

# Appendix J: Sediment Transport Analysis

Coastal Virginia Offshore Wind Commercial Project



Submitted by:  
**Dominion Energy Services, Inc.**  
707 E. Main Street,  
Richmond, VA 23219

Prepared by:  
**Tetra Tech, Inc.**  
4101 Cox Road, Suite 120  
Glen Allen, VA 23060

Submitted To:  
**Bureau of Ocean Energy Management**  
45600 Woodland Road  
Sterling, VA 20166

# **CONSTRUCTION AND OPERATIONS PLAN**

## **Coastal Virginia Offshore Wind Commercial Project**

### **Appendix J Sediment Transport Analysis**

Prepared for:



707 East Main Street  
Richmond, VA 23219

Prepared by:



Tetra Tech, Inc.  
4101 Cox Road, Suite 120  
Glen Allen, VA 23060

[www.tetratech.com](http://www.tetratech.com)

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**ACRONYMS AND ABBREVIATIONS**

|                 |  |
|-----------------|--|
| BOEM            | Bureau Of Ocean Energy Management                                      |
| cm              | centimeter   |
| CVOW            | Coastal Virginia Offshore Wind   |
| Dominion Energy | Virginia Electric And Power Company D/B/A Dominion Energy Virginia     |
| ESPreSSO        | Experimental System for Predicting Shelf and Slope Optics              |
| ft              | feet   |
| ft/s            | feet per second  |
| HYCOM           | Hybrid Coordinate Ocean Model  |
| in              | inch   |
| km              | kilometer  |
| Lease Area      | Outer Continental Shelf (OCS) Offshore Virginia (Lease No. OCS-A-0483) |
| m               | meter  |
| m/s             | meters per second  |
| mg/L            | milligrams per liter   |
| MOCHA           | Mid-Atlantic Ocean Climatological Hydrographic Analysis                |
| nm              | nautical mile  |
| OCS             | Outer Continental Shelf  |
| PDE             | Project Design Envelope  |
| Project         | Coastal Virginia Offshore Wind Commercial                              |
| Project Area    | Offshore Export Cable Route Corridor                                   |
| ROMS            | Regional Ocean Modeling System   |
| Tetra Tech      | Tetra Tech, Inc.   |
| USGS            | U.S. Geological Survey   |

## J.1 INTRODUCTION

Tetra Tech, Inc. (Tetra Tech) was contracted by Virginia Electric and Power Company, doing business as Dominion Energy Virginia (hereafter referred to as Dominion Energy), to evaluate the potential suspended sediment transport and deposition associated with Coastal Virginia Offshore Wind (CVOW) Commercial Project (hereafter referred to as the Project) construction activities, including the installation of Offshore Export and Inter-Array Cables. The Project will be 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), which was awarded through the Bureau of Ocean Energy Management (BOEM) competitive renewable energy lease auction of the Wind Energy Area offshore of Virginia in 2013.

Disturbance of sediments during Project construction has the potential to affect water quality through increases to total suspended solids into the water column and deposition of sediments away from the location of sediment disturbance, including potentially outside the Offshore Project Area (defined as the Lease Area and Offshore Export Cable Route Corridor) through resuspension, dispersal, and subsequent sedimentation.

To provide a conservative estimate of potential maximum suspended sediment transport and deposition impacts, publicly available water circulation data and site-specific sediment data covering the Offshore Project Area was used to develop the sediment transport model. The modeling was undertaken to quantify potential maximum plume dispersion, suspended sediment concentrations, and potential maximum sediment deposition thicknesses that may occur due to Project construction.

The sediment transport assessment contained herein includes a description of the Project Components and Project Design Envelope (PDE) that were evaluated (Section J.1.1, Project Description); a discussion of the modeling approach undertaken (Section J.2, Modeling Approach); a summary of the data sources and associated hydrodynamic and sediment characteristics applied (Section J.3, Data Sources); a description of the model runs executed (Section J.4, Sediment Transport Model); and results of the analysis and associated conclusions (Section J.5, Results, and Section J.6, Conclusions).

### J.1.1 Project Description

The Project is located off the coast of Virginia (Figure J-1). The boundary of the Lease Area is located 20.45 nautical miles (nm) (37.87 kilometers [km]) from the northwest corner to the Eastern Shore Peninsula and 23.75 nm (43.99 km) from Virginia Beach, Virginia. The Lease Area itself is 13.0 nm (24.08 km) from the westernmost to easternmost edge and 10.4 nm (19.26 km) from the northernmost to southernmost edge. The Lease Area is 112,799 total acres in size.

The onshore components of the Project, which will be located in the cities of Virginia Beach and Chesapeake, Virginia, include the Onshore Export Cable, Switching Station, Interconnection Cable, and an Onshore Substation. The offshore components of the Project, including the Wind Turbine Generators, Offshore Substations, and Inter-Array Cables, are located in federal waters within the Lease Area, while the Offshore Export Cable Route Corridor traverses both federal and state territorial waters of Virginia. During construction, the Project will include temporary construction laydown area(s) and construction port(s) in Europe or North America. The operation stage of the Project includes an onshore Operations and Maintenance facility with an associated Base Port.

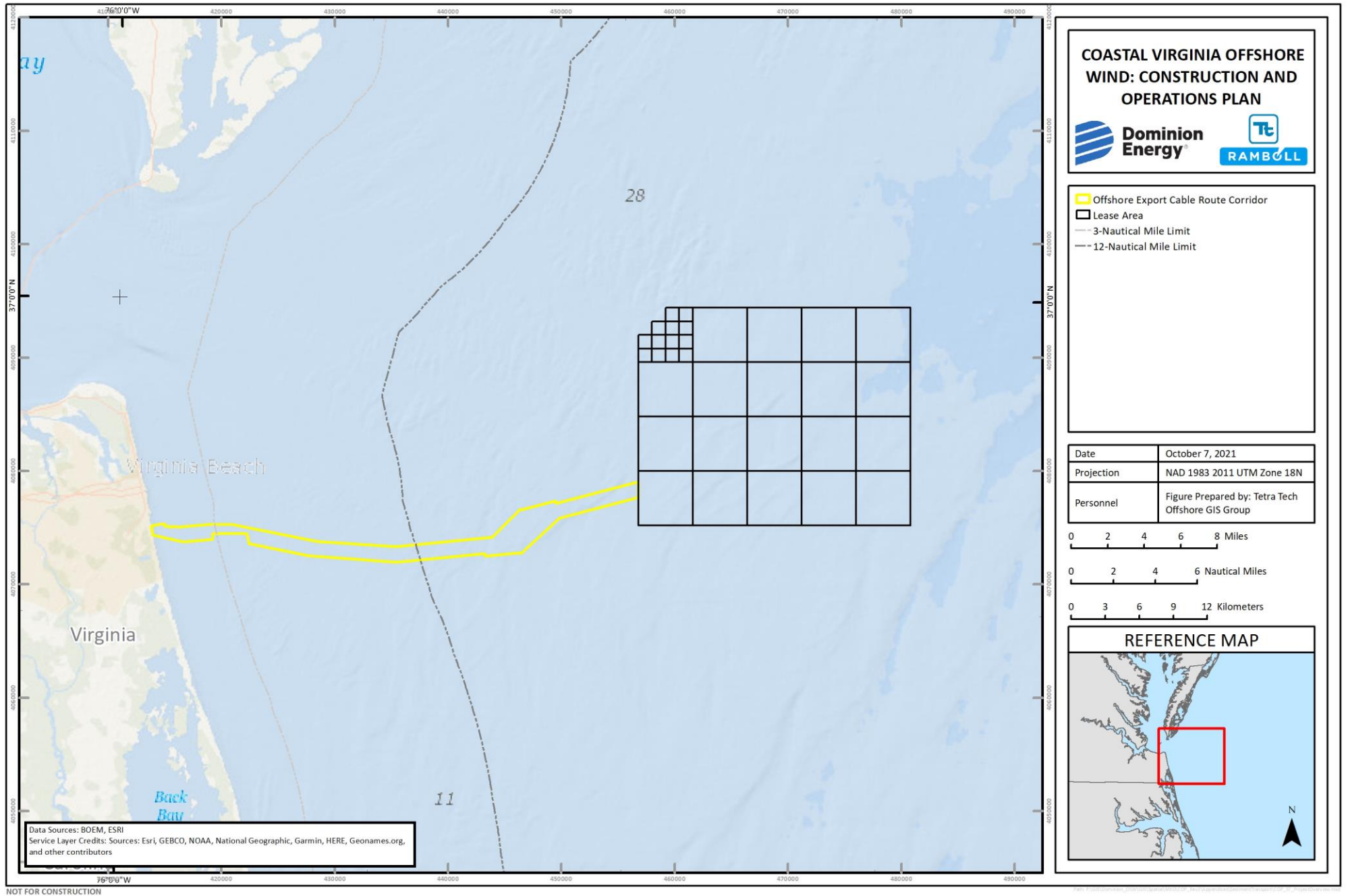


Figure J-1. Offshore Project Area Overview

The facility locations for development of the Project were selected based on the preliminary environmental and engineering site characterization studies that have been completed to date. The location of Project facilities will be further refined by the final engineering design as well as ongoing and continuing discussions, agency reviews, public input, and the National Environmental Policy Act review process.

The purpose of this Project is to provide between 2,500 and 3,000 megawatts of clean, reliable offshore wind energy; to increase the amount and availability of renewable energy to Virginia consumers; to create the opportunity to displace electricity generated by fossil fuel-powered plants; and to offer substantial economic and environmental benefits to the Commonwealth of Virginia.

Based on current understanding of site-specific conditions within the Offshore Project Area, Dominion Energy is currently recommending jet trenching, jet plow, mechanical plow, hydroplow, mechanical cutter, and/or other available technologies as the primary cable installation methods. In areas where these methods cannot be employed because of deeper burial requirements or other challenges such as vessel draft requirements, other methods may be employed. In general, the Offshore Export Cables and Inter-Array Cables will be buried to maximum depths of 16.4 feet (ft; 5 meters [m]) and 9.8 ft (3 m), respectively,<sup>a</sup> below the seabed surface.

### **J.1.2 Modeling Assumptions and the Project Design Envelope Approach**

To evaluate how Offshore Export Cable installation would affect suspended sediment concentrations, transport and deposition, Tetra Tech conducted a sediment transport analysis of the Project. Results from a previously developed publicly available hydrodynamic model (Experimental System for Predicting Shelf and Slope Optics [ESPreSSO]) was used to gather information regarding current velocity and direction in the Offshore Project Area. An analytical sediment transport model was developed to predict the fate and transport of sediment suspended by cable installation along the offshore export cable routes. Tetra Tech used site-specific sediment data to inform the analytical model.

The analytical model adopted a PDE approach to evaluate the effects of proposed submarine cable burial activities in terms of suspended sediment concentrations in the water column and sediment transport and deposition characteristics, such as deposition depth and sediment footprint, to assess potential Project effects on surrounding water quality and habitats. The model simulated installation impacts of a single trench. Each trench/cable will be installed separately in space and time during construction (vessel constraints would not allow simultaneous installations), with enough time between installations for disturbed sediment to resettle on the seafloor. The model simulated jet plow installation along the cable route, which would result in greater disturbance of marine sediments than mechanical plow or mechanical cutter installation. Jet plowing therefore provides the maximum expected disturbance of seabed sediment in the Offshore Project Area. This approach is consistent with BOEM's *Draft Guidance Regarding the Use of a Project Design Envelope in a Construction and Operations Plan* (BOEM 2018). This approach provides the Project reasonable flexibility to make prudent development and design decisions prior to

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<sup>a</sup> Based on guidance provided by the U.S. Army Corps of Engineers in a letter dated September 20, 2018, submarine cables will be buried to a minimum target burial depth of 15 ft (4.7 m) below the current (and future) authorized depth or depth of existing seabed (whichever is deeper) of federally maintained navigation features (e.g., anchorages and shipping channels).



construction. Therefore, for the purpose of this analysis, the Project has assumed the following as the maximum design scenario:

- Nine proposed Offshore Export Cables;
- Boulder and sandwave removal are not expected;
- The use of a jet plow<sup>b</sup>/jet trenching, because this technology would result in greater disturbance of marine sediments than mechanical plow or mechanical cutter installation;
- A maximum burial depth for the Offshore Export Cables of 16.4 ft (5 m). Trench depth of 18.0 ft (5.5 m) was used in the analysis;
- A maximum burial depth for cables in the Lease Area of 9.8 ft (3 m). Trench depth of 11.4 ft (3.5 m) was used in the analysis;
- The maximum scenario for sediment disturbance will be during construction, during which the disturbance is expected to be equal to or greater than that associated with operation or decommissioning activities; and
- Project activities during operations may include inspection and repair of subsea infrastructure (i.e., cables); however, any impacts are expected to be less than those anticipated during construction since they would only involve a portion of the overall Project. Thus, this assessment focuses on activities and impacts during the construction stage of the Project.<sup>c</sup>

## J.2 MODELING APPROACH

The aim of this study is to evaluate the effects of Offshore Export Cable installation and burial activities in terms of suspended sediment concentrations in the water column and sediment deposition characteristics, such as deposition depth and sediment deposition footprint.

