Chapter III.D: Water Resources – Fjord Trail North

A. INTRODUCTION

This chapter presents the existing conditions and assesses the Proposed Action's potential impacts on water resources, including groundwater, floodplains, surface waters, and wetlands, within the Fjord Trail North Corridor. An evaluation of the proposed Fjord Trail South is provided in Chapter IV.D, "Water Resources – Fjord Trail South."

METHODOLOGY

STUDY AREA AND EXISTING CONDITIONS

The study area for the evaluation of groundwater, floodplains, surface waters, and wetlands is the potential limit of disturbance for Fjord Trail North (also referred to as the Fjord Trail North Corridor) from Long Dock Park in the City of Beacon south to the north end of the Breakneck Connector and Bridge Project (BNCB) in the Town of Fishkill. The study area for surface waters includes the Hudson River adjacent to the Fjord Trail North Corridor, smaller streams that pass through the Fjord Trail North Corridor, and any reservoirs connected to those streams.

The following data sources were used to identify the existing conditions for groundwater, floodplains, surface waters, and wetlands along the Fjord Trail North Corridor:

- U.S. Environmental Protection Agency (USEPA) Sole Source Aquifer maps;
- U.S. Geological Survey (USGS) groundwater mapping tools for upstate New York, including the Upstate New York Surficial Aquifer Viewer and Detailed Aquifer Mapping Program in Upstate New York;
- New York State Department of Environmental Conservation (NYSDEC) Primary and Principal Aquifer maps and databases for Water Wells and Water Withdrawals;
- Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRMs);
- NYSDEC projections of sea level rise at 6 NYCRR Part 490;
- NYSDEC Environmental Resource Mapper and Hudson Valley Natural Resource Mapper (layers for state regulated freshwater wetlands, waterbody classifications for rivers/streams, significant natural communities, and rare plants or animals);
- U.S. Fish and Wildlife Service (USFWS) National Wetland Inventory (NWI) wetland maps;
- Wetland and surface water surveys conducted for the project in 2017 and 2019 (see **Appendix III/IV.D**); and
- Surface water mapping data from Dutchess and Putnam Counties GIS and client team.

REGULATORY CONTEXT

The Proposed Action must comply with federal, state, and, on privately owned property, local, environmental laws and regulatory programs that pertain to activities in and adjacent to coastal areas,[1] floodplains, wetlands, and surface waters. The anticipated permits and approvals required for the project are listed in Table II-1 in Chapter II, "Project Description," along with the agencies responsible for authorization. The section below provides a summary description of the environmental laws and regulatory programs that may apply to Fjord Trail North.

FEDERAL

Clean Water Act (33 USC §§ 1251 to 1387)

The objective of the Clean Water Act is to restore and maintain the chemical, physical, and biological integrity of the waters of the United States. It regulates point sources of water pollution, such as discharges of municipal sewage, industrial wastewater, and stormwater; the discharge of dredged or fill material into navigable waters and other waters of the U.S.; and non-point source pollution (e.g., runoff from streets, agricultural fields, construction sites, and mining) that enter waterbodies from sources other than the end of a pipe. Section 404 of the Clean Water Act requires authorization from the Secretary of the Army, acting through the U.S. Army Corps of Engineers (USACE) for the discharge of dredged or fill material into waters of the U.S. Under Section 401 of the Act, any applicant for a federal permit or license for an activity that may result in a discharge to navigable waters must provide to the federal agency issuing a permit a certificate that the discharge would comply with other sections of the Clean Water Act. Applicants for discharges to navigable waters in New York must obtain a Water Quality Certification from NYSDEC, as discussed below.

Rivers and Harbors Act of 1899

Section 10 of the Rivers and Harbors Act of 1899 requires authorization from the Secretary of the Army, acting through USACE, for the construction of any structure in or over any navigable water of the United States, the excavation from or deposition of material in these waters, or any obstruction or alteration in navigable waters of the United States. The purpose of this Act is to protect navigation and navigable channels. Any structures placed in or over navigable waters, such as pilings or bridge abutments, are regulated pursuant to this Act.

NEW YORK STATE

Protection of Waters (New York Environmental Conservation Law [ECL] Article 15, Title 5, Implementing Regulations 6 NYCRR Part 608)

NYSDEC is responsible for administering the Protection of Waters Act and regulations to govern activities on surface waters (rivers, streams, lakes, and ponds). The Protection of Waters Permit Program regulates five different categories of activities: disturbance of stream beds or banks of a protected stream or other watercourse; construction, reconstruction, or repair of dams and other impoundment structures; construction, reconstruction, or expansion of docking and mooring facilities; excavation or placement of fill in navigable waters and their adjacent and contiguous

[1] Chapter X, "Coastal Zone Management Program Consistency," evaluates the Proposed Action's consistency with the applicable policies of the New York State Coastal Management Program and the Local Waterfront Revitalization Program for the City of Beacon.

wetlands; and Water Quality Certification for placing fill or other activities that result in a discharge to waters of the United States in accordance with Section 401 of the Clean Water Act.

State Pollutant Discharge Elimination System (SPDES) (ECL Article 3, Title 3; Article 15; Article 17, Titles 3, 5, 7, 8; Article 21; Article 70, Title 1; Article 71, Title 19; Implementing Regulations 6 NYCRR Part 750)

Title 8 of Article 17, ECL, Water Pollution Control, authorized the creation of SPDES to regulate discharges to New York State's waters pursuant to a delegation by USEPA to New York State of permitting authority pursuant to the Clean Water Act. Activities requiring a SPDES permit, as authorized by NYSDEC, include point source discharges of wastewater into surface or groundwater of the state, constructing or operating a disposal system (sewage treatment plant), discharge of stormwater, and construction activities that disturb one or more acres.

Freshwater Wetlands Act (ECL Article 24, Implementing Regulations 6 NYCRR Parts 662, 663, and 664)

The Freshwater Wetlands Act, which seeks to preserve and protect the benefits that wetlands provide, requires NYSDEC to map freshwater wetlands in the State. Freshwater wetlands larger than 12.4 acres (5 hectares) in size, and certain smaller wetlands of unusual local importance, are protected under the Act along with a 100-foot adjacent area around the mapped wetland boundary. NYSDEC regulates these freshwater wetlands through its Freshwater Wetlands Regulatory Program. A permit is required for activities that would alter wetlands or land within the 100-foot wetland adjacent area.

In 2022, NYSDEC amended the Freshwater Wetlands Act to modify the way the program is administered and amended the regulations to include updated definitions and criteria for wetlands. As part of the statutory changes, on January 1, 2025, the NYSDEC freshwater wetland maps will become informational and any wetlands that meet the applicable definition and criteria defined in the new rule will be regulated by NYSDEC and subject to permitting, regardless of whether they appear on the maps. Small wetlands of "unusual importance" will also be regulated if they meet certain criteria. In 2028, the Freshwater Wetlands Act will be further updated to decrease the size threshold for regulated wetlands from 12.4 acres to 7.4 acres. Until these updated regulations come into effect, NYSDEC continues to administer the Freshwater Wetlands Act as described above.

New York State Community Risk and Resiliency Act (6 NYCRR Part 490)

NYSDEC's Community Risk and Resiliency Act (CRRA) was enacted to establish projections of sea-level rise for New York's tidal coast, including the main stem of the Hudson River. The CRRA established projected sea level rise levels for Long Island, New York City, the Lower Hudson River, and the Mid-Hudson River. Under this Part, the CRRA requires applicants for permits or funding to demonstrate that future physical climate risks due to sea level rise, storm surge, and flooding have been considered in the project design. NYSDEC and New York State Department of State (NYSDOS) have prepared guidance documents (i.e., State Flood Risk Management Guidance, Using Natural Measures to Reduce the Risk of Flooding) recommending flood-risk management elevations and the use of natural resilience measures, or actions that conserve, restore, or mimic natural landforms and processes to reduce climatic risks. NYSDEC may apply these guidelines in consideration of permit issuance and development of permit conditions intended to reduce significant future risk due to sea level rise, storm surge, or flooding.

