HUDSON RIVER HABITAT RESTORATION

ECOSYSTEM RESTORATION
DRAFT INTEGRATED FEASIBILITY REPORT AND ENVIRONMENTAL ASSESSMENT

Appendix G1: Detailed Environmental Assessment

U.S. ARMY CORPS OF ENGINEERS
NEW YORK DISTRICT

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This Appendix contains additional detailed information on the existing conditions and potential effects of the Tentatively Selected Plan at each site. This information has been summarized in Chapter 5 of the Main Report.

CHAPTER 1: Affected Existing Conditions

1.1 Binnen Kill

1.1.1 Physical Setting

The Binnen Kill site is located on the west shore of the Hudson River in the Towns of Bethlehem and Coeymans, in Albany County, New York. The restoration site (hereafter referred to as "the site"), where proposed actions would be implemented, is limited to a low-lying river terrace of approximately 1,000 acres extending at its southern boundary from Castleton-on Hudson Bridge (Route 912M) to approximately two miles to the north. The Binnen Kill Channel descends a steep slope from the west and turns towards the south, flowing through the terrace before joining the Hudson at the south end of the site. The eastern edge of the site, adjacent to the Hudson River, previously consisted of three islands (Shad, Schermerhorn, and Poplar), which have since been joined to a continuous landform, primarily due to the historic placement of dredged material. The terrace is a mixture of tidal and other wetlands, shrubs, forest, and current or former agricultural fields. Development at the site has been minimal, with the exception of several historical ice houses, and a water treatment facility with groundwater wells at the northern end, which is currently in operation. Several gravel roads are present on the site including an access road connecting to River Road. The Castleton-on-Hudson Bridge, railroad tracks, and an electrical transmission line cross the southern edge of the site. Additionally, the site has several culvert crossings on both former and active gravel access roads.

1.1.1.1 Geology and Physiography

The site is within the Hudson-Mohawk Lowlands physiographic region. The Hudson River flows from the southeastern Adirondacks, through a 15-20 mile wide lowland area, which is bounded by the Helderberg Plateau and the Catskill Mountains to the west, and the Taconic Mountains to the east. This section of the Hudson River Valley consists of a narrow inner valley with adjacent terraces approximately 100-200 feet high, bordered by gently rolling terrain and low hills. The valley is underlain by weak sedimentary rock, primarily formed during the Cambrian and Lower Ordovician periods (NYSDOT, 2013). Specifically, the site is mapped as the Austin Glen Formation, which consists of highly folded, interbedded greywacke sandstone and shale that formed in a deep marine setting from the erosion of pre-existing sedimentary rocks (NYS Museum, 1995). In general, the surficial geology of the region is heavily influenced by its history of glaciation, including glacial till and lacustrine sediment deposited during the most recent glacial advance and retreat 70,000 to 16,000 years ago. The Hudson River has since reworked these sediments, and the site is currently mapped as alluvium (NYS Museum, 1991). Additionally, the area has been influenced by dredging, and dredge spoils have

filled in the areas between islands that historically existed at the site (Louis Berger, 2017).

1.1.1.2 Topography

As discussed above, the area of the Hudson River Valley consists of a low-lying inner valley, bordered by steep slopes to terraces 100-200 feet high. The site is located within the inner valley on a river terrace close in elevation to the Hudson River. Based on a 2011–2012 LiDAR dataset developed by the New York State Department of Environmental Conservation (NYSDEC), the topography of the site is generally low-lying and gently sloping, with the majority of the site sitting at an elevation of less than 8 feet (NYSDEC, 2011 - 2012). There is an overall slope from north to south, with the shoreline of the Hudson River and Binnen Kill at the lowest elevation, and the site is bounded on the western edge by a steeply sloping hillside. Mounds and berms are present in areas of dredged material placement.

1.1.1.3 Soils

Soils data and soils descriptions for the site were acquired from the National Resources Conservation Service (NRCS) Web Soil Survey for Albany County, New York. The majority of the site was mapped as one of six soils: Hamlin silt loam, Medihemists and Hydraquents, Teel silt loam, Udipsamments (dredged), Wakeland silt loam, and the Wayland soil complex (NRCS, Web Soil Survey).