The modeling approach uses the publicly available ESPreSSO hydrodynamic model to develop information regarding current velocity and flow direction in the Project Area. This model has been used to obtain velocities and flows for other sediment transport models in the region (Tetra Tech 2015). ESPreSSO uses the Regional Ocean Modeling System (ROMS). ROMS is a three-dimensional, free-surface, terrain-following ocean model that solves the Reynolds-averaged Navier-Stokes equations using the hydrostatic vertical momentum balance and Boussinesq approximation (Haidvogel et al. 2000; Shchepetkin and McWilliams 2005). The ESPreSSO model domain extends from the center of Cape Cod, Massachusetts, southward to Cape Hatteras, North Carolina, with 3 mi (5 km) horizontal resolution and 36 terrain-following vertical levels. The Offshore Project Area falls inside the model domain, which allows model outputs to be used to gather the circulation characteristics within the Offshore Project Area. The current speed and direction from the ESPreSSO model help determine the path of the suspended sediments generated by

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<sup>b</sup> The jet plow's water nozzle temporarily loosens the soil, creating a narrow trench. The cable is fed into this trench as the plow moves along the ocean floor. Marine sediment resettles upon the cable, closing the trench with minimal impact to the sea floor. However, some marine sediments may remain suspended in the water column, temporarily increasing total suspended solids, and dispersion of the sediments may cause material to deposit outside the area of disturbance.

<sup>c</sup> A Scour Protection Analysis for impacts associated with operations will be completed and submitted as part of the Fabrication and Installation Report / Facility Design Report.

submarine cable jet plowing activities. More details about the hydrodynamic data used in the sediment transport model are provided in Section J.3.1, Hydrodynamic Data.

An analytical sediment transport model was developed to assess the suspended sediment water column concentrations and sediment deposition characteristics as a result of the submarine cable jet plowing activities. Site-specific sediment grain size distribution data were collected by Geoquip Marine in the Project Area (Geoquip Marine 2020a,b). These sediment characteristics were used to inform the calculations of volume and concentrations of suspended sediment due to jet plowing operations.

Calculations were made along the centerline of the Offshore Export Cable Route Corridor based on the different current velocities available from the ESPreSSO model and the site-specific sediment grab sample data. More detail about the analytical model and the sediment characteristics is provided in Section J.3.1, Hydrodynamic Data and Section J.3.2, Sediment Characteristic Data, respectively. The final results of the analytical model include the extent and duration of suspended sediment concentrations within the water column along the submarine cable routes and the final sediment deposition thickness associated with the jet plowing operations.

## J.3 DATA SOURCES

### J.3.1 Hydrodynamic Data

As part of the effort to evaluate the variability of ocean currents within the Offshore Project Area, Tetra Tech looked at the publicly available velocity data from the ESPreSSO model.

The ESPreSSO model uses ROMS, which is a free-surface, terrain-following, primitive equations ocean model widely used by the scientific community for a diverse range of applications. ROMS is an open-source model that is continually supported by researchers at Rutgers University, University of California–Los Angeles, and contributors worldwide (Haidvogel et al. 2000; Marchesiello et al. 2003; Peliz et al. 2003). ESPreSSO open boundary values were taken from global Hybrid Coordinate Ocean Model (HYCOM) with adjustments using Mid-Atlantic Ocean Climatological Hydrographic Analysis (MOCHA) climatology and the addition of harmonic tides (Mukai et al. 2002). Meteorology conditions were taken from the North American Mesoscale model. Inflows for the seven largest rivers entering the model were taken from daily average U.S. Geological Survey (USGS) discharge data. Strong constraint four-dimensional variational (4D-Var) data assimilation (Moore et al. 2011) was used to incorporate satellite sea surface height from Jason-2, satellite sea surface temperature from infrared and microwave radiometers, monthly MOCHA temperature, salinity, climatology, and hourly Coastal Ocean Dynamics Applications Radar surface currents (Zavala-Garay et al. 2012).

The ESPreSSO data set included hourly simulations covering the period from October 2009 through February 2014.<sup>d</sup> The ESPreSSO model provides velocity, salinity, and temperature outputs at regularly spaced locations throughout the Offshore Project Area. Hourly bottom velocity outputs at ESPreSSO model stations located within the Offshore Project Area were downloaded for the available period. A rolling 4-hour average velocity was calculated at each hourly time-step for all stations. The 90th percentile of the rolling 4-hour average ebb and flood velocities was selected to represent the potential high velocities during

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<sup>d</sup> Model information can be accessed at <http://www.myroms.org/espresso/>.

these tidal periods. To represent the variability in the flow throughout the Offshore Project Area, velocity data was paired with the closest Geoquip Marine borehole locations in the analytical model.

The velocity stations used in the analytical sediment transport model are shown in Figure J-2. For the purpose of this study, the velocity stations were assigned station identification numbers (Station ID) for easy reference. The stations were also assigned zones based on their proximity to Offshore Project Components. All stations close to the Offshore Export Cable Route Corridor were assigned “Offshore Export Cable Route Corridor” zone and the ones close to the Lease Area were assigned “Lease Area” zone. The current magnitudes at these stations ranged from 1.54 ft per second (ft/s) (0.47 m per second [m/s]) to 2.36 ft/s (0.72 m/s). Table J-1 lists the representative flood and ebb velocities at all the stations. Both ebb and flood velocities were used to calculate the possible maximum extent of sediment deposition and suspended sediment water column concentrations within the Project Area under these conditions.

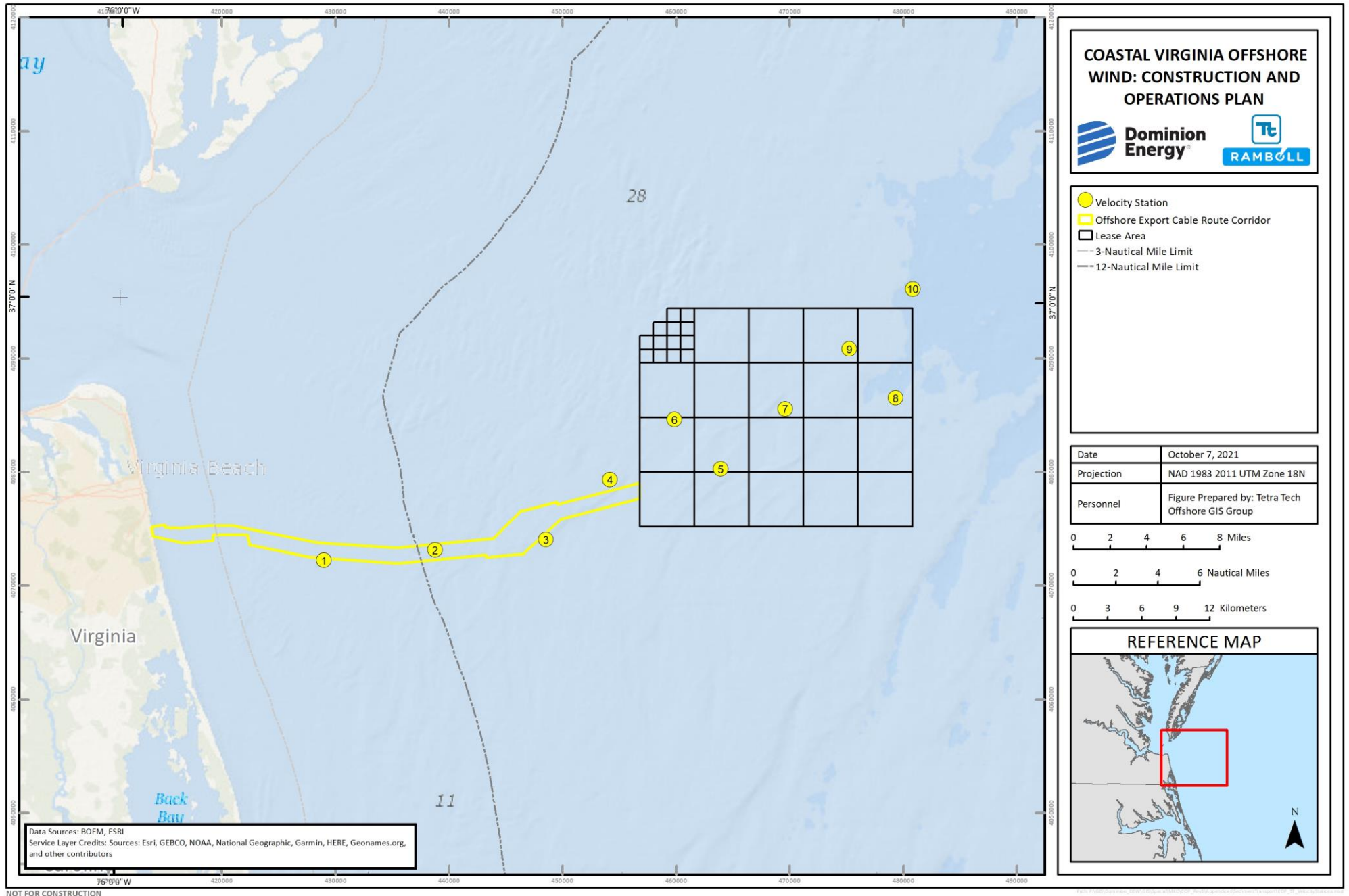
**Table J-1. Maximum Flood and Ebb Current Velocity from the EPreSSO Model**

| Station ID | Longitude (W) | Latitude (N) | Depth (m) | Flood Velocity (m/s) | Ebb Velocity (m/s) | Offshore Project Area Zone                      |
|------------|---------------|--------------|-----------|----------------------|--------------------|---|
| 1          | -75.80        | 36.79        | 55        | 0.68                 | 0.53               | Offshore Export Cable Route Corridor            |
| 2          | -75.69        | 36.80        | 63        | 0.65                 | 0.54               | Offshore Export Cable Route Corridor            |
| 3          | -75.58        | 36.81        | 68        | 0.68                 | 0.49               | Offshore Export Cable Route Corridor            |
| 4          | -75.51        | 36.86        | 74        | 0.69                 | 0.47               | Offshore Export Cable Route Corridor/Lease Area |
| 5          | -75.40        | 36.87        | 84        | 0.72                 | 0.53               | Lease Area                                      |
| 6          | -75.45        | 36.91        | 84        | 0.68                 | 0.52               | Lease Area                                      |
| 7          | -75.34        | 36.92        | 93        | 0.70                 | 0.56               | Lease Area                                      |
| 8          | -75.23        | 36.92        | 105       | 0.70                 | 0.60               | Lease Area                                      |
| 9          | -75.28        | 36.96        | 101       | 0.68                 | 0.61               | Lease Area                                      |
| 10         | -75.22        | 37.01        | 112       | 0.68                 | 0.67               | Lease Area                                      |