LOCAL

Sections of the Fjord Trail North Corridor located within HHSPP would not be subject to local wetlands, floodplain, or surface water regulations. To the extent portions of the Fjord Trail North Corridor are located on private property, the following regulations would apply.

Freshwater Wetlands, Watercourse, and Water Body Law of the Town of Fishkill, Fishkill Code Chapter 82

The Town of Fishkill regulates activities in and adjacent to wetlands, watercourses, and waterbodies such that these resources are preserved, protected, and conserved and activities do not impact public safety or the natural environment or cause environmental degradation.

Flood Damage Prevention, City of Beacon General Legislation, Chapter 123

Chapter 123 "Flood Damage Prevention" of the General Legislation for the City of Beacon includes provisions that control the alteration of natural floodplains, stream channels, and natural protective barriers that accommodate floodwaters. This includes filling, grading, dredging, and other development that could increase erosion or flood damage.

Wetlands and Watercourses; hilltops, ridgelines, and steep slopes, City of Beacon Zoning Regulations §223-16

Under the zoning regulations for the City of Beacon, the City regulates the alteration of wetlands or watercourses such that these activities do not result in significant adverse effects to water recharge areas, water table levels, water pollution, aquatic animal and plant life, temperature, drainage, flooding, runoff, or erosion.

B. EXISTING CONDITIONS

GROUNDWATER

Groundwater is present in almost all bedrock and overburden (e.g., rock or soil overlying a mineral deposit) below the ground surface in the study area as a result of soil infiltration of precipitation and surface runoff to drainage courses, streams, and rivers during precipitation events. Geologic materials that can yield appreciable quantities of groundwater are referred to as aquifers. USEPA designates aquifers that supply at least 50 percent of the drinking water for the overlying area as Sole-Source Aquifers. NYSDEC identifies two categories of aquifers where groundwater resources are most productive and most vulnerable: 1) Primary Aquifers, which are "highly productive aquifers presently utilized as sources of water supply by major municipal water supply systems," and 2) Principal Aquifers, which are "aquifers known to be highly productive or whose geology suggests abundant potential water supply, but which are not intensively used as sources of water supply by major municipal systems at the present time." There are no Sole-Source, Primary, or Principal Aquifers in the study area (USEPA 2024, NYSDEC 2024) (see **Figure III.D-1**).

The primary source of groundwater within the study area is infiltration within recharge areas with groundwater flow toward the tributaries and the Hudson River, which is a regional groundwater discharge boundary. Upstream from the Fjord Trail North Corridor, Fishkill Creek flows over a surficial valley-fill aquifer consisting of alluvial silt and sand, glacial outwash, gravel, till, and other materials. The water table within this aquifer is gently sloping and directs groundwater flow towards streams into which discharge occurs (Moore et al. 1982). The Fjord Trail North Corridor

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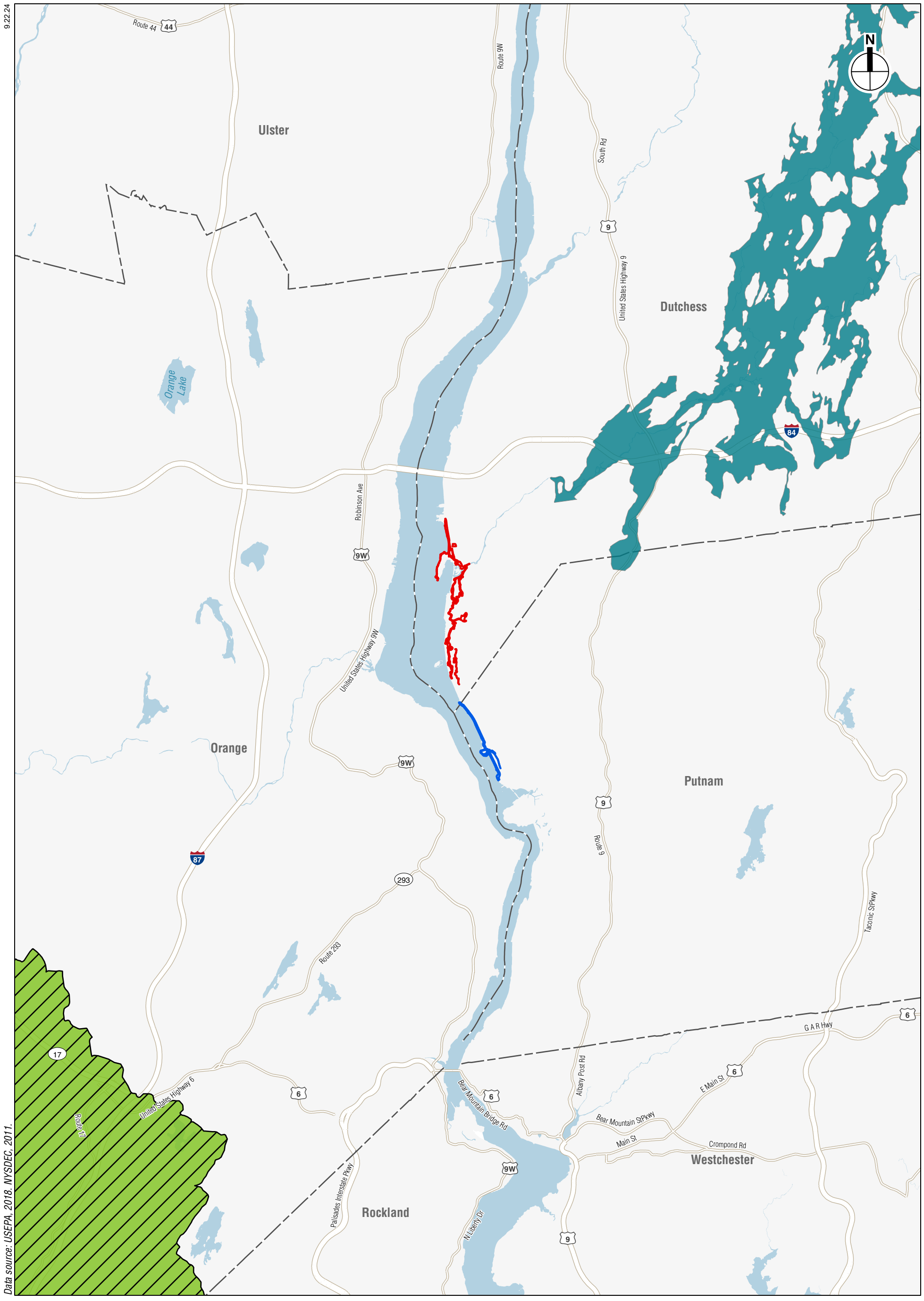

Data source: USEPA, 2018. NYSDEC, 2011.

HUDSON HIGHLANDS FJORD TRAIL

Sole Source Aquifers

Figure III.D-1

is located southwest of the surficial aquifer. The depth to groundwater within the study area is variable depending on the proximity to a surface waterbody and the amount of rainfall, stormwater runoff, and other seasonal factors.

FLOODPLAINS

The Fjord Trail North Corridor is represented by three FEMA floodplain maps (36027C0463E, 36027C0576E, and 36027C0578E updated 5/2/2012). Portions of the Fjord Trail North Corridor closer to the Hudson River, including sections connecting to the Klara Sauer Trail and Denning's Point and along Fishkill Creek, are within the 1-percent annual chance (100-year) floodplain in Zone AE (see **Figure III.D-2**). Zone AE identifies the area subject to inundation by the 1-percent annual chance flood event and is considered to be a special flood hazard area. Based on the FEMA floodplain maps listed above, the base flood elevation (BFE) for the areas of the Fjord Trail North Corridor in Zone AE is about +7 feet NAVD88.[2] Fishkill Creek is also designated as a Regulatory Floodway, defined as the channel of a river or other watercourse and the adjacent land areas that must be preserved to discharge the base flood without cumulatively increasing the water surface elevation beyond a designated height. Smaller areas on the border of Zone AE, including portions along Klara Sauer Trail and within Denning's Point and Madam Brett Park are within the 0.2-percent annual chance (500-year) floodplain (see **Figure III.D-2**), which is not assigned a BFE.

