PHASE I MARINE ARCHAEOLOGICAL RESOURCES ASSESSMENT FOR THE COASTAL VIRGINIA OFFSHORE WIND (CVOW) COMMERCIAL PROJECT LOCATED ON THE OUTER CONTINENTAL SHELF BLOCK OCS-A 0483, AND OFFSHORE VIRGINIA

Non-Technical Summary

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INTRODUCTION

R. Christopher Goodwin & Associates, Inc. (RCG&A) completed phase I submerged cultural resources analyses and interpretation of high-resolution geophysical (HRG) survey and geotechnical data to support the Coastal Virginia Offshore Wind (CVOW) Commercial Project (Project). This work was performed for the Virginia Electric and Power Company, doing business as Dominion Energy Virginia (Dominion Energy). The Project is located in the Commercial Lease of Submerged Lands for Renewable Energy Development on the Outer Continental Shelf (OCS) Offshore Virginia (Lease No. OCS-A 0483, Lease Area). The Lease Area covers approximately 112,799 acres (ac) (45,658 hectares [ha]) and is 27 statute miles (mi) (23.5 nautical miles [nm], 43.5 kilometers [km]) off the Virginia Beach coastline (Figure 1). The Project Offshore Export Cables will reach a maximum length of 416.9 mi (671 km) in total across nine cables, averaging approximately 46.3 mi (74.5 km) each, and will connect the Lease Area to a Cable Landing Location at the State Military Reservation (SMR) in Virginia Beach.