Hamlin silt loam is a nearly level, very deep and well-drained soil found on floodplains along the Hudson River. It is formed from silty alluvium from areas of siltstone, shale and limestone. Typical depth to the water table is 36-72 inches, and it is not considered hydric. The surface layer is typically dark brown silt loam, underlain by layers of dark grayish brown silt loam.

Medihemists and Hydraquents, ponded, are very poorly drained organic or mineral soils found in level areas and shallow ponds bordering lakes, ponds, or other water bodies. These soils are very poorly drained, with moderately high hydraulic conductivity, and are classified as hydric. Typical vegetation includes cattails, rushes, and other water-tolerant herbaceous species.

Teel silt loam soils are very deep, moderately well drained soils found on floodplains of major streams, formed from silty alluvium. The seasonal high water table for these soils is 18 to 24 inches from February to April, and is occasionally flooded from November to May. It is not classified as hydric.

Udipsamments, dredged, are made up of very deep, level areas of well drained sand and gravel, formed from soil material pumped from the Hudson River. Typically, sandy material containing up to 35% gravel is deposited in layers up to 10 feet thick on top of the original soil.

Wakeland silt loam is a very deep, somewhat poorly drained soil found on floodplains of streams in areas with stratified silts. The soil is formed from silty alluvium and is not classified as hydric. The seasonal water table is at a depth of 12-36 inches from January to April and is occasionally flooded from January to May. The depth to bedrock is greater than 60 inches.

Wayland soils complex is very deep and poorly drained and is found in depressions on floodplains along major streams. The seasonal water table is at a depth of 0-6 inches from November to June, and is frequently flooded for brief periods from November to June. The soils are formed from silty and clayey alluvium derived from interbedded sedimentary rock.

1.1.2 Climate and Weather

A National Weather Service (NWS) station is located approximately 7.8 miles west of the site, at the Alcove Dam. Records for this station are available between 1942 and 2018, via the Agricultural Applied Climate Information System (AgACIS). Records at this station indicate that between 1942 and 2018, Average monthly temperatures ranged for 21.1°F in January to 69.5°F in July (AgACIS, 2018). Average annual precipitation was 39.74 inches, with monthly averages ranges from 2.18 inches in February to 3.89 inches in June. Average annual snowfall was 29.5 inches, primarily occurring between December and March. The average number of days with 0.10 inches of precipitation or more was 76 days per year; such precipitation days occurred at a roughly equally rate per month (5-8 days per month).

1.1.2.1 Climate Resiliency

According to the Intergovernmental Panel on Climate Change's (IPCC) Special Report 15, released in October of 2018, human activities have caused approximately 1.0° C (1.8° F) of global warming above pre-industrial levels, causing many land and ocean ecosystems to change. The same report also stated that, "...Increasing warming amplifies the exposure of small islands, low-lying coastal areas and deltas to the risks associated with sea level rise for many human and ecological systems, including saltwater intrusion, flooding and damage to infrastructure." (IPCC, 2018). The United States Army Corps of Engineers (USACE) performed an analysis of existing tidal datums at the site, as well as a relative sea level rise analysis using intermediate curve projections. These projections estimate a 0.13, 0.44, and 1.07 foot rise in water surface elevations at the site by 2027, 2045, and 2075 respectively.

Climate projections developed by New York State indicate a future increase in temperatures, precipitation, sea levels, and severity of flooding (NYSDEC, 2018a). The State's average annual temperature is expected to increase approximately four to six degrees Fahrenheit by mid-century and as much as 11 degrees Fahrenheit by 2100. The total annual precipitation is expected to increase as much as 11% by mid-century and 18% by 2100. These changing climatic factors will likely alter flooding patterns in the Hudson River; it is projected that today's 1% storm will become 20 to 50% more likely by 2020 and as much as 610% more likely by 2100.