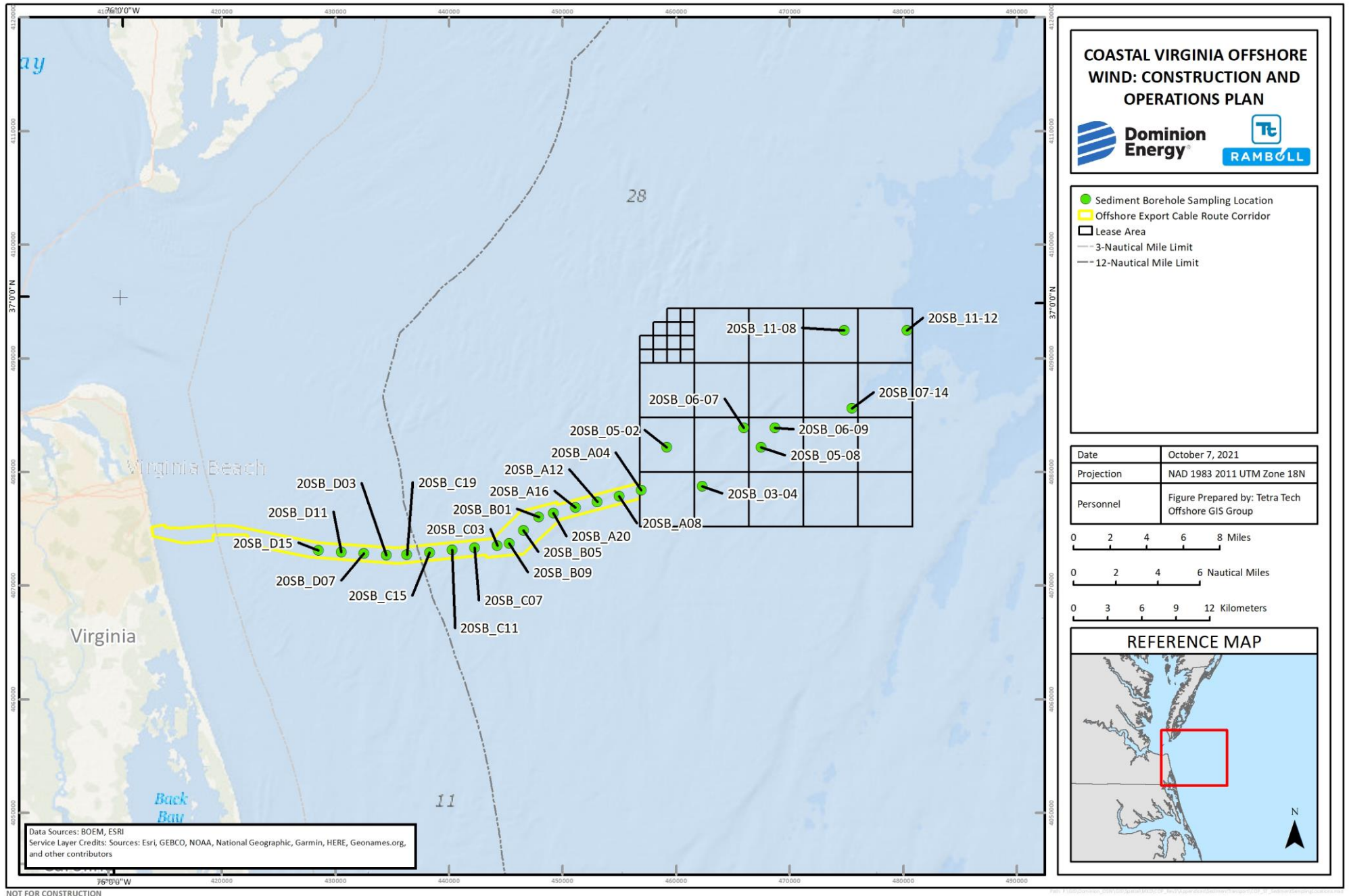
### J.3.2 Sediment Characteristic Data

Preliminary sediment characteristic data, including site-specific sediment grain size distribution data and density, were collected throughout the Offshore Project Area by Geoquip Marine in 2020 (Geoquip Marine 2020a,b). Geoquip Marine collected borehole sediment samples in and around the Offshore Project Area at 25 locations. Of the 25 locations where sediment data were collected, 17 locations fell in the Offshore Export Cable Route Corridor and the rest were in the Lease Area (Figure J-3). The borehole sampling evaluated particle size distribution to a depth of between 22.97 and 27.9 ft (7 and 8.5 m) in the Export Cable Route Corridor and as deep as 315 ft (96 m) in the Lease Area. Relative density was performed on select borehole samples.

When cables are installed using jet plowing, only fine sediments, consisting of fine sand and smaller particle sizes, remain suspended in the water column long enough to be transported away from the immediate trench. Larger particle sizes such as coarse sands resettle immediately into the trench (Tetra Tech 2012, 2015); therefore, only finer sand and mud were assessed in the sediment transport model. The sediment sampling provided “percent finer” (percentage of material of the total sample that will pass through the each sieve) for sieve sizes 0.375 in (9.53 millimeter), #4, #10, #20, #40, #60, #100, #140, and #200. For samples equal to or greater than 15 percent finer than the #200 sieve size, sedimentation methods were used to determine the size distribution. Table J-2 shows the sieve sizes or particle size used to define the percent finer for each sediment class.



**Figure J-2. Velocity Station Locations**



**Figure J-3. Sediment Sampling Locations**

**Table J-2. Sediment Class Sieve Size and Particle Size**

| Sediment Class | Sieve Size  | Particle Size (mm) |
|----------------|-------------|--------------------|
| Gravel         | > #4        | -                  |
| Coarse Sand    | #4 – #10    | -                  |
| Medium Sand    | #10 – #20   | -                  |
| Fine Sand      | #20 – #140  | -                  |
| Very Fine Sand | #140 – #200 | -                  |
| Silt           | -           | >0.002             |
| Clay           | -           | <0.002             |

Sediment particle percentages from each sample depth were depth-weighted to the maximum trench depth of 18.04 ft (5.5 m) for the Export Cable Route and a maximum depth of 11.48 ft (3.5 m) for the Lease Area, resulting in a representative sediment particle size distribution for each borehole location. For boreholes where none of the samples included additional sedimentation analysis, the silt and clay distribution were equally divided. Settling velocities were assigned to fine sand, very fine sand, silt, and clay classes (USGS 2005). Maximum and minimum density was measured at 21 borehole locations. The maximum sediment density was assigned to each borehole location in the sediment transport model. For borehole locations without measured density, the average of all measured maximum densities, or 2,758 lb/yd<sup>3</sup> (1,636 kilograms per cubic meter [kg/m<sup>3</sup>]), was used.

Table J-3 provides the depth-weighted representative sediment particle percentages for the borehole locations in the Offshore Project Area. In 18 sediment sampling locations, fine particles made up more than 80 percent of the total sediment sample. The percentage of fine particles within the sediment samples ranged from 43 percent to 99 percent. On an average, sediment sampling location along the Offshore Export Cable Route Corridor had 81 percent fine sediment while stations in the Lease Area had around 85 percent fine sediment.

**Table J-3. Project Area Depth Weighted Sediment Particle Size Distributions and Assumed Density**

| Sample                  | Offshore Project Area Zone  | Density (kg/m <sup>3</sup> ) | Coarse Sediment (%) | Fine Sand (%) | Very Fine Sand (%) | Silt (%) | Clay (%) |
|-------------------------|-----------------------------|------------------------------|---------------------|---------------|--------------------|----------|----------|
| 20SB_03-04 <sup>a</sup> | Lease Area                  | 1,560                        | 54.71               | 39.86         | 0.51               | 4.02     | 0.89     |
| 20SB_05-02              | Lease Area                  | 1,560                        | 2.43                | 51.71         | 29.29              | 10.22    | 6.35     |
| 20SB_05-08              | Lease Area                  | 1,500                        | 4.00                | 65.36         | 18.79              | 7.11     | 4.74     |
| 20SB_06-07              | Lease Area                  | 1,636                        | 9.60                | 81.40         | 2.70               | 3.44     | 2.86     |
| 20SB_06-09              | Lease Area                  | 1,520                        | 8.67                | 48.59         | 5.34               | 23.05    | 14.35    |
| 20SB_07-14 <sup>p</sup> | Lease Area                  | 1,710                        | 29.14               | 61.71         | 4.07               | 2.92     | 2.15     |
| 20SB_11-08              | Lease Area                  | 1,490                        | 3.71                | 72.29         | 3.00               | 14.87    | 6.13     |
| 20SB_11-12 <sup>c</sup> | Lease Area                  | 1,420                        | 9.80                | 52.41         | 1.28               | 10.39    | 26.11    |
| 20SB_A04                | Export Cable Route Corridor | 1,790                        | 44.02               | 35.29         | 2.05               | 11.26    | 7.38     |
| 20SB_A08                | Export Cable Route Corridor | 1,780                        | 55.82               | 40.42         | 0.66               | 1.55     | 1.55     |
| 20SB_A12                | Export Cable Route Corridor | 1,770                        | 37.15               | 58.50         | 0.97               | 1.69     | 1.69     |
| 20SB_A16                | Export Cable Route Corridor | 1,690                        | 8.32                | 75.65         | 7.19               | 6.95     | 1.90     |
| 20SB_A20                | Export Cable Route Corridor | 1,636                        | 2.25                | 88.13         | 4.37               | 2.62     | 2.62     |
| 20SB_B01                | Export Cable Route Corridor | 1,680                        | 10.41               | 79.46         | 4.11               | 3.01     | 3.01     |

| Sample   | Offshore Project Area Zone  | Density (kg/m <sup>3</sup> ) | Coarse Sediment (%) | Fine Sand (%) | Very Fine Sand (%) | Silt (%) | Clay (%) |
|--|-----------------------------|------------------------------|---------------------|---------------|--------------------|----------|----------|
| 20SB_B05   | Export Cable Route Corridor | 1,720                        | 7.95                | 80.25         | 5.79               | 3.01     | 3.01     |
| 20SB_B09   | Export Cable Route Corridor | 1,700                        | 4.98                | 84.21         | 4.90               | 2.95     | 2.95     |
| 20SB_C03   | Export Cable Route Corridor | 1,650                        | 10.45               | 79.20         | 3.73               | 3.31     | 3.31     |
| 20SB_C07   | Export Cable Route Corridor | 1,590                        | 6.10                | 41.77         | 14.86              | 34.18    | 3.09     |
| 20SB_C11   | Export Cable Route Corridor | 1,690                        | 19.91               | 74.03         | 1.52               | 2.27     | 2.27     |
| 20SB_C15   | Export Cable Route Corridor | 1,636                        | 16.78               | 39.55         | 4.73               | 25.74    | 13.20    |
| 20SB_C19   | Export Cable Route Corridor | 1,636                        | 16.35               | 40.30         | 3.02               | 24.96    | 15.37    |
| 20SB_D03   | Export Cable Route Corridor | 1,480                        | 29.91               | 23.38         | 14.67              | 23.42    | 8.61     |
| 20SB_D07   | Export Cable Route Corridor | 1,720                        | 29.04               | 35.64         | 2.65               | 21.00    | 11.67    |
| 20SB_D11   | Export Cable Route Corridor | 1,630                        | 10.98               | 65.53         | 9.00               | 10.35    | 4.13     |
| 20SB_D15   | Export Cable Route Corridor | 1,700                        | 14.84               | 69.69         | 3.49               | 8.74     | 3.24     |
| Note:<br>Total sediment = coarse sediment + fine sand + very fine sand + silt + clay. Values may not add to 100 percent due to rounding.<br><sup>a</sup> Combined with 20SB_03-04A<br><sup>b</sup> Combined with 20SB_07-14A<br><sup>c</sup> Combined with 20SB_11-12A |                             |                              |                     |               |                    |          |          |

## J.4 SEDIMENT TRANSPORT MODEL

This section describes the methodology followed to develop the conservative analytical sediment transport model to characterize the potential maximum sediment transport and deposition scenario for the jet plow activities. The model simulates sediment resuspension due to jet plow operations and analyzes suspended sediment concentrations and subsequent sediment deposition pattern in the water column to determine potential sediment impacts during Project installation activities. The analytical model incorporates the hydrodynamic data from the ESPreSSO model. The sediment settling and transport assumptions are conservative in nature so that the expected maximum water quality column concentrations and potential sediment transport are calculated. The analytical model is based on the physical laws governing transport of sediment due to local current conditions, and the settling of sediment is based on Stokes Law. Assumptions used to develop a project design envelope approach for the sediment transport analysis are listed in detail in Section J.4.1, Model Setup and Parametrization.

### J.4.1 Model Setup and Parametrization

Jet plowing utilizes high-pressured water jets to fluidize soil as the machine traverses along a submarine cable route. The cable descends into a temporary trench incised by the jetting blades and is subsequently buried as the fluidized sediments resettle inside the trench. During jet plow operations, the operator monitors the burial and adjusts the angle of the jetting blades and the water pressure to obtain desired burial depth while minimizing sediment mobilization into the water column.

By design, coarser sediments settle immediately to fill the trench and bury the cable or settle in the immediate vicinity, typically within a foot (Tetra Tech 2012, 2015; Vinhateiro et al. 2013). An earlier study has shown that sediments coarser than 0.2 mm settle immediately over the trench (Tetra Tech 2015). A conservative approach was taken by assuming that sediments finer than 0.25 mm (fine sand) would be mobilized into the water column and transported by the ambient currents varying distances depending on a number of factors.

The height of the sediment plume above the seabed is dependent on local hydrodynamics, sediment size distribution, and the jet plow operating parameters. Previous studies have shown that the plume of sediment released during jet plowing reaches heights of roughly 7 ft (2 m) above the seabed (Tetra Tech 2012, 2015). The suspended sediment plume is then dispersed by local tidal currents and moves in the direction of the dominant current, which for the Project would be northward during flood tides and southward during ebb tides. Tidal conditions and currents will be dependent on current conditions during each stage of Project construction. The analytical sediment transport model simulated transport for both the maximum flood and ebb conditions to better estimate potential transport in both directions.

Settling velocity determines the time it takes for a fine grain sediment to settle back to the seabed based on Stokes Law. Based on the sediment grain size distribution, representative sediment classes were selected and settling velocities were assigned to those classes (USGS 2005). However, in many instances, the fine clay and silt sediment particles become cohesive when they are forced into resuspension by the jet plow, causing them to have settling velocities similar to larger sized particles (Swanson et al. 2015; Van Rijn 2019). The settling velocities determine the duration for which the resuspended sediment remains in the water column before eventually settling to the seabed. These velocities have been assigned to each sediment class based on a USGS study (USGS 2005). Table J-4 lists the different sediment classes and the associated settling velocities used for the modeling.