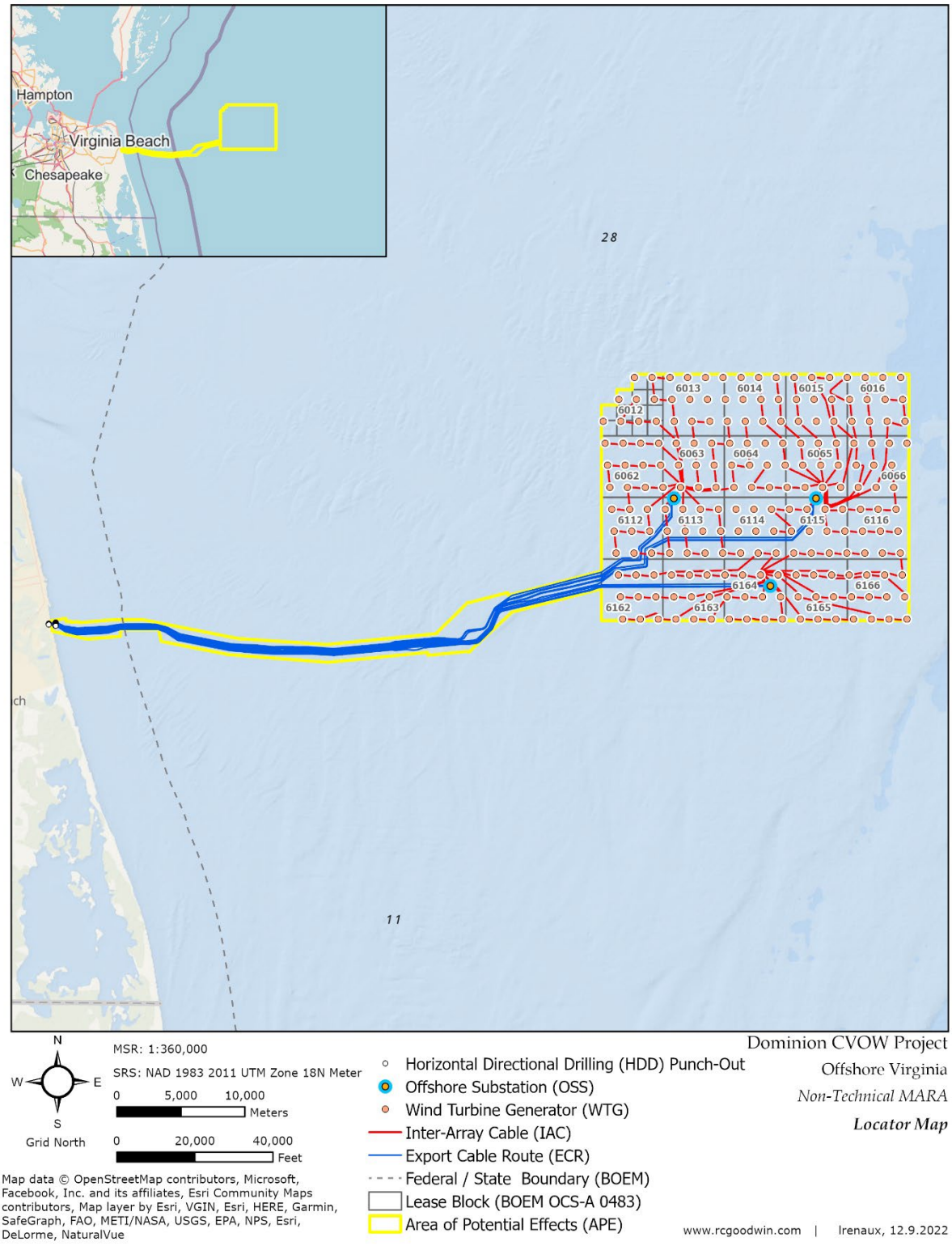

Figure 1: Project Locator Map

The offshore component of the proposed Project will consist of 176 Wind Turbine Generator (WTG) positions and three Offshore Substations, across up to 205 candidate locations in the Lease Area, for a target generation capacity between 2,500 megawatts (MW) and 3,000 MW. Inter-Array Cables will connect the WTGs through a series of cable "strings" to the Offshore Substations, with a maximum cable length of 31,804 feet (ft) (9,694 meters [m]). The WTG Monopile Foundations are proposed to consist of two parts, a lower foundation pile (monopile) driven into the seabed and an upper transition piece mounted on top of the monopile (together referred to as the WTG Monopile Foundation). The transition piece is connected to the WTG tower above and to the monopile below with bolted flanges. The transition piece also has a grout filled skirt that acts to prevent water ingress to the monopile-transition piece bolted flange. The three Offshore Substations will be built either on a pre-or post-installation piled jacket foundation that may require scour protection (to be determined through consultation with relevant jurisdictional agencies prior to construction and installation), however, pre-installed piled jacket foundations are considered the Preferred Alternative. Water depths in the Lease Area range between 61.0 ft (18.6 m) and 135.5 ft (41.3 m) below Mean Lower Low Water.

Electricity would be transferred from each of the three Offshore Substations to the Cable Landing Location via three 3-core copper and/or aluminum-conductor 230-kV subsea cables, for a total of nine Offshore Export Cables. Upon exiting the Lease Area, the nine Offshore Export Cables would merge to become one overall Offshore Export Cable Route Corridor containing all nine Offshore Export Cables. Target burial depths for the far shore portions of the Offshore Export Cables will range from 3.3 ft (1 m) to 16.4 ft (5 m) below stable seabed. Dominion Energy plans to use trenchless installation via Direct Steerable Pipe Thrusting to install the Offshore Export Cables under the beach and dune from the Offshore Trenchless Installation Punch-Out approximately 1,000 to 1,800 ft (304 to 549 m) offshore of the Cable Landing Location to a maximum depth of 125 ft (38 m) below grade. The Offshore Export Cables would be brought to shore through a series of High Density Polyethylene casings.

