Appendix D.7

Natural Environment Technical Report

BALTIMORE-WASHINGTON SUPERCONDUCTING MAGLEV PROJECT

DRAFT ENVIRONMENTAL IMPACT STATEMENT AND SECTION 4(f) EVALUATION

U.S. Department of Transportation
Federal Railroad Administration

MARYLAND DEPARTMENT OF TRANSPORTATION

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Appendix D.7A Introduction

D.7A.1 Background

In 2001, Federal Railroad Administration (FRA) published a Record of Decision (ROD) following completion of a Programmatic Environmental Impact Statement (PEIS) for the Maglev Deployment Program (MDP). The purpose of this action was to demonstrate high-speed magnetic levitation train (MAGLEV) technology by identifying a viable project in the United States and assisting a public/private partnership with the planning, financing, construction, and operation of the project. As published in the ROD, FRA concluded that MAGLEV was an appropriate technology for use in new transportation options in Maryland and Pennsylvania and should be further studied at the project level.

In 2003, FRA prepared and circulated a Draft Environmental Impact Statement (DEIS) for a MAGLEV project linking downtown Baltimore, BWI Marshall Airport, and Union Station in Washington, D.C. The DEIS documented project needs, including transportation demand, regional economic growth, and strategies for reducing corridor congestion. The DEIS also documented feasible mitigation measures for the environmental impacts as well as the benefits of the Build Alternatives. FRA is now preparing an updated DEIS in accordance with the National Environmental Policy Act (NEPA) that evaluates the environmental impacts of Build Alternatives using the Superconducting Magnetic Levitation (SCMAGLEV) technology.

D.7A.2 Purpose and Need

FRA selected the Baltimore-Washington corridor as the location of the first SCMAGLEV project due to the area's high level of congestion, economic importance, increased development, and the need for connectivity between the two cities. Demand on the existing roadway, transit and rail networks continues to increase, and the levels of service of systems that operate near, or above capacity also continue to worsen. To improve the level of transportation service, additional infrastructure capacity is needed.

All four of the main roadway corridors (US 29, I-95, US 1 and Baltimore-Washington Parkway [BWP]) between Baltimore and Washington, D.C. area experience heavy and/or severe congestion during peak hours. Travel time between Baltimore and Washington, D.C. continues to increase on the roadways within the area, adding to commute and travel times to and from transit stations and BWI Marshall Airport. In addition, there are no dedicated busways along major corridors in Maryland. This increase in travel time directly correlates to the degradation in level of service on the transportation network. These declining transportation conditions translate into the need to evaluate and implement an improved mobility option of travel between the Baltimore and Washington, D.C. metropolitan areas. The purpose of the SCMAGLEV Project is to evaluate, and ultimately construct and operate, a safe, revenue-producing, high-speed ground transportation system that achieves the optimum operating speed of the

SCMAGLEV. This type of technology/transportation system would significantly reduce travel time in order to meet the capacity and ridership needs of the Baltimore-Washington region.

D.7A.3 Build Alternatives

The SCMAGLEV high-speed rail runs on a grade-separated, fixed viaduct powered by magnetic forces. It would operate at speeds over 300 miles per hour. The SCMAGLEV system does not operate on standard steel wheel railroad tracks and therefore requires a separate operating environment. The operating system includes maintenance of way (MOW) facilities, one trainset maintenance facility (TMF), and other ancillary facilities such as fresh air and emergency egress (FA/EE) facilities, substations, and stormwater management facilities. The SCMAGLEV system would operate on both underground (deep tunnel) and aboveground elevated guideway (viaduct). The Project would also include two terminal stations (Washington, D.C., and Baltimore, MD) and one intermediate station at the Baltimore-Washington International Thurgood Marshall Airport (BWI Marshall Airport Station). Design and construction of the SCMAGLEV train and system requires consideration of environmental, economic, and community impacts. Two Build Alternatives have been selected for detailed study, each with six different route alignments, resulting in a total of twelve alignments for consideration (see **Figures 1-1, 1-2, 1-3, 1-4**).

D.7A.3.1 Build Alternative J; Alignments J-01 – J-06 (See Figures D.7-1, D.7-2)

The Build Alternatives J alignments are a combination of tunnel sections and viaduct. Build Alternative J alignments extend 33 to 36 miles end-to-end, depending upon which Baltimore Station option is selected, and would average approximately 75 percent (or 25 to 27 miles) tunnel and 25 percent (or 8 to 9 miles) viaduct. Build Alternatives J (BWP East) includes a newly constructed independent station in Washington, D.C. (Mount Vernon Square East). The proposed alignment would be in a tunnel under Washington, D.C. from the southern terminus near Mount Vernon Square to east of the Capital Beltway (I95/I-495). In this section, Build Alternatives J would be in a deep tunnel, typically 80 feet to 260 feet deep, with an optimum depth of approximately 320 feet and minimum depth equivalent to one tunnel diameter or approximately 50 feet.

After crossing under the Capital Beltway (I-95/I-495), the guideway would transition from tunnel to a viaduct, on the east side of the BWP between the National Aeronautics and Space Administration (NASA) Goddard Space Flight Center (GSFC) overpass and Beaver Dam Road. A portal structure would transition the guideway between tunnel and viaduct. In Build Alternatives J alignments, the viaduct would be an optimum of 131 feet above ground level and 125 feet above the elevation of the northbound travel lanes of the BWP. Build Alternatives J would generally follow the east side of the BWP travel lanes on viaduct through Federal lands including the BWP, the U.S. Department of Agriculture's Beltsville Agricultural Research Center (BARC), Patuxent Research Refuge (PRR), and Fort George G. Meade, and run adjacent to Federal facilities (U.S.

Secret Service [USSS] and National Security Agency [NSA]) before returning to a tunnel on Fort George G. Meade. Build Alternatives J would continue north in tunnel toward a newly constructed underground BWI Marshall Airport Station. North of the airport, Build Alternatives J would continue in a tunnel to Baltimore, MD. The northern terminus would be a newly constructed passenger station.

D.7A.3.2 Build Alternative J1; Alignments J1-01 – J1-06 (See Figures D.7-3, D.7-4)

The Build Alternatives J1 alignments a combination of tunnel sections and viaduct. Build Alternative J1 alignments would range in length approximately 33 to 36 miles, depending on the Baltimore Station option selected, and would average approximately 83 percent tunnel and 17 percent of a viaduct. Build Alternatives J1 (BWP West) would also include a newly constructed station in Washington, D.C. (Mount Vernon Station East). Similar to Build Alternatives J, Build Alternatives J1 would tunnel under Washington, D.C. from the southern terminus to north and east of the Capital Beltway. The guideway would be in a deep tunnel (typically 80 feet to 260 feet deep, with an optimum depth of approximately 320 feet) until crossing under I-95/I-495.

The guideway would transition to a viaduct, but unlike Build Alternatives J, Build Alternatives J1 would align on the west side of the BWP between the NASA GSFC overpass and Beaver Dam Road. Build Alternatives J1 would generally follow the west side of the BWP on a viaduct through BARC and BWP; then continue on a viaduct adjacent to residential developments in South Laurel. In Build Alternatives J1 alignments, the viaduct would be an optimum of 164 feet above ground level and 150 feet above the elevation of the northbound travel lanes of the BWP. The guideway would transition to a tunnel south of Maryland City and turn east towards a newly constructed independent underground BWI Marshall Airport Station. The guideway would continue in tunnel to Baltimore, MD. The northern terminus station would be a newly constructed independent station.

D.7A.3.2.1 Stations and TMFs

The SCMAGLEV Project would have three stations: a southern terminal station in Washington, D.C., known as Mount Vernon Square East; an intermediate station at BWI Marshall Airport; and a northern terminal station in Baltimore, MD. Two station options are under consideration in Baltimore, a Cherry Hill Station in the Cherry Hill section of the city and a Camden Yards Station in the downtown area. **Table D.7-1** provides a summary of each station and general details.

Figure D.7-1: Build Alternatives J-01 through J-03 BWP East with Cherry Hill Station

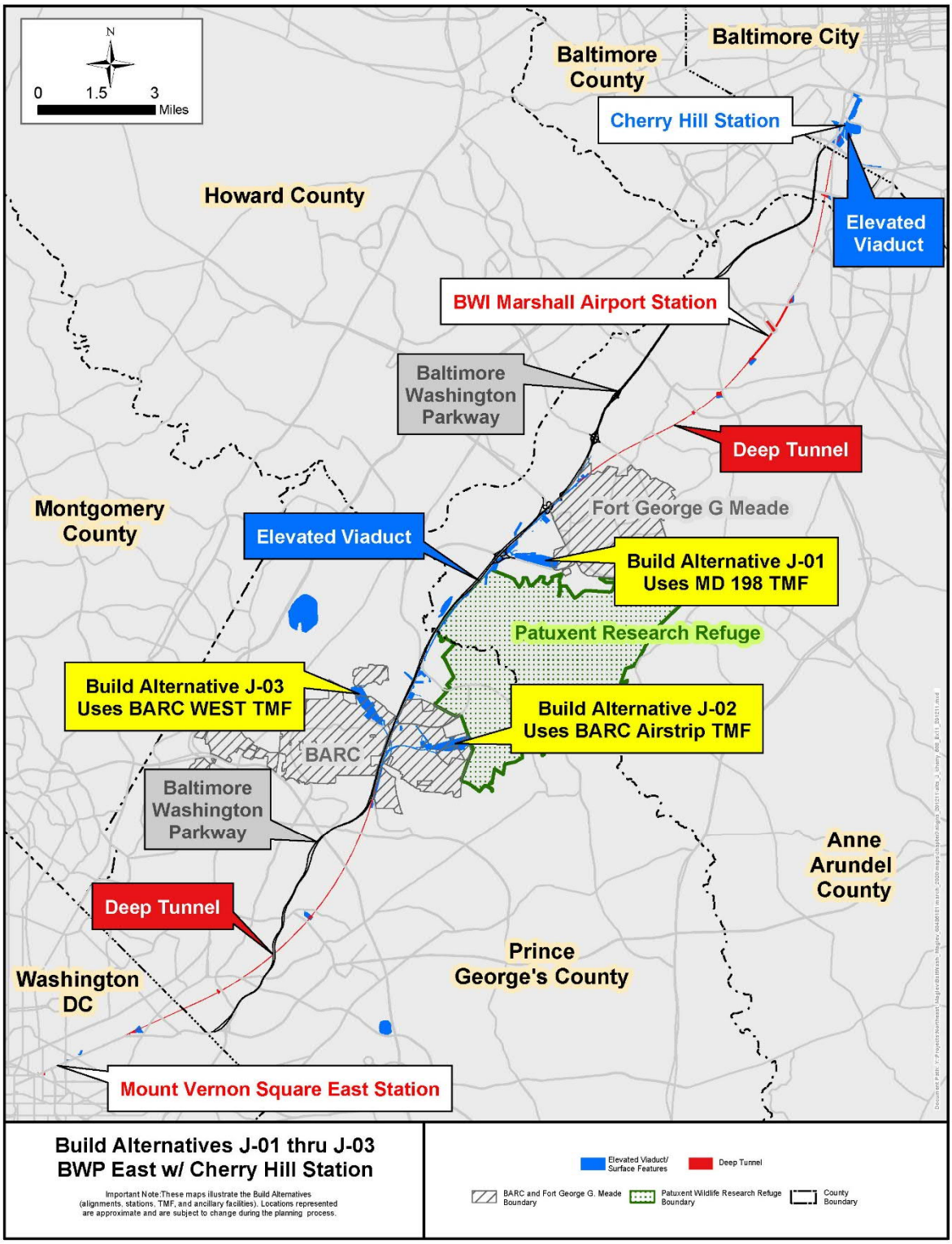

Figure D.7-1: Build Alternatives J-04 through J-06 – BWP East with Camden Station

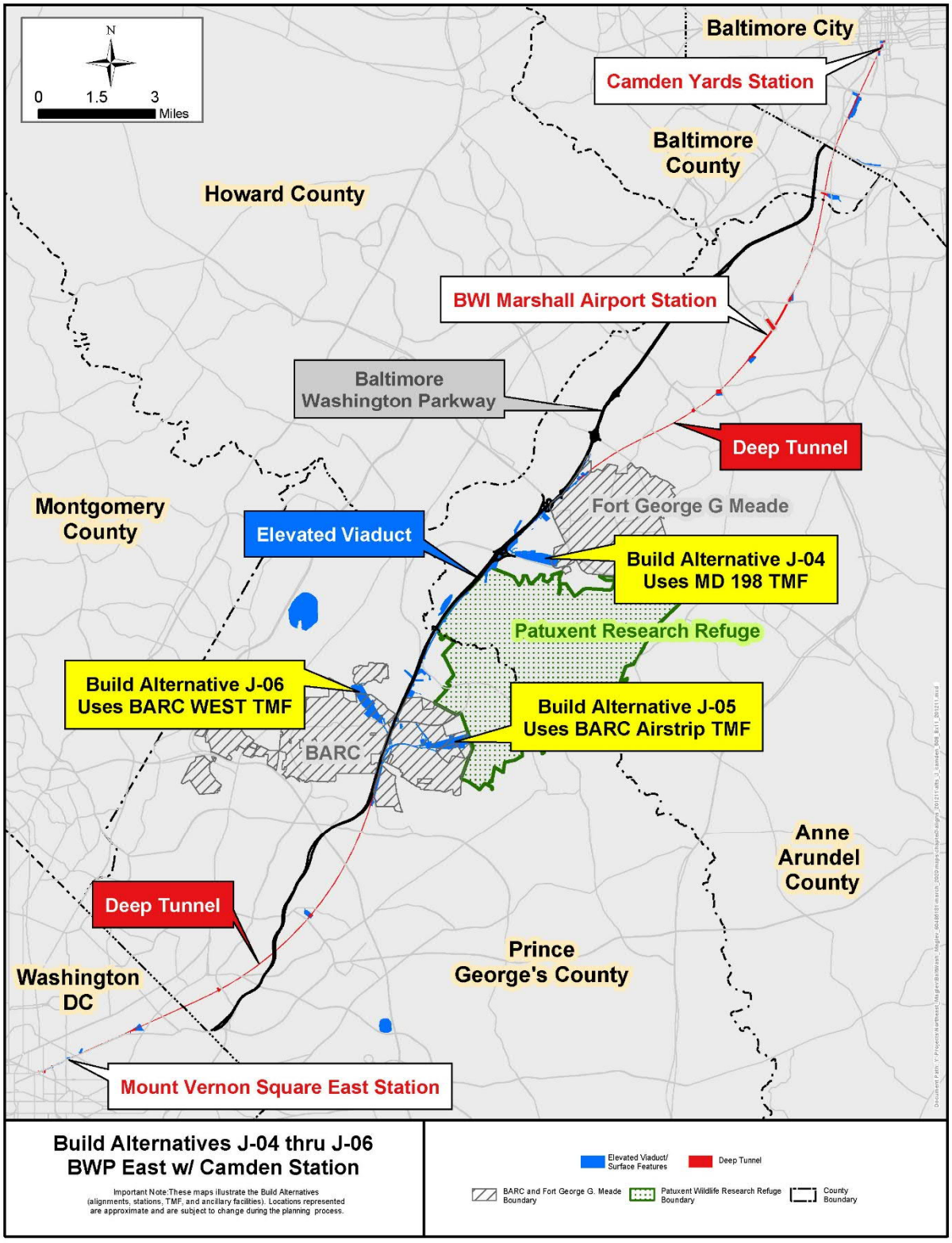

Figure D.7-2: Build Alternatives J1-01 through J1-03 – BWP West with Cherry Hill Station

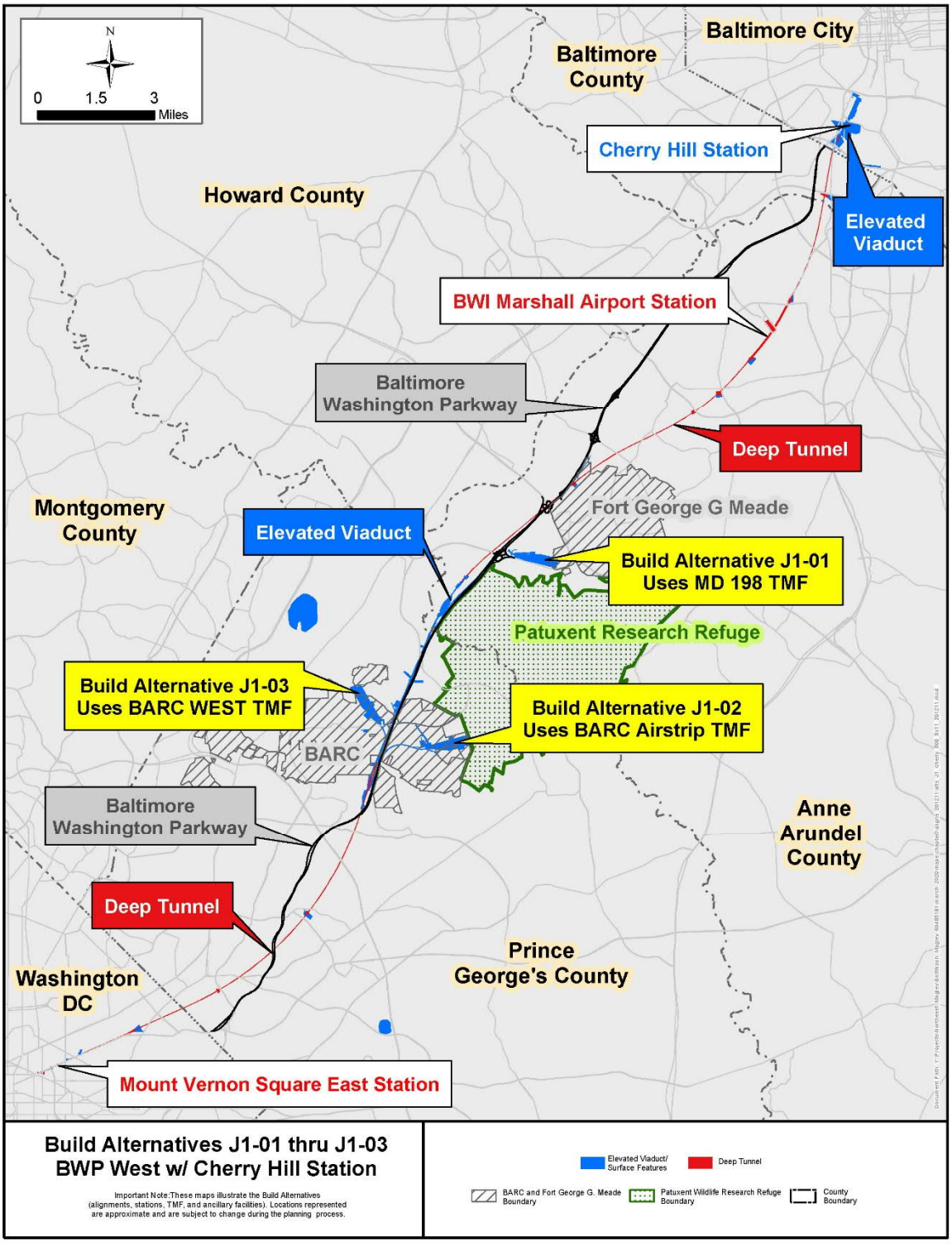

Figure D.7-3: Build Alternatives J1-04 through J1-06 – BWP West with Camden Station

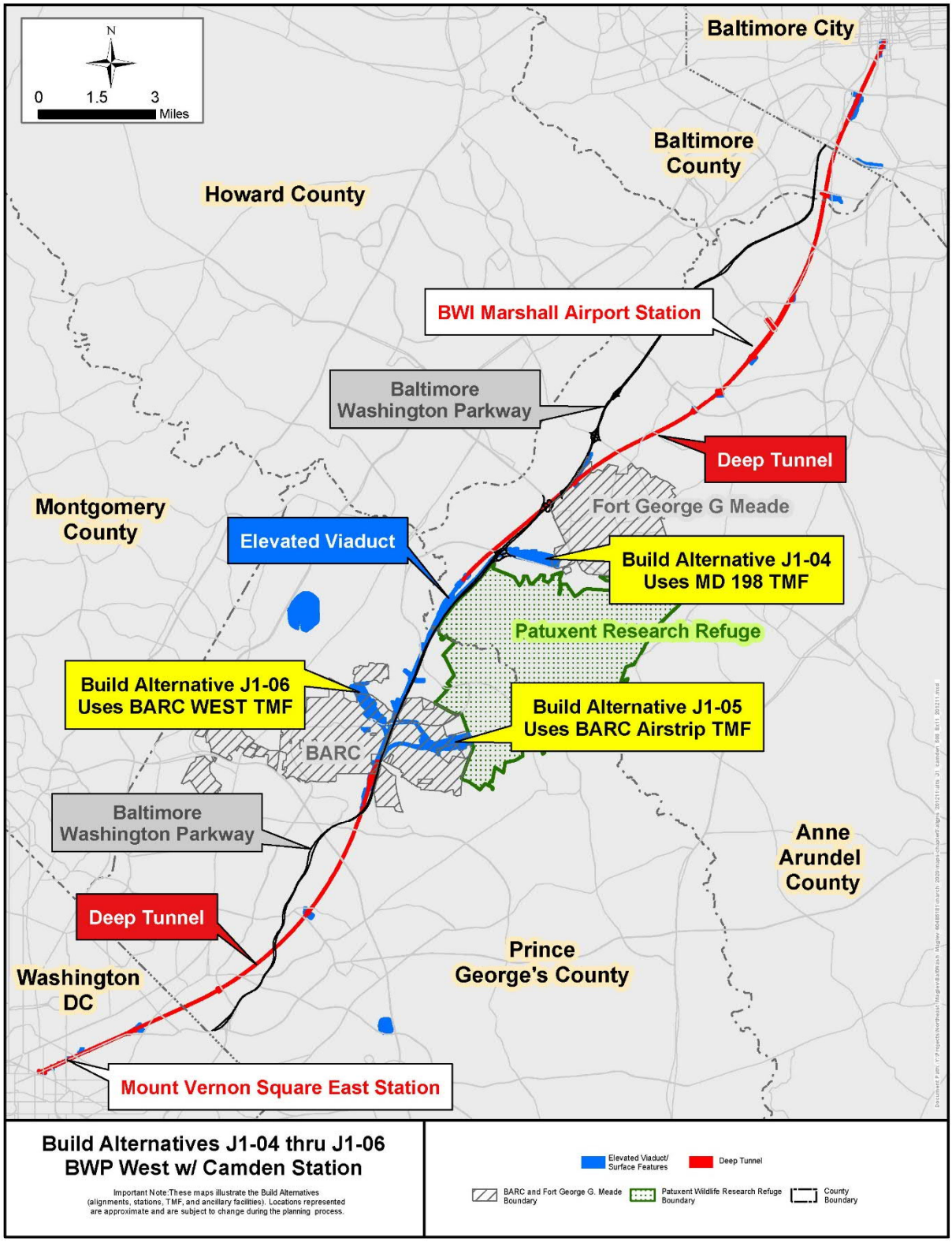

Table D.7-1: Summary of Station Locations and Features

Station	Location	Access	Connectivity	Parking
Mount Vernon Square East (Washington, D.C.)	Underground along New York Avenue between 7th Street NW and 4th Street NW	Via Carnegie Library building; Massachusetts Avenue at Chinatown Park; or New York Avenue	Existing Metro Convention Center and Gallery Place stations; city bus services; roadway network; bicycle/ pedestrian networks	5-level, 1,000 space underground facility
BWI Marshall Airport	Underground beneath the existing hourly parking garage and airport terminals on either side	Parking garage/airport terminal via new multimodal facility above the station	BWI Airport; Amtrak/MARC rail; Raillink light rail; bus services; roadway network	Parking would be available at a new hourly garage (coordinated with BWI)
Cherry Hill Option (Baltimore)	Elevated above the MTA Cherry Hill Light Rail along and east of MD 295, south of Waterview Avenue,	Via Cherry Hill Station and via new pedestrian connection to adjacent proposed parking facility	Raillink light rail; city bus network; roadway network; bicycle/ pedestrian networks	4-level, 5,000 space facility
Camden Yards Option (Baltimore)	Underground beneath the Convention Center generally between Martin Luther King Jr Blvd to Pratt Street	Via Howard/Camden Streets; Camden MARC Station; or adjacent to Convention Center along Conway Street	Raillink light rail; city bus network; roadway network; bicycle/ pedestrian networks	7-level, 5,000 space facility constructed north of Pratt Street between Sharp and Charles Streets

Appendix D.9B FRA considered three locations for the TMF, with only one location being required: the BARC Airstrip TMF, the BARC West TMF, and MD 198 TMF. The TMF location must be near the guideway; the preferred location is along the guideway rather than near an end point of the SCMAGLEV system. **Table D.7-2** summarizes the location and elements of each TMF location. Operation of the SCMAGLEV system requires one TMF; as such only one location would be selected. To meet operational needs and activities, a TMF facility is 180 acres in size and generally rectangular in shape. Each TMF would accommodate the full range of activities that typically occur at a SCMAGLEV TMF (for example, train storage, maintenance shops, factory and repair shops, cleaning facilities, train inspection facilities, offices, employee facilities, and on-site parking). Utilities to these sites, including electric, communications, water and wastewater service will be determined during later phases of design. Utility requirements for these facilities would be similar to those for any commercial site, and it is assumed that local providers have capacity to provide these services.

Table D.7-2: Summary of TMF Location Options

TMF Option	Location	Viaduct Ramps	Maintenance of Way Facility
BARC Airstrip	BARC airfield	Build Alternatives J connection: no new BWP crossing Build Alternatives J1 connection: one new BWP crossing	Adjacent to the TMF
BARC West	BARC forest at Entomology Road	Build Alternatives J connection: one new BWP crossing Alignments J1 connection: no new BWP crossing	Adjacent to the TMF
MD 198	Northeast quadrant of BWP/MD 198 interchange, Laurel, MD	Build Alternatives J connection: no new BWP crossing Build Alternatives J1 connection: one new BWP crossing	Build Alternatives J: near Beaver Creek Trail east of BWP Build Alternatives J1: near Springfield Road west of BWP

Appendix D.7A Geology

D.7A.4 Introduction

Topography relates to the shape and features of the earth; and a geologic resource can be described as a naturally occurring feature that has formed during evolution of the earth. Geologic resources, including fossilized flora and fauna (i.e., paleontological resources), fossil fuels, mineral resources, and rock formations, may provide value to the human and/or physical environment. Geologic hazards, such as earthquakes, sinkholes, and landslides, can be described as a naturally occurring feature that may result in a threat to the human or physical environment. This section evaluates how the Superconducting Magnetic Levitation Project (SCMAGLEV Project) would interact with and potentially impact regional topography, geologic resources and hazards, as well as the SCMAGLEV Project's location in relation to setting and features such as existing mines.

D.7A.5 Regulatory Context and Methodology

D.7A.5.1 Regulatory Context

In accordance with the National Environmental Policy Act (NEPA), 42 U.S.C. § 4321 et seq., the Council on Environmental Quality (CEQ) regulations, 40 C.F.R. Parts 1500 - 1508, and the FRA Procedures for Considering Environmental Impacts, 64 Fed. Reg. 28545 (May 26, 1999), FRA assessed the existing geologic conditions along the Build Alternatives to determine whether the SCMAGLEV Project would impact geologic resources. In addition, the following regulatory requirements are relevant should certain geologic resources or hazards be identified during final design and construction:

- 16 U.S. Code (U.S.C.) § 470aaa (Paleontological Resources Preservation Act)
- 29 U.S.C. § 651 et seq. (Occupational Safety and Health Act)
- 42 U.S.C. § 300f et seq. (Safe Drinking Water Act of 1974)
- Maryland Surface Mining Control and Reclamation Act (SMCRA)
- Code of Maryland Regulations: COMAR 26.20.30: Postmining Land Use

D.7A.5.2 Methodology

FRA performed a qualitative analysis based on readily and publicly available desktop information such as published and online reports and maps from the U.S. Geological Survey (USGS), Maryland Geological Survey (MGS), Maryland Department of the Environment (MDE), and site-specific studies. These sources provide information concerning the topographic and geologic setting and geologic formations. FRA reviewed existing data in these published reports and maps and existing transportation studies including the FRA Tier 1 Draft Environmental Impact Statement for the Northeast Corridor (NEC), to document the presence or absence of geologic resources and hazards within and surrounding the SCMAGLEV Project Affected Environment. FRA defined the geographic limits of the SCMAGLEV Project Affected Environment for geology as the proposed impact area, which includes the limits of operational/physical disturbance proposed as well as the construction-related impact area, which includes additional areas of temporary disturbance required for construction activities. These areas have been identified as an overall limit of disturbance (LOD) of the SCMAGLEV Project Build Alternatives. FRA identified relationships between project components and geologic resources/hazards at locations within the SCMAGLEV Project Affected Environment for proposed subsurface work such as tunnels, underground stations, and construction borings. As relevant, analyses extended beyond the SCMAGLEV Project LOD to describe the overall topographic setting as well as capture resources such as mines that could be close to the Build Alternatives. FRA considered mines within 300 feet of the LOD in this analysis. The following geologic resources and hazards were analyzed:

D.7A.1.1.1 Geologic Resources

- **Mines** – mineral resources that can be extracted from the earth
- **Paleontological Resources** – physical evidence (e.g., fossils) of preexisting organisms
- **Unique Geological Features –** any unique or rare physical feature of the earth's surface, or of the rocks exposed at the surface, that is formed by a geologic process

D.7A.1.1.2 Geologic Hazards

- **Seismic Hazards/Faulting (Seismicity)** – the frequency and severity of earthquakes. Seismic hazards are typically associated with a geologic fault or

fracture and areas requiring tunnels or bridges may be especially susceptible to potential damage.

- **Naturally Occurring Asbestos** – United States Environmental Protection Agency (USEPA) regulated asbestiform minerals, as a natural component of soil or rock. Excavating in areas with naturally occurring asbestos typically requires engineering controls, site monitoring, and regulatory interaction and reporting.
- **Radon Gas** – a common radioactive gas that results from the natural breakdown of uranium in soil, rock, and water. USEPA recommends reducing concentrations of radon gas that may accumulate in the air in poorly ventilated enclosed spaces.
- **Landslide Prone Soils** – the susceptibility for rock or landslides (debris, mudflows, rock fall). Construction and tunneling in areas that contain landslide prone soils require engineering/design considerations to minimize hazards to workers during construction and the future utilization of the corridor.
- **Acid Producing Soils** – soils with low pH. These soils may contain enough acidity to degrade concrete and steel structures, requiring additional consideration during design.
- **Karst Topography** - dissolution of a soluble layer or layers of bedrock. These areas are susceptible to sinkholes, groundwater contamination, and erosion.

D.7A.6 SCMAGLEV Project Affected Environment

Topography surrounding the SCMAGLEV Project ranges from approximately 5 feet above sea level to over 200 feet above sea level, spanning a broadly undulating landscape with relative topographic highs within Anne Arundel and Prince George's Counties, and relative lows near Washington, D.C. and Baltimore City. The SCMAGLEV Project falls entirely within the Atlantic Coastal Plain physiographic province, located just south and east of the Fall Zone[1] separating it from the Piedmont Plateau Physiographic Province as seen in **Figure D.7-5**. A physiographic province is a geographic area in which the geology (including lithology[2] and structure) and climate history have resulted in

Figure D.7-5: Physiographic Provinces in the SCMAGLEV Project Vicinity

[1] Fall Zone is typically where the upland region meets the coastal plain. The uplands are generally hard crystalline basement rock, and the coastal plain is softer sedimentary rock.

[2] Lithology – the study of the general physical characteristics of rocks.

landforms that are distinctly different from adjacent areas. The Atlantic Coastal Plain represents the easternmost contact with crystalline bedrock to the shorelines of major estuaries or the Atlantic Ocean. Sediments across the province include gravel, sand, silt, and clay of both terrigenous and marine origin. **Figure D.7-6** illustrates the general geology in the SCMAGLEV Project Affected Environment, which mostly occurs within the Patapsco and Patuxent Formations. Figures from the FRA NEC study, which surrounds the SCMAGLEV Project, were used for reference for asbestos, faults and seismic hazards, karst topography, landslide incidence and susceptibility, and sole source aquifers (see Attachment B). **Table D.7-3** summarizes the affected geologic resources within the area by municipality. The geologic hazards and resources known to occur within the SCMAGLEV Project Affected Environment are summarized below.

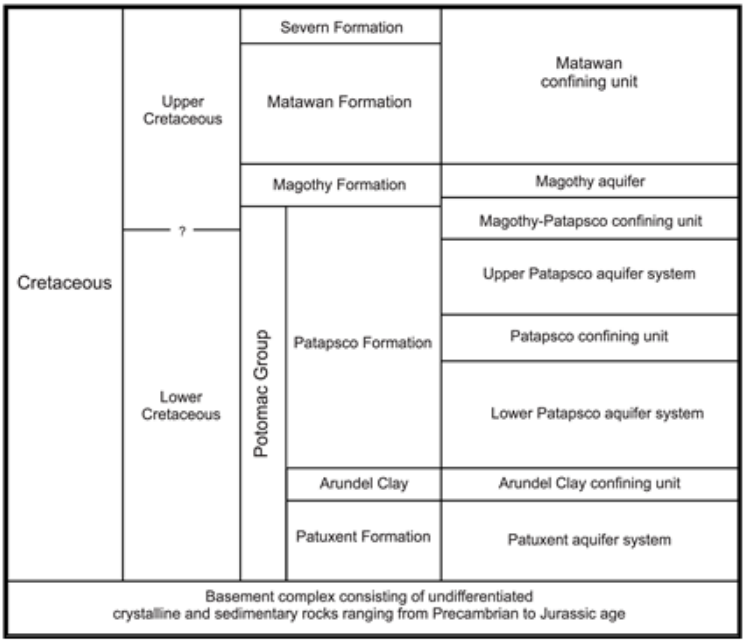

Figure D.7-6: Stratigraphy

Table D.7-3: Geologic Deposits

Deposit		Locations	Description
Modern Alluvium		Washington, DC	Holocene-Pleistocene; loose to dense silty sands with gravels and clays
Terrace Deposits		Prince George's County	Pleistocene; Interbedded sand, gravel, and silty-clay
Potomac Group	Patapsco Formation	Washington, DC, Maryland, and Baltimore	Cretaceous; clays, sands, and silts
	Arundel Formation	Washington, DC, Maryland, and Baltimore	Cretaceous; Dense, low permeability lignitic clay to silt; confining unit between Lower Patapsco Aquifer and Patuxent Aquifer; potential dinosaur fossil content
	Patuxent Formation	Washington, DC, Maryland, and Baltimore	Cretaceous; permeable sand with low permeability clay/silt interbeds; unconformably lies on

Deposit	Locations	Description
		top of bedrock
Bedrock	Washington, DC, Maryland, and Baltimore	Cambrian; Separated from overlying sediment by layer of saprolite; dips to the east-southeast

Seismicity - The SCMAGLEV Project is in an area of the U.S. with a low probability of seismic activity. The USGS identifies the eastern U.S. as a "Stable Continental Region" because of its location in the center of a tectonic plate. According to the MGS, strong earthquakes are unusual in Maryland, although the state occasionally experiences perceptible earthquakes. In 2011, a 5.8 magnitude quake occurred 35 miles north of Richmond, Virginia, and registered as a 2.2 magnitude quake in Anne Arundel County. In 2010, a 3.6 magnitude quake occurred in nearby Montgomery County. The latest quake occurred in Maryland on November 11, 2017, classified as a 1.5 magnitude.

Naturally Occurring Asbestos - Given the composition of bedrock throughout the region, there is the potential for the SCMAGLEV Project to encounter naturally occurring asbestos within the bedrock. The USGS Mineral Resources Data System (MRDS) lists multiple occurrences of naturally occurring asbestos to the northwest of Washington, D.C., one occurrence in Baltimore City, and multiple occurrences to the northwest of Baltimore. Although these known occurrences do not fall within the SCMAGLEV Project Affected Environment, they indicate the potential for naturally occurring asbestos within the regional bedrock formations that do extend into the SCMAGLEV Project Affected Environment beneath the unconsolidated surficial strata. The presence of asbestos-containing rock will be further determined during the next phase of geotechnical investigations.

Radon Gas - Radon gas is a colorless, odorless, radioactive gas. It forms naturally from the decay of radioactive elements, such as uranium, which are found in different amounts in soil and rock throughout the world. Radon gas in soil and rock can move into the air and into underground water and surface water. Generally, the EPA recommends mitigating structures where radon gas concentrations exceed 4 picocuries per liter (pCi/L).[3] According to the Maryland Department of Health, the SCMAGLEV Project Affected Environment includes one ZIP Code designation where radon gas concentrations exceed 4 pCi/L[4], and this part of the alignment is on elevated track. In Washington, D.C., no radon gas tests near the alignment exceeded 3.1 pCi/L.[5]

[3] Environmental Protection Agency. Accessed July 2020. https://www.epa.gov/radon/what-epas-action-level-radon-and-what-does-it-mean#:~:text=EPA%20recommends%20homes%20be%20fixed,L%20and%204%20pCi%2FL.

[4] Maryland Department of Health. *Maryland: 2005-2016 Average Radon Measurements by ZIP Code*. Accessed July 2020. https://maps.health.maryland.gov/phpa/eh/radon/

[5] District Department of the Environment. *District of Columbia Radon Map 2010-2012*. Accessed July 2020. https://doee.dc.gov/node/22322

Landslide Prone Soils - Regional topography, precipitation, and past events are taken into account when developing a landslide susceptibility percentage for a region. According to information obtained from the USGS, FRA has identified much of the SCMAGLEV Project within a "High Landslide Incidence Area," which means that over 15 percent of the area is prone to land sliding. Within the SCMAGLEV Project Affected Environment, the clay layers of the Arundel Formation (from deposits of the Potomac Group), act as the confining unit between aquifers, and are known to cause stability issues and create a landslide risk.[6] Reports of rockslides in the coastal plain are rare. Given the flat topography and deep sandy soils generally found in this physiographic region, rockslides are not considered an exceptional risk.

Acid Producing Soils - Atlantic Coastal Plain sediments have the potential to contain acid producing sediments which are considered a geologic hazard. Such sediments are known to exist in Virginia and New Jersey in the Atlantic Coastal Plain region and are likely to occur in Atlantic Coastal Plain sediments of Maryland, and potentially the SCMAGLEV Project Affected Environment. FRA did not identify published Maryland- and Washington, D.C.-specific information available for review. The presence of iron ore mines in the vicinity of the SCMAGLEV Project however, as discussed below, indicates the likely presence of acid producing soils.[7]

Karst Topography - According to the MGS, karst areas do not occur in the unconsolidated sediments of the Atlantic Coastal Plain; therefore, FRA has not further evaluated this geologic resource.

Mines - Nine mining locations, identified as "past producers" are present within 300 feet of the SCMAGLEV Project LOD[8] as listed in **Table D.7-4**. The locations listed are locations where sand, gravel, and iron ore have historically been mined, including six iron ore and three sand/gravel mines. One mine located near the tunnel laydown area for the Camden Station also mined heavy metals. These mines are currently inactive, and the potential for modern mining of resources in these areas is limited due to land development and economic feasibility. Because details such as the extent and type of backfill at the former open quarries and the extent of mine reclamation activities is not available, additional coordination with state sources is necessary. Although sand and gravel mines in this area are typically mined from the surface, the type of iron ore mine can vary depending on the type of iron being mined. The acquisition and reclamation of abandoned mines may require coordination under the Maryland SMCRA.

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[6] Pomeroy, J.S. (1988). Map showing landslide susceptibility in Maryland. United States Geological Survey. Retrieved from *https://pubs.er.usgs.gov/publication/mf2048*

[7] Acidic Soil, Metal in Soils and Acid Rock Drainage. Virginia Division of Geology and Mineral Resources. Accessed January 2019. Retrieved from *https://www.dmme.virginia.gov/DGMR/acidicsoils.shtml*

[8] Mineral Resource Data System by common geographic areas. United States Geological Survey. Mineral Resource Data System. KML files. Washington, D.C. and Maryland. Retrieved from *https://mrdata.usgs.gov/mrds/geo-inventory.php*

Table D.7-4: Mine Records

Record Number	Mine Name	Material Produced	Distance from LOD*
10073691	Annapolis Junction Pit and Mill	Sand and gravel, Construction	200 feet away from bridge reconstruction associated with J alignments
10170114 &10110276	Unnamed Sand & Gravel Pits	Sand and gravel	240 feet away from deep tunnel associated with J1 alignments
10121615	John Sadilek Ore Banks	Iron	80 feet away from viaduct construction associated with J alignments
10121585	Priest Deposit	Iron	200 feet away from deep tunnel associated with J1 alignments
10218084	Rose Ore Bank	Iron	Less than 10 feet from MD 198 TMF LOD
10242950	Skully Ore Bank	Iron	Within the LOD for relocation of existing powerlines associated with J alignments
10146089, 10169804, 10170777, 10218262, 10267002, & 10291344	Various	Sand and Gravel, Construction, Chromium, Manganese, Antimony, Copper	270 feet away from the tunnel laydown associated with Camden Yards Station
10218333	Obrien Ore Banks	Iron	Within long term construction laydown area associated with all Build Alternatives
10242629	Westport Paving Brick Company Bank	Iron	Within Cherry Hill Station parking garages

* The dataset available from the USGS MRDS includes a point location for each mine occurrence. Information about boundaries and the spatial extent of each mine were not available.

