre. Route 1B will be within 50 feet of the Life Time Athletic outdoor swimming pool area.

Route 1C

Route 1C will cross the southwest corner of the Life Time Athletic property, affecting approximately 0.30 acre. Route 1C will be within 110 feet of the Life Time Athletic outdoor swimming pool area.

4.1.2.2 Option 2

Route 2A

Route 2A will cross the planned Broad Run Stream Valley Linear Park on the west side of the Broad Run crossing where the route is collocated with the Columbia Gas pipeline easement.

Route 2B

The same recreational resource (Broad Run Stream Valley Linear Park) will be affected by the construction of Route 2B at this location.

4.1.3 Planned Developments

4.1.3.1 Option 1

Route 1A

Route 1A will cross 0.18 mile of the Project NOVA planned development, affecting 1.57 acres of the approximate building envelope located north of the proposed Prentice Drive Extension.

The Route 1A right-of-way will parallel and overhang portions of the proposed Prentice Drive Extension project for 0.32 mile.

Route 1B

Route 1B will cross 0.20 mile of the Project NOVA planned development, affecting 0.89 acre of the approximate building envelope located north of the proposed Prentice Drive Extension.

The Route 1B right-of-way will parallel and overhang portions the proposed Prentice Drive Extension project for 0.32 mile.

Route 1C

Route 1C will cross 0.20 mile of the Project NOVA planned development, affecting 0.89 acre of the approximate building envelope located north of the proposed Prentice Drive Extension.

The Route 1C right-of-way will parallel and overhang portions the proposed Prentice Drive Extension project for 0.49 mile.

4.1.3.2 Option 2

Route 2A

Route 2A will parallel, then cross, the proposed Prentice Drive Extension near MP 0.2 before entering the Project NOVA planned development. Route 2A will run along the southern edge of the Project NOVA approximate building envelope located north of the Columbia Gas pipeline. Route 2A will cross 0.48 mile of the planned development and will affect 1.30 acres of the proposed building envelope. Route 2A ties into Line #2188 on the Dulles Berry planned

development, crossing the property for 0.02 mile. Route 2A will not affect any buildable areas of the Dulles Berry planned development.

Route 2B

In order to avoid USPS property, Route 2B will leave the proposed Lockridge Substation to the west and make two crossings of the proposed Shellhorn Road Extension before rejoining Route 2A at MP 0.2.

4.1.4 Conservation Lands

4.1.4.1 Option 1

Route 1A

No conservation easements will be crossed by Route 1A. VDCR did not identify any conservation lands crossed by Route 1A.

Route 1B

No conservation easements will be crossed by Route 1B. VDCR did not identify any conservation lands crossed by Route 1B.

Route 1C

No conservation easements will be crossed by Route 1C. VDCR did not identify any conservation lands crossed by Route 1C.

4.1.4.2 Option 2

Route 2A

No VOF easements or AFDs will be crossed by Route 2A. VDCR identified one conservation land crossed by Route 2A: a stream conservation unit. Broad Run – Route 670 SCU is a branching stream system and is crossed by Route 2A once within the existing Columbia Gas right-of-way. Natural heritage resources of concern associated with this SCU are the yellow lance and the dwarf wedgemussel. The yellow lance has been documented in this SCU, while the dwarf wedgemussel is documented as having the potential to occur in the waterway.

Route 2B

No VOF easements or AFDs will be crossed by Route 2B. The VDCR identified one conservation land crossed by Route 2B: a stream conservation unit. Broad Run – Route 670 SCU is crossed by Route 2B once within the existing Columbia Gas right-of-way. Natural heritage resources of concern associated with this SCU are the yellow lance and the dwarf wedgemussel. The yellow lance has been documented in this SCU, while the dwarf wedgemussel is documented as having the potential to occur in the waterway.

4.1.5 Transportation

4.1.5.1 Option 1

Route 1A

Route 1A will cross one road (Prentice Drive). The road crossing will be spanned.

Route 1B

Route 1B will cross one road (Prentice Drive). The road crossing will be spanned.

Route 1C

Route 1C will cross one road (Prentice Drive). The road crossing will be spanned.

4.1.5.2 Option 2

Route 2A

Route 2A will cross one road (Lockridge Road). The road crossing will be spanned.

Route 2B

Route 2B will cross two roads, the existing Lockridge Road and the Planned Shellhorn Road Extension. All road crossings will be spanned.

4.1.6 Airports

Dominion Energy Virginia consulted with the FAA and the Virginia Department of Aviation. To determine if any of the tower heights associated with each specific tower location would penetrate any of the relevant flight surfaces associated with Runway 19C, the Company conducted a preliminary evaluation of the tower heights and locations using the FAA defined Civil Airport Imaginary Surfaces and applying standard GIS tools, including ESRI's ArcMap 3D and Spatial Extension software. This software was used to create and geo-reference the imaginary surfaces in space and in relationship to the transmission towers.

The ground surface data for the Project area were acquired as contour lines from Loudoun County on June 3, 2019. The 4-foot elevation contour intervals have an assumed margin of error of +/- 2 feet at any given point. The elevation contours were converted to a raster dataset (Digital Elevation Model) for the purpose of conducting the airport analysis. Runway 19C and its associated imaginary surfaces were selected for this analysis because the small Project area (i.e., the area encompassing all tower locations) is bisected by the extended runway centerline associated with Runway 19C's precision approach surface, and therefore represents the most conservative scenario for assessing tower penetration of all of the airport's relevant runway flight surfaces.

Civil airport imaginary surfaces have been established by the FAA with relation to each airport and to each runway. The imaginary surfaces were developed to prevent existing or proposed objects from extending from the ground into navigable airspace. The Civil Airport Imaginary Surfaces evaluated for Runway 19C at Washington-Dulles Airport included:

- Horizontal surface at 463 feet ASL: A horizontal plane 150 feet above the established airport elevation of 313 feet ASL, the perimeter of which is constructed by swinging arcs of specified radii from the center of each end of the primary surface of each runway and connecting the adjacent arcs by lines tangent to those arcs.
- Conical surface: A surface extending outward and upward from the periphery of the horizontal surface at a slope of 20 to 1 for a horizontal distance of 4,000 feet. The conical surface for this runway has an elevation that extends from 463 feet to 663 feet ASL.
- Primary surface: A surface longitudinally centered on a runway. The primary surface extends 200 feet beyond the end of each runway. The elevation of any point on the primary surface is the same as the elevation of the nearest point on the runway centerline.
- Approach Surface: A surface longitudinally centered on the extended runway centerline and extending outward and upward from each end of the primary surface. An approach surface is applied to each end of each runway based upon the type of approach available or planned for that runway end (e.g., precision instrument approach, visual approach).
- Transitional Surface: These surfaces extend outward and upward at right angles to the runway centerline and the runway centerline extended at a slope of 7 to 1 from the sides of the primary surface and from the sides of the approach surfaces. Transitional surfaces for those portions of the precision approach surface that project through and beyond the limits of the conical surface extend a distance of 5,000 feet measured horizontally from the edge of the approach surface and at right angles to the extended runway centerline.

Potential Tower Locations - The distance of potential tower locations from the end of the primary surface associated with Runway 19C vary from approximately 1.78 miles or 9,398 feet (Tower 2B-01 on Route 2B, see Appendix F, Figure 2B-1) to 2.33 miles or 12,302 feet (Tower 1B-08 on Route 1B, see Appendix F, Figure 1B-1). All tower locations for all five of the routes fall within (below) either the horizontal surface or the conical surface and all fall within (below) the approach surface. None of the potential towers for any of the routes are located beyond the conical surface and none fall within (below) the transitional surface associated with the precision approach surface to Runway 19C.

Site-Specific Tower Design and Height Data - Once the towers were located along each route, Company engineers conducted preliminary design engineering to estimate tower height of each tower based on site-specific conditions, tower separation distances and angles, and tower design. Tower design for this Project is planned to consist of double circuit single pole structures. While engineering of tower design and height is preliminary, the height of individual towers is expected to vary between 90 feet and 115 feet above the existing ground surface elevation. The existing ground surface elevation along the centerline of all the routes varies from 220 feet to 263 feet ASL. See Figures 1A-1, 1B-1, 1C-1, 2A-1 and 2B-1 included in Appendix F.

Obstruction Analysis Results - Once the geo-referenced tower locations and site-specific tower height data were entered into the GIS system, and using the current ground level elevation data provided by Loudoun County, these data were overlain by the modeled flight surfaces for Runway 19C to determine whether any of the constructed towers would penetrate any of the flight surfaces. Results of analyses for each tower are presented in Table 4.1.6-1 below and in Figures

1A-2, 1B-2, 1C-2, 2A-2 and 2B-2 included in Appendix G. The profile view figures graphically present the locations and heights of each tower, and the separation distance between the tops of each tower and the imaginary surfaces in question (i.e., the horizontal, conical and approach surfaces).

TABLE 4.1.6-1

Lockridge 230 kV Line Loop and Lockridge Substation
Minimum and Maximum Separation Distances between Towers and Flight Surfaces

Route/ Figure No.	Minimum Separation		Maximum Separation	
	Distance (feet)	Closest Imaginary Surface	Distance (feet)	Closest Imaginary Surface
1A-2	92	Horizontal/Approach	197	Approach
1B-2	92	Horizontal/Approach	208	Approach
1C-2	83	Approach	201	Approach
2A-2	97	Horizontal/Approach	158	Approach
2B-2	82	Approach	158	Approach

Separation distances between the tops of the towers and the relevant flight surfaces are presented above in Table 4.1.6-1 and vary between 82 feet (Route 2B) and 208 feet (Route 1B). In all routes, none of the towers would penetrate any of the surfaces.

Since the FAA manages air traffic in the United States, it will evaluate any physical objects that may affect the safety of aeronautical operations through an obstruction evaluation. During the permitting process, the Company will provide these results and other data to the FAA in support of an obstruction analysis pursuant to 14 CFR Part 77 (Part 77).

The Company also notified Metropolitan Washington Airports Authority (MWAA) regarding the Project. In a letter dated December 9, 2019, MWAA informed the Company that it did not object to any of the routes provided they do not exceed 410 feet Above Mean Sea Level ("AMSL") and expressed a preference for Alternative Route 1B. The Company's proposed structure heights along any of the Proposed or Alternative Routes do not exceed MWAA's limit of 410 feet AMSL, based on preliminary conceptual design and subject to change based on final engineering design. See DEQ Supplement Attachment 2.N.2.

4.2 NATURAL RESOURCES

4.2.1 Wetlands

To minimize impacts on wetland areas, the transmission line will be designed to span or avoid wetlands where possible. Most of the wetlands in the area are associated with streams and rivers, and it is anticipated that these features can be spanned keeping tower locations outside of wetlands. Where the removal of trees or shrubby vegetation occurs within wetlands, Dominion Energy Virginia will use the least intrusive method reasonably possible to clear the corridor. Hand-cutting of vegetation will be conducted, where needed, to avoid and minimize impacts on streams and/or wetlands. There will be no change in contours or redirection of the flow of water, and the amount of spoilage from foundations and structure placement will be minimal. Excess soil in wetlands generated through foundation construction will be removed from the wetland.

Mats will be used for construction equipment to travel over wetlands, as appropriate. Due to the absence of an existing right-of-way, some new access roads may be necessary along this section of the Project. If a section of line cannot be accessed from existing roads, Dominion Energy Virginia may need to install a culvert, ford, or temporary bridge along the right-of-way to

cross small streams. In such cases, some temporary fill material in wetlands adjacent to such crossings may be required. This fill will be placed on erosion control fabric and removed when work is completed, returning ground elevations to original contours. Potential direct impacts on wetlands will be temporary in nature, but a reduction in wetland functions and values will occur where tree clearing within wetlands is necessary.

Upon SCC approval of a route and final line engineering, Dominion Energy Virginia will obtain the appropriate permits from the USACE for work within wetlands to ensure full compliance with Section 404 of the CWA and to minimize potential impacts on wetlands located within the transmission line corridor.

4.2.1.1 Option 1

Route 1A

Based on ERM's desktop wetland and waterbody analysis, Route 1A crosses approximately <0.1 linear mile of wetlands affecting a total of 0.98 acre comprising 0.15 acre of PFO wetlands and 0.83 acre of PEM wetlands.

Route 1B

Based on ERM's desktop wetland and waterbody analysis, Route 1B crosses approximately 0.1 linear mile of wetlands affecting a total of 1.46 acres comprising 0.63 acre of PFO wetlands and 0.83 acre of PEM wetlands.

Route 1C

Based on ERM's desktop wetland and waterbody analysis, Route 1C crosses approximately <0.1 linear mile of wetlands affecting a total of 0.95 acre comprising 0.11 acre of PFO wetlands, 0.83 acre of PEM wetlands, and 0.01 acre of PSS wetlands.

4.2.1.2 Option 2

Route 2A

Based on ERM's desktop wetland and waterbody analysis, Route 2A crosses approximately <0.1 linear mile of wetlands affecting a total of 1.4 acres comprising 0.22 acre of PFO wetlands and 1.18 acres of PEM wetlands.

Route 2B

Route 2B crosses approximately <0.1 linear mile of wetlands affecting a total of 1.43 acres comprising 0.22 acre of PFO wetlands and 1.21 acres of PEM wetlands.

4.2.2 Waterbodies

Short-term, minor water quality impacts could occur during the construction of either alternative route. Such impacts will be associated with the soils from disturbed areas being transported by stormwater into adjacent waters during rain events. Increased turbidity and localized sedimentation of the stream bottom may occur as a result of the runoff. However, these

impacts will be significantly reduced by the implementation of Dominion Energy Virginia's erosion control measures, including the installation of erosion control structures and materials.

Waterways crossed by the Project will be maintained for proper drainage through the use of culverts or other crossing devices, according to Dominion Energy Virginia's standard policies. Where clearing of trees and/or woody shrubs is required, clearing within 100 feet of a stream will be conducted by hand. Vegetation will be at or slightly above ground level, and there will be no grubbing of stumps. Dominion Energy Virginia will use sediment barriers along waterways and steep slopes during construction to protect waterways from soil erosion and sedimentation. If a section of line cannot be accessed from existing roads, Dominion Energy Virginia may need to install a culvert or temporary bridge to cross small streams. In such case, there may be some temporary fill material required that will be placed on erosion control fabric and removed when work is completed, returning the surface to original contours.

4.2.2.1 Option 1

Route 1A

Route 1A will cross no waterbodies or open bodies of water.

Route 1B

Route 1B will cross no waterbodies or open bodies of water.

Route 1C

Route 1C will cross no waterbodies or open bodies of water.

4.2.2.2 Option 2

Route 2A

Route 2A will cross two waterbodies having intermittent or perennial flow (including one perennial stream and one intermittent stream). The proposed crossings include one intermittent tributary to Broad Run and one crossing of perennial Broad Run.

Route 2B

Route 2B follows Route 2A from MP 0.2 to 0.7 and will cross the same streams as Route 2A.

4.2.3 Areas of Ecological Significance

4.2.3.1 Option 1

Route 1A

The VDCR did not identify any SCUs crossed by Route 1A.

Route 1B

The VDCR did not identify any SCUs crossed by Route 1B.

Route 1C

The VDCR did not identify any SCUs crossed by Route 1C.

4.2.3.2 Option 2

Route 2A

The VDCR identified one SCU crossed by Route 2A. Broad Run – Route 670 SCU is a branching stream system and is crossed by Route 2A once within the existing Columbia Gas right-of-way. Natural heritage resources of concern associated with this SCU are the yellow lance and the dwarf wedgemussel. The yellow lance has been documented in this SCU, while the dwarf wedgemussel is documented as having the potential to occur in the waterway.

Route 2B

Construction of the variation Route 2B will require the same crossing of the Broad Run SCU as Route 2A.

4.2.4 Protected Species

4.2.4.1 Federally and/or State-Listed Species

Twelve state-listed species, which includes 3 species that are also federally listed, were identified that may potentially occur within the study area. These species are identified in Table 3.2.4-1 above.

Option 1

Route 1A

Route 1A will cross forested land, which may provide suitable habitat for the federally-listed NLEB, and state-listed little brown bat, tri-colored bat, Appalachian grizzled skipper, Henslow's sparrow, loggerhead shrike, peregrine falcon, and wood turtle.

Route 1B

Route 1B will cross forested land, which may provide suitable habitat for the federally-listed NLEB, and state-listed little brown bat, tri-colored bat, Appalachian grizzled skipper, Henslow's sparrow, loggerhead shrike, peregrine falcon, and wood turtle.

Route 1C

Route 1C will cross forested land, which may provide suitable habitat for the federally-listed NLEB, and state-listed little brown bat, tri-colored bat, Appalachian grizzled skipper, Henslow's sparrow, loggerhead shrike, peregrine falcon, and wood turtle.