ARCHAEOLOGICAL ASSESSMENT

The HRG campaigns were carried out in the Lease Area, which encompasses 112,799 ac (45,658 ha). The Offshore Export Cable Route Corridor was surveyed between its exit from the western end of the Lease Area to the Offshore Trenchless Installation Punch-Out locations; approximately 15,886 ac (6,429 ha) of seabed was surveyed. RCG&A conducted detailed cultural resources analyses of the HRG survey data sets that included side scan sonar (SSS), magnetometer, and seismic data collected on behalf of Dominion Energy. Geophysical and geotechnical data products were submitted to the Qualified Marine Archaeologist (QMA) in accordance with data transfer protocols established during survey planning in

April 2020. All data were analyzed and interpreted by the QMA using currently accepted scientific methodologies. This included correlation with a variety of inhouse, public, and restricted shipwreck databases, geomorphic and historical research results, nautical charts, and the Project survey logs.

Archival Research

Research included a wide range of primary and secondary sources obtained both electronically and as a result of onsite visits to relevant repositories, which were utilized to provide the data to support the conclusions presented in the report. The National Oceanic and Atmospheric Administration's (NOAA's) Wrecks and Obstructions Database, the Archaeological Resource Information (ARI) database maintained by the Bureau of Ocean Energy Management (BOEM), and additional published wreck databases of Virginia and Maryland, provided baseline data about previously identified submerged cultural resources located in both federal and Virginia state waters. Those data were augmented by reviewing additional sources and reports generated by state and federal agencies, including NOAA's National Centers for Environmental Information and Office of Coast Survey and the Norfolk District Office of the U. S. Army Corps of Engineers. Dominion Energy provided supplemental information about some of the vessels within the NOAA and BOEM databases, as well as information on potentially uncharted wrecks. The aggregated information from these studies facilitated the construction of a cultural context, which elaborated the nature and scope of maritime activity over the last four centuries and delimited the potential for pre-contact remains dating back to the Paleoindian period (between 16,000 years before present [BP] and 11,500 BP).

Relevant NOAA hydrographic surveys were consulted in conjunction with various scholarly articles and government reports to inform the Project Area physiography, geology, and geomorphology. This research was focused on coastline and sea level changes that occurred due to ice sheet melting. The elucidation of baseline geology, geomorphology, and ecology of the Area of Potential Effects (APE) informs the potential for the presence and state of preservation of archaeological remains. The natural settings of the area, its geological history, and the evolution of the landscape with specific attention to the formative processes, has been constructed for the intervening period between the present and the Last Glacial Maximum (LGM).

Geophysical Surveys

TerraSond, Ltd. (TerraSond) and Alpine Ocean Seismic Survey (Alpine) were contracted to complete a series of HRG and geotechnical campaigns between April 2020 and August 2021. In addition, the Project utilized HRG and geotechnical data from Tetra Tech, Inc. and Fugro Consultants, along with data from

the CVOW Pilot Project, to develop the geologic ground model, seabed characterization, geohazard evaluation, and geotechnical design evaluation. The HRG surveys met the guidelines and requirements of the Project Design Envelope, as well as the Constructions and Operations Plan (§582.626 (a) (1-6)) and BOEM 30 CFR Part 585 and pursuant to 30 CFR Part 585.

Pre-survey coordination, as required by Lease stipulations, included the development of a survey plan as well as details of planned activities for each survey. The survey plan was submitted to BOEM and the Virginia Department of Historic Resources, acting as the State Historic Preservation Office, for review and approval. Additionally, it was presented to 15 federally recognized tribes:

Cheroenhaka (Nottoway)	Chickahominy
Eastern Chickahominy	Lenape of Delaware
Mattaponi	Monacan
Nansemond	Narragansett
Nottoway of Virginia	Pamunkey
Patawomeck of Virginia	Rappahannock
Shinnecock	Upper Mattaponi
Eastern Shawnee of Oklahoma	