Paleontological Resources - Mesozoic Era rock found within northern Prince George's and Anne Arundel Counties is called the Potomac Group which consists of three subgroups: the Patuxent Formation, the oldest and westernmost subgroup that abuts the Fall Zone; the Arundel Formation; and the Patapsco Formation, the youngest deposits of the Group. The Potomac Group is believed to be up to 1,000 feet thick within and surrounding the SCMAGLEV Project Affected Environment. During the late 19th century, dinosaur teeth and bones were found in sedimentary iron mines that intersected the Potomac Group rock layer[9]. In 2012, exceptionally preserved fossilized reptile and mammal tracks from the Cretaceous Patuxent Formation were discovered at NASA's GSFC about one-half mile from the proposed SCMAGLEV project. The finding contains the largest number of dinosaur-era mammal tracks on a single slab and the

[9] Kranz, Peter M., 1989, Dinosaurs in Maryland: Maryland Geological Survey, Educational Series No. 6, 34 p.

largest sized mammal track known from the age of dinosaurs. The finding is considered one of the most important dinosaur-era mammal track fossils ever discovered.[10] The Patuxent formation is found along the entire LOD and may be present as surface rock outcroppings or overlain by the Arundel Formation.[11]

Given the SCMAGLEV Project's location within the Potomac Group sediments, there is the possibility for prehistoric animal and plant fossils to be present in the subsurface, specifically within the Patuxent Formation and Arundel Clay, however fossils are expected to be especially scarce in Washington, D.C. and parts of Prince George's County, where the Arundel Clay is thinner and discontinuous.

Unique Geological Features - Exposed bedrock in the Atlantic Coastal Plain is rare. MGS does not identify any geologic features of particular interest near the proposed alignment. The geologic features near the proposed alignment are similar to those found along the Fall Zone along the eastern coast of North America. Perhaps the most notable geologic features are the fossil containing beds discussed above.

[10] Stanford, R., Lockley, M.G., Tucker, C. et al. A diverse mammal-dominated, footprint assemblage from wetland deposits in the Lower Cretaceous of Maryland. Sci Rep 8, 741 (2018). https://doi.org/10.1038/s41598-017-18619-w

[11] Stanford, R., Lockley, M.G., Tucker, C. et al. A Diverse Mammal-Dominated, Footprint Assemblage from Wetland Deposits in the Lower Cretaceous of Maryland. Sci Rep **8,** 741 (2018)

Table D.7-5 summarizes potential geologic hazards in the SCMAGLEV Project Affected Environment.

Table D.7-5: Presence of Geologic Hazards and Resources within Affected Environment

Alternative	Seismicity	Naturally Occurring Asbestos	Radon Gas	Landslide Prone Soils	Acid Producing Soils	Karst Topography	Mines	Fossils
J-01	Unlikely	Possible near Tunnels	Unlikely	Possible	Possible	Unlikely	Possible	Possible near Tunnels
J-02	Unlikely	Possible near Tunnels	Unlikely	Possible	Possible	Unlikely	Possible	Possible near Tunnels
J-03	Unlikely	Possible near Tunnels	Unlikely	Possible	Possible	Unlikely	Possible	Possible near Tunnels
J-04	Unlikely	Possible near Tunnels	Unlikely	Possible	Possible	Unlikely	Possible	Possible near Tunnels
J-05	Unlikely	Possible near Tunnels	Unlikely	Possible	Possible	Unlikely	Possible	Possible near Tunnels
J-06	Unlikely	Possible near Tunnels	Unlikely	Possible	Possible	Unlikely	Possible	Possible near Tunnels
J1-01	Unlikely	Possible near Tunnels	Unlikely	Possible	Possible	Unlikely	Possible	Possible near Tunnels
J1-02	Unlikely	Possible near Tunnels	Unlikely	Possible	Possible	Unlikely	Possible	Possible near Tunnels
J1-03	Unlikely	Possible near Tunnels	Unlikely	Possible	Possible	Unlikely	Possible	Possible near Tunnels
J1-04	Unlikely	Possible near Tunnels	Unlikely	Possible	Possible	Unlikely	Possible	Possible near Tunnels
J1-05	Unlikely	Possible near Tunnels	Unlikely	Possible	Possible	Unlikely	Possible	Possible near Tunnels
J1-06	Unlikely	Possible near Tunnels	Unlikely	Possible	Possible	Unlikely	Possible	Possible near Tunnels

D.7A.7 Environmental Consequences

Geologic hazards exist throughout the SCMAGLEV Project Affected Environment and affect the types and placement of infrastructure where such hazards exist. FRA identified areas where the Build Alternatives intersect known geologic resources or hazards. Given the proximity of the Build Alternatives, they generally have the same potential to encounter geologic features and hazards. FRA determined that the greatest impacts would occur in areas where the SCMAGLEV Project proposes tunnel or subsurface features.

D.7A.7.1 No Build Alternative

Under the No Build Alternative, the SCMAGLEV Project will not be built and therefore no impacts to site topography and geology related to the construction or operation of a SCMAGLEV system would occur. However, other planned and funded transportation projects would continue to be implemented in the area in and surrounding the LOD and could result in alterations to geologic conditions.

D.7A.7.2 Build Alternatives

Construction of the Build Alternatives J1-01 through J1-06 would require more subsurface activity than construction of Build Alternatives J-01 through J-06; therefore, Build Alternatives J1 may inherently result in greater potential to encounter geologic hazards.

Permanent topographical changes would occur from grading or filling landscape to accommodate appropriate structure stability requirements for surface features (i.e., viaduct piers, stations, TMF) and are similar for Build Alternatives J and J1. The landscape would continue to undulate above or below the viaduct as it exists now. Some modifications may be required in areas of access needed for maintenance to the viaduct but would remain largely unchanged. Groundwater pumping could result in minor topographic subsidence and ground compaction which has the potential to affect sensitive instrumentation at Goddard Space Flight Center (GSFC). The Project Sponsor will continue to coordinate with NASA to determine the potential risk of topographic subsidence. Other long-term changes are consistent with many transportation projects and would not be considered an adverse effect, nor induce indirect effects.

Although the SCMAGLEV Project is located in an area considered low potential for seismic hazards, there have been earthquakes in Maryland, as identified in the Affected Environment section. Continuing ground investigations and geotechnical studies for the SCMAGLEV Project will be analyzed and the Project Sponsor will consider seismic risk, safety factors, and potential mitigation measures should an event occur that affects the structures and/or surrounding infrastructure and population. At this time the need for blasting is not identified. Future studies will also consider the possibility for construction

of the tunnels to result in any micro-seismic activity and the Project Sponsor will evaluate the need for and specific type of micro-seismic monitoring needed.

Alignment

Both Build Alternative alignments have similar potential to encounter naturally occurring asbestos, radon gas, landslide prone soils, acid producing soils, mines and fossils during construction of subsurface features. All open trench type soil excavations and a majority of the tunneling activity would be conducted within the Patapsco Formation. Given that Potomac Group sediments of this Formation lie close to the surface and are believed to run as deep as 1,000 feet beneath the surface, there is potential for an adverse impact to the fossil record. This would be of greater concern for Build Alternatives J1-01 through J1-06 due to the greater use of tunneling

Geologic hazards of greatest concern during operation and potential to incur long-term and indirect impacts include landslide prone soils and acid producing soils. These are considered of greater risk due to their widespread occurrence either documented within the SCMAGLEV Project Affected Environment (landslide) or in areas near the SCMAGLEV Project Affected Environment (acid producing soil). The risk of landslides after completion of construction could present a concern, as areas of tunneling and excavation would be particularly vulnerable to these occurrences. This impact would be consistent for any alignment. Future geotechnical investigations would determine whether accounting for rockslides in the project design is recommended.

Similarly, risks from acid producing soil hazards are also present and certain unconsolidated soils and sediments in the Atlantic Coastal Plain could contain minerals that produce enough acidity to degrade concrete and steel structures to the point of failure.[10] Potential erosion resulting during construction or during heavy precipitation events, could directly result in acidity in surface water runoff and indirectly impair water quality in nearby surface waters and/or groundwater.

Potential indirect effects would also include potential worker health concerns associated with airborne asbestiform particles, should naturally occurring asbestos be encountered. Surface water run-off containing acidic discharges from soils could also degrade the environment, which has the potential to indirectly affect water quality and aquatic species, discussed in greater detail in Section D.7D Water Resources.

Stations

All stations have the potential to encounter naturally occurring asbestos, landslide prone soils, and acid producing soils. The Baltimore-Washington International Thurgood Marshall Airport Station (BWI Marshall Airport Station) (associated with all Build Alternatives) and Camden Yards Station (Build Alternatives J-04 through J-06 and J104 through J1-06) have a greater potential to encounter fossil deposits as they are in the Patapsco Formation. The Cherry Hill and Camden Yards Stations are within 300 feet of recorded mines, therefore affecting all Build Alternatives.

TMF

The BARC Airstrip, BARC West, and MD 198 TMFs have the potential to encounter landslide prone soils and acid producing soils. There is a mine within 300 feet of the MD 198 TMF, associated with Build Alternatives J-01, J-04, J1-01 and J1-04. All the TMFs are located in the Patapsco Formation and have potential to include fossil deposits, with the BARC TMFs potentially disrupting recent finds of dinosaur footprint fossil records.

D.7A.7.3 Short-term Construction Effects

Geologic conditions and hazards have the greatest potential to be impacted during short-term construction activities of subsurface features. Where construction will intersect bedrock, most notably in Washington, D.C. and Baltimore City, (Mount Vernon Square East Station and Camden Yards Station, respectively) naturally occurring asbestos would be of concern.

Future geotechnical investigations and determinations of final construction methods necessary based on subsurface materials will provide a better assessment of potential disruption to BWI Marshall Airport and its daily operations, as well as Tipton Airport operations.

Natural factors considered to most directly contribute to landslide potential are precipitation, slope, and the nature of the geologic unit (or lithology). During construction activities and the exposure of soils, creation of exposed slopes, and removal of vegetation that help to stabilize these features, are areas more susceptible to landslide.

Subsurface excavation and construction also have the potential for permanent impacts to paleontological resources caught in the transport and movement of earth and soil during construction activities, which are not always captured by the contractor or inspector on site and thus go unnoticed. Measures to avoid such impacts are discussed below. During subsequent phases of SCMAGLEV Project development, subsurface geotechnical testing and documentation would be undertaken to confirm locations of geologic hazards and recommend structural materials that will mitigate for such hazards during construction.

D.7A.8 Potential Minimization and Mitigation Strategies

D.7A.8.1 Minimization

The Project Sponsor will minimize construction impacts to geologic resources using specifically identified Best Management Practices (BMPs) and construction techniques within SCMAGLEV erosion and sediment design plans and geotechnical investigations. Such measures utilized to minimize risk of landslides, exposure to naturally occurring asbestos and acid producing soils include, but are not limited to the following:

- Use of a “one-pass tunnel lining system” and a “pressurized closed-face tunnel boring machine (TBM)” to reduce the amount of subsurface soils and

groundwater dewatering required by tunneling activities and to minimize the amount of geologic material disturbed.

- In areas of excavation of ground surface not utilizing TBM techniques, BMPs include the use of sheeting and shoring methods in order to minimize the amount of subsurface soils disturbed and removed during excavation.
- Other possible measures include soldier pile and lagging, tangent piles, and secant pile walls as potential excavation support systems to be used during excavation.
- Use of engineered slopes and fill material can be used for areas of identified for landslide susceptibility.
- Use of engineered fill material such as soil amendments in areas of acid producing soils, to attempt to correct acidity content.
- Additional details regarding piers/pilings as well as cofferdams that may be used surrounding in-stream piers can be found in Section D.7D Wetlands and Waterways.

The Project Sponsor will minimize exposure to geologic hazards during construction by adhering to appropriate building codes, Occupational Safety and Health Administration (OSHA) regulations, and engineering controls. In construction areas where potential naturally occurring asbestos is encountered in bedrock, implementation of proper protection and engineering controls to protect and educate workers on handling and monitoring would be necessary and would be described in a Health and Safety Plan prepared for the SCMAGLEV Project during the design-build phase. The use of a tunnel boring machine (TBM), a water-tight segmental lining, and constant ventilation helps ensure that no accumulation of radon during construction and during the post-construction lifespan of the structures. Radon gas will be monitored in tunnels during construction and, if necessary, additional ventilation or personal protective equipment will be used to minimize health risk. Additional evaluation of radon content of sediments and groundwater will also be conducted at later design phase. Tests will also include the presence of other gases such as methane and hydrogen sulfide.

The Project Sponsor will monitor for paleontological resources in excavated soil and TBM spoils. These may be more likely found in areas around Camden Yards and BWI Marshall Airport Stations. Methods to minimize impacts to these geologic resources include, but are not limited to:

- Identification of those locations of the selected Build Alternatives where subsurface activities will disturb previously undisturbed strata in rock units considered to have a higher paleontological sensitivity.
- Conduct ground penetrating radar surveys of areas proposed for surface disturbance to determine the presence of large, potentially fossil-rich rocks.
- Retaining a certified paleontologist to supervise monitoring of construction excavations.

- Conducting visual surveys of ground disturbance areas before construction.
- Training provided to personnel running ground disturbing equipment.
- If paleontological materials are found during construction qualified paleontological resource staff would be contacted, and construction would be suspended, as appropriate.

D.7A.8.2 Mitigation

The Project Sponsor will further evaluate subsurface structures and construction methods in order to mitigate potential effects and will design soil staging and removal practices to mitigate potential acidic surface water runoff. Recognition and appropriate soil amendments for burial, removal, or disposal of acid producing soils would mitigate the amount of potential acidic material produced.[12]

The Project Sponsor will identify and document former mine locations within the LOD on final site plans. For cases in which the guideway tunnel would pass below a former mine without intersecting it, reclamation documentation may not be necessary.

The Project Sponsor will consider seismic risk and adopt appropriate mitigation measures, as developed during later design and continued study.

Appendix D.7B SOILD AND FARMLANDS

D.7B.1 Introduction

This section identifies soil types, potential soil hazards, and areas designated prime and unique or soils of statewide and local importance (farmland) that could either influence project design or be affected by the Superconducting Magnetic Levitation Project (SCMAGLEV Project).

D.7B.2 Regulatory Context and Methodology

D.7B.2.1 Regulatory Context

In accordance with the National Environmental Policy Act (NEPA), 42 U.S.C. § 4321 et seq., the Council on Environmental Quality (CEQ) regulations, 40 C.F.R. Parts 1500 1508, and the FRA Procedures for Considering Environmental Impacts, 64 Fed. Reg. 28545 (May 26, 1999) FRA assessed impacts to soils and farmland. In addition, the Farmland Protection Policy Act (FPPA) of 1981 (7 U.S.C. § 4201 et seq.) was created “to minimize the extent to which Federal programs contribute to the unnecessary and irreversible conversion of farmland to non-agricultural uses” and is regulated by the

[12] New Jersey Department of Agriculture-State Soil Conservation Committee. May 2012. *The Standards for Soil Erosion and Sediment Control in New Jersey*.

Natural Resources Conservation Service (NRCS). All lands identified with soils that are prime, unique, or of statewide or local importance are subject to FPPA. For the purposes of this analysis, farmland includes soils designated as prime farmland (prime soil characteristics), unique farmland (high value specialty crops), and farmland of statewide or local importance. Although soils are not a regulated resource, as detailed in Section D.7D Water Resources, Section 402 of the Clean Water Act (CWA) requires that an Erosion and Sediment Control (ESC) Plan, and/or Stormwater Pollution Prevention Plan (SWPPP), be prepared and approved, considering the potential loss of soils from the project site during construction activities and addressing the risk to pollution of waterways.

D.7B.2.2 Methodology

FRA conducted an analysis of resources based on readily and publicly available desktop information such as published/online reports and maps from the NRCS, the U.S. Geological Survey (USGS), and the U.S. Census Bureau (USCB). These agencies provide information concerning soil types, characteristics and limitations, topography, and land use, including information on “urbanized area” that is generally excluded under the FPPA. FRA considered the geographic limit of the SCMAGLEV Project Affected Environment on a regional landscape level to complete a qualitative assessment of potential impacts that may result from the Build Alternatives and the implications or limitations that may be encountered as a result of the SCMAGLEV Project. FRA overlaid the proposed limit of disturbance (LOD) of the Build Alternatives for both permanent surface and subsurface elements as well as anticipated construction laydown areas onto the existing soils and farmland mapping and identified areas of direct and indirect conversion of farmland soils. Through coordination with the NRCS, it was determined that the SCMAGLEV Project would result in direct conversion from all activities within the LOD, whether temporary or permanent, and that an indirect conversion would occur outside of the LOD where access to land will be permanently restricted by SCMAGLEV Project features or other natural/physical barriers that prevent access. Parameters used in the quantitative analysis for direct and indirect conversion of farmland includes the following:

Direct Conversion:

- Direct conversion occurs within the LOD in areas of surface disturbance only (subsurface LOD will not result in soil conversion)
- The entire surface LOD will result in direct conversion, regardless of the duration of the work/feature (i.e. temporary or permanent) (e.g. temporary laydown area or permanent viaduct)
- The analysis considers all soils within the LOD, not just mapped farmland soils
- The analysis can exclude Urban Areas (as designated by the U.S. Census Bureau)

Indirect Conversion:

- Indirect conversion occurs where the project results in restricted access. Parameters considered for access include:
- BWP cannot be considered access
- BWP or major transportation route ramps cannot be considered access
- Stream crossings cannot be considered access
- SCMAGLEV portal crossings cannot be considered access
- Access has been considered feasible in areas of proposed viaduct. It is assumed for this analysis that the Project Sponsor will coordinate with the landowner to propose the use of gates, allowing for a crossing of the land by farming equipment, as necessary. This parameter would need to be reevaluated per final design and selection of a preferred alternative.
- Local roads are assumed to allow access
- Adjacent areas of SCMAGLEV temporary LOD
- Surface LOD only (subsurface LOD will not result in soil conversion)
- The analysis considers all soils within the LOD, not just mapped farmland soils
- The analysis can exclude Urban Areas (as designated by the U.S. Census Bureau)

Land protected under the FPPA does not have to currently be in use (e.g., irrigated) for agriculture. As such, FRA considered mapped prime farmland and any area mapped as having prime farmland soils the same. Generally, land that is already in, or committed to, urban development or water storage is not considered protected under the FPPA. Using the published and available data FRA prepared Parts I, II, and VI of the NRCS-CPA-106 (*Farmland Conversion Impact Rating for Corridor Type Projects*) form, and the local NRCS field office completed Parts IV and V. The forms aid in identifying the relative value of farmland and rank it across a series of criteria that account for the site in a larger context such as whether there is farming support services or urban areas in the greater landscape. The ranked relative value of the farmland is added to the sitewide context and the overall value of the farmland is assigned a score by the NRCS on a scale of 0 to 260. For farmland that scores below 160, no additional action is required under the FPPA. If the farmland scores 160 or above, Federal agencies will give increasingly higher levels of consideration for protection. Forms prepared in coordination with the NRCS are included in Attachment C.

FRA reviewed existing soil data to document the presence or absence of soil hazards that may be encountered by the SCMAGLEV Project. Potential soil hazards evaluated include:

- Linear Extensibility (Shrink-Swell Potential) – the relative change in volume to be expected with changes in moisture content. The NRCS describes this potential for change as "low," "moderate," "high," or "very high."
- Erosion Hazard – based on soil erodibility (K factor), slope, and content of rock fragments. The hazard rating is described as "slight," "moderate," "severe," or "very severe."
- Risk of Corrosion – indication of where soil-induced electrochemical or chemical action may weaken concrete or uncoated steel. The risk of corrosion is expressed as "low," "moderate," or "high."

D.7B.3 SCMAGLEV Project Affected Environment

D.7B.3.1 Soils

Silt loam to sandy loam soils occur throughout the SCMAGLEV Project Affected Environment. Silt loams usually occur in lowland areas and sandy loams occur in uplands. Hydric soils and occasional swamp areas occur within most of the lowland soils. In the Washington, D.C. and Baltimore, MD areas, soils are greatly disturbed and mostly categorized as urban land by the NRCS.

In evaluating soil hazards, FRA did not identify any soils with a shrink-swell potential described as "high" or "very high."[13] FRA identified seven soil map units described as "severe" (none as "very severe") for potential erodibility. FRA identified several soil map units described as "high" risk of corrosion throughout the length of the SCMAGLEV Project LOD, with almost every soil type having this risk present. NRCS mapping and data for corrosiveness, erosion hazard, linear extensibility, soil slippage hazard, and farmland classifications are provided in Attachment C. Soil map units and detailed soil series descriptions are also presented in Attachment C.

D.7B.3.2 Farmlands

The USDA uses a farmland classification system to designate soils as prime farmland, unique farmland, farmland of statewide importance, or farmland of local importance. Prime farmland includes land with "the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and that is available for these uses." Unique farmland includes "land other than prime farmland that is used for production of specific high-value food and fiber crops" (7 USC § 4201(c)(1)(B)). Farmland of statewide or local importance is land that is identified by state or local agencies, respectively, as being important to produce food, feed, fiber, forage, and/or oilseed crops in the corresponding state or local community.

Soils with farmland classifications for prime farmland soils and farmland of statewide importance, located outside of urbanized areas, are illustrated on natural resource

[13] Natural Resources Conservation Service, 2019. Web Soil Survey. United States Department of Agriculture. Available online at https://websoilsurvey.nrcs.usda.gov/ Accessed January 8, 2019.

mapping and listed below in **Table D.7-6**. Most NRCS-mapped soil locations are ultimately excluded from consideration as farmland under FPPA, as much of the SCMAGLEV Project LOD occupy areas identified as "UA" on USCB mapping, denoting an urban area.[14]

Prime farmland or farmland of statewide importance occurs in the SCMAGLEV Project Affected Environment in Prince George's and Anne Arundel Counties. These mapped soils are predominantly located between Beaverdam Creek and the Little Patuxent River, including land within and surrounding the Patuxent Research Refuge (PRR) and the Beltsville Agricultural Research Center (BARC).

Table D.7-6: Important Farmland Soils

Soil	Map Unit Symbol	Presence in Alternative		Farmland Classification
		J1	J	
Beltsville	BaA	No	Yes	All areas are prime farmland
	BaB	Yes	Yes	All areas are prime farmland
	BaC	Yes	No	Farmland of statewide importance
Christiana	CcrB	Yes	Yes	All areas are prime farmland
	CcC	Yes	Yes	Farmland of statewide importance
	CcrC	Yes	Yes	Farmland of statewide importance
Comus	CTA	Yes	Yes	All areas are prime farmland
Downer	DoB	Yes	Yes	All areas are prime farmland
	DvB	Yes	Yes	All areas are prime farmland
	DoC	Yes	Yes	Farmland of statewide importance
	DvC	Yes	Yes	Farmland of statewide importance
Evesboro	EwB	Yes	Yes	Prime farmland if irrigated
Fallsington	FaaA	Yes	Yes	Prime farmland if drained
Hammonton	HaA	Yes	Yes	All areas are prime farmland
Patapsco	PfB	Yes	Yes	Farmland of statewide importance
Russett	RcA	Yes	Yes	All areas are prime farmland
	RcB	Yes	Yes	All areas are prime farmland

[14] United States Census Bureau, 2017. Cartographic Boundary Shapefiles – Urban Areas, 2017 Urban Areas Boundary File. Available online at https://www.census.gov/geo/maps-data/data/cbf/cbf_ua.html Accessed July 14, 2020.

Soil	Map Unit Symbol	Presence in Alternative		Farmland Classification
		J1	J	
Sassafras	ShA	Yes	Yes	All areas are prime farmland
	SfB	Yes	Yes	All areas are prime farmland
	ScC	Yes	Yes	Farmland of statewide importance
	SaaC	Yes	Yes	Farmland of statewide importance
	SaaB	Yes	Yes	All areas are prime farmland
Woodstown	WdaA	No	Yes	All areas are prime farmland
	WdaB	Yes	Yes	All areas are prime farmland

Source: NRCS Web Soil Survey, National Cooperative Soil Survey – Farmland Classification

Located in Prince George's County, BARC is owned and administered by the U.S. Department of Agriculture (USDA), Agricultural Research Service (ARS) and includes approximately 6,500 acres for agricultural research, approximately 3,037 of which are considered prime farmland soils. Refer to the Baltimore-Washington SCMAGLEV DEIS B.3 Natural Resource Map Atlas for figures depicting the location of BARC and of farmland soils. The research experiments and studies conducted on the property are critical to the ongoing mission of USDA. The property supports a variety of agricultural research including approaches to remote sensing; sustainable agriculture; plant, animal, and insect research; and genetics and genomics studies.

D.7B.4 Environmental Consequences

D.7B.4.1 No Build Alternative

Under the No Build Alternative, the SCMAGLEV Project will not be built and therefore no impacts related to the construction or operation of a SCMAGLEV system will occur. However, other planned and funded transportation projects will continue to be implemented in the Project Study Area and could result in alterations to soil conditions and existing farmland.

D.7B.4.2 Build Alternatives

Based on a qualitative assessment of soil impacts and a quantitative assessment of farmlands, impacts to soils are similar for each Build Alternative, as there are similar soil types throughout the SCMAGLEV Project Affected Environment. However, impacts do vary by alternatives due to the comparative length of viaduct and tunnel for the alignments, and for the different station and trainset maintenance facility (TMF) locations. FRA does not expect that the SCMAGLEV Project would result in changes to, or increased risk to public safety or the built environment from soil resources or hazards. **Table D.7-7** shows permanent impacts to farmland soil for each Build Alternative.

Table D.7-7: Summary of Direct Prime Farmland Soil Conversion

Alternative	Acres of Permanent Impact by Federal and State Recognition*		
	Farmland of Statewide Importance	Prime Farmland	Total
J-01	50	160	210
J-02	44	114	158
J-03	59	167	226
J-04	50	160	210
J-05	44	114	158
J-06	59	167	226
J1-01	63	128	191
J1-02	51	79	130
J1-03	67	133	199
J1-04	63	128	191
J1-05	51	79	130
J1-06	67	133	199

* Numbers have been rounded to the nearest whole number.

A direct impact to soils would occur if the SCMAGLEV Project directly alters soil stability during construction. This could result in both long-and-short-term impacts, depending on the type of construction and stabilization procedures such as filling, grading, earthmoving, and/or permanent inundation that would result in the physical or chemical change of soils and/or preclude agricultural use. The conversion of farmland to a non-agricultural use, such as transportation,[3] directly impacts farmlands. An indirect impact occurs if the SCMAGLEV Project induces other changes that could affect soils, such as creating a long-term potential for ongoing soil erosion or creating/ increasing the potential for future development that could impact soil stability or impact drainage.

FRA has prepared the NRCS-CPA-106 worksheet (*Farmland Conversion Impact Rating for Corridor Type Projects*), obtained NRCS input on Land Evaluation Information, and applied the corridor assessment criteria outlined in 7 CFR 658.5(c) for each of the proposed Build Alternatives. The 10 criteria included in Part VI of the worksheets are summarized below:

- Area in Nonurban Use: determined using Census Bureau GIS data for the above ground LOD. Percentage in Nonurban Use scored according to the NRCS-CPA-106 guidance.
- Perimeter in Nonurban Use: determined using Census Bureau GIS data for the above ground LOD. Percentage in Nonurban Use scored according to the NRCS-CPA-106 guidance.

- Percent of Corridor Being Farmed: determined by field ground-truthing. Percentage of corridor being farmed scored according to the NRCS-CPA-106 guidance.
- Protection Provided by State and Local Government: determined by NRCS provided state and local government farmland protection easement data. Federal properties excluded. No protected farms were identified.
- Size of Present Farm Unit Compared to Average: BARC farmland comprises about 98 percent of all land farmed in the Build Alternative corridors. Because the BARC farm is larger than the average sized farms in Prince George's and Anne Arundel counties, this criterion was given the maximum score.
- Creation of Nonfarmable Farmland: the acreage of indirect farmland conversion was scored according to the NRCS-CPA-106 guidance.
- Availability of Farm Support Services: Farm support infrastructure is generally available in Prince George's and Anne Arundel Counties. This criterion was given the maximum score.
- On-Farm Investments: BARC farmland comprises about 98 percent of all land farmed in the Build Alternative corridors. Because the BARC farm has a high amount of on-farm investment, this criterion was given the maximum score.
- Effects of Conversion on Farm Support Services: BARC would continue to operate as an agricultural research facility. Demand for farm support services from other farmers is not expected to increase or decline because of the SCMAGLEV Project; therefore, this criterion was given the minimum score.
- Compatibility with Existing Agricultural Use: although the project might induce growth in the vicinity of each of the stations, it is not anticipated to directly induce growth in non-urban areas. The general expansion of the Baltimore and Washington metropolitan areas is more likely to lead to farm loss than construction of the SCMAGLEV. This criterion was given the minimum score.

Using the information above in conjunction with NRCS review/data, the result is that none of the alignments impact rating scores exceeds 160 points. **Table D.7-8** shows the total impact rating score of each of the Build Alternatives. The score is presented by county for consistency with how NRCS tracks farmland impacts.

Table D.7-8: Summary of Farmland Conversion Impact Rating Scores

Build Alternative	Anne Arundel County Rating Score	Prince George's County Rating Score
J-01	111	94
J-02	108	112
J-03	108	105
J-04	111	94
J-05	108	112

Build Alternative	Anne Arundel County Rating Score	Prince George's County Rating Score
J-06	108	105
J1-01	113	114
J1-02	109	108
J1-03	105	103
J1-04	113	114
J1-05	109	108
J1-06	105	103

Alignments

FRA identified the following soil hazards along the both the Build Alternatives J and J1 alignments:

- Shrink-swell potential of soils is minimal, as existing soils are rated as "low" to "moderate" throughout the length of the alignments
- Severe erosion hazard potential in soils is located predominantly within Washington, DC, Prince George's County, and Baltimore City
- Risk of corrosion to concrete and steel occurs throughout both alignments

Both alignments result in impacts to farmland from the conversion of prime farmland soils or soils of statewide importance to a transportation use. Alignments associated with Build Alternatives J have greater impacts to farmland soils (approximately 81 to 83 acres) compared to alignments associated with Build Alternatives J1 (approximately 50 to 57 acres).

Of these totals, alignments associated with Build Alternatives J impacts about two and a half acres of farmland soils within the BARC property whereas alignments associated with Build Alternatives J1 impact between approximately 11 and 13 acres. The use of tunnel for a large portion of the SCMAGLEV Project would minimize direct impacts to surface soils and would not preclude continuing or new agricultural use in those areas. The use of viaduct may however result in indirect effects to existing farmland soils, by fragmenting, or cutting off adjacent farmland uses.

Stations

The same soil conditions and risks described above exist in station areas. The potential for "severe" erosion hazards exists at the Cherry Hill Station, including the proposed parking garage at that station. No prime farmland soils or farmland soils of statewide importance would be impacted by any of the proposed stations.

Trainset Maintenance Facilities (TMFs)

The same soil conditions and risks described above exist at TMF locations with the potential for "severe" erosion hazards for soils at all three TMF options. Prime farmland soil exists at all three TMF locations. The BARC Airstrip TMF would impact the least amount of prime farmland soil (approximately 73-75 acres), BARC West TMF the most (approximately 142-147 acres), and MD 198 TMF impacts approximately 129-140 acres. Due to the significance of prime farmland soils located on BARC property, FRA considered an additional breakdown of BARC impacts from the TMFs.

The BARC Airstrip TMF would directly convert approximately two percent of the BARC lands overall classified prime farmland soils, with 58 to 60 acres for TMF associated with Build Alternatives J1 and J respectively, identified on BARC. The BARC West TMF would directly convert approximately four percent of BARC's overall prime farmland soils, with 115 acres identified on BARC. The MD 198 TMF would directly convert less than 0.2 percent of BARC's overall prime farmland soils, due to necessary supporting viaduct ramps connecting the alignment to the TMF, equating to approximately six acres on BARC due to necessary supporting viaduct ramps associated with Build Alternatives J1 only.

D.7B.4.3 Short-term Construction Effects

During construction, land would be disturbed, and soil removed. Construction activities would include cut/cover, excavation, filling, cutting, pile driving, vegetation clearing, and the development of temporary impervious surfaces and physical elements. Short-term construction activities, including vegetation clearing, would also impact soils and farmland. However, these areas have the potential to be re-vegetated and restore the soil's ability to absorb and retain water, stabilize the soil, and retain potential environmental benefits to adjacent farmland.

Construction of the Build Alternatives would result in the disposal of excavated soils. Soils removed will require testing prior to disposal. During construction, contractors would follow United States Environmental Protection Agency (USEPA) guidelines to remove, test, and dispose of soils, including those that may be suspected of contamination. Testing ensures that spoils can be safely placed into the environment at approved locations. Prior to construction the Project Sponsor will prepare a Construction Management Plan which includes a Waste Management Plan to address sampling analysis, characterization, handling, storing, transporting and disposing of hazardous waste and construction and demolition waste generated during construction and operation activities.

D.7B.5 Potential Minimization and Mitigation Strategies

D.7B.5.1 Minimization

The Project Sponsor will prepare and implement an SCMAGLEV Project-specific ESC Plan and ensure that appropriate BMPs are in place during construction. An ESC Plan

will be prepared during final design in accordance with the guidelines provided by Maryland Department of the Environment (MDE) and the DC Department of Energy and the Environment (DOEE). Successful implementation of appropriate BMPs would ensure that the SCMAGLEV Project complies with state and Federal requirements, and that the resulting short-term and long-term soil impacts are maintained at acceptable levels. These measures could include the following:

- Install and monitor erosion-prevention measures, such as silt fences and water breaks, sedimentation basins, filter fences, sediment berms, interceptor ditches, straw bales, riprap, swales, and/or other sediment control structures; and re-spreading stockpiled topsoil.
- Seed and revegetate areas temporarily cleared of vegetation, and use native seed mixes and plants, whenever possible.
- Retain vegetation to the extent reasonably feasible.
- Install and maintain soil-stabilizing vegetation, mulch, or man-made materials to provide soil stabilization on disturbed areas.
- Minimize soil compaction by restricting vehicle travel, avoiding working on wet soils, and restoring soil conditions when necessary.

FRA has considered indirect conversions of farmland to be minimized in areas of proposed fencing under the elevated viaduct with the use of gates, to allow farming equipment to access land that has been split by the alignment. With more detailed design, the Project Sponsor will continue coordination with the USDA and other landowners where farmland may be impacted to enable use of these lands if desired, while maintaining safety and security to the SCMAGLEV systems and users of the property.

D.7B.5.2 Mitigation

Once a preferred Build Alternative is selected, the appropriate NRCS-CPA-106 worksheet would be finalized and submitted to the local NRCS field office. Because none of the Build Alternatives exceeds 160 points on the conversion impact rating, mitigation for prime farmland soils is not anticipated.

Appendix D.7C WATER RESOURCES

D.7C.1 Introduction

This section discusses watersheds, water quality, groundwater, floodplains, Scenic and Wild Rivers, and the Chesapeake Bay Critical Areas that could be physically affected by the Superconducting Magnetic Levitation Project (SCMAGLEV Project). Refer to Section D.7E for additional details regarding wetlands and waterways and Section D.7F for additional details regarding ecological resources.

- **Watersheds** - As defined by the National Oceanic and Atmospheric Administration (NOAA), a watershed, or drainage basin, is defined as "a land area that channels rainfall and snowmelt to creeks, streams, and rivers, and eventually to outflow points such as reservoirs, bays, and the ocean."[15]
- **Water Quality** - As defined by the United States Environmental Protection Agency (USEPA), water quality standards "form a legal basis for controlling pollutants entering the waters of the United States… Water quality standards consist of three core components. These include designated uses of a water body, criteria to protect designated uses, and antidegradation requirements to protect existing uses and high quality/high value waters."[16]
- **Groundwater Resources, including wells and aquifers** - Groundwater resources consist of water beneath the ground surface in soil pore spaces and in the fractures of rock formations. A unit of rock or soil deposit is called an aquifer when it can yield a usable quantity of water.
- **Floodplains** - Floodplains refer to the lowland and relatively flat areas adjoining inland and coastal waters including, at a regulatory minimum, that area subject to a one percent or greater chance of flooding in any given year (100-year floodplain).
- **Scenic and Wild Rivers** - The Maryland State Scenic and Wild Rivers System was created by the Scenic and Wild Rivers Act of 1968 to preserve certain rivers with outstanding natural, cultural, and recreational values. No National Wild and Scenic Rivers are designated in Maryland or Washington, D.C.
- **Chesapeake Bay Critical Area** - The Chesapeake Bay Critical Area (Critical Area) includes all land within 1,000 feet of Maryland's tidal waters and tidal wetlands. This includes the waters of the Chesapeake Bay, the Atlantic Coastal Bays, their tidal tributaries, and the lands underneath these tidal areas.

D.7C.2 Regulatory Context and Methodology

D.7C.2.1 Regulatory Context

Water resources are protected and regulated under various Federal, state, and local laws, regulations, and Executive Orders (EO), including but not limited to:

- The Clean Water Act (CWA) – Section 401 Water Quality Certification and Section 402 National Pollution Discharge Elimination System (NPDES)
- Safe Drinking Water Act (SDWA) (42 U.S.C. 330f-330j)
- Section 10 of the Rivers and Harbors Act of 1899
- EO 11988 Floodplain Management

[15] https://oceanservice.noaa.gov/facts/watershed.html

[16] https://www.epa.gov/standards-water-body-health/what-are-water-quality-standards

- The District of Columbia Municipal Regulations (DCMR) – Title 21 Section 5 Stormwater Management Rule; Title 8 Section 1 Water Pollution Control Act; and Title 20 Section 31 Floodplain Regulations
- Code of Maryland Regulations (COMAR) Title 27 Natural Resources Article, Title 8, Subtitle 18 Critical Area Law, Chesapeake Bay Critical Area Protection Program
- State Scenic and Wild Rivers Act of 1968 (Maryland)
- Executive Order (EO) 11990, Protection of Wetlands, 1977
- Coastal Zone Management Act (CZMA), Section 307 of the Coastal Zone Management Act of 1972, as amended
- Executive Order establishing Patuxent Research Refuge, 1936
- National Wild and Scenic Rivers Act, 1968 (Public Law 90-542; 16 U.S.C. 1271 et seq.)
- Executive Order (EO) 13508: Chesapeake Bay Protection and Restoration

The National Coastal Zone Management Program (CZMP) is authorized by the Coastal Zone Management Act (CZMA) of 1972, amended by the Coastal Zone Act Reauthorizations Amendments of 1990 (CZARA) and is administered by NOAA (15 CFR Part 930). Under the CZMA, direct Federal actions, Federal license or permit projects, and Federal assistance activities with reasonably foreseeable coastal effects must be consistent with the enforceable policies of a state's approved CZMP. The process by which a state decides if a Federal action meets its enforceable policies is called Federal consistency. FRA initiated coordination with the Maryland Department of the Environment (MDE) and the Maryland Department of Natural Resources (MDNR) during the development of the DEIS and at this stage of the SCMAGLEV Project a consistency determination has not been provided. MDE and MDNR have indicated that they will review the consistency documentation as part of the wetlands permit or license process and provide a determination through that process. A permit would be required for nontidal wetland and waterway impacts, whereas a tidal wetland license would be required for tidal wetland and waterway impacts. Vegetated tidal wetland impacts are not anticipated based on the current design, and the only tidal waters within the SCMAGLEV Affected Environment will be tunneled under. Additional coordination among FRA, the Project Sponsor, MDE, and MDNR will occur prior to the issuance of the Final Environmental Impact Statement to complete the Federal consistency review for the SCMAGLEV Project. Maryland participates in the National CZMP, but Washington, D.C. does not. Therefore, consistency with the CZMP is required for Maryland only.

D.7C.2.2 Methodology

FRA gathered publicly available information, including Geographic Information System (GIS) data, for the SCMAGLEV Project, from the MDE, MDNR, Maryland Department of Planning (MDP), the U.S. Geological Survey (USGS), and the USEPA. Additional site-

specific information regarding existing water resources and permitting requirements was gained through field visits with the U.S. Army Corps of Engineers (USACE), the U.S. Fish and Wildlife Service (USFWS), and MDE. FRA evaluated existing conditions, overlaid existing resources on SCMAGLEV Project mapping, and assessed the potential for direct and indirect impacts as well as temporary and permanent impacts to water resources.

FRA defined the geographic limit of the SCMAGLEV Project Affected Environment for water resources on both a regional level as well as the SCMAGLEV Project impact area, plus an additional 30-foot buffer. The impact area includes the limits of operational/physical disturbance, as well as the construction related impact area, which includes additional areas of temporary disturbance required for construction activities. These impact areas comprise the overall limit of disturbance (LOD) of the SCMAGLEV Project Build Alternatives. The LOD includes all surface and subsurface elements. FRA considered a qualitative analysis of watersheds, water quality and groundwater, supported by a quantitative analysis of floodplain, Critical Area, and impervious surfaces within each watershed in the SCMAGLEV Project Affected Environment. Variability of water quality is highly correlated with the quality of and impacts to surrounding vegetated habitats including wetlands. For additional discussion related to these resources, refer to Section D.7E Wetlands and Waterways and Section D.7F Ecological Resources.

D.7C.3 SCMAGLEV Project Affected Environment

D.7C.3.1 Watersheds

All land areas within the SCMAGLEV Project Affected Environment occur within the greater Chesapeake Bay watershed, which is divided into smaller watersheds and sub-watersheds associated with major contributing waterways. Four watersheds and eight sub-watersheds are traversed as listed in **Table D.7-9**. **Figure D.7-7** illustrates the location of the affected sub-watersheds: Anacostia River, Patuxent River Upper, Little Patuxent River, Severn River, Patapsco River Lower North Branch, Baltimore Harbor, Gwynns Falls, and Jones Falls.

These watersheds consist of surface waters and associated floodplains, existing wetlands, and underlying groundwater. Major receiving waters within these watersheds include the Anacostia River, Beaverdam Creek, Patuxent River, the Patapsco River, and the Middle Branch Patapsco River. The SCMAGLEV DEIS Appendix B.3 Natural Resources Mapping Atlas and Section D.7E Wetlands and Waterways of this report include a more detailed representation of the major receiving waters. All watersheds within the SCMAGLEV Project Affected Environment contain several land uses and one or more major transportation corridors. As illustrated in **Table D.7-9**, the Anacostia River Watershed has the most significant acreage of proposed SCMAGLEV Project.