Because the Hudson River is a tidal estuary in the study area, it is affected by sea level rise and its shores are vulnerable to coastal flooding. NYSDEC has developed sea level rise projections for the Lower Hudson-New York City Region (6 NYCRR Part 490).[3] Under the High Scenario projections, sea levels are likely to increase by up to 23 inches by the 2050s, 45 inches by the 2080s, and 65 inches by 2100. Under current conditions, the highest BFE in the study area is estimated at +7.3 feet NAVD88 for portions of the Fjord Trail North Corridor located in Zone AE, as described above. The existing mean higher high water (MHHW) elevation, a representation of high tide, is +2.06 feet NAVD88, as determined through a site-specific survey conducted by the design team for the project. Based on the NYSDEC High Scenario projections, the 1-percent annual chance flood elevation for the Fjord Trail North Corridor could increase to +9.2 feet NAVD88 by the 2050s and +12.7 feet NAVD88 by 2100, and MHHW elevation could increase to +4.0 feet NAVD88 by the 2050s and +7.5 feet NAVD88 by 2100.

WETLANDS

NYSDEC WETLANDS

NYSDEC Regulated Freshwater Wetland maps obtained through its Environmental Resource Mapper indicate the presence of one 42.9-acre freshwater wetland (classified as wetland WT-1) within the study area at the mouth of Fishkill Creek (see **Figure III.D-3**). The limits of this wetland would be confirmed as the design advances for Fjord Trail North. Wetland WT-1 is a Class 2 wetland, which is the second highest category of wetlands based on the benefits and values they provide, and is therefore afforded a high level of protection. NYSDEC has also mapped areas of submerged aquatic vegetation within portions of the study area in the Hudson River and at the

[2] The base flood elevation is listed as +7.3 feet NAVD88 for Putnam County in FEMA's Flood Insurance Study #36079C0087E (effective March 4, 2013) and +7.2 feet NAVD88 for Dutchess County in FEMA's Flood Insurance Study #36027C0463E (effective May 2, 2012).

[3] https://dec.ny.gov/sites/default/files/2024-02/part490expressterms2024pub.pdf

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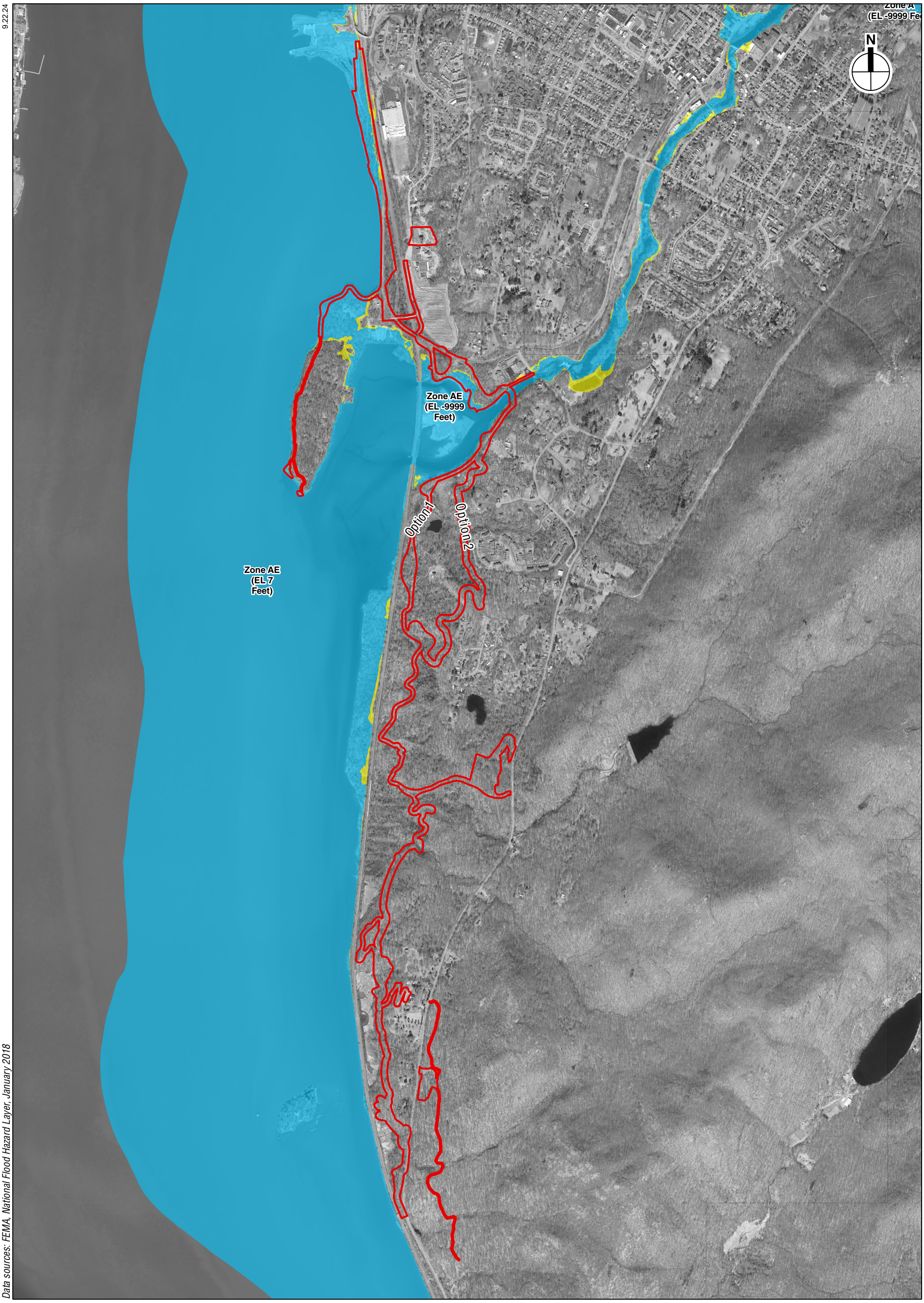

Data sources: FEMA, National Flood Hazard Layer, January 2018

Trail Corridor - Fjord Trail North

1% Annual Chance of Flooding

0.2% Annual Chance of Flooding

0 2,000 FEET

FEMA 100-year and 500-year Floodplains

HUDSON HIGHLANDS FJORD TRAIL

Figure III.D-2

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Data sources: New York State Department of Environmental Conservation, 2016

Trail Corridor - Fjord Trail North

NYSDEC Freshwater Wetlands

0 2,000 FEET

NYSDEC Regulated Wetlands

HUDSON HIGHLANDS FJORD TRAIL

Figure III.D-3

mouth of Fishkill Creek, which are described and evaluated in Chapter III.E, "Biological Resources – Fjord Trail North." There are no state-regulated tidal wetlands along the Fjord Trail North Corridor.

NWI WETLANDS

USFWS NWI wetland maps indicate that 16 types of mapped tidal wetlands and freshwater wetlands occur within the Fjord Trail North Corridor (see **Figure III.D-4** and **Table III.D-1**). The limits of any wetlands under USACE jurisdiction would be confirmed as the design advances for Fjord Trail North. The NWI-mapped tidal wetlands include estuarine and marine deepwater types, which generally comprise the Hudson River and areas around the mouth of Fishkill Creek. Freshwater wetland types present along the Fjord Trail North Corridor include riverine wetlands, freshwater forested/shrub wetlands, freshwater emergent wetlands, and freshwater ponds. **Table III.D-1** provides the wetland codes and descriptions for these types.