Option 2

Route 2A

Route 2A will cross forested land, which may provide suitable habitat for the federally-listed NLEB, and state-listed little brown bat, tri-colored bat, Appalachian grizzled skipper, Henslow's sparrow, loggerhead shrike, peregrine falcon, and wood turtle. The route will also cross one stream, Broad Run – Route 670 SCU, which is historically associated with the federally-listed yellow lance and dwarf wedgemussel.

Route 2B

Route 2B will cross similar habitats as those described for Route 2A.

4.2.4.2 Bald Eagle Management

The study area is not located within an Eagle Concentration Area, and none of the alternative routes are located within the Primary or Secondary Buffers of any documented eagle nest locations. Route 1B is the route nearest to the eagle nest (nest code LD 1901); the nest is approximately 1,350 feet northeast of the route, and outside the 660-foot management buffer global positioning system (GPS) coordinates for this nest, which is located at GPS coordinates 39.005337, -77.455512. The nest was last occupied in 2019. If additional eagle nests are identified within 660 feet of the Project right-of-way, Dominion Energy Virginia will work with the appropriate jurisdictional agencies to minimize any impacts on this species.

4.2.4.3 Federally Listed Species of Concern and Other Documented Occurrences

The VDCR review identified one species of concern with the potential to occur within the study area: yellow lance. The invertebrate is found in aquatic habitats; Broad Run – Route 670 SCU is the only waterway within the study area.

Option 1

Routes 1A, 1B, and 1C will not cross any waterways.

Option 2

Routes 2A and 2B will cross Broad Run – Route 670 SCU, which is historically associated with the yellow lance.

4.2.5 Vegetation

ERM reviewed publicly-available Virginia Statewide Land Cover Dataset (VSLCD) to calculate impacts on vegetation. The vegetation resource primarily affected by installation of a new transmission line will be forested land. Trees will be cleared from right-of-way during construction and the area of forest will be converted to and maintained as an herbaceous cover type for the life the transmission line. Along the existing Columbia Gas right-of-way, most of the trees have already been cleared; however, in certain locations, additional tree clearing could be required where the right-of-way will be expanded to accommodate the new transmission line. Herbaceous vegetation will not be removed but could be temporarily affected by construction and vehicular movement. After construction, vegetation within the existing right-of-way will be allowed

to revert to preconstruction conditions. Disturbed areas resulting from the temporary right-of-way utilization will also be allowed to revert back to preconstruction vegetative conditions.

A summary of potential vegetation impacts for each route is provided in Table 4.2.5-1.

TABLE 4.2.5-1
Lockridge 230 kV Line Loop and Lockridge Substation Project
Vegetation Impacts (acres)

Vegetation Type	Route 1A	Route 1B	Route 1C	Route 2A	Route 2B
Forest [a]	1.30	0.89	1.74	2.46	4.02
Hydro [b]	0.00	0.00	0.00	0.16	0.16
Impervious [c]	1.41	1.53	1.41	0.26	0.15
NWI/Other [d]	0.00	0.00	0.05	0.00	0.00
Pasture land [e]	3.89	3.89	3.89	3.89	3.85
Tree [f]	1.30	1.80	1.53	1.50	0.99
Turf grass [g]	2.82	2.86	2.88	2.98	1.98
TOTAL	**10.71**	**10.97**	**11.49**	**11.24**	**11.15**

[a] Includes areas characterized by tree cover of natural or semi-natural woody vegetation (deciduous, evergreen, and mixed foliage types) over an acre in size.
[b] Includes drainage network and basins such as rivers, streams, lakes, canals, waterways, reservoirs, ponds, bays estuaries, and ocean as defined by the NHD.
[c] Includes areas characterized by a high percentage of constructed materials such as asphalt and concrete, buildings and parking lots.
[d] Includes areas mapped as wetland by the National Wetland Inventory (NWI).
[e] Includes areas of grasses, legumes, or a mixture planted for livestock grazing or the production of seed or hay crops.
[f] Includes areas characterized by tree cover that does not encompass at least an acre in size.
[g] Primarily grasses planted in developed settings for erosion control or aesthetic purposes, as well as natural herbaceous vegetation and undeveloped land.

Source: VSLCD, 2016.

4.2.5.1 Option 1

Route 1A

Route 1A will cross approximately 1.30 acres of forest, 1.41 acres of impervious surface, 3.89 acres of pasture land, 1.3 acres of treed land, and 2.8 acres of turf grass. Based on VSLCD data, approximately 2.6 acres of treed/forest land will be cleared for a permanent right-of-way.

Route 1B

Route 1B will cross approximately 0.89 acre of forest, 1.53 acres of impervious surface, 3.89 acres of pasture land, 1.8 acres of treed land, and 2.86 acres of turf grass. Based on VSLCD data, approximately 2.69 acres of forest/treed land will be cleared for a permanent right-of-way.

Route 1C

Route 1C will cross approximately 1.74 acres of forest, 1.41 acres of impervious surface, 0.05 acre of NWI wetland, 3.89 acres of pasture land, 1.53 acres of treed land, and 2.88 acres of turf grass. Based on VSLCD data, approximately 3.27 acres of forest/treed land will be cleared for a permanent right-of-way.

4.2.5.2 Option 2

Route 2A

Route 2A will cross approximately 2.46 acres of forest, 0.16 acre of hydro, 0.26 acre of impervious surface, 3.89 acres of pasture land, 1.50 acres of treed land, and 2.98 acres of turf

grass. Based on VSLCD data, approximately 3.96 acres of forest/treed land will be cleared for a permanent right-of-way.

Route 2B

Route 2B will cross approximately 4.02 acres of forest, 0.16 acre of hydro, 0.15 acre of impervious surface, 3.85 acres of pasture land, 0.99 acre of treed land, and 1.98 acres of turf grass. Based on VSLCD data, approximately 5.01 acres of forest/treed land will be cleared for a permanent right-of-way.

4.3 VISUAL ASSESSMENT

To assess the potential for the Project to affect viewsheds or visually-sensitive features associated with each route, aerial photographs were reviewed and specific viewer groups were considered, including motorists; recreationalists; and residents. In addition, visual simulations were prepared for the Option 1 Alternative Routes. Visual simulations were prepared for Routes 1A, 1B, and 1C from key observations points (KOPs) associated with Life Time Athletic. A field investigation was undertaken to assess possible visual impacts on cultural resources for each route. Visually-sensitive resources include: scenic byways; recreational areas; and natural areas. Resources listed in or eligible for listing in the NRHP are addressed in Section 4.4. Visual simulations are provided in Appendix G. The proposed structure locations for the various routes are depicted on Appendix A, Figure 4.3.

For each alternative route considered, the new rights-of way will result in a visible change as new structures and electric lines cross areas where a transmission line did not previously exist. The change will not be visible to Loudoun County homeowners because there are no residences within the study area, nor will the towers be visible from residences outside of the study area. The new transmission lines will affect views of users of existing roads, as well as recreational areas. Topography, structure placement, and tree cover can be utilized to minimize visual impacts to some extent.

As discussed above in Section 3.3, Life Time Athletic represents the only visually-sensitive feature in the study area. The facility is located in the northeastern section of the study area and is situated to the east of the northern portions of Option 1, Routes 1A, 1B, and 1C. In addition to a gym, the athletic facility also includes a large outdoor pool complex located on the west side of the building.

4.3.1.1 Option 1

Two KOPs on the Life Time Athletic property were chosen to generate visual simulations and assess possible visual impacts to this sensitive visual feature. KOP 1 (Photo Viewpoint Location #1 in Appendix G, Figure 1) is located just north of the Life Time Athletic pool complex and faces west toward the Project NOVA planned development. KOP 1 was chosen in order to help assess visual impacts from the pool complex where patrons of Life Time Athletic would likely be most sensitive to any change in the existing visual environment. The view from KOP 1 encompasses the pool complex and small outdoor turf training field in the foreground as well as vegetated and treed areas that exist on the perimeter of the Life Time Athletic property. KOP 1 is at a slightly elevated position so the viewshed is not completely enclosed by the line of trees in the foreground.

KOP 2 (Photo Viewpoint Location #2 in Appendix G, Figure 1) is located in the Life Time Athletic parking lot near the main entrance, facing northwest toward the Project NOVA site and the location of Routes 1A, 1B, and 1C. KOP 2 was placed at the front entrance of Life Time Athletic to help assess visual impacts from an area that is highly trafficked by Life Time Athletic patrons. The view from KOP 2 is framed by the front façade of the Life Time Athletic building to the north and the parking lot to the west and south. The view from KOP 2 extends to the property line where the viewshed becomes partially enclosed by the existing line of trees that begin at the edge of the western edge of the Life Time Athletic property.

The visual simulations were conducted in the fall of 2019. Due to seasonality, there is variable foliage on trees which influences the interpretation of the visual assessment. As seen in Appendix G, some of the taller trees have lost their leaves while many the short trees and shrubs have retained their leaves. Foliage on the taller trees impact the visibility of Routes 1A and 1C from KOP 1.

Route 1A

From KOP 1, at least two proposed structures would be visible traversing southeast to northwest across the viewshed (see Appendix G, Figure 2). Because the Route 1A right-of-way is not immediately adjacent to the Life Time Athletic property at this location, existing trees provide a degree of visual mitigation from KOP 1. Appendix G, Figure 2 shows that approximately the top half of proposed structures 1A-06 and 1A-07 would be visible from KOP 1 and extend well above the existing tree canopy. While the two nearest proposed structures are visible from KOP 1, structure 1A-08 to the west would be obscured by existing trees.

From KOP 2, at least two proposed structures are visible traversing south to north across the viewshed (see Appendix G, Figure 5). Because the right-of-way for Route 1A is located near the western edge of the Life Time Athletic property, the proposed structures are visible from KOP 2. Appendix G, Figure 5, illustrates the visual impact of the two nearest tower structures from KOP 2, structures 1A-06 and 1A-05. These two nearest proposed structures are visible across the parking lot from KOP 2, while structures situated to the west are obscured by the existing Life Time Athletic building.

Route 1B

From KOP 1, at least two proposed structures would be visible traversing southeast to northwest across the viewshed (see Appendix G, Figure 3). Because the Route 1B right-of-way is immediately adjacent to the Life Time Athletic property at this location, existing trees would be removed along the property line including some of the taller trees that would provide visual mitigation. Appendix G, Figure 3 shows that the proposed structures nearest the pool would be visible from KOP 1. Structures 1B-06 and 1B-07 extend well above the existing tree canopy and would be easily visible from the pool complex. The two nearest proposed structures are visible from KOP 1, while structure 1B-08, located further west, would be obscured by existing trees.

From KOP 2, at least two proposed structures are visible traversing south to north across the viewshed (see Appendix G, Figure 6). Because the right-of-way for Route 1B is located adjacent to the western edge of the Life Time Athletic property, the majority of the proposed structures are visible from KOP 2, structures 1B-06 and 1B-05. Figure 6, Appendix G illustrates the visual impact of these structures from KOP 2. These proposed structures are visible across the parking lot from KOP 2, while structures situated to the west would be obscured by the existing Life Time Athletic building.

Route 1C

From KOP 1, at least three proposed structures would be visible traversing southeast to west across the viewshed (see Appendix G, Figure 4). Because the right-of-way for Route 1C is not immediately adjacent to the Life Time Athletic property at this location, existing trees provide a degree of visual mitigation from KOP 1. Appendix G, Figure 4 shows that approximately the top half of proposed structure 1C-06 to the south would be visible from KOP 1, while structure 1C-07 in the center of the viewshed is mostly obscured by existing trees. As Route 1C turns west along the proposed Prentice Drive Extension, structures 1C-08 and 1C-09 fall out of view.

From KOP 2, several proposed structures are visible traversing south to west across the viewshed (see Appendix G, Figure 7). Because the right-of-way for Route 1C right-of-way is located near the western edge of the Life Time Athletic property, the proposed structures nearest to the Life Time Athletic property (1C-05, 1C-06, and 1C-07) would be visible from KOP 2. Appendix G, Figure 7 illustrates the visual impact of the three nearest tower structures from KOP 2. Structures 1C-05 and 1C-06 are visible across the parking lot from KOP 2, while structure 1C-07, situated to the west, is partially obscured by existing tree cover.

4.3.1.2 Option 2

Route 2A

Route 2A will be visible from the USPS property and future developments on the Project NOVA property, but will not be visible from Life Time Athletic or other visually sensitive features. At MP 0.4, Route 2A crosses Broad Run and the Broad Run Stream Valley Linear Park on the west side of the Broad Run. Route 2A structures will be visible from any future trail; however, the perpendicular crossing of the proposed trail will minimize visibility for trail users. Furthermore, this section of Route 2A will be collocated and overhang the Columbia Gas pipeline right-of-way, thereby reducing the amount of additional tree clearing in this area.

Route 2B

Construction of Route 2B will result in very similar visual impacts as described for Route 2A.

4.4 CULTURAL RESOURCES

Effects for the considered resources relevant to each proposed route are discussed below. The full Stage I Cultural Resource Report prepared by D+A is provided in Appendix E.

4.4.1 Archaeology Findings

None of the proposed alternatives have archaeological sites mapped within the proposed rights-of-way.

4.4.2 Above-ground Historic Properties

Only one considered resource defined in accordance with VDHR Guidelines is associated with all of the alternative routes. The Broad Run Ford and Ox Road (053-6416) is a linear resource determined potentially eligible for the NRHP. It is within 0.5-mile north of both options and all five routes considered. However, the routes do not intersect the resource.

The setting of the resource has been compromised by non-historic development, including an existing utility easement, which has substantially changed the setting. North of the ford and road trace is a large-scale private development that is still under construction, while to the south, between the ford and the route alternatives, the setting has been compromised by existing transportation and utility corridors. Since proposed improvements related to the Project will be set behind existing non-historic development and utility corridors in the immediate vicinity of resource 053-6416, all of the Project route alternatives will be largely obscured from visibility and not introduce any substantially new or different features into the views from the Broad Run Ford and Ox Road. Further, the extended setting encompassing the resource is already considered compromised and not integral to the significance of the resource. As such, it is D+A's opinion that the proposed Project will have no more than a minimal impact on the Broad Run Ford and Ox Road.

4.5 GEOLOGICAL CONSTRAINTS

There are no mineral operations located within 0.5 mile of the routes considered under Option 1. As such, Routes 1A, 1B and 1C will not impact any identified mineral resources.

There are no mineral operations located within 0.5 mile of Option 2. As such, Routes 2A and 2B will not impact any identified mineral resources.

4.6 COLLOCATION OPPORTUNITIES

4.6.1 Option 1

Route 1A

Route 1A will be collocated with Lockridge Road for 0.34 mile and the Dominion Energy Virginia electric distribution line easement for 0.40 mile. Because these collocation features parallel one another, the total collocation opportunity for this route is equal to the length of the longer feature (i.e., the Dominion Energy Virginia electric distribution line easement) at 0.40 mile.

Route 1B

Route 1B will be collocated with Lockridge Road for 0.34 mile and the Dominion Energy Virginia electric distribution line easement for 0.47 mile. Because these collocation features parallel one another, the total collocation opportunity for this route is equal to the length of the longer feature (i.e., the Dominion Energy Virginia electric distribution line easement) at 0.47 mile.

Route 1C

Route 1C will be collocated with Lockridge Road for 0.34 mile and the Dominion Energy Virginia electric distribution line easement for 0.40 mile. Because these two collocation features parallel one another, the total collocation opportunity for this portion of Route 1C is equal to the length of the longer feature (i.e., the Dominion Energy Virginia electric distribution line easement) at 0.40 mile. Before reaching the tap on future Line #2214, Route 1C parallels the sanitary sewer easement for 0.04 mile.

4.6.2 Option 2

Route 2A

Route 2A will be collocated with Lockridge Road for 0.10 mile and the Dominion Energy Virginia electric distribution line easement for 0.08 mile. Because these two collocation features parallel one another, the total collocation opportunity for this portion of Route 1C is equal to the length of the longer feature (i.e., Lockridge Road) at 0.10 mile. Route 2A is collocated with the Columbia Gas pipeline for 0.35 mile, for a total of 0.45 mile of total collocation.

Route 2B

Route 2B will not be collocated with Lockridge Road or the Dominion Energy Virginia electric distribution line easement. Route 2B is collocated with the Columbia Gas pipeline for 0.27 mile for a total of 0.27 mile of total collocation.

5.0 ANALYSIS OF ALTERNATIVES

5.1 ROUTE ALTERNATIVES

This section provides a summary of the pros and cons of the three alternative routes associated with Option 1 compared with the two routes considered under Option 2.