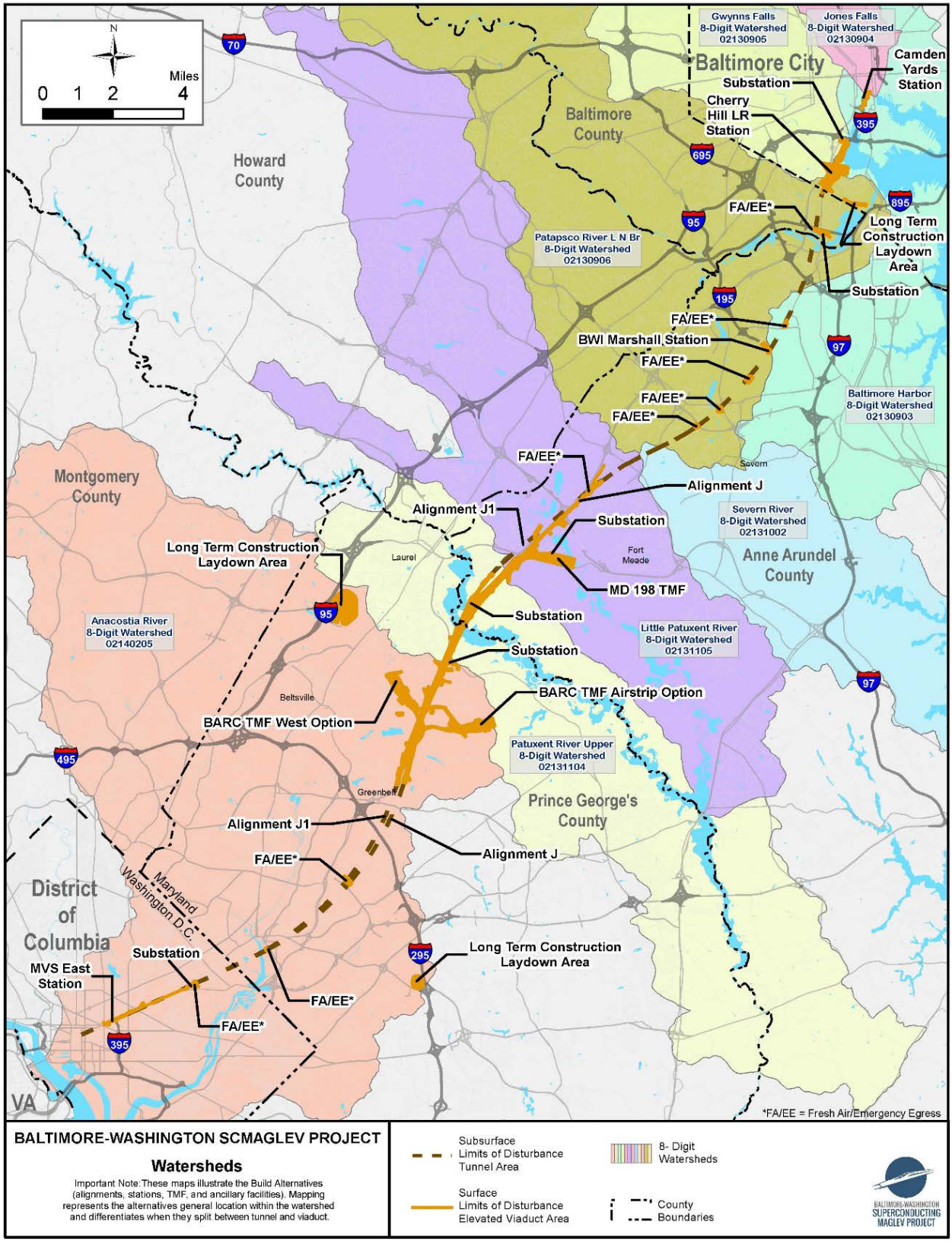
Table D.7-9: Existing Watersheds within the SCMAGLEV Project Affected Environment

Sub-Watershed Name	Geographic/Land Use Description	Watershed 8-digit Hydrologic Unit Code	MDNR Watershed Name	MDNR Watershed 6-digit Code	Overall Watershed Size (acres)	Watershed Area within SCMAGLEV Project Affected Environment* (acres)
Anacostia River	Urbanized developed areas in Washington, D.C. to rural or undeveloped areas in Prince George's County	02140205	Middle Potomac	021402	116,511	820-1,067
Patuxent River Upper	Forested, urban, and agricultural development. Within Anne Arundel County and Prince George's County	02131104	Patuxent	021311	56,446	114-157
Little Patuxent River	Forested, industrial/commercial, and residential, and drains much of the urbanized areas of Howard County	02131105	Patuxent	021311	66,214	82-421
Severn River	Single family residential and forest being the most prevalent land use	02131002	Lower Western Shore	021310	51,744	10
Patapsco River Lower North Branch	Densely populated and urbanized watersheds within and surrounding Baltimore County and Baltimore City	02130906	Patapsco Back River	021309	75,755	231-346
Baltimore Harbor	Densely populated and urbanized watersheds within and surrounding Baltimore County and Baltimore City	2130903	Patapsco/ Back River	021309	74,899	117-125
Gwynns Falls	Densely populated and urbanized watersheds within and surrounding Baltimore County and Baltimore City	2130905	Patapsco/ Back River	021309	41,711	23-45
Jones Falls	Densely populated and urbanized watersheds within and surrounding Baltimore County and Baltimore City	2130904	Patapsco/ Back River	021309	37,282	0-7

Source: University of Maryland Center for Environmental Science. Eco Health Report Cards, https://ecoreportcard.org/report-cards/chesapeake-bay/regions/patuxent-river/

*Acreage within the SCMAGLEV Project Affected Environment is presented as a range for some watersheds based upon the varying Build Alternatives located in the watershed.

Figure D.7-7: Watershed Boundaries



The Anacostia River Watershed is considered an interstate watershed, with most of its non-tidal tributaries lying within Maryland and its tidal waters within the District of Columbia. However, the SCMAGLEV Project is proposed to tunnel under a tidal portion of the Anacostia River in Prince George's County, Maryland. Approximately 80 percent of the watershed is in Maryland.[17] Upper Beaverdam Creek is the least developed sub-watershed within the Maryland portion of the Anacostia watershed. As such, it has been used by MDE and other agencies as a reference stream for the Coastal Plain portion of the Anacostia. The Anacostia Watershed is also a designated location by the Urban Waters Federal Partnership, which aims to improve interagency collaboration to restore the Anacostia. The USEPA studies of the Anacostia indicate that it has lost 6,500 acres of wetlands and 70 percent of its forest cover, resulting in impervious surfaces covering more than 25 percent of the watershed as a result of urbanization. It is however indicated as ecologically steadily improving.[18]

MDE designates Stronghold Watersheds, which are "watersheds around the State that are the most important for the protection of Maryland's aquatic biodiversity. These locations are the places where rare, threatened, or endangered species of fish, amphibians, reptiles or mussels have the highest numbers."[19] Within the SCMAGLEV Project Affected Environment, the Little Patuxent River Watershed is a Stronghold Watershed. This watershed has a diverse land use, with sub-watersheds to the north and south dominated by urban uses however a large portion of the watershed dominated by forest and natural systems, as present within the SCMAGLEV Project Affected Environment within the Patuxent Research Refuge (PRR). According to the *Little Patuxent Watershed Assessment Comprehensive Summary Report*[20] the watershed received a Maryland Physical Habitat Index (MPHI) score of 79.3, which equated to a "partially degraded" condition. Approximately 40 percent of perennial stream miles received the same rating. Approximately 48 percent of streams were rated "minimally degraded".

D.7C.3.2 Water Quality

Pollutants can enter the waterways within the SCMAGLEV Project Affected Environment by atmospheric deposition, soil erosion, seepage, runoff, or direct discharge. If the pollution can be attributed to a single source, such as a sewage outfall, it is considered point source pollution. Non-point source pollution originates from dispersed locations and not one specific source. Examples of pollutants that impact water quality within the SCMAGLEV Project Affected Environment due to the existing roadway network and developed landscape include sediment, oil and grease from motor

[17] Maryland Department of the Environment and District of Columbia Department of the Environment – Natural Resources Administration. August 2010. *Total Maximum Daily Loads of Trash for the Anacostia River Watershed, Montgomery and Prince George's Counties, Maryland and the District of Columbia*.

[18] https://www.epa.gov/urbanwaterspartners/urban-waters-and-anacostia-watershed-washington-dcmaryland

[19] https://dnr.maryland.gov/streams/Pages/streamhealth/Maryland-Stronghold-Watersheds.aspx

[20] Anne Arundel County Department of Public Works Bureau of Engineering Watershed Protection and Restoration Program (WPRP). June 2016. *Little Patuxent Watershed Assessment Comprehensive Summary Report.*

vehicles, road salts, pesticides and nutrients from lawns, and thermal pollution from dark impervious surfaces. Regulatory agencies directly associate water quality with the amount of impervious surface and vegetated areas within a waterway's drainage area (or watershed). Pervious surfaces, such as forests and fields, absorb rain and snow, slow and cool stormwater runoff, and allow pollutants to settle before entering waterways. For a full discussion of the vegetated habitats in the SCMAGLEV Project Affected Environment, refer to Section D.7E Wetlands and Waterways and Section D.7F Ecological Resources. In contrast, impervious surfaces, such as roads and rooftops, prevent precipitation from being absorbed into the soil. Instead, stormwater runoff carries high volumes of pollutants, such as heavy metals and bacteria, over impervious surfaces and directly into waterways.

The USACE's Public Interest Review (PIR) provides a framework of 21 factors used to evaluate projects that have submitted a permit application. Water quality, water supply and conservation, and floodplain values and flood hazards are all factors included in this review. These factors and others related to water resources have been evaluated in the Environmental Consequences section.

In compliance with Sections 303(d), 305(b), and 314 of the CWA and the SDWA, states develop a prioritized list of water bodies that currently do not meet water quality standards. Washington, D.C. and Maryland regulate water quality based on standards set by the D.C. Department of Energy and Environment (DOEE) and MDE, respectively, and the USEPA. States can choose to adopt national water quality standards or revise and adopt state specific standards. Water Quality Standards (WQS) establish the environmental baselines used for measuring the success of the CWA, to protect aquatic life and wildlife, recreational uses, and sources of drinking water. WQS include:

- Designated use or uses such as "supporting aquatic life" or "recreation;"
- Criteria necessary to protect the designated uses;
- Antidegradation requirements; and
- General policies affecting the application and implementation of WQS that states and 79 authorized tribes may include at their discretion.

Use Classifications

MDE has several designations to assign to a watershed or waterbody that identify current water quality standards, goals, and existing conditions. These "Use Classes" designate uses by humans and/or aquatic life based on state goals for water quality. In order to protect aquatic species, in-stream work is prohibited during portions of the year based on the classification of the stream. FRA identified all waterways within the SCMAGLEV Project Affected Environment as Use I, Use I-P, or Use II. A Use I waterbody is designated for Water Contact Recreation and Protection of Nontidal Warmwater Aquatic Life. A Use I-P waterbody is designated for public water supply in addition to the Use I uses. A Use II waterbody is designated for support of estuarine and

marine aquatic life and shellfish harvesting, although all Use II waterbodies do not necessarily support shellfish harvesting as some waters may be tidal but too fresh to support viable populations of shellfish. Refer to Attachment D Table D.2 for designated Use Classes within each watershed present within the SCMAGLEV Project Affected Environment.

Total Maximum Daily Loads (TMDL)

A TMDL is an indicator of the total pollutant that a waterbody can withstand without exceeding its water quality standard for that pollutant. A TMDL accounts for both point sources and nonpoint sources of pollutants as well as surrounding environmental conditions. For example, the portion of the Anacostia River in Maryland within the Affected Environment has been listed in reports as being impaired by trash and debris. Similarly, the Patapsco River Watershed in the area of Middle Branch has been indicated as the predominant source of trash being inappropriate waste disposal, which is considered a direct correlation to the urbanized surroundings.

Impaired waters can be designated into five different categories:

- Category 1 – waters attaining all standards
- Category 2 – waters attaining some standards
- Category 3 – waters with insufficient information to determine if water quality standards are attained
- Category 4 – impaired or threatened waters that do not need or have already completed a TMDL
- Category 5 – impaired waters for which a TMDL is required

FRA conducted a cursory review of Maryland Biological Stream Survey (MBSS) data and Section 303(d) of the CWA listed impaired waters. In general, all major waterways were indicated as having fair to poor water quality, except for Beaverdam Creek (part of the Anacostia watershed), which is identified as having good health with the presence of sensitive macroinvertebrates and fish. MBSS data helps the MDE designate certain waterbodies as Tier II High Quality Waters, which are “waters that have water quality that is better than the minimum standard necessary to meet designated uses.”21 FRA identified two locations; Beaverdam Creek, a Tier II stream segment within Beaverdam Creek Tier II Catchment; and T the Patuxent River Upper Watershed Tier II Catchment, with Tier II waters.

Additional detail regarding aquatic biota present within the waterways is addressed in Section D.7F Ecological Resources. Additional details and a summary of the

[21] https://mde.maryland.gov/programs/Water/TMDL/WaterQualityStandards/Pages/Antidegradation_Policy.aspx

watersheds with 303(d) listed waters, Tier II Waters, and Stronghold Watersheds is included in Attachment D Table D.2.

D.7C.3.3 Groundwater Resources

Aquifers form in geologic formations, which are distinct rock units consisting of either single or interrelated rock layers. As previously described in Section D.7B Geology, the geologic formations of the Potomac Group that would be encountered by the proposed Build Alternatives are (from shallowest to deepest) the Patapsco Formation, the Arundel Formation, and the Patuxent Formation. The Patuxent and Patapsco Formations represent important regional aquifers. See **Figure D.7-8** for an illustration of the Patapsco aquifer system in relation to the SCMAGLEV Alignment Alternatives. Regional groundwater studies indicate a shallow groundwater table within the SCMAGLEV Project Affected Environment.[22] The depth to groundwater ranges from approximately 10 to 15 feet below ground level however, local variations in the groundwater are expected. FRA has identified the areas where these aquifers overlap with the Build Alternatives guideway tunnels as primary locations where effects to groundwater could occur.

FRA used published data to identify existing well-head protection areas (WHPAs) in the vicinity of the Build Alternatives. Local governments and water suppliers establish WHPAs to improve the safety of water supply to public supply wells. Factors such as flow rate, direction, and groundwater levels, as well as existing sources of nearby contamination can all affect the selection of a WHPA and/or how it is anticipated to function.

Portions of the proposed tunnel are located within or adjacent to several WHPAs in Anne Arundel and Prince George's Counties. Groundwater in Washington, D.C. is not currently being used as a potable water source; therefore, there are no WHPAs in this jurisdiction. However, groundwater in Washington, D.C. is protected for beneficial uses, including surface water recharge, drinking water in other jurisdictions, and potential future use as a drinking water source. With further detailed design and selection of a preferred alternative, additional research will be conducted to evaluate what contaminants may be the most prominent in the vicinity of the WHPAs. **Figure D.7-9** illustrates data on WHPAs in aquifers within a one-mile radius of the Build Alternatives. Identified sites within the SCMAGLEV Project Affected Environment with potential for hazardous materials concerns are illustrated in the Baltimore-Washington SCMAGLEV DEIS Appendix B.3 Map Atlas. FRA has not identified existing hazardous materials sites of concern within the location of WHPAs. Additional details describing the aquifers and water supply well owner(s) present in the WHPAs shown in **Figure D.7-9** are included in Attachment D Table D.4.

[22] Andreason, David C.; Staley, Andrew W.; & Achmad, Grufron. (2013). Maryland Coastal Plain Aquifer Information System: Hydrogeologic Framework. Maryland Department of Natural Resources. Open File Report No. 12-02-20. Retrieved from http://www.mgs.md.gov/reports/OFR_12-02-20.pdf

Figure D.7-8: Patapsco Aquifer in Relation to the SCMAGLEV Alignment

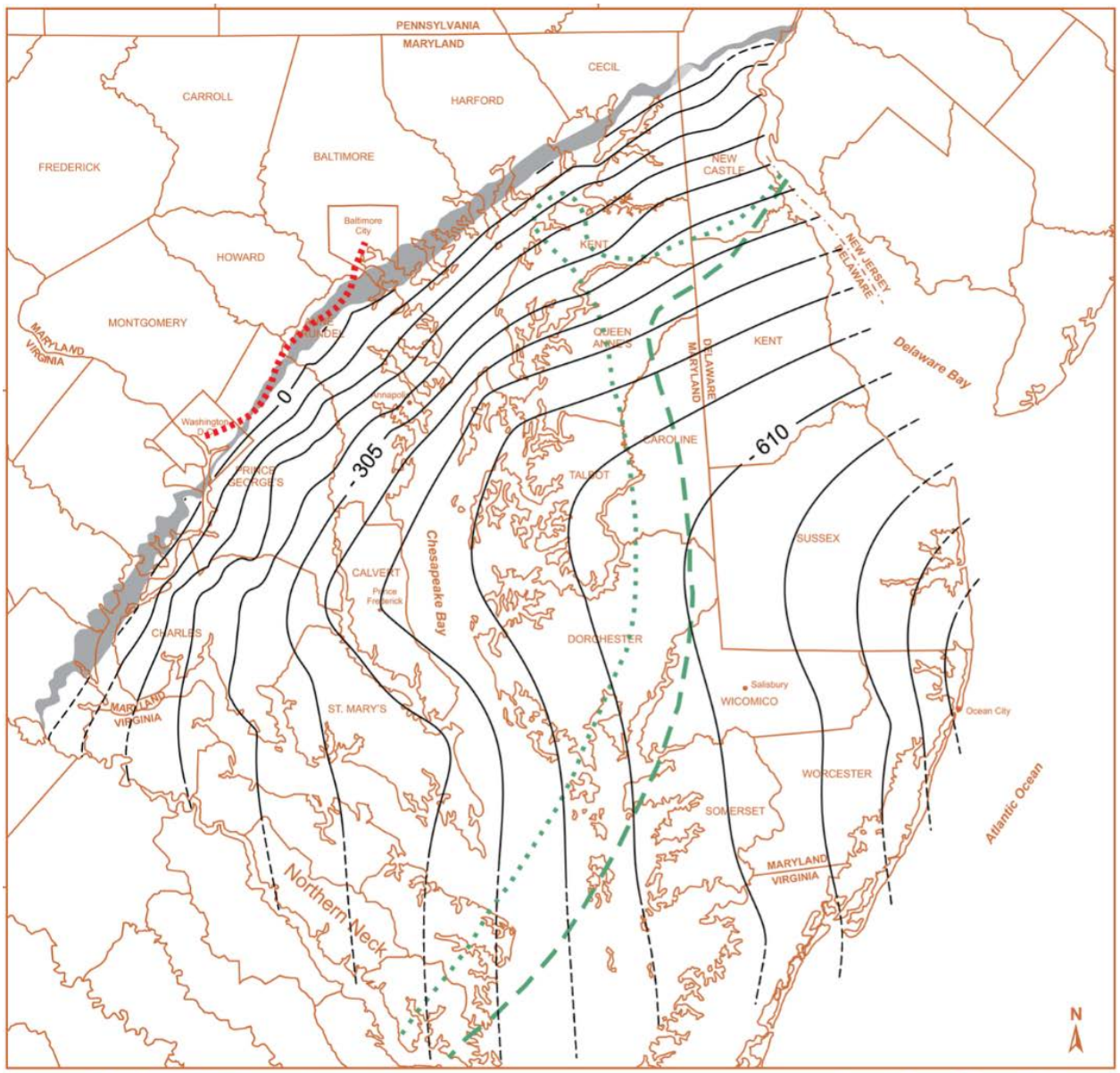
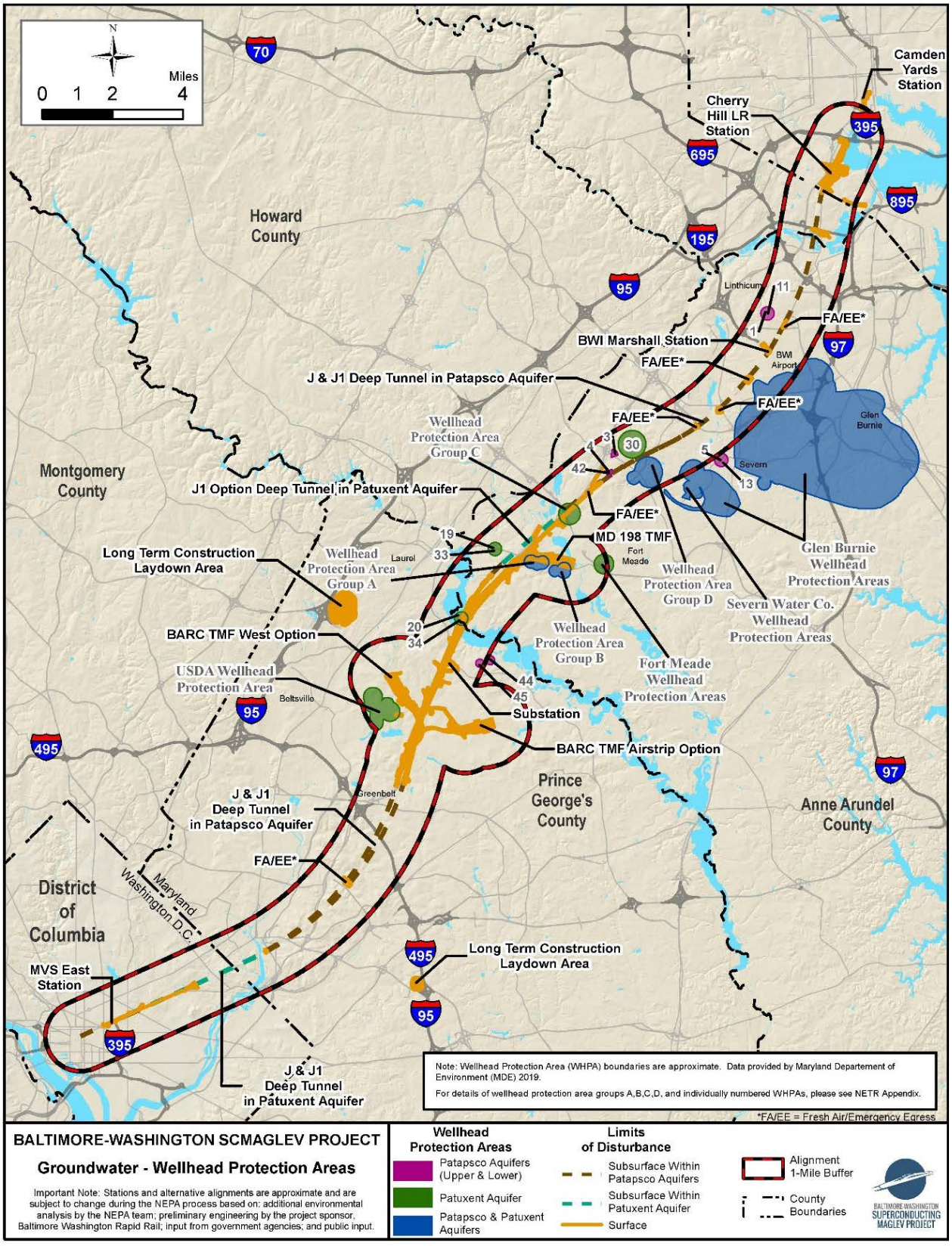


Figure D.7-9: Groundwater Wellhead Protection Areas



D.7C.3.4 Floodplains

Floodplains perform important natural functions, including temporary storage of floodwaters, moderation of peak flows, maintenance of water quality, groundwater recharge, and prevention of erosion. FRA focused this analysis on areas designated by the Federal Emergency Management Agency (FEMA) as “special flood hazard areas,” which is the area that would be inundated by the one percent annual chance flood, also known as a 100-year flood. FRA conducted an analysis based on readily available desktop information including FEMA’s National Flood Hazard Layer (NFHL).

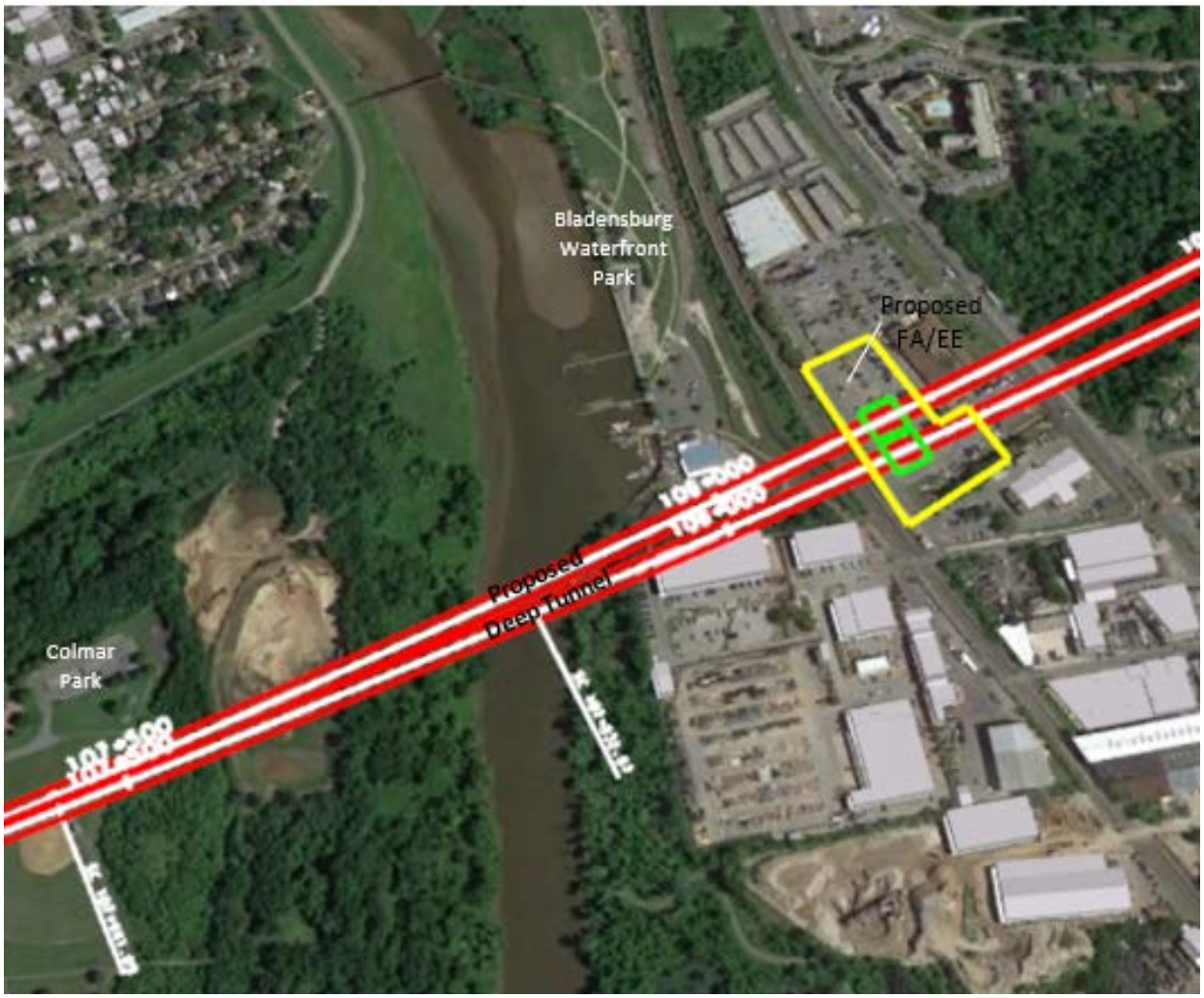
Within the SCMAGLEV Project Affected Environment, areas of 100-year floodplain are associated with several surface waters and waterbodies within the previously identified watersheds: the Anacostia River and tributaries, an unnamed tributary to Brier Ditch, Beck Branch, Beaverdam Creek and tributaries, Patuxent River and tributaries, Little Patuxent River and tributaries, Stony Run and tributaries, Dorsey Run, Patapsco River and tributaries, Middle Branch Patapsco River, and Gwynn Falls.

D.7C.3.5 Scenic and Wild Rivers

There are no nationally recognized rivers in Maryland under the National Wild and Scenic Rivers Program; however, there are nine state-designated Scenic Rivers under the Maryland Scenic and Wild Rivers System regulated under the MDNR. Scenic Rivers are rivers whose shorelines are dominated by forest, agricultural land, grasslands, marshland, or swampland with a minimum distance for development of at least two miles for the length of the river and have been given such status by MDNR. FRA identified two state Scenic Rivers located within the SCMAGLEV Project Affected Environment: the Anacostia River and the Patuxent River.

Figure D.7-10 provides a view of the Anacostia River and surrounding landscape within the vicinity of the proposed tunnel under the river, which is consistent for all Build Alternatives. The location shown is adjacent to Bladensburg Waterfront Park and commercial/industrial properties to the east beyond the park, and natural landscape associated with Colmar Manor Park to the west. There is an active dredge containment facility located within this area of Colmar Manor.

Figure D.7-10: Maryland Scenic River – Anacostia River (Build Alternatives J and J1)



Figures D-7-11 and **D-7-12** provide a view of the Patuxent River and surrounding landscape within the SCMAGLEV Affected Environment, bounded by Maryland City Park to the west of the BWP and PRR to the east of the BWP. Build Alternatives associated with Build Alternative J-01 through J-06 include only elevated viaduct. Build Alternatives J1-01 through J1-06 may vary with needs for elevated viaduct and ramps dependent upon TMF options.

Figure D-7-11: Maryland Scenic River – Patuxent River (Build Alternatives J-01 – J-06)

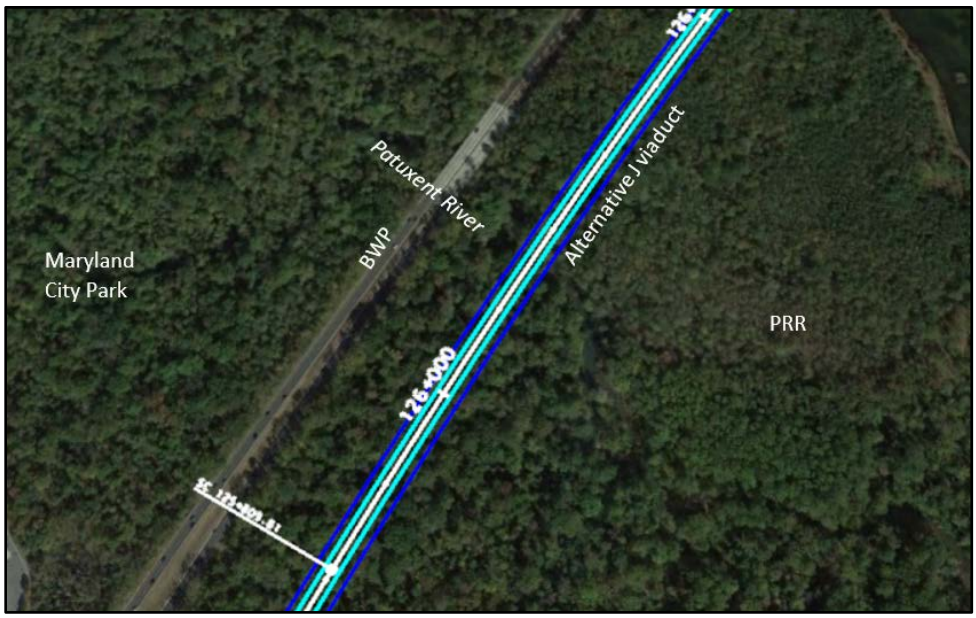


Figure D-7-12: Maryland Scenic River – Patuxent River (Build Alternatives J1-01 – J1-06)

The Anacostia and Patuxent Rivers have an existing undeveloped corridor surrounded by urban lands. They are both bounded by forest, wetlands and grasslands for extensive sections of the rivers within and adjacent to the SCMAGLEV Affected Environment, with the Patuxent River most significantly surrounded by natural resources. Because this portion of the proposed Build Alternatives includes surface

elements, this was field investigated within the Affected Environment. A representative photograph of the Patuxent River surrounded by Nontidal Wetlands of Special State Concern (NTWSSC) within the SCMAGLEV Project Affected Environment is illustrated in **Figure D-7-13**. These corridors provide important wildlife habitat and protect water quality and are the reason the rivers are considered scenic. The surrounding lands are part of a MDNR Green Infrastructure system, which is a mapped network of large blocks of intact forest and wetlands linked together by linear forested stream valleys, ridgelines, and other natural corridors. These rivers are shown in in the Baltimore-Washington SCMAGLEV DEIS Appendix B.3 Natural Resources Mapping Atlas.

Figure D-7-13: **Patuxent River within the Affected Environment**

D.7C.3.6 Chesapeake Bay Critical Area

The Chesapeake Bay Critical Area Protection Program serves to help control future development in the Chesapeake Bay watershed. The Critical Area includes all land within 1,000 feet of the mean high-water line of tidal waters, their tributaries, and any adjacent tidal wetlands to the Chesapeake Bay and Atlantic Coastal Bays.

Land within the Critical Area is assigned one of three land classifications based on predominant land use and the intensity of development. These classifications include Intensely Developed Areas (IDAs), Limited Development Areas (LDAs), and Resource Conservation Areas (RCAs). Baltimore City's Critical Area Management Program (CAMP) identifies Critical Area within the City Limits as only IDA and RCA. No LDA exists within Baltimore City and use classifications are subject to development guidelines, which are focused on improving water quality, managing development activities, and conserving habitat. Any proposed development within the Critical Area is subject to additional regulations and required mitigation to protect existing natural resources and to account for increased impervious surfaces.

Intensely Developed Areas (IDA)

IDAs are areas of concentrated development, where 20 or more acres are dominated by residential, commercial, institutional, or industrial land uses[23]. New development and redevelopment must include techniques to reduce pollutant loading associated with stormwater runoff to improve water quality. State and local Critical Area regulations require a ten percent reduction in nutrient loads post development from the previous developed site conditions, otherwise known as the "10% Rule".

Within Baltimore City, the majority of the Critical Area is classified as IDA, which are further broken down into subdistricts; Waterfront Industrial Areas (WIAs) and Waterfront Revitalization Areas (WRAs). WIAs generally have fewer structures and less lot coverage than the WRAs.

Limited Development Areas (LDA)

LDAs are characterized by low or moderate intensity development and contain areas of natural plant and animal habitats. In order to be classified as an LDA, the area must have a housing density between one dwelling unit per five acres and four dwelling units per acre, have public water and sewer, or have IDA characteristics but consist of fewer than 20 acres. State and local Critical Area regulations require development and redevelopment to maintain or improve water quality and conserve existing areas of natural habitat.

Resource Conservation Areas (RCA)

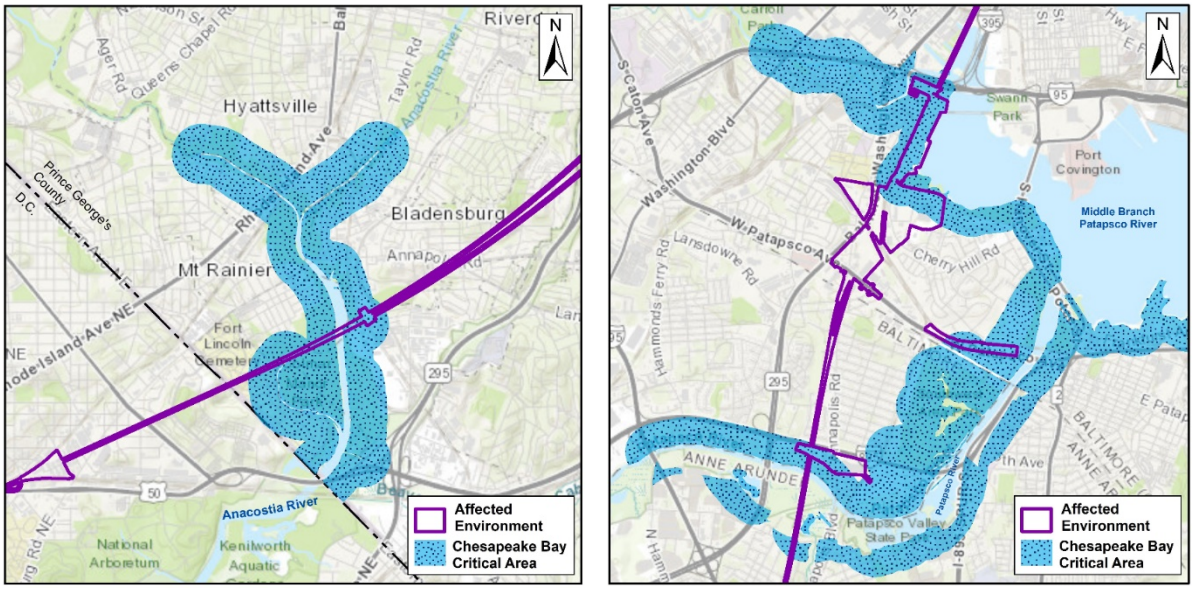
RCAs comprise approximately 80 percent of the Critical Area and are natural areas where resource-utilization activities take place, such as agriculture, forestry, fisheries, and aquaculture. In order to be classified as an RCA, the area must have a housing density of less than one dwelling unit per five acres or be dominated by agricultural uses, wetlands, forests, surface water, or open space. Land use regulations within the RCA are the most restrictive, with new development limited to residential uses and uses associated with resource utilization activities. New commercial, industrial, and

[23] https://dnr.maryland.gov/criticalarea/Pages/development_in_CAC.aspx

institutional uses are not permitted. In addition, performance standards must be met to address lot coverage, forest retention, construction on steep slopes, and stormwater management.

The Critical Area is associated with three major rivers and one water body within the SCMAGLEV Project Affected Environment: the Anacostia River, the Patapsco River, the Middle Branch Patapsco River, and the Baltimore Harbor as indicated in **Figure D.7-14 (A, B.).** Designated Critical Area Buffer within the SCMAGLEV Project Affected Environment occurs in the vicinity of Gwynns Falls and Middle Branch Patapsco River in Baltimore.

Figure D.7-14 (A, B): Critical Areas within the SCMAGLEV Project Affected Environment



Critical Area Buffer

The first 100 feet landward of the mean high-water line has been established as the Critical Area Buffer (Buffer), however, the presence of steep slopes, nontidal wetlands, and highly erodible soils require an expansion of the Buffer. In areas of steep slopes, the buffer is expanded four feet for every one percent of slope or to top of slope, whichever is greater. For NTWSSC, the Buffer is expanded to include the wetlands and the MDE required 100-foot wetland buffer. For other nontidal wetlands, the Buffer is expanded to include the entire wetland but not any associated wetland buffer. In areas with highly erodible soils, the Buffer is expanded to the edge of the NRCS soil series boundary or 300 feet. For the purpose of this analysis, FRA quantified the Buffer impacts based on the required 100-foot limit as per Critical Area Program regulations, without making assumptions on an expanded buffer; however, based on the presence of erodible soils, wetlands, and steep slopes, the SCMAGLEV Project would require the development of a detailed expanded Buffer, subject to review and confirmation by the Critical Area Commission and/or local reviewers.

The Buffer is considered the most significant land within the Critical Area because it acts as a water quality filter that removes or reduces sediment, nutrients, and toxic substances found in runoff.

D.7C.4 Environmental Consequences

FRA evaluated the environmental consequences of the No Build Alternative and Build Alternatives. Anticipated permanent and temporary impacts to water resources, including direct and indirect impacts, were identified. FRA provided a qualitative and quantitative analysis when applicable.

D.7C.4.1 No Build Alternative

Under the No Build Alternative, the SCMAGLEV Project would not be built and therefore no impacts related to the construction or operation of a SCMAGLEV system would occur. However, other planned and funded transportation projects would continue to be implemented in the Project Study Area, which is roughly bound by I-95 on the west and by the former Washington-Baltimore & Annapolis Electric Railroad alignment on the east, and it includes portions of Baltimore City, Baltimore County, Howard County, Anne Arundel County, Prince George's County, and Washington, D.C. These implemented projects could affect water resources by increasing impervious surfaces or adding additional pollutant load to the area's water resources.

D.7C.4.2 Build Alternatives

Permanent, temporary, direct, and indirect impacts would result from the construction of any Build Alternative. Permanent impacts would include the removal of vegetation to allow for the construction of fresh air and emergency egress (FA/EE) facilities, substations, maintenance of way (MOW) facilities, viaduct piers, and train maintenance facilities (TMF), resulting in an increase in impervious surfaces and an associated increase in runoff and pollutant transport. FRA anticipates temporary stream relocations or diversions necessary within the watersheds during construction of the SCMAGLEV Project as well as permanent stream relocations for structural elements noted above. In general areas with above-ground Project elements would likely experience greater overall impacts to water resources, especially surface waters, than areas with below-ground station or tunnel locations. Temporary impacts would include areas of cut/cover, entrances for tunnel boring machines, and miscellaneous construction LOD area including disturbed areas surrounding bridge crossings over rivers that require a greater expanse for construction. Additional details regarding ancillary facilities, roadway and utility line relocations, and placement of spoil material are possible and would be accounted for in permit documents and final design.

Summary of Build Alternative Impacts

- Build Alternatives J-01 and J-04 would have a water resources impact to the Little Patuxent River Watershed, river, and its surrounding natural habitat within

the watershed. Due to proposed viaduct piers, SCMAGLEV systems, and TMF located within two locations of this resource, these Build Alternatives would directly affect floodplain functions, riparian habitat, NTWSSC, water quality, surface hydrology, and wildlife and aquatic species (including rare, threatened or endangered species or species of concern).