Lease Area

Survey activities within the Lease Area were carried out by TerraSond in 2020 and were designed to characterize site conditions, identify potential geologic and anthropogenic hazards, and identify engineering constraints for installation within the APE. The instrument array aboard survey vessels included: a multibeam sounder (MBES), SSS, magnetic gradiometer arranged in a dual-headed transverse gradiometer (TVG) array, subbottom profiler (SBP), grab sampler, and both multi-channel and single-channel ultra-high resolution seismic (S-UHRS). These efforts enabled bathymetric characterization further than had already been obtained, along with classification of seabed sediments and morphology, identification of geohazards and anthropogenic features, and recording of magnetic field distortion caused by ferromagnetic objects. The 2020 geophysical campaigns surveyed 26 WTG corridors for a total of 31 lines, with a width of 0.49 nm (900 m) oriented NE-SW. A line spacing of 98 ft (30 m) was observed in anticipation of the spacing of turbine rows. Tie-lines were surveyed on a NW-SE axis with a width of 590 ft (180 m) for 26 of the primary lines, and 295 ft (90 m) for three of the primary lines along the turbine rows. Twenty-eight secondary tie-lines were surveyed between the outer wing lines of adjacent tie-line corridors at a spacing of 950 ft (290 m).

Survey activities were carried out in 2021 in order to achieve 100 percent coverage in the Lease Area. The instrument array aboard the survey vessels was the same as the instrument array from 2020, although the 2021 campaigns did not collect any grab samples. The primary goal of the 2021 HRG surveys was to procure infill data, and therefore the campaign was carried out in two components. Component A provided data in a NE-SW survey direction between the primary corridors surveyed in 2020, while Component B provided data from the perimeter of the Lease Area. Both components were carried out with a 98.4 ft (30 m) spacing in the primary survey direction and a 1,640 ft (500 m) spacing between tie-lines, adherent to BOEM guidelines at the time.

The 2020 and 2021 HRG campaigns in the Lease Area identified 28,094 magnetic anomalies; 306 correlated with other magnetic anomalies and 309 were correlated with at least one sonar contact. The surveys also identified 1,396 sonar contacts within the Lease Area. The QMA performed line-by-line analyses of the magnetic data and high-resolution georeferenced sonar transects, and found that 310 sonar contacts correlated with magnetic anomalies. The largest sonar contact is associated with a shipwreck in a fish haven.

While archival research indicated 15 wrecks within the Lease Area, only two of these showed up in the HRG data collected during the surveys. The HRG survey data, reviewed by the QMA, identified 18 potential cultural resources within the Lease Area,. The dimensions of these targets, their spatial layout, and magnetic characteristics are representative of cultural resources, and all are considered historical properties subject to mitigation as National Register of Historic Places (NRHP) eligible resources. However, under current design parameters, all historic properties (i.e., ancient submerged landforms [ASLFs], shipwrecks, etc.) will be avoided.

Offshore Export Cable Route Corridor

Surveys of the Offshore Export Cable Route Corridor were carried out by TerraSond and Alpine and were designed to acquire the full suite of HRG survey data, as was acquired in the Lease Area. Survey vessels were equipped with equipment listed above. For the purposes of the survey, the Offshore Export Cable Route Corridor was subdivided into six segments, labelled A through F. Three areas were examined in total; the primary Offshore Export Cable Route Corridor, an extension area that may provide an alternate route composing Segment B, and the nearshore portions of the Offshore Export Cable Route Corridor, which covered the nearshore and shallow portions of Segment F.

In 2020, HRG surveys performed on the primary Offshore Export Cable Route Corridor, Segments A and C through F, were carried out with a spacing of 98.4 ft (30 m) along the 45 primary lines surveyed. There were five changes to route orientation, spaced no more than 1,640 ft (500 m) apart that constituted the tie-lines for the survey. The corridor's length totaled 23.8 nm (44 km), with a width of 0.7 nm (1.32 km), and primarily captured MBES bathymetry with backscatter, side scan sonar, TVG, SBP, and S-UHRS data.