Considerations relevant to selecting a proposed route from the five alternatives are discussed below:

Length of Route/Amount of New Right-of-Way – The length of routes does not vary significantly between Option 1 and the Option 2 routes. The two shortest routes are Option 1 Routes 1A and 1B (0.62 mile and 0.64 mile, respectively). The next shortest is Route 2B at 0.65 mile, followed by Route 2A at 0.66 mile. The longest route is Route 1C at 0.68 mile. Similarly, Routes 1A and 1B require the least amount of right-of-way at 10.71 and 10.97 acres, respectively. Routes 2B and 2A require the next least amount of right-of-way at 11.15 and 11.24 acres each. Route 1C requires the most right-of-way at 11.49 acres.

Forested Land Affected –The routes affecting the least amount of forested land are Route 1B (2.77 acres), 1A (2.86 acres), and Route 1C (3.35 acres). Route 2A will affect 3.99 acres while the variation will affect the most forested land (4.78 acres). Due to rapid development of data centers, the amount of forestland in Loudoun County is quickly declining. Although the routes vary in the amount of forest land affected, one must consider that a majority of the area within the study area is planned for development.

Wetlands Affected – Routes 1C and Route 1A will affect the least amount of wetlands (0.95 acre and 0.98 acre, respectively), followed by Routes 2A and 2B (1.40 acres and 1.43 acres). Route 1B will affect 1.46 acres. The type of wetland affected by all routes will be primarily emergent followed by forested wetlands. Forested wetlands crossed by the Project will sustain greater construction and operational impacts due to the permanent forest removal necessary for line clearance versus the emergent wetlands where the features can be spanned with limited impacts during construction and operation. Route 1B affects the most forested wetlands (0.63 acre). Routes 2A and 2B each affect 0.2 acre of forested wetlands, while Route 1A affects 0.15 acre of forested wetlands. Route 1C affects the least forested wetland at 0.11 acre.

Waterbody/SCU Crossings – Routes 2A and 2B will both require one intermittent stream crossing (tributary to Broad Run), and one perennial stream crossing of Broad Run, and the associated SCU. Routes 1A, 1B, and 1C will not result in a stream or SCU crossings.

Routing Opportunities – All of the routes make use of existing rights-of-way within the study area by collocating (e.g., Lockridge Road) and in some cases overlapping the existing rights-of-way (e.g., Dominion Energy Virginia electric distribution line and Columbia Gas pipeline easements). Routes 1B and 2A make the most use of existing rights-of-way by collocating and/or overlapping existing rights-of-way at 0.47 and 0.45 mile, respectively, followed by Routes 1C at 0.44 mile and 1A at 0.40 mile. Route 2B utilizes the least amount of existing rights-of-way at 0.27 mile.

Cultural Resources – There is one property that is considered eligible for listing in the NRHP within 0.5-miles of the study area. Field inspection and desktop analysis reveal that the one NRHP-eligible resource within 0.5 mile of the Project area, Broad Run Ford and Ox Road (053-6416) has historical significance related to early transportation in the region and is considered significant for its representation of a colonial-era ford and road; however, its setting has been compromised by a variety of non-historic development in the vicinity. This includes large-scale private development and utility corridors, including an existing transmission line corridor between it and the Project study area. As views from the resource are already interrupted by these features, none of the proposed alternative routes or substation to be set behind them will introduce any substantial new or uncharacteristic features into the already compromised setting. As such, the proposed Project will have no more than a minimal impact on the Broad Run Ford and Ox Road.

Planned Developments – There are three planned developments in the Study Area that could be affected by the Option 1 and Option 2 routes: Project NOVA and the Prentice Drive and Shellhorn Road Extension projects. With the exception of Route 1A, the Option 1 routes largely avoid impacts to Project NOVA. With reference to the Option 2 Routes, Route 2A would have a minimal impact on Project NOVA. However, the impact of Route 2B on Project NOVA would be somewhat more significant. The Company believes that none of the noticed Option 1 and Option 2 Routes will conflict with the County's planned road extension projects (based on preliminary drawings shared by the County) and can co-exist. It is the Company's understanding that the avoidance of any potential constraints to the construction of the extension of the road is of primary importance to Loudoun County.

6.0 CONCLUSIONS AND RECOMMENDATION

The lengths of the routes evaluated do not differ significantly and the environmental features impacted do not vary substantially based on the small study area and similarity of the terrain crossed by the routes. Given the limited variability between the routes considered, the specific resources associated with some or all of the alternative routes that have a noteworthy variance include the following:

- Length of route;
- Amount of forested lands affected;
- Amount of forested wetland affected;
- Amount of new right-of-way required;
- Amount of waterbody/SCU crossings;
- Length of collocation opportunities;
- Visual impacts; and

- Impacts on planned developments.

Considering the factors discussed in this report and listed above, ERM reached the following conclusions:

Option 1, Route 1A was identified as the Proposed Route for three primary reasons, when compared with Routes 1B and 1C. First, in comparison to Route 1B, Route 1A will have much less of a visual impact on the Life Time Athletic facility. In particular, as discussed in Section 4.3, the alignment of Route 1B is very close to an outdoor pool on the east side of this facility and, consequently, the construction of this route would have the greatest visual impact on Life Time Athletic's pool and recreation area. Second, in comparison to Route 1C, Route 1A should have no potential impacts on the construction of the Prentice Drive Extension. The Company believes that none of the noticed Option 1 routes will conflict with the County's planned roads (based on preliminary drawings shared by the County) and can co-exist. However, in comparison to Route 1C, which parallels the northern portion of the Prentice Drive Extension, the northern portion of Route 1A deviates away from that portion of the Prentice Drive Extension.

While all three Option 1 routes affect the planned building envelope of Project NOVA located north of the planned Prentice Drive Extension, Route 1A will result in the greatest impact; however, this route was chosen because it limits impact on the existing Life Time Athletic facility and the planned Prentice Drive Extension. The avoidance of any potential constraints to the construction of the extension of the road is of primary importance to Loudoun County. Because Route 1A is the shortest route and requires the least amount of new right-of-way, it will be the least expensive route to construct. Additionally, Route 1A affects the second least amount of forest land of all the routes considered.

While Route 1B will affect the largest amount of forested wetlands of the routes considered, the forested wetlands occur on a parcel that is subject to the planned development of a data center (Project NOVA). Much of the forest on this parcel will be cleared in conjunction with the development of this data center. Routes 1A and 1B would limit the development of Project NOVA building envelope north of the Prentice Drive Extension.

Routes 2A and 2B are deemed less favorable due to the crossing of Broad Run and the associated SCU and the Broad Run Stream Valley Linear Park planned for the west side of Broad Run. In addition, the Company has determined that Option 2 (Routes 2A and 2B) represent a somewhat less robust electrical solution than the proposed Project, Option 1, (Routes 1A, 1B, and 1C).

For these reasons, the Company has selected Route 1A as its Proposed Route. Finally, in the event that the Company is not able to obtain an easement to cross property managed by USPS and construct any of the Option 1 routes, then Option 2, Route 2B will serve as the Proposed Route.

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DOMINION ENERGY
LOCKRIDGE 230 kV LINE LOOP AND LOCKRIDGE SUBSTATION PROJECT

Environmental Routing Study

Appendix A
Figures

Dominion Energy

Figure 2.0
Overview Map
Lockridge 230 kV Line Loop and Lockridge Substation
Loudoun County, Virginia

- Lockridge Study Area
- Substation Polygon
- Pipeline Right of Way
- Existing Dominion Transmission Lines
- NHD Flowline
- Sanitary Sewer Easement
- Parcel Boundary
- Loudoun County Road Extension

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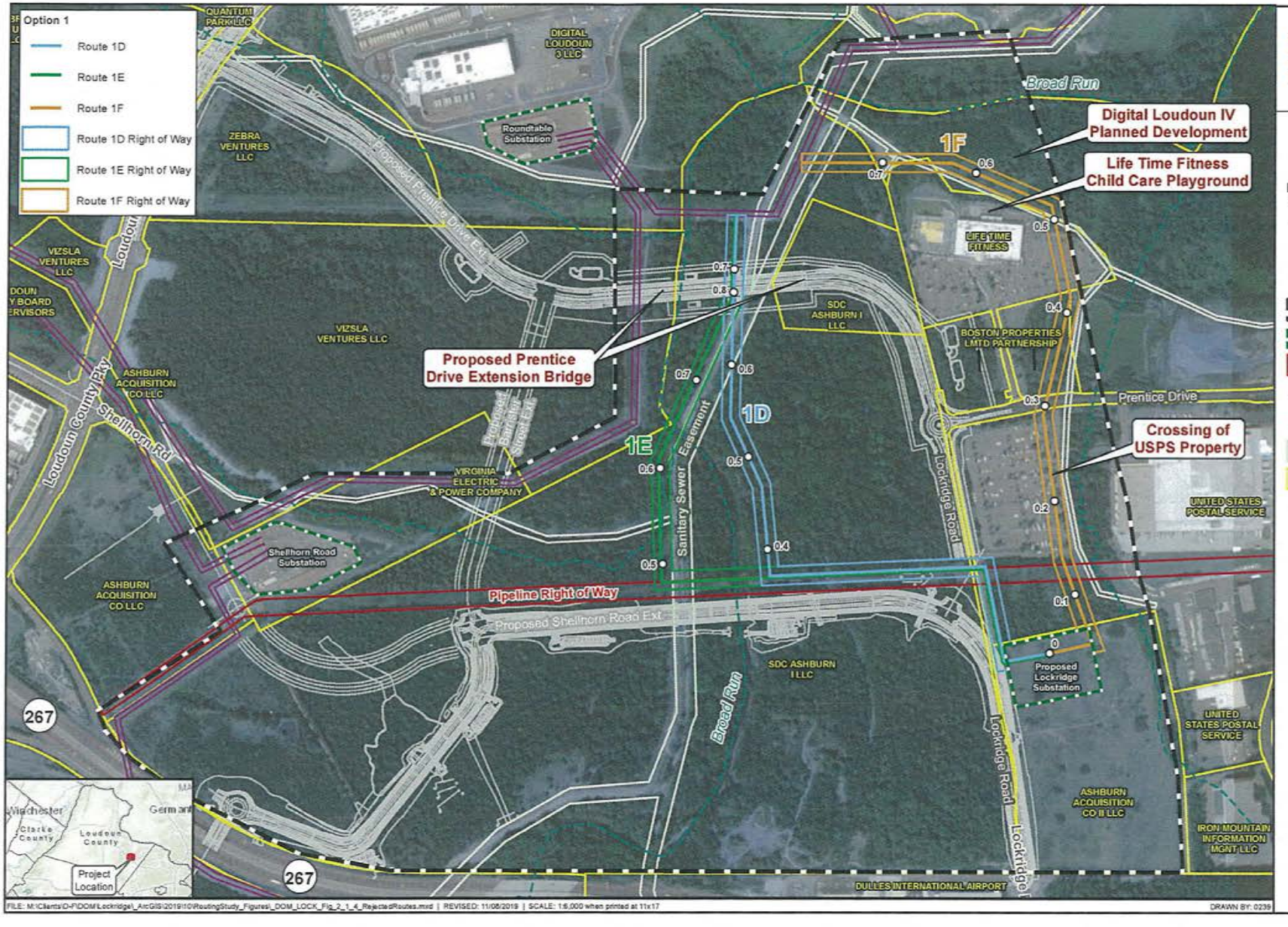

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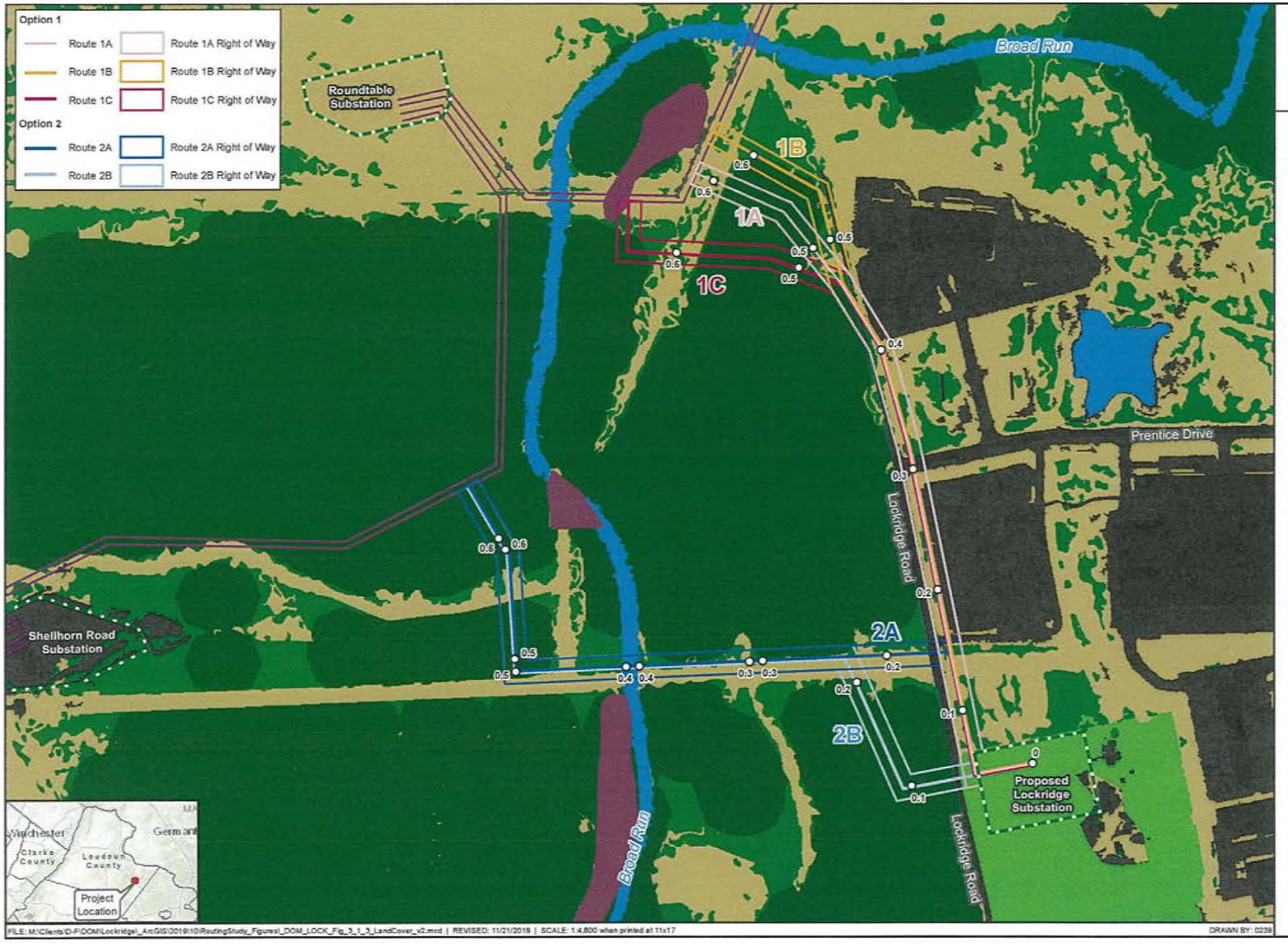
Figure 2.1.4
Rejected Routes
Lockridge 230 kV Line Loop and Lockridge Substation
Loudoun County, Virginia



Dominion Energy

Figure 3.1.3
Existing Land Cover Types
Lockridge 230 kV Line Loop
and Lockridge Substation
Loudoun County, Virginia

- Milepost
- Substation Polygon
- Existing Dominion Transmission Lines

Land Cover Type

- 11 - Hydro
- 21 - Impervious (extracted)
- 22 - Impervious (Local datasets)
- 31 - Barren
- 41 - Forest
- 42 - Tree
- 51 - Scrub/Shrub
- 61 - Harvested/Disturbed
- 71 - TurfGrass
- 81 - Pasture
- 82 - Cropland
- 91 - NWI/Other