- Both the Camden Yards Station and Cherry Hill Station would result in permanent impacts within the Critical Area Buffer and floodplain of the Patapsco River located near the Inner Harbor.
- Build Alternatives J-01 through J-06 would largely impact greater water resources than Build Alternatives J1-01 through J1-06, such as watershed acreage, floodplain, surface waters, and groundwater, due to its greater proposed elevated alignment.

Watersheds

FRA has considered several characteristics of the watersheds in the SCMAGLEV Project Affected Environment, including its overall size, land use, geology, and existing vegetation and presence of waterways, into the analysis of watershed effects from the SCMAGLEV Project. Each Build Alternative would directly and permanently impact watersheds as a result of grading, vegetation clearing, new structures, and conversion of pervious to impervious surfaces. These impacts may have the potential to alter watershed functions such as storage of rainfall and habitat for wildlife and aquatic species.

Permanent watershed impacts range from approximately 900 acres to 1,100 acres of overall watershed disturbance as identified in Attachment D Table D.1. FRA quantified the approximate total acreage of permanent impacts from the surface features associated with each proposed Build Alternative, which provides a conservative estimate, as the viaduct would potentially only cause permanent fill at pier locations. Beyond the LOD in each watershed, these permanent changes to the landscape have the potential to affect the watershed downstream of the Project. Watershed impacts were further defined by estimated new impervious surface. FRA evaluated areas of existing impervious surfaces in the landscape with consideration of existing urbanized and developed environments. Areas with no change in impervious surfaces are not anticipated to result in a change to the function of the watershed. The water quality subsection specifically discusses new impervious surface impacts associated with the Build Alternatives.

With proposed development to an area there is an associated change to the landscape that coincides with the addition of new impervious surfaces, including utilities such as for sewer systems (both sanitary and stormwater), water, gas and electrical lines. Utilities can affect both wetlands and waterways, altering hydrologic connections and increasing potential erosion, and bisect areas of vegetation, causing a disconnect in continuous natural features. Stormwater conveyance becomes drastically important within the watershed, to both treat runoff and maintain flow. This results in changes to

the landscape through the addition or alteration of pipes and drainage ditches. In addition, increased development is usually synonymous with greater human presence. This therefore increases the potential for human induced dumping of trash, sediment, and debris.

Alignment

Permanent watershed impacts associated with Build Alternative alignments would be more evident in the Little Patuxent River Watershed, Anacostia River Watershed, and the Patuxent River Watershed. Permanent impacts would be greater for alignments associated with J-01 through J-06 due to the greater proposed above ground features. This difference between Build Alternatives is most significantly found within the Little Patuxent River watershed, where the Build Alternatives J alignments are proposed largely above ground and Build Alternatives J1 alignments are in deep tunnel (Figure 4-1). Direct and indirect impacts as a result of the alignments in this location specifically includes removal of vegetation within wetlands and riparian forest, construction within the floodplain, and potential affect to water quality (identified in greater detail below). These vegetated stream buffers and adjacent floodplain provide habitat and shading for wildlife, slow runoff velocities and filter pollutants from reaching the streams. This may also result in stream bank erosion as discussed in greater detail in Section D.7E Wetlands and Waterways.

Due to these proposed impacts to water resources and the indirect effects to the surrounding natural environment, the Build Alternatives associated with the Build Alternatives J alignments may have an adverse effect to the Little Patuxent River Watershed. Strict adherence to stormwater and waterway BMPs, erosion and sediment controls (ESC), and expedited mitigation of resources to the greatest extent possible would be necessary within this watershed to protect biodiversity and its designation as a Stronghold Watershed. FRA has proposed design techniques called “straddle bents” to aid in spanning large sinuous river systems, such as the Little Patuxent River, with the goal to avoid instream pier construction. These techniques and additional BMPs for waterway protections are outlined in Section D.7E Wetlands and Waterways.

The greatest total acreage of impact for any alignment (Build Alternatives J or J1) occurs in the Anacostia River Watershed, as this watershed has the longest segment of proposed tunnel and viaduct. Build Alternative J and J1 alignments within this watershed have similar impacts because they generally represent similar areas of proposed tunnel, proposed SCMAGLEV elements, and viaduct. As an example, the maintenance of way (MOW) proposed to support Build Alternatives J-01 through J-04 propose approximately 12.5 acres of new impervious surface within the watershed and within NPS property. The MOW supporting J1-01 through J1-04 proposes the same but on Maryland City Park property. Different property impacts, but similar disturbance within the watershed.

The Build Alternative J and J1 alignments will also have similar impacts within the Patuxent River Watershed, as all alignments are largely proposed as viaduct through

this area. Impacts associated with the alignments in this watershed are consistent with that of the J alignments within the Little Patuxent River Watershed noted above, with proposed construction in the floodplain, removal of vegetation, and potential affects to water quality. Although direct, indirect, permanent and temporary impacts are proposed within these watersheds and may pose an adverse effect to resources within the watershed, with BMPs and mitigation in place, it is anticipated that the overall function of these watersheds would not be adverse as a result of the alignments alone (surface viaduct, subsurface tunnel, and ancillary features). The alignments are largely located along the existing transportation corridor where risks to runoff and pollutants currently exist.

Stations

The Cherry Hill Station and associated project features would have far more permanent impacts (approximately 180 acres) located in the Patapsco River, Gwynns Falls, and Baltimore Harbor Watersheds than the Camden Yards Station (with approximately 27 acres) because the Cherry Hill Station would be primarily above ground. However, despite the greater acreage of impact proposed, the permanent impacts at the Cherry Hill Station would occur largely on previously developed land, as it is situated in a largely commercial and industrial area of Baltimore City. Therefore, the functions of these watersheds are not anticipated to change.

TMF

FRA anticipates that the TMFs would have the greatest impact on watersheds due to their size and the conversion of primarily natural areas with multiple habitat types, to impervious surfaces resulting in a direct and permanent long-term impact within the watershed. These impacts are based on significant increases to impervious surfaces, grading, and vegetation clearing resulting from the presence of the structures and the associated increase in runoff. The BARC Airstrip TMF would have approximately 193 to 200 total acres of permanent watershed impacts, BARC West TMF would have approximately 192 to 194 acres of impact, and the MD 198 TMF would have 194 to 216 acres of impact. The BARC West and BARC Airstrip TMFs would have the greatest impact on the Anacostia River Watershed (Tier II Watershed), including Beaverdam Creek tributaries and headwaters.

The MD 198 TMF would have the greatest impact on the Little Patuxent River Watershed. Due to the significant new impervious surface and the significant amount of fill required to the landscape, it is possible that the boundary defining the drainage area of the Little Patuxent River Watershed could be altered. The TMF site slopes downward toward the Little Patuxent River to the north and east. Current design indicates the need to provide up to 154 feet of fill to raise the site to a level grade. The fill would be supported by perimeter retaining walls. This results in a significant change to the landscape and to the drainage pattern of the adjacent Little Patuxent River and its upstream and downstream tributaries. This facility is located less than one-half mile upstream from the PRR, and with the added impervious surface, fill within the floodplain

and wetlands, and loss for forest canopy, it is expected to indirectly affect resources located withing PRR. With the changes in topography, extensive BMPs, construction controls, and Environmental Site Design (ESD) measures would be required to protect the surrounding environment and prevent further degradation. Additional impacts to this system and watershed, including floodplain and water quality, are described below in subsequent sections.

Both the BARC Airstrip TMF and MD 198 TMF would also impact the Patuxent River Upper Watershed (Tier II Watershed), with approximately 10 acres (Build Alternatives J and J1), and approximately 29 acres (Build Alternative J1), respectively. It is anticipated that with appropriate mitigation measures in place, the BARC Airstrip would not result in a permanent loss of this watersheds function and not change its status as a Stronghold Watershed. Similarly, although the MD 198 TMF is anticipated to have direct permanent impacts to the Little Patuxent Watershed functions as noted above, FRA does not anticipate a direct loss of watershed function to the Patuxent River Upper Watershed as a result of this TMF. Build Alternatives J1-01 through J1-06 impact this watershed from the necessary viaduct connections spanning over the BWP and to the 198 TMF.

With approximately 200 acres of permanent impact proposed for any of the TMFs, it is anticipated that both the Anacostia and the Little Patuxent Watersheds will experience a change in watershed function, specifically its ability to filter and store water in the soil, and may risk a change in status of Stronghold Watersheds. Hydrology patterns in and surrounding any of the TMF sites will also be altered, which may influence seeps and low-lying areas that may support sensitive species. These effects are discussed in greater detail in Sections D.7E and D.7F.

Water Quality

All Build Alternatives would introduce new impervious surfaces to the landscape, result in clearing of vegetation, and have the potential for downstream impacts within the watershed, specifically to water quality. Examples of pollutant sources from the SCMAGLEV Project would include the runoff of chemicals and increased stormwater from SCMAGLEV operations at proposed facilities and viaduct, and sediment from soil erosion during construction. Permanent clearing of forest canopy may result in detrimental effects to areas supporting vernal pools and waterways, allowing greater light and heat to directly reach waters. This can cause a direct effect to the instream temperatures, changing both the physical and chemical properties of the waterway. Indirect effects may result in detriment to species who rely on a shaded environment to thrive. Habitat and species effects are described further in Section D.7E Wetlands and Waterways and Section D.7F Ecological Resources.

New impervious surface as a result of the Build Alternatives range from approximately 712 acres to 826 acres as identified in **Table D.7-10**. FRA included the proposed long-term construction laydown areas in the calculations of new impervious surface because of the duration of work; however, specific needs of the site are not defined at this phase, and it is anticipated that these areas may not be completely converted to impervious

surfaces. Land note required for new structures will be returned to natural conditions, with the intent to replace lost resources to the extent possible, pending future use of that land by the property owner. As this land may not function exactly as it did pre-construction due to soil disturbance and compaction, restoration is not possible on the potential laydown areas on BARC's long-term research project areas.

Below-ground project elements or elements that are proposed in areas of already existing impervious surfaces were not considered within these estimated impacts, because it is the intent that no change in the amount of impervious surface would occur per these conditions post construction. FRA also excluded from this calculation of new impervious surface, areas of proposed permanent stormwater management facilities associated with each Build Alternative, as these elements would not contribute to additional impervious surfaces.

Table D.7-10: New Impervious Surface per Build Alternatives

Acres of New Impervious Surface by Alignment, Station, and TMF								
Build Alternative	Alignment	Stations			TMF			Build Alternatives Total Permanent Acres of Impact
		BWI Marshall Airport	Cherry Hill	Camden Yards	BARC Airstrip	BARC West	MD 198	
J-01	554	2	74	-	-	-	177	808
J-02	557	2	74	-	193	-	-	826
J-03	558	2	74	-	-	187	-	822
J-04	552	2	-	14	-	-	177	745
J-05	555	2	-	14	193	-	-	764
J-06	556	2	-	14	-	187	-	760
J1-01	505	2	74	-	-	-	198	780
J1-02	511	2	74	-	188	-	-	776
J1-03	507	2	74	-	-	190	-	774
J1-04	503	2	-	14	-	-	198	718
J1-05	510	2	-	14	188	-	-	714
J1-06	506	2	-	14	-	190	-	712

The increased impervious surfaces can generate greater risk of stormwater runoff that can make its way to streams. The runoff can carry pollutants from SCMAGLEV operations and maintenance. Vehicles and wayside equipment, particularly maintenance activities, would use cleaners, lubricants, and other materials. Minor but continuous release of materials via water runoff into the environment over time would create the potential for long-term impacts to water quality. During final design, the Project Sponsor would produce final calculations of new impervious surfaces per location within each county, Baltimore City, and Washington, D.C. to comply with applicable stormwater management and Critical Area laws. Stormwater management

ESD practices and BMPs would reduce these potential impacts from runoff, and ensure there is no discharge into adjacent waterways, in accordance with National Pollutant Discharge Elimination System (NPDES) regulations. Refer to Section D.7D.5 for additional information on how stormwater management can minimize and mitigate effects to water quality.

Alignment

For the purpose of this analysis, FRA considered the viaduct to be new impervious surface because it would intercept and concentrate stormwater runoff. As noted above, long-term construction laydown areas are included in the calculations of new impervious surface because of the duration of the work intended at these locations. All Build Alternative alignments include approximately 402 acres of new impervious surface associated with long-term construction laydown areas, which is approximately 50 percent of the total estimated new impervious surface as a result of the SCMAGLEV Project. Build Alternatives J-01 through J-06 alignments would have roughly 50 acres more impervious surface than Build Alternatives J1-01 through J1-06 alignments due to their longer above-ground viaduct.

The Anacostia River and an unnamed tributary and the Patapsco River and tributaries are crossed as deep tunnel for any alignment, with nearby SCMAGLEV structures proposed in locations of existing developed impervious environments. FRA does not anticipate a resulting change in the landscape at these locations, and therefore no change is anticipated in water quality. Beaverdam Creek, Beck Branch, the Patuxent River, and smaller unnamed tributaries throughout the SCMAGLEV Affected Environment are crossed as viaduct for any alignment, with potential long-term impacts to these waterways as a result of SCMAGLEV operations, introducing the threat of increased runoff bringing larger quantities of pollutants into the affected water resources. For example, a diesel-powered, rubber tire fleet of maintenance vehicles would be on the alignment nightly for inspections and other activities and may add diesel pollutant load to the nearby waterways. As previously noted, construction of the viaduct will also require the clearing of vegetation over and surrounding these waterways. This vegetation helps regulate temperatures within the waterways and supports healthy aquatic habitats. The effects noted here are anticipated to be of greater significance in areas of existing natural environments, such as within the parklands of Anne Arundel and Prince George's Counties, and on Federal properties such as Fort George G. Meade, PRR and BARC.

The effects of the alignments alone may contribute to the overall impairment of nearby waterways as a result of a Build Alternative but are not expected to affect a designated waterway status. Such increases in runoff and/or thermal impacts are not anticipated to be as significant in areas of greater existing urbanization, located mostly within Baltimore County and Baltimore City. In order to minimize the effects of diesel pollutant and other pollutants entering the waterways, the Project Sponsor will evaluate ESD measures to trap runoff from the viaduct and ancillary facilities along the alignment.

Stations

The Mount Vernon Square East, Baltimore-Washington International Thurgood Marshall Airport (BWI Marshall Airport), and Camden Yards Stations would result in very little new impervious surface and no clearing of vegetation due to their proposed locations below ground and in areas of existing impervious surface cover. These station locations would not likely contribute to impairments in the waterways nor affect status. The Cherry Hill Station would have the greatest increase in impervious surface at 74 acres due to its above-ground location. Of the 74 acres of new impervious surface, approximately 30 acres are associated with a long-term construction laydown area, which is currently partially vegetated and adjacent to the Middle Branch of the Patapsco River. This location currently functions as an open space providing a buffer between adjacent commercial/industrial and residential areas and the tidal waters. Stormwater and erosion and sediment control BMPs would be developed to minimize and mitigate for the disruption of this area and to prevent sedimentation and potential hazardous substances from leaving the laydown area and into the waterway. The Cherry Hill Station is located close to waterways and within the Critical Area and therefore has a greater likelihood of impacting water quality through pollutant runoff.

TMF

All TMF sites under study occur in areas with low existing impervious coverage and require the clearing of forest canopy in watersheds associated with notable quality waterways, so each TMF site would have the potential to result in detrimental permanent impacts to water quality. For the purpose of this analysis, the TMF was considered a totally impervious project element. The MD 198 TMF would convert approximately 177 to 198 acres of undeveloped land to new impervious surface in the Little Patuxent Watershed, a Stronghold Watershed. With the significant changes to the landscape proposed for grading, and the removal of vegetation and habitat at the MD 198 TMF, it is anticipated that water quality within the Little Patuxent River and tributaries would be impaired as a result.

The BARC Airstrip and BARC West TMFs would add approximately 188 to 193 acres and 187 to 190 acres, respectively, of new impervious surface and impacts to Beaverdam Creek and tributaries, with BARC Airstrip most notably impacting Beaverdam Creek, headwaters. FRA anticipates that stream relocations and/or creation of large culverts would be required for these streams, including the headwaters. Beaverdam Creek (part of the Anacostia watershed) was the only major waterway identified within the SCMAGLEV Project Affected Environment as having good health indices based on MBSS data. With direct and permanent impacts to its headwaters proposed there is the potential that the health of this waterway would decline, potentially resulting in inclusion on 303(d) listed waters.

FRA anticipates that during final design the TMF locations would have areas within the site where pervious features would be integrated into the design to help mitigate potential runoff. Construction of any of the TMFs would incorporate appropriate

stormwater management facilities that would meet water quantity and water quality requirements at the Federal, state, and county level. Redundant practices and/or treatment train configurations[24] would be considered to further improve water quality. It is anticipated that all stormwater management would be maintained within the existing limits of the indicated TMF LOD. Additionally, with the significant increase in impervious surfaces and direct impact to waterways, it is anticipated that MDE would prioritize these watersheds (Little Patuxent River and Anacostia) for total optimum daily load (TMDL) requirements and potential status changes to waterways. Affects to the waterways are described further in Section D.7E Wetlands and Waterways and Section D.7F Ecological Resources. Similar concerns of water quality are a concern for groundwater, and potential impacts to drinking water sources, wells and aquifers.

Groundwater

The SCMAGLEV Project has the potential to impact groundwater through many of the same direct and indirect ways as it would impact surface waters, including but not limited to: the increase of impervious surface and therefore potential decrease in the amount of natural precipitation connecting with the ground surface, the potential for dewatering during construction activities, and a potential for greater stormwater runoff contributing to potential groundwater contamination.

The level of the water table can naturally change over time due to changes in weather cycles and precipitation patterns, streamflow and geologic changes, and even human-induced changes, such as the increase in impervious surfaces on the landscape[25]. The greater the distance between a source of contamination and a groundwater source, the more likely that natural processes reduce impacts of contamination. Processes such as oxidation and adsorption (binding of materials to soil particles) can reduce the concentration of a contaminant before it reaches groundwater.[26] Releases of hazardous materials into the environment noted to affect surface water quality would also have the potential to impact groundwater quality, especially if a water supply well is near a source of contamination. The well would then be at risk, which could result in human health impacts. These factors are all considered when WHPAs are created.

Specific areas of contamination are not anticipated, however would need to be further analyzed following more detailed hazardous materials investigations and groundwater studies. As groundwater is the most significant source of fresh drinking water in Maryland's Coastal Plain, continued ground investigations and agency coordination will be critical to ensuring the SCMAGLEV Project does not adversely affect drinking water quantity and quality. The Project Sponsor will coordinate with the MDE Water Supply Program, part of the Water and Science Administration, appropriate local governments, water suppliers, and other agencies that developed the WHPAs and wells to further

[24] Stormwater management treatment trains include a combination of stormwater treatment processes to treat pollutants.

[25] USGS. https://www.usgs.gov/media/images/cone-depression-pumping-a-well-can-cause-water-level-lowering

[26] Environmental Protection Agency. https://www.epa.gov/sites/production/files/2015-08/documents/mgwc-gwc1.pdf

assess the potential for impacts and develop appropriate measures to avoid or minimize impacts, as needed. Water level and water quality monitoring will also be necessary to evaluate the health of the aquifers and determine greater detail and potential for impacts to aquifers.

Alignment

Build Alternative J1-01 through J1-06 alignments have greater lengths of guideway in a deep tunnel, and therefore potentially more susceptible to impacts to groundwater than Build Alternatives J-01 through J-06 alignments. Proposed tunneling would occur in the Patapsco aquifer and the Patuxent aquifer in Anne Arundel County, particularly within or near WHPAs in the aquifers. The depth of the Patuxent aquifer ranges greatly within Maryland, from approximately 125 feet to 525 feet, and the Patapsco aquifer between 250 to 350 feet. The depth of SCMAGLEV tunnel is proposed to reach an optimum depth of approximately 320 feet, therefore it is possible that the aquifers would experience direct impacts such as disruption within the aquifer and therefore changes in recharge and/or groundwater levels, and indirect impacts such as a change in the water supply or increased risk of contamination. A few of these locations include the vicinity of the Washington, D.C. and Prince George's County line; the area just south of the Veterans Parkway FA/EE; and just south of MD 198. Geotechnical studies completed at later design phase would support design and construction measures proposed to reduce risk of aquifer impacts.

With the tunnel structures potential for localized changes to the water table and water pressures affecting the aquifers, creates the potential for a loss of groundwater recharge to the WHPAs. Build Alternatives J1-01 through J1-06 alignments tunnel sections would cross more WHPAs than Build Alternatives J-01 through J-06 alignments. They would also reach greater depths near a WHPA in the vicinity of MD 198, while Build Alternatives J-01 through J-06 alignments would be elevated in this area.

Stations

None of the proposed stations are located within a WHPA, however with underground station construction (Mount Vernon Square East, BWI Marshall Airport, and Camden Yards) there may be risk of long-term sources of contamination from operational activities within the stations more closely located to levels of groundwater. The Cherry Hill Station is the least impactful station when considering groundwater due to its proposed construction above ground and its largely already disturbed and developed landscape.

TMF

All TMF sites, although above ground surface structures, would influence groundwater, as groundwater is largely derived from precipitation and all the TMF locations would result in a large increase of impervious surfaces, greater than 160 acres. This reduces

the landscape's ability to absorb precipitation directly and support the groundwater supply, potentially affecting water table levels. Additionally, the MD 198 TMF and the BARC West TMF are also located within identified WHPAs, therefore these areas may have a greater effect on groundwater as noted above. Due to the risk of contamination of BARC well water supplies, the identification and location of additional wells in the area surrounding the proposed BARC TMF sites will need to be coordinated with property owners during later design and provide greater detailed information regarding their connection to existing infrastructure and potential impacts that may result from the SCMAGLEV Project. This would occur with further detailed design and selection of a preferred alternative. The significant vegetation clearing for these areas would also remove or alter those natural features such as nontidal wetlands, riparian buffers and floodplain, that capture runoff and increase the potential for contaminants to reach groundwater.

The BARC Airstrip TMF is adjacent to the GGAO, and the impacts that would occur if there is a withdrawal or modification of groundwater may extend onto the GGAO site. As groundwater is withdrawn, pore spaces within the aquifer can no longer support the load and can become crushed, causing subsidence and ground compaction, which has the potential to impact the geodetic stability of the GGAO site.

Floodplains

All proposed Build Alternatives would result in permanent floodplain impact. FRA proposes several permanent project features within the floodplain including viaduct piers, transition portals, TMFs, and various SCMAGLEV system elements. Refer to Attachment D Table D.3 for a summary of acres of permanent impacts and temporary construction impacts on 100-year floodplains by alignment, station, and TMF. These floodplain impacts will require permitting through the MDE. Based on proposed permanent SCMAGLEV Project elements and anticipated grading and/or fill that would be required in the floodplain, FRA has also provided a qualitative assessment of direct and indirect effects to the floodplain. Changes to the floodplain elevation associated with grading and fill will likely require a Letter of Map Amendment (LOMA) or Letter of Map Revision (LOMR) from FEMA. Through these processes, FEMA can issue a document that officially removes a property from the mapping for a Special Flood Hazard Area[27]. Additional studies including a hydraulic and hydrology analysis would be required as part of permitting and final design to estimate the total impacts of the proposed structures on floodplain elevations and functions. If these studies find that flood elevation would change, floodplain storage mitigation would be proposed, if required.

Floodplain impacted within National Park Service (NPS) property will require a Statement of Findings per Directors Order (DO) 77-1 and DO-77-2 as well as wetland and waterway impacts described in Section D.7E Refer to impact summary tables in

[27] https://www.fema.gov/flood-maps/change-your-flood-zone/loma-lomr-f

Attachment D for the supplemental quantitative analysis specifically for NPS floodplain impacts per the SCMAGLEV Project.

Alignment

Build Alternatives J-01 through J-06 alignments would incur more permanent floodplain impacts (15 acres) than Build Alternatives J1-01 through J1-06 alignments (9 to 10 acres) because of the longer above ground viaduct crossing more floodplains of surface waters and waterbodies. Specifically, the greatest difference in floodplain impact between alignments, as noted similarly for other water resources, is due to Build Alternatives J alignments impact to the floodplain of the Little Patuxent River with viaduct piers and SCMAGLEV systems. Additionally, the MDNR indicates that the projects disturbance within this floodplain may affect rare species, and work should incorporate stringent BMPs for sediment and erosion control in order to reduce the likelihood of adverse impact to these species. Build Alternatives J1 alignments would not impact this floodplain as it is within deep tunnel under this resource.

All alignments cross over the floodplains of Beaverdam Creek and the Patuxent River with viaduct and the Middle Branch of the Patapsco River with construction of a substation. The location of SCMAGLEV facilities above-ground structures within the floodplains such as a tunnel portal at Beaverdam Creek or the noted proposed substation, may increase flooding risk to these structures but it is not expected to put the viaduct piers or viaduct at risk. Additionally, piers located within the floodplain and viaduct spanning over the floodplain are not anticipated to affect the base flood elevations or diminish floodplain functions.

Station

The Mount Vernon Square East and the BWI Marshall Airport Stations would not have any impacts to 100-year floodplains. The Cherry Hill Station would result in approximately 28 acres of permanent impact to the 100-year floodplain mostly due to the long-term construction laydown area located within the floodplain of the Patapsco River associated with this station (Refer to the Baltimore-Washington SCMAGLEV DEIS Appendix B.3 Map Atlas Sheet 12). This impact is not anticipated to affect the base flood elevations. Because this low-lying area of topography has only portions that consist of pervious open space and a minimal amount of vegetated surface, FRA has considered these existing conditions and located the laydown area largely over portions of existing gravel and pavement and avoided the vegetated northern corner of the site. There is the potential that this long-term construction laydown area could be affected by storm events producing flood hazards, but it is not anticipated that it would affect the function of the floodplain. The Project Sponsor will consider risk management to be prepared for potential flooding to reduce the potential for delayed project timelines, damage to the site and/or construction equipment, and any potential for contamination.

The Camden Yards Station would result in approximately seven acres of permanent floodplain impact however largely in already disturbed or developed area. This station

has a greater temporary impact to the floodplain described in Section D.7D.4. Additional measures to avoid and minimize floodplain impacts are identified in Section D.7D.5 below.

TMF

The MD 198 TMF would have the greatest floodplain impact of the three TMF options, between 31 and 39 acres of permanent disturbance along the Little Patuxent River due to new impervious surface. These impacts are associated with the TMF footprint, viaduct, and the MOW ramp. The TMF overlaps the Little Patuxent River and would require a significant amount of fill material within the 100-year floodplain. This area is currently subject to routine flooding that impacts vehicular traffic. Impacts to the Little Patuxent River would include a decrease in the flood storage capacity and toxicant filtering functions and increase risks for erosion in this location. Indirect effects of this floodplain impact would include alteration and decrease to the riparian buffer surrounding the Little Patuxent River, potential changes to water temperature and thus water quality due to alterations in shading and filtering capacity and a resulting effect upon aquatic species.

The BARC West TMF would have limited impact to floodplains, between two and three acres, whereas the BARC Airstrip TMF would have a larger impact to the Beaverdam Creek floodplain and its tributaries, between 14 and 16 acres. This acreage of proposed new impervious surface within the floodplain presents similar direct and indirect effects as noted above for the MD 198 to impact the Little Patuxent River. Additional hydraulic studies would need to be conducted to determine if site-specific SCMAGLEV facilities located within the floodplain would result in a change in base floodplain elevation.

Scenic and Wild Rivers

All Build Alternatives would cross in tunnel under the Anacostia River and on viaduct over the Patuxent River, which are designated as state Scenic Rivers.

Alignment

All Build Alternatives propose tunneling under the Anacostia River (approximately 275 linear feet) with no proposed surface impacts within the river or immediately along the shoreline. A proposed FA/EE would be located within approximately 500 feet of the river to the northeast co-located in an existing developed landscape. No instream work would occur; therefore, FRA does not anticipate a change to the physical character or quality of the Anacostia River per any Build Alternative alignment. Use of appropriate ESD and BMPs described below would mitigate potential impacts to water quality.

FRA identified direct, temporary and permanent impacts associated with both alignments for the proposed viaduct crossing over the Patuxent River, with additional discussion provided in Section D.7E Wetlands and Waterways and Section D.7F

Ecological Resources. FRA considered the following characteristics to evaluate the potential impacts to this scenic river:

- **Viaduct span over the Patuxent River**: Build Alternatives J-01 through J-06 alignments would span the approximately 65-foot-wide river one time at a perpendicular crossing. Build Alternatives J1-01 through J1-06 alignments would cross the Patuxent three times due to the waterway's sinuosity beneath the viaduct, for a total span of approximately 190 linear feet. Piers would be designed to limit impact to waterways.
- **Location of viaduct piers within surrounding natural resources (tributaries, wetlands, floodplain, and forest)**: Piers associated with viaduct would potentially impact adjacent natural resources resulting in permanent vegetation impacts. Final design would avoid placement of piers within waterways to the greatest extent possible, which would reduce or eliminate permanent impacts to the river and nearby tributaries; however, adjacent wetlands and floodplains would be permanently impacted by pier placement.
- **Properties crossed:** Build Alternatives J-01 through J-06 alignments would cross NPS and Washington Suburban Sanitary Commission properties north to the PRR. Build Alternatives J1-01 through J1-06 alignments would cross Maryland National Capital Park and Planning Commission's Patuxent River Park north through Anne Arundel County's Maryland City Park, where both parks border NPS property.
- **Viewshed of the Patuxent River**: Both alignments would require clearing of vegetation and construction of viaduct and piers over/adjacent to the river; therefore, the SCMAGLEV Project would permanently alter the current viewshed in the vicinity of the viaduct. Although the viewshed would be altered, it is anticipated that minimization and immediate mitigation measures such as site plantings would enable this river to maintain its status as a Scenic River. This would require detailed coordination with the agencies to address issues such as aesthetics of the viaduct and piers and type of species planted.

As a result of construction of the viaduct, the indirect effects to the Patuxent River would include changes to species composition and biodiversity from the removal of adjacent forested wetland and riparian habitat, and increased potential for runoff from the overhead viaduct to the waters below affecting water quality. Additional discussion on the effects to wetlands, waters and habitat is located in Section D.7E Wetlands and Waterways and Section D.7F Ecological Resources.

Station

No proposed stations would be in or near the Anacostia or Patuxent Rivers; therefore, the proposed stations would not impact the Anacostia or Patuxent Rivers or their designations.

TMF

No proposed TMF sites would be in or near the Anacostia or Patuxent Rivers; proposed stations would not impact the Anacostia or Patuxent Rivers or their designations.

Chesapeake Bay Critical Area

The Critical Area is associated with three major rivers and one water body within the SCMAGLEV Project Affected Environment: the Anacostia River, the Patapsco River, the Middle Branch Patapsco River, and the Baltimore Harbor**.** Temporary and permanent impacts would occur primarily in the Baltimore City area within Intensely Developed Areas (IDA), ranging from 57 to 124 acres of permanent impact per Build Alternative. Impacts to Resource Conservation Areas (RCA) would be very limited and would include those areas converted to infrastructure and impervious surface that could increase pollutant loads. RCA impacts would range from one to two acres of permanent impact per Build Alternative. No impacts to Limited Development Areas (LDA) would occur. Additional impacts to the Critical Area Buffer would occur in the vicinity of Gwynns Falls and Middle Branch Patapsco River. The Buffer impact analysis is based on the minimum 100-foot limit; therefore, it represents the minimum acreage of impact associated with the Buffer. **Table D.7-11** enumerates impacts to the Critical Area, associated land classifications, and impacts specifically within the Buffer of proposed LOD of all SCMAGLEV Project surface features. Permanent impact illustrated in the table is calculated per acreage of any surface feature within the LOD. It does not infer that it is all new impervious surface. Many of these areas already have considerable impervious surface present, as they are situated within developed areas.

Table D.7-11: Acres of Critical Area Impact per Land Classification

Build Alternative	RCA			IDA			Total Critical Area Boundary Impact			Total Critical Area Buffer Impacts*		
	P	T	Total	P	T	Total	P	T	Total	P	T	Total
J-01	2	0	2	124	2	126	126	2	128	9	<1	9
J-02	2	0	2	124	2	126	126	2	128	9	<1	9
J-03	2	0	2	124	2	126	126	2	128	9	<1	9
J-04	1	1	2	57	27	83	57	27	85	3	6	9
J-05	1	1	2	57	27	83	57	27	85	3	6	9
J-06	1	1	2	57	27	83	57	27	85	3	6	9
J1-01	2	0	2	124	2	126	126	2	128	9	<1	9
J1-02	2	0	2	124	2	126	126	2	128	9	<1	9
J1-03	2	0	2	124	2	126	126	2	128	9	<1	9
J1-04	1	1	2	57	27	83	57	27	85	3	6	9
J1-05	1	1	2	57	27	83	57	27	85	3	6	9
J1-06	1	1	2	57	27	83	57	27	85	3	6	9

Alignment

Permanent impacts would be similar for all Build Alternatives, including impacts resulting from:

- fresh air emergency egress (FAEE) within the Anacostia River Critical Area (approximately three acres);
- FAEE and substation located southeast of the intersection of Interstates 895 and 295 within the Patapsco River Critical Area (approximately 17 acres); and
- long-term construction laydown proposed in the Patapsco River Critical Area (approximately 14 acres).

The two FA/EE facility impacts do not pose a significant change of land use within the Critical Area. These are both situated on already developed industrial properties, of almost entirely paved surface. The long-term construction laydown would provide the greatest change in land use, as this area is currently open space, natural features. A portion of the property is paved; however, no development exists. Temporary impacts associated with cut/cover and construction are also similar for both alignments. Refer to Baltimore-Washington SCMAGLEV DEIS Appendix B.3 Natural Resources Mapping Atlas Sheets 2, 11, and 12.

Station

Permanent and temporary impacts associated with the construction of both the Cherry Hill Station and the Camden Yards Station would occur primarily in Baltimore City and are associated with the Middle Branch Patapsco River. The Cherry Hill Station impacts would result in approximately 126 acres of permanent impacts and two acres of temporary impacts, resulting from the station features including the main station, parking garage, long-term construction laydown areas, and the substation. Nearly nine acres of this permanent impact is within the 100-foot Buffer, mostly associated with the long-term construction laydown areas. The Camden Yards Station would result in approximately 57 acres of permanent impacts and 27 acres of temporary impacts to the Critical Area. Most of the permanent impacts are associated with the maintenance of way facility and the temporary impacts are associated with the construction LOD. Of the permanently impacted Critical Area, approximately three acres would be within the Buffer.

TMF

None of the TMF options are proposed within the Critical Area.

D.7C.4.3 Short-Term Construction Effects

Watersheds - During construction of any Build Alternative, land would be disturbed, and soil removed. Construction activities would include excavation, filling, cutting, pile

driving, and clearing of vegetation. In some instances, construction would involve the demolition of existing buildings. Temporary impacts would occur and would be both direct and indirect. Direct impacts to water resources include increased runoff, additional pollutant and sediment load to surface waters and groundwater resources. Indirect effects include disruption to species or habitat as a result of pollutant and sediment loads. During agency coordination discussions, USFWS requested that a sediment load analysis be performed. The Project Sponsor would return areas with temporary surface disturbances to their original state if feasible, or to natural conditions, through restoration and/or replanting in all possible locations, with the goal of maintaining pervious surface coverage. Selective limb and root pruning would be conducted to reduce damage to plants. With ESD and BMPs in place during construction, and minimization and mitigation measures proposed for all water resources described below, it is not anticipated that overall watershed functions would be lost due to short-term construction operations.

Water Quality – Sediment deposition in adjacent waterways may occur during construction due to grading and forest/vegetation clearing needed for laydown/staging areas and construction equipment. The clearing of vegetation would result in greater potential for runoff, as the vegetative cover would no longer be present to absorb rainfall, the runoff would in turn carry higher sediment and pollutant loads into affected water resources. Sedimentation in waterways could result in cloudy water, which could prevent natural vegetation growth and indirectly affect species in search of food and habitat in the waterways. Temporary stream crossings for construction access are anticipated and would result in temporary disturbance to streambed habitat and hydrology from the use of stream diversions, temporary culverts, and other standard construction and access elements. For additional description on temporary waterway and habitat impacts, refer to Section D.7E Wetlands and Waterways and Section D.7F Ecological Resources. Other impacts to water quality may occur due to the introduction of pollutants from the use of chemicals and fuels during construction.

There is a potential frac-out risk associated with tunnel construction, which is when drilling fluid penetrates fractured bedrock or seeps into the rock and sand that surrounds the bedrock, traveling towards the Earth's surface. This risk will be further analyzed through site-specific analysis based on more detailed ground investigations and anticipated construction techniques. The Project Sponsor will prepare a Spill Prevention Plan and Contingency Restoration Plan as part of the SCMAGLEV construction, operational and safety measures. These plans will be submitted to the MDE with project permitting materials.

Groundwater –Impacts to groundwater resources could occur during construction from dewatering during excavations for tunnels which could affect groundwater quantity and flows. Due to the regionally high-water table, activities such as tunneling, and underground station construction would take place just above or within the identified aquifers. Dewatering could result in a depression of the cone of groundwater and possibly result in a loss of aquifer recharge capacity to nearby WHPA supply wells and

surface water bodies. Nearby supply wells located at similar depths as the construction would be especially vulnerable.

With advancing design details, FRA would identify more precisely if supply wells would be at similar depths as proposed tunnel and underground stations. The Project Sponsor will need to provide effective groundwater control through construction techniques such as either pumping the groundwater out to control flow and pressure or using barriers to keep the groundwater out of tunneling operations. The construction contractor would need to comply with USEPA's dewatering requirements, as well as state requirements for treatment and metering of pumped groundwater. Through approval from MDE, DOEE, and USEPA, disposal of clean water from the dewatering operations can be directed into a stable channel, such as a storm drain or an existing swale. Sediment laden water would be discharged into sediment bags, portable sediment tanks, or pumped into a sediment trap. Compliance with agency requirements would mitigate impacts. Additionally, the chemicals and fuels used during construction that affect surface water quality may also impact groundwater due to seepage and exposure during construction. The Project Sponsor will develop a Waste Management Plan and/or Spill Prevention Plan that addresses measures to avoid and minimize, and mitigate if necessary, the threat of contamination.

Floodplains - During construction, direct, short-term effects would occur within the 100-year floodplains in those areas of temporary use identified for cut/cover operations, tunnel boring machine locations for tunnel construction, and around large river crossing largely due to vegetation removal and site grading. Additionally, compaction from construction equipment may affect the softer soils located within floodplain and may affect the base floodplain elevation. All areas without an above-ground structure would be returned to original conditions or as close to original conditions as possible. In general, Build Alternatives J-01 through J-06 would also incur more temporary impacts to floodplains during SCMAGLEV Project construction due to the greater proposed above ground viaduct proposed with these Build Alternatives.

Scenic and Wild Rivers – Short-term effects to the Anacostia River and the Patuxent River would be the same as those identified in the water resource sections above. BMPs and mitigation measures noted below would offset the impacts and it is not anticipated that short-term construction effects would alter the Scenic and Wild River designation.

Chesapeake Bay Critical Area - Short-term effects within the Critical Area would be the same as those identified in the water resource sections above. Build Alternatives J using the Camden Yards Station Option result in the greatest temporary impact within the Critical Area and specifically the Buffer. The Project Sponsor will mitigate the impact of short-term construction effects and it is not anticipated that construction activities would be in conflict with regulations.

D.7C.5 Potential Minimization and Mitigation Strategies

D.7C.5.1 Minimization

Impacts within watersheds would be unavoidable, as construction of Build Alternatives would result in an increase in the amount of impervious surface area, removal of vegetation, and alteration of the surrounding environment. The Project Sponsor will approach design and development of TMFs, stations, and ancillary facilities with the goal of avoiding and minimizing impacts to water resources and will optimize opportunities to incorporate ESD to meet (and exceed where feasible) floodplain, Critical Area, groundwater, and water quality-related requirements. The Build Alternatives would be primarily situated in deep tunnels and stations located underground, minimizing increases in impervious area and removal of vegetation. Above-ground portions of the Build Alternatives would utilize a viaduct, which inherently attempts to avoid and minimize impacts to waterways and floodplains.

In accordance with the NPDES permit program, the Project Sponsor will prepare a Stormwater Pollution Prevention Plan (SWPPP) and identify activities and conditions that could cause water pollution and detail steps taken to prevent the discharge of any unpermitted pollution. The SCMAGLEV Project would also require strict Erosion and Sedimentation Control Plan (ESC) practices and BMPs, such as silt fence and temporary soil stabilization measures, to reduce the potential for water quality impacts and ensure that all required ESC practices are put in place to prevent sediment loading.

The Project Sponsor will conduct groundwater modeling during final design and permitting to quantify potential effects. Modeling may demonstrate that nearby supply wells that obtain groundwater from deeper depths than the proposed Build Alternatives, obtain groundwater beneath confining layers, or are not hydraulically connected to the area of impact, have no predicted loss of recharge. The Project Sponsor is proposing the use of a closed-face Tunnel Boring Machine (TBM) capable of maintaining a pressurized face during excavation. The pressurized face would prevent dewatering of the sediments and minimize the loss of potential groundwater recharge to nearby supply wells and surface water features during construction. Use of the U.S. Environmental Protection Agency (EPA) mapping and guidance for delineating and protecting surface and groundwater sources would supplement the next phase of ground investigations and geotechnical surveys. This will provide site specific information regarding drinking water supplies.

The purpose of these measures would be to avoid short-term effects and ensure that no long-term impacts would result. As the SCMAGLEV Project design advances, FRA and the Project Sponsor will further consider several planning measures designed to minimize, restore, and preserve natural and beneficial watershed, groundwater, and floodplain values. This would include, but is not limited to, the following:

- Evaluate additional construction staging/laydown areas to avoid construction staging and any temporary fill within 100-year floodplain.