Both Albany County and the Town of Bethlehem are participants in the NYS Climate Smart Communities Program, an interagency initiative of New York State which aims to engage and educate local governments in New York State, provide a robust framework to guide their climate action efforts, and recognize their achievements through a certification program (New York State, 2018). While neither governing body has implemented the required climate programs and policies to achieve certification from the program, both have been designated as Registered Climate Smart Communities after

committing to such programs and policies via passing a Climate Smart Community pledge as a formal resolution.

The Town of Bethlehem has established a Local Waterfront Advisory Committee to aid in the development of a Local Waterfront Revitalization Plan (LWRP); The LWRP is still in development as of January 2019. A draft LWRP references Henry Hudson Park as a municipal asset that is vulnerable to the projected sea level rise (Town of Bethlehem, 2018). The final LWRP is expected to include a master plan for Henry Hudson Park and develop waterfront revitalization policies.

1.1.3 Floodplains and Coastal Processes

The site lies within the one percent floodplain (AE Zone) with base flood elevations ranging from 17 to 18 feet (NAVD88), as shown on the Effective Flood Insurance Rate Map (FIRM) issued March 16, 2015 – Panels numbered 36001C0317D and 36001C0319D. This floodplain is confined between the Hudson River and a steep slope, quickly rising above the floodplain to an elevation of 100 to 150 feet (NAVD88). No habitable structures lie within the floodplain in vicinity the site.

A United States Geological Survey (USGS) stream gage is located approximately 6 miles upstream of the project area on right bank of the Hudson River at the Port of Albany (NWIS Site Number 01359165) (USGS, 2018). Records for this gage begin on September 30, 2016. The gage is under continuous operation as of December 5, 2018. During this period the maximum water elevation was 7.41 feet (NAVD88), April 7, 2017 and the minimum water elevation was -4.20 feet, February 14, 2017.

A USGS Short-Term Network (STN) Monitoring site is located across the Hudson River from the project area, in Castleton-on-Hudson (STN Site Number NYCOL07401) (USGS, 2012). After Hurricane Sandy in 2012, a high water mark was recorded at elevation of approximately 10 feet (NAVD88) at this site.

1.1.4 Water Resources

1.1.4.1 Surface Waters

Located within the Middle Hudson Watershed (HUC-8 02020006), the Hudson River and Binnen Kill are the primary surface water bodies at the site, with several small freshwater ponds mapped at the site as well. The Hudson River forms the eastern boundary of the site, while Binnen Kill delineates the southwestern boundary and runs through the middle of the northern portion of the site. The Hudson River has a drainage area of approximately 8,570 square miles (USGS Streamstats) to the Binnen Kill site. Water levels in the Hudson River are in part controlled by the Federal Dam located in Troy, approximately 18 miles upstream. This dam marks the upstream extent of tidal influence in the Hudson River. The Binnen Kill drainage area is a small subset of the Hudson River drainage area, with an area of approximately 1.8 square miles (USGS Streamstats). The Binnen Kill is crossed in four places by gravel access roads with culverts or bridges constraining the flow (Louis Berger, 2017).

1.1.4.2 Water Quality

Binnen Kill and the Hudson River are both classified as Class C water bodies, which support fisheries and are suitable for non-contact recreation (6 CRR-NY X B). The

Hudson River in Albany County is on the 2016 EPA 303(d) list as “impaired” due to fish consumption advisories from sediment contaminated with polychlorinated biphenyls (PCBs). Previously, a Natural Resource Inventory determined that there has been no record of spills or other contamination in the area of the site (Louis Berger, 2017). However, there may be remnant agricultural chemicals at the site, as some areas have been used for agriculture since 1940 and older forms of pesticides can result in lead, arsenic, and other contamination (Louis Berger, 2017).

1.1.4.3 Regional Hydrogeology and Groundwater

In general, aquifers in the Hudson Valley are unconfined, and related to thick layers of sediment glacially deposited over bedrock. One aquifer has been identified at the Binnen Kill site by the New York State Department of Conservation Division of Water, Bureau of Water Resources Management. This aquifer is described as an unconfined, high yield aquifer with a yield of greater than 100 gallons per minute. The aquifer is composed of sand and gravel deposits, with high transmissivity and a saturated thickness greater than 10 feet. The mapped aquifer generally follows the footprint of the Hudson River and associated alluvium deposits, and overlaps with the western edge of the site. However, this aquifer was mapped at a 1:250,000 scale, based on published surficial and bedrock geology maps, and the boundaries of this aquifer indicate the general location only. The Dinmore Road Wellfield is located at the northeastern edge of the site and provides water to the Town of Bethlehem from 11 wells at a rate of 6 million gallons per day via the Clapper Road Water Treatment Plant.