**Table J-4. Project Sediment Particle Diameter Classes and Settling Velocity**

| Sediment Class | Settling Velocity (cm/s) |
|----------------|--------------------------|
| Fine Sand      | 3.000                    |
| Very Fine Sand | 1.000                    |
| Silt           | 0.126                    |
| Clay           | 0.023                    |

## J.4.2 Methodology

This section describes how the analytical sediment transport model was implemented to calculate the maximum suspended sediment water column concentrations and deposition depths. The approach assumes that the fine sediments released from the jet plow are released at a fixed height. The sediment particles are then transported by local tidal currents and settle down at fixed rates over the horizontal sea floor (Tetra Tech 2012, 2015; Vinhateiro et al. 2013; Swanson et al. 2015). No secondary resuspension of sediment particles was considered. Resuspension is a result of the naturally occurring bottom currents and turbulence and is therefore not directly related to jet plowing activities. The model focuses on the initial dispersion of particles due to jet plowing activities that may generate brief episodes of elevated fine sediment concentrations in the water column and the resulting transport and deposition of these suspended sediments.



The expected sediment transport was calculated for each sediment sampling location. It was assumed that these stations would be representative of the general conditions of the Offshore Project Area. Each sediment sample location was assigned the representative flood and ebb velocities that corresponded to the velocity station and sediment characteristics based on the Offshore Project Area zone it fell in. The flood and ebb velocities were used to calculate the maximum extent of sediment deposition and the duration for which the sediment remained in suspension for each sediment class at all stations.

The travel speed of the jet plow was assumed at 656 ft per hour (200 m per hour). For the model analysis, it was assumed that 30 minutes of trenching activities were suspended at each time-step. Based on the provided specifications, the trench was assumed to be 328 ft (100 m) long<sup>e</sup>, 4.9 ft (1.5 m) wide, and 18.0 ft (5.5 m) deep for trenching in the Offshore Export Route Corridor. Therefore, for each sediment location, the maximum volume of potential sediment fluidized in the water column was 29,135 cubic feet (825 cubic meters) if all of it is fine sand or smaller. For trenches within the Lease Area, the trench was assumed to be 328 ft (100 m) long, 4.9 ft (1.5 m) wide, and 11.5 ft (3.5 m) deep with a maximum volume of 18,540 cubic feet (525 cubic meters) if all of it is fine sand or smaller.

This volume of sediment was assumed to be instantaneously suspended at time-step zero seconds in the analytical sediment transport model. This conservative assumption results in a higher concentration of suspended sediments in the water column than if a smaller volume of sediments at a shorter time-step were suspended; however, it does not impact deposition depths.

The sediment concentration at the release location was determined based on the estimated bed sediment and the percentage of sediment in each class. The sediment concentrations of each class were added together to calculate the total volume of sediment resuspended at the release point. With time, the sediment plume was allowed to grow based on the velocity at that location. The sediment plume does not grow in the vertical direction and is always close to the bottom of the water column. The duration of suspension for each sediment class was calculated using the release height and sediment class settling velocity. The maximum extent of travel for each sediment class was calculated using the current velocity and sediment settling velocity. Sediment particles in each class were assumed to settle out of the water column at a linear rate. The suspended sediment concentrations at each location along the trench were calculated based on the sediment left in the water column at the time and the size of the plume.

The point of deposition for each particle was calculated based on the settling velocity of each sediment class. Coarser sediments with higher settling velocity settle out of the water column faster and closer to the release point as compared to finer sediments. The finer sediment classes remain in the water column for longer periods of times and are advected further than the coarser sediments. In addition, the finer clay and silt sediment particles, which are typically cohesive, undergo enhanced settling due to flocculation and settle out of the water column with large-sized particles (Swanson et al. 2015; Van Rijn 2019). Sediments were assumed to settle out of the water column at a linear rate for each sediment particle class, i.e., varying sized sediments within each class were assigned to be evenly distributed within the plume. Sediment classes larger than medium silt all deposited within an hour, while fine silts and clays remained in suspension for several hours. In addition, the model did not explicitly simulate dispersion, which could cause some

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<sup>e</sup> Dominion Energy assumed a jet plow speed of 656 ft (200 m) per hour. As a conservative assumption, the model assumed that all the fine material dislodged by the jet plow during an interval of 30 minutes would be dispersed into the water column at the same time.

particles to be transported further than estimated, but this mostly impacts smaller particles that will most likely stay in suspension. Instead, dispersion was represented by the plume growth in terms of spreading of the sediment particles based on the ambient currents and the settling velocity.

## J.5 RESULTS

This section describes the sediment transport analytical model results in terms of suspended sediment concentrations, deposition depth, and distance at which the sediment is deposited. Results of the conservative analytical sediment transport model representing the Offshore Project Area are provided at all locations with available velocity data.

### J.5.1 Suspended Sediment Concentrations

Table J-5 and Figure J-5 list the predicted maximum suspended sediment concentrations by distance from the trench centerline at locations perpendicular to the trench centerline for all sample stations for flood and ebb currents, respectively. Figure J-4 and Figure J-5 show the estimated maximum suspended sediment concentrations for maximum flood and ebb tides at two representative sediment sample locations—20SB\_A08 (Cable Route) and 20SB\_C19 (Cable Route). These same values are shown throughout the Offshore Project Area in Figure J-6 and Figure J-7, respectively. The silt and clay sediment percentage is 3 percent at 20SB\_A08 and 40 percent at 20SB\_C19. These stations were chosen to ensure that the variability in fine sediment percentage is captured well. Table J-8 shows the expected maximum instantaneous suspended sediment concentrations at any given time-step along the cable installation routes. Figure J-6 was developed using one representative cable within the Offshore Project Area. It is important to note that these concentrations do not occur at all locations simultaneously. Given the speed of the jet plow, only small sections of the Offshore Project Area would be disturbed at any given time during Project construction, which is the reason the model used the volume of sediment put into suspension in 30 minutes of jet plow travel (trench length of 328 ft [100 m]). In addition, due to the depth of water within the Offshore Project Area, the plume should not be visible from the surface. The plume concentrations are typically lower at all non-riverine stations due to lesser fine sediment content, plume dispersion, and sediment deposition.

Twenty-three of 25 sediment sampling locations had a fine sediment content of more than 50 percent. Typically, stations had around 8 percent silt and clay. On an average, sediment sampling locations along the Offshore Cable Route Corridor had 81 percent fine sediment while stations in the Lease Area had around 85 percent fine sediment. The type of fine sediments at each location impacted the maximum plume concentrations. Fine sand, the coarsest fine sediment particle class, has a settling velocity of 5.9 ft/min (3 cm per second) and remains in suspension for approximately 1 minute. Therefore, at locations with higher sand content, suspended sediment concentrations decreased by 69 percent or greater within 1 minute of jet plowing operations. This reduced the amount of sediment that could be transported in the water column due to currents, and most of the fine sand deposits within 16.4 ft (5 m) of the trench centerline.

#### J.5.1.1 Offshore Export Cable Route Corridor

The fine sediment content along the Offshore Export Cable Route Corridor varied from a low of 56 percent at sampling location 20SB\_A04 to a high of 98 percent at 20SB\_A20. Maximum plume horizontal distances

varied between 1,640 ft and 3,280 ft (500 m and 1,000 m) for flood tides (Table J-5). Maximum plume distances were always less than 820 ft (250 m) for ebb tides (Table J-6).

Expected maximum suspended sediment concentrations were between 46 milligrams per liter (mg/L) and 364 mg/L at 1,150 ft (350 m) from the trench centerline for flood tides. For ebb tides, expected maximum suspended sediment concentration was zero mg/L and reached background concentration 1,150 ft (350 m) from the trench centerline. Studies have shown suspended sediment concentrations of anywhere from 50 to 1,000 mg/L at distances around 1,000 ft (300 m) from the centerline (Tetra Tech 2012, ESS Group 2013; Swanson et al. 2015). The sediment plume was confined near the substrate layer and is not expected to reach the surface.

The potential maximum suspended sediment concentrations were dependent on the burial depth and total percent fines at each sampling location. Stations with higher percentages of fine sediment particle classes had higher concentrations of suspended sediments because more particles were suspended during jet plowing. If a station had a total percent fine sediment composition of 50 percent, half of the disturbed sediments would be mobilized into the water column following resuspension by the jet plow. Assuming a trench depth of 18.0 ft (5.5 m), slightly over 8.2 ft (2.5 m) of fine sediments would be resuspended into the water column. The highest concentrations occurred at the release point, and concentrations decreased further from the trench. These concentrations, specifically at the trench, were confined close to the substrate. For sediment sampling locations that had at least 80 percent fine sediments, nearly all of the material disturbed by the jet plow would be released into the water column. The conservative sediment transport model predicted that maximum suspended sediment concentration would be greater than  $4.44 \times 10^6$  mg/L at the release point during flood and ebb conditions. For stations with lower fine sediment percentage (less than 45 percent), the predicted maximum suspended sediment concentration is lower than  $2.20 \times 10^6$  mg/L at the release point.

#### **J.5.1.2 Lease Area**

At the Lease Area sediment sampling locations, maximum plume distances were typically between 820 and 3,280 ft (250 m and 1,000 m). The plume traveled further distances during the flood tide as compared to the ebb tide. The total distance the sediment plumes traveled was dependent on the current velocities. Suspended sediment concentrations were always below 620 mg/L at a distance of 820 ft (250 m) from trench centerline during flood and ebb tides. Results indicated that the plume would travel to a maximum distance of 3,280 ft (1,000 m) during the flood tide, although the maximum suspended sediment concentrations at that distance would be typically less than 3 mg/L. During ebb tides, the maximum plume distance traveled is typically around 820 ft (250 m). Expected maximum suspended sediment concentrations drop to below 50 mg/L at 1,640 ft (500 m) from the trench centerline during flood tides and at 820 ft (250 m) during ebb tides. Maximum plume distance at any station depends on the current velocity and its components perpendicular and parallel to the direction of trench movement.

The sediment transport model predicted that maximum suspended sediment concentrations would be around  $1.90 \times 10^6$  mg/L for sediment sampling locations at the release point during flood and ebb conditions. For flood tides, the suspended sediment concentration averaged around 1,600 mg/L at a distance of 328 ft (100 m), and for ebb tides, the concentrations averaged around 169 mg/L at a travel distance of 328 ft (100 m).

**J.5.1.3 General Observations**

While the maximum suspended sediment concentrations were relatively high for sediment sampling locations in the Offshore Project Area, these concentrations decreased rapidly with time. The coarser fine particles, such as fine sand, remained in suspension for about 1 minute, while the very fine sediments (clay) remained in suspension for about 4 hours, a relatively short period of time. In areas that consist predominantly of gravels and sands, the analysis indicates a limited extent of increased sediment concentrations because the larger grain size sediments immediately deposit in the trench. In locations that are dominated by fine sand, silts, or clays, these sediments can be released into the water column and temporarily increase total suspended solids near the trench and cause sediment deposition outside of the trench, but eventually settle down to background concentrations (Tetra Tech 2012, 2015; Vinhateiro et al. 2013). Table J-7 and Table J-8 present the time varying suspended sediment concentrations for flood and ebb tides, respectively, for all sediment sampling locations. The concentrations decreased rapidly with time, and water column concentrations are expected to return to ambient conditions within 4 hours (14,400 seconds).