- Utilize site design practices and ESD measures for construction staging/laydown areas such as minimizing impacts, maintaining vegetated buffers, disconnecting impervious areas, and supplementing vegetated areas with shallow ponding and microscale stormwater facilities. By supplementing vegetated areas with these BMPs, additional vegetation impacts are avoided. Larger BMPs, such as ponds and sand filters, may be considered where ESD measures are not practicable.
- Return disturbed areas to existing natural contours.
- Use minimum grading requirements.
- Reduce compaction of soils.
- Minimize vegetation removal.
- Span floodplains, floodways, wetlands, and waterways, where possible, with strategic placement of viaduct piers, thus avoiding direct and permanent impacts.
- Utilize BMPs for stream work, such as perpendicular crossings of waterways and floodplain and avoiding longitudinal crossings to the extent practicable as these would result in greater fill that could affect conveyance and floodplain levels.
- Where possible, temporary crossings would bridge waters to allow for natural stream channel design and aquatic organism passage.
- Develop erosion and sediment controls and stormwater management to meet the Critical Area 10% Rule regarding phosphorus load requirements, to maintain and improve water quality.
- Avoid placement of any features or disturbance inside the Critical Area Buffer.
- Prepare a Spill Prevention Plan and Contingency Restoration Plan.

The Project Sponsor will also establish an operations plan that would include stipulations for the use, handling, and disposal of hazardous materials, as well as an emergency plan for addressing accidental spills of materials.

D.7C.5.2 Mitigation

As the proposed SCMAGLEV Project is located within coastal zone counties identified by the MDNR, continued coordination with the MDNR and MDE will be necessary to ensure that proposed actions are in compliance with the program. The Coastal Zone Consistency Determination process and compliance with the CZMP will inform the FRA and Project Sponsor of any proposed actions that may not be consistent with the program and any additional avoidance and/or mitigation measures that may be necessary to bring it into compliance. Minimization and mitigation measures that would support a consistency determination include all identified within the proposed SCMAGLEV Project Draft Environmental Impact Statement.

Water Quality and Groundwater

SCMAGLEV Project designs would adhere to the developed ESD and required BMP, erosion and sediment control, and stormwater management practices as noted above, to treat runoff from new impervious surfaces and implement MDNR recommendations to manage stormwater in a way that mimics natural infiltration. BMPs would help to attenuate and infiltrate runoff, filter pollutants, and trap sediments. Such measures would reduce water quality impacts due to additional impervious surfaces in the watersheds. The Project Sponsor will adhere to Maryland's Antidegradation Policy which states that if the water quality is better than the minimum requirements specified by water quality standards, then that water quality shall be maintained (Tier II waters).[28] As necessary the Project Sponsor will submit an application to the MDE for any plans to discharge into a Tier II waterway.

In addition to these measures, FRA has evaluated the need for mitigation as a result of permanent impacts to water resources and potential indirect effects of these impacts to other resources. Specific mitigation measures associated with surface waters including wetlands is addressed in Section D.7E Wetlands and Waterways and affects to habitat and species is addressed in Section D.7F Ecological Resources.

Floodplain

All development within the floodplain will require compliance with local and state permit conditions. Proposed development cannot increase flooding or create a dangerous condition during flooding. Structures must be constructed to minimize damage during flooding. Impacts to floodplains are regulated under the Joint Federal/State permitting process for nontidal and tidal wetlands and waterways by the MDE. Floodplain analyses will also require approval through the MDE Water Science Administration.

Critical Area

Mitigation is required for forest clearing within the Critical Area, with requirements differing for clearing inside and outside of the Critical Area Buffer[29]. Outside of the Buffer and on an RCA or LDA site the following criteria apply:

- If less than 20 percent of forest cover is removed mitigation is required at a 1:1 ratio.
- If 20-30 percent of forest cover is removed, mitigation is required at a rate of 1.5 acres of planting for every one acre of forest removed.
- Clearing of more than 30 percent of forest cover may require a variance in certain jurisdictions and mitigation would be required at a rate of three acres of planting for every one acre of forest removed.

[28] COMAR 26.08.02 Water Quality

[29] https://www.cbf.org/document-library/cbf-guides-fact-sheets/Citizens-Guide-to-MD-Critical-Area-Programdf0b.pdf

- If there is no existing forest onsite, the site must be afforested to at least 15 percent woodland cover.

In IDAs there are no reforestation or afforestation requirements, however, vegetation should be established where practicable and development activities should minimize the destruction of forest and woodland vegetation.

Within the City of Baltimore, development on unforested sites in the Critical Area must but be afforested to provide a vegetative cover of at least 15 percent. Mitigation for clearing outside of the Buffer and within the IDA (both WRAs and WIAs) is required at a 1:1 ratio and mitigation within the RCA is required at a 3:1 ratio. Since there is little forest cover within the Critical Area within the Affected Environment for the SCMAGLEV Project, it is assumed that efforts will be focused on areas of afforestation. Direct coordination with the Baltimore City CAMP will be needed to identify areas within the City and surrounding the SCMAGLEV Project for afforestation.

Because the Buffer provides such an important role in protecting water quality, different mitigation ratios are applied for Buffer disturbance. Forest clearing within the Buffer is prohibited without a variance or special exception granted from the local governing agency. In all areas of the Buffer (both within and outside of the City of Baltimore) trees or vegetation cleared for an approved purpose must be replanted at a 3:1 ratio. The Project Sponsor will prepare a Critical Area Buffer Management Plan in accordance with state and local guidelines.

Critical Area rules require that new development and redevelopment include techniques to reduce pollutant loadings associated with stormwater runoff. State and local Critical Area regulations specify that these techniques must be capable of reducing pollutant loads generated from a developed site to a level at least 10% below the loads generated at the same site prior to development. As previously noted, this requirement is commonly referred to as the "10% Rule". FRA would work to adjust the design to minimize impacts within the Buffer and RCA areas, and would abide by mitigation requirements including:

- Planting for all permanent vegetation clearing impacts, including a higher ratio of required planting within the Buffer (as noted above);
- Improvements to water quality and overall watershed health through 10% phosphorus removal requirements;
- Adhering to appropriate MDE Time-of-Year Restrictions[30] for in-stream construction when working in and around waters of the U.S.

[30]Time-of-Year Restrictions are windows during which construction activities cannot occur to minimize impacts to aquatic habitats during construction projects. These windows are set by MDE and based on Use Class (refer to Section 5.0).

Scenic and Wild Rivers

Due to the visual setting differences proposed to the Patuxent River, FRA recognizes that avoidance and minimization of the surrounding environment would be required, and FRA would continue through final design to make determinations of bridge pier locations, and the potential to restore resources lost in and around the river following construction. Aesthetic treatments of these areas would also be required and directly coordinated with the MDNR and adjacent property owners including the U.S. Fish and Wildlife Service (USFWS) and the National Park Service (NPS).

Appendix D.7D WETLANDS AND WATERWAYS

D.7D.1 Introduction

This section evaluates the existing Waters of the U.S. and other jurisdictional[31] systems that could be affected by the SCMAGLEV Project. This section also identifies and evaluates impacts on select notable wetlands and Nontidal Wetlands of Special State Concern.

D.7D.2 Regulatory Context and Methodology

D.7D.2.1 Regulatory Context

In accordance with the National Environmental Policy Act (NEPA), 42 U.S.C. § 4321 et seq., the Council on Environmental Quality (CEQ) regulations, 40 C.F.R. Parts 1500 - 1508, and the FRA Procedures for Considering Environmental Impacts, 64 Fed. Reg. 28545 (May 26, 1999) FRA assessed impacts to Waters of the U.S. Jurisdictional waters are regulated by the U.S. Army Corps of Engineers (USACE) and the U.S. Environmental Protection Agency (USEPA) under Section 404 of the Clean Water Act (CWA), and the Rivers and Harbors Act. In Maryland and Washington, D.C., the Maryland Department of the Environment (MDE) and the D.C. Department of Energy and Environment (DOEE), respectively, jointly administer this program with the USACE.

MDE also regulates activities within waters of the State, which includes altering tidal or nontidal wetlands, the 25-foot nontidal wetland buffer, and certain designated high-quality wetlands called Nontidal Wetlands of Special State Concern (NTWSSC). A NTWSSC is one with unique ecological value, often those in which rare, threatened or endangered (RTE) species or exemplary or specialized wetland habitat types occur. In coordination with MDNR regarding protected species and ecological value, MDE maintains mapping of designated NTWSSCs, per COMAR Sec. 26.23.06.01, and regulates activities in these wetlands, including a 100-foot buffer, to protect these wetlands from the impacts of development. Impacts to tidal wetlands require a tidal

[31] State-regulated and/or District-regulated waters

license issued by the Maryland Board of Public Works (BPW). The DOEE also regulates activities within waters of the District, including wetlands, in accordance with the District's Water Pollution Control Act, D.C. Official Code §§ 8-103.01, et seq.

With the majority of the SCMAGLEV Project occurring within Maryland, it is worth noting that in Maryland, USACE jurisdiction over waters of the U.S. and MDE jurisdiction over waters of the State generally overlap, with a few notable distinctions. USACE and MDE typically take jurisdiction over intermittent and perennial waterways; however, only USACE may take jurisdiction over ephemeral waterways. USACE and MDE typically take jurisdiction over wetlands that meet all three wetland indicators (i.e., wetland hydrology, hydrophytic vegetation, and hydric soils); however, only MDE regulates impacts to isolated wetlands and wetland buffers.

Additional regulations include, but are not limited to:

- The Navigable Waters Protection Rule: Definition of ''Waters of the United States'' (85 Fed. Reg. 22250, April 21, 2020) (effective June 22, 2020)
- Code of Maryland Regulations (COMAR) Title 26, Subtitle 23 Nontidal Wetlands, Subtitle 24 Tidal Wetlands, and Subtitle 17 Section 04 Construction on Nontidal Waters and Floodplains;
- COMAR Title 26, Subtitle 23, Section 6, Wetlands of Special State Concern;
- National Park Service (NPS) Director's Order 77-1 Wetland Protection;
- Executive Order 11990, Protection of Wetlands (42 Fed. Reg. 26961, May 24, 1977);
- U.S. Department of Transportation Order 5660.1A, Preservation of the Nation's Wetlands

D.7D.2.2 Methodology

The FRA conducted a qualitative analysis of resources within the SCMAGLEV Project Affected Environment, identifying the presence of wetlands and waterways.

Wetlands include "those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas." Wetlands and other waters of the U.S. defined in the 33 CFR Part 328 and identified using the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Atlantic and Gulf Coastal Plain Region (Version 2.0)*, and National Park Service (NPS) methodologies and policies have been identified within the SCMAGLEV Affected Environment.

FRA defined the geographic limits of the SCMAGLEV Project Affected Environment for wetland and waterways analyses as the proposed SCMAGLEV Project impact area plus

an additional 30-foot buffer. The SGMAGLEV Project impact area includes the limits of operational/physical disturbance, as well as the construction related impact area, which includes additional areas of temporary disturbance required for construction activities. These impact areas comprise the overall limit of disturbance (LOD) of the SCMAGLEV Project Build Alternatives. The LOD includes all surface and subsurface elements. As noted, the SCMAGLEV Project Affected Environment for wetland and waterways includes an additional 30-foot buffer around the LOD. This buffer was included so field investigations would capture areas of potentially regulated 25-foot wetland buffers and notable landscape features adjacent to the LOD.

FRA obtained the location, extent, and defining characteristics of wetlands and waterways from multiple sources, including field-based delineations and observations, available published mapping, and aerial imagery. Between July 2018 and July 2020, FRA conducted field delineations specifically within the areas of proposed surface disturbance of the SCMAGLEV Project Affected Environment, which includes the 30-foot buffer around the LOD. Investigations were conducted for areas where property access was available, which accounted for approximately 70 percent of the total field investigation area. In areas of proposed surface disturbance where property access was not available, as well as for areas of proposed subsurface disturbance, FRA used existing published information from the Maryland Department of Natural Resources (MDNR) wetland mapping, U.S. Fish and Wildlife Services (USFWS) National Wetland Inventory (NWI), MDE stream mapping, and the U.S. Geological Survey (USGS) National Hydrologic Data (NHD) to approximate the boundaries of wetlands and waterways within the SCMAGLEV Project Affected Environment that were not field investigated.

For field-investigated areas, FRA performed wetland delineations in accordance with the USACE *Wetland Delineation Manual (Environmental Laboratory, 1987) and the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Atlantic and Gulf Coastal Plain Region (Version 2.0)* (USACE, 2010), *Regional Guidance Letter No. 05-05: Ordinary High-Water Mark Identification* (USACE 2005), and applicable supplements, court rulings, and federal/state policies. For field delineations on NPS property, FRA followed NPS DO 77-1 Section 4.1.2. The USACE and NPS delineation procedures require assessing the presence and extent of three wetland parameters: wetland hydrology, hydrophytic vegetation, and hydric soils.

At the Patuxent Research Refuge (PRR), coordination with USFWS staff revealed the potential for encountering unexploded ordnance (UXO)[32] during soil investigations. As a result, field investigation methods were modified to delineate wetlands based on hydrophytic vegetation and surficial indicators of hydrology, in conjunction with topographic characteristics, to identify geomorphic position. It is the intent that after sample plot locations have been swept for UXO and cleared for soil disturbance, these

[32] UXO are explosive weapons (bombs, bullets, shells, grenades, land mines, navel mines, etc.) that did not explode when they were deployed and still pose a risk of detonation, potentially many decades after they were used or discarded.

systems would require evaluation of soils to confirm delineated wetlands. The location of wetlands and waterways identified and considered in this analysis are illustrated in Attachment E Wetland Location Maps.

In accordance with the *Highway Methodology Workbook Supplement: Wetland Functions and Values, a Descriptive Approach,*[33]FRA completed a wetland functions and values assessment for all field-delineated wetlands measuring greater than one-half acre within the SCMAGLEV Project Affected Environment. This methodology is used to assess the following 13 wetland functions and values to aid in evaluating impacts and mitigation options.

- Groundwater Recharge/Discharge
- Floodflow Alteration
- Fish and Shellfish Habitat
- Sediment/Toxicant Retention
- Nutrient Removal
- Production Export
- Sediment/Shoreline Stabilization
- Wildlife Habitat
- Recreation
- Educational/Scientific Value
- Uniqueness/Heritage
- Visual Quality/Aesthetics
- Endangered Species Habitat

FRA identified both potential direct and indirect effects from the SCMAGLEV Project to resources within the SCMAGLEV Project Affected Environment. FRA conducted a quantitative analysis for resources proposed within the LOD for areas of surface disturbance only (which includes areas of tunnel portals, cut and cover areas, elevated viaduct, and above ground ancillary facilities, stations, and TMF) and construction-related surface disturbance (e.g. laydown areas, etc.), as coordination with USACE, MDE, and DOEE indicated permits that resources located under proposed deep tunnel areas would not be considered an impact in the permitting process. Impacts are described as both permanent and temporary. Although systems tunneled under may not be considered an impact, work proposed “in, on, over, or under” a tidal system will be regulated and subject to Maryland Board of Public Works authorization. All tidal

[33] USACE New England District. 1999. *Highway Methodology Workbook Supplement: Wetland Functions and Values, a Descriptive Approach*.

systems were evaluated based on the State Tidal Boundaries and corresponding designated use classes.

FRA has applied an exception to the methodology presented above for calculating wetland and waterway impacts to the proposed long-term construction laydown area near MD 200 and I-95. FRA did not conduct field delineations at this site; therefore, published information, described above, was used to identify wetlands and waterways. Published data indicated approximately 21 acres of wetlands and 10,500 linear feet of waterways located at the site; however, aerial imagery indicates extensive site clearing and development of the site has occurred that has impacted the amount and quality of these resources. If the site is used during construction, the Project Sponsor will conduct delineations to confirm the locations of remaining jurisdictional features and ensure that they are avoided. No impacts to wetlands and waterways are anticipated at this site; therefore, while the site's wetlands and waterways (as shown in published data) are included in totals presented for the SCMAGLEV Project Affected Environment, the site was excluded from the quantitative impact analyses.

For evaluating the presence of and potential effects to NTWSSC as a result of the SCMAGLEV Project, FRA utilized published mapping from MDNR, which generally includes a larger identified NTWSSC boundary as compared with associated field-delineated wetlands; therefore, FRA is presenting the most conservative evaluation of potential effects to NTWSSC. The FRA used this approach because NTWSSC boundaries must be confirmed by the agencies upon review of field conditions. FRA illustrates both MDNR NTWSSC boundaries and associated field-delineated wetland boundaries in Attachment E.1 Wetland Location Maps. Refer to Section D.7E.2.4 for further discussion regarding discrepancies between published data and field-delineated boundaries.

USACE and MDE determine jurisdiction based on wetland delineation data and field reviews and require documentation of impacts in a Joint Federal/State Application for the Alteration of Any Floodplain, Waterway, Tidal or Nontidal Wetland in Maryland (often referred to as a Joint Permit Application, or JPA). Additionally, NPS requires all wetland systems on NPS property to be characterized using the Cowardin classification system34 and all impacts to wetlands documented in a Wetland Statement of Findings (SOF) under Directors Order (DO) 77-1. With selection of a Preferred Alternative, the Project Sponsor will prepare a JPA and SOF.

D.7D.2.3 SCMAGLEV Project Affected Environment

Wetlands and waterways occur throughout the SCMAGLEV Project Affected Environment, with larger and more notable systems occurring on undeveloped lands on the BARC property, PRR property, and NPS property adjacent to the BWP. Other concentrations of wetlands and waterways are located at National Aeronautics and

[34] Cowardin, et al. 1979 and FGDC (2013).

Space Administration (NASA) Goddard Space Flight Center (GSFC), on City of Greenbelt properties, on Washington Suburban Sanitary Commission (WSSC) property, on Fort George G. Meade property, at county parks and open spaces (Springfield and Maryland City Parks, and Tipton Airport), on National Security Administration (NSA) property, and on D.C.-owned land on several parcels identified northeast of the BWP/MD 198 interchange and currently leased to the Maryland Department of Juvenile Services. These surface water systems represent individual and interconnected wetland and waterway complexes that ultimately convey hydrologic flow to and through major regional stream systems, including the Anacostia River, Patuxent River, Little Patuxent River, Patapsco River, and Baltimore Harbor.

The following subsections describe wetlands and waterways, including notable systems, that occur in the SCMAGLEV Project Affected Environment. A broader discussion of these resources in the context of watersheds, other water resources, and aquatic habitats is provided in Section D.7D Water Resources and Section D.7F Ecological Resources. Attachment E provides exhibits identifying the location of wetlands and waterways and summary tables characterizing all field-delineated systems. **Table D.7-12** provides a summary of existing wetland and waterways within the SCMAGLEV Affected Environment.

Table D.7-12: Affected Environment Wetlands and Waterways Summary

Build Alternative	Wetlands* (acres)	Wetlands designated as NTWSSC**(acres)	Waterways*** (linear feet)
J-01	83	12	37,371
J-02	69	30	41,859
J-03	62	19	40,910
J-04	82	12	38,348
J-05	68	30	42,837
J-06	61	19	41,887
J1-01	89	7	38,363
J1-02	67	23	40,077
J1-03	58	9	39,256
J1-04	89	7	39,341
J1-05	66	23	41,054
J1-06	57	9	40,234

* All Build Alternative alignments include the long-term laydown area near MD 200 and I-95, which accounts for over 21 acres of wetlands and 10,500 linear feet of waterways, all identified through published data. No tidal vegetated wetlands are present within the Affected Environment. Waterways represent all systems, both tidal and nontidal crossed by the SCMAGLEV Project.
**NTWSSC acreages are not in addition to the wetland acreage presented but are a separate analysis of impacts based on state-published boundaries, not field-delineated boundaries.

FRA initiated coordination with the USACE and MDE in 2018 for the SCMAGLEV Project and this coordination is currently ongoing. On September 6, 2018, representatives from multiple state, Federal and county agencies and departments, the Project Sponsor and design engineers, and MTA, FRA, and NEPA team members conducted a field review of several of the planned surface disturbance locations for proposed alignment and ancillary features. Meeting minutes from this field walk are included in Attachment A. In July of 2019, a pre-application meeting was held specifically with the MDE and USACE. Major waterways and wetland complexes were visited and reviewed. In November 2020 an additional field walk was held with the USEPA, USACE, MDE, and USDA/BARC to review and discuss the proposed TMF locations and facilitate the agency reviews. . Pending a formal jurisdictional determination for the SCMAGLEV Project in coordination with USACE, all aquatic resources delineated in the field and described herein are assumed to be jurisdictional.

D.7D.2.4 Wetlands

FRA identified extensive wetlands within the SCMAGLEV Project Affected Environment, ranging from 61 to 89 acres depending upon Build Alternative, with approximately 21 acres of wetlands (identified via published data) associated specifically with the proposed long-term construction laydown area near MD 200 and I-95.[35] All wetlands identified are nontidal palustrine systems and are classified into four types: PEM – palustrine emergent; PSS – palustrine scrub-shrub; PFO – palustrine forested; and PUB – palustrine unconsolidated bottom (pond-like).[36] Most wetlands that FRA identified are classified as PFO and are located predominantly on many of the Federal and county lands noted above. Many of these wetland systems are associated with and located within the floodplain of a perennial waterway. FRA identified smaller, more fragmented and sometimes more disturbed wetlands influenced by urbanization closer to Baltimore City, within existing roadway infrastructure and utility easements, and between residential neighborhoods. It is anticipated that the majority of wetlands present would be regulated under both USACE and MDE jurisdiction, however this jurisdictional designation has not been coordinated and defined by the agencies. No vegetated tidal wetlands were identified within the SCMAGLEV Project Affected Environment. Open water tidal systems are present within the Affected Environment and discussed in the following waterways section.

Of those wetlands noted above, FRA identified wetlands classified as NTWSSCs based on MDNR mapping, located along three major waterways and their tributaries within the SCMAGLEV Project Affected Environment, including Beaverdam Creek, Beck Branch, and the Patuxent River (Attachment E.1 Wetland Location Maps, Sheets 5 and 6)**.** As shown in **Table D.7-12**, NTWSSC range from seven acres to as much as 30 acres of

[35] Of the approximately 21 acres of wetland, published data shows two PEM wetlands (totaling less than an acre), 15 PUB wetlands (totaling nearly seven acres), and one PFO wetland (totaling over 13 acres). Most of these systems appear to be no longer present based on recent aerial imagery.

[36] Cowardin et al. 1979. *Classification of Wetlands and Deepwater Habitats of the United States*. Prepared for the USFWS.

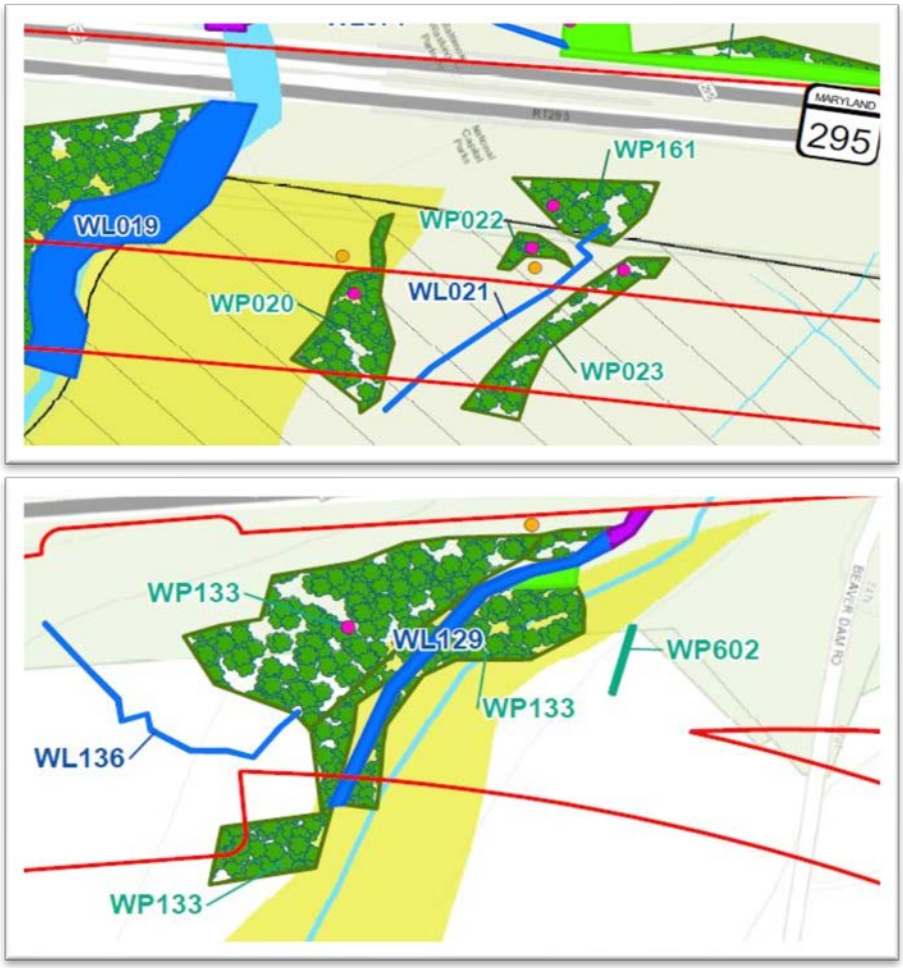
the total wetland acreage identified per Build Alternative. In coordination with MDNR, FRA determined that these NTWSSCs provide habitat for RTE odonate (a dragonfly or damselfly), fish, and plant species. As mentioned above, field-delineations within the footprint of state-mapped NTWSSCs generally resulted in a smaller, more defined wetland boundaries, with some exceptions where the delineated boundaries extend beyond the published data. Examples are provided in **Figure D.7-15**. In all cases, coordination with both MDNR and MDE to confirm the field-verified extents of NTWSSCs is required, which will subsequently allow for proper determination of regulated wetlands and 100-foot buffers. The agencies determinations would be based on a combination of factors, including protection of sensitive species and jurisdictional wetland boundaries. No vegetated tidal wetlands were identified within the SCMAGLEV Project Affected Environment. MDNR and MDE NWI mapping of published wetlands identifies one E2EM1P (estuarine intertidal emergent persistent vegetated irregularly flooded) system located along/within the Gwynns Falls confluence with Middle Branch, just north of the laydown area. This is immediately adjacent to the SCMAGLEV Project LOD proposed deep tunnel extending to the Camden Yards Station, therefore adjacent to Build Alternatives J-04 through J-06 and J1-04 through J1-06. This area is not considered an impact as it is just outside of the LOD and located adjacent to deep tunnel.

FRA identified several notable wetland systems within the SCMAGLEV Project Affected Environment that should be avoided if possible and may require special protection if they cannot be avoided. FRA identified these systems based on their classification, location within the SCMAGLEV Project Affected Environment and possible connection to larger natural systems/habitat, presence of a high-quality resource, and/or through agency coordination. FRA identified the following important wetland systems:

- NTWSSCs and associated field-delineated wetland and waterway complexes located within riparian buffers of Beaverdam Creek, Beck Branch, and Patuxent River (**Figure D.7-15**, top figure). These wetlands are identified by MDNR as supporting RTE species.
- Vernal pools, spring-fed wetland complexes, and forest-stream complexes containing RTE plants identified by the USFWS at PRR.
- High-quality wetlands located north of the Patuxent River west of the BWP, requested by the USACE to be avoided. Wetland WP070 (shown on Sheet 11 of the Attachment E.1 Wetland Location Maps and in **Figure D.7-16**) is located in the wooded buffer between the Maryland City Park athletic fields and the BWP and exhibits low invasive species presence and notable wetland plant diversity.
- A bald cypress swamp identified as Wetland WP133 (shown on Attachment E.1 Wetland Location Maps, Sheet 4; in **Figure D.7-15**, bottom figure; and in **Figure D.7-17**) located on BARC and NPS property east of the BWP. During the July 2019 site visits, MDE identified this wetland as having unique character, and USACE (not present at this wetland review) requested visiting the site during the next round of agency site visits. In subsequent coordination, MDE requested

efforts to determine if the bald cypress stand was planted or occurred naturally. Native bald cypress swamps in Maryland garner special protection and attention from the agencies.

Figure D.7-15: Comparison of NTWSSC and Field-Delineated Boundaries



These figures provide details from the Attachment E.1 Wetland Location Maps, showing mapped NTWSSCs in yellow and field delineated wetlands in dark green. In the top figure (Attachment E.1 Map Sheet 11), only a small portion of Wetland WP020 is delineated within the NTWSSC boundary. In the bottom figure (Attachment E.1 Map Sheet 4), Wetland WP133 is delineated partially within the NTWSSC boundary but overall is larger than the footprint of the NTWSSC within the SCMAGLEV

Figure D-7-16: Wetland WP070

Figure D.7-17: Wetland WP133 Bald Cypress Swamp

Commonly identified indicators of hydrology and wetland vegetation identified during field investigations is provided in **Table D.7-13**. The most common indicator of a hydric soil found in field delineated wetlands was a "depleted matrix," which refers to the colors created in the soil where there is a restriction of oxygen and reduced iron.

Table D.7-13: Common Hydrology and Vegetation

Hydrology Indicators Present	Wetland Vegetation Present
high water table	red maple (*Acer rubrum*)
surface water	black tupelo (*Nyssa sylvatica*)
saturation	sweetgum (*Liquidambar styraciflua*)
drainage patterns	northern spicebush (*Lindera benzoin*)
geomorphic positioning	sweet wood-reed (*Cinna arundinacea*)
water-stained leaves	Japanese stiltgrass (*Microstegium vineminum*)
drainage patterns	horsebrier or greenbrier (*Smilax rotundifolia*)

FRA field delineated 26 wetlands measuring greater than a half-acre within the SCMAGLEV Project Affected Environment. These systems and their principal functions and values are summarized in **Table D.7-14**. The most common principal functions and values include: floodflow alteration, sediment/toxicant retention, and wildlife habitat. FRA identified those systems associated with NTWSSCs as having the value of "endangered species habitat" because they potentially support RTE species.

Table D.7-14: Wetland Functions and Values

Wetland ID	Principal Functions and Values
WP031	Floodflow Alteration, Sediment/Toxicant Retention, Wildlife Habitat
WP066	Floodflow Alteration, Sediment/Toxicant Retention, Wildlife Habitat
WP068	Floodflow Alteration, Sediment/Toxicant Retention, Nutrient Removal, Wildlife Habitat, Endangered Species Habitat
WP070	Floodflow Alteration, Nutrient Removal, Wildlife Habitat
WP084	Floodflow Alteration
WP098	Floodflow Alteration, Sediment/Shoreline Stabilization, Uniqueness/Heritage
WP107	Floodflow Alteration, Wildlife Habitat, Educational/Scientific Value
WP108	Floodflow Alteration, Sediment/Toxicant Retention, Sediment/Shoreline Stabilization, Wildlife Habitat
WP115	Floodflow Alteration, Sediment/Toxicant Retention, Nutrient Removal
WP128	Groundwater Recharge/Discharge, Floodflow Alteration, Sediment/Toxicant Retention, Wildlife Habitat, Endangered Species Habitat
WP133	Groundwater Recharge/Discharge, Floodflow Alteration, Sediment/Toxicant Retention, Wildlife Habitat
WP143	Floodflow Alteration, Fish and Shellfish Habitat, Sediment/Toxicant Retention, Wildlife Habitat
WP144	Groundwater Recharge/Discharge, Nutrient Removal, Wildlife Habitat

Wetland ID	Principal Functions and Values
WP169	Floodflow Alteration, Sediment/Toxicant Retention, Nutrient Removal
WP170	Groundwater Recharge/Discharge, Floodflow Alteration, Sediment/Toxicant Retention, Nutrient Removal
WP203	Floodflow Alteration, Sediment/Toxicant Retention, Nutrient Removal
WP212	Floodflow Alteration, Sediment/Toxicant Retention, Nutrient Removal, Wildlife Habitat
WP221	Sediment/Toxicant Retention, Nutrient Removal, Wildlife Habitat
WP227	Sediment/Toxicant Retention, Nutrient Removal, Wildlife Habitat
WP231	Sediment/Toxicant Retention, Nutrient Removal, Wildlife Habitat
WP234	Sediment/Toxicant Retention, Nutrient Removal, Wildlife Habitat
WP239	Floodflow Alteration, Sediment/Toxicant Retention, Nutrient Removal, Wildlife Habitat
WP300	Floodflow Alteration, Wildlife Habitat, Endangered Species Habitat
WP306	Groundwater Recharge/Discharge, Floodflow Alteration, Wildlife Habitat
WP407	Sediment/Toxicant Retention, Wildlife Habitat, Endangered Species Habitat
WP414	Sediment/Toxicant Retention, Nutrient Removal, Wildlife Habitat

At the long-term construction laydown area near MD 200 and I-95, aerial imagery suggests that resources appear to have been removed or minimized and wet signatures (indicative of potential persistently wet conditions) and channelized drainage patterns are present. Based on published information from previous regional transportation projects, several wetlands associated with this area are characterized as abandoned wash ponds that were created during prior mining activities. They were documented as being dominated by invasive common reed (*Phragmites australis*) and identified by regulatory agencies has having low habitat value and little to no sediment retention or flood storage function. However, two RTE species associated with water resources were also noted at this site (see Section D.7F Ecological Resources for further details).

D.7D.2.5 Waterways

FRA identified tidal and nontidal waterways within the SCMAGLEV Project Affected Environment. Waterway classifications include perennial (groundwater flows year-round), intermittent (groundwater flows at some point during the year), and ephemeral (does not intersect groundwater at any time of the year) systems. With new ruling in 2020 on the definition of Waters of the U.S., ephemeral features that contain water only indirect response to rainfall or snowmelt are no longer considered jurisdictional resources. Therefore, ephemeral waters delineated during field investigations may no longer need representation on SCMAGLEV documentation and mapping, pending confirmation from the USACE. As previously identified in Section D.7D Water Resources, waterways are also given designated Use classes by MDE, identifying the state's goals for water quality. FRA identified all nontidal waterways within the SCMAGLEV Project Affected Environment as:

- Use I (water contact recreation and protection of nontidal warmwater aquatic life)

- Use I-P (water contact recreation, protection of aquatic life, and public water supply)
- Use II (water contact recreation and support of estuarine and marine aquatic life) for tidal systems within the SCMAGLEV Project Affected Environment. Tidal waterways crossed with deep tunnel are classified as E1UBL (estuarine subtidal unconsolidated bottom permanently flooded) and R1UBV (tidally influenced riverine deepwater habitat, permanently flooded.

Digital files for the project currently illustrate a boundary that encroaches slightly into the Middle Branch of the Patapsco River for a proposed construction laydown area. The Affected Environment has included this acreage. This analysis assumes this to be inconsistencies in graphic/digital line work, and the Project Sponsor will not encroach upon tidal open water wetland in this area. All staging would be on land.

Greater than 37,000 linear feet of waterway crossings are located within the SCMAGLEV Project Affected Environment, increasing up to approximately 43,000 linear feet depending upon Build Alternative. All Build Alternatives include the long-term laydown area near MD 200 and I-95, which includes 10,500 linear feet of waterway; however, the presence of these waterways is based on published data requiring field verification. Several waterways within the SCMAGLEV Project Affected Environment are notable for their position as headwater or first order tributaries, significant riparian habitat supporting potential RTE species, associated with NTWSSC, or designation as a state Scenic River (also detailed in Section D.7D Water Resources). FRA identified the presence of several important waterways in the SCMAGLEV Project Affected Environment including the following:

- Headwaters of Beaverdam Creek
- Headwaters of Little Patuxent River
- Headwaters for a tributary known to support sensitive species and habitats at the north end of PRR property
- Beck Branch, bounded by NTWSSC
- Beaverdam Creek, bounded by NTWSSC
- Patuxent River, State Scenic and Wild River, bounded by NTWSSC
- Little Patuxent River, upstream of NTWSSC
- Four tidal waterways: Anacostia River (a State Scenic and Wild River); tributary to Anacostia River, Middle Branch Patapsco River, and Gwynns Falls

Also at PRR, the aquatic systems within the Baltimore Gas and Electric (BGE) right-of-way (ROW) within the SCMAGLEV Project Affected Environment form the headwaters of Welsh's Run, which according the PRR staff is "considered one of the most diverse Maryland streams feeding to the Patuxent River" (Site Walk Meeting Minutes from November 2018; see Attachment A).

D.7D.3 Environmental Consequences

FRA evaluated potential impacts to wetlands and waterways associated with the No Build Alternative and the Build Alternatives. FRA considered direct and indirect, permanent and temporary impacts associated with the Build Alternatives, as well as the short-term construction effects. FRA considers direct impacts that will result from new permanent structures and operations to be permanent impacts. FRA considers direct impacts that will result from areas of anticipated temporary disturbances associated with construction activities to be temporary impacts, with some resulting in short-term effects and others in long-term effects. FRA presents a breakdown of anticipated permanent and temporary impacts for each Build Alternative, including station and TMF options. However, a determination on temporary impacts will have to be finalized through further agency coordination and final design. All impacts present totals rounded to the nearest whole number. All impacts to wetlands and waterways should be considered estimates as they use a combination of published information and field investigations subject to further review and jurisdictional determination by the regulatory agencies.

Coordination with the regulatory agencies for submission of a Joint Federal/State Application for the Alteration of Any Floodplain, Waterway, Tidal or Nontidal Wetland in Maryland (JPA), is currently ongoing and anticipated to coincide with release of this document. The Project will trigger an individual permit with the USACE and MDE through the Section 404(b)(1) process and will be thoroughly evaluated to determine compliance with all provisions of those guidelines. Coordination with the DOEE will occur as relevant per impacts to wetlands and waterways located within Washington D.C. Submission of an application for a tidal wetlands license will be required through the BPW, as the agency regulates all tidal systems “in, over, or under” project activities. No tidal systems are anticipated to result in an impact that would require tidal mitigation. Coordination with the USACE has also been initiated in accordance with Section 10 of the Rivers and Harbors Act for bridging over or tunneling under navigable waters and Section 408 review under Section 14 of the Rivers and Harbors Act for the proposed tunneling under the Anacostia River Federal Navigation Channel and levee system located in the area of the Bladensburg Waterfront Park. Additionally, the SCMAGLEV Project must submit a Statement of Findings per DO 77-1 and DO-77-2 would be required for impact to any wetland and floodplain located on NPS property.

Coordination with the Critical Area Commission would also be required as noted in Section D.7D Water Resources, to address impacts to wetlands and waterways within the Chesapeake Bay Critical Area (Critical Area) should final review of permit materials indicate wetland impacts in these areas. At this time there are no wetlands identified where proposed surface disturbance will occur within the Critical Area. Additional compensation/mitigation may be required for impacts to wetlands that fall within this boundary.

D.7D.3.1 No Build Alternative

Under the No Build Alternative, the Project will not be built and therefore no impacts related to the construction or operation of the SCMAGLEV Project will occur. However, other planned and funded transportation projects will continue to be implemented in the area and could result in effects to wetlands and waterways such as filling wetlands, crossing or culverting waterways, and increasing stormwater runoff to these systems as a result of roadway expansions.

D.7D.3.2 Build Alternatives

FRA evaluated the potential for effects to wetlands and waterways located within the SCMAGLEV Project Affected Environment. FRA has considered all areas of surface disturbance to be a direct impact to wetlands and waterways. In coordination with the USACE and MDE, FRA learned that a deep tunnel under wetlands and waterways will not result in impacts that will require permitting through their agencies; therefore, no calculated impacts are attributed in these areas. The following section provides both a qualitative and quantitative analysis of impacts. Impact calculations include wetlands and waterways located within the footprint of the LOD for all proposed surface disturbance. As clarified in the methodology section, quantitative analyses do not include published resources at the proposed long-term construction laydown area near MD 200 and I-95. Wetland and waterway impacts as a result of the SCMAGLEV Project would include the following types of resource disturbance:

- Complete or partial fill of a wetland system and disconnection and/or fill within a waterway as a result of placement of permanent structures such as viaduct piers or other standing structures including maintenance of way (MOW) facilities, fresh air/emergency egress (FA/EE) facilities, TMFs, or stations.
- Conversion of wetland type (e.g. removal of vegetation from a PFO wetland resulting in a PEM wetland due to disturbance during construction and/or the systems location under elevated viaduct).
- Relocation of waterways or creation of culverted systems, while maintaining hydrologic connection.

Impact calculations also include areas that will require temporary cut/cover for tunnel construction. Impacts have not been calculated for wetland boundaries that may either extend beyond the LOD or be directly connected hydrologically if they are beyond the LOD. FRA recognizes that significant minimization and mitigation efforts would be required to ensure that the impacts identified within the LOD do not also directly or indirectly affect those adjacent systems through potential dewatering from loss of groundwater supply and/or hydrologic connections; alterations in habitat which may introduce invasive species and competition for food and protection; and visual/human intrinsic value that may be placed upon these natural areas. Typically, a greater number of systems and more finely defined boundaries of published systems are found during field investigations than are presented in published data; therefore, areas of published

data only may under-represent the area/linear feet of systems w/in the LOD. Wetland impacts are presented in **Tables D.7-15** through **D.7-21.** Waterway impacts are presented in **Tables D.7-22** through **D.7-26**.

Summary of Build Alternative impacts:

- Build Alternatives J-02, J-03, J-06, and J1-03 would result in the greatest linear feet of waterway impact. Build Alternative J-04 would result in the least waterway impact.
- Build Alternatives J-01, J-04, J1-01, J1-04, associated with the MD 198 TMF, would result in the greatest acreage of wetland impact, just less than two times the permanent wetland impacts as compared to the other eight Build Alternatives.
- Build Alternatives J-02, J-05, J1-02, and J1-05, associated with the BARC Airstrip TMF option, would result in more than two times the permanent NTWSSC impacts as compared to the other eight Build Alternatives.
- Build Alternatives J1-03 and J1-06 would result in the least permanent wetland impact and among the lowest permanent NTWSSC impacts.