Table III.D-1
Federally Mapped Wetland Types Within the Study Area

Wetland Code	Wetland Type	Description
PFO1Ch	Freshwater forested/shrub	Palustrine (P), forested (FO), broad-leaved deciduous (1), seasonally flooded (C), diked/impounded (h)
PFO1C	Freshwater forested/shrub	Palustrine (P), forested (FO), broad-leaved deciduous (1), seasonally flooded (C)
PFO1A	Freshwater forested/shrub	Palustrine (P), forested (FO), broad-leaved deciduous (1), temporary flooded (A)
PFO1Eh	Freshwater forested/shrub	Palustrine (P), forested (FO), broad-leaved deciduous (1), seasonally flooded/saturated (E), diked/impounded (h)
PFO1/SS1Ah	Freshwater forested/shrub	Palustrine (P), forested (FO), broad-leaved deciduous (1), scrub/shrub (SS), broad-leaved deciduous (1), temporary flooded (A), diked/impounded (h)
PSS1E	Freshwater forested/shrub	Palustrine (P), scrub/shrub (SS), broad-leaved deciduous (1), seasonally flooded/saturated (E)
PEM1Eh	Freshwater emergent	Palustrine (P), emergent (EM), persistent (1), seasonally flooded/saturated (E), diked/impounded (h)
PEM1F	Freshwater emergent	Palustrine (P), emergent (EM), persistent (1), semipermanently flooded (F)
PEM1Fh	Freshwater emergent	Palustrine (P), emergent (EM), persistent (1), semipermanently flooded (F), diked/impounded (h)
PEM1C	Freshwater emergent	Palustrine (P), emergent (EM), persistent (1), seasonally flooded (C)
PUBHx	Freshwater pond	Palustrine (P), unconsolidated bottom (UB), permanently flooded (H), excavated (x)
R4SBC	Riverine	Riverine (R), intermittent (4), streambed (SB), seasonally flooded (C)
R5UBH	Riverine	Riverine (R), unknown perennial (5), unconsolidated bottom (UB), permanently flooded (H)
E2EM1N6	Estuarine and marine	Estuarine (E), intertidal (2), emergent (EM), persistent (1), regularly flooded (N), oligohaline (6)
E1ABL6	Estuarine and marine deepwater	Estuarine (E), subtidal (1), aquatic bed (AB), subtidal (L), oligohaline (6)
E1UBL6	Estuarine and marine deepwater (Hudson River)	Estuarine (E), subtidal (1), unconsolidated bottom (UB), subtidal (L), oligohaline (6)

Source: USFWS National Wetlands Inventory mapper, 2024 (fws.gov/wetlands/data/mapper.html)

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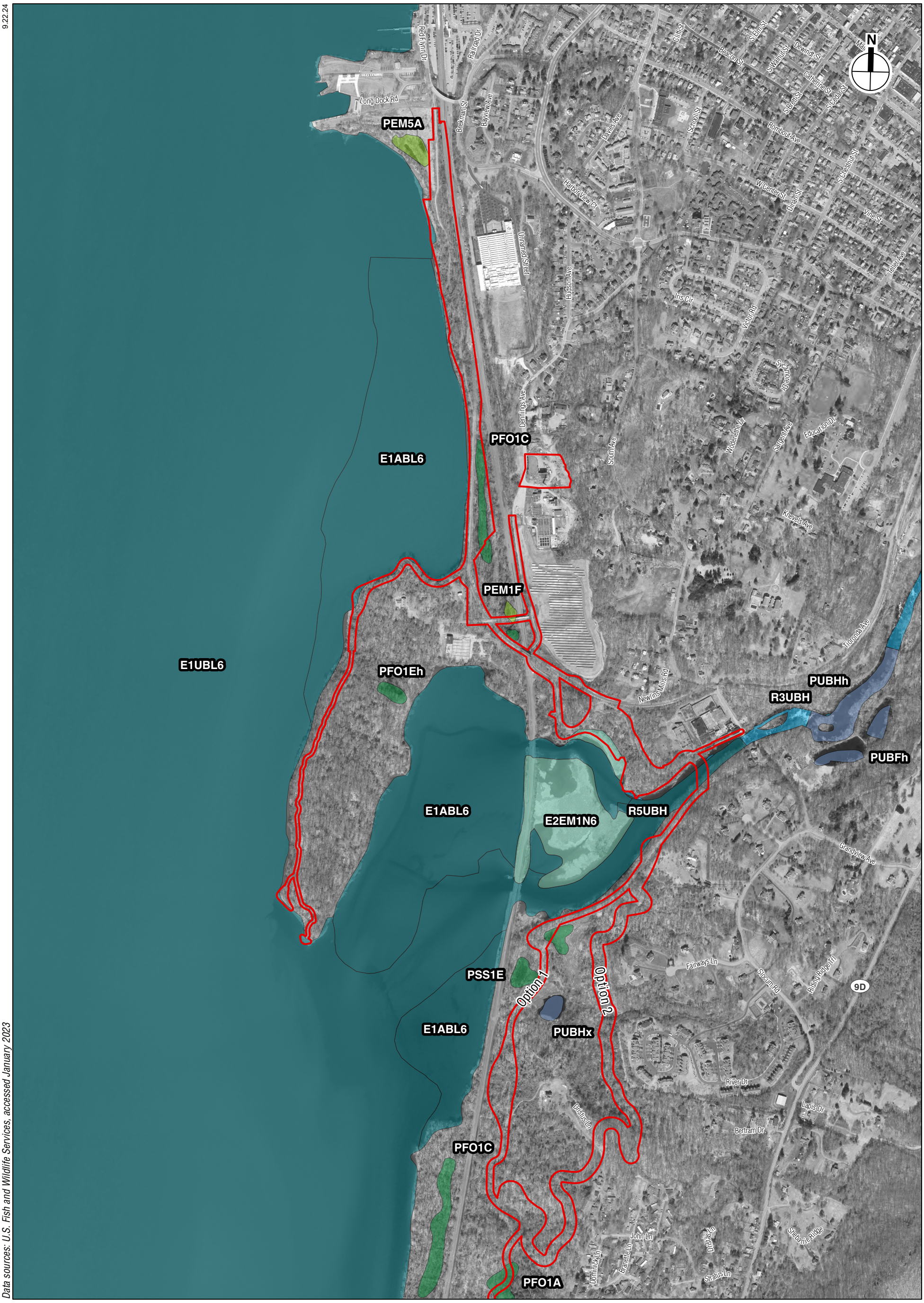

Data sources: U.S. Fish and Wildlife Services, accessed January 2023

- *Trail Corridor - Fjord Trail North*
- *Estuarine and Marine Deepwater*
- *Estuarine and Marine Wetland*
- *Freshwater Emergent Wetland*
- *Freshwater Forested/Shrub Wetland*
- *Freshwater Pond*
- *Riverine*