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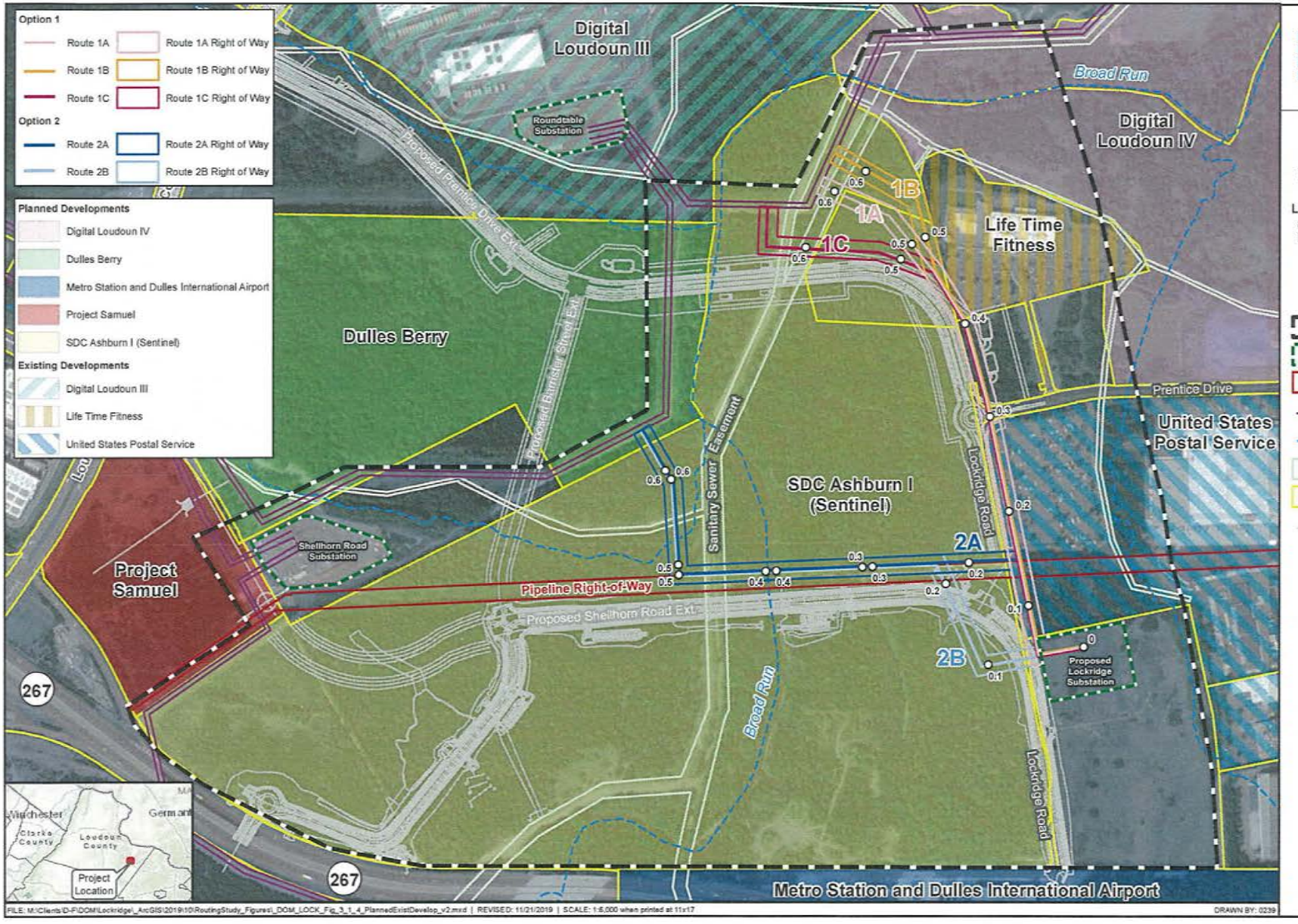

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Figure 3.1.4
Planned and Existing Developments
Lockridge 230 kV Line Loop and Lockridge Substation
Loudoun County, Virginia

- Milepost
- Lockridge Study Area
- Substation Polygon
- Pipeline Right of Way
- Existing Dominion Transmission Lines
- NHD Flowline
- Sanitary Sewer Easement
- Parcel Boundary
- Loudoun County Road Extension

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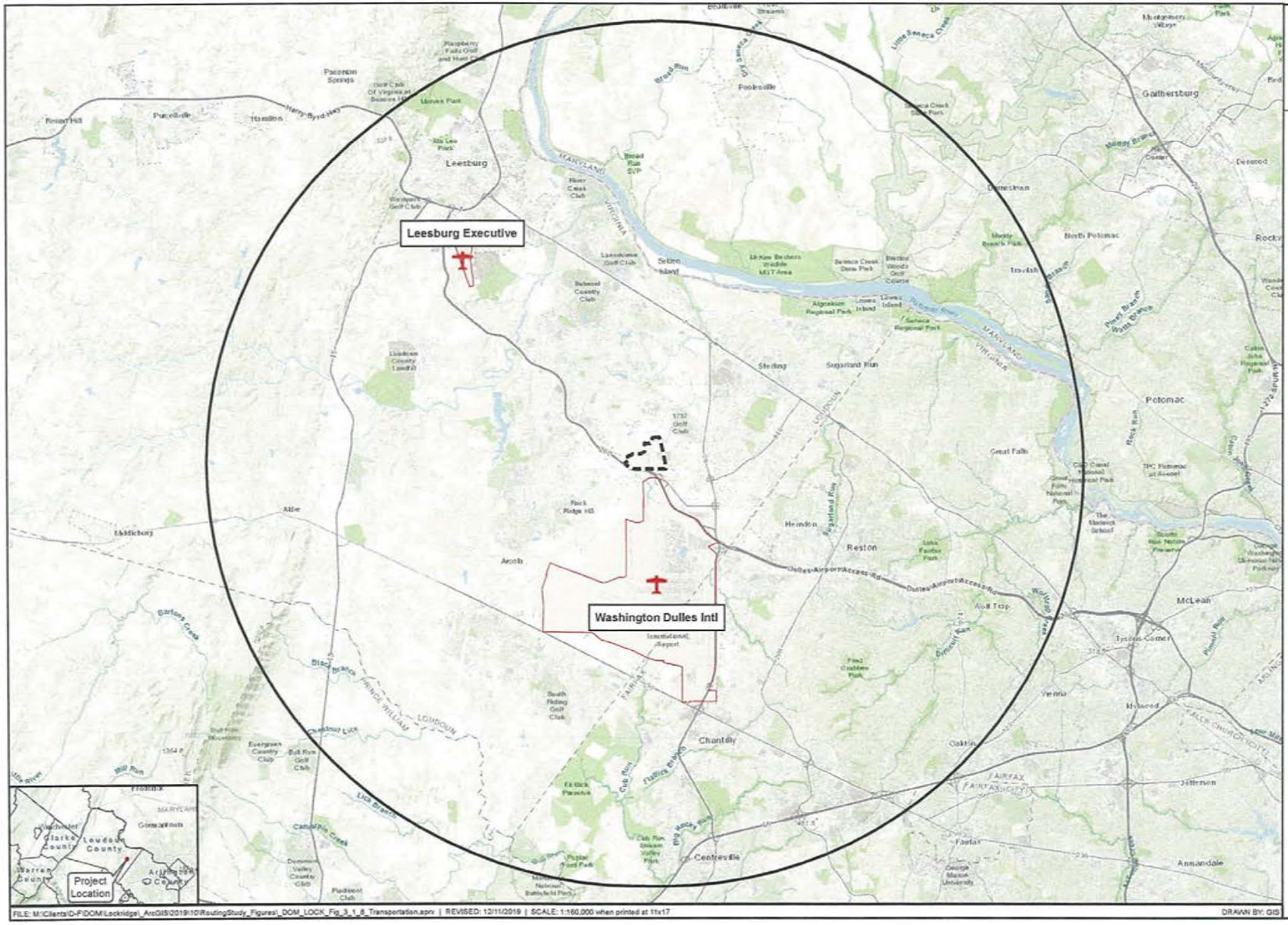
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Study Area
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Figure 3.1.8
Transportation
Lockridge 230 kV Line Loop and Lockridge Substation
Loudoun County, Virginia
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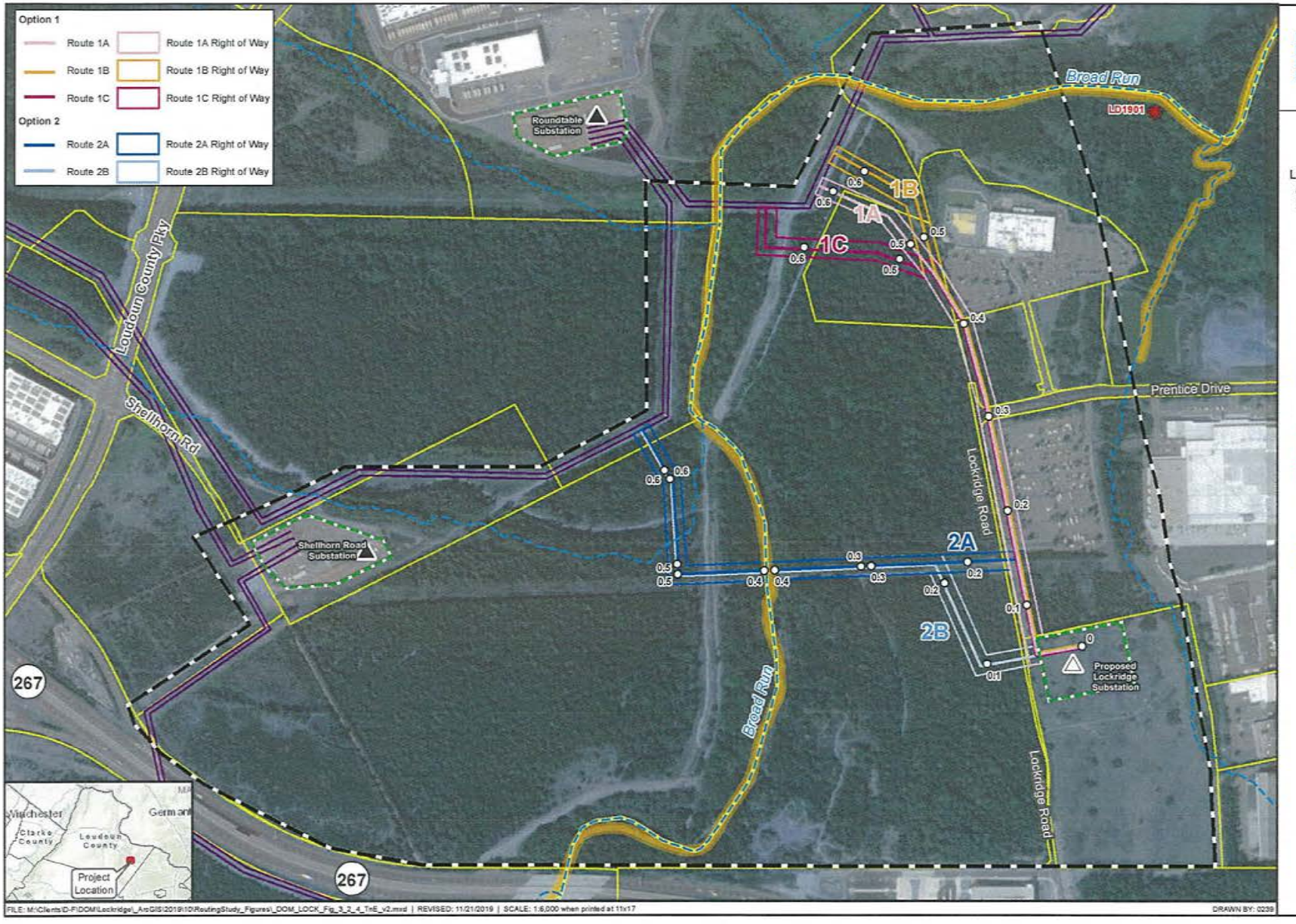

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Figure 3.2.4
Protected Species
Lockridge 230 kV Line Loop and Lockridge Substation
Loudoun County, Virginia

- Milepost
- Bald Eagle Nest
- Yellow Lampmussel and Dwarf Wedgemussel Potential Habitat
- Broad Run Stream Conservation Unit (SCU)
- Lockridge Study Area
- Substation Polygon
- Pipeline Right of Way
- Existing Dominion Transmission Lines
- NHD Flowline
- Parcel Boundary

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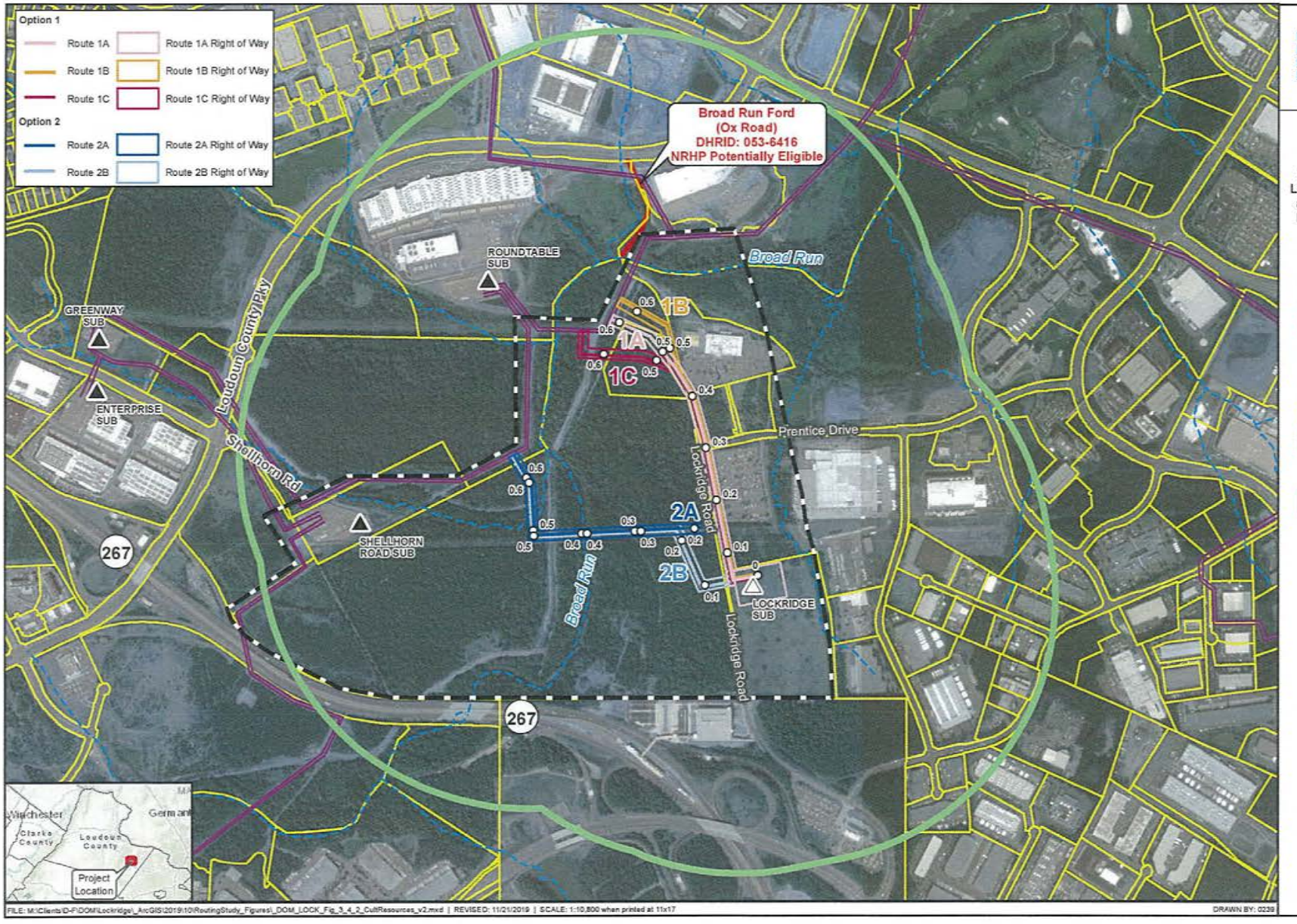

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Figure 3.4.2
Cultural Resources Near the Project Area
Lockridge 230 kV Line Loop and Lockridge Substation
Loudoun County, Virginia

- Milepost
- Lockridge Study Area
- Substation Polygon
- Existing Dominion Transmission Lines
- NHD Flowline
- Parcel Boundary
- 0.5-Mile Workspace Buffer

VDHR Architecture Resource
- Broad Run Ford (Ox Road)