Wetlands

Direct wetland impacts would occur at locations of proposed surface disturbances, where existing wetland vegetation would be removed, soils altered/removed, and/or sources of hydrology disrupted. Refer to **Table D.7-15** for a breakdown of anticipated permanent and temporary wetland impacts for each Build Alternative, including station and TMF options. The table provides acres of temporary and permanent wetland impacts by Build Alternative resulting from all types of surface disturbance, including short-term, construction-related activities. All Build Alternative impact calculations exclude published wetland data associated with the long-term construction laydown area near MD 200 and I-95 (approximately 21 acres of primarily PUB and PFO wetlands). There are no wetland impacts associated with the Mount Vernon Square East, BWI Marshall Airport, or Camden Yards Stations. **Table D.7-16** provides a summary of direct permanent wetland impacts by wetland classification and for NTWSSC associated with each Build Alternative. **Table D.7-17** provides a breakdown of NTWSSC total impacts.

Table D.7-15: Acres of Permanent and Temporary Impacts on Wetlands

Build Alternative	Alignment		Stations		TMF						Build Alternatives Total Permanent Acres of Impact
			Cherry Hill		BARC Airstrip		BARC West		MD 198		
	P	T	P	T	P	T	P	T	P	T	
J-01	11	6	<1	<1	-	-	-	-	33	<1	45
J-02	11	6	<1	<1	14	2	-	-	-	-	26
J-03	11	6	<1	<1	-	-	10	1	-	-	22
J-04	11	6	-	-	-	-	-	-	33	<1	45
J-05	11	6	-	-	14	2	-	-	-	-	25
J-06	11	6	-	-	-	-	10	1	-	-	22
J1-01	13	2	<1	<1	-	-	-	-	38	1	51
J1-02	13	4	<1	<1	13	3	-	-	-	-	27
J1-03	13	3	<1	<1	-	-	10	1	-	-	23
J1-04	13	2	-	-	-	-	-	-	38	1	51
J1-05	13	4	-	-	13	3	-	-	-	-	27
J1-06	13	3	-	-	-	-	10	1	-		23

Table D.7-16: Permanent Wetland Impact Summary

Build Alternative	Acres of Permanent Impact by Wetland Type				Total Wetland Impact (acres) Classified as NTWSSC*	Total Wetland Buffer Impact (acres)
	PUB	PEM	PFO	TOTAL**		
J-01	1	7	37	45	6	
J-02	1	2	22	26	19	
J-03	1	3	18	22	9	
J-04	1	7	37	45	6	
J-05	1	2	22	25	19	
J-06	1	3	18	22	9	
J1-01	<1	8	43	51	4	
J1-02	<1	3	24	27	14	
J1-03	<1	3	20	23	5	
J1-04	0	8	43	51	4	
J1-05	0	3	24	27	14	
J1-06	0	3	20	23	5	

* NTWSSC acreage is calculated separately from the total acreage, based on state-published boundaries, not field-delineated boundaries

Table D.7-17: Permanent and Temporary Impacts on NTWSSC (Acres)

Build Alternative	Alignment		TMF						Build Alternatives Total Permanent Acres of Impact
			BARC Airstrip		BARC WEST		MD 198		
	P	T	P	T	P	T	P	T	
J-01	6	2	-	-	-	-	<1	0	6
J-02	6	1	12	1	-	-	-	-	19
J-03	6	2	-	-	3	1	-	-	9
J-04	6	2	-	-	-	-	<1	0	6
J-05	6	1	12	1	-	-	-	-	19
J-06	6	2	-	-	3	1	-	-	9
J1-01	4	1	-	-	-	-	1	0	4
J1-02	3	2	11	2	-	-	-	-	14
J1-03	3	<1	-	-	2	1	-	-	5
J1-04	4	1	-	-	-	-	1	0	4
J1-05	3	2	11	2	-	-	-	-	14
J1-06	3	<1	-	-	2	1	-	-	5

Removal or fill within wetlands would result in an immediate and permanent removal of habitat, potential hydrologic disconnection, and alter the functions and values of the systems. The functions and values that may be altered include:

- A direct removal or change in habitat which may indirectly affect the species relying on the wetland for food, water, protection, and breeding.
- A direct removal or change in hydrologic functions may include a reduction in water storage capacity which may indirectly affect both surface water hydrology downstream and groundwater recharge and supply. This may also affect flooding patterns, and the ability to slow down flow velocities.
- A direct removal or fill within wetlands can directly affect the landscape's capacity to trap and filter sediments and pollutants, which may indirectly affect water quality.

Wetlands that would only experience a temporary conversion of cover type (e.g. PFO wetland converted to PEM or PSS wetland) would not lose total function and value to the environment, but they would be altered. A forested wetland habitat that is cleared for construction may have the ability to regenerate or be restored with plantings, but the length of time it will take to become reforested may result in indirect changes in habitat and species dynamics noted above. This may occur at locations of viaduct, where permanent maintenance access is not required under the viaduct and a natural system is able to be reestablished, or at a location of temporary clearing just for construction activities. FRA has determined that a conversion of wetland type will have both direct and indirect effects. For example, the effects of tree removal from a PFO wetland or its

buffer may result in increased ground saturation affecting site hydrology, as well as increased sunlight to the wetland resulting in the potential introduction of invasive vegetation. These direct habitat changes lead to indirect effects to terrestrial and aquatic species. FRA provides additional detail regarding potential habitat effects in Section D.7F Ecological Resources.

Permanent structures and construction activities outside of wetlands but within wetland buffers can also indirectly affect wetlands. Wetland buffers are critical to the function of wetland systems. Changes to upstream hydrology from new impervious surface can indirectly affect wetland hydrology for downstream receiving wetlands.

The following subsections describe the wetland impacts of the alignments, stations, and TMFs. Due to the expanse of wetland impacts located on Federal properties, FRA also provided a breakdown of impacts per Federal lands in **Tables D.7-18** and **D.7-19**, as well as state, county and local land in **Tables D.7-20** and **D.7-21**. Impacts do not represent a comprehensive list of impacts broken down per all properties impacted by the project, but rather the more prominent areas of natural systems traversed. Only Build Alternatives J-01 through J-06 alignments would result in NTWSSC impacts on PRR property. Only Build Alternatives J-01 through J-06 alignments would result in wetland impacts on Washington Suburban Sanitary Commission (WSSC) property. Only Build Alternatives J1-01 through J1-06 alignments would result in wetland impacts on City of Greenbelt and MNCPPC properties.

Table D.7-18: Wetland Impact Summary on Federal Properties (Acres)

Build Alternative	NPS	NASA*	BARC	Secret Service	PRR**	NSA/Ft. Meade	US General Services	FDA	USACE
J-01	5	1	1	<1	2	1	17	0	0
J-02	5	1	16	<1	2	1	2	0	0
J-03	5	1	9	<1	2	1	2	<1	3
J-04	5	1	1	<1	2	1	17	0	0
J-05	5	1	16	<1	2	1	2	0	0
J-06	5	1	9	<1	2	1	2	<1	3
J1-01	10	0	2	0	0	<1	15	0	<1
J1-02	8	<1	14	<1	0	<1	0	0	<1
J1-03	7	0	6	0	0	<1	0	<1	3
J1-04	10	0	2	0	0	<1	15	0	<1
J1-05	8	<1	14	<1	0	<1	0	0	<1
J1-06	7	0	6	0	0	<1	0	<1	3

*Calculations noted under NASA for Build Alternatives J-02, J-05, J1-02 and J1-05 include approximately 0.02 acres of wetland impact existing on NASA leased property owned by BARC.
**Only Build Alternatives J-01 through J-06 alignments would result in wetland impacts on PRR property.

Table D.7-19: NTWSSC Impact Summary on Federal Properties (Acres)

Build Alternative	NPS	BARC	PRR
J-01	4	1	1
J-02	4	14	1
J-03	4	4	1
J-04	4	1	1
J-05	4	14	1
J-06	4	4	1
J1-01	3	2	0
J1-02	4	12	0
J1-03	3	2	0
J1-04	3	2	0
J1-05	4	12	0
J1-06	3	2	0

Table D.7-20: Wetland Impact Summary on Local Properties (Acres)

Build Alternative	Anne Arundel County	City of Greenbelt	MNCPPC	WSSC
J-01	17	0	0	3
J-02	0	0	0	3
J-03	0	0	0	3
J-04	17	0	0	3
J-05	0	0	0	3
J-06	0	0	0	3
J1-01	18	7	2	0
J1-02	1	8	2	0
J1-03	1	7	2	0
J1-04	18	7	2	0
J1-05	1	8	2	0
J1-06	1	7	2	0

Table D.7-21: NTWSSC Impact Summary on Local Properties (Acres)

Build Alternative	City of Greenbelt	WSSC
J-01	0	2
J-02	0	2
J-03	0	2
J-04	0	2
J-05	0	2
J-06	0	2
J1-01	3	0
J1-02	4	0
J1-03	3	0
J1-04	3	0
J1-05	4	0
J1-06	3	0

Alignments

Impacts to wetlands for the alignments would result in similar amount of permanent acreage, with only two acres differentiating the alignments associated with Build Alternatives J-01 through J-06 (11 acres) versus alignments associated with Build Alternatives J1-01 through J1-06 (13 acres). Of the total permanent impacts, FRA estimates that the Build Alternatives J alignments would permanently impact approximately six acres of NTWSSC surrounding Beck Branch (including the bald cypress swamp, Wetland WP133), Beaverdam Creek, and Patuxent River. By comparison, the Build Alternatives J1 alignments would permanently impact approximately three to four acres of NTWSSC surrounding Beck Branch and Beaverdam Creek. Therefore, the Build Alternatives J1 alignments would have less permanent impact to NTWSSC.

The total LOD for the viaduct is included in the calculations of permanent wetland impacts to present the most conservative estimation. Through final design and engineering, and continued coordination with the agencies, FRA will account for areas located underneath of the viaduct where wetland functions and values may be retained. In most locations, shading of wetlands underneath of the viaduct is not anticipated to diminish the functions of the wetland or its ability to regenerate. Areas calculated as permanent PEM wetland impacts have the potential to be reduced to temporary impacts. For other wetland types, conversion of vegetation type would be considered a permanent impact.

FRA has considered important wetland systems present in the SCMAGLEV Project Affected Environment within their design and has modified design plans to the extent feasible. For example, impact to the high quality PFO wetland located just north of the Patuxent River west of the BWP was specifically minimized by placement of bridge piers for Build Alternative J1 alignments, outside of this wetland with elevated viaduct spanning above. The unavoidable portion of this wetland within the LOD would require

vegetation removal and temporary disturbance during construction, but with appropriate BMPs and continued ESD techniques it would not lose important wetland functions.

Similarly, FRA has considered the more extensive wetland systems present, largely located around the major waterways and present NTWSSC. In these areas, FRA has proposed extended elevated guideway sections, with longer spans between piers in order to minimize ground disturbance. Refer to the minimization and mitigation section below for additional details.

Stations

FRA found no wetland impacts or NTWSCC impacts associated with the Mount Vernon Square East, BWI Marshall Airport, and Camden Yards Stations. The Cherry Hill Station would impact less than one acre of wetland and would result in no impacts to NTWSSC.

Trainset Maintenance Facilities (TMFs)

The MD 198 TMF would impact the most acres of wetland among the three TMF options, with total permanent impacts of 33 acres with Build Alternatives J-01 through J-06 or 38 acres with Build Alternatives J1-01 through J1-06. The direct and permanent wetland impacts as a result of this TMF would significantly alter habitat, including sensitive species habitat and RTE species, water quality, flood storage, and drainage patterns of the Little Patuxent River Watershed, as previously detailed in Section D.7D Water Resources.

The BARC Airstrip TMF would result in 13 to 14 acres of permanent wetland impacts, which includes the most permanent NTWSSC impacts (11 to 12 acres). BARC West would result in 10 acres of permanent wetland impact, which includes two to three acres of permanent NTWSSC impacts. While the MD 198 TMF option has by far the greatest wetland impact (33 to 38 acres), it would impact no more than one acre of NTWSSC.

All TMF options will directly and permanently impact significant wetland systems located within Tier II and Stronghold Watersheds. Fill within these wetlands in order to construct the TMF buildings and tracks would result in a direct loss of these wetlands and would permanently alter the existing natural environment and valuable functions provided by wetlands as noted previously. During final design of the TMF locations, ESD would be utilized to intermix natural systems to the area, for example, stormwater management swales that would provide conveyance of hydrology and attenuation of stormwater runoff, with the goal to restore lost functions for both water quantity and water quality for the surrounding landscape.

Waterways

Direct waterway impacts will occur at locations of proposed surface disturbances, where waterway geomorphology, flow, or water quality will be altered. Greater detail regarding water quality impacts is discussed in Section D.7D Water Resources.

Table D.7-22 provides a breakdown of anticipated permanent and temporary nontidal waterway impacts for each Build Alternative, including station and TMF options. The table provides linear feet of temporary and permanent waterway impacts by Build Alternative resulting from all types of surface disturbance, including short-term, construction-related activities. All Build Alternative impact calculations exclude published waterway data associated with the long-term construction laydown area near MD 200 and I-95 (approximately 10,500 linear feet of perennial and intermittent waterways). There are no waterway impacts associated with the Mount Vernon Square East, BWI Marshall Airport, or Camden Yards Stations. **Table D.7-23** provides a summary of direct permanent nontidal waterway impacts by waterway classification associated with each Build Alternative. Tidal waterways are not located within areas of proposed SCMAGLEV surface disturbance but are crossed underneath by proposed deep tunnel. **Table D.7-24** provides a summary of tidal waterways crossed.

Table D.7-22: Acres of Permanent and Temporary Impacts on Nontidal Waterways

Build Alternative	Alignment		Stations		TMF						Build Alternatives Total Permanent Linear Feet of Impact
			Cherry Hill		BARC Airstrip		BARC WEST		MD 198		
	P	T	P	T	P	T	P	T	P	T	
J-01	7,623	3,076	315	241					2,324	24	10,261
J-02	7,721	3,127	315	241	4,589	1,160					12,624
J-03	7,799	3,156	315	241			4,782	229			12,896
J-04	7,569	3,076							2,378	24	9,947
J-05	7,721	3,127			4,589	1,160					12,310
J-06	7,799	3,156					4,782	229			12,582
J1-01	6,981	1,314	315	241					4,714	231	12,009
J1-02	7,375	2,147	315	241	4,419	1,448					12,108
J1-03	7,323	1,728	315	241			5,021	371			12,659
J1-04	6,981	1,314							4,714	231	11,694
J1-05	7,375	2,147			4,419	1,448					11,794
J1-06	7,323	1,728					5,021	371			12,344

Table D.7-23: Permanent Nontidal Waterway Impact Summary

Build Alternative	Linear Feet of Impact by Waterway Type*			
	Ephemeral	Intermittent	Perennial	TOTAL
J-01	1,224	5,296	3,741	10,261
J-02	1,418	5,649	5,557	12,624
J-03	1,549	5,385	5,962	12,896
J-04	1,224	5,296	3,426	9,946
J-05	1,418	5,649	5,243	12,310
J-06	1,549	5,385	5,647	12,581

Build Alternative	Linear Feet of Impact by Waterway Type*			
	Ephemeral	Intermittent	Perennial	TOTAL
J1-01	814	4,526	6,669	12,009
J1-02	893	3,487	7,728	12,108
J1-03	852	3,617	8,189	12,659
J1-04	814	4,526	6,354	11,694
J1-05	893	3,487	7,414	11,794
J1-06	852	3,617	7,875	12,344

Table D.7-24: Tidal Waterway Impact Summary

Summary of LOD Crossings Under Tidal Portions of Anacostia River, Unnamed Tributary to the Anacostia River, Gwynns Falls, and Middle Branch Patapsco River						
Build Alternative	Alignment*		Camden Station*		Total*	
	LF	SF	LF	SF	LF	SF
J-01	146	15,251	0	0	146	15,251
J-02	146	15,251	0	0	146	15,251
J-03	146	15,251	0	0	146	15,251
J-04	146	15,251	1,105	50,839	1,251	66,090
J-05	146	15,251	1,105	50,839	1,251	66,090
J-06	146	15,251	1,105	50,839	1,251	66,090
J1-01	142	15,406	0	0	142	15,406
J1-02	142	15,406	0	0	142	15,406
J1-03	142	15,406	0	0	142	15,406
J1-04	142	15,406	1,105	50,839	1,247	66,245
J1-05	142	15,406	1,105	50,839	1,247	66,245
J1-06	142	15,406	1,105	50,839	1,247	66,245

The Patapsco River is crossed by deep tunnel just south of I-895 and east of Route 295. This area is included within the scanned areas of the 1972 State Tidal Waterways and adjacent land therefore considered within the Chesapeake Bay Critical Area; however it is identified as a Use I water and a tidally influenced, riverine, deep water system (R1UBV) by MDE. Because this particular location would require coordination with the regulatory agencies to determine its final jurisdiction, it has not been included within either **Table D.7-22** as a nontidal waterway impacted by surface features, or **Table D.7-23** as a tidal waterway crossed beneath by deep tunnel. Approximately 9,575 square feet of this system falls within the SCMAGLEV Project LOD.

FRA also provided a breakdown of impacts per Federal lands in **Table D.7-25** as well as state, county and local land in **Table D.7-26.** With final design, all efforts will be made to span waterways underneath of viaducts by placing the support piers outside of

the waterway banks. For the purpose of this analysis, though, the viaduct was counted as a permanent impact. Although ephemeral waterways are treated separately dependent upon the regulatory authority, FRA has included ephemeral waterways in this analysis. Due to the use of published data and that ephemeral channels are a published resource; FRA has assumed that additional systems (largely ephemeral) may be present within the overall Affected Environment than what is illustrated in **Table D.7-12**.

Table D.7-25: Waterway Impacts on Federal Properties (Linear Feet)

Build Alternative	NPS	NASA*	BARC	Secret Service	PRR	NSA/ Ft. Meade	US General Services	FDA	USACE
J-01	4,602	1,532	1,018	281	1,388	239	1,244	0	0
J-02	4,292	3,874	3,925	497	1,388	239	145	0	0
J-03	4,446	1,532	3,848	393	1,388	239	145	218	1,574
J-04	4,602	1,532	1,018	281	1,388	239	1,244	0	0
J-05	4,292	3,874	3,925	497	1,388	239	145	0	0
J-06	4,446	1,532	3,848	393	1,388	239	145	218	1,574
J1-01	5,848	0	1,413	0	0	52	1,099	0	65
J1-02	4,742	2,343	3,522	105	0	52	0	0	0
J1-03	4,336	0	3,791	0	0	52	0	221	1,679
J1-04	5,848	0	1,413	0	0	52	1,099	0	65
J1-05	4,742	2,343	3,522	105	0	52	0	0	0
J1-06	4,336	0	3,791	0	0	52	0	221	1,679

*Calculations noted under NASA for Build Alternatives J-02, J-05, J1-02 and J1-05 include approximately 2,342 linear feet of waterway impact existing on NASA leased property owned by BARC.

Table D.7-26: Waterway Impacts on Local Properties (Linear Feet)

Build Alternative	Anne Arundel County	City of Greenbelt	WSSC
J-01	271	0	634
J-02	0	0	634
J-03	0	0	634
J-04	271	0	634
J-05	0	0	634
J-06	0	0	634
J1-01	1,518	1,742	262
J1-02	1,235	2,029	337
J1-03	1,235	1,533	337
J1-04	1,518	1,742	262
J1-05	1,235	2,029	337
J1-06	1,235	1,533	337

The Build Alternatives would require the relocations, culverting, or fill within waterways at various locations within the SCMAGLEV Affected Environment for ancillary facilities along the alignments, TMF options, and at the Cherry Hill Station. FRA assumes the following as a result of surface disturbance:

- FRA recognizes that waterway channel formations are variable, depending on changes in flow and underlying geology. The addition of SCMAGLEV Project runoff from structures into waterway channels could cause direct impacts to the channel with additional changes in flow, bank or in-channel erosion, sand and gravel bar creation and shifting, and scouring.
- Waterway relocations will be a direct temporary impact with potential for long-term effects noted above. Waterway relocation design would attempt to mimic the appropriate waterway dimensions, materials, and volume capacity. Additional factors such as waterway length, soils, and surrounding land uses could affect the success of a given relocation.
- FRA would consider construction of culverts to maintain hydrologic connections in locations of proposed permanent surface disturbance where fill would be required. This loss of natural substrate for the waterway would affect the temperature and composition of species able to function with these new conditions.

FRA evaluated the effects to waterways not only for the direct impacts that will result from the SCMAGLEV Project, but the indirect effects that other Project actions will have on waterways. Many waterways in the LOD are buffered by forest, which will be removed by the Project. As previously described, many of the waterways identified within the SCMAGLEV Project Affected Environment consist of interconnected wetland and waterway complexes that ultimately convey hydrologic flow to and through major regional stream systems. The greatest loss of forested stream buffers are associated with these major waterways, identified in proposed areas of elevated viaduct and surface ancillary features. Acreage of forest impacts is included in the following Section D.7F Ecological Resources.

- The loss of forest along waterways will directly affect water temperature regimes and in-stream/floodplain vegetation composition. Although the viaduct would provide or replace shading to portions of stream, the full benefit of forest shading would not be achieved.
- Potential changes to water temperature and vegetation changes would affect aquatic organisms and water quality, wildlife habitat and corridors, flood control and reducing the effects of nutrient runoff into waters. Changes to flooding regimes of waterways could affect the forest buffers and could potentially influence the species present that are adapted to life along waterways.
- With loss of forest buffers is the potential for greater stream bank erosion, which can result from an increase in stream velocities. These velocities may increase due to the increase in impervious surfaces and runoff reaching the streams more rapidly. The erosion can in turn can increase pollutants and phosphorus

downstream. Additional effects to potential important habitat for aquatic species as a result of erosion is addressed in Section D.7F Ecological Resources.

The following subsections identify and compare the waterway impacts among the alignments, stations, and TMFs.

Alignments

The alignments would result in similar amounts of permanent impacts. The alignments associated with Build Alternatives J-01 through J-06 would permanently impact between approximately 7,600 and 7,800 linear feet of waterways. The alignments associated with Build Alternatives J1-01 through J1-06 would permanently impact between approximately 7,000 and 7,400 linear feet of waterways. Likely the most notable difference in impacts results from the Build Alternatives J alignments being elevated over the Little Patuxent River and the Build Alternatives J1 alignments tunneling under. Additionally, only the Build Alternatives J alignments have the potential to impact important headwaters identified by USFWS on PRR.

The additional length of elevated viaduct associated with the alignments of Build Alternatives J-01 through J-06, does not significantly increase proposed waterway impacts compared with the alignments of Build Alternatives J1-01 through J1-06. This is in part due to the sinuosity of the waterways within the SCMAGLEV Affected Environment. For example, several tributaries paralleling the BWP and alignment associated with Build Alternatives J1-01 through J1-06 require multiple crossings of the same waterway, which increases the risk of both direct and indirect waterway impacts. These occurrences would be considered during final planning and design to avoid instream impacts by spanning systems and use of temporary stream crossings to the extent possible during construction. Further design techniques and BMPs to minimize impacts is discussed in later sections.

Two tidal waterways are traversed through deep tunnel by alignments associated with all Build Alternatives, the Anacostia River and an unnamed tributary to the Anacostia. The top of the SCMAGLEV tunnel would be approximately 75 feet below the surface elevation of the Anacostia River. Although historic records of the Anacostia show it to have been as deep as 40 feet in this area near Bladensburg, it is currently thought to be as shallow as three feet at the Bladensburg Waterfront Park[37], therefore the tunnel would be of significant depth below this resource.

As noted previously, coordination would be required with the regulatory agencies to determine the jurisdiction and classification of the Patapsco River at the location it is crossed by any alignment, just south of I-895. The proposed top of tunnel beneath the surface elevation of the Patapsco River would be approximately 78 feet. This is also anticipated to be significantly below the depth of the Patapsco River, although further ground investigations would need to be conducted to provide official depths of the rivers.

[37] https://www.anacostiaws.org/our-watershed/aws-faqs.html

It is not anticipated that these waterways will be impacted by the SCMAGLEV Project tunnel, as they are in deep areas below the surface at these locations. However, tunneling under these systems will require coordination with the USACE and MDE Tidal Wetlands Division and the BPW for the waterway crossings illustrated in Table 4.11-4 and potentially for the approximate 9,575 square feet of the Patapsco River tunneled under by all Build Alternatives.

Stations

There are no waterway impacts at the Mount Vernon Square East Station or BWI Marshall Airport Stations. Deep tunnel proposed for Build Alternatives J-04 through J-06 and J1-04 through J1-06 associated with the Camden Yards Station (illustrated in Table 4.11-4) will cross under the Gwynns Falls at its confluence with the Middle Branch of the Patapsco River and three small “fingers” of the Middle Branch. Depth to the top of tunnel below these tidal systems is approximately 40 to 60 feet below the water surface. The Cherry Hill Station would permanently impact approximately 315 linear feet of nontidal waterways.

Trainset Maintenance Facilities (TMFs)

The MD 198 TMF would permanently impact over 2,300 linear feet of waterways for Build Alternatives J-01 and J-04 and over 4,700 linear feet of waterways for Build Alternatives J1-01 and J1-04. The difference in this approximate doubling of impact would result from the MD 198 connecting tracks from any Build Alternatives J1 alignments through a long portal area just below the surface and at-grade, which would traverse the Little Patuxent River and its tributaries.

The BARC Airstrip TMF and BARC West TMF would similarly result in approximately 4,500 to 5,000 linear feet of permanent impacts to waterways. The BARC Airstrip TMF would impact important headwaters of Beaverdam Creek, and the BARC West TMF would impact Beaverdam Creek and its tributaries. The impacts to these waterways located largely on BARC and NPS properties have been provided in additional detail in Sections D.7D Water Resources and Section D.7F Ecological Resources. No tidal waterways would be impacted by any TMF.

D.7D.3.3 Short-term Construction Effects

D.7D.3.3.1 Wetlands

Construction of viaduct and other surface features will require temporary access roads for equipment and materials. Use of these roads could require crossing of wetlands and their buffers and removal of wetland vegetation. These actions would result in temporary direct impacts, dependent upon the needs of the contractor, the type of access road necessary, and the ability for selective removal of vegetation. Impacts could result from matting over wetlands for construction vehicles to traverse the site which has the potential to compact wetland vegetation and soils. However, removal of construction equipment and matting would allow the area to regenerate.

As previously noted, additional temporary impacts (a decrease of proposed permanent impacts) to wetlands could occur in locations where proposed viaduct will span aerially over existing PEM wetland, although FRA has identified this as a very small amount of the overall wetland impacts as a result of the SCMAGLEV Project (note: placement of viaduct piers will be considered a permanent impact). The total estimated PEM wetlands that will be aerially spanned for Build Alternatives J-01 through J-06 is one acre and less than 0.1 acre for Build Alternatives J1-01 through J1-06. Estimated temporary impacts to wetlands are included in **Table D.7-15**.

Dewatering may be required during construction of subsurface features, to remove any accumulated water within areas of excavation. As noted in Section D.7D Water Resources, this action may affect the availability of groundwater, which in turn may affect the groundwaters ability to support sustained hydrology to adjacent wetlands. The Project Sponsor will determine the most appropriate means of dewatering, either excluding the groundwater from reaching the work area or pumping it out. The length of time that dewatering would be required may dictate proposed measures to mitigate for potential impacts.

The improper disposal of excavated material from tunnel construction would also have the potential to affect wetlands if the excavated materials were placed within wetlands or in un-stabilized areas where they could be washed into existing wetlands. FRA expects that compliance with any USACE CWA Section 404 permit and implementation of all BMPs would reduce or avoid this potential.

D.7D.3.3.2 Waterways

FRA has identified short-term construction impacts that may occur within waterways as a result of the Build Alternatives. Short-term temporary effects would occur as a result of temporary waterway crossings, which could utilize existing fords if possible and small bridges that span a waterway from bank to bank. Larger instream construction activities may require instream diversions, use of cofferdams, pump-arounds, or other BMPs to minimize the effects to the waterway during construction of surface features. In addition, pumping or washing operations would be necessary for tunnel construction. All these potential short-term construction effects could result in sedimentation or increased turbidity within the waterways. Effects of tunneling could cause the disposal of excavated materials into waterways, as stated previously for wetland effects. Refer to **Table D.7-21** for a breakdown of estimated temporary waterway impacts.

D.7D.4 Potential Minimization and Mitigation Strategies

The Project Sponsor will avoid and minimize impacts to wetlands and waterways to the maximum extent practicable, not only for short-term construction activities, but also for long-term operational effects on the resources. For impacts that cannot be avoided, the following measures would be considered to minimize and mitigate potential impacts.

D.7D.4.1 Minimization

FRA has considered the vast expanse of wetlands and waterways throughout the SCMAGLEV Protect Affected Environment, most notably in areas of proposed surface features located on several Federal and county properties. Alignment shifts were considered as feasible during early design phases and supplemented with design measures such as increased elevated span lengths and pier construction techniques to allow for avoidance of instream piers to large waterways to the extent possible.

Spanning large systems, such as the Patuxent River, may not be feasible, specifically for the alignments associated with Build Alternatives J1-01 through J1-06, due to the bend in the river. An alternative option would be to use a “straddle bent,” which is often used when crossing a skewed surface feature or constraint. This allows for an extension of the superstructure without extending the impact of the pier to the surface below. The Project Sponsor will consider additional minimization, and mitigation measures as it advances its engineering design.

In addition to the high-level design minimization measures noted above, the Project Sponsor has minimized and avoided impacts at the following noted sensitive areas:

- Wetland, stream, and riparian buffers located immediately north of Veterans Highway. The design is avoiding all direct impacts to these systems by shifting the proposed FA/EE north and proposing access to the area from Riverdale Road instead of Veterans Highway.
- High-quality wetlands located within Maryland City Park north of the Patuxent River, west of the BWP. The design is avoiding direct placement of piers within this system.
- High-quality wetlands that support rare species located in the Harman’s area of Baltimore County. The design is avoiding above ground impacts by shifting the proposed FA/EE farther north in the commercial/developed area.
- Floodplain and wetlands located along the northern boundary of the Patapsco River, south of I-895. The design is avoiding above ground impacts by shifting the proposed FA/EE farther east in the commercial/developed area.

The Project Sponsor will continue to identify design opportunities to avoid and minimize impacts to wetlands and waterways, with removing viaduct pier locations from these resources as a priority strategy. This may include spanning as many resources as feasible. Impacts to wetlands and waterways for any Build Alternative would likely occur along the Patuxent River and Beaverdam Creek and their associated tributaries, wetlands (including NTWSSC), forests, and floodplains. MDE has indicated that the Patuxent River floodplain wetlands east (NTWSSC) and west of the BWP would need a more detailed delineation to determine wetland impacts. FRA and MDE identified these wetlands as exhibiting upland inclusions. Upon determination of a preferred alternative, therefore, MDE recommends refining the delineation to site viaduct piers to avoid wetlands to the extent practicable. Because resources along these waterways would be impacted, the Project Sponsor will implement BMPs during construction, in addition to

complying with MDE, USACE, and NPS regulations. The Project Sponsor will also develop and implement restoration efforts in these areas in coordination with the USFWS.

The Project Sponsor will avoid and minimize short-term construction effects mainly using site BMPs required through existing agency coordination and future permitting process with the state and Federal agencies including the USACE, MDE, NPS, USFWS, and MDNR, as well as in accordance with county/local authorities. These BMPs can include:

- Same-day stabilization measures as feasible for any earth disturbing activities.
- Use of appropriate erosion and sediment control BMPs.
- Compliance with MDNR Time-of-Year restrictions for all work that occurs within waterways. All waterways within the proposed Build Alternatives area of surface disturbance are classified as Use I or Use I-P waters, which MDNR suggested should avoid work within the channel between February 15 and June 15, inclusive, during any year.
- Use of temporary bridge crossings over smaller waterways. Where practicable, bridge crossings will be installed perpendicular to the waterway. If a bridge cannot be installed without impact to the waterway, a diversion will be set up and the site dewatered.
- Proposed low-water fords for crossing small streams will be limited to areas where the streambed has a firm bottom and/or stable material, and where fish passage is less of a concern. These measures will require coordination with the MDE to maintain in accordance with their “no work in the wet” policy for all stream activities which includes mechanized equipment crossing of streams.
- If instream work cannot be avoided the use of cofferdams will be evaluated. This is a system in which a watertight enclosure can be pumped dry to allow construction work to happen below the waterline, while the remainder of the waterway can flow freely to allow fish passage.
- Placement of ground protection matting over wetland and wetland buffers.
- Vegetation clearing required for construction activities will attempt to fell trees away from streams or wetlands to prevent organic debris from entering the wetland or waterway, as well as avoid rutting and soil disturbance.

If the long-term construction laydown area near MD 200 and I-95 is used during construction, the Project Sponsor will refine site development design after conducting wetland and waterway delineations. With consideration of ESD and planning to strategically locate entrances, storage, and other site uses, and with implementation of onsite BMPs, the Project Sponsor will avoid all permanent impacts to these resources.

D.7D.4.2 Mitigation

All Build Alternatives would result in wetland and waterway impacts and would require a permit under Section 404 of the CWA. Mitigation for wetland loss may include a combination of onsite and offsite wetland mitigation. USACE requires no-net-loss of wetlands and a replacement of lost or degraded wetland functions and values. As per NPS regulations, any impacts will also require a Statement of Findings. The NPS will be consulted on proposed methods of mitigation on NPS lands.

Additional field surveys and agency coordination is required within areas of NTWSSC to receive final concurrence on delineation of boundaries. This final determination will support final design efforts to avoid and minimize impacts to these systems. Clearing of vegetation, filling, excavation, flooding, or draining within a NTWSSC or the expanded 100-foot wetland buffer require a permit with a stringent review process. To qualify for a permit, ground and surface water must be protected, as well as the character of the wetland. If a permit is granted to impact the wetland, mitigation will be required, and the mitigation area may be greater than the area impacted. For impacts to NTWSSC, additional protections, such as 100-foot buffers would be required. NTWSSC also receive higher mitigation ratios than other nontidal wetlands.

At PRR, the Project Sponsor will coordinate with USFWS to finalize delineations of vernal pools and other sensitive wetlands to establish, as feasible, protective buffer zones for resources within and adjacent to the LOD.

The Project Sponsor is currently pursuing possible mitigation strategies to satisfy anticipated compensatory mitigation that will be required for potentially significant impacts to wetland and waterways. Coordination with the USACE and MDE and corroborating agencies and stakeholders is ongoing, and additional detail on mitigation proposed is anticipated prior to completion of a Final Environmental Impact Statement.

The USACE has a hierarchal preference for wetland mitigation requirements to first seek an approved wetland mitigation bank with available wetland credits to purchase. If this option is not feasible due to credit availability, or unallowable bank service areas, the second preference is for mitigation to be provided “in-kind.” This means that impacts to a PFO would be mitigated with restored PFO, ideally within the same watershed.

The Project Sponsor will submit a Phase I Mitigation Plan, developed and prepared during the permitting process, that identifies the proposed mitigation selected, whether it is determined to be an on-site or off-site mitigation project, payment towards credits into an approved Wetland Mitigation Bank, or a combination of methods.

A mitigation bank is a site, or a suite of sites, where resources (e.g., wetlands, streams, riparian areas) are restored, established, enhanced, and/or preserved for the purpose of providing compensatory mitigation for authorized impacts. In general, a mitigation bank sells compensatory mitigation credits to permittees whose obligation to provide compensatory mitigation is then transferred to the mitigation bank sponsor. The operation and use of a mitigation bank are governed by a mitigation banking instrument,

which is a legal document for the establishment, operation, and use of a mitigation bank.

To compensate for permanent non-tidal wetland impacts, wetland replacement ratios are used to determine the amount of mitigation required. The MDE regulates the conversion of forested to emergent wetlands at a mitigation ratio of 1:1, meaning for every acre of PFO wetland being flush cut and converted to PEM, one acre of wetland must be created, restored or enhanced. Although these impacts do not result in a loss of wetland acreage, they do result in a loss of forested wetland functions. For impacts where permanent emergent wetlands will be lost due to the regulated activity, again a mitigation ratio of 1:1 is required. A higher acreage replacement ratio is utilized when using a bank for mitigation, however. A mitigation ratio of 1.5:1 would be required for any non-tidal wetland impacts, which includes conversion of forested wetland to emergent wetland. All ratios are subject to coordination with the MDE and as noted above are likely to be higher for impact to NTWSSC.

Stream restoration and mitigation will also be required. Compensatory mitigation aims to provide restoration of waters by improving the physical, chemical and biological processes of the waterway. Stream restoration may also be satisfied through payment of credits into an existing mitigation bank, as coordinated and approved by the agencies.

Tidal mitigation must be connected to existing tidal wetlands or tidal waterways. Tidal wetland impacts requiring approval through the Board of Public Works (BPW) may require mitigation; there is no minimum threshold set. As no vegetated tidal wetland systems are anticipated to be impacted by the SCMAGLEV Project, and tidal open waters will be crossed under by deep tunnel, it will require a Tidal Wetland License through the BPW, but is not anticipated to require mitigation, however this would be coordinated directly with the regulatory agencies.

As stated above, wetland mitigation requires development of Phase I Mitigation Plan followed by Phase II Mitigation Plans (concept and final plans, respectively) that may be a combination of wetland creation, restoration, enhancement, and preservation, and/or bank credit purchase, while concurrently incorporating mitigation for impacts to other sensitive habitats. These plans are reviewed and approved by USACE and MDE, in collaboration with Federal and state resource agencies and other stakeholders.

Additional mitigation strategies that would be considered during final design and construction planning may include:

- Onsite re-establishment of wetland habitat, where feasible
- Onsite re-establishment of forested wetland habitat, where feasible, including planting of trees of appropriate mature height under the guideway to provide contiguous canopy while maintaining the 13-foot clearance beneath the structure
- Offsite wetland mitigation, whether through banking or permittee-created wetlands within the watersheds

- Onsite and offsite restoration of degraded stream reaches associated with the major river systems
- Coordination with MDE and USFWS to determine compensatory mitigation value and restoration opportunities for unavoidable impacts to NTWSSC and other high-value wetlands and waterways at PRR
- Coordination with MDNR and county and local municipalities to identify wetland and waterway restoration priorities
- Purchasing of intact wetland complexes for placement in perpetual easement
- Invasive species management of onsite and adjacent habitats
- Funding ecological research and restoration at PRR and BARC

Dam removal for "the removal of obsolete dams and other obsolete in-stream structures can be an effective approach to restoring river and stream structure, functions, and dynamics."[38]

Appendix D.7E ECOLOGICAL RESOURCES

D.7E.1 Introduction

This section describes the regulatory context and methodology the FRA used to evaluate the Superconducting Magnetic Levitation Project (SCMAGLEV Project) effects to ecological resources and minimization and mitigation measures that would reduce impacts to these resources. This study of ecological resources includes an analysis of the relationships between living things and their environment. FRA has included the following dominant resources in this analysis:

- **Forest** – As defined by the Maryland Department of Natural Resources (MDNR), a forest is "a biological community dominated by trees and other woody plants covering a land area of 10,000 square feet or greater."[39]
- **Forest Interior Dwelling Species (FIDS) Habitat** – Habitat supporting bird species that depend upon large, contiguous forested habitat to successfully breed and produce sustainable populations.
- **Terrestrial and Aquatic Wildlife** – Animal species living on land and species living in waters.
- **Rare, Threatened, or Endangered (RTE) Species** – Plant and animal species that may be the rarest or the most in need of conservation (at the Federal and/or state level), which are provided a designated status under the Endangered

[38] USACE. September 25, 2018. Regulatory Guidance Letter No18-01.

[39] Maryland Department of Natural Resources (MDNR). 1997. *State Forest Conservation Technical Manual*, Maryland Department of Natural Resources, Third Edition, 1997.

Species Act (ESA) of 1973 and/or granted additional protections by the government. Critical habitats for RTE species are also protected.

- **Sensitive Species Project Review Areas (SSPRA)** – State-wide database developed and maintained by the MDNR Wildlife and Heritage Service (WHS) to aggregate and portray state and locally significant habitat areas, often including habitat for RTE species.

D.7E.2 Regulatory Context and Methodology

D.7E.2.1 Regulatory Context

In accordance with the National Environmental Policy Act (NEPA), 42 U.S.C. § 4321 et seq., the Council on Environmental Quality (CEQ) regulations, 40 C.F.R. Parts 1500 - 1508, and FRAs Procedures for Considering Environmental Impacts, 64 Fed. Reg. 28545 (May 26, 1999), FRA assessed both construction period (short-term impacts) and long-term impacts of the Build Alternatives on wildlife and vegetation in the SCMAGLEV Project Affected Environment. FRA's analysis of ecological resources considered comments received by state and Federal agencies, specifically the United States Fish and Wildlife Service (USFWS) and MDNR through coordination meetings, and considers the various applicable laws and regulations governing ecological resources, including but not limited to:

- ESA 16 U.S.C. § 1531 et seq
- Maryland Forest Conservation Act regulations and Nongame and Endangered Species Conservation Act of 1975, COMAR 08.03.08
- Fish and Wildlife Coordination Act, 16 U.S.C. § 661-667e; Bald and Golden Eagle Protection Act, 16 U.S.C. § 668-668c; and Migratory Bird Treaty Act, 16 U.S.C. § 703-712. May require approval of the Migratory Bird Conservation Commission.
- Magnuson-Stevens Fishery Conservation and Management Act, 16 U.S.C. § 1801 et seq
- Executive Orders 13112 (Feb. 3, 1999), and 13751 (Dec. 5, 2016)

Additional discussion regarding ESA Section 7 consultation with USFWS is provided in Section D.7F.5.