HUDSON HIGHLANDS FJORD TRAIL

NWI Wetlands

Figure III.D-4a

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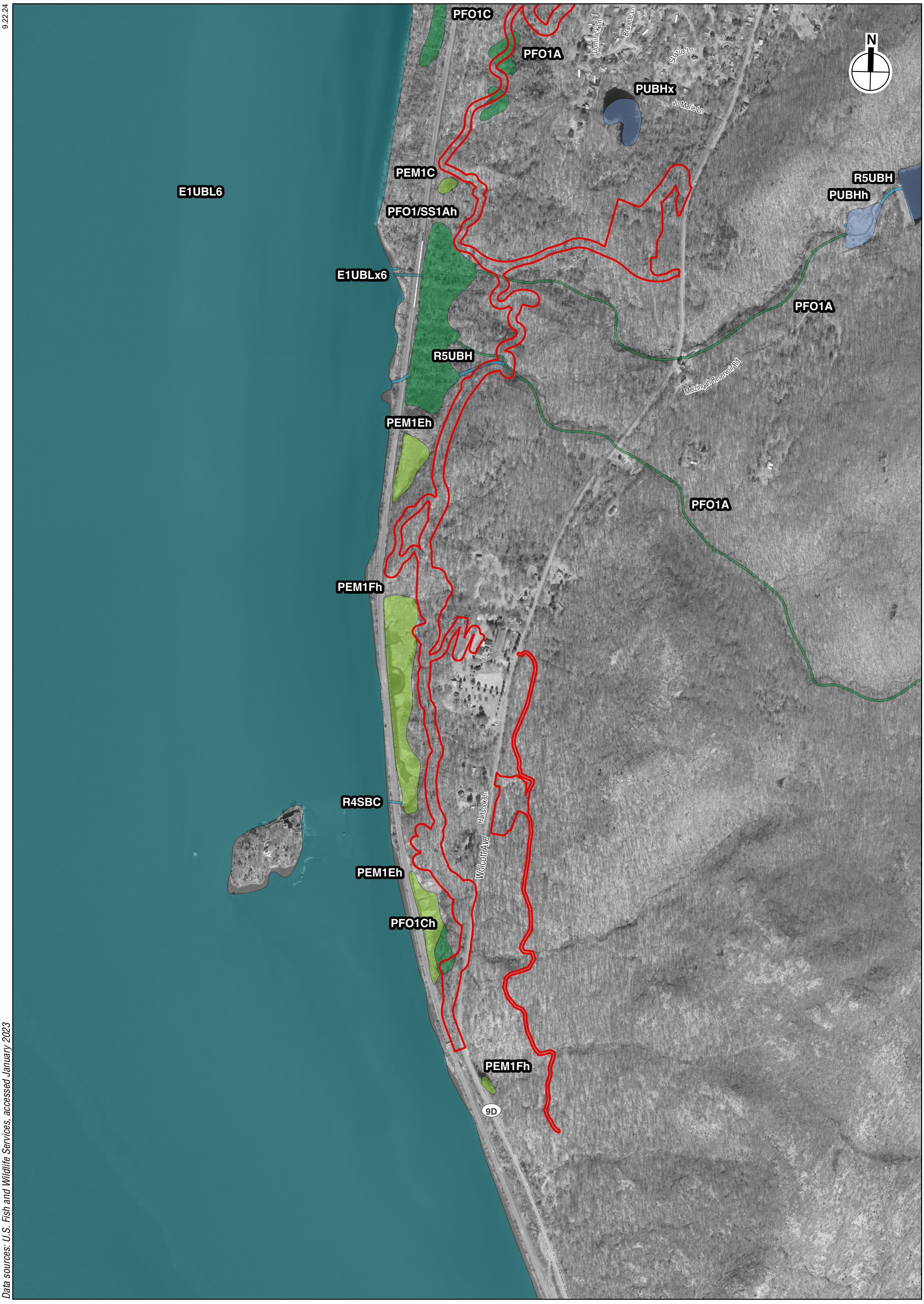

Data sources: U.S. Fish and Wildlife Services, accessed January 2023

Trail Corridor - Fjord Trail North
Estuarine and Marine Deepwater
Freshwater Emergent Wetland
Freshwater Forested/Shrub Wetland
Freshwater Pond
Riverine

0 2,000 FEET

HUDSON HIGHLANDS FJORD TRAIL

NWI Wetlands

Figure III.D-4b

DELINEATED WETLANDS

A wetland screening survey was conducted by the project team along the Fjord Trail North Corridor with a 50-foot offset applied to both sides of the proposed alignment in 2017 and 2019. The survey identified wetlands based on prevalence of hydrophytic vegetation and surface wetland hydrology indicators and did not identify soils or subsurface hydrological indicators. Locations were recorded by GPS points. Twenty-five potential wetlands were identified in 2017 and sixteen potential wetlands were identified in 2019. These wetlands are described, and their locations are depicted, in **Appendix III/IV.D**. Additional wetland surveys or delineations would be conducted to determine the specific boundaries of these areas within the Corridor, as needed, as the design for Fjord Trail North advances.

SURFACE WATERS

Much of the Fjord Trail North Corridor runs along or near the eastern shore of the Hudson River. Within the vicinity of the Fjord Trail North Corridor, the Hudson River receives freshwater input from various tributaries that flow in a generally west or southwesterly direction through the project area. In addition to the Hudson River, surface water resources in the study area include Wades Brook, Gordons Brook, Fishkill Creek, and lakes or ponds that are connected to these stream systems (see **Figures III.D-5a and III.D-5b**). Several reservoirs are also maintained to the east of the Fjord Trail North Corridor. These surface water resources are discussed further in the following sections.

WATERSHEDS

The Fjord Trail North Corridor is in the Lower Hudson River Watershed, which covers approximately 12,800 square miles and makes up about 40 percent of the larger Hudson/Mohawk River Basin. It covers the majority of Westchester, Putnam, Orange, Ulster, Columbia, and Albany Counties. The Lower Hudson River Watershed comprises the rivers and streams that flow to the Hudson River, including any ponds, lakes, and reservoirs in their path. The Fjord Trail North Corridor passes through two sub-watersheds of the larger Lower Hudson River Watershed: Breakneck Brook-Hudson River and Wiccopee Creek-Fishkill Creek (see **Figure III.D-6**). Most of Fjord Trail North is within the Breakneck Brook-Hudson River sub-watershed, which drains 41.5 square miles and provides water for the City of Beacon through the Melzingah Reservoir located east of the Fjord Trail North Corridor. This sub-watershed is made up of three streams that directly discharge to the Hudson River (from south to north): Breakneck Brook, Wades Brook, and Gordon Brook. A portion of the Fjord Trail North Corridor that crosses Fishkill Creek is in the Wiccopee Creek-Fishkill Creek sub-watershed, which drains approximately 31.7 square miles. Breakneck Brook is within the Fjord Trail South Corridor and is discussed in Chapter IV.D., "Water Resources – Fjord Trail South."

HUDSON RIVER

The Fjord Trail North Corridor includes Hudson River shoreline locations at Denning's Point and along the Klara Sauer Trail in the City of Beacon. The Hudson River is tidally influenced from the Battery in Manhattan to the Federal Dam at Troy. The Fjord Trail North Corridor is near river mile 55, where the Hudson River is a freshwater tidal waterbody. NYSDEC classifies the Hudson River as a Class B fresh surface water, which are waters that are best used for primary and secondary contact recreation and fishing, and water quality should be suitable for fish, shellfish, and wildlife propagation and survival. Along the Fjord Trail North Corridor, the river is over one

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Trail Corridor - Fjord Trail North