1.1.4.4 Tidal Influences

A Hudson River Environmental Conditions Observing System (HRECOS) monitoring station and tide gauge are located at Schodack Island, approximately 3,000 feet downstream of the site. Three additional monitoring stations were installed within Binnen Kill as part of this project (BK-1, BK-2, and BK-3). Water surface elevations for BK-1, BK-2, and BK-3 were very similar, therefore only BK-1 elevations are displayed below. The Project Development Team calculated the existing tidal datums at these stations.

Figure 1Binnen Kill Tidal Datums

Datum	HRECOS Schodack Island Station	BK-1
MHHW	3.80	3.59
MHW	3.47	3.39
MTL	1.12	0.89
MLW	-1.42	n/a
MLLW	-1.62	n/a

Elevations referenced to NAVD88 in feet

1.1.5 Land Use and Zoning

The project area's land use consists primarily of protected open space. This open space consists of a mixture of tidal and nontidal freshwater wetlands, forested wetlands, shrubs, and mixed forest. The open space areas are made up of a mix of properties owned by New York State and by Scenic Hudson Land Trust, a nonprofit land conservation organization. Portions of the project area are also utilized as agricultural fields under private ownership. Land uses in the surrounding area are similar in density, containing mostly agricultural or forested land interspersed by low-density residential or light commercial properties. The land immediately across the Hudson River consists of publicly owned protected open space, specifically Schodack Island State Park.

Historically, the southern portion of the site along the Hudson River once held a side channel, separating the historic shoreline from Shad Island and Schermerhorn Island. This side channel was filled during the early 20th century, connecting the islands with a contiguous landmass (NYSDOS, 2012; Louis Berger, 2017).

The project area is located partially within the Town of Bethlehem Rural Riverfront (RR) zoning districts and partially within the Residential & Agricultural (R-A) zoning districts. These zones are regulated under Chapter 128 and Chapter 165 of the Bethlehem and Coeymans municipal codes, respectively. Both of these districts generally zone for low-density, residential, or agricultural-oriented development. Habitat restoration/creation is not explicitly regulated under either town's municipal zoning code.

Pursuant to §24-0501 of the New York State Freshwater Wetlands Act (Article 24 of the New York Environmental Conservation Law), the towns of Bethlehem and Coeymans

have fully accepted responsibility with regard to activities subject to regulation under the Act within officially designated freshwater wetlands.

1.1.6 Economics

Eco-tourism is an important economic driver in this region, as the natural and scenic resources draw millions of visitors to these areas annually. Many people come from out of town to pursue wildlife-associated recreation, outdoor sporting, angling, hunting, and wildlife watching, bringing with them business for local restaurants, hotels, shops, etc. According to a report by the Fish and Wildlife Service, 3.8 million people watch birds and other wildlife in NYS, generating approximately $1.6 billion in ecotourism revenue every year (USFWS, 2006).

The town of Bethlehem has formed a Waterfront Advisory Committee (WAC), consisting of government officials, residents, business owners, and environmental activists, to examine the town's 10 miles stretch of waterfront and developing a LWRP, currently in draft stage (Town of Bethlehem, 2018. The committee expressed interest in expanding the recreational, residential and business activity along this stretch of the river by attracting companies that could utilize the Port of Albany, which is approximately 8-10 miles from the Binnen Kill.

1.1.7 Socio-Economics

The site is located within the Towns of Bethlehem and Coeymans, in Albany County, New York. According to the U.S. Census Bureau (USCB) American Community Survey 5-year survey for 2013-2017 (USCB, 2013-2017), the population in the Town of Bethlehem, NY is an estimated 33,656 people, and is predominantly white. The median age in the Town of Bethlehem, NY is approximately 42.8 years of age and median household income is $96,384. An estimated 14,485 occupied housing units are present within the town, with a majority of structures being built in 1990 to 1999 (2,154 structures).