D.7E.2.2 Methodology

FRA analyzed ecological resources within the SCMAGLEV Project Affected Environment to evaluate the presence of vegetated communities and specifically the condition of forests (including FIDS habitat), terrestrial and aquatic wildlife and habitat, and RTE species and habitat. FRA defined the SCMAGLEV Project Affected Environment for ecological resources as the impact area limits of operational/physical disturbance, as well as the construction related impact area, which includes additional areas of temporary disturbance required for construction activities. These impact areas

comprise the overall limit of disturbance (LOD) of the SCMAGLEV Project Build Alternatives which includes all surface and subsurface elements, and FRA included an additional 30-foot buffer around the LOD. FRA qualitatively evaluated permanent and temporary impacts as well as direct and indirect effects to these resources, with additional quantitative analysis conducted for forest, FIDS habitat, and SSPRA impacts. To conduct this evaluation, FRA sought information via the following resources:

- Federal and state statutes; local and regional agency policies and ordinances; published Geographic Information Systems (GIS) databases; and aerial imagery.
- Results of FRA field visits conducted between 2018 and 2020 to characterize habitat types within the SCMAGLEV Project Affected Environment. FRA identified upland field/meadow, scrub-shrub, and forested habitats, in addition to wetlands and waterways, all of which support common terrestrial and aquatic wildlife.
- Federal and state resource agency correspondence and meetings, which yielded agency input regarding species and habitats monitored for conservation located within or adjacent to the SCMAGLEV Project Affected Environment (see Attachment A for agency correspondence).
- Previously published transportation projects NEPA documentation.

The USACE's Public Interest Review considers fish and wildlife values to aid their evaluation of projects that have submitted a permit application. FRA has considered these values and provided an evaluation of impacts in the Environmental Consequences section.

In accordance with Section 7 of the ESA, FRA queried the USFWS Information for Planning and Consultation (IPaC) online system to identify Federally listed RTE species and their habitats within the SCMAGLEV Project Affected Environment. FRA contacted MDNR WHS to identify any known occurrences of state-listed RTE species and their associated habitats within the SCMAGLEV Project Affected Environment. FRA reviewed MDNR GIS data for SSPRA locations and accessed Maryland Biological Stream Survey (MBSS) data to assess aquatic habitat for waterways within and adjacent to the SCMAGLEV Project Affected Environment. Although wetlands and waterways habitat are discussed in this section, impacts to these resources were specifically addressed in Section D.7E Wetlands and Waterways, including detailed discussion of NTWSSCs, which are closely associated with aquatic-related SSPRAs. Similarly, because the variability of water quality is highly correlated with the quality of and impacts to vegetated habitats, this section is also supported by Section D.7D Water Resources.

D.7E.3 SCMAGLEV Project Affected Environment

Ecological resources within the SCMAGLEV Project Affected Environment include terrestrial and aquatic habitats associated with forests (including FIDS habitat), fields/meadows, scrub-shrub areas, aquatic environments, and SSPRAs (including RTE species habitat). **Table D.7-21** provides a summary of habitat types and their quantified presence within each SCMAGLEV Project Affected Environment.

Table D.7-27: Presence of Habitat Types within the SCMAGLEV Project Affected Environment

Build Alternative	Forest (acres)	FIDS (acres)	Shrub-Scrub (acres)	Field (acres)	Aquatic (linear feet)*	SSPRA (acres)**
J-01	627	530	100	493	37,371	295
J-02	602	490	108	602	41,859	381
J-03	663	573	100	502	40,910	430
J-04	606	529	88	487	38,348	306
J-05	581	490	96	595	42,837	392
J-06	642	573	88	496	41,887	441
J1-01	618	461	29	486	38,363	291
J1-02	540	397	34	595	40,077	356
J1-03	596	475	26	494	39,256	392
J1-04	597	461	17	480	39,341	302
J1-05	519	397	22	589	41,054	367
J1-06	575	475	14	487	40,234	403

* Aquatic habitat is presented above as a function of linear feet of waterways, as presented in Section D.7E Wetlands and Waterways.

** SSPRAs are not a specific habitat type, but instead can include any of the above listed habitat types. They are included in the table to indicate their presence in the SCMAGLEV Project Affected Environment.

FRA identified forest as the dominant ecological resource in the portions of the SCMAGLEV Project Affected Environment in Prince George's County and Anne Arundel County, including deciduous and coniferous vegetative communities, with several areas of FIDS habitat (described in more detail below). FRA identified forest fragments or hedge rows as more common on the fringes of densely developed areas, often surrounding existing transportation systems and commercial/industrial businesses. Forested fragments and hedge rows include wooded areas, but do not meet the MDNR size and composition criteria of a forest.

Forested habitats, including forest fragments, and FIDS habitat are somewhat more prevalent in the SCMAGLEV Project Affected Environment of Build Alternatives associated with alignment J (at 581 to 663 acres for forests, and 490 to 573 acres for FIDS habitat) than in those associated with alignment J1 (at 519 to 618 acres for forests, and 397 to 475 acres for FIDS habitat).

Areas of roadway right-of-way (ROW) and utility crossings largely consist of meadow and scrub-shrub vegetation, which include low lying woody and herbaceous vegetation, no greater than 20 feet in height. Other areas of meadow habitat include fallow and maintained agricultural and recreational fields. On average, the SCMAGLEV Project

Affected Environment for Build Alternatives associated with alignment J include 75 percent more scrub-shrub habitat than those associated with alignment J1. Acreage of field/meadow habitat across Build Alternatives is similar for those associated with alignments J and J1.

Aquatic habitats occur within the waterways (and adjacent wetland and floodplain systems) as identified in Section D.7E Wetlands and Waterways. Depending on the Build Alternative, linear feet of aquatic habitat ranges from approximately 37,00 to 42,000, with slightly more habitat areas occurring within Build Alternatives associated with the BARC West and BARC Airstrip TMF options.

The SCMAGLEV Project Affected Environment consists of areas of urbanized land with habitat fragments and roadside edges of larger forest systems. Noxious weeds and invasive species typically occur in, and often dominate, these disturbed habitat areas; however, interior areas of large, unfragmented forests and vegetated corridors typically exhibit little to no invasive species presence or dominance. FRA did not catalog noxious and invasive species within the project LOD. However, FRA does address the threat of contaminating functioning native plant-based habitats through project-related disturbance and fragmentation in Section D.7F.4.

FRA considered local biodiversity, as an aggregate of the ecological resources discussed below, within the SCMAGLEV Project Affected Environment. In addition to documenting the locations of forests, FIDS habitat, RTE species, SSPRAs, and NTWSSCs (discussed in Section D.7E Wetlands and Waterways), MDNR maintains a geospatial dataset identified as the Biodiversity Conservation Network (BioNet), which systematically identifies and prioritizes ecologically important lands to conserve Maryland's biodiversity (i.e., plants, animals, habitats, and landscapes). This dataset aggregates numerous separate data layers hierarchically according to the BioNet Criteria Matrix. These data were needed to maximize the influence and effectiveness of public and private conservation investments; promote shared responsibilities for land conservation between public and private sectors; and guide and encourage compatible land uses and land management practices.[40] BioNet data are ranked among five tiers. A description of these tiers and of areas of the SCMAGLEV Project Affected Environment that overlap BioNet data are discussed further in Attachment F.

D.7E.3.1 Forests and Forest Interior Dwelling Species Habitat

Forests and forest fragments are common throughout the SCMAGLEV Project Affected Environment and provide nesting, foraging, and refuge for wildlife including birds, fish, mammals, insects, reptiles, and amphibians. Forested riparian corridors provide wildlife passages and are the optimal vegetative cover for meeting water quality goals (see Section D.7F.3.2 for more information on wildlife habitat and Section D.7D Water Resources for more information on water quality). MDNR identifies mesic mixed hardwood and Coastal Plain oak-pine forests as the primary forested wildlife habitats

[40] MDNR, MD iMAP Feature Layer: Biodiversity Conservation Network – BioNet (ID:0). Accessed October 2020. https://geodata.md.gov/imap/rest/services/Biota/MD_BiodiversityConservationNetwork/MapServer/0

within the SCMAGLEV Project Affected Environment.[41] During field investigations, FRA identified common forested wetland communities dominated by sweet-gum (*Liquidambar styraciflua*), red maple (*Acer rubrum*), black tupelo (*Nyssa sylvatica*), and various oak species (*Quercus* spp.), as presented in the wetland delineation vegetation data summarized in Attachment E. In addition to functioning as habitat, forests help to enhance water quality and air quality and promote human health and recreation. According to the USFWS, important communities of chestnut oak (*Quercus montana*) and other mature native tree species of substantial size (greater than 24 inches diameter at breast-height) have been identified on Patuxent Research Refuge (PRR) lands. Within the forests at PRR, USFWS staff have identified "sensitive terrestrial or aquatic communities…such as vernal pools, sphagnum bogs, and heath communities" (USFWS letter dated August 5, 2020; see Attachment A). At BARC, published information[42] indicates the presence of large, old pitch pines (*Pinus rigida*), the National Champion dwarf chinquapin oak (*Quercus prinoides*), and the state champion sand hickory (*Carya pallida*), located at the "East Farm" (exact location not identified in literature).With continued design and refinement of alternatives the Project Sponsor will complete a Forest Stand Delineation (FSD) and survey for specimen trees, which are defined as trees having a diameter measured at 4.5 feet above the ground of 30 inches or more, or trees having 75 percent or more of the diameter of the current state champion tree. During field investigations between 2018 and 2020, FRA observed specimen trees within the SCMAGLEV Project Affected Environment, commonly consisting of tulip poplar (*Liriodendron tulipifera*), northern red oak (*Quercus rubra*), and white oak (*Quercus alba*). Required compliance with the FCA is discussed in greater detail in Section D.7F.5.

FIDS depend upon large, contiguous forest to successfully breed and produce sustainable populations. FIDS include migratory songbirds, warblers, the barred owl, and various hawks and woodpeckers. According to a Critical Area Commission for the Chesapeake and Atlantic Coastal Bays guidance document[43], FIDS habitat includes a forest tract that meets either of the following conditions:

- Greater than 50 acres in size and containing at least 10 acres of forest interior habitat (forest greater than 300 feet from the nearest forest edge); or
- Riparian forests that are, on average, at least 300 feet in total width and greater than 50 acres in total forest area. The stream within the riparian forest must be perennial.

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[41] MDNR. 2015. *Maryland State Wildlife Action Plan.* Annapolis, Maryland. Available at: https://dnr.maryland.gov/wildlife/Pages/plants_wildlife/SWAP_Submission.aspx

[42] Simmons, R. 2016. *Vanishing Pine Barrens Communities of the Washington, D.C. Vicinity.* Presented at the Maryland Native Plant Society 2016 Annual Fall Conference. Accessed July 2020. https://www.mdflora.org/resources/Documents/Handouts/Vanishing%20Pine%20Barrens%20of%20the%20Washington,%20D.C.%20Vicinity.pdf

[43] Critical Area Commission (CAC) for the Chesapeake and Atlantic Coastal Bays. 2000. *A Guide to the Conservation of Forest Interior Dwelling Birds in the Chesapeake Bay Critical Area*. Available at: http://dnr2.maryland.gov/education/Documents/tweetyjune_2000.pdf

Historically, there has been an overall decline of bird species populations dependent on FIDS habitat and acreage of this habitat type in the Mid-Atlantic Region. FRA identified areas of forest and FIDS habitat most notably adjacent to the BWP within the NPS property, BARC, PRR, Fort George G. Meade, City of Greenbelt properties, and north of MD 198 on and in the vicinity of the MD 198 TMF site. Other notable areas of forest and FIDS habitat are located along Veterans Parkway (MD 410), at NASA GSFC, at county parks and open spaces (Springfield and Maryland City Parks, and Tipton Airport), at Patuxent River Park, and within Washington Suburban Sanitary Commission (WSSC) property. FIDS habitat is also identified at the proposed long-term construction laydown area near MD 200 and I-95; however, recent aerial imagery shows evidence of clearing and development. FRA used the MDNR FIDS GIS database to map areas of FIDS habitat.[44]

FIDS habitat identified in PRR include, but are not limited to, warblers and thrushes such as the Kentucky warbler (*Geothlypis formosa*), Nashville warbler (*Leiothlypis ruficapilla*), Swainson's thrush (*Catharus ustulatus*), wood thrush (*Hylocichla mustelina*), and northern parula (*Setophaga americana*). In a letter dated August 5, 2020, USFWS indicated the presence of other "sensitive terrestrial and aquatic communities associated with forest such as vernal pools, sphagnum bogs, and heath communities."

Easements

Depending on Build Alternative, the SCMAGLEV Project Affected Environment includes 31 to 39 existing forest conservation areas (one in Prince George's County and 38 in Anne Arundel County), which provide compliance with the Maryland Forest Conservation Act (FCA). These areas are preserved and/or reforested areas under long-term protective easements for compensation for forest impacts. Forest conservation easements are maintained at the state and county levels. **Table D.7-28** provides a summary of forest conservation areas by Build Alternative.

[44] MDNR. 2013. Maryland Living Resources - Forest Interior Dwelling Species. Feature Service Link: https://geodata.md.gov/imap/rest/services/Biota/MD_LivingResources/FeatureServer/10

Table D.7-28: Forest Conservation Easements within the Affected Environment

Build Alternative	Forest Conservation Easements	
	Number of Sites	Total Acreage
J-01	35	19
J-02	33	15
J-03	33	15
J-04	35	19
J-05	33	15
J-06	33	15
J1-01	35	29
J1-02	31	21
J1-03	31	21
J1-04	35	29
J1-05	31	21
J1-06	31	21

Per coordination with BARC staff, a seven-acre reforestation mitigation site occurs within the footprint of the land that is part of the proposed BARC West TMF option. Further coordination with MDNR and BARC would be necessary to determine the repercussions of disturbing this mitigation site. Likewise, proposed disturbance to any forest conservation easements would necessitate mitigation for new disturbance as well as replacement of disturbed reforestation, likely at a higher mitigation ratio, to be determined in coordination with MDNR.

Additionally, there is a Maryland Environmental Trust (MET) Easement that occurs at the eastern end of the MD 198 TMF. This easement is associated with high quality forested habitat identified for conservation. The MET is operated by the MDNR and is coordinated with landowners for protection. Easements are considered perpetual and apply to all present and future owners of the land. This easement is identified as the Oak Hill property and recorded in the 501C Land Trusts. This was put into an easement as a result of an EPA mandated transaction over a water resource violation. A portion of this property is dedicated to the District of Columbia and is a youth correctional facility. If use of this easement is sought, the review process would be similar as that for existing parkland and would need to be coordinated and approved through the Board of Public Works (see Attachment A for MDNR meeting minutes).

Attachment F provides an exhibit of the forest, FIDS habitat, and forest conservation easements that occur throughout the SCMAGLEV Affected Environment.

D.7E.3.2 Terrestrial and Aquatic Wildlife

The SCMAGLEV Project Affected Environment contains multiple habitat types ranging from small vegetated fragments with marginal resource value to large habitat corridors with exceptional resource value that support common and rare wildlife. The SCMAGLEV Project Affected Environment occurs at the intersection of the Atlantic

Coastal Plain and Piedmont Physiographic Provinces, which gives rise to a diverse array of ecological niches. Migrating and resident birds, including FIDS and raptors, are dependent on small and large areas of vegetation for foraging and nesting. A diversity of terrestrial and aquatic fauna is reliant on vegetated riparian habitats for uninterrupted access to resources within waterways and adjacent wetlands and uplands. During field investigations, FRA identified upland field/meadow, scrub-shrub, and forested habitats, in addition to wetlands and waterways, all of which support common terrestrial and aquatic wildlife.

The MDNR Environmental Review Unit (ERU) identified the following aquatic resources and habitat within the SCMAGLEV Project Affected Environment: anadromous fish habitat from tidal waters into major stream systems; black bass and largemouth bass fisheries in the tidal areas; American eel habitat; and stocked trout management areas. According to MBSS data, most rivers and streams intersecting the SCMAGLEV Project are characterized as supporting fish and benthic macroinvertebrate communities with high pollutant/impact tolerance. Other streams were noted to support several sensitive fish and benthic species or have suboptimal instream habitat and poor amounts of stable substrate for benthic species colonization. A study completed at PRR in 2009 also indicated relatively poor biological health of streams based on benthic macroinvertebrate populations; however, the study did show good habitat scores with most of the land cover identified as pervious and forested. This study concluded that the biological communities in these streams may still be recovering from past impacts on the property prior to PRR ownership[45] as this correlation is not necessarily what is expected.

MDNR WHS identified two large Nontidal Wetlands of Special State Concern (NTWSSC) and great blue heron (GBH) colonies near the Little Patuxent River, Patuxent River, and Beaverdam Creek crossings. An additional GBH colony occurs within the SCMAGLEV Project Affected Environment in the vicinity of the MD 198 TMF. The NTWSSCs support common and RTE species. Smaller wetlands present within the SCMAGLEV Project Affected Environment include vernal pools critical for amphibian breeding and nesting, and emergent, forested, and marsh wetlands that support a wide variety of aquatic and terrestrial wildlife. As discussed in Section D.7D Water Resources, MDNR identified the Little Patuxent as a Stronghold Watershed, a designation for “watersheds around the State that are the most important for the protection of Maryland’s aquatic biodiversity. These locations are the places where rare, threatened, or endangered species of fish, amphibians, reptiles or mussels have the highest numbers.”[46]

The USFWS IPaC report states that there are migratory birds of conservation concern protected under the Migratory Bird Treaty Act within the SCMAGLEV Project Affected Environment but did not identify critical habitats or fish hatcheries. Potential impacts to

[45] Anne Arundel County Department of Public Works Bureau of Engineering Watershed, Ecosystem, and Restoration Services. 2009. *Assessment of the biological health of streams on the Patuxent Research Refuge within Anne Arundel County, Maryland*.

[46] https://dnr.maryland.gov/streams/Pages/streamhealth/Maryland-Stronghold-Watersheds.aspx

PRR, which encompasses a diversity of habitats, would necessitate coordination with PRR, a designated National Wildlife Refuge. At PRR, USFWS manages vegetation beneath the BGE ROW to promote and maintain scrub-shrub habitat, which functions as necessary habitat for shrub-nesting bird species. USFWS also maintain 28 ecological observation points within this ROW corridor to annually document bird, plant, and lepidopteran (butterfly and moth) species. In areas southeast of the SCMAGLEV Project Affected Environment, USFWS conducts periodic prescribed burns, likely not impacted by the proposed SCMAGLEV Project.

USFWS has noted that, in addition to FIDS species, PRR forests support active communities of bats, and has also identified that management of PRR habitats for pollinator species is a high priority for the Refuge. During field visits, FRA observed the following species, which represent typical terrestrial and aquatic species for the area: wood frog (*Lithobates sylvaticus*), box turtle (*Terrapene carolina carolina*), yellow garden spider (*Argiope aurantia*), American bullfrog (*L. catesbeianus*), green frog (*L. clamitans*), white-tailed deer (*Odocoileus virginianus*), American toad (*Anaxyrus americanus*), Fowler's toad (*A. fowleri*), red-eyed vireo (*Vireo olivaceus*), great blue heron (*Ardea herodias*), crayfish (burrows), various dragonfly species, various duck species, and additional bird and insect species. See **Figures D.7-18 and D.7-19**.

Figure D.7-18: Wood Frog Observation

FRA observed this individual near Wetlands WP064 and WP065, located on NPS property between the BWP and Hermosa Drive (Attachment E.1, Map Sheet 10). FRA also observed wood frogs in Wetland WP106, located on PRR property (Attachment E.1, Map Sheet 12).

Figure D.7-19: Box Turtle Observation

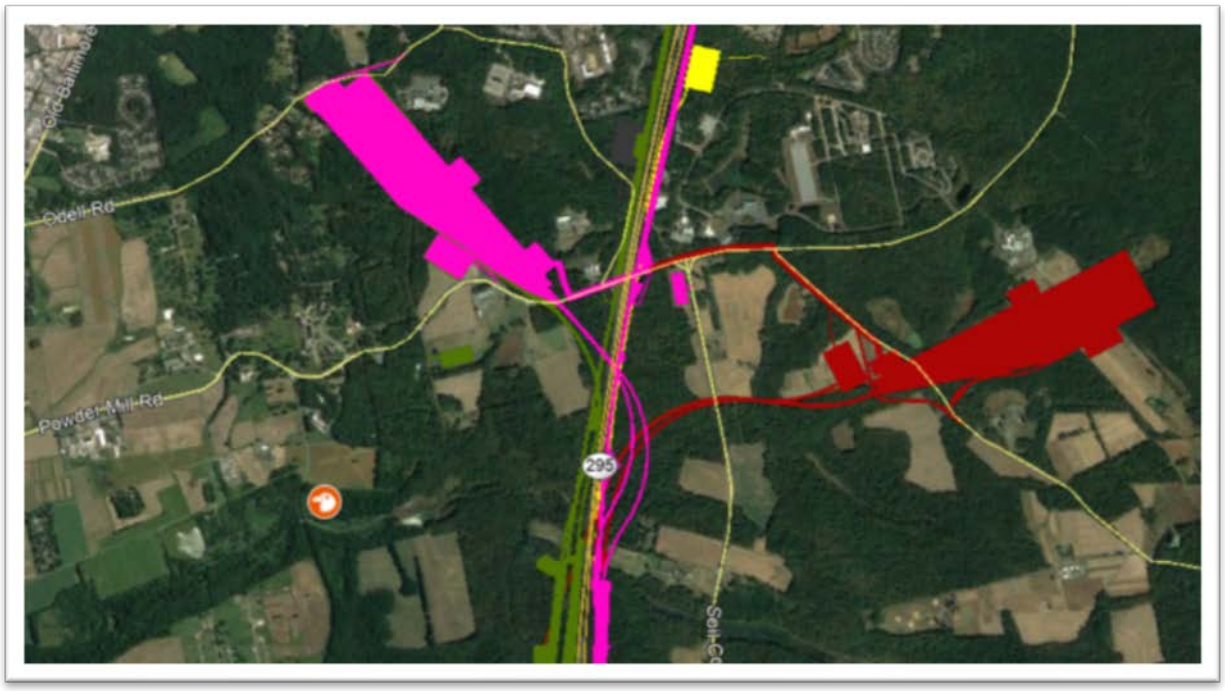
FRA observed this individual in Wetland WP133, located on NPS and BARC property between the BWP and Beck Branch (Attachment E.1, Map Sheet 4). FRA also observed a box turtle during a site visit to Ft. George G. Meade property.

Information obtained from the Maryland Bird Conservation Partnership online mapping program indicates two assigned bald eagle nest locations less than one mile of the SCMAGLEV Project Affected Environment (see **Figures D.7-20 and D.7-21**). One nest site is located along the Patapsco River west of the proposed FA/EE, tunnel boring machine (TBM) launch-retrieval, and substation site near I-895. The other nest site is located along Beaverdam Creek west of the Build Alternatives J1 alignments and south of the BARC West TMF.

Figure D.7-20: Bald Eagle Nest Site in Anne Arundel County (Patapsco River)

Source: Maryland Bird Conservation Partnership. https://marylandbirds.org/bald-eagle-nest-monitoring

Figure D.7-21: Bald Eagle Nest Site in Prince George's County (Beaverdam Creek)



Source: *Maryland Bird Conservation Partnership.* https://marylandbirds.org/bald-eagle-nest-monitoring

Bald eagles do not rely on large tracts of forest as FIDS do, instead they can often be found along a forest edge, usually near a water source such as a lake, marsh or coastline. Although bald eagles are no longer considered an RTE species, Maryland continues to survey existing nesting sites and promote sound design practices to limit the effects of development to habitat and to limit disturbance during nesting season.

D.7E.3.3 Rare, Threatened, and Endangered (RTE) Species

Several habitats that support RTE species exist in the SCMAGLEV Project Affected Environment, most notably in larger natural forested tracts in Anne Arundel and Prince George's Counties as described previously. Through the IPaC report and coordination with USFWS and MDNR WHS, FRA has identified the following Federal and state listed species and habitats:

- Northern long-eared bat (*Myotis septentrionalis*): This Federally listed threatened species is identified through the IPaC report and requires live and standing dead hardwood trees for summer roosting habitat (see Attachment F for additional species information in the USFWS Federal Register).
- Swamp pink (*Helonias bullata*): This Federally and state listed plant species is identified through the IPaC report and specifically identified by MDNR WHS as occurring in the Harmans area in Anne Arundel County. According to MDNR WHS (October 22, 2020 letter), this species typically occurs in "perennially saturated nontidal wetland habitat, including forested wet depressions, spring seeps, bogs, wet meadows and margins of small streams, but has very specific hydrological requirements."(see Attachment F for additional species information in the USFWS Federal Register).
- American peregrine falcon (*Falco peregrinus anatum*): This state-listed species is identified by the MDNR WHS as In Need of Conservation and occurring at a nest site in downtown Baltimore.

Little Patuxent River and Vicinity:

- Dorsey Run forms the headwaters of the Little Patuxent River and supports two state-listed Threatened fish species, glassy darter (*Etheostoma vitreum*) and American brook lamprey (*Lethenteron appendix*), both "found in the sandy, gravelly river bottom and spawn in the riffles" (MDNR WHS October 22, 2020 letter).
- The segment of the Little Patuxent River within and downstream of the SCMAGLEV Project Affected Environment supports the lassy darter, American brook lamprey, white catfish (*Ameiurus catus*), which is identified by DNR WHS as possibly rare, and fifteen RTE dragonfly species.

Patuxent River and Vicinity:

- Upstream and downstream of the SCMAGLEV Project Affected Environment, this river also supports American brook lamprey and is designated as a Stronghold watershed due to presence and abundance of glassy darter populations.

- An extensive NTWSSC at PRR that provides habitat for state-listed species: ten odonate (dragonfly and damselfly) species, two RTE fish species, and one RTE plant species.
- A globally rare natural community (coastal plain oak floodplain forest) occurs within the SCMAGLEV Project Affected Environment west of the BWP, north of the Patuxent River.

Beaverdam Creek and Vicinity:

- In the area of the BARC West TMF, MDNR has identified two RTE plant species, white fringed orchid (*Platanthera blephariglottis* var. *blephariglottis*) and northern pitcher-plant (*Sarracenia purpurea*), both associated with high quality wetlands. This area also supports the American brook lamprey and three RTE odonate species.
- A highly globally rare/imperiled woodland community (pine barrens pine-oak woodland) occurs east and west of the BWP.
- The Beaverdam Creek NTWSSC extends east and west of the BWP along Beaverdam Creek and Beck Branch. Within and adjacent to the SCMAGLEV Project Affected Environment, this NTWSSC provides habitat for three RTE odonate species, one RTE fish species, white fringed orchid, a globally critically imperiled natural community (coastal plain-piedmont acidic seepage swamp), and a globally imperiled natural community (coastal plain-piedmont acidic seepage fen).

  The area of the BARC Airstrip TMF also falls within the drainage area of another NTWSSC near Telegraph Road, which supports three RTE odonate species. Additional RTE species observations on BARC property within one mile of the SCMAGLEV Project Affected Environment include a state-listed endangered odonate species and nine other RTE plant species.

In addition to the RTE species identified by USFWS and MDNR above, PRR staff notified FRA of the presence of vernal pools, spring-fed wetland complexes, and forest stream complexes containing RTE and other at-risk plant and animal species. Yellow lance (*Elliptio lanceolate*), a Federally endangered mussel species, has been found in surveys of the Patuxent River on the PRR property. Spotted turtle (*Clemmys guttata*), which is a petitioned species for listing, and eastern box turtle (*Terrapene carolina carolina*), a designated species of greatest conservation need, have also been known to use the habitats within PRR. Refer to RTE and coordination letters with detailed information in Attachment A Agency Correspondence.

In addition to those species identified above, BARC staff notified FRA of the presence of unique forest communities supporting pitch pine (*Pinus rigida*) and dwarf chinquapin oak (*Quercus prinoides*).

Based on published information from previous regional transportation projects, the following RTE plant species have been documented in the area associated with the long-term construction laydown area near MD 200 and I-95: state-endangered low rough aster (*Eurybia radula*) and state-threatened long-stalk greenbrier *(Smilax*

pseudochina). Low rough aster is known to occur in bogs, swamps, and streambanks primarily in the more mountainous areas of Maryland but is also known to occur infrequently in the Washington-Baltimore area.[47] Long-stalk greenbrier is known to occur in low woods or damp, sandy soils of the Coastal Plain and Washington-Baltimore area.[48] Due to the presence of these species, a protective easement is in place. With receipt of additional MDNR coordination, these species and protections can be confirmed.

RTE species are typically associated with high quality, contiguous habitats and are sensitive to habitat disturbance and fragmentation. Therefore, potential RTE species habitat, beyond those areas identified above, may occur within the SCMAGLEV Project Affected Environment in large undeveloped areas and corridors, as illustrated in the Baltimore-Washington SCMAGLEV DEIS Appendix B.3 Map Atlas, including aquatic and upland forested areas near Fort Lincoln Park; along the Anacostia River and its adjacent floodplain parks (including Bladensburg South Park), along Veterans Highway near Martins Wood Park, south of the southern tunnel portals, between BARC and PRR, on Ft. George G. Meade military base, along Stony Run and tributaries south of Baltimore-Washington International Thurgood Marshall Airport (BWI Marshall Airport), and along the Patapsco River and its adjacent floodplain parks. As Build Alternatives are refined, the Project Sponsor will coordinate with MDNR and USFWS to identify areas for more detailed surveys for RTE and sensitive species habitats.

As discussed in Section D.7E Wetlands and Waterways, FRA delineated Wetland WP133 within the NTWSSC and SSPRA associated with Beck Branch, at the boundary of NPS and BARC properties. This wetland is characterized by the presence of a mature bald cypress (*Taxodium distichum*) stand and was identified by MDE for further investigation and avoidance measures. MDNR characterizes bald cypress swamps as unique ecosystems providing habitat for many rare, threatened or endangered species of plants and animals, noting that these systems are declining in numbers and size due to harvesting of wood and changes in hydrology related to development (see Attachment F for more information on bald cypress swamps).[49] If it is determined through coordination with MDE and DNR that this bald cypress stand is a naturally occurring community as opposed to a planted population, the Project Sponsor will need to coordinate further with MDNR and MDE regarding further actions.

Potential RTE Communities/Habitat at PRR

In addition to the RTE species identified by USFWS and MDNR above, PRR staff notified FRA of the presence of vernal pools, spring-fed wetland complexes, and forest stream complexes containing RTE and other at-risk plant and animal species (see Attachment F for a full list of PRR species and habitats of concern provided by

[47] Brown, M.L. & R. G. Brown. 1984. *Herbaceous Plants of Maryland*. Port City Press, Inc., Baltimore, MD.

[48] Brown, M.L. & R. G. Brown. 1984. *Herbaceous Plants of Maryland*. Port City Press, Inc., Baltimore, MD.

[49] MDNR WHS. n.d. *Rare, Threatened and Endangered Plant Fact Sheet: Bald Cypress Swamps*. Accessed October 2020. https://dnr.maryland.gov/wildlife/Pages/plants_wildlife/rte/rteplantfacts.aspx?PID=Bald%20Cypress%20Swamps

USFWS). Yellow lance (*Elliptio lanceolate*), a Federally endangered mussel species, has been found in surveys of the Patuxent River on the PRR property. Spotted turtle (*Clemmys guttata*), which is a petitioned species for listing, and the eastern box turtle (*Terrapene carolina carolina*), a designated species of greatest conservation need by the 2015 Maryland State Wildlife Action Plan, have also been known to use the habitats within PRR. Refer to RTE and coordination letters with detailed information in Attachment A.

Potential RTE Communities/Habitat at BARC

Like PRR, BARC property contains extensive undeveloped land and a notable variety of unique and sensitive species and habitats. The following documents describe significant species and communities that occur at BARC. Further coordination with BARC and other agencies and stakeholders would be needed to determine if any of the rare species or habitats identified in these research documents occur within the SCMAGLEV Project Affected Environment.

- A review of the *Annotated List of the Flora of the Beltsville Agricultural Research Center, Beltsville, Maryland* states that this list documents 901 plant species as occurring at BARC, including "13 lichens, 71 mosses, 24 ferns and fern-like relatives, 7 pines and pine-like relatives, and 786 seed plant species," of which 17 percent are identified as rare.[50,51]
- The *Upper Anacostia Watershed Plant Communities of Conservation Significance*[52] documents the presence of several significant plant communities at BARC, including:
    - Upland pitch pine (*Pinus pungens*) stands potentially associated with the globally rare pine barrens pine – oak community;
    - Pine barrens lowland forest, a globally rare community characterized as an unusual type of wetland dominated by pitch pine and deciduous hardwood species. This community was identified near the "Airport Bog on the East Farm at BARC";
    - An upland depression swamp potentially characteristic of the pin oak – swamp white oak seasonal pond community, identified as globally rare;
    - Potentially newly described floodplain forest community along Beaverdam Creek dominated by swamp chestnut oak (*Quercus michauxii*), red maple (*Acer rubrum*), black gum (*Nyssa sylvatica*), and tuliptree (*Liriodendron tulipifera*).

[50] Terrell, E.E., J.L. Reveal, R.W. Spjut, R.F. Whitcomb, J.H. Kirkbride, Jr., M.T. Cimino, and M.T. Strong. 2000. Annotated List of the Flora of the Beltsville Agricultural Research Center, Beltsville, Maryland. USDA, Agricultural Research Service, ARS-155.

[51] Becker, H. 2000. *First Ever Survey at Beltsville Farm Reveals Some Rare Species.* Accessed July 2020. https://www.ars.usda.gov/news-events/news/research-news/2000/first-ever-survey-at-beltsville-farm-reveals-some-rare-species/

[52] Teague, et al. 2006. *Upper Anacostia Watershed Plant Communities of Conservation Significance.* NatureServe, Arlington, Virginia.

- A published presentation[53] from the 2016 Maryland Native Plant Society Annual Fall Conference highlighted additional significant plant communities at BARC, including:
    - Pine barrens pine-oak woodland of the western shore, a globally and state-ranked rare community identified at the "Central Farm";
    - Sandy woodland gaps and edges supporting rare species such as grass-leaved golden-aster (*Pityopsis graminifolia* var. *latifolia*);
    - Lowland pine barrens of the western shore, located at the "Central Farm";
    - Pitch pine and sphagnum moss seepage areas supporting rare species such as small white-fringed orchid (*Platanthera blephariglottis*), located at the "Central Farm";
    - Acidic seepage swamp, pine barrens lowland forest, and bogs at the "Airport Bog" between Springfield Road and Powder Mill Road on the "East Farm."

Sensitive Species Project Review Area

SSPRAs are state and locally significant habitat areas including RTE species and their habitats, Natural Heritage areas, colonial water bird sites, NTWSSCs, habitat protection areas, areas subject to Critical Area review, and geographic areas of concern. Species and resources are categorized into one of four SSPRA Groups depending on their level of regulation and protection. Groups 1 and 2 contain species that are officially regulated, with federally listed threatened or endangered species classified as Group 1, and state-listed species and their habitats classified as Group 2. Group 3 includes species or resources of concern to MDNR that lack a Federal- or state-regulated status. Group 4 includes areas with bald eagle nests and suitable surrounding habitat.[54] Because SSPRAs are designated by the MDNR, none are identified in Washington, D.C.

FRA identified the following SSPRAs within the SCMAGLEV Project Affected Environment, as illustrated on mapping in the Baltimore-Washington SCMAGLEV DEIS Appendix B.3 Map Atlas:

- Baltimore City: A Group 2 SSPRA, likely associated with the peregrine falcon nest site, is located in the area proposed as the Camden Yards Station.
- Anne Arundel County: A Group 1 SSPRA is near the SCMAGLEV Project's intersection with Ridge Road (MD 713) which is likely associated with the swamp pink site. A Group 2 SSPRA is near the SCMAGLEV Project's intersection with the Little Patuxent River north of MD 198 (TMF site) and its intersection with PRR property just south of MD 198, likely associated with the NTWSSC downstream

[53] Simmons, R. 2016. *Vanishing Pine Barrens Communities of the Washington, D.C. Vicinity*. Presented at the Maryland Native Plant Society 2016 Annual Fall Conference. Accessed July 2020. https://www.mdflora.org/resources/Documents/Handouts/Vanishing%20Pine%20Barrens%20of%20the%20Washington,%20D.C.%20Vicinity.pdf

[54] Note: Although two bald eagle nesting sites were identified less than one mile of the SCMAGLEV Project Affected Environment (see Section D.7F.3.2), FRA did not identify any Group 4 SSPRAs within the SCMAGLEV Project Affected Environment.

of the SCMAGLEV Project. This Group 2 SSPRA also intersects the headwaters and wetlands on the Fort George G. Meade property. A small Group 3 SSPRA is also located at the eastern end of the MD 198 TMF along the Little Patuxent River.

- Anne Arundel and Prince George's County boundary: A large Group 2 SSPRA is partially within PRR, likely associated with the NTWSSC along the Patuxent River.
- Prince George's County: A large Group 2 SSPRA encompasses much of the BARC property, north of Powder Mill Road to south of Beaver Dam Road, including a portion of Springfield Park, likely associated with the NTWSSC along Beaverdam Creek. Another larger Group 2 SSPRA intersects the long-term construction laydown area near MD 200 and I-95, likely associated with state-listed plant species identified during previous regional transportation project coordination.

D.7E.4 Environmental Consequences

FRA evaluated the potential impacts to ecological resources as a result of the Build Alternatives. FRA concluded that impacts would occur in areas with surface disturbance to forests and other habitat components. The greatest potential direct impacts would occur in areas where permanent structures would replace habitat, in areas of vegetation removal or alteration of habitat (e.g., shading of normally open areas or forest fragmentation), and destruction of individual plants or animal habitats during construction. These impacts can be permanent, such as fill in wetlands, or temporary, such as alterations of habitat during construction that can be re-established when construction ends. Forest and other habitat fragmentation may also result in direct removal of functioning nesting and foraging spaces for terrestrial and aquatic species.

Indirect impacts include degradation of water quality or hydrologic changes on aquatic organisms. Indirect impacts also include effects of habitat disturbance, such as vegetation clearing and noise, on habitats and species beyond those immediately within and adjacent to the SCMAGLEV Project LOD. USFWS identified concerns with impacts to flying species from air force and suction from train speed and from potential construction and operational noise. FRA considered some of these effects to be temporary and identified appropriate measures the Project Sponsor will apply to mitigate indirect impacts.

FRA examined operational impacts that would result from ongoing, routine, and occasional activities associated with the SCMAGLEV Project and related services, as well as short-term impacts during SCMAGLEV Project construction. FRA's analysis focused on the following potential impacts:

- Changes in migration patterns and accessibility of habitat to fish, wildlife, or sensitive species.

- Current conditions of natural habitats and their proximity to the SCMAGLEV Project and how that could change important habitat characteristics (for example, water and air quality, noise and vibration, and water resources).
- The type and amount of habitat and potential impacts by direct removal, filling, hydrological interruption, or other means.
- Sensitivity of ecological conditions that may rely on soil type, quality, or characteristics specific to the area.

D.7E.4.1 No Build Alternative

Under the No Build Alternative, the SCMAGLEV Project would not be built and no impacts related to the construction or operation of the SCMAGLEV would occur. However, other planned and funded transportation projects would continue to be implemented in the area and could result in effects to ecological resources including disturbance to forest, FIDS habitat, RTE species, and habitat for other flora and fauna.

D.7E.4.2 Build Alternatives

The Build Alternatives would result in direct and indirect impacts to ecological resources. The subsections below describe potential SCMAGLEV Project impacts to forests and FIDS habitat, terrestrial and aquatic wildlife, and RTE species.

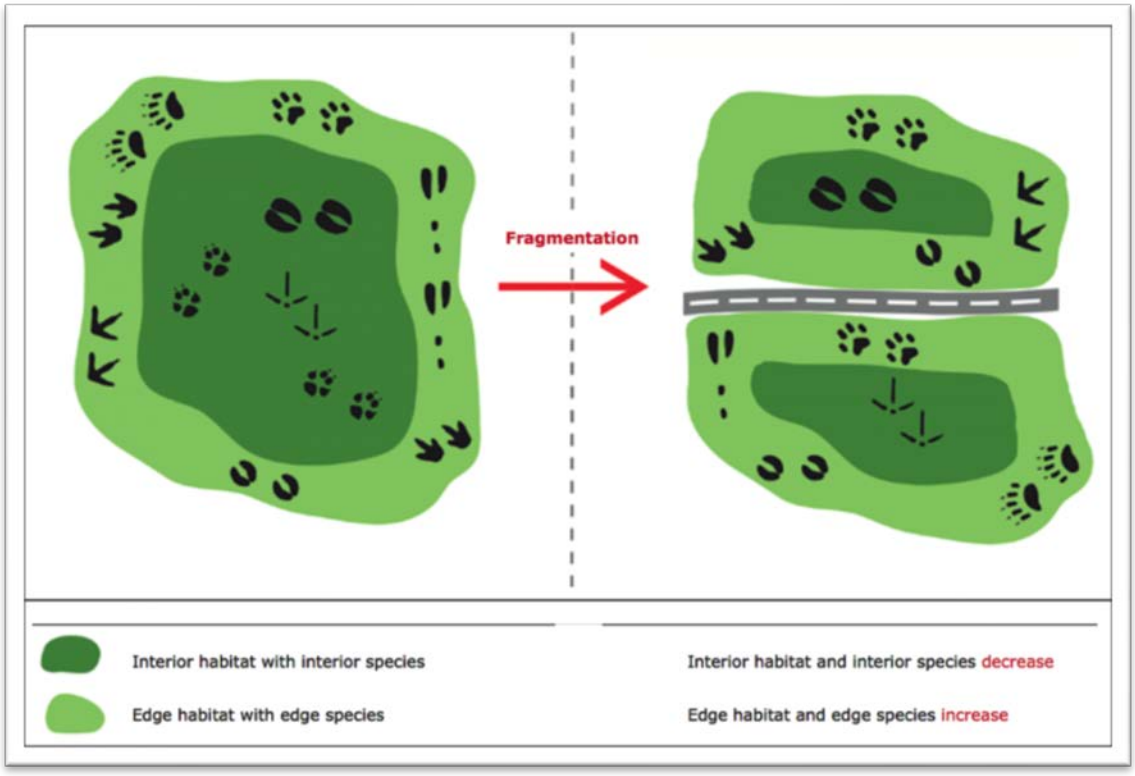
Summary of Build Alternative Impacts

- Build Alternatives J-01 through J-06 would result in forest, FIDS, and other sensitive species habitat impacts at PRR, a National Wildlife Refuge. Build Alternatives J1-01 through J1-06 would not result in impacts to PRR.
- Build Alternatives J1-01 through J1-06 would result in an estimated 40 acres of forest habitat impacts on City of Greenbelt property and an estimated 5 to 16 acres of forest impacts on MNCPPC park property, depending on Build Alternative. Build Alternative J would not result in impacts to these properties.
- The three TMF options would result in substantial impacts to forest, FIDS habitat, and SSPRAs. The BARC Airstrip TMF option would be the least impactful, with just under 100 acres of forest impact and approximately 93 acres of FIDS habitat. The other TMF options (BARC West and MD 198) would each impact over approximately 150 acres of forest and FIDS habitat. For SSPRAs, the MD 198 TMF would result in the fewest impacts at 59 acres, and BARC West would result in the greatest impacts at 157 acres.
- All Build Alternatives would impact forest, FIDS habitat, and SSPRAs along NPS property, but those associated the Build Alternatives J1 would incur greater impacts (46 to 47 acres) to SSPRAs than those associated with the Build Alternatives J (31 to 35 acres).