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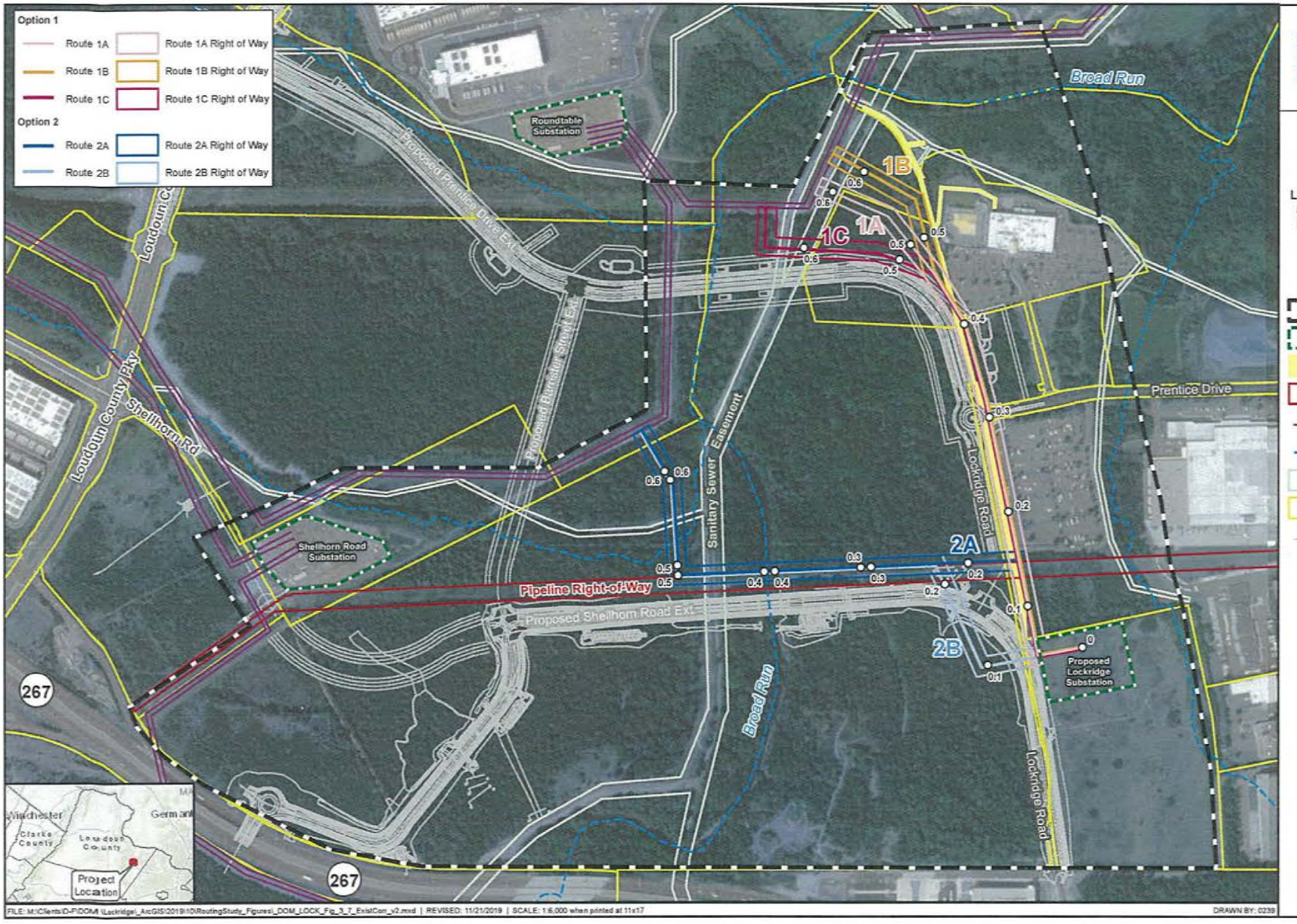

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Figure 3.7
Existing and Planned Corridors
Lockridge 230 kV Line Loop and Lockridge Substation
Loudoun County, Virginia

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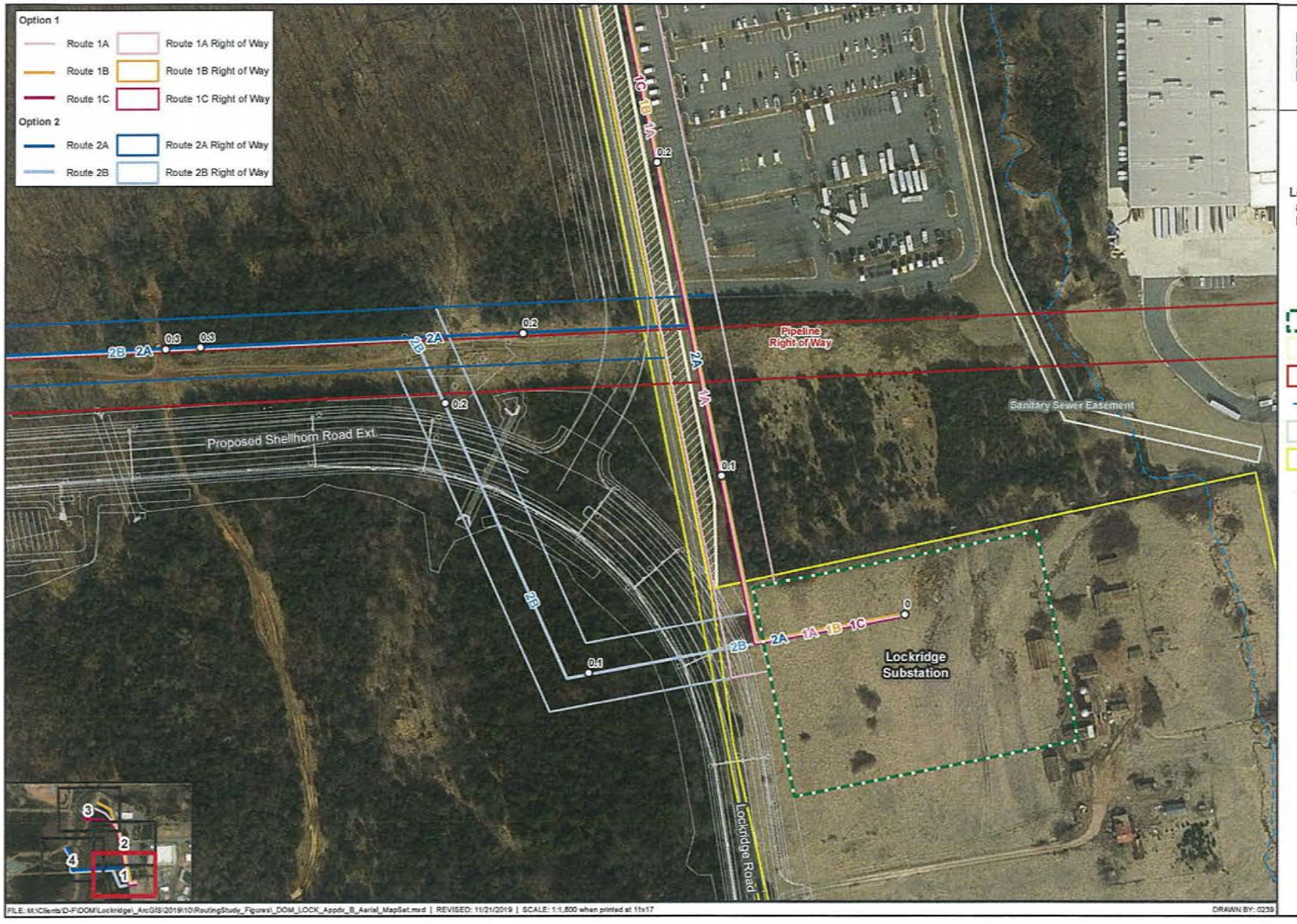
Figure 4.3
Structure Location Map
Lockridge 230 kV Line Loop and Lockridge Substation
Loudoun County, Virginia

DOMINION ENERGY
LOCKRIDGE 230 kV LINE LOOP AND LOCKRIDGE SUBSTATION PROJECT

Environmental Routing Study

Appendix B
Aerial Photo-Based Route Map Set



Dominion Energy®

Appendix B
Aerial Map Set
Lockridge 230 kV Line Loop and Lockridge Substation
Loudoun County, Virginia

- Substation Polygon
- Existing VEPCO Easement
- Pipeline Right of Way
- NHD Flowline
- Sanitary Sewer Easement
- Parcel Boundary
- Loudoun County Road Extension

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ERM

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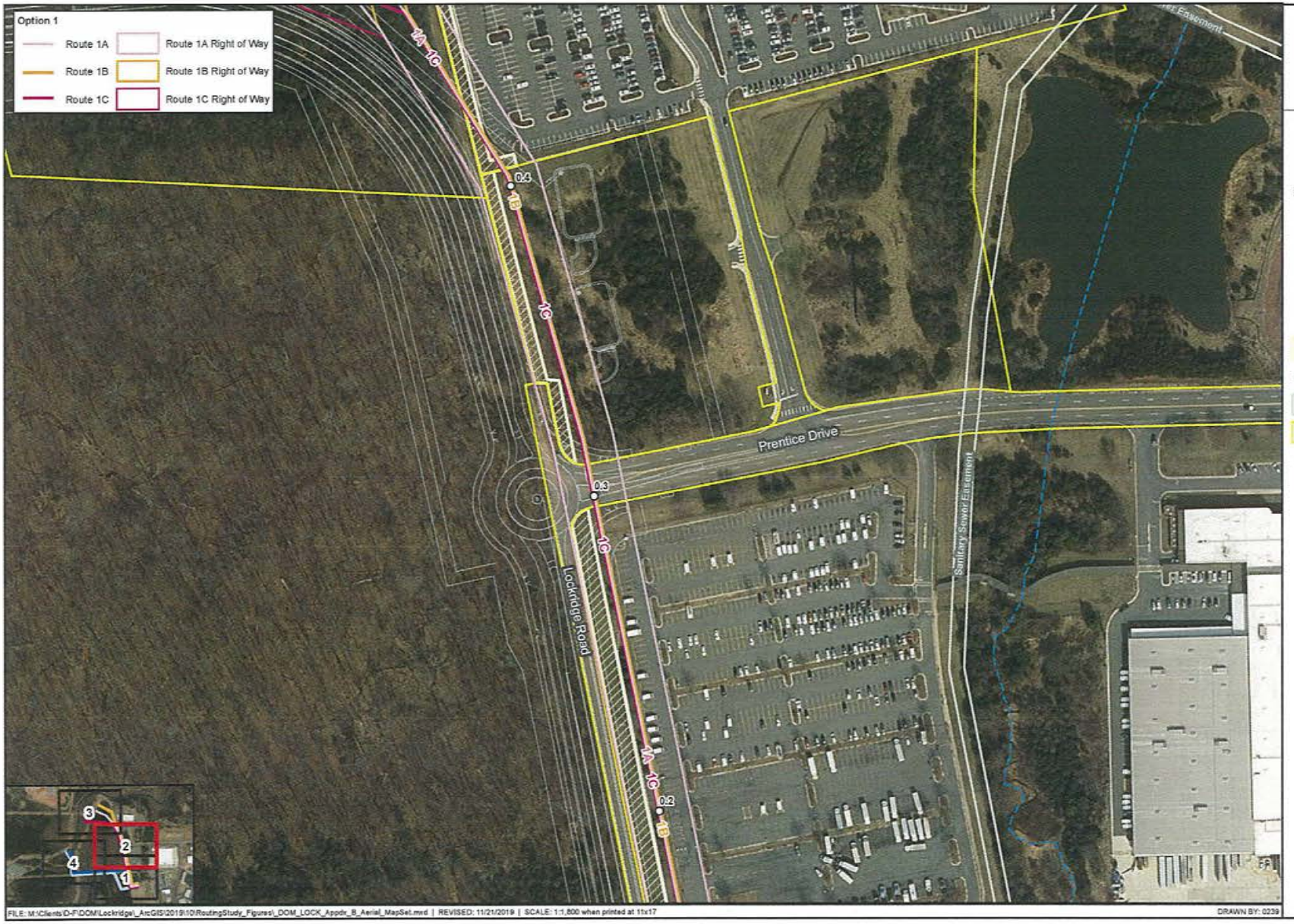

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Appendix B
Aerial Map Set
Lockridge 230 kV Line Loop and Lockridge Substation
Loudoun County, Virginia

Existing VEPCO Easement
NHD Flowline
Sanitary Sewer Easement
Parcel Boundary
Loudoun County Road Extension

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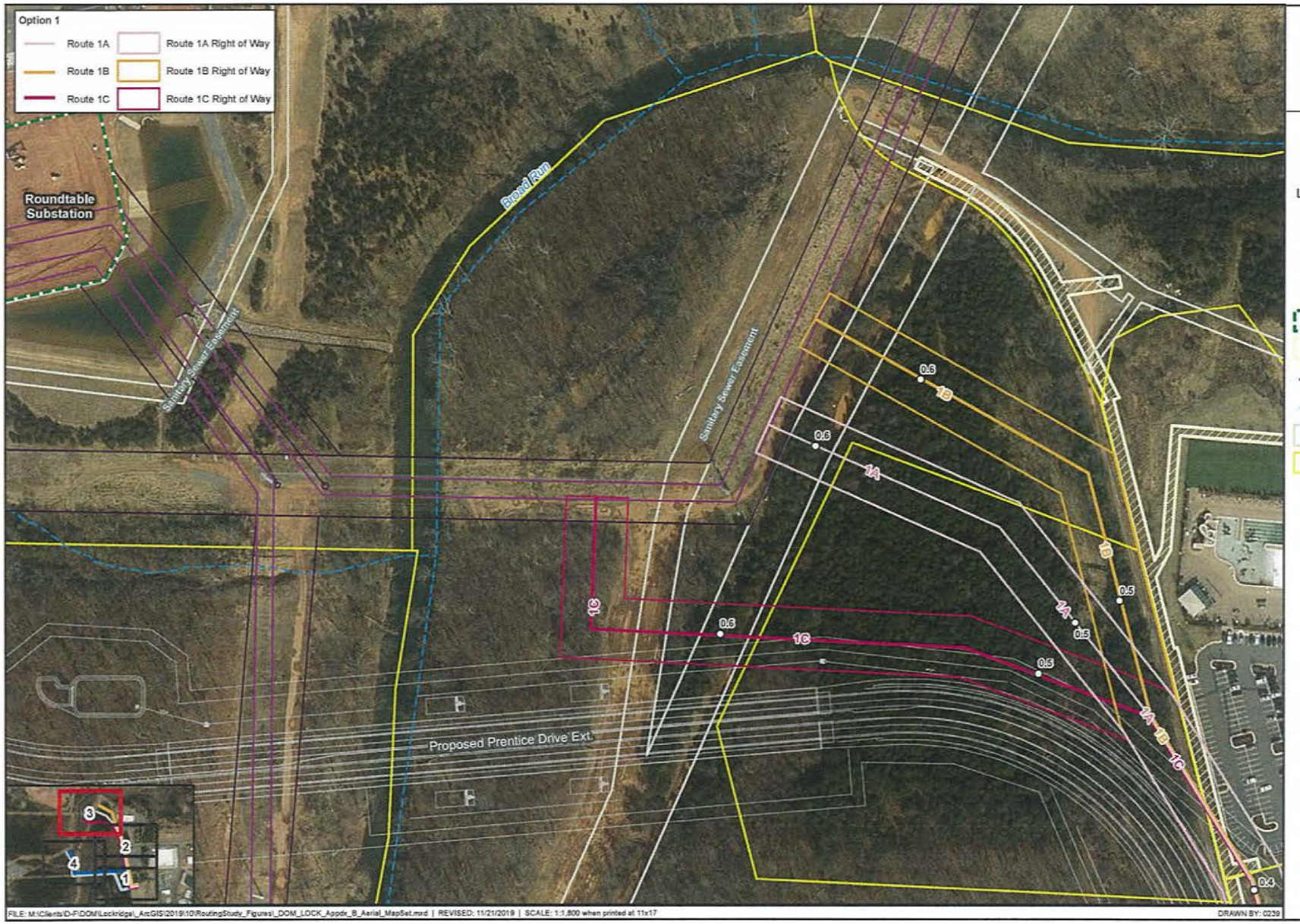

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Dominion Energy®

Appendix B
Aerial Map Set
Lockridge 230 kV Line Loop and Lockridge Substation
Loudoun County, Virginia

- Substation Polygon
- Existing VEPCO Easement
- Existing Dominion Transmission Lines
- NHD Flowline
- Sanitary Sewer Easement
- Parcel Boundary
- Loudoun County Road Extension

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ERM

Dominion Energy®

Appendix B
Aerial Map Set
Lockridge 230 kV Line Loop and Lockridge Substation
Loudoun County, Virginia

Pipeline Right of Way
Existing Dominion Transmission Lines
NHD Flowline
Sanitary Sewer Easement
Parcel Boundary
Loudoun County Road Extension