Approximately 97.0% of the population are high school graduates or higher while 58.6% of the population have a bachelor's degree or higher. The estimated number of companies in the Town of Bethlehem is 3,119. The civilian employed population 16 and over is an estimated 18,384 people. Of this employed population, an estimated 10,719 people work in management, business, science, and arts occupations, 1,957 people in service occupations, 3,927 in sales and office occupations, 863 in natural resources, construction, and maintenance occupations, and 918 in production, transportation, and material moving occupations.

The population in the Town of Coeymans, NY is an estimated 7,433 people, and is predominantly white. The median age in the Town of New Windsor, NY is approximately 42.4 years of age and median household income is $60,812. An estimated 3,456 occupied housing units are present within the town, with a majority of structures being built in 1939 or earlier (1,083 structures).

Approximately 91.1% of the population are high school graduates or higher while 24.3% of the population have a bachelor's degree or higher. The estimated number of companies in the Town of New Windsor is 157. The civilian employed population 16 and over is an estimated 3,980 people. Of this employed population, an estimated 3,980

people work in management, business, science, and arts occupations, 512 people in service occupations, 990 in sales and office occupations, 336 in natural resources, construction, and maintenance occupations, and 762 in production, transportation, and material moving occupations.

1.1.7.1 Environmental Justice

According to the New York State Department of Environmental Conservation's Maps & Geospatial Information System (IGST) Tools for Environmental Justice data set, the site is not located within an Environmental Justice area (NYSDEC, 2018b).

1.1.8 Coastal Zone Management

The Hudson River, downstream of the Federal Dam in Troy, New York, is a designated Coastal Area, subject to regulation under the federal Coastal Zone Management Act, and managed under the New York Coastal Management Program. The landward boundary of the coastal area is typically 1,000 feet inland from the shoreline.

The New York State Department of State (NYSDOS) has designated Shad Island and Schermerhorn Island as a Significant Coastal Fish and Wildlife Habitat, which includes the Binnen Kill site. Based on an evaluation by the New York State Department of Environmental Conservation (NYSDEC), this area is considered significant because it consists of a large undeveloped floodplain ecosystem that provides multiple types of habitat including deepwater channel, the littoral zone, freshwater tidal wetlands, and tidal mudflats. These areas in the Hudson River and Binnen Kill provide nursery habitat for migratory and resident fish species, including American shad (*Alosa sapidissima*), blueback herring (*Alosa aestivalis*), striped bass *(Morone saxatilis)*, and alewife *(Alosa pseudoharengus*). Submerged aquatic vegetation provides food and cover for fish and macroinvertebrates and contributes to dissolved oxygen in the water.

The Town of Bethlehem is in the process of developing a LWRP, currently in draft stage (Town of Bethlehem, 2018), which provides more detailed implementation of the state Coastal Zone Management Program. Upon approval of the LWRP, state and federal actions within the town would be required to be consistent, to the maximum extent practicable, with the approved LWRP, and the town would become eligible for waterfront revitalization grants.

1.1.9 Wetlands

The United States Fish and Wildlife Service (USFWS) National Wetland Inventory (NWI) map indicates the presence of both freshwater emergent wetlands and freshwater forested/shrub wetlands at the Binnen Kill site. Several freshwater ponds are also mapped, and the Hudson River and Binnen Kill are mapped as riverine environments. Additionally, tidally influenced wetlands have been mapped by the NYSDEC's Hudson River Estuary Program as a separate effort in 2007 based off of aerial photographs. This dataset overlaps the NWI inventory and indicates the presence of multiple types of tidal environments including: submerged aquatic vegetation, wooded swamp, unvegetated flats, scrub shrub wetland, Cattail (*Typha angustifolia)* dominated, Common Reed (*Phragmites australis)* dominated, intertidal mix, and open water. These are primarily mapped along the shoreline of the Hudson, along the Binnen Kill, and in the westernmost portion of the site (NYSDEC, 2007).