Forest and Forest Interior Dwelling Species

Clearing of forest and mature trees, even if replanted, would result in long-term impacts to adjacent and surrounding forest resources. Re-establishment of contiguous forest requires decades of woody and herbaceous plant growth and species succession, which can be undermined by competition from invasive vines and trees adapted to such disturbances. Adjacent forested areas not cleared as part of the SCMAGLEV Project may convert to fragmented forest unsuitable for FIDS. Edge forest habitat, while supportive of common avian and other wildlife species, allows for the introduction of invasive birds and plants that reduce the viability of FIDS habitat. Furthermore, depending on the location of impacts, the loss of FIDS habitat may be substantially larger than the acreage of forest removed because FIDS habitat is dependent on forest buffer presence and particularly sensitive to fragmentation (see **Figure D.7-22**).

Figure D.7-22: Edge Effect Impact to Forest Interior Habitat



Source: Food Climate Research Network (FCRN), Foodsource. Accessed October 2020.
https://www.foodsource.org.uk/54-how-do-food-systems-affect-land-use-and-biodiversity

With the removal of forest and FIDS habitat, noise associated with the operation of trains and ancillary facilities may also negatively affect FIDS species, which are adapted to interior forests buffered from the sounds of transportation and other human activities. Increased anthropogenic noise has the potential to disrupt typical species behavior, such as vocal communication and foraging, and result in reduced species abundance

and fitness.[55] Similar impacts may result from increased light pollution, which refers to the introduction of artificial light into these newly denuded forests. These species effects are discussed below.

An indirect impact of forest and FIDS habitat loss is the potential for change in species composition and a decrease in biodiversity, with a less complex vegetative structure. This change may result from increased light and wind or a decrease in humidity. There is then the potential for a ripple effect to other species in the area, both flora and fauna. These changes can make the ecosystem more vulnerable to invasive species and introduce more competing or predatory edge species. According to the CAC guidance, FIDS can help control insect numbers, insects that can prove harmful to human health, such as those which may carry disease.

The quantitative analysis of forest and FIDS provides acreage within the LOD of surface features only, which includes elevated viaduct and piers, transition portals and areas of cut and cover, maintenance-of-way (MOW) and fresh air/emergency egress (FA/EE) facilities, miscellaneous systems features, and TMFs. FRA recognizes however that FIDS may be impacted beyond these limits in many areas beyond the LOD, as much as 300 feet, as noted previously as favorable forest habitat conditions for FIDS.

Tables D.7-29 and D.7-30 provide acres of forest impacts, including forest fragments, and FIDS impacts by Build Alternative resulting from surface disturbance noted above, including the removal of forest or FIDS for short-term, construction-related activities. There are no forest impacts associated with the Mount Vernon Square East and BWI Marshall Airport Stations, or FIDS impacts associated with any station. FRA presents the FIDS impacts within the LOD as an approximation, as the MDNR datasets provide rough boundaries that in many locations have not been updated to account for new development and transportation systems. Site specific qualitative assessments of FIDS impacts are provided in the following sections. Acreage presented on all tables is rounded to the nearest whole number.

Table D.7-29: Build Alternative Forest Impacts Summary (acres)

Acres of Permanent Construction Impacts on Forest Habitat by Alignment, Station, and TMF							
Build Alternative	Alignment	Stations		TMF			Build Alternatives Total Permanent Acres of Impact
		Cherry Hill	Camden Yards	BARC Airstrip	BARC West	MD 198	
J-01	250	24	-	-	-	147	420
J-02	259	24	-	99	-	-	381
J-03	260	24	-	-	167	-	451
J-04	249	-	6	-	-	147	402
J-05	259	-	6	99	-	-	363

[55] A synthesis of two decades of research documenting the effects of noise on wildlife. Available at https://doi.org/10.1111/brv.12207. Accessed 9/4/20.

Acres of Permanent Construction Impacts on Forest Habitat by Alignment, Station, and TMF							
Build Alternative	Alignment	Stations		TMF			Build Alternatives Total Permanent Acres of Impact
		Cherry Hill	Camden Yards	BARC Airstrip	BARC West	MD 198	
J-06	260	-	6	-	167	-	432
J1-01	187	24	-	-	-	178	388
J1-02	202	24	-	98	-	-	324
J1-03	197	24	-	-	171	-	392
J1-04	187	-	6	-	-	178	370
J1-05	202	-	6	98	-	-	306
J1-06	197	-	6	-	171	-	374

Table D.7-30: Build Alternative FIDS Habitat Impacts Summary (acres)

Acres of Permanent Construction Impacts on FIDS by Alignment, Station, and TMF					
Build Alternative	Alignment	TMF			Build Alternatives Total Permanent Acres of Impact
		BARC Airstrip	BARC West	MD 198	
J-01	255			150	404
J-02	262	92			354
J-03	262		175		437
J-04	254			150	404
J-05	262	92			354
J-06	262		175		437
J1-01	172			157	330
J1-02	175	93			268
J1-03	171		180		352
J1-04	172			157	330
J1-05	175	93			268
J1-06	171		180		352

Table D.7-31 provides acres of forest impacts by Build Alternative for several notable local municipal properties. Only Build Alternatives J1-01 through J1-06 alignments would result in forest clearing on Maryland City and Patuxent River Parks on Anne Arundel County and MNCPPC properties, respectively. Build Alternatives associated with the MD 198 TMF would result in impacts to Anne Arundel County property along the Little Patuxent River.

Table D.7-31: Permanent Impacts to Forests on Local Properties (acres)

Build Alternative	Anne Arundel County	City of Greenbelt	MNCPPC	Prince George's County	WSSC
J-01	16	0	0	0	3
J-02	<1	0	0	<1	3
J-03	<1	0	0	<1	3
J-04	16	0	0	0	3
J-05	<1	0	0	<1	3
J-06	<1	0	0	<1	3
J1-01	43	39	16	<1	0
J1-02	20	42	5	<1	<1
J1-03	20	41	5	<1	<1
J1-04	43	39	16	<1	0
J1-05	20	42	5	<1	<1
J1-06	20	41	5	<1	<1

Table D.7-32 provides acres of forest impacts by Build Alternative for several notable Federal properties.

Table D.7-32: Permanent Impacts to Forests on Federal Properties (acres)

Build Alternative	NPS	NASA*	BARC	Secret Service	PRR	NSA/Ft. Meade	US General Services	FDA	USACE	Cryptology Museum
J-01	85	13	32	5	31	23	90	0	0	<1
J-02	69	34	101	11	30	23	8	0	0	<1
J-03	70	13	160	7	30	23	8	1	34	<1
J-04	85	13	32	5	31	23	90	0	0	<1
J-05	69	34	101	11	30	23	8	0	0	<1
J-06	70	13	160	7	30	23	8	1	34	<1
J1-01	80	<1	27	0	0	8	82	0	3	0
J1-02	68	21	88	4	<1	8	0	0	<1	0
J1-03	72	<1	144	0	0	8	0	2	36	0
J1-04	80	<1	27	0	0	8	82	0	3	0
J1-05	68	21	88	4	<1	8	0	0	<1	0
J1-06	72	<1	144	0	0	8	0	2	36	0

*The BARC Airstrip TMF footprint includes impacts to forest resources, specifically associated with Build Alternatives J-02, J-05, J1-02, and J1-05. This proposed TMF is located on a parcel that NASA currently leases from BARC. Therefore, approximately 21 acres of forest impacts identified on NASA property is associated with the BARC lease area.

FRA will consider Site Design Guidelines published by the CAC for protection, minimization, and mitigation for the loss of FIDS habitat. It is anticipated that there

would be an adverse effect on forest and FIDS as a result of the SCMAGLEV Project, however minimization and mitigation measures are viable as described further in Section D.7F.5.

Alignments

Forest clearing, grading, and land development associated with the alignments would directly remove forest and FIDS habitat. Build Alternatives J alignments would have approximately 30 percent more impacts to forests and approximately 50 percent more impacts to FIDS habitat than Build Alternatives J1 alignments. See **Tables D.7-31** and **D.7-32** for calculation of forest and FIDS habitat impacts on public property (primarily Federal and local properties), which generally encompass the largest areas of contiguous forest. Distinguishing factors for impacts to forest and FIDS include the following:

- The greater forest and FIDS impact with the Build Alternatives J alignments is largely due to the amount of contiguous forest impacts proposed on PRR (only impacted by the Build Alternatives J alignments) and Fort George G. Meade / NSA properties (larger impacts from Build Alternatives J alignments). Forest impacts on Fort George G. Meade property would diminish and fragment the forested buffer and wildlife corridor that separates the military base from the BWP. At PRR, USFWS staff have stated that the footprint of disturbance from construction of permanent structures, even if partially replanted, would have an undesirable effect on the maintenance of productive and potentially irreplaceable relationships among canopy trees, co-dependent vegetation, root structure, and soil characteristics that have developed over generations.
- Although Build Alternatives J1-01 through J1-06 have less overall forest and FIDS habitat impacts, only the Build Alternatives J1 alignments would result in forest clearing on City of Greenbelt property (approximately 40 acres) and at Maryland City and Patuxent River Parks in Anne Arundel County and Prince George's County, respectively.
- Local property/park impacts with the Build Alternatives J1 alignments are smaller in size and existing acreage than the larger Federal properties and would experience a greater percent loss of forest per property, and remove existing forest buffers between more residential land uses and the existing transportation corridor along BWP.
- One example where the impact to FIDS habitat would be similar per any Build Alternative, however the quantitative calculations are likely underestimated per this methodology, is evident just north of Veterans Highway (represented in Attachment F Forest Resource Map Sheet 3). This area, called Martins Woods Park, is bound on all sides by either roadway or residential development. A FA/EE and access road is proposed. When considering a 300-foot buffer from development to the interior of the forest, with this bound on all sides by development, this location becomes much less viable to maintain FIDS. With the increase of edge and/or invasive species and competition, increased noise from proposed SCMAGLEV operations, decreased vegetated buffer from the

surrounding residential and commercial land uses, species currently occupying this area may be driven out completely.

- Approximately 12.5 acres of forest would be removed from Maryland City Park for the MOW associated with J1-01 through J1-04. The same acreage of forest impact is proposed to NPS property for the MOW for J-01 through J-04.
- Although all Build Alternatives result in considerable impacts to contiguous forests on NPS and BARC properties, the alignments in these locations are closely associated with the existing forest edges along the BWP. FRA's intent with alignment selection along the existing transportation corridor was that it would decrease the acreage of forest impact required and attempt to avoid greater fragmentation.
- All Build Alternatives would result in impacts to forest conservation easements.
    - Those associated with Build Alternatives J1 alignments would result in greater acreage of impacts (approximately nine to 13 acres, versus approximately three to six acres from those associated with J alignments), specifically due to impacts from the portal, SWM facility, construction laydown, and other SCMAGLEV Project elements proposed in Maryland City Park in Anne Arundel County.
    - Despite the greater acreage of impacts, Build Alternatives J alignments would result in impacts to nine to 10 forest conservation easement parcels versus seven to 10 parcels for Build Alternatives J1 alignments.

Stations

The four stations associated with the Build Alternatives would not impact FIDS habitat, as the stations are in primarily unforested or already forest fragmented areas. However, between the Baltimore-area station options, the Cherry Hill Station would impact approximately 24 acres of forest and forest fragments, which is three times the impact associated with the Camden Yards Station. No forest impacts are associated with the Mount Vernon Square East or BWI Marshall Airport stations, and none of the four stations would impact forest conservation easements.

TMFs

All three TMF options would require extensive clearing of over 90 acres of forest and FIDS habitat. A comparison of the impacts includes the following:

- MD 198 and BARC West TMFs each have about 60 percent more forest impacts than the BARC Airstrip TMF, including impacts to the seven-acre reforestation mitigation site identified by BARC staff.
- MD 198 and BARC West TMF are roughly comparable in their proposed FIDS habitat impacts of between 150 to 180 acres, respectively. The BARC Airstrip TMF results in fewer impacts to FIDS habitat (92 to 93 acres).
- The MD 198 TMF would result in approximately 20 acres of permanent impact to a Maryland Environmental Trust Easement.

- The MD 198 TMF would result in impacts to three to four forest conservation easements.

Both direct and indirect effects of deforestation as a result of any TMF have been discussed previously in Chapters 4 and 5 as well as detailed within this chapter below. In summary, these effects include, but are not limited to, forest fragmentation, changes in biodiversity, invasive species introduction, weather effects such as sunlight and wind, precipitation and stormwater, alteration in water chemistry and quality, and human effects from noise and artificial light.

Terrestrial and Aquatic Wildlife

The Build Alternatives would directly impact terrestrial and aquatic resources, including a diverse array of habitats for terrestrial and aquatic wildlife, primarily through the removal of habitat for the proposed above-ground structures. Removal of vegetation would temporarily (if restored post-construction) or permanently (if not) remove specific forest, scrub-shrub, wetland and/or meadow habitats critical for the nesting, foraging, and refuge of migratory birds, raptors, reptiles, amphibians, bats, pollinator species, mammals, and other faunal species. Permanent fragmentation of habitat resulting from clearing and construction may undermine the viability of some wildlife populations and allow for the establishment and/or dominance of invasive species in areas currently valued for their native species communities. Indirect effects of the SCMAGLEV Project include potential changes in water quality, which could adversely affect state-monitored fisheries and further degrade benthic habitat in the major streams and tributaries within and downstream of the SCMAGLEV Project Affected Environment. Short-term and long-term displacement of plant and animal species would result in further loss of species diversity, which can disrupt food webs and create the potential for undesirable species introduced to the environment. See Attachment F for temporary and permanent impact summaries for scrub-shrub and field habitats.

Fencing would be installed along discrete segments of the proposed ROW, including at tunnel transition portals, open cut sections, restricted areas associated with stations and facilities, other sensitive aboveground locations, and as needed for safety. Fencing proposed in low-development areas could impact wildlife habitat access and movement.

The SCMAGLEV Project LOD avoids direct impacts to the two bald eagle nesting sites identified within a mile of the SCMAGLEV Project Affected Environment. Construction and operation activity are unlikely to exceed current activity levels closer to the nesting sites, and thus not likely to disrupt nesting behavior. There are multiple patches of forest and agricultural or open space located between the identified nests and the proposed elements, providing the bald eagles appropriate adjacent habitat and buffer from the SCMAGLEV Project. The nest along Beaverdam Creek is greater than 0.6 mile from any proposed project element. The nest along the Patapsco River is greater than 0.3 mile from any propose project element, with the I-895/MD295 interchange between the nest and the SCMAGLEV Project. Upstream impacts to water quality have the potential to negatively affect bald eagle aquatic food sources, as bald eagles' primary food is fish (see Section D.7D Water Resources for further discussion on water quality).

The effects of increased noise may not only impact FIDS that require greater depth of forested habitat described previously, but other terrestrial and aquatic species. Surrounding changes and increases in noise may affect how species search for food, avoid predators with the protection of vegetation or call out in distress, or seek a mate for reproduction through their sound. Species may have to adjust their vocal behaviors to adapt to the increased human noises in their surroundings, which could put them in danger and ultimately affect their populations. The Federal Highway Administration has conducted studies to determine the potential effects of noise on wildlife.[56] This can prove useful in areas that have been dominated by human noises in an industrial area for example, which would be able to account for potential impacts surrounding the MOW's or TMF locations for the SCMAGLVE Project. Studies regarding the effects of noise on wildlife however are limited, existing to some extent for road traffic, aircraft, and ships. The effects from the elevated viaduct or tunneling would require more detailed studies on noise level effects to wildlife to more accurately represent the indirect impacts to certain species. With final design and selection of a preferred alternative, additional species and habitat surveys would support a more thorough investigation as to the noise effects of the SCMAGLEV system on wildlife. Noise studies completed for the SCMAGLEV Project indicate that airborne noise impacts may extend up to 2,100 feet from the guideway. Additional operational research and study would be required to provide a more detailed analysis of the proposed systems effects on species, FIDS in particular.

Additionally, the effects of light pollution may affect species in areas where forest clearing has occurred and there has been an introduction to artificial lights. Humans and wildlife perceive light differently. Artificial light may also disrupt critical behaviors and cause physiological changes in wildlife.[57] These effects can be difficult to measure and regulate, however there are studies that can provide guidelines to support design measures to reduce light pollution.

The following subsections describe terrestrial and aquatic wildlife impacts of the alignments, stations, and TMF, which generally align with the impact discussions associated with forest impacts, RTE impacts, and wetland and water resources impacts presented in Section D.7D Water Resources and Section D.7E Wetlands and Waterways.

Alignments

Build Alternatives associated with the J alignments would result in greater overall habitat impacts than those associated with the Build Alternative J1 alignments, primarily because it has a longer above-ground viaduct and includes direct impacts to PRR, in addition to BARC, NPS, and Fort George G. Meade/NSA properties, all large areas of existing natural communities. The direct loss of habitat causes a direct loss of species

[56] U.S. Department of Transportation Federal Highway Administration. Noise Effect on Wildlife. Accessed at https://www.fhwa.dot.gov/environment/noise/noise_effect_on_wildlife/effects/wild04.cfm

[57] Australian Government Department of the Environment and Energy Department of Biodiversity, Conservation and Attractions. National Light Pollution Guidelines for Wildlife. January 220 Version 1.0.

who may rely on that habitat. Additional impacts of the proposed alignments include the following:

- Permanent clearing of forest canopy along the Build Alternatives J alignments at PRR may result in detrimental effects in areas supporting vernal pools, where USFWS staff and wetland delineation field assessments identified the presence of such habitat. This may affect the breeding success of local amphibian populations, particularly for species only adapted to a shaded environment.
- Build Alternatives J alignments would impact non-forested areas of PRR, particularly the BGE ROW that is managed for shrub-dependent bird species and pollinators.
- An assigned bald eagle nest is located approximately 2,000 feet from a proposed fresh air emergency egress (FA/EE) associated with all Build Alternatives located immediately north of the Patapsco River and south of I-895. The alignment is located underground at this location. Existing noise levels near I-895 is 72 to 75 decibels (dBA). Future operational noise is estimated to be approximately 66 dBA, with temporary construction noises for the FA/EE reaching approximately 70-74 dBA. Therefore, the FA/EE is not anticipated to impact this resource, as the proposed structure would be located in an existing area of industrial and commercial development. If blasting will be required for any construction, which would be assessed post future ground/geotechnical investigations, this would be re-evaluated. The National Bald Eagle Management Guidelines advise against blasting within 0.5 miles of bald eagle nests during the breeding season.
- As assigned bald eagle nest is located approximately 5,000 feet from Build Alternative J-01 through J-06 viaduct and 3,500 feet from a viaduct laydown area. This nest is also located approximately 5,500 feet from Build Alternatives J1-01 through J1-6 viaduct. Adjacent undeveloped habitat provides a sufficient buffer between the nesting site and the SCMAGLEV Project, so no impacts are anticipated.
- Build Alternatives J alignments would directly impact the NTWSSC located on PRR, southeast of the viaduct crossing of the Patuxent River, with potential impacts to a GBH colony site.
- All Build Alternative alignments would directly impact the NTWSSC located on BARC property, associated with Beaverdam Creek. With the placement of piers potentially within these sensitive habitats and clearing of vegetation (including forests, as discussed above) for construction needs and potential continuing maintenance needs along the alignment, a direct impact would result to NTWSSC sensitive species.
- Water-related impacts associated with Build Alternatives J alignments crossing the Little Patuxent River upstream of the Patuxent River NTWSSC could result in indirect adverse effects to sensitive species and habitats.
- Impacts to waterways from the Build Alternative alignments may include shading of wetlands and streams by overpassing structures, increased sunlight from riparian vegetation removal, and potential waterway relocations necessary at

various locations, such as for the Build Alternatives J alignments portal area at Fort George G. Meade. These impacts may induce changes to water quality and hydrology due to grading, which could impact aquatic organisms and plant communities dependent on pre-construction hydrologic conditions.

Stations

The Mount Vernon Square East and BWI Marshall Airport Stations would have no impacts on terrestrial and aquatic wildlife, as these stations are in areas of urbanized land uses and impervious surfaces, not located near terrestrial and aquatic wildlife habitats.

Impacts to habitats associated with the Cherry Hill Station and Camden Yards Station would likely include shading of wetlands and streams by overpassing structures, increased sunlight from riparian vegetation removal, potential waterway relocations, and loss of remnant forest and hedgerow habitats. Features associated with both Baltimore area stations occur adjacent to the Gwynns Falls and Patapsco River (Middle Branch) and may result in impacts to remnant vegetative and aquatic habitats associated with these waterbodies.

TMFs

All three TMFs would impact diverse terrestrial and aquatic habitats primarily through clearing, grading, and creation of impervious surface. Each TMF proposes at least 90 acres of forest habitat removal and at least 20 acres of wetland impacts, including impacts to NTWSSC and other sensitive species habitats. Forest and water-related impacts associated with and surrounding tributaries at each TMF site could result in indirect adverse effects to sensitive species and habitats, with the same adverse impacts noted previously. Although the BARC Airstrip may result in 50 to 60 percent fewer acres of forest and FIDS habitat removal, this TMF option would result in the largest impact to the Beaverdam Creek NTWSSC, including disruption to the system's forested headwaters with new developed impervious surface.

An assigned bald eagle nest is located within 5,000 feet from Build Alternative J-06 and J1-06 MOW facility associated with the BARC West TMF. Adjacent undeveloped habitat provides a sufficient buffer between the nesting site and the SCMAGLEV Project, so no impacts are anticipated.

Rare, Threatened, and Endangered Species

While efforts would be made to avoid and minimize impacts to RTE species and their habitats, each Build Alternative removes, fragments, disturbs, and/or otherwise affects sensitive wildlife habitats, specifically:

- Northern long-eared bat: Depending on the proximity of SCMAGLEV Project forest removal activities, locations of summer roosting areas may be directly or indirectly affected through immediate loss of forest or the presence of adjacent temporary construction disruption or new structures.

- Swamp pink: The Project Sponsor will avoid impacts to the swamp pink population and associated wetland hydrology near the Harmans area.
- Peregrine falcon: Project activity in downtown Baltimore is not expected to exceed typical noise or disturbance conditions associated with the nesting area.
- At PRR, BARC, and within NTWSSCs supporting RTE plant, odonate, and fish species, SCMAGLEV Project disturbance may result in direct impacts to species populations that rely on forested uplands and wetlands, vernal pools, or riparian areas during any part of their life cycles, specifically:
    - RTE fish, odonate, and mussel species associated with Dorsey Run, Little Patuxent River, Patuxent River, Beaverdam Creek, and/or associated tributaries are particularly sensitive to sedimentation and siltation, disturbance to sand/gravel stream bed conditions, changes in hydrology, water quality degradation, increased stream temperatures, and loss of riparian vegetation. SCMAGLEV Project disturbance, including forest clearing, runoff from permanent structures, and stream crossings would result in direct and indirect impacts to RTE fish populations.
    - RTE odonate (dragonfly) species associated with these waterways are "considered highly sensitive to changes in hydrology and water quality, especially during their aquatic larval stages," according to MDNR WHS (October 22, 2020 letter). Important habitat elements include streambed habitat and riffles, small headwaters for life cycle migratory patterns, and perching areas along the shoreline.
- RTE plant species and globally rare natural communities associated with wetland hydrology, most notably along the Patuxent floodplain and throughout the BARC property, are particularly vulnerable to direct impacts from SCMAGLEV Project elements that will result in direct removal of vegetation, filling surface water areas, altering above and below ground hydrology, or contributing runoff to these areas. RTE plant species and globally rare natural communities associated with upland areas would also experience direct impacts resulting from vegetation removal and potentially from changes in grade.
- If potentially rare vegetation communities occur at BARC within the SCMAGLEV Project Affected Environment, they may be directly or indirectly impacted by project construction and operation.

The SSPRAs that intersect the surface components of the Build Alternatives are closely associated with sensitive species and habitats described above (FIDS, NTWSSCs, RTE species, fisheries). Temporary and permanent impacts to SSPRAs are presented in Attachment F. **Table D.7-33** provides acres of SSPRA impacts by Build Alternative for several notable Federal properties.

Table D.7-33: Total Impacts to SSPRAs on Federal Properties (acres)

Build Alternative	NPS	NASA	BARC	Secret Service	PRR	NSA/Ft. Meade	US General Services	FDA	USACE
J-01	34	<1	24	1	28	1	35	0	0
J-02	31	5	131	3	28	1	5	0	0
J-03	35	<1	151	1	28	1	5	2	33
J-04	34	<1	24	1	28	1	35	0	0
J-05	31	5	131	3	28	1	5	0	0
J-06	35	<1	151	1	28	1	5	2	33
J1-01	47	0	30	0	0	1	29	0	3
J1-02	46	4	131	2	0	1	0	0	<1
J1-03	46	0	149	0	0	1	0	2	34
J1-04	47	0	30	0	0	1	29	0	3
J1-05	46	4	131	2	0	1	0	0	<1
J1-06	46	0	149	0	0	1	0	2	34

RTE species are of particular concern as their declining populations or limited habitat may already be threatened. Therefore, the SCMAGLEV Project requires continued coordination with MDNR, National Marine Fisheries Service (NMFS), and USFWS, including ESA Section 7 consultation, to refine impacts, construction and design BMPs, and mitigation plans, as discussed in Section D.7F.5. FRA anticipates that specific species surveys would be required throughout the SCMAGLEV Project LOD and/or specifically on identified properties within the LOD.

Alignments

Surface disturbances associated with the viaduct crossings of the Little Patuxent River, the Patuxent River (at the NTWSSC), and Beaverdam Creek (at the NTWSSC) have the potential to adversely impact RTE species of odonates, fish, and an aquatic plant.

- The MDNR WHS identified 14 species and potentially two GBH colonies that may be impacted due to Build Alternatives J alignments crossing the Little Patuxent River. This would potentially be avoided by Build Alternatives J1 alignments that tunnels under the river, avoiding surface disturbance.
- All Build Alternatives include a proposed access road across Dorsey Run in the vicinity of Fort Meade, which would require vegetation removal and may result in impacts to water quality and habitat.
- Additional species of concern identified by USFWS may also incur detrimental impacts from Build Alternatives J alignments, largely through PRR property.
- The MDNR WHS identified 13 noted species that the existing NTWSSC associated with the Patuxent River may support as well as a GBH site. All Build Alternatives have the potential to impact these species. The MDNR WHS states that Build Alternatives J alignments would directly impact part of a population of state-listed rare dragonfly species. Refer to Attachment A for additional details.

- Build Alternatives J1 alignments would directly impact the Globally Rare Coastal Plain Oak Floodplain Forest natural community, located north of the Patuxent River.
- Impacts to the potentially native bald cypress swamp (Wetland WP133 on NPS and BARC properties) may result from construction of the viaduct associated with the Build Alternatives J alignments.
- Impacts to the two RTE species identified at the long-term construction laydown area near MD 200 and I-95 may result from construction activities.

Stations

MDNR WHS does not anticipate adverse impacts to the peregrine falcon nest site in Baltimore City from construction or operational activity associated with the SCMAGLEV Project, including the Camden Yards Station. RTE species and SSPRAs are not present at any other station.

TMFs

The MD 198 TMF would convert a large area of vegetated habitats, wetlands, and waterways within the SSPRA and upstream of the Little Patuxent NTWSSC into permanent surface features, resulting in the risk for habitat removal and localized species eradication. Direct impacts to the Little Patuxent River may threaten populations of RTE fish and odonate species. MDNR indicates the location of a GBH colony overlapping with the LOD of this TMF.

Likewise, construction of both BARC TMFs would have similar effects on the Beaverdam Creek NTWSSC, globally rare natural communities, and associated RTE species and GBH colonies. The BARC Airstrip TMF could result in greater threat to species as it impacts the headwaters to this waterway and its associated wetland and riparian habitat buffers. Fill within or adjacent to the north branch of Beaverdam Creek associated with the BARC West TMF could result in degradation of aquatic and riparian habitat sufficient to disrupt the local occurrence of American brook lamprey. Construction of either TMF on BARC property would result in grade changes, which would alter surface hydrology associated with sensitive species and habitats within and adjacent to the SCMAGLEV Project LOD. Groundwater and surface water changes, sedimentation, and nutrient runoff resulting from project elements may degrade suitable habitat for populations of White Fringed Orchid and acidic seepage fen and swamp communities, which are highly sensitive to these types of disturbances. More coordination and field surveys would be needed to determine if the BARC Airstrip TMF would impact the globally rare Pine Barrens Lowland Forest community near the “Airport Bog” or other notable communities identified on the “East Farm” or “Central Farm” at BARC.

D.7E.4.3 Short-term Construction Effects

The Build Alternatives have the potential for short-term impacts to ecological resources during construction. Construction activities for viaduct piers, tunnels, and other

structural components of the project would require temporary access, laydown/staging areas, and launching of tunnel boring machines and construction equipment. This results in additional habitat clearing and human activity, including the introduction of additional noise in sensitive habitats. Degradation of FIDS habitat will result during construction.

Temporary stream crossings for construction access would have short-term impacts to aquatic wildlife, including some species of fish, odonates, and mussels. Temporary disturbance to streambed habitat and hydrology may result from the use of stream diversions, temporary culverts, and other standard construction and access elements. The Project Sponsor would adhere to in-stream and near-stream BMPs and time of year restrictions for in-stream work.

Construction of the MD 198 TMF, BARC TMFs, and Build Alternatives J over the Patuxent River would potentially impact GBH colony sites. GBH colonies are sensitive to human activity, especially during the breeding season, and may disband if disturbed by nearby development.

D.7E.5 Potential Minimization and Mitigation Strategies

D.7E.5.1 Minimization

FRA has determined that the SCMAGLEV Project would impact ecological resources, including forest and FIDS; terrestrial and aquatic species and their habitats; and RTE species and habitats. The following section provides measures that the Project Sponsor has taken and will take to minimize impacts.

Following DEIS publication and selection of a Preferred Alternative, FRA will continue targeted coordination with USFWS, NPS, BARC, MDNR, NMFS, and other stakeholders in identifying future studies and coordinating impact avoidance, minimization, and mitigation efforts. FRA will continue ESA Section 7 consultation with USFWS and will also coordinate with the Migratory Bird Permit Office regarding the potential for bald eagle nesting sites and the need for an eagle conservation plan prior to the FEIS. To reduce the likelihood of an eagle take, additional consideration for implementation of carrion removal protocol will be addressed, as train strikes are a known source of mortality for bald eagles. Eagles tend to be struck when attempting to feed on remains of carrion.

FIDS habitat, other terrestrial and aquatic habitats, and RTE species and habitats (including SSPRAs) generally occur within the same largely forested areas within the SCMAGLEV Project LOD. Therefore, impacts to one of these sensitive resources is typically associated with impacts to one or more of the other resources, often also overlapping with NTWSSC. As a result, the Project Sponsor will have the opportunity to minimize impacts to multiple sensitive habitats when forest, FIDS or other sensitive habitat is avoided. Likewise, the Project Sponsor may have a compounded mitigation requirement in areas supporting multiple sensitive habitats.

An Invasive Species Control and Management Plan will be required for construction and operational activities on PRR property and anticipated within NPS, BARC, and other Federal lands. Similarly, the Critical Area Commission Site Design Guidelines should be considered, and invasive plant treatments considered for all project activities located within the Chesapeake Bay Critical Area. This is anticipated to include a minimum of five years of treatment, with multiple treatments within the growing season.

To minimize bisecting large areas of intact sensitive habitats, Build Alternatives J-01 through J-06 and J1-01 through J1-06 were located as close to existing transportation corridors as possible. In addition, large portions of the SCMAGLEV Project have been designed as guideway tunnels, with 75 to 83 percent of the Build Alternatives located in tunnel. As a result, habitats and sensitive species associated with the Anacostia River and Patapsco River crossings have been avoided. Additionally, based on agency input, the Project Sponsor revised the location of an ancillary facility to avoid impacts to the federally threatened swamp pink and extensive wetlands in the Harmans area of Anne Arundel County.

Although the SCMAGLEV Project would span across or tunnel beneath major waterways and their tributaries to avoid impacts to aquatic and riparian habitats, temporary construction-related instream activities may be necessary, as outlined in Section D.7E Wetlands and Waterways. The Build Alternatives largely avoid fisheries resources and migration paths associated with major stream systems and/or high-quality Tier II Waters (Anacostia, Patuxent, and Patapsco Rivers, Beaverdam Creek, Baltimore Harbor and tributaries) by tunneling below or spanning over the systems. FRA has considered ESD in planning and placement of piers to avoid and minimize impacts to wetlands and waterways to the extent possible. Because of the sensitive nature of these systems and their ecological surroundings, further ESD and additional BMPs to avoid greater impacts would be included during final design.

Short-term effects have less opportunity for indirect impacts compared to long-term effects because the Project Sponsor will employ specific construction related BMPs, per regulatory requirements and coordination with regulatory agencies, including:

Complying with time-of-year restrictions associated with streams, and for nesting and breeding habitats associated with sensitive species, including FIDS and GBH colonies.

- MDNR recommended a February 15 through June 15 time of year restriction for the protection of anadromous fish and yellow perch spawning activities. Minimizing impacts to active GBH colonies would require implementing a one-quarter-mile buffer around each colony and avoiding disturbance activities during the breeding season (February 15 through July 31, during any year). During final design, the Project Sponsor will conduct further coordination with MDNR to refine restrictions on allowable activities within this buffer.
- USFWS recommended time of year restrictions for breeding migratory birds (April through August) and breeding wintering birds (November through February) for forest clearing activities.

- Continued observation of bald eagle nesting sites and compliance with applicable National Bald Eagle Management Guidelines, including buffer recommendations, as appropriate to any findings.
- Developing construction sequencing to minimize effects to the same location continuously.
- Incorporating detailed erosion and sediment control (ESC) BMPs, including performing frequent inspection of BMPs to ensure their optimal performance and revegetating temporarily disturbed areas as soon as possible. Because many of the sensitive species and habitats identified by USFWS and MDNR are associated with wetland and waterway habitats, MDNR has requested strict adherence to all appropriate BMPs for sediment and erosion control during any ground disturbance or instream work, to minimize siltation that could adversely affect RTE aquatic species located upstream and downstream of the SCMAGLEV Project.

The Project Sponsor will also incorporate detailed stormwater BMPs into the final design and throughout all phases of construction to further minimize impacts to forests, habitats, and sensitive species. The location of permanent stormwater management features associated with the alignments are proposed within or adjacent to areas already proposed for surface disturbance. The Project Sponsor will approach design and development of TMFs, stations, and ancillary facilities with the goal of avoiding and minimizing impacts to forests, habitats, and sensitive species and will optimize opportunities to incorporate beneficial ESD to meet (and exceed where feasible) water quality-related requirements. The Project Sponsor will implement supplemental protection measures based on MDNR recommendations to prevent changes to wetland and stream hydrology and water quality and implementing environmentally sensitive design to manage stormwater in a way that mimics natural infiltration (see Section D.7D Water Resources for more discussion on stormwater).

Construction staging areas and access roads would coincide with existing infrastructure, where feasible, to minimize impacts to natural areas and therefore potential habitat. An existing gravel access road in the PRR/BGE ROW could be used during construction of the SCMAGLEV Project to minimize impacts, if agreeable by BGE. The Project Sponsor will also coordinate with the USFWS to identify and implement a designated route in existing access roads and maintenance locations of PRR, and with other land owners on properties with existing ecological resources to avoid impacts to habitats to the greatest extent practicable.

FRA will implement, as feasible, specific efforts to reduce FIDS habitat impact. Although no FIDS habitat impacts would occur within the Critical Area, FRA's impact minimization will consider the CAC Site Design Guidelines, which include but are not limited to:

- Limiting forest clearing to the minimum footprint of disturbance necessary;
- Maintaining forest canopy closure over access roads;
- Avoiding forest clearing during FIDS breeding seasons;

- Reestablishing forest cover using native tree and shrub species; and,
- Targeting forest reestablishment along riparian corridors, in gaps of existing forest, and abutting existing FIDS habitat.

Build Alternatives J-01 through J-06 would require more ecological coordination and surveys due to impacts at PRR. The Project Sponsor will coordinate with USFWS to conduct required surveys during the appropriate time of year to determine species presence/absence. USFWS has requested the following efforts to aid in identifying feasible avoidance, minimization, and mitigation measures for resources within and adjacent to the Project LOD:

- acoustic surveys and mist-netting for northern long-eared bat;
- surveys in the Patuxent River for yellow lance;
- large-diameter tree surveys; and
- delineation of vernal pools and RTE species wetlands.

USFWS also requested further assessment of the risk of collisions with birds, forest bats, and migrating pollinators, and opportunities to preserve forest edges and other vegetative buffer zones. Specifically, USFWS “seeks maximum protection of mature hardwoods in the riparian, upland and floodplain forest interior by maintaining a 300-meter buffer zone from disturbance edges” (USFWS Letter dated August 5, 2020; see Attachment A). Additionally, in coordination with USFWS, FRA may be required to find sensitive species, such as spotted or box turtles, to consider relocation of individuals prior to construction, with the understanding that species relocation poses disease transmission risks. The NPS has indicated that bat surveys should be more comprehensive, to include all declining bat species such as tricolored, Indiana, big brown, and little brown. NPS has also indicated that seeps and springs should be added to the list of surveys to aid in identifying feasible avoidance, minimization and mitigation measures. These habitats support a variety of species, including potential RTE species.

To eliminate or greatly reduce the impacts to birds due to direct strikes with moving rail cars, FRA examined mitigation techniques such as a form of shroud or hood over the guideway to prevent birds from accessing the vicinity of the moving train. Similarly, techniques such as bat gates can be considered at tunnel openings to prevent bats from entering.

Upon identification of a preferred alternative, the Project Sponsor will consider further details regarding fence design and siting in coordination with resource agencies and landowners to address concerns over wildlife passage and habitat fragmentation.

D.7E.5.2 Mitigation

Impacts to forest resources would require compliance with the Maryland FCA. As previously noted, the Project Sponsor will conduct a full FSD and specimen tree survey to identify forest stand impacts, specimen trees, priority retention areas, and reforestation requirements. The Project Sponsor will prepare a Forest Conservation

Plan (FCP) to identify areas of forest retention, reforestation, afforestation, and long-term protective measures, such as easements. As part of FCA compliance, the Project Sponsor will request a variance for any impacts to or removal of specimen trees. If a variance is granted, mitigation for specimen tree removal will be provided. The Project Sponsor will also mitigate for forest loss with onsite and offsite forest mitigation, with emphasis on expanding FIDS habitat in the region. Mitigation of impacts to forests would also include additional requirements associated with impacting existing forest conservation easements and tree conservation plans, if such areas cannot be avoided. Impacts to state and county-level forest conservation easements would require additional mitigation and coordination with MDNR and county agencies. These often require a greater mitigation ratio be applied to those areas. The Project Sponsor will also coordinate with MDNR and the MET regarding impacts to forest conservation easements. Additionally, property owners may require additional or separate mitigation for vegetation removal. US Secret Service would require a minimum 1:1 replacement for lost forest habitat with similar habitat.

The Project Sponsor will continue to coordinate with agencies and consider the following additional mitigation strategies during final design and construction planning:

- Onsite re-establishment of forest habitat, where feasible, including planting of trees of appropriate mature height under the guideway to provide contiguous canopy while maintaining the 13-foot clearance beneath the structure
- Offsite native plantings to expand and restore forests, FIDS, and riparian habitats within the watersheds
- Offsite protection of large tracts of high-quality forest that provide FIDS habitat
- Onsite and offsite wetland mitigation, whether through banking or permittee-created wetlands within the watersheds
- Tidal marsh restoration within or near the Baltimore Harbor, Patapsco River, and/or Anacostia River
- Onsite and offsite restoration of degraded stream reaches associated with the major river systems
- Coordination with USFWS to determine compensatory mitigation value and restoration opportunities for unavoidable impacts to large-diameter trees and areas of FIDS habitat encroachment at PRR. This analysis would consider ecological functions lost such as nesting habitat, carbon sequestration, oxygen production, and seed production (forest regeneration or wildlife food resource). Other factors may include a municipal function such as the ability to capture stormwater runoff or groundwater recharge and would the loss of these functions have a dollar value to the new artificially created municipal systems that may be required.
- Coordination with MDNR and county and local municipalities to identify ecological restoration priorities and consider funding agency and nonprofit community greening, water quality, and/or environmental education projects and programs

- Purchasing of intact forest and/or wetland complexes for placement in perpetual easement
- Invasive species management of onsite and adjacent habitats
- Funding ecological research and restoration at PRR and BARC

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