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ERM

DOMINION ENERGY
LOCKRIDGE 230 kV LINE LOOP AND LOCKRIDGE SUBSTATION PROJECT

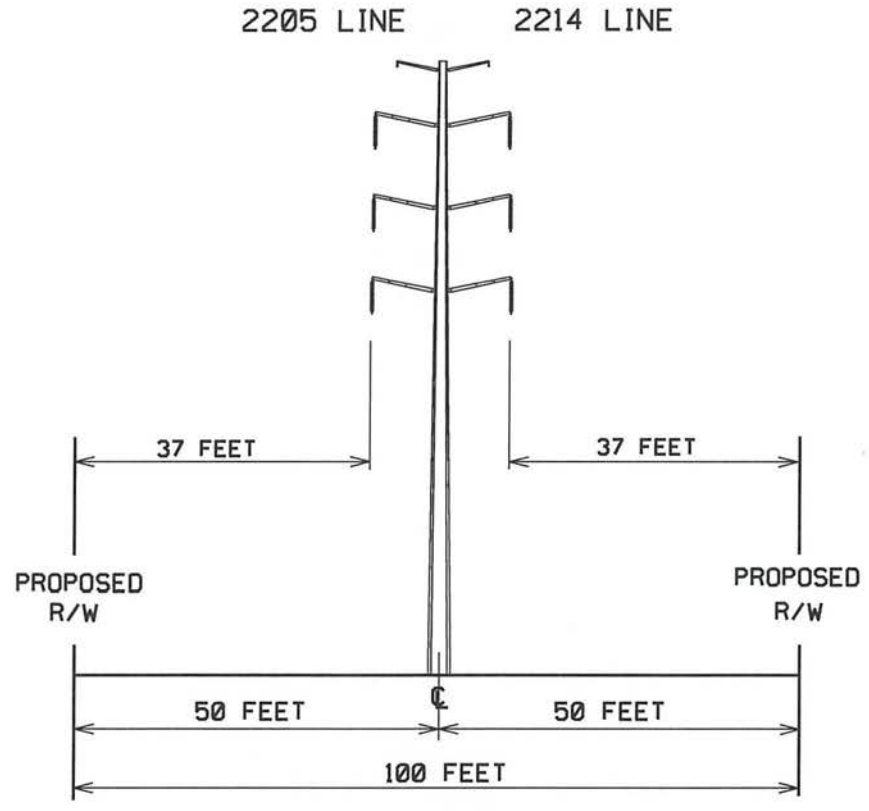
Environmental Routing Study

Appendix C
Structures Types

PROPOSED STRUCTURES

PRELIMINARY

ROUTE 1A



PROPOSED CONFIGURATION

TYPICAL RIGHT OF WAY LOOKING TOWARD LOCKRIDGE

NOTES:
1. ROUTE 1A BORDERS AND SHARES AN ELECTRIC EASEMENT FOR A PORTION OF THE ROUTE
2. INFORMATION CONTAINED ON DRAWING IS TO BE CONSIDERED PRELIMINARY IN NATURE AND SUBJECT TO CHANGE BASED ON FINAL DESIGN

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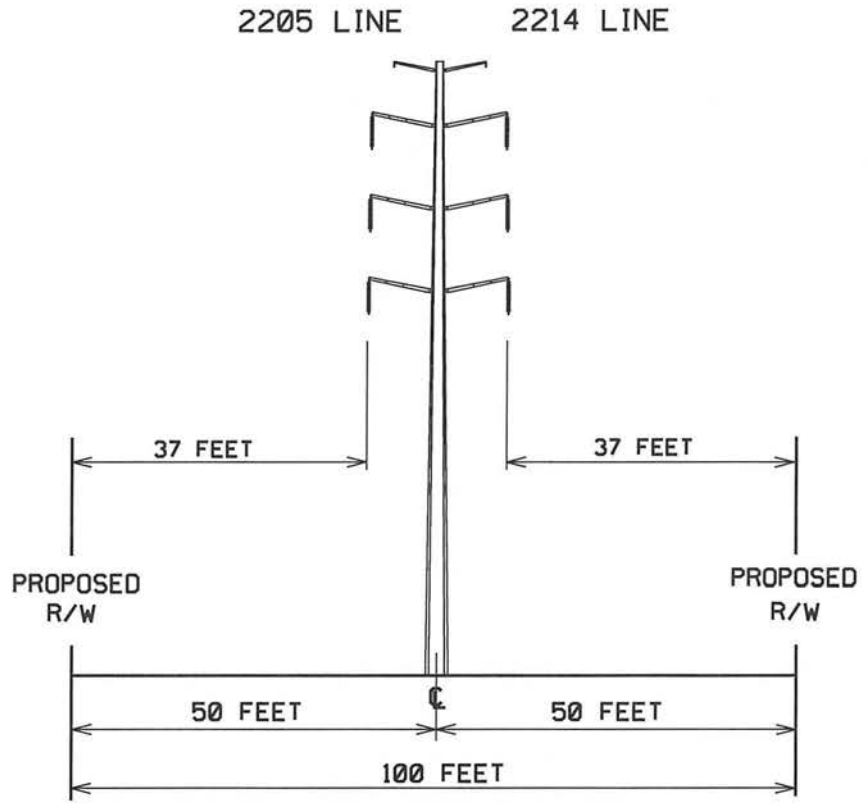
PROPOSED STRUCTURES

PRELIMINARY

ROUTE 1B



PROPOSED CONFIGURATION

TYPICAL RIGHT OF WAY LOOKING TOWARD LOCKRIDGE

NOTES:
1. ROUTE 1B BORDERS AND SHARES AN ELECTRIC EASEMENT FOR A PORTION OF THE ROUTE
2. INFORMATION CONTAINED ON DRAWING IS TO BE CONSIDERED PRELIMINARY IN NATURE AND SUBJECT TO CHANGE BASED ON FINAL DESIGN

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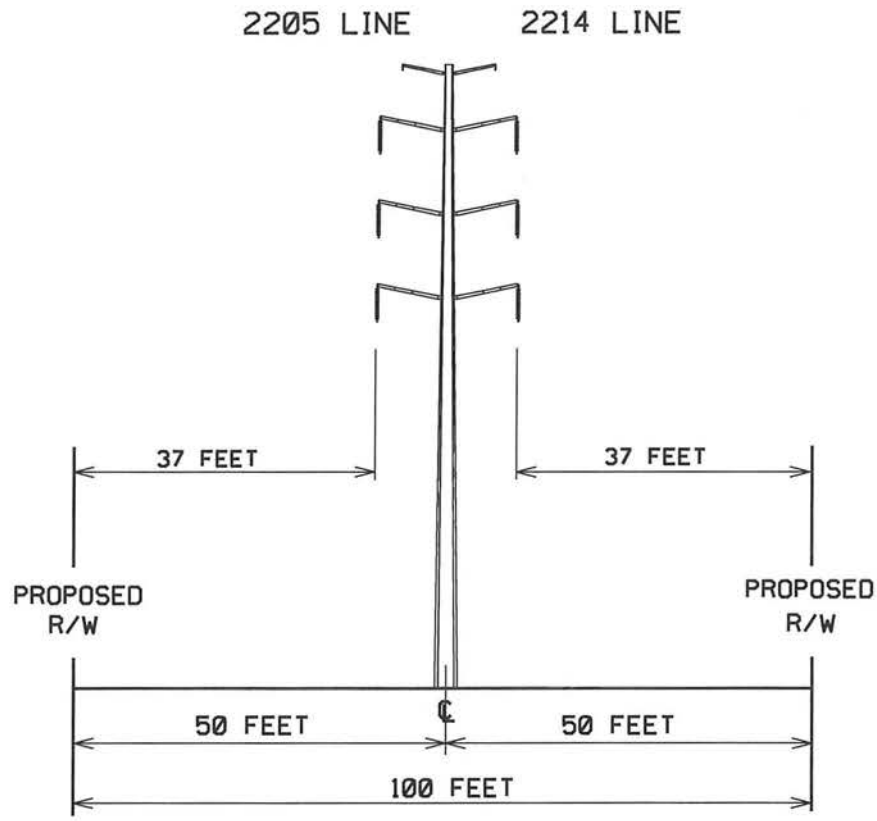
PROPOSED STRUCTURES

PRELIMINARY

ROUTE 1C



PROPOSED CONFIGURATION

TYPICAL RIGHT OF WAY LOOKING TOWARD LOCKRIDGE

NOTES:
1. ROUTE 1C BORDERS AND SHARES AN ELECTRIC EASEMENT FOR A PORTION OF THE ROUTE
2. INFORMATION CONTAINED ON DRAWING IS TO BE CONSIDERED PRELIMINARY IN NATURE AND SUBJECT TO CHANGE BASED ON FINAL DESIGN

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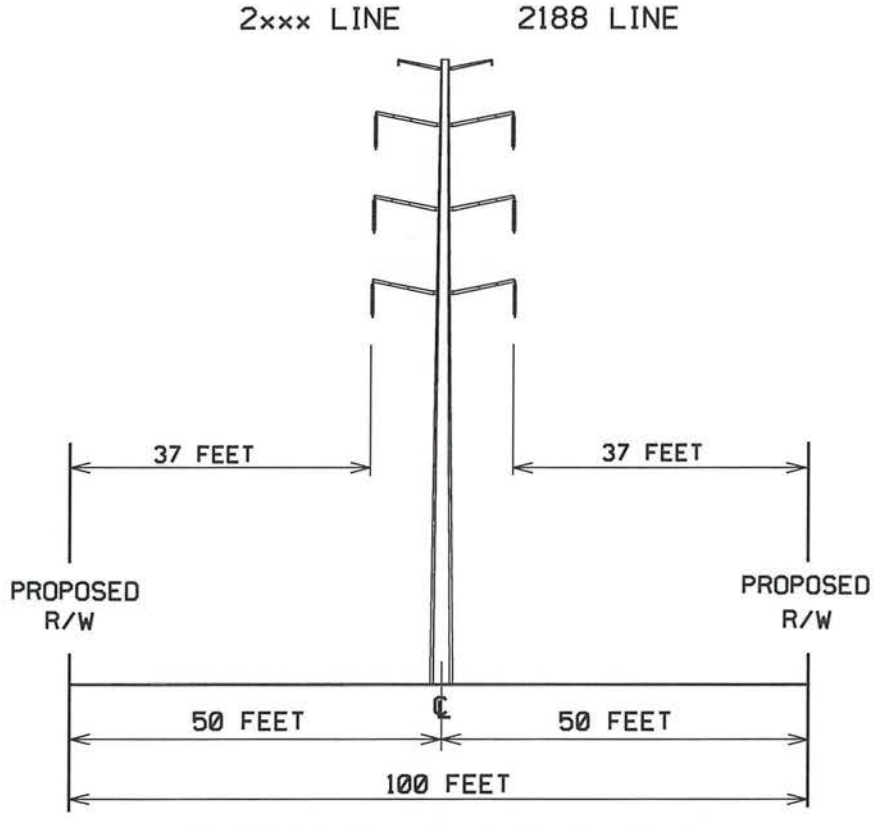
PROPOSED STRUCTURES

PRELIMINARY

ROUTE 2A



PROPOSED CONFIGURATION

TYPICAL RIGHT OF WAY LOOKING TOWARD LOCKRIDGE

NOTES:
1. ROUTE 2A BORDERS AND SHARES A GASLINE AND AN ELECTRIC EASEMENT FOR A PORTION OF THE ROUTE
2. INFORMATION CONTAINED ON DRAWING IS TO BE CONSIDERED PRELIMINARY IN NATURE AND SUBJECT TO CHANGE BASED ON FINAL DESIGN

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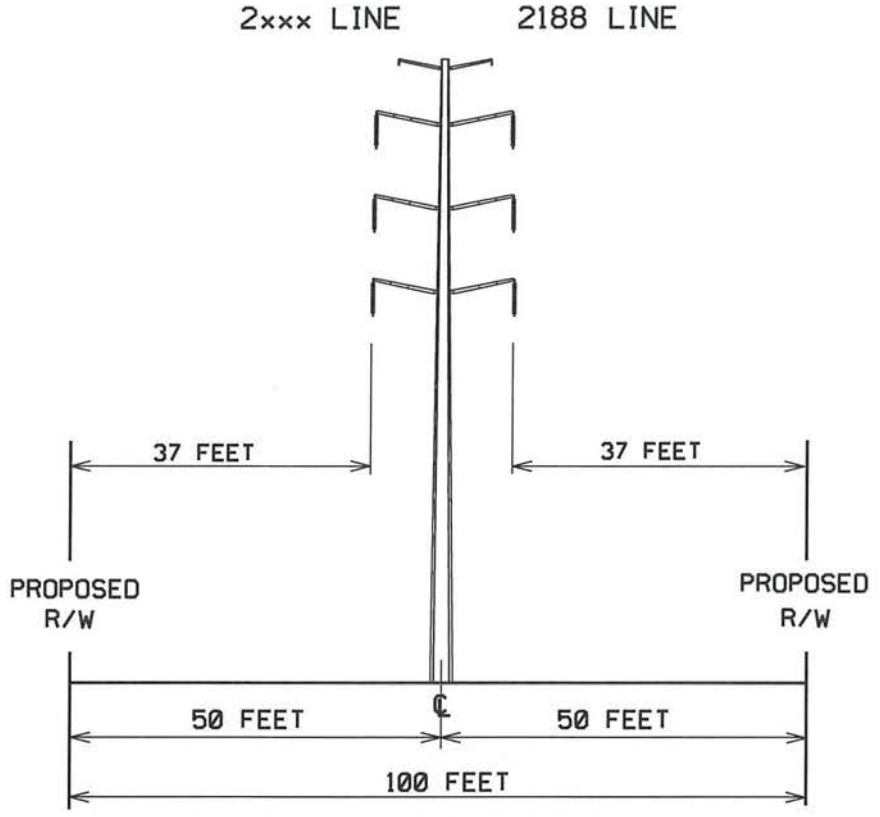
PROPOSED STRUCTURES

ROUTE 2B

PRELIMINARY



PROPOSED CONFIGURATION

TYPICAL RIGHT OF WAY LOOKING TOWARD LOCKRIDGE

NOTES: 1. ROUTE 2B BORDERS AND SHARES A GASLINE EASEMENT FOR A PORTION OF THE ROUTE

2. INFORMATION CONTAINED ON DRAWING IS TO BE CONSIDERED PRELIMINARY IN NATURE AND SUBJECT TO CHANGE BASED ON FINAL DESIGN

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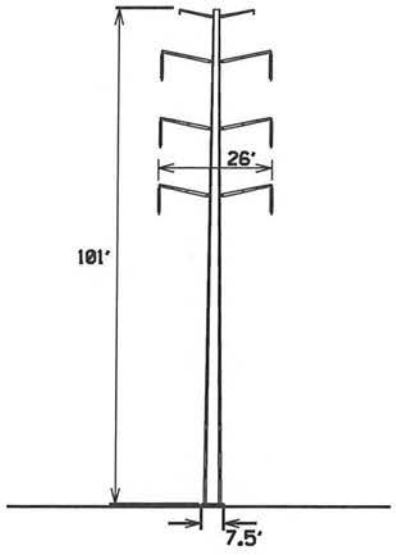
PROPOSED STRUCTURES - ROUTE 1A

PRELIMINARY

2205 LINE 2214 LINE



PROPOSED CONFIGURATION

TYPICAL RIGHT OF WAY LOOKING TOWARD LOCKRIDGE

A: MAPPING OF PREFERRED ROUTE:	SEE ATTACHMENT I.F.1
B: RATIONALE FOR STRUCTURE TYPE :	VERTICAL PROFILE MINIMIZES REQUIRED ROW, RESEMBLES THE STRUCTURE TYPES IN THAT VICINITY
C: LENGTH OF R/W (STRUCTURE QTY.)	0.62 MI (8 STRUCTURES)
D: STRUCTURE MATERIAL :	GALVANIZED STEEL
RATIONALE FOR STRUCTURE MATERIAL :	TO MATCH THE STRUCTURE MATERIAL OF THE ADJACENT TRANSMISSION LINES IN THE VICINITY
E: FOUNDATION/FOUNDATION MATERIAL :	DRILLED PIER/CONCRETE
AVERAGE FOUNDATION REVEAL :	1.5 FEET, SEE NOTE 4
F: AVERAGE WIDTH AT CROSSARM :	26 FEET
G: AVERAGE WIDTH AT BASE :	7.5 FEET
H: MINIMUM STRUCTURE HEIGHT :	90 FEET
MAXIMUM STRUCTURE HEIGHT :	115 FEET
AVERAGE STRUCTURE HEIGHT :	101 FEET
I: AVERAGE SPAN LENGTH :	408 FEET
J: MINIMUM GROUND CLEARANCE AT MOT:	22.5 FEET

NOTES:
1. INFORMATION ON DRAWING IS PRELIMINARY AND SUBJECT TO CHANGE DURING FINAL ENGINEERING
2. INDIVIDUAL POLE HEIGHTS ABOVE GROUND MAY VARY SUBJECT TO FINAL LOCATION AND TERRAIN
3. STRUCTURE HEIGHTS ARE MEASURED FROM CENTERLINE AND DO NOT INCLUDE FOUNDATION REVEAL
4. MINIMUM FOUNDATION REVEAL SHALL BE 1.5', MAX REVEAL SUBJECT TO FINAL LOCATION AND TERRAIN