Fjord Trail North

Fjord Trail North - Alternate Alignment

Surface Waters

HUDSON HIGHLANDS FJORD TRAIL

Surface Waters

Figure III.D-5a

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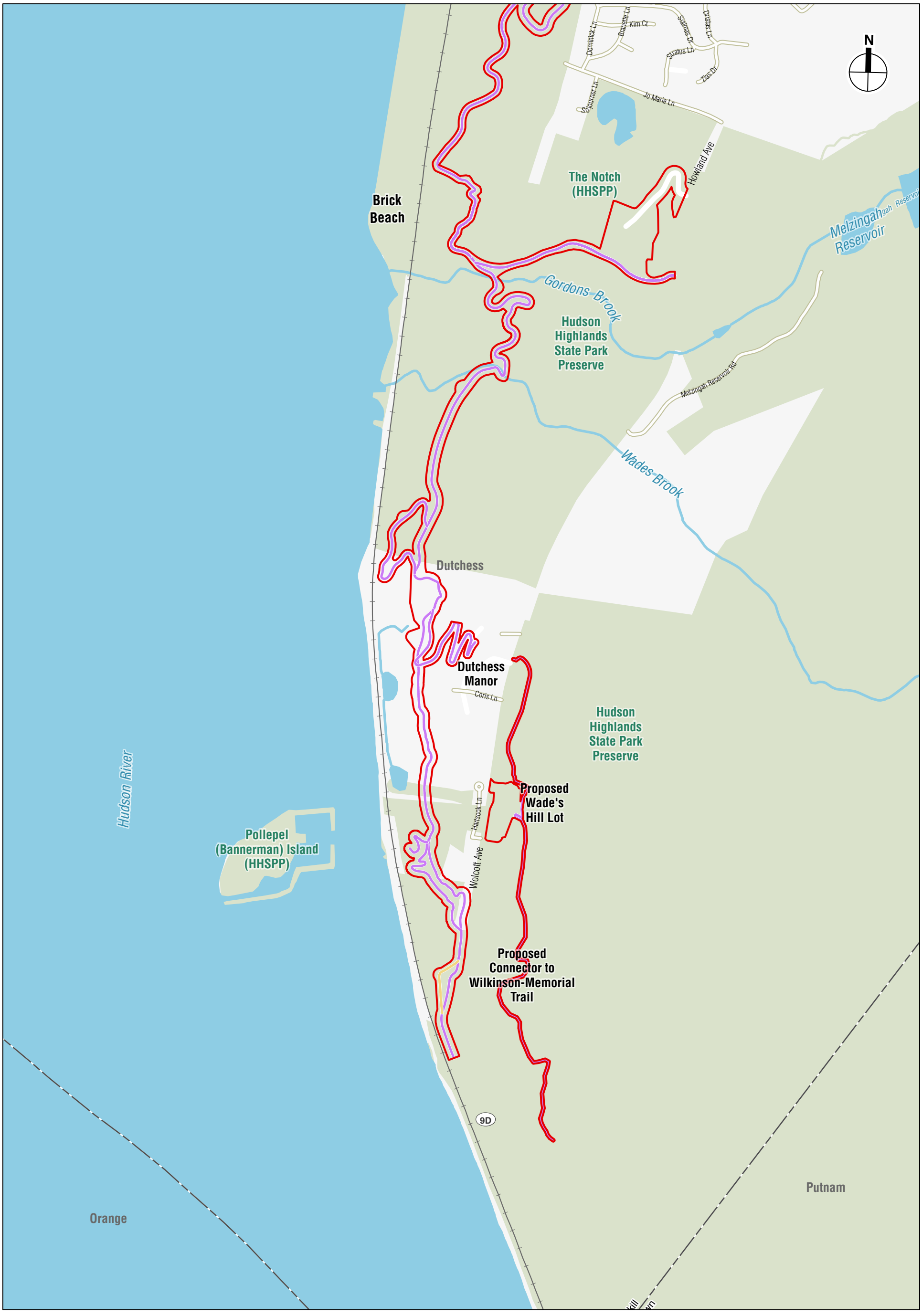

HUDSON HIGHLANDS FJORD TRAIL

Surface Waters

Figure III.D-5b

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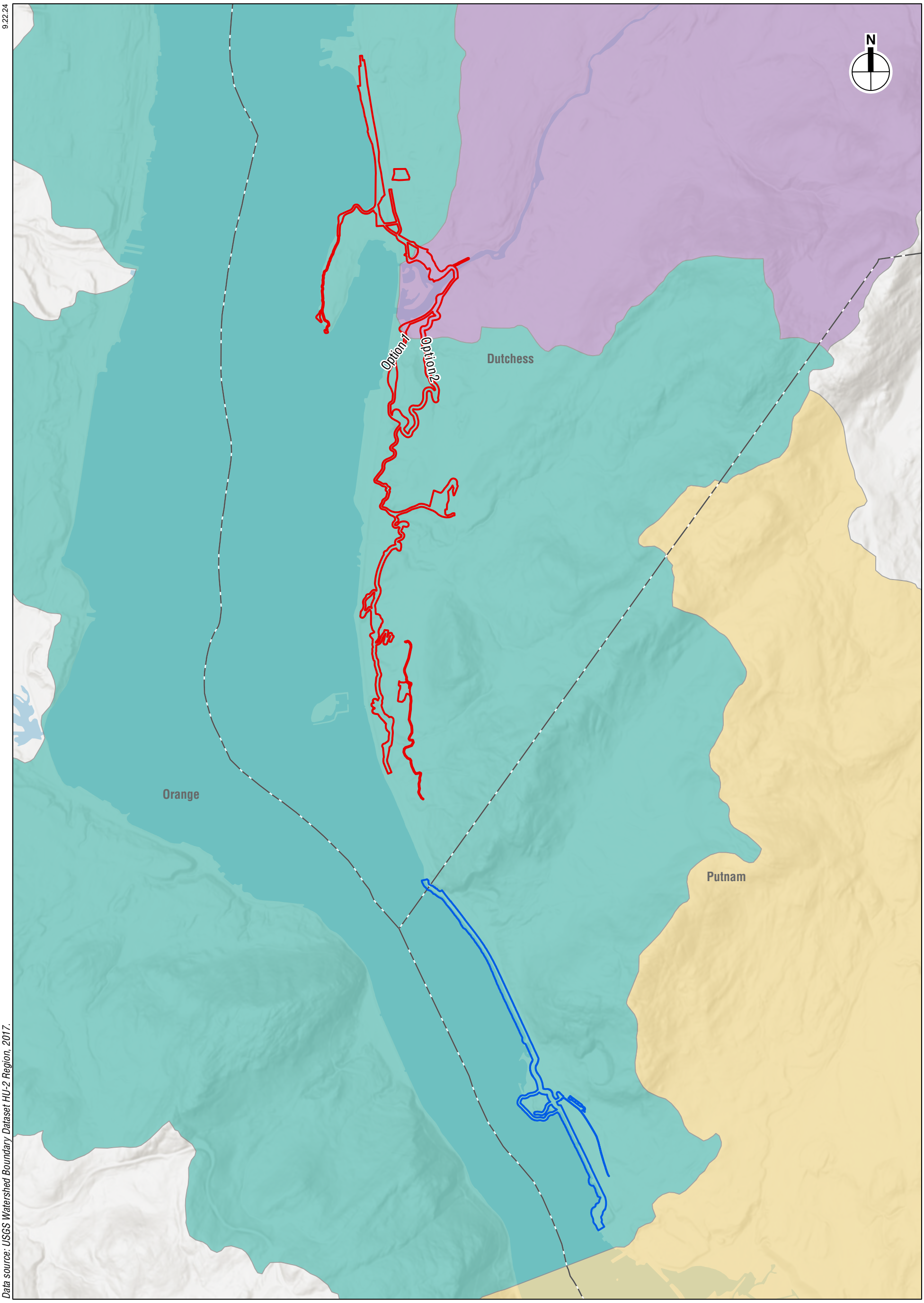

Data source: USGS Watershed Boundary Dataset HU-2 Region, 2017.

Trail Corridor - Fjord Trail North
Trail Corridor - Fjord Trail South
Breakneck Brook-Hudson River
Foundry Brook-Hudson River
Wiccopee Creek-Fishkill Creek

0 2,000 FEET

HUDSON HIGHLANDS FJORD TRAIL

Watersheds

Figure III.D-6

mile wide. Water depth ranges from a few feet near the shoreline to more than 60 feet deep in the navigation channel.

STREAMS AND RESERVOIRS

Wades Brook

Wades Brook is a NYSDEC Class C fresh surface water that flows generally east to west from higher elevations in the Hudson Highlands to the Hudson River. Best uses for Class C waters are fishing, and water quality should be suitable for fish, shellfish, and wildlife propagation and survival. Wades Brook feeds into an NWI-mapped freshwater forested/shrub wetland west of NYS Route 9D just before reaching the Hudson River. NYSDEC identifies Wades Brook as a High Condition stream, which indicates high quality based on calculated land cover, habitat, connectedness, and infrastructure indices.

Gordons Brook and Melzingah Reservoir

Gordons Brook is a NYSDEC Class C fresh surface water that flows generally east to west from the Melzingah Reservoir located east of the Fjord Trail North Corridor. The Melzingah Reservoir is fed from the east by Squirrel Hollow Brook and Gordons Brook, which join as one stream about 425 feet east of the reservoir. West of the reservoir, Gordons Brook flows about one mile until it flows into the NWI-mapped freshwater forested/shrub wetland west of NYS Route 9D before reaching the Hudson River. NYSDEC also identifies Gordons Brook as a High Condition stream.

Fishkill Creek

Fishkill Creek is the largest stream network located along the Fjord Trail North Corridor, incorporating many tributaries upstream before flowing in an approximately southwest direction into the Hudson River. Fishkill Creek is a NYSDEC Class C surface water where it flows through Beacon and joins the Hudson River east of Denning's Point. There are several NWI- and NYSDEC-mapped wetlands near this confluence, as described in previous sections of this chapter. NYSDEC identifies Fishkill Creek as a Low Condition stream based on low ratings related to land cover, connectedness and damming, and trout habitat suitability.