The 2021 HRG campaigns covered the Segment B extension, and nearshore portions of Segment F. The former of the two surveys was conducted in Spring 2021, and utilized 40 lines that were oriented N-S where existing cables were present. Width of data coverage was expanded for this segment to 1.56 nm (2,900 m). The primary data collected were from the MBES, SSS, TVG, SBP, and S-UHRS. The second of the surveys, focusing on Segment F's nearshore portions, was carried out by a research vessel in 16 ft (5 m) water depths. The survey began near the landfall for the Offshore Export Cable and the Trenchless Installation Punch-Out locations before moving further away from the shore as the survey progressed. Further adjustments to the Export Cable Route Corridor as a result of micro-siting activities did not impact the assessment initially provided in the Marine Archaeological Resources Assessment.

The 2020 and 2021 surveys of the Offshore Export Cable Route Corridor identified a total of 6,345 magnetic anomalies. These data were reviewed by the QMA with particular attention paid to anomalies that exhibited complex magnetic signatures, clustered together, and possessed high amplitude and duration. Distribution of these anomalies was fairly even across the Offshore Export Cable Route Corridor, and 446 of the anomalies could be correlated with existing features (BRUSA, Dunant MAREA, and the CVOW Pilot Project export cable). The surveys also identified 872 sonar contacts, reviewed by the QMA on a line-by-line basis of the high-resolution georeferenced targets. The largest sonar contact did not have an associated magnetic anomaly despite being located on a magnetometer trackline, and therefore was described as a rope wire due to a lack of width, height, or associated data.

Archival research indicated two possible wrecks in the Offshore Export Cable Route Corridor identified through NOAA hydrographic surveys, and two unnamed wrecks in BOEM's ARI database. These were not identified during surveys completed by Dominion Energy. NOAA does, however, list two marked obstructions, one of which can be correlated to survey data collected by Dominion Energy. The QMA has identified 13 potential cultural resources in the Offshore Export Cable Route Corridor dataset, two of which are located outside of the APE for the route. The dimensions of these targets, their spatial layout and magnetic characteristics are representative of cultural resources, and all are considered historical

properties subject to mitigation as NRHP eligible resources. However, under current design parameters, all will be avoided.

Geotechnical Campaigns

The HRG data also facilitated planning of the geotechnical campaign, the aims of which were to ground-truth the HRG data as well as inform the ground model and construction plans. HRG survey data were acquired within analytical areas established at each proposed geotechnical sampling location. The campaigns were carried out in 2020 and 2021, non-contiguously, by Geoquip Marine; the 2020 surveys including seabed Cone Penetrometer Tests (CPTs), composite sampling, CPT exploration, and P/S logging, while the 2021 survey also collected Downhole CPTs and sampling boreholes. The final HRG campaign, conducted by Alpine in July and August 2021, also took seabed CPTs and vibracores. In total, 251 grab samples, 30 borehole samples, and 240 vibracores were taken.

Seismic Stratigraphy

Geotechnical campaigns in the Lease Area identified six seismic stratigraphic units (A-F) through seismic data along with associated unconformable bounding horizons (H-1 – H-6). Only the two surficial strata, A and B, were sub-aerially exposed after the populating of the western hemisphere, and therefore are the only two units with potential for preservation of cultural resources. The most surficial unit, unit A, exhibits extensive sediment reworking which has most likely heavily impacted the preservation potential of the unit. Unit B, underlying unit A in portions of the Lease, exhibits a patchy distribution with most concentrations falling in the southern portion of the Lease Area. Therefore, the southern portions of Unit B are considered by the QMA and geoarchaeologist to be the only areas of high cultural resource preservation potential.

There were five seismic stratigraphic units (1-5) identified within the Offshore Export Cable Route Corridor, along with four unconformable boundaries (H-10, H-20 and H-35) and two localized horizons (H-40 and P-35). None of the units appear throughout the entire Offshore Export Cable Route Corridor; however, all are shallow enough to have potentially preserved cultural resources. There has been extensive sediment reworking of all units, and therefore the preservation potential for these units can be considered low.