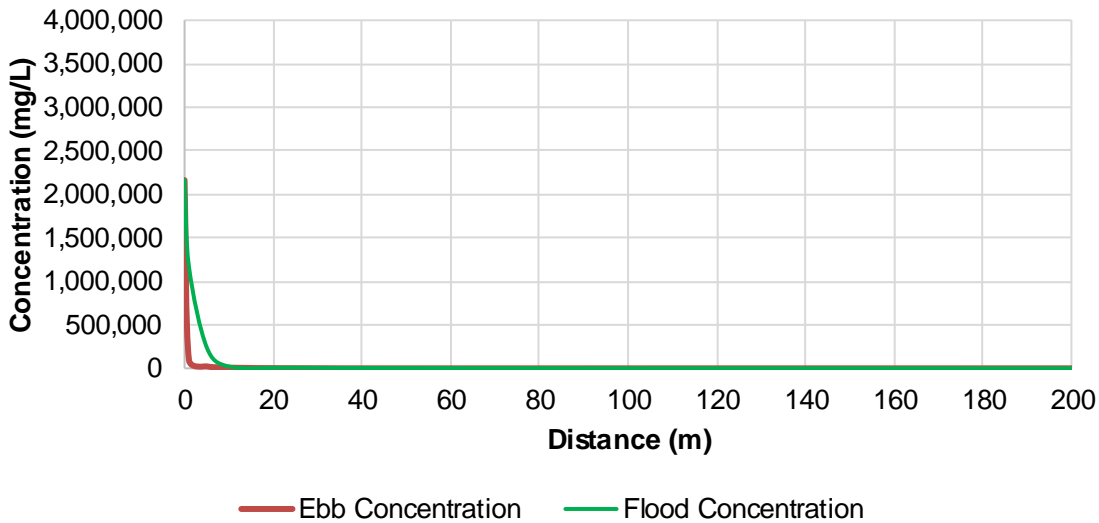


Figure J-4. Maximum Flood and Ebb Tide Suspended Sediment Concentrations at 20SB\_A08 (3% clay and silt)

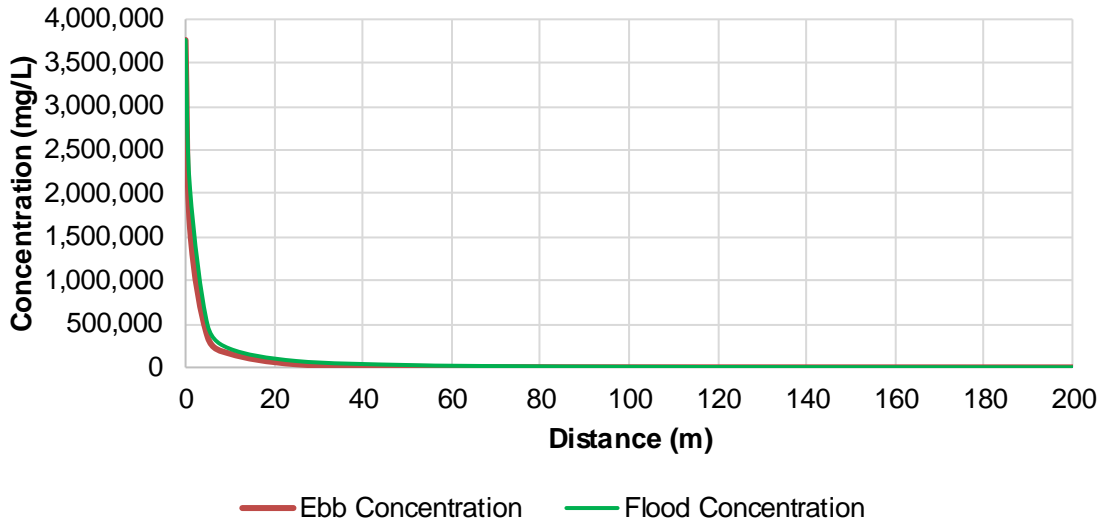


Figure J-5. Maximum Flood and Ebb Tide Suspended Sediment Concentrations at 20SB\_C19 (40% clay and silt)

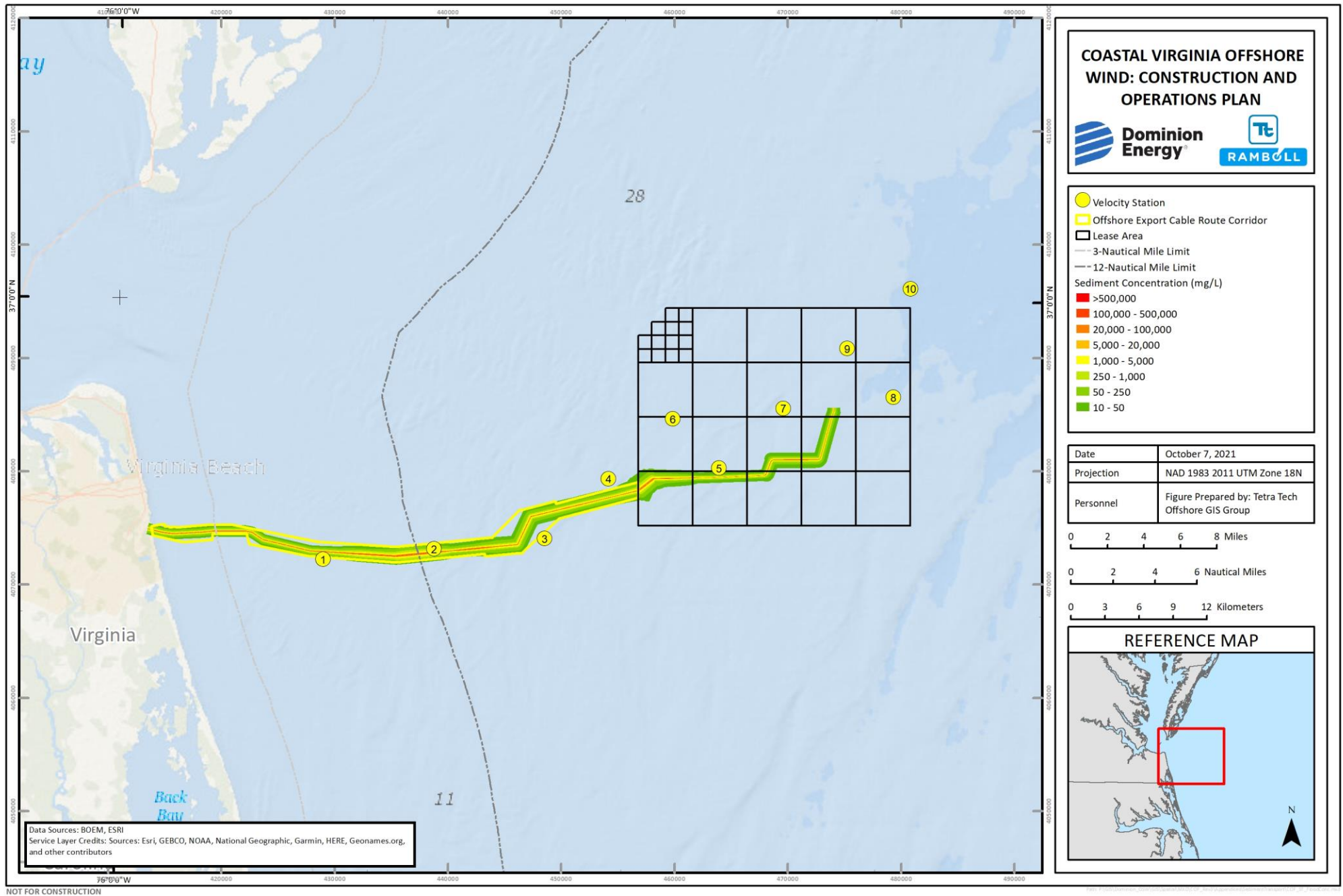


Figure J-6. Maximum Flood Tide Suspended Sediment Concentrations Along Representative Offshore Export Cable Route

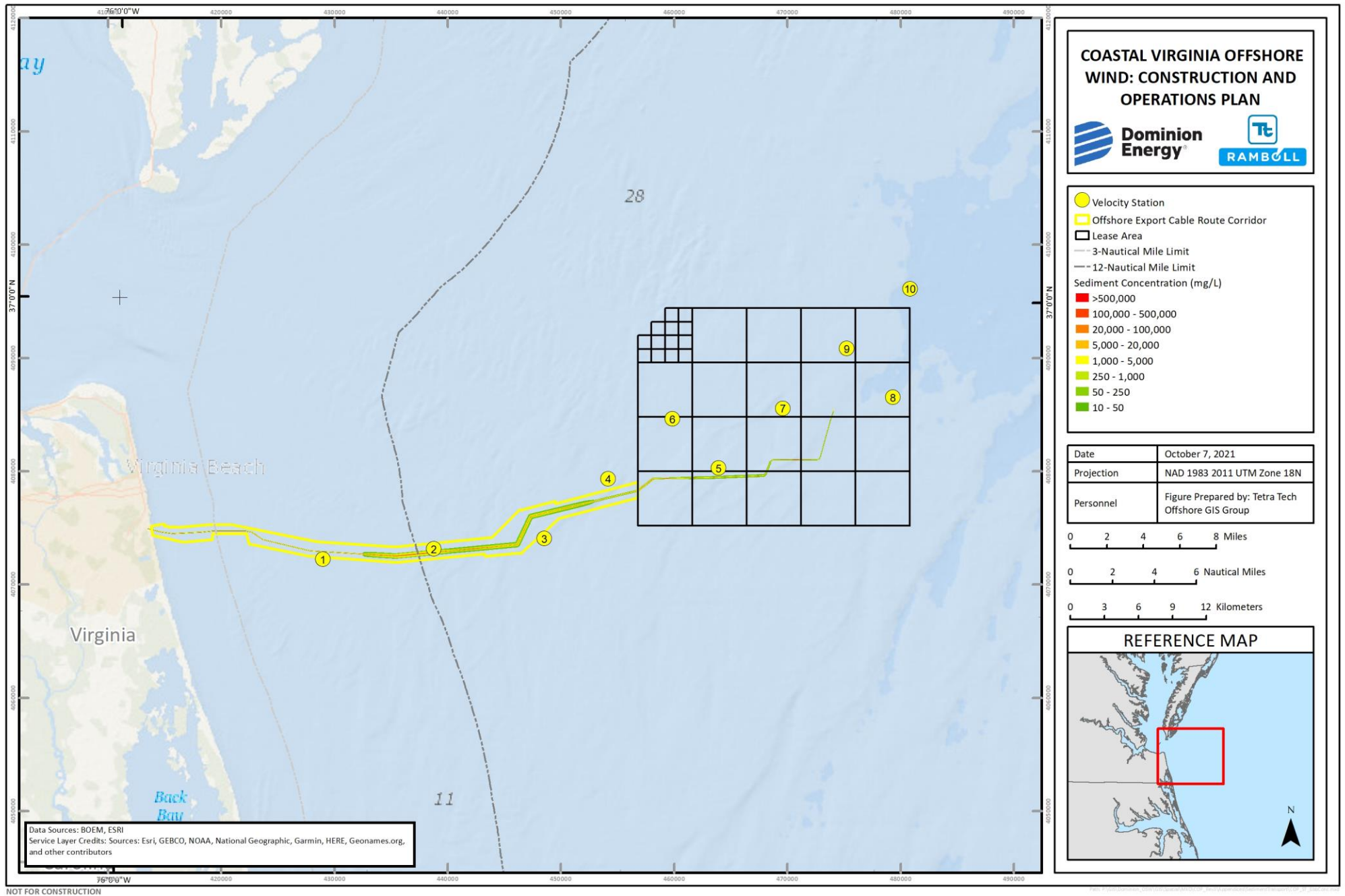


Figure J-7. Maximum Ebb Tide Suspended Sediment Concentrations Along Representative Offshore Export Cable Route