STORMWATER

The area around the Fjord Trail North Corridor does not contain manmade stormwater management infrastructure except for culverts that allow stormwater to pass beneath the Metro-North Railroad (MNR) tracks and NYS Route 9D. Since there is minimal existing stormwater infrastructure located along the Fjord Trail North Corridor, most runoff travels to existing wetlands and waterbodies via overland flow and through tributary streams. Small culverts channel stream and stormwater flows, including Gordons Brook and Wades Brook, under the railroad tracks and elevated crossings maintain the hydrologic connection between Fishkill Creek and the Hudson River.

C. FUTURE WITHOUT THE PROPOSED ACTION

In the future without the Proposed Action, Fjord Trail North would not be constructed and there would be no temporary effects on water resources from construction activities. The Hudson River

Sustainable Shorelines Project[4] (HRSSP), a long-term initiative dedicated to the use of nature-based management practices, would continue to engage communities and partners along the Hudson River to implement these practices where possible. The HRSSP is funded through the Hudson River National Estuarine Research Reserve (HRNERR) and conducted through a number of communities and partnerships with government agencies and municipalities (e.g., NYSDEC, OPRHP, Village of Cold Spring), academic partners (e.g., Cary Institute for Ecosystem Studies, Cornell University), and natural resource managers (e.g., Scenic Hudson).

In the future without Fjord Trail North, the Trail Corridor is expected to remain in its current condition with no substantial changes in water resources. The Trail Corridor along the Hudson River shoreline would be susceptible to projected sea level rise as described under Existing Conditions. With or without Fjord Trail North, the Hudson River Sustainable Shorelines Project would continue to engage communities and partners along the Hudson River to implement natural shoreline stabilization practices where possible.

D. FUTURE WITH THE PROPOSED ACTION

This section considers the potential effects of the proposed Fjord Trail North on water resources. The assessment of impacts considers the existing characteristics of water resources in the area, and the potential for upland, shoreline, or in-water construction to result in temporary or permanent impacts to water resources. As described in Chapter II "Project Description," construction for Fjord Trail North would be completed in three phases, each covering a section of the trail. Each phase would begin with tree clearing and grubbing along the proposed trail alignment, with tree clearing completed between November 1 and March 31 to avoid potential direct impacts to protected bat species. Clearing would be followed by grading and trail installation, installation of stormwater management features as needed, paving, hardscape improvements, and landscaping. Access for workers, equipment, and construction vehicles would be determined by the future contractor. Potential impacts would primarily be related to short-term temporary impacts during construction associated with ground disturbing activities from land clearing and grading. Long-term permanent impacts would be associated with changes to ground elevation or surface type, and modifications to surface runoff.

GROUNDWATER

Fjord Trail North would not have the potential to affect any sources of recharge for aquifers in the vicinity of the Fjord Trail North Corridor. If municipal water is not available, the proposed Fjord Trail North may result in groundwater withdrawals at one or more of the proposed restroom building locations to provide water to composting toilets. As noted in Chapter III.M, "Infrastructure – Fjord Trail North," the estimated water demand per composting toilet would be less than 20 gallons per day. In total, the restroom buildings would result in a minimal withdrawal of groundwater that would not meet the threshold for a NYSDEC Water Withdrawal permit and would not affect the overall groundwater resources in the study area. Potential impacts to groundwater due to grading or pile installation along portions of the trail would be minimal, limited to surficial soils, and designed so as not to result in alterations of groundwater flow paths or quantities. Therefore, Fjord Trail North would not be expected to result in significant adverse impacts to groundwater resources.

[4] https://hrnerr.org/sustainable-shorelines/#about

FLOODPLAINS

As discussed under Existing Conditions and shown on **Figure III.D-2**, portions of the proposed Fjord Trail North alignment would be located within the 1-percent and 0.2 percent annual chance floodplains, particularly north of Fishkill Creek in Madam Brett Park, a portion of Denning's Point, and along the Klara Sauer Trail. The Hudson River is tidal, and its water level is controlled mainly by tidal conditions rather than freshwater inflow from upriver or from tributaries. Because the floodplain within and adjacent to the proposed Fjord Trail North is affected by coastal flooding rather than fluvial flooding, the project's presence in the floodplain would not be expected to result in adverse impacts with respect to flooding. Construction of Fjord Trail North would result in minimal occupation of the floodplain and would not exacerbate flooding conditions in adjacent areas. Fjord Trail North, including the Main Trail and Meanders, within the floodplain would be almost entirely on existing trails (Klara Sauer Trail, trails within Denning's Point, and trails within Madam Brett Park). Portions of Fjord Trail North that would incorporate the existing Klara Sauer Trail would be elevated on a berm with a minimum elevation of +8.3 feet NAVD88 to address future sea level rise, but this would not affect conditions within the existing floodplain, as coastal flooding would not be affected by this minimal displacement. Sections of the trail that would require a berm above existing grade would also include new drainage infrastructure designed to support existing flow patterns, which would allow tidal, coastal surge, and stormwater hydrology to function similarly to existing conditions. The design would also support drainage in the future under projected conditions with climate risks due to sea level rise, storm surge, and flooding. With this drainage design, the trail would not result in adverse impacts from flooding on adjacent infrastructure or natural features.

As noted above, the 1-percent annual chance flood elevation for the project site could increase to +9.2 feet NAVD88 by the 2050s and to +12.7 feet NAVD88 by 2100, and MHHW elevation could increase to +4.0 feet NAVD88 by the 2050s and to +7.5 feet NAVD88 by 2100. The Main Trail of Fjord Trail North would be installed at an elevation of at least +8 feet NAVD88, which would be above the projected MHHW elevation for year 2100 under the High Scenario. The Meanders would be installed at existing surface grade, which varies throughout the proposed Fjord Trail North alignment.

Due to its location along the Hudson River or near connected waterbodies, portions of the trail would be susceptible to flooding during 1-percent annual chance flood events under current and projected future conditions. Therefore, in accordance with NYSDEC's CRRA as summarized under Regulatory Context above, the project would incorporate the following resiliency measures to reduce the risk of damage during flood events:

- Materials used for the trail would be designed to be floodable and easily repaired when flood waters recede.
- All exterior materials used for construction of Fjord Trail North would be designed or selected to last a minimum of 50 years.
- Structural materials would be chosen or protected such that they are not susceptible to rot or corrosion.
- At-grade sections would be designed to prevent the foundation from being inundated more than 3 or 4 times per year to minimize the amount of maintenance required to replace finer materials used along the trail.

- At-grade sections adjacent to waterbodies would be planted with stabilizing vegetation and supported by boulder edges along the water side to minimize potential damage to the trail resulting from flood waters or associated shoreline erosion.

WETLANDS

CONSTRUCTION

Based on current conceptual designs, construction of Fjord Trail North would result in temporary impacts to wetlands due to ground disturbance, generally along the outer edges of the 50-foot survey offset (see **Appendix III/IV.D**) or at the edges of the limit of disturbance shown on **Figures III.D-3, III.D-4a, and III.D-4b**. Installation of the pedestrian/bicycle bridge over Fishkill Creek, boardwalks over wetland areas just south of Fishkill Creek in Main Trail Option 1 (see **Figure III.D-4a**), and sections of the on-grade trail that would pass through NWI wetlands to the south (see **Figure III.D-4b**) would result in temporary impacts from construction and equipment access. Construction disturbance within wetlands would be limited to the extent possible, and temporary impacts would be minimized with the use of wetland mats, low pressure equipment, and other best management practices that would be developed as the design for Fjord Trail North is advanced. These temporarily disturbed areas would be restored to existing conditions through grading and planting of native wetland species, if necessary, and construction of Fjord Trail North would not result in permanent adverse effects to these outer edge areas. Erosion and sediment control measures (e.g., silt fencing and straw bales) would be implemented in accordance with the SPDES General Permit GP-0-20-001 for Stormwater Discharges from Construction Activity (General Permit), in coordination with NYSDEC, and would minimize potential impacts to wetlands associated with the discharge of sediment during construction. Main Trail Option 2 would turn south from Fishkill Creek and would remain upslope and to the east rather than crossing the NYSDEC-mapped wetlands shown on **Figure III.D-3** and the NWI wetlands shown on **Figure III.D-4a**. Erosion and sediment control measures would minimize the potential impacts of the trail on mapped wetlands and their adjacent areas during construction.