Geochronology

There were 30 borehole samples taken from the Lease Area based on the presence of enriched organic compounds or the presence of shallow marine invertebrate remains that can act as index fossils. None

were taken in the Offshore Export Cable Route Corridor due to the low archaeological preservation potential from the intensive sediment reworking. The 15 samples taken in 2020 primarily informed the identification of Units C-F as pre-LGM, and therefore prior to the arrival of humans in the western hemisphere. Two of the samples from Unit B, taken in 2020, produced valid radiocarbon dates between 13,200—12,600 cal BP, which correlates to the Paleoindian Period. Thirteen of the 15 samples taken in 2021 produced valid radiocarbon dates, 12 of which dated post-LGM. Eleven of these samples dated to the Paleoindian Period, with one sample producing an Archaic date with a low confidence interval (indicating the date is not secure).

Paleolandscape Reconstruction

Landscape reconstruction used seismic data and analysis of sediment cores to recognize potentially intact landforms present within the Project Area. The paleolandscape reconstruction suggests that deposits that could have supported human occupation from the terminal Pleistocene until submergence are present within the Offshore Project Area.

Seismic analysis observed evidence for six potentially preserved ASLFs within the Lease Area, and none within the Offshore Export Cable Route Corridor. All of the features were given an avoidance area up to 164 ft (50 m) from the end of the horizontal extent, as all contained features such as channel beds and flood plains, if sub-aerially exposed, possess the potential for human habitation and preservation. One of these landforms, labelled P-02, is located within the APE of a WTG, and another (P-05) is located within the horizontal APE of the Inter-Array Cable, although the latter is below the vertical APE for the cable and therefore will not be impacted.

As mentioned above, two of the seismic units identified date to the period after human migration into the Americas. Wherever they are preserved, terrestrial surfaces within these units will require avoidance or mitigation efforts to protect any *in-situ* cultural resources not impacted by construction. These mitigation efforts may include additional analyses of the features using seismic and/or sampling methods and will be further outlined in the Mitigation Plan. Consultation with BOEM and the relevant authorities and stakeholders may be required to finalize mitigation plans.

CONCLUSIONS AND RECOMMENDATIONS

The HRG campaigns to date have surveyed the entire Offshore Project Area, inclusive of approximately 112,799 ac (45,658 ha) in the Lease Area and 15,886 ac (6,429 ha) within the Offshore Export Cable

Route Corridor, from the western edge of the Lease Area to landfall at the SMR in Virginia Beach. The HRG survey revealed the presence of 34,439 magnetic anomalies and 2,268 sonar contacts within the APE of the Project. From these data, 31 potential cultural resources were identified; 18 in the Lease Area and 13 in the Offshore Export Cable Route Corridor. There were also six ASLFs identified within the Lease Area; none were found in the Offshore Export Cable Route Corridor. The evaluation of paleolandforms was informed by the geotechnical campaigns, including CPTs, boreholes, and vibracores, while boreholes provided dateable samples to determine which landforms most likely contained preserved cultural materials.

Dominion Energy has engaged with consulting parties, including Native American Tribes, to discuss the potential for seabed disturbance and associated effects to identified marine archaeological resources and options to avoid, minimize, or mitigate any adverse effects to NRHP eligible resources. The results of discussions among Dominion Energy and consulting parties have been incorporated in a marine cultural resources Mitigation Plan, which includes proposed measures to mitigate adverse effects through consultations with BOEM and Native American Tribes if, following micro siting and Project design changes, any Project-related impacts to an ASLF are unavoidable. At present, Dominion Energy is able to avoid all potential cultural resources within the APE.

Disturbance to the seafloor during construction activities has the potential to encounter and cause significant, long-term, and adverse effects to unidentified submerged cultural resources. Although remote sensing surveys conducted in accordance with current professional standards for cultural resource identification are expected to be highly effective in identifying submerged cultural resources, the possibility of encountering an unidentified and unanticipated submerged cultural resource is always present during dredging and construction activities. As a result, Dominion Energy is planning to implement an Unanticipated Discoveries Plan, including archaeological resource identification training.