**Table J-5. Project Maximum Suspended Sediment Concentrations for Flood Conditions (with Distance)**

| Sample     | Project Element                      | Total Fines (%) | Distance from Trench (m)              |           |         |         |        |        |        |       |       |     |     |     |     |       |       |       |
|------------|--------------------------------------|-----------------|---------------------------------------|-----------|---------|---------|--------|--------|--------|-------|-------|-----|-----|-----|-----|-------|-------|-------|
|            |                                      |                 | 0                                     | 1         | 5       | 10      | 25     | 50     | 75     | 100   | 150   | 250 | 350 | 500 | 800 | 1,000 | 2,500 | 5,000 |
|            |                                      |                 | Maximum Sediment Concentration (mg/L) |           |         |         |        |        |        |       |       |     |     |     |     |       |       |       |
| 20SB_03-04 | Lease Area                           | 45.3%           | 846,300                               | 456,795   | 97,108  | 12,657  | 4,540  | 1,812  | 950    | 553   | 207   | 33  | 17  | 8   | 2   | 1     | 0     | 0     |
| 20SB_05-02 | Lease Area                           | 97.6%           | 1,899,300                             | 1,047,784 | 260,513 | 74,287  | 10,342 | 4,026  | 2,168  | 1,305 | 542   | 149 | 76  | 33  | 7   | 2     | 0     | 0     |
| 20SB_05-08 | Lease Area                           | 96.0%           | 1,856,250                             | 1,001,728 | 212,570 | 52,293  | 9,757  | 3,871  | 2,024  | 1,183 | 459   | 137 | 67  | 27  | 5   | 0     | 0     | 0     |
| 20SB_06-07 | Lease Area                           | 90.4%           | 1,840,179                             | 967,894   | 163,611 | 16,680  | 4,820  | 1,928  | 1,018  | 603   | 244   | 76  | 37  | 15  | 3   | 0     | 0     | 0     |
| 20SB_06-09 | Lease Area                           | 91.3%           | 1,740,780                             | 971,752   | 259,906 | 101,761 | 34,372 | 13,603 | 7,089  | 4,128 | 1,580 | 462 | 226 | 93  | 16  | 0     | 0     | 0     |
| 20SB_07-14 | Lease Area                           | 70.9%           | 1,590,300                             | 828,493   | 126,649 | 20,215  | 4,970  | 1,916  | 975    | 555   | 200   | 66  | 31  | 12  | 1   | 0     | 0     | 0     |
| 20SB_11-08 | Lease Area                           | 96.3%           | 1,817,800                             | 949,943   | 150,171 | 29,160  | 10,053 | 3,807  | 1,886  | 1,030 | 315   | 96  | 46  | 18  | 2   | 0     | 0     | 0     |
| 20SB_11-12 | Lease Area                           | 90.2%           | 1,545,670                             | 844,798   | 196,935 | 73,222  | 26,930 | 11,017 | 5,999  | 3,698 | 1,683 | 611 | 292 | 114 | 14  | 0     | 0     | 0     |
| 20SB_A04   | Offshore Export Cable Route Corridor | 56.0%           | 2,755,705                             | 1,531,481 | 399,335 | 118,276 | 42,504 | 17,566 | 9,637  | 5,919 | 2,587 | 697 | 360 | 161 | 39  | 13    | 0     | 0     |
| 20SB_A08   | Offshore Export Cable Route Corridor | 44.2%           | 2,162,700                             | 1,163,622 | 241,206 | 20,878  | 7,171  | 2,973  | 1,655  | 1,035 | 475   | 146 | 75  | 34  | 8   | 3     | 0     | 0     |
| 20SB_A12   | Offshore Export Cable Route Corridor | 62.9%           | 3,059,445                             | 1,642,967 | 335,298 | 23,612  | 7,842  | 3,230  | 1,798  | 1,124 | 516   | 158 | 82  | 36  | 9   | 3     | 0     | 0     |
| 20SB_A16   | Offshore Export Cable Route Corridor | 91.7%           | 4,260,913                             | 2,289,984 | 470,355 | 73,496  | 18,186 | 7,214  | 3,758  | 2,169 | 785   | 154 | 78  | 34  | 7   | 2     | 0     | 0     |
| 20SB_A20   | Offshore Export Cable Route Corridor | 97.7%           | 4,396,800                             | 2,343,155 | 448,002 | 42,882  | 10,773 | 4,444  | 2,430  | 1,492 | 659   | 207 | 104 | 45  | 10  | 2     | 0     | 0     |
| 20SB_B01   | Offshore Export Cable Route Corridor | 89.6%           | 4,139,100                             | 2,209,932 | 429,477 | 47,407  | 12,676 | 5,234  | 2,862  | 1,758 | 776   | 244 | 123 | 53  | 11  | 2     | 0     | 0     |
| 20SB_B05   | Offshore Export Cable Route Corridor | 92.1%           | 4,354,180                             | 2,327,728 | 457,363 | 54,408  | 12,992 | 5,355  | 2,928  | 1,798 | 794   | 249 | 126 | 54  | 11  | 2     | 0     | 0     |
| 20SB_B09   | Offshore Export Cable Route Corridor | 95.0%           | 4,442,100                             | 2,371,376 | 460,291 | 50,115  | 12,612 | 5,203  | 2,845  | 1,747 | 771   | 242 | 122 | 53  | 11  | 2     | 0     | 0     |
| 20SB_C03   | Offshore Export Cable Route Corridor | 89.5%           | 4,063,125                             | 2,170,455 | 423,637 | 48,536  | 13,685 | 5,655  | 3,092  | 1,899 | 838   | 263 | 133 | 57  | 12  | 3     | 0     | 0     |
| 20SB_C07   | Offshore Export Cable Route Corridor | 93.9%           | 4,105,778                             | 2,242,715 | 520,228 | 217,246 | 62,473 | 21,518 | 9,380  | 4,186 | 436   | 158 | 71  | 24  | 0   | 0     | 0     | 0     |
| 20SB_C11   | Offshore Export Cable Route Corridor | 80.1%           | 3,722,225                             | 1,877,066 | 181,254 | 28,046  | 8,679  | 3,288  | 1,647  | 921   | 341   | 123 | 56  | 19  | 0   | 0     | 0     | 0     |
| 20SB_C15   | Offshore Export Cable Route Corridor | 83.2%           | 3,743,332                             | 2,046,500 | 477,587 | 210,863 | 70,111 | 25,667 | 12,277 | 6,428 | 1,918 | 693 | 313 | 107 | 0   | 0     | 0     | 0     |
| 20SB_C19   | Offshore Export Cable Route Corridor | 83.6%           | 3,762,552                             | 2,057,272 | 480,530 | 214,456 | 73,125 | 27,017 | 13,089 | 6,986 | 2,233 | 807 | 364 | 124 | 0   | 0     | 0     | 0     |
| 20SB_D03   | Offshore Export Cable Route Corridor | 70.1%           | 2,852,700                             | 1,585,331 | 411,833 | 179,612 | 51,594 | 18,592 | 8,693  | 4,392 | 1,133 | 409 | 185 | 63  | 0   | 0     | 0     | 0     |
| 20SB_D07   | Offshore Export Cable Route Corridor | 71.0%           | 3,356,580                             | 1,774,772 | 345,244 | 172,354 | 55,266 | 18,234 | 7,767  | 3,454 | 1,338 | 432 | 169 | 36  | 0   | 0     | 0     | 0     |
| 20SB_D11   | Offshore Export Cable Route Corridor | 89.0%           | 3,990,240                             | 1,983,244 | 193,937 | 83,521  | 22,856 | 7,362  | 3,013  | 1,237 | 449   | 145 | 57  | 12  | 0   | 0     | 0     | 0     |
| 20SB_D15   | Offshore Export Cable Route Corridor | 85.2%           | 3,981,400                             | 1,947,354 | 141,246 | 65,894  | 19,641 | 6,294  | 2,553  | 1,027 | 367   | 119 | 46  | 10  | 0   | 0     | 0     | 0     |

**Table J-6. Project Maximum Suspended Sediment Concentrations for Ebb Conditions (With Distance)**

| Sample     | Project Element                      | Total Fines (%) | Distance from Trench (m)              |           |         |         |        |       |       |       |     |     |     |     |     |       |       |       |
|------------|--------------------------------------|-----------------|---------------------------------------|-----------|---------|---------|--------|-------|-------|-------|-----|-----|-----|-----|-----|-------|-------|-------|
|            |                                      |                 | 0                                     | 1         | 5       | 10      | 25     | 50    | 75    | 100   | 150 | 250 | 350 | 500 | 800 | 1,000 | 2,500 | 5,000 |
|            |                                      |                 | Maximum Sediment Concentration (mg/L) |           |         |         |        |       |       |       |     |     |     |     |     |       |       |       |
| 20SB_03-04 | Lease Area                           | 45.3%           | 846,300                               | 122,281   | 16,958  | 6,595   | 643    | 112   | 42    | 17    | 0   | 0   | 0   | 0   | 0   | 0     | 0     | 0     |
| 20SB_05-02 | Lease Area                           | 97.6%           | 1,899,300                             | 243,250   | 25,648  | 6,364   | 847    | 95    | 0     | 0     | 0   | 0   | 0   | 0   | 0   | 0     | 0     | 0     |
| 20SB_05-08 | Lease Area                           | 96.0%           | 1,856,250                             | 109,300   | 11,629  | 2,675   | 172    | 0     | 0     | 0     | 0   | 0   | 0   | 0   | 0   | 0     | 0     | 0     |
| 20SB_06-07 | Lease Area                           | 90.4%           | 1,840,179                             | 54,095    | 6,217   | 1,490   | 96     | 0     | 0     | 0     | 0   | 0   | 0   | 0   | 0   | 0     | 0     | 0     |
| 20SB_06-09 | Lease Area                           | 91.3%           | 1,740,780                             | 384,817   | 39,951  | 9,058   | 583    | 0     | 0     | 0     | 0   | 0   | 0   | 0   | 0   | 0     | 0     | 0     |
| 20SB_07-14 | Lease Area                           | 70.9%           | 1,590,300                             | 46,273    | 2,769   | 476     | 0      | 0     | 0     | 0     | 0   | 0   | 0   | 0   | 0   | 0     | 0     | 0     |
| 20SB_11-08 | Lease Area                           | 96.3%           | 1,817,800                             | 505,767   | 44,011  | 19,118  | 3,700  | 556   | 238   | 117   | 31  | 0   | 0   | 0   | 0   | 0     | 0     | 0     |
| 20SB_11-12 | Lease Area                           | 90.2%           | 1,545,670                             | 693,488   | 123,854 | 59,689  | 17,332 | 4,972 | 2,196 | 1,214 | 462 | 77  | 0   | 0   | 0   | 0     | 0     | 0     |
| 20SB_A04   | Offshore Export Cable Route Corridor | 56.0%           | 2,755,705                             | 540,827   | 129,704 | 41,636  | 5,366  | 974   | 141   | 0     | 0   | 0   | 0   | 0   | 0   | 0     | 0     | 0     |
| 20SB_A08   | Offshore Export Cable Route Corridor | 44.2%           | 2,162,700                             | 94,469    | 22,199  | 7,547   | 1,121  | 203   | 29    | 0     | 0   | 0   | 0   | 0   | 0   | 0     | 0     | 0     |
| 20SB_A12   | Offshore Export Cable Route Corridor | 62.9%           | 3,059,445                             | 106,030   | 24,120  | 8,200   | 1,218  | 221   | 32    | 0     | 0   | 0   | 0   | 0   | 0   | 0     | 0     | 0     |
| 20SB_A16   | Offshore Export Cable Route Corridor | 91.7%           | 4,260,913                             | 1,379,459 | 86,174  | 35,619  | 7,749  | 898   | 409   | 215   | 69  | 0   | 0   | 0   | 0   | 0     | 0     | 0     |
| 20SB_A20   | Offshore Export Cable Route Corridor | 97.7%           | 4,396,800                             | 1,335,534 | 50,847  | 21,741  | 5,521  | 1,202 | 547   | 288   | 92  | 0   | 0   | 0   | 0   | 0     | 0     | 0     |
| 20SB_B01   | Offshore Export Cable Route Corridor | 89.6%           | 4,139,100                             | 1,275,459 | 58,901  | 25,607  | 6,503  | 1,416 | 645   | 339   | 109 | 0   | 0   | 0   | 0   | 0     | 0     | 0     |
| 20SB_B05   | Offshore Export Cable Route Corridor | 92.1%           | 4,354,180                             | 1,354,843 | 62,141  | 26,197  | 6,653  | 1,448 | 660   | 347   | 111 | 0   | 0   | 0   | 0   | 0     | 0     | 0     |
| 20SB_B09   | Offshore Export Cable Route Corridor | 95.0%           | 4,442,100                             | 1,367,355 | 59,502  | 25,454  | 6,464  | 1,407 | 641   | 337   | 108 | 0   | 0   | 0   | 0   | 0     | 0     | 0     |
| 20SB_C03   | Offshore Export Cable Route Corridor | 89.5%           | 4,063,125                             | 1,256,857 | 62,781  | 27,666  | 7,026  | 1,529 | 697   | 366   | 118 | 0   | 0   | 0   | 0   | 0     | 0     | 0     |
| 20SB_C07   | Offshore Export Cable Route Corridor | 93.9%           | 4,105,778                             | 1,743,984 | 311,174 | 131,997 | 24,764 | 1,259 | 562   | 290   | 89  | 0   | 0   | 0   | 0   | 0     | 0     | 0     |
| 20SB_C11   | Offshore Export Cable Route Corridor | 80.1%           | 3,722,225                             | 1,070,358 | 41,842  | 18,838  | 4,593  | 985   | 440   | 227   | 70  | 0   | 0   | 0   | 0   | 0     | 0     | 0     |
| 20SB_C15   | Offshore Export Cable Route Corridor | 83.2%           | 3,743,332                             | 1,595,804 | 335,326 | 150,680 | 33,663 | 5,538 | 2,472 | 1,275 | 392 | 0   | 0   | 0   | 0   | 0     | 0     | 0     |
| 20SB_C19   | Offshore Export Cable Route Corridor | 83.6%           | 3,762,552                             | 1,604,860 | 347,447 | 157,572 | 36,065 | 6,448 | 2,878 | 1,485 | 456 | 0   | 0   | 0   | 0   | 0     | 0     | 0     |
| 20SB_D03   | Offshore Export Cable Route Corridor | 70.1%           | 2,852,700                             | 1,300,326 | 255,036 | 110,388 | 23,626 | 3,270 | 1,460 | 753   | 231 | 0   | 0   | 0   | 0   | 0     | 0     | 0     |
| 20SB_D07   | Offshore Export Cable Route Corridor | 71.0%           | 3,356,580                             | 788,859   | 116,814 | 22,334  | 2,557  | 0     | 0     | 0     | 0   | 0   | 0   | 0   | 0   | 0     | 0     | 0     |
| 20SB_D11   | Offshore Export Cable Route Corridor | 89.0%           | 3,990,240                             | 328,688   | 45,597  | 7,496   | 858    | 0     | 0     | 0     | 0   | 0   | 0   | 0   | 0   | 0     | 0     | 0     |
| 20SB_D15   | Offshore Export Cable Route Corridor | 85.2%           | 3,981,400                             | 282,909   | 38,686  | 6,123   | 701    | 0     | 0     | 0     | 0   | 0   | 0   | 0   | 0   | 0     | 0     | 0     |