OPERATION

Fjord Trail North would result in some permanent impacts to NYSDEC wetland WT-1 from the proposed wetlands boardwalk crossing south of Fishkill Creek and from the installation of trails in Madam Brett Park. The trail would also cross a number of NWI-mapped freshwater wetlands and surveyed wetlands south of Fishkill Creek (see **Figure III.D-3**, and **Appendix III/IV.D**). Main Trail Option 1 would pass along the edge of a forested/shrub wetland (PSS1E) (see **Figure III.D-4a**) and could require a boardwalk or other crossing depending on the specific design. Main Trail Option 2 would travel further upland and avoid disturbance to these wetlands. As the design of Fjord Trail North advances, additional wetland surveys and formal wetland delineations would be conducted to determine the specific boundaries of wetlands within the Corridor, and the alignment would be modified under either Main Trail Option to avoid these wetlands to the extent practicable to avoid permanent impacts. In areas where a wetland crossing could not be avoided, design measures such as narrowing the trail, using a boardwalk, or installing an elevated boardwalk on piles, would be considered to minimize the potential disturbance to wetlands. The Project Sponsor would seek a permit from the appropriate regulatory agency(s) for any activities affecting wetlands and, if required, appropriate compensatory mitigation to offset any permanent loss of wetland habitat would be determined in coordination with NYSDEC and/or USACE.

SURFACE WATERS

CONSTRUCTION

It is expected that Fjord Trail North would be constructed entirely using land-based equipment, staging, and access routes. Portions of the trail where construction would have the potential to impact surface waters would include the crossings over Fishkill Creek, Gordons Brook, and Wades Brook, where a bridge or boardwalk would be required. The pedestrian/bicycle bridge over Fishkill Creek would likely be pile-supported and would require in-water construction. All in-water work to install the bridge would be conducted in accordance with time-of-year restrictions and best management practices (e.g., turbidity curtain) to protect aquatic resources. The crossings over the two brooks would be further investigated as Fjord Trail North design advances and impacts to these resources would be avoided to the extent possible. Stormwater Pollution Prevention Plans (SWPPP) would be prepared for review and approval in accordance with the requirements of the NYSDEC SPDES General Permit for Stormwater Discharges from Construction Activities for each section of Fjord Trail North that would minimize the potential for discharge of materials into the Hudson River or adjacent waterbodies or wetlands during construction through the implementation of stormwater management measures (e.g., straw bales or silt fences). Any clearing of vegetation and grading would be limited to the minimum necessary to construct the trail, reducing the potential for erosion and sediment discharge due to destabilization of the soils.

OPERATION

Fjord Trail North would result in overwater coverage from the crossings over Fishkill Creek, Wades Brook, and Gordons Brook. The bridge over Fishkill Creek would also result in a minimal footprint on the Creek bottom from the supporting piles. The number, type, and size of piles would be determined as the design is advanced. Ultimately, Fjord Trail North would be designed to avoid or minimize impacts to waterbodies to the extent possible, including minimizing in-water pile footprints, limiting over-water components to areas where the trail must avoid existing infrastructure or steep slopes, or to maintain the Main Trail grade for Accessibility purposes. Minimization of potential impacts to surface waters could also include the incorporation of culverts and/or elevated trail sections (boardwalk or bridge) where a stream crossing cannot be avoided. Existing culverts along the alignment would be maintained, where streamflow is facilitated beneath the railroad and roadways to the Hudson River, and hydrologic connections between the river, brooks, and wetlands would not be altered. The trail alignment would be refined further as the design advances.

STORMWATER

The drainage design for the proposed Fjord Trail North would maintain existing flow patterns and would not add new point source discharges. As described above, sections of the Trail that would require a berm above existing grade would also incorporate drainage infrastructure designed to support existing stormwater flow patterns and would also support drainage in the future based on projected climate risks due to sea level rise, storm surge, and flooding. Where appropriate, the project design would incorporate best management practices such as vegetated dry swales and infiltration trenches to capture runoff and promote infiltration. Much of the at-grade sections of Fjord Trail North would be constructed using crushed stone, which would allow some infiltration of stormwater depending on size/compaction, but for purposes of this project has been considered

impervious to provide a more conservative assessment.[5] Steeper portions of the proposed trail would include a swale along the shoulder where stormwater would be directed through a pipe below the trail and out through a spreader to distribute the outlet flow across a greater surface area. Alternative stormwater practices could be incorporated in areas where infiltration is not feasible or appropriate. The proposed Fjord Trail North design would incorporate pervious trail materials (e.g., grasscrete pavers, pervious concrete) where possible throughout the alignment to reduce the potential impact of stormwater runoff, and the elevated portions of the trail would use wood or precast concrete decking with slats to allow stormwater drainage to pervious surfaces beneath the trail.

Fjord Trail North would incorporate a series of drainage swales to minimize the need for storm sewers, and the existing stormwater culverts that cross beneath NYS Route 9D and the railroad would remain in place. Fjord Trail North would result in an approximately 11.5-acre increase in impervious surface from the materials used to develop the trail (e.g., crushed stone with limited permeability, paved parking at the Notch and the Wade's Hill Lot, and trail surface required to maintain Accessibility). The proposed elevated sections of Fjord Trail North are not included in the impervious surface area as water would run through the gaps in the elevated trail surface and infiltrate into the ground below. Each section of the trail would be developed and managed under its own SWPPP, which would ensure that potential impacts from stormwater runoff would be minimized. Stormwater from most of the trail would run over land and would either infiltrate to groundwater or flow into the Hudson River or other surface waters. Fjord Trail North would be exempt from quantity controls for stormwater due to its proposed use as a linear pathway and not part of a residential, commercial, or institutional development. Sections located further inland at the Notch or further south along the proposed Fjord Trail North alignment may be subject to stormwater quantity controls based on local regulations and would be evaluated and designed as the project advances. The design team would continue to explore pervious material options for each of these areas and minimize the impervious footprint of Fjord Trail North.

E. MITIGATION

As set forth above, measures would be incorporated into the Fjord Trail North's final design to avoid, minimize, or mitigate impacts to water resources. These measures include the following:

- Erosion and sediment control measures (e.g., silt fencing and straw bales) would be implemented in accordance with the SPDES General Permit and would minimize discharge of sediment to water resources during construction.
- All construction activities for Fjord Trail North would be conducted in accordance with permit conditions issued by NYSDEC and/or USACE to avoid, minimize or mitigate potential construction impacts to water resources.
- Any wetland areas temporarily disturbed during construction would be restored to existing conditions through grading to existing surface grades and planting of native vegetation, in accordance with permit conditions issued by the NYSDEC and USACE.
- Design measures such as narrowing or elevating the trail, installing a boardwalk, or incorporating culverts would be considered to minimize potential permanent impacts to wetlands and surface waters where crossings cannot be avoided.

[5] NYSDEC considers crushed gravel to be impervious under the Freshwater and Tidal Wetlands regulatory programs. However, crushed gravel is considered to be pervious for stormwater purposes, depending on the MS4 requirements specific to the project area.

- Fjord Trail North would use pervious materials (e.g., grasscrete pavers, pervious concrete) to the extent possible, minimizing the increase in impervious surface area resulting from the project.

If required, compensatory mitigation for unavoidable impacts to surface waters or wetlands resulting from the project would be determined in coordination with NYSDEC and/or USACE. Mitigation may comprise restoration or enhancement of similar surface water or wetland habitats in the area, but specific requirements would be determined in coordination with the regulatory agencies.

F. REFERENCES

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