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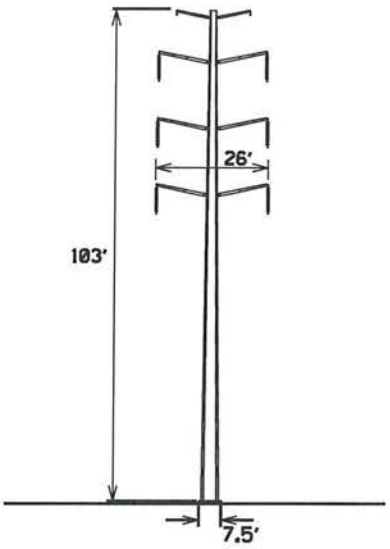
PROPOSED STRUCTURES - ROUTE 1B

2205 LINE 2214 LINE

PRELIMINARY



PROPOSED CONFIGURATION

TYPICAL RIGHT OF WAY LOOKING TOWARD LOCKRIDGE

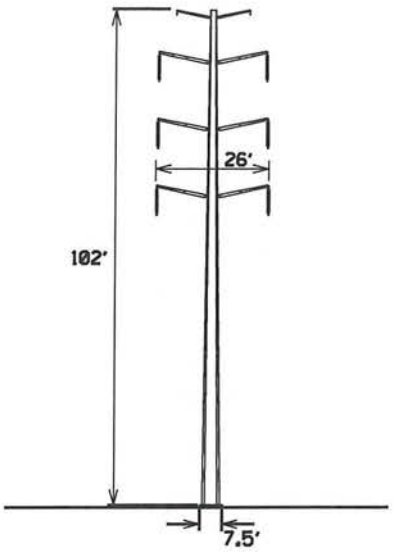
B: RATIONALE FOR STRUCTURE TYPE :	VERTICAL PROFILE MINIMIZES REQUIRED ROW, RESEMBLES THE STRUCTURE TYPES IN THAT VICINITY
C: LENGTH OF R/W (STRUCTURE QTY.)	Ø.64 MI (8 STRUCTURES)
D: STRUCTURE MATERIAL :	GALVANIZED STEEL
RATIONALE FOR STRUCTURE MATERIAL :	TO MATCH THE STRUCTURE MATERIAL OF THE ADJACENT TRANSMISSION LINES IN THE VICINITY
E: FOUNDATION/FOUNDATION MATERIAL :	DRILLED PIER/CONCRETE
AVERAGE FOUNDATION REVEAL :	1.5 FEET, SEE NOTE 4
F: AVERAGE WIDTH AT CROSSARM :	26 FEET
G: AVERAGE WIDTH AT BASE :	7.5 FEET
H: MINIMUM STRUCTURE HEIGHT :	9Ø FEET
MAXIMUM STRUCTURE HEIGHT :	115 FEET
AVERAGE STRUCTURE HEIGHT :	1Ø3 FEET
I: AVERAGE SPAN LENGTH :	421 FEET
J: MINIMUM GROUND CLEARANCE AT MOT:	22.5 FEET

NOTES:
1. INFORMATION ON DRAWING IS PRELIMINARY AND SUBJECT TO CHANGE DURING FINAL ENGINEERING
2. INDIVIDUAL POLE HEIGHTS ABOVE GROUND MAY VARY SUBJECT TO FINAL LOCATION AND TERRAIN
3. STRUCTURE HEIGHTS ARE MEASURED FROM CENTERLINE AND DO NOT INCLUDE FOUNDATION REVEAL
4. MINIMUM FOUNDATION REVEAL SHALL BE 1.5', MAX REVEAL SUBJECT TO FINAL LOCATION AND TERRAIN

PROPOSED STRUCTURES - ROUTE 1C

2205 LINE 2214 LINE

PRELIMINARY



PROPOSED CONFIGURATION

TYPICAL RIGHT OF WAY LOOKING TOWARD LOCKRIDGE

B: RATIONALE FOR STRUCTURE TYPE :	VERTICAL PROFILE MINIMIZES REQUIRED ROW, RESEMBLES THE STRUCTURE TYPES IN THAT VICINITY
C: LENGTH OF R/W (STRUCTURE QTY.)	0.68 MI (9 STRUCTURES)
D: STRUCTURE MATERIAL :	GALVANIZED STEEL
RATIONALE FOR STRUCTURE MATERIAL :	TO MATCH THE STRUCTURE MATERIAL OF THE ADJACENT TRANSMISSION LINES IN THE VICINITY
E: FOUNDATION/FOUNDATION MATERIAL :	DRILLED PIER/CONCRETE
AVERAGE FOUNDATION REVEAL :	1.5 FEET, SEE NOTE 4
F: AVERAGE WIDTH AT CROSSARM :	26 FEET
G: AVERAGE WIDTH AT BASE :	7.5 FEET
H: MINIMUM STRUCTURE HEIGHT :	90 FEET
MAXIMUM STRUCTURE HEIGHT :	115 FEET
AVERAGE STRUCTURE HEIGHT :	102 FEET
I: AVERAGE SPAN LENGTH :	398 FEET
J: MINIMUM GROUND CLEARANCE AT MOT:	22.5 FEET

NOTES:
1. INFORMATION ON DRAWING IS PRELIMINARY AND SUBJECT TO CHANGE DURING FINAL ENGINEERING
2. INDIVIDUAL POLE HEIGHTS ABOVE GROUND MAY VARY SUBJECT TO FINAL LOCATION AND TERRAIN
3. STRUCTURE HEIGHTS ARE MEASURED FROM CENTERLINE AND DO NOT INCLUDE FOUNDATION REVEAL
4. MINIMUM FOUNDATION REVEAL SHALL BE 1.5', MAX REVEAL SUBJECT TO FINAL LOCATION AND TERRAIN

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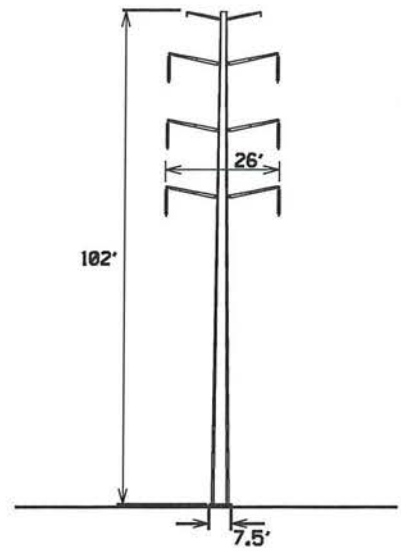
PROPOSED STRUCTURES - ROUTE 2A

2xxx LINE 2188 LINE

PRELIMINARY



PROPOSED CONFIGURATION

TYPICAL RIGHT OF WAY LOOKING TOWARD LOCKRIDGE

B: RATIONALE FOR STRUCTURE TYPE :	VERTICAL PROFILE MINIMIZES REQUIRED ROW, RESEMBLES THE STRUCTURE TYPES IN THAT VICINITY
C: LENGTH OF R/W (STRUCTURE QTY.)	0.66 MI (8 STRUCTURES)
D: STRUCTURE MATERIAL :	GALVANIZED STEEL
RATIONALE FOR STRUCTURE MATERIAL :	TO MATCH THE STRUCTURE MATERIAL OF THE ADJACENT TRANSMISSION LINES IN THE VICINITY
E: FOUNDATION/FOUNDATION MATERIAL :	DRILLED PIER/CONCRETE
AVERAGE FOUNDATION REVEAL :	1.5 FEET, SEE NOTE 4
F: AVERAGE WIDTH AT CROSSARM :	26 FEET
G: AVERAGE WIDTH AT BASE :	7.5 FEET
H: MINIMUM STRUCTURE HEIGHT :	95 FEET
MAXIMUM STRUCTURE HEIGHT :	110 FEET
AVERAGE STRUCTURE HEIGHT :	101 FEET
I: AVERAGE SPAN LENGTH :	435 FEET
J: MINIMUM GROUND CLEARANCE AT MOT:	22.5 FEET

NOTES:
1. INFORMATION ON DRAWING IS PRELIMINARY AND SUBJECT TO CHANGE DURING FINAL ENGINEERING
2. INDIVIDUAL POLE HEIGHTS ABOVE GROUND MAY VARY SUBJECT TO FINAL LOCATION AND TERRAIN
3. STRUCTURE HEIGHTS ARE MEASURED FROM CENTERLINE AND DO NOT INCLUDE FOUNDATION REVEAL
4. MINIMUM FOUNDATION REVEAL SHALL BE 1.5', MAX REVEAL SUBJECT TO FINAL LOCATION AND TERRAIN

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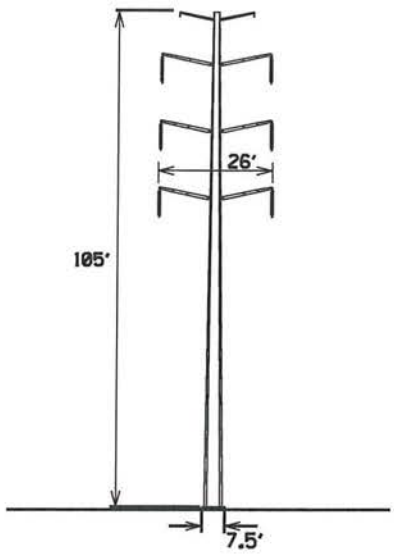
PROPOSED STRUCTURES - ROUTE 2B

PRELIMINARY

2xxx LINE 2188 LINE



PROPOSED CONFIGURATION

TYPICAL RIGHT OF WAY LOOKING TOWARD LOCKRIDGE

B: RATIONALE FOR STRUCTURE TYPE :	VERTICAL PROFILE MINIMIZES REQUIRED ROW, RESEMBLES THE STRUCTURE TYPES IN THAT VICINITY
C: LENGTH OF R/W (STRUCTURE QTY.)	0.65 MI (7 STRUCTURES)
D: STRUCTURE MATERIAL :	GALVANIZED STEEL
RATIONALE FOR STRUCTURE MATERIAL :	TO MATCH THE STRUCTURE MATERIAL OF THE ADJACENT TRANSMISSION LINES IN THE VICINITY
E: FOUNDATION/FOUNDATION MATERIAL :	DRILLED PIER/CONCRETE
AVERAGE FOUNDATION REVEAL :	1.5 FEET, SEE NOTE 4
F: AVERAGE WIDTH AT CROSSARM :	26 FEET
G: AVERAGE WIDTH AT BASE :	7.5 FEET
H: MINIMUM STRUCTURE HEIGHT :	95 FEET
MAXIMUM STRUCTURE HEIGHT :	115 FEET
AVERAGE STRUCTURE HEIGHT :	105 FEET
I: AVERAGE SPAN LENGTH :	490 FEET
J: MINIMUM GROUND CLEARANCE AT MOT:	22.5 FEET

NOTES:
1. INFORMATION ON DRAWING IS PRELIMINARY AND SUBJECT TO CHANGE DURING FINAL ENGINEERING
2. INDIVIDUAL POLE HEIGHTS ABOVE GROUND MAY VARY SUBJECT TO FINAL LOCATION AND TERRAIN
3. STRUCTURE HEIGHTS ARE MEASURED FROM CENTERLINE AND DO NOT INCLUDE FOUNDATION REVEAL
4. MINIMUM FOUNDATION REVEAL SHALL BE 1.5', MAX REVEAL SUBJECT TO FINAL LOCATION AND TERRAIN

$DGNSPEC$

DOMINION ENERGY
LOCKRIDGE 230 kV LINE LOOP AND LOCKRIDGE SUBSTATION PROJECT

Environmental Routing Study

Appendix D
Desktop Wetland Summary Report

Suite 330
300 West Summit Avenue
Charlotte, NC 28203

ERM

telephone (980) 297-7283
facsimile (980) 297-7272
www.ERM.com

December 13, 2019

Ms. Bettina Sullivan, Manager
Virginia Department of Environmental Quality
Office of Environmental Impact Review
P.O. Box 1105
Richmond, Virginia 23218

RE: Wetland and Waterbody Summary
Lockridge 230 kV Line Loop and Lockridge Substation
New SCC Filing

Dear Ms. Sullivan:

Environmental Resources Management (ERM), on behalf of Virginia Electric and Power Company (Dominion Energy Virginia or the Company), conducted a desktop wetland and waterbody review of publically-available information for the proposed Lockridge 230 kV Line Loop and Lockridge Substation located in Loudoun County, Virginia. Attached are two figures: Figure 1 depicts the general location of the proposed Project and Figure 2 illustrates the wetland boundaries that were identified as part of the desktop review.

Dominion Energy Virginia is filing an application with the State Corporation Commission (SCC) for the following:

In order to provide service requested by a retail electric service customer (the Customer); to maintain reliable service for the overall growth in the area; and to comply with mandatory North American Electric Reliability Corporation (NERC) Reliability Standards, Dominion Energy Virginia proposes to construct in Loudoun County, Virginia:

(i) a new approximately 0.7-mile 230 kV double circuit transmission line loop on new right-of-way, supported by eight double circuit, single-shaft galvanized steel poles and utilizing three-phase twin bundled 768.2 ACSS/TW type conductor, from a tap point junction located on future 230 kV Buttermilk-Roundtable Line #2214 approximately 0.3 mile east of the Company's existing Roundtable Substation to a new 230-34.5 kV Lockridge Substation (the Lockridge Loop); and

(ii) a new 230-34.5 kV Lockridge Substation located on land owned by the Customer along Lockridge Road in Loudoun County, Virginia (Lockridge Substation) (the Lockridge Loop and Lockridge Substation, collectively, the Project).

The purpose of this desktop analysis was to identify and evaluate potential impacts of the Project on wetlands and streams. In accordance with Virginia Department of Environmental Quality (DEQ) and the SCC's Memorandum of Agreement, the evaluation was conducted using various data sets that may indicate wetland location and type. The information summarized in this report will be submitted to the DEQ as part of the DEQ Wetland Impacts Consultation.

This assessment did not include the field investigations required for wetland delineations in accordance with the U.S. Army Corps of Engineers Wetland Delineation Manual (Environmental Laboratory, 1987) and the Eastern Mountains and Piedmont Regional Supplement (Environmental Laboratory, 2010).

Project Study Area and Potential Routes

For this Project, Dominion Energy Virginia proposes two new build options that could address reliability and accommodate increased future demand in the area.

- Option 1: a 230 kV overhead route that would tap the future 230 kV Buttermilk-Roundtable Line #2214 between the proposed Lockridge Substation and a proposed junction located east of the Roundtable Substation; and,

- Option 2: a 230 kV overhead route that would tap the existing 230 kV Roundtable-Shellhorn Line #2188 between the proposed Lockridge Substation and a proposed junction located northeast of the Shellhorn Substation.

The Company considered the facilities required to construct and operate the new feeds; the length of new rights-of-way that would be required; the amount of existing development in each area; the potential for environmental impacts on communities; and the relative cost of each option.

Five routes were identified that had the potential to meet the Project objectives. These five routes are described below and depicted in Figures 1 and 2. The Company is including Route 1A as its preferred route (Proposed Route) and is recommending Routes 1B, 1C, 2A, and 2B as acceptable alternative routes for SCC consideration (Alternative Routes). Descriptions of the Proposed Route and Alternative Routes are presented below.

Proposed Route (Option 1, Route 1A)

The length of the corridor for the Proposed Route is approximately 0.62 mile. Beginning at the proposed Lockridge Substation, the Proposed Route heads west from the substation for 0.05 mile before turning north for 0.27 mile along the east side of Lockridge Road. This portion of the route is parallel to and overlaps an existing Dominion Energy Virginia overhead and underground electric distribution line right-of-way, as well as the road verge along the eastern edge of Lockridge Road, and abuts the paved parking lot that services the Dulles Post Office owned by the USPS. After crossing the existing Prentice Drive, the route continues north within the Dominion Energy Virginia right-of-way for about 0.09 mile, following the western boundary of an undeveloped parcel owned by Boston Properties Limited Partnership (Boston Properties). The route then continues across the southwest corner of the Life Time Athletic parking lot. The route then veers slightly northwest for 0.14 mile, away from the Life Time Athletic parking lot, and onto an undeveloped parcel owned by SDC Ashburn I, LLC. The Proposed Route then continues west for 0.07 mile crossing DC Water's Potomac Interceptor easement and Loudoun Water's Broad Run Interceptor easement (referred to collectively as the sanitary sewer easement) until reaching the tap point location with future Line #2214.