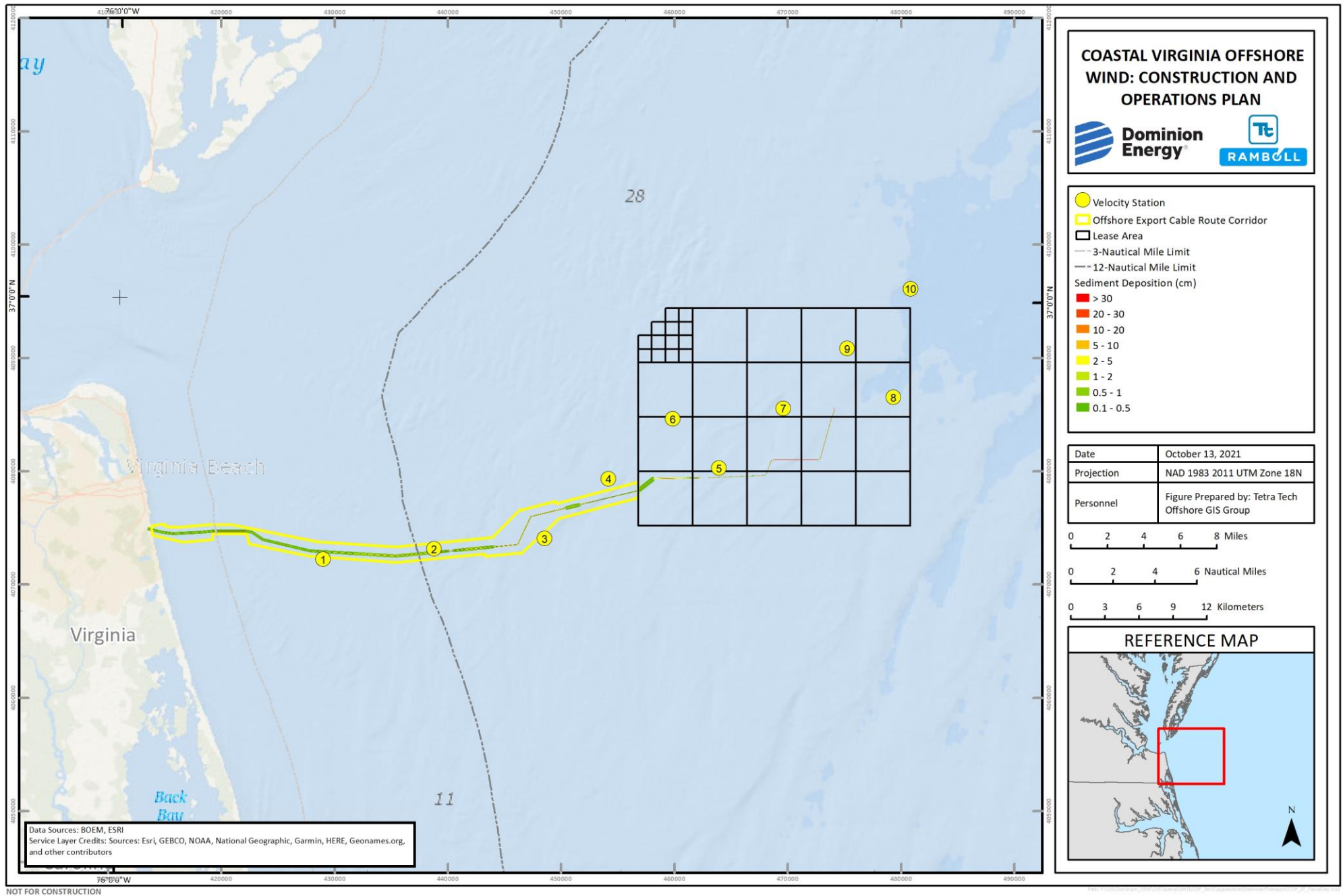
## J.5.2 Sediment Deposition Rates

Table J-9 and Table J-10 list the deposition thicknesses at locations perpendicular to the trench centerline for all stations under the maximum flood and ebb currents. Figure J-8 and Figure J-9 show the maximum predicted sediment deposition along a representative export cable within the Offshore Project Area. It is important to note that deposition does not occur at all locations simultaneously because of the speed of the jet plow. The sediment resuspended because of jet plow operations moves in the direction of the local ambient current and then eventually settles and deposits in a layer along the marine seabed. For the analytical sediment transport model, it was assumed that sediments finer than 0.25 mm (fine sand) would be mobilized in the water column and transported by the ambient currents, which would distribute sediments in each particle class uniformly over the marine seabed. All sediments coarser than 0.25 mm would redeposit in or immediately adjacent to the trench (and therefore, not be considered suspended).

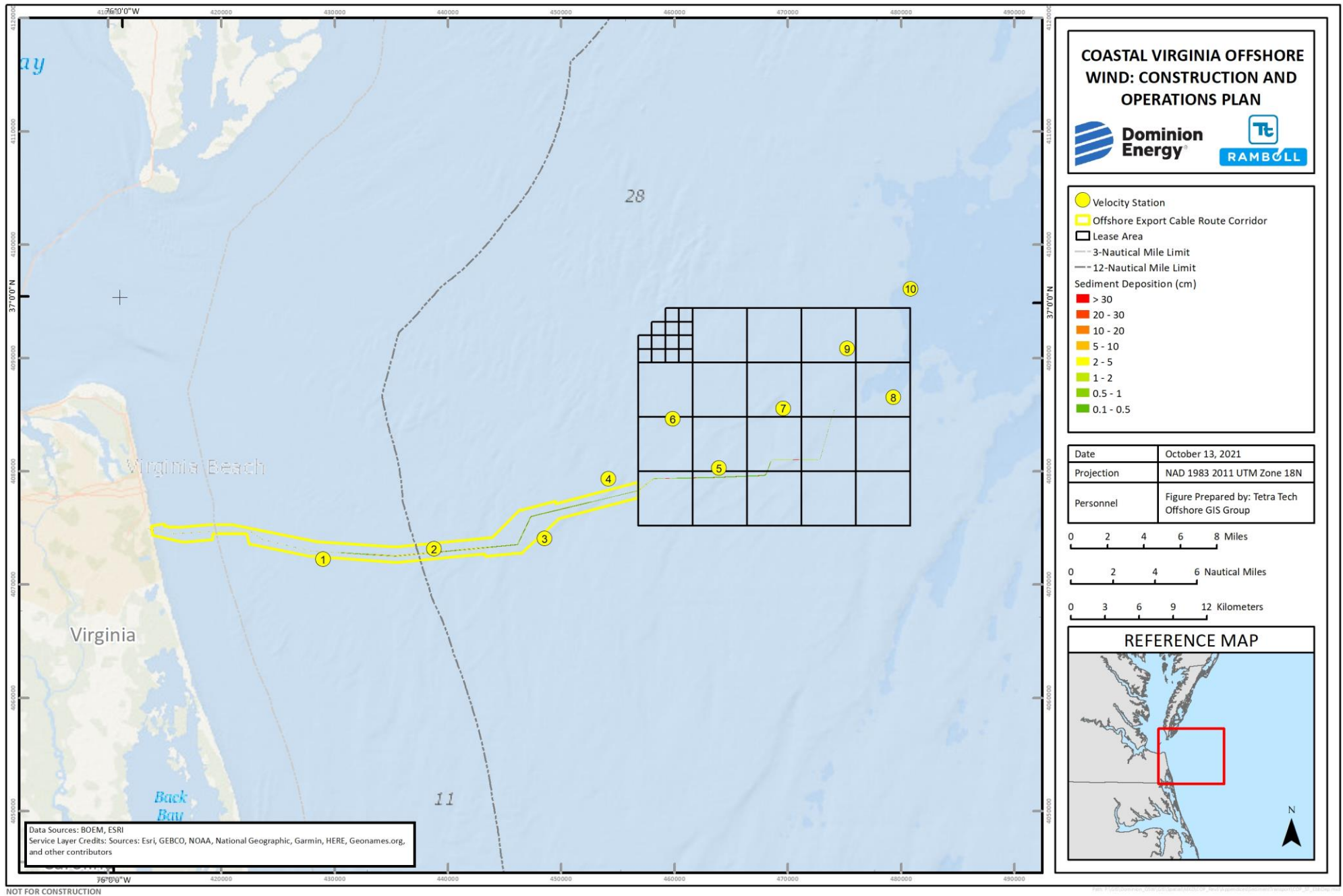
The deposition thickness was highest in the vicinity of the jet plow because fine sand tends to deposit close to the trench centerline due to its higher settling rate. Most of the coarser fine sediments settled to the marine floor within 16 ft (5 m) of the trench, and deposition depths decreased rapidly. For example, 20SB\_A20 had a fine sand content of 88 percent and the maximum observed deposition depth during flood tides was 28.35 in (72 cm) at the trench, but within 32 ft (10 m) of the trench, the deposition decreased to 0.48 in (1.22 cm).

About 3.3 ft (1 m) from the trench, the highest predicted deposition thicknesses was 35.87 in (91.1 cm) during flood tides and 128.89 in (327.39 cm) during ebb tides that occurred at 20SB\_D15, which was dominated by fine sands. At 20SB\_D15 during flood tides, the deposition thickness reduced to less than 0.4 in (less than 1 cm) within 82 ft (25 m) of the trench centerline. At 20SB\_D15 during ebb tides, the deposition thickness reduced to less than 0.4 in (less than 1 cm) within 32.8 ft (10 m) of the trench centerline. For sediment sampling locations with lower velocities during ebb tide (e.g., 20SB\_D11 and 20SB\_D15), sediment was not able to travel long distances and resulted in thicker depositions near the trench. These depositions decreased rapidly away from the trench.

As discussed previously, the model did not evaluate secondary resuspension that could occur after initial deposition because this would not be caused by the jet plow. Secondary resuspension could result in the recently deposited sediment being transported further than estimated; however, it would be expected that as this resuspended sediment is dispersed over a wider area, the thickness of deposited sediments would decrease.



**Figure J-8. Maximum Flood Tide Sediment Deposition Along Representative Offshore Export Cable Route**



**Figure J-9. Maximum Ebb Tide Sediment Deposition Along Representative Offshore Export Cable Route**

**Table J-9. Project Deposition Depths for Flood Conditions**

| Sample     | Project Element                      | Total Fines (%) | Distance from Trench (m)         |       |       |      |      |      |      |      |      |      |      |      |      |       |       |       |
|------------|--------------------------------------|-----------------|----------------------------------|-------|-------|------|------|------|------|------|------|------|------|------|------|-------|-------|-------|
|            |                                      |                 | 0                                | 1     | 5     | 10   | 25   | 50   | 75   | 100  | 150  | 250  | 350  | 500  | 800  | 1,000 | 2,500 | 5,000 |
|            |                                      |                 | Maximum Sediment Deposition (cm) |       |       |      |      |      |      |      |      |      |      |      |      |       |       |       |
| 20SB_03-04 | Lease Area                           | 45.3%           | 12.99                            | 12.99 | 12.99 | 0.07 | 0.07 | 0.03 | 0.03 | 0.03 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00  | 0.00  | 0.00  |
| 20SB_05-02 | Lease Area                           | 97.6%           | 23.17                            | 23.17 | 23.17 | 4.04 | 4.04 | 0.06 | 0.06 | 0.06 | 0.06 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00  | 0.00  | 0.00  |
| 20SB_05-08 | Lease Area                           | 96.0%           | 28.85                            | 28.85 | 28.85 | 2.69 | 0.06 | 0.06 | 0.06 | 0.06 | 0.06 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00  | 0.00  | 0.00  |
| 20SB_06-07 | Lease Area                           | 90.4%           | 32.39                            | 32.39 | 32.39 | 0.37 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00  | 0.00  | 0.00  |
| 20SB_06-09 | Lease Area                           | 91.3%           | 18.01                            | 18.01 | 18.01 | 1.07 | 0.22 | 0.22 | 0.22 | 0.22 | 0.22 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00  | 0.00  | 0.00  |
| 20SB_07-14 | Lease Area                           | 70.9%           | 27.99                            | 27.99 | 27.99 | 0.73 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00  | 0.00  | 0.00  |
| 20SB_11-08 | Lease Area                           | 96.3%           | 36.00                            | 36.00 | 36.00 | 0.23 | 0.09 | 0.09 | 0.09 | 0.09 | 0.09 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00  | 0.00  | 0.00  |
| 20SB_11-12 | Lease Area                           | 90.2%           | 21.93                            | 21.93 | 21.93 | 0.25 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00  | 0.00  | 0.00  |
| 20SB_A04   | Offshore Export Cable Route Corridor | 56.0%           | 26.95                            | 26.95 | 26.95 | 0.71 | 0.71 | 0.19 | 0.19 | 0.19 | 0.19 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01  | 0.00  | 0.00  |
| 20SB_A08   | Offshore Export Cable Route Corridor | 44.2%           | 30.25                            | 30.25 | 30.25 | 0.19 | 0.19 | 0.03 | 0.03 | 0.03 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00  | 0.00  | 0.00  |
| 20SB_A12   | Offshore Export Cable Route Corridor | 62.9%           | 43.77                            | 43.77 | 43.77 | 0.27 | 0.27 | 0.03 | 0.03 | 0.03 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00  | 0.00  | 0.00  |
| 20SB_A16   | Offshore Export Cable Route Corridor | 91.7%           | 62.38                            | 62.38 | 62.38 | 2.05 | 2.05 | 0.13 | 0.13 | 0.13 | 0.13 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00  | 0.00  | 0.00  |
| 20SB_A20   | Offshore Export Cable Route Corridor | 97.7%           | 71.51                            | 71.51 | 71.51 | 1.22 | 1.22 | 0.05 | 0.05 | 0.05 | 0.05 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00  | 0.00  | 0.00  |
| 20SB_B01   | Offshore Export Cable Route Corridor | 89.6%           | 64.53                            | 64.53 | 64.53 | 1.16 | 1.16 | 0.06 | 0.06 | 0.06 | 0.06 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00  | 0.00  | 0.00  |
| 20SB_B05   | Offshore Export Cable Route Corridor | 92.1%           | 65.62                            | 65.62 | 65.62 | 1.61 | 1.61 | 0.06 | 0.06 | 0.06 | 0.06 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00  | 0.00  | 0.00  |
| 20SB_B09   | Offshore Export Cable Route Corridor | 95.0%           | 68.53                            | 68.53 | 68.53 | 1.37 | 1.37 | 0.06 | 0.06 | 0.06 | 0.06 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00  | 0.00  | 0.00  |
| 20SB_C03   | Offshore Export Cable Route Corridor | 89.5%           | 64.23                            | 64.23 | 64.23 | 1.06 | 1.06 | 0.06 | 0.06 | 0.06 | 0.06 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00  | 0.00  | 0.00  |
| 20SB_C07   | Offshore Export Cable Route Corridor | 93.9%           | 50.32                            | 50.32 | 50.32 | 6.25 | 0.82 | 0.82 | 0.82 | 0.82 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00  | 0.00  | 0.00  |
| 20SB_C11   | Offshore Export Cable Route Corridor | 80.1%           | 78.70                            | 78.70 | 78.70 | 0.61 | 0.06 | 0.06 | 0.06 | 0.06 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00  | 0.00  | 0.00  |
| 20SB_C15   | Offshore Export Cable Route Corridor | 83.2%           | 44.09                            | 44.09 | 44.09 | 2.36 | 0.63 | 0.63 | 0.63 | 0.63 | 0.02 | 0.02 | 0.02 | 0.02 | 0.00 | 0.00  | 0.00  | 0.00  |
| 20SB_C19   | Offshore Export Cable Route Corridor | 83.6%           | 44.23                            | 44.23 | 44.23 | 1.72 | 0.62 | 0.62 | 0.62 | 0.62 | 0.02 | 0.02 | 0.02 | 0.02 | 0.00 | 0.00  | 0.00  | 0.00  |
| 20SB_D03   | Offshore Export Cable Route Corridor | 70.1%           | 30.60                            | 30.60 | 30.60 | 5.93 | 0.57 | 0.57 | 0.57 | 0.57 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00  | 0.00  | 0.00  |
| 20SB_D07   | Offshore Export Cable Route Corridor | 71.0%           | 47.48                            | 47.48 | 1.84  | 1.84 | 0.63 | 0.63 | 0.63 | 0.63 | 0.02 | 0.02 | 0.02 | 0.02 | 0.00 | 0.00  | 0.00  | 0.00  |
| 20SB_D11   | Offshore Export Cable Route Corridor | 89.0%           | 88.32                            | 88.32 | 4.40  | 4.40 | 0.31 | 0.31 | 0.31 | 0.31 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00  | 0.00  | 0.00  |
| 20SB_D15   | Offshore Export Cable Route Corridor | 85.2%           | 91.10                            | 91.10 | 1.85  | 1.85 | 0.26 | 0.26 | 0.26 | 0.26 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00  | 0.00  | 0.00  |

**Table J-10. Project Deposition Depths for Ebb Conditions**

| Sample     | Project Element                      | Total Fines (%) | Distance from Trench (m)         |        |       |      |      |      |      |      |      |      |      |      |      |       |       |       |
|------------|--------------------------------------|-----------------|----------------------------------|--------|-------|------|------|------|------|------|------|------|------|------|------|-------|-------|-------|
|            |                                      |                 | 0                                | 1      | 5     | 10   | 25   | 50   | 75   | 100  | 150  | 250  | 350  | 500  | 800  | 1,000 | 2,500 | 5,000 |
|            |                                      |                 | Maximum Sediment Deposition (cm) |        |       |      |      |      |      |      |      |      |      |      |      |       |       |       |
| 20SB_03-04 | Lease Area                           | 45.3%           | 52.50                            | 52.50  | 0.25  | 0.25 | 0.25 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00  | 0.00  | 0.00  |
| 20SB_05-02 | Lease Area                           | 97.6%           | 137.44                           | 39.09  | 0.94  | 0.94 | 0.03 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00  | 0.00  | 0.00  |
| 20SB_05-08 | Lease Area                           | 96.0%           | 176.41                           | 1.84   | 1.84  | 0.07 | 0.07 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00  | 0.00  | 0.00  |
| 20SB_06-07 | Lease Area                           | 90.4%           | 179.68                           | 0.76   | 0.76  | 0.03 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00  | 0.00  | 0.00  |
| 20SB_06-09 | Lease Area                           | 91.3%           | 109.25                           | 6.55   | 6.55  | 0.22 | 0.22 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00  | 0.00  | 0.00  |
| 20SB_07-14 | Lease Area                           | 70.9%           | 157.86                           | 1.42   | 0.06  | 0.06 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00  | 0.00  | 0.00  |
| 20SB_11-08 | Lease Area                           | 96.3%           | 97.83                            | 97.83  | 0.36  | 0.36 | 0.36 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00  | 0.00  | 0.00  |
| 20SB_11-12 | Lease Area                           | 90.2%           | 47.49                            | 47.49  | 0.64  | 0.27 | 0.27 | 0.27 | 0.03 | 0.03 | 0.03 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00  | 0.00  | 0.00  |
| 20SB_A04   | Offshore Export Cable Route Corridor | 56.0%           | 140.29                           | 7.27   | 2.76  | 2.76 | 0.10 | 0.10 | 0.10 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00  | 0.00  | 0.00  |
| 20SB_A08   | Offshore Export Cable Route Corridor | 44.2%           | 154.19                           | 1.84   | 0.39  | 0.39 | 0.02 | 0.02 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00  | 0.00  | 0.00  |
| 20SB_A12   | Offshore Export Cable Route Corridor | 62.9%           | 223.05                           | 2.55   | 0.42  | 0.42 | 0.02 | 0.02 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00  | 0.00  | 0.00  |
| 20SB_A16   | Offshore Export Cable Route Corridor | 91.7%           | 187.77                           | 187.77 | 8.03  | 0.59 | 0.59 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00  | 0.00  | 0.00  |
| 20SB_A20   | Offshore Export Cable Route Corridor | 97.7%           | 214.16                           | 214.16 | 4.76  | 0.23 | 0.23 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00  | 0.00  | 0.00  |
| 20SB_B01   | Offshore Export Cable Route Corridor | 89.6%           | 193.34                           | 193.34 | 4.52  | 0.26 | 0.26 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00  | 0.00  | 0.00  |
| 20SB_B05   | Offshore Export Cable Route Corridor | 92.1%           | 196.95                           | 196.95 | 6.25  | 0.26 | 0.26 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00  | 0.00  | 0.00  |
| 20SB_B09   | Offshore Export Cable Route Corridor | 95.0%           | 205.42                           | 205.42 | 5.33  | 0.26 | 0.26 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00  | 0.00  | 0.00  |
| 20SB_C03   | Offshore Export Cable Route Corridor | 89.5%           | 192.34                           | 192.34 | 4.15  | 0.29 | 0.29 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00  | 0.00  | 0.00  |
| 20SB_C07   | Offshore Export Cable Route Corridor | 93.9%           | 119.62                           | 119.62 | 18.51 | 2.82 | 2.82 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00  | 0.00  | 0.00  |
| 20SB_C11   | Offshore Export Cable Route Corridor | 80.1%           | 180.98                           | 180.98 | 1.80  | 0.20 | 0.20 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00  | 0.00  | 0.00  |
| 20SB_C15   | Offshore Export Cable Route Corridor | 83.2%           | 102.90                           | 102.90 | 7.16  | 2.17 | 2.17 | 0.06 | 0.06 | 0.06 | 0.06 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00  | 0.00  | 0.00  |
| 20SB_C19   | Offshore Export Cable Route Corridor | 83.6%           | 102.84                           | 102.84 | 5.30  | 2.12 | 2.12 | 0.07 | 0.07 | 0.07 | 0.07 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00  | 0.00  | 0.00  |
| 20SB_D03   | Offshore Export Cable Route Corridor | 70.1%           | 74.04                            | 74.04  | 17.45 | 1.96 | 1.96 | 0.04 | 0.04 | 0.04 | 0.04 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00  | 0.00  | 0.00  |
| 20SB_D07   | Offshore Export Cable Route Corridor | 71.0%           | 177.54                           | 9.39   | 9.39  | 0.28 | 0.28 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00  | 0.00  | 0.00  |
| 20SB_D11   | Offshore Export Cable Route Corridor | 89.0%           | 326.76                           | 4.59   | 4.59  | 0.10 | 0.10 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00  | 0.00  | 0.00  |
| 20SB_D15   | Offshore Export Cable Route Corridor | 85.2%           | 327.39                           | 3.87   | 3.87  | 0.08 | 0.08 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00  | 0.00  | 0.00  |

## J.6 CONCLUSIONS

Tetra Tech performed an analytical sediment transport study to conservatively evaluate the potential suspended sediment transport and deposition characteristics of installation of the Project's Offshore Export and Inter-Array Cables. The modeling was conducted using existing available data and a PDE approach to evaluate the effects of proposed submarine cable burial activities in terms of suspended sediment concentrations in the water column and sediment deposition characteristics such as deposition depth and deposited sediment footprint, so that an assessment of potential Project effects on surrounding water quality and habitats could be made. The conservative model assumed maximum trench dimension parameters and that all fine sediment (fine sand and smaller grain size sediment) disturbed by the jet plow during cable burial would be suspended in the water column; however, jet plow operations, including the angle of the plow blade and water pressure through the jet nozzles, can be adjusted during cable installation and could result in less sediment mobilizing in the water column.

The analytical sediment transport model yielded the following general conclusions:

- The suspended sediment concentration, deposition depth, and area of influence is dependent upon flood and ebb current velocities, burial depth, and the percentage of fine sediments in the sediment sample;
- The silt and clay sediment particles remain in suspension for about 4 hours after being mobilized in the water column. Coarser particles (fine sand) settle at a faster rate—about 1 minute after being mobilized; and
- For peak flood and ebb tides:
  - The initial maximum concentration at the release point is dependent on the percentage of fine particles (defined as particles in the fine sand class and smaller). At stations that are 80 percent fine particles, maximum concentrations at the trench line are approximately  $4.44 \times 10^6$  mg/L for a trench depth of 18 ft (5.5 m). This instantaneous concentration is conservatively high and assumes that all particles finer than fine sand are instantly mobilized in the water column and remain in suspension until they settle;
  - The suspended sediment concentrations diminish rapidly away from the release point, and at most stations, over 85 percent of the suspended particles deposit within 16.4 ft (5 m) of the trench centerline. The typical concentration at 328 ft (100 m) is about 2,400 mg/L above background concentration for flood tides and about 290 mg/L above background concentration for ebb tides;
  - The suspended sediment concentrations drop rapidly with time. At most locations, the concentration drops by 75 percent or greater within 4 minutes of jet plowing activity. The maximum concentration at 4 minutes is  $7.17 \times 10^5$  mg/L for ebb tide and  $9.3 \times 10^4$  mg/L for flood tide. Average concentration at 4 minutes is  $1.5 \times 10^5$  mg/L for ebb tide and  $2.7 \times 10^4$  mg/L for flood tide;
  - The plume suspended sediment concentrations are higher for locations with higher proportions of very fine sediment contents, defined as sediments in the silt and clay classes;

- The deposition thicknesses were predicted to be greatest closest to the centerline trench. The maximum expected sediment deposition thickness under simulated conditions is 128.89 in (327.39 cm) at the trench centerline;
- The model indicated that most sediment deposited within or just outside the trench, specifically during ebb tide; and
- Deposition thicknesses were predicted to decrease rapidly away from the trench. Average deposition thicknesses were less than 0.4 in (1 cm) within 82.0 ft (25 m) of the trench centerline for flood tides and less than 0.4 in (1 cm) within 32.8 ft (10 m) of the trench centerline for ebb tides. Deposition thicknesses were less than 0.004 in (0.01 cm) at all stations within 8,202 ft (2,500 m) of the trench centerline.



## J.7 REFERENCES

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