Option 1, Route 1B

The length of the corridor for Alternative Route 1B is approximately 0.64 mile. Beginning at the proposed Lockridge Substation, Alternative Route 1B heads west from the substation for 0.05 mile before heading north for 0.27 mile along the east side of Lockridge Road. This portion of the route is parallel to and overlaps an existing Dominion Energy Virginia overhead and underground electric distribution line right-of-way, as well as the road verge along the eastern edge of Lockridge Road, and abuts a paved parking lot that services the Dulles Post Office owned by the USPS. After crossing the existing Prentice Drive, the route continues north for about 0.09 mile, following the western boundary of an undeveloped parcel owned by Digital Loudoun IV, LLC. The route then continues across the southwest corner of the Life Time Athletic parking lot. Alternative Route 1B then veers slightly northwest for 0.06 mile, away from the Life Time Athletic parking lot, and onto an undeveloped parcel owned by SDC Ashburn I, LLC. The route then continues north then west for 0.17 mile, crossing a sanitary sewer easement, until reaching the tap point location to future Line #2214.

Option 1, Route 1C

The length of the corridor for Alternative Route 1C is approximately 0.68 mile. Beginning at the proposed Lockridge Substation, Alternative Route 1C heads west from the substation for 0.05 mile before heading north for 0.27 mile along the east side of Lockridge Road. This portion of the route is parallel to and overlaps an existing Dominion Energy Virginia overhead and underground electric distribution line right-of-way, as well as the road verge along the eastern side of Lockridge Road, and abuts a paved parking lot that services the Dulles Post Office owned by the USPS. After crossing the existing Prentice Drive, the route then continues north for about 0.09 mile, following the western boundary of an undeveloped parcel owned by Digital Loudoun IV, LLC and crosses the southwest corner of the Life Time Athletic parking lot. The route then veers slightly northwest for 0.06 mile away from the Life Time Athletic. The route then heads west for 0.17 mile, running parallel to and north of the planned Prentice Drive Extension, and crossing a sanitary sewer easement before heading north for 0.04 mile to a tap point location to future Line #2214.

Option 2, Route 2A

The length of the corridor for Alternative Route 2A is approximately 0.66 mile. Beginning at the proposed Lockridge Substation, Alternative Route 2A heads west from the substation for 0.05 mile before heading north for 0.1 mile along the east side of Lockridge Road, parallel and overlapping an existing Dominion Energy Virginia overhead and underground electric distribution line right-of-way. After crossing a Columbia Gas natural gas pipeline right-of-way, the route heads west for 0.35 mile along an undeveloped parcel owned by SDC Ashburn I, LLC. Along this section, Alternative Route 2B crosses Lockridge Road and runs parallel with and overlaps the pipeline right-of-way, then crosses Broad Run, a tributary to Broad Run and a sanitary sewer easement. Route 2A then veers north and northwest for 0.16 mile, crossing a tributary to Broad Run and continuing along a parcel owned by Vizsla Ventures, LLC to a tap point location at Line #2188.

Option 2, Route 2B

The length of the corridor for Alternative Route 2B is approximately 0.65 mile. The portion of Alternative Route 2B that is different from Alternative Route 2A is a 0.17-mile-long section that begins at the point where Alternative Route 2A heads north of the proposed Lockridge Substation. From this location, Alternative Route 2B turns west for about 0.06 mile, crossing Lockridge Road and onto an undeveloped parcel owned by SDC Ashburn I, LLC. Alternative Route 2B then continues north for about 0.11 mile where it crosses the planned Shellhorn Road Extension. After crossing a Columbia Gas natural gas pipeline right-of-way, the route heads west for 0.27 mile along an undeveloped parcel owned by SDC Ashburn I, LLC. The route runs parallel with and overlaps the pipeline right-of-way, then crosses Broad Run, a tributary to Broad Run and a sanitary sewer easement. Route 2B then veers north and northwest for 0.16 mile, crossing a tributary to Broad Run and continuing along a parcel owned by Vizsla Ventures, LLC to a tap point location at Line #2188. Alternative Route 2B contains a variation to Alternative Route 2A that avoids crossing an undeveloped parcel owned by the USPS. The variation was developed so that in the event that the Company was unable to secure an easement to cross property managed by the USPS, this route could still be constructed.

Desktop Evaluation Methodology

The area of effect considered for this study consists of the proposed rights-of-way identified above within which the electric transmission lines would be constructed and operated. Data sources used for this review include the following, each of which is described briefly below:

- National Agricultural Imagery Program (NAIP) Digital Ortho-Rectified Natural Color Images, Virginia, 1-meter pixel resolution, photo date 2017;
- NAIP Digital Ortho-Rectified Infrared Images, Virginia, 1-meter pixel resolution, photo date 2017;
- Virginia Base Mapping Program (VBMP) Digital Ortho-Rectified Infrared Images, East Zone of Virginia, 1-foot ground sample distance resolution, photo date 2009, 2012, and 2017;
- U.S. Geological Survey (USGS) 7.5-minute current (2014-2017) and historic (1988-2012) topographic mapping;
- U.S. Fish and Wildlife Service (USFWS) National Wetland Inventory (NWI) mapping;
- U.S. Department of Agriculture-Natural Resources Conservation Service (USDA-NRCS) Soil Survey Geographic (SSURGO) database for Loudoun County, Virginia;
- Loudoun County Hydrology (water feature lines) and Hydrolopy (water feature polygons) Datasets (Loudoun County Streams);
- Loudoun County Wetlands (wetland feature polygons) Dataset (Loudoun County Wetlands); and
- USGS National Hydrography Dataset (NHD).

Natural Color and Infrared Aerial Photography

Recent (2017) natural color aerial photography was used to provide a visual overview of the Project area and to assist in evaluating current conditions. Recent (2009 and 2017) infrared aerial photography was used to identify the potential presence of wetlands based on signatures associated with the levels of reflectance. For example, areas that are

inundated with water appear very dark (almost black) due to the low level of reflectance in the infrared spectrum. The presence of these dark colors can be used as a potential indicator of hydric or inundated soils that are likely associated with wetlands.

USGS Topographic Maps

The recent (2014-2017) USGS topographic maps show the topography of the area. The USGS topographic maps also depict other important landscape features such as forest cover, development, buildings, agricultural areas, streams, lakes, and wetlands. Historic topographic mapping (1988-2012) was used to identify potential changes in topography due to the high level of urban disturbance in a portion of the study area.

NWI Maps

The NWI maps provide the boundaries and classifications of potential wetland areas as mapped by the USFWS. However, NWI data are based primarily on aerial photo interpretations with limited ground-truthing and may represent incorrect boundaries or wetland cover types. NWI data can be unreliable in some areas, especially in forested landscapes, when aerial photography is used as the major data source. The classifications of the majority of the NWI polygons in the study area appear to be accurate based on a review of the cover types observed in the aerial photography. However, in areas where there was an obvious discrepancy between the NWI classification and the aerial photography, ERM modified the classification to more accurately reflect current conditions. For example, an area mapped by NWI data as open water was adjusted to an emergent wetland type. For the purposes of this review, wetlands mapped as unconsolidated bottom or riverine were considered open water. In order to acknowledge ERM's adjustment of NWI classifications where appropriate, all of the wetland types referenced in this assessment are referred to as "assigned wetland cover types" regardless of whether the cover type was actually modified from the NWI classification.

USDA-NRCS Soils Data

The soils in the study area were identified and assessed using the SSURGO database, which is a digital version of the original county soil surveys. The attribute data within the SSURGO database provides the proportionate extent of the component soils and their properties (e.g., hydric rating) for each soil map unit. The soils in the study area were grouped into three categories based on the hydric rating of the component soils within each map unit: hydric, partially hydric, and non-hydric. Hydric soils were defined as those where the major component soils, and minor components in some cases, are designated as hydric. Hydric components in these map units account for more than 80 percent of the map unit. Partially hydric soils include map units that only contain minor component soils that are designated as hydric. The partially hydric map units in the Project area contain 10 percent or less hydric soils. The remaining map units do not contain any component soils that are designated as hydric. Areas mapped as hydric or partially hydric have a higher probability of containing wetlands than areas with no hydric soils.

USGS Hydrography, Loudoun County Waterbody Datasets

The NHD and Loudoun County Waterbody datasets contain features such as lakes, ponds, streams, rivers, canals, dams and stream gages. The waterbodies mapped by the

NHD appeared consistent with those visible on the USGS maps and aerial photography. The Loudoun County Waterbody datasets were used in coordination with the USGS Hydrography dataset for additional refinement.

ERM used a stepwise process to identify probable wetland areas along the transmission line routes, as follows:

1. Infrared and natural color aerial photography was used in conjunction with USGS topographic maps, soils maps, and Loudoun County wetland dataset to identify potential wetland areas. Boundaries were assigned to the areas that appeared to exhibit wetland signatures based on this review and a cover type was determined based on aerial photo interpretation. For the purpose of the study, these areas are referred to as Interpreted Wetlands.

2. To further determine the probability of a wetland occurring within a given location, the Interpreted Wetland polygon shape files were digitally layered with the NWI mapping and hydric soils information from the SSURGO database.

3. The probability of a wetland occurring was assigned based on the number of overlapping data layers (i.e., indicators of potential wetland presence) that occurred in a particular area.

The criteria assigned to each probability class are outlined in Table 1 below.

Table 1

Lockridge 230 kV Line Loop and Lockridge Substation

Criteria Used to Rank the Probability of Wetland Occurrence

Probability	Criteria
High	Areas where layers of hydric soils, Interpreted Wetlands, and NWI data overlap
Medium/High	NWI data overlaps hydric soils; or NWI data overlaps Interpreted Wetlands with or without partially hydric soils; or Hydric soils overlap Interpreted Wetlands
Medium	Interpreted Wetlands with or without overlap by partially hydric soils
Medium/Low	Hydric soils only; or NWI data with or without overlap by partially hydric soils
Low	Partially hydric soils only
Very Low	None of the layers present

Results

Wetland Crossings

A range of wetland occurrence probabilities are reported by this study from very low to high. The probability of wetland occurrence increases as multiple indicators begin to overlap towards the "high" end of the spectrum. The medium-high and high probability category are the most reliable representation of in-situ conditions and these categories are typically reported in the summary

below as a percentage of the total acreage of each route. Attachment Figure 2 depicts the interpreted wetlands displayed on color infrared base map images.

TABLE 2
Lockridge 230 kV Line Loop and Lockridge Substation
Summary of the Probabilities of Wetland Occurrence by Type along Each Route

Probability	Total Acres	Wetland Type (acres)		
		Forested	Scrub/Shrub	Emergent
Proposed Route (Option 1, Route 1A)				
High	0.00	0.00	0.00	0.00
Medium/High	0.98	0.15	0.00	0.83
Medium	0.15	0.00	0.00	0.15
Medium/Low	1.46	0.42	0.00	1.04
Low	7.67	N/A	N/A	N/A
Very Low	0.45	N/A	N/A	N/A
Alternative Route 1B (Option 1)				
High	0.00	0.00	0.00	0.00
Medium/High	1.46	0.63	0.00	0.83
Medium	0.17	0.02	0.00	0.15
Medium/Low	1.29	0.20	0.00	1.09
Low	7.52	N/A	N/A	N/A
Very Low	0.52	N/A	N/A	N/A
Alternative Route 1C (Option 1)				
High	0.00	0.00	0.00	0.00
Medium/High	0.95	0.11	0.01	0.83
Medium	0.15	<0.01	0.00	0.15
Medium/Low	1.23	0.79	0.04	0.40
Low	8.50	N/A	N/A	N/A
Very Low	0.65	N/A	N/A	N/A
Alternative Route 2A (Option 2)				
High	0.05	0.05	0.00	0.00
Medium/High	1.34	0.17	0.00	1.18
Medium	0.23	0.03	0.00	0.19
Medium/Low	0.76	<0.01	0.00	0.76
Low	8.47	N/A	N/A	N/A
Very Low	0.39	N/A	N/A	N/A
Alternative Route 2B (Option 2)				
High	0.05	0.05	0.00	0.00
Medium/High	1.38	0.17	0.00	1.21
Medium	0.23	0.03	0.00	0.19
Medium/Low	1.08	<0.01	0.00	1.08
Low	8.02	N/A	N/A	N/A
Very Low	0.39	N/A	N/A	N/A

N/A = Not applicable because areas assigned a probability based on the presence of hydric soils alone do not have an assigned cover type.
For the purposes of this review, wetlands mapped as unconsolidated bottom or riverine were considered open water.

Proposed Route (Option 1, Route 1A)

The Proposed Route is approximately 0.62 mile long; the 100-foot-wide right-of-way along this route encompasses a total of approximately 10.71 acres. Based on the methodology discussed above, the right-of-way will encompass approximately 9.2 percent (0.98 acre) of land with a medium/high or higher probability of containing wetlands.

Option 1, Route 1B

Alternative Route 1B is approximately 0.64 mile long; the 100-foot-wide right-of-way along this route encompasses a total of approximately 10.97 acres. Based on the methodology discussed above, the right-of-way will encompass approximately 13.3 percent (1.46 acre) of land with a medium/high or higher probability of containing wetlands.

Option 1, Route 1C

Alternative Route 1C is approximately 0.68 mile long; the 100-foot-wide right-of-way along this route encompasses a total of approximately 11.49 acres. Based on the methodology discussed above, the right-of-way will encompass approximately 8.3 percent (0.95 acre) of land with a medium/high or higher probability of containing wetlands.

Option 2, Route 2A

Alternative Route 2A is approximately 0.66 mile long; the 100-foot-wide right-of-way along this route encompasses a total of approximately 11.24 acres. Based on the methodology discussed above, the right-of-way will encompass approximately 12.4 percent (1.39 acre) of land with a medium/high or higher probability of containing wetlands.

Option 2, Route 2B

Alternative Route 2B is approximately 0.65 mile long; the 100-foot-wide right-of-way along this route encompasses a total of approximately 11.15 acres. Based on the methodology discussed above, the right-of-way will encompass approximately 12.8 percent (1.43 acre) of land with a medium/high or higher probability of containing wetlands.

Waterbody Crossings

Proposed Route (Option 1, Route 1A)

- Based on NHD and Loudoun County Waterbody Datasets, the Proposed Route crosses no perennial or intermittent waterbodies or open bodies of water.

Option 1, Route 1B

- Based on NHD and Loudoun County Waterbody Datasets, Alternative Route 1B crosses no perennial or intermittent waterbodies or open bodies of water.

Option 1, Route 1C

- Based on NHD and Loudoun County Waterbody Datasets, Alternative Route 1C crosses no perennial or intermittent waterbodies or open bodies of water.

Option 2, Route 2A

- Based on NHD and Loudoun County Waterbody Datasets, Alternative Route 2A crosses one perennial and one intermittent stream. No open water features are crossed by this route.

Option 2, Route 2B

- Based on NHD and Loudoun County Waterbody Datasets, Alternative Route 2B crosses one perennial stream and one intermittent stream. No open water features are crossed by this route.

Project Impacts

Avoiding or minimizing impacts on wetlands and streams was among the criteria Dominion Energy Virginia used in developing potential routes for the Project. While crossings of wetlands and streams could not be entirely avoided in siting this linear facility, Dominion Energy Virginia has minimized crossings of these features to the extent practicable.

To minimize impacts on wetland areas, the Project would be designed to avoid wetlands where possible. Where the removal of shrubby vegetation occurs within wetlands, Dominion Energy Virginia would use the least intrusive method reasonably possible to clear the corridor. Hand-cutting of vegetation would be conducted, where needed, to avoid and minimize impacts on streams and/or wetlands. There would be no change in contours or redirection of the flow of water, and the amount of spoil from trenching would be minimal. Excess soil in wetlands generated during construction would be removed from the wetland.

Mats would be used for construction equipment to travel over wetlands, as appropriate. Grading in wetlands will consist of the minimum necessary for safe and efficient equipment operation. Potential direct impacts on wetlands would be temporary in nature, but a reduction in wetland functions and values would occur where tree clearing within wetlands is necessary.

Closing

This Wetland and Waterbody Summary report was prepared in accordance with the Memorandum of Agreement between the Department of Environmental Quality and the State Corporation Commission for purposes of initiating a Wetlands Impact Consultation. Please note: a formal onsite wetland delineation was not conducted as part of this review.

In addition, we have a Project website where the SCC application will be available after filing, as well as maps and discussions about the Project. It can be accessed at: https://www.dominionenergy.com/lockridge. If you have any questions regarding this wetland assessment please contact me at 980-297-7283 or by email at christopher.clary@erm.com.

Sincerely,

Environmental Resources Management

Christopher Clary

cc: Laura Meadows, Virginia Electric and Power Company
Rachel Studebaker, Virginia Electric and Power Company

Attachments: Figures 1 and 2

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FIGURE 1