1.1.10 Vegetation

A habitat survey conducted by Louis Berger in 2017 revealed a wide variety of habitat types at the Binnen Kill site, with a number of rare plant species identified (Louis Berger, 2017). Approximately half of the site is occupied by wetland or aquatic habitat. Wetland habitats ranged in elevation and type, including tidal, non-tidal, or both. Tidal areas spanned a range of elevations. Perpetually submerged areas included vegetation such as water celery (*Vallisneria* spp.), Eurasian watermilfoil (*Myriophyllum* spicatum), eelgrass (*Zostera* spp.), and pondweed (*Potamogeton* spp.). Tidal mudflats exposed at low tide were primarily unvegetated but contained small plants such Dwarf Arrowhead (*Sagittaria pygmaea*) and Awl Leaved-arrowhead (*Sagittaria subulata)*. Lower tidal marsh habitat, also exposed a low tide, typically contained intertidal Spatterdock (*Nuphar lutea)*, Pickerelweed (*Pontederia cordata)*, and Common Arrowhead (*Sagittaria latifolia)*. Upper tidal marsh habitat, flooded above mid-tide, was found along the Binnen Kill and tributaries, and typically had abundant narrow-leaved Cattail (*Typha angustifolia)*, River Bulrush (*Scirpus fluviatilis)*, Giant Bur-reed (Sparganium eurycarpum), Rice Cutgrass (*Leersia oryzoides)*, Arrow Arum (*Peltandra)*, and Common Arrowhead. Tidal swamps were primarily dominated by trees such as White Willow *(Salix alba)*, but also contain herbaceous understory species such as Arrow Arum, Common Reed (*Phragmites australis)*, and Orange Jewelweed (*Impatiens capensis)*.

A variety of non-tidal wetlands were also present on the site. Emergent marshes are permanently saturated and dominated by emergent herbaceous plants such as Large Bur-reed (*Sparganium eurycarpum)*, Cattail (*Typha)*, Reed Canary Grass *(Phalaris arundinacea)*, River Bulrush, and Rice Cutgrass. Wet meadows are saturated during part of the growing season and are also dominated by herbaceous vegetation including Reed Canary Grass, Fox Sedge *(Carex vulpinoidea)*, Field Thistle (Cirsium discolor), Japanese Stiltgrass (*Microstegium vimineum)*, Common Rush (Juncus effusus), Beggar-ticks (*Bidens)*, and Blue Vervain (*Verbena hastata)*. Shrub swamps were present to a limited extent at the site, and were dominated by Buttonbush (*Cephalanthus occidentalis)*, Dogwood (*Cornus)*, and Viburnum. Hardwood swamps were dominated by trees including Silver Maple (*Acer saccharinum)*, Green Ash (*Fraxinus pennsylvanica)*, White Willow (*Salix alba)*, Eastern Cottonwood (*Populus deltoides)*, and Swamp White Oak (*Quercus bicolor)*. They typically had a diverse understory, including Bell's Honeysuckle *(Lonicera x bella)*, Multiflora Rose (*Rosa multiflora)*, Spicebush (*Lindera benzoin)*, Heart-leaved Willow (*Eriogonum plumatella)*, Moneywort (*Lysimachia nummularia)*, Sensitive Fern (*Onoclea sensibilis)*, Reed Canary Grass, Common Reed, Beggar-ticks, False Waterpepper (*Polygonum hydropiperoides)*, and American Hogpeanut (*Amphicarpaea bracteata)*. Though not considered tidal, these swamps are likely flooded during unusually high flows.

Other wetland habitats included small ponds, both intermittent and perennial, with sparse emergent vegetation such as Common Reed, Cattail, or River Bulrush. Areas of dominated by the invasive species Common Reed and Reed Canary Grass were observed in both tidal and non-tidal environments.

A significant proportion of the upland habitat area on site consisted of current or former agricultural land, including areas under active row cropping (corn) or hayfield cultivation.

Vegetation included various perennial European hay grasses such as tall fescue (*Festuca arundinacea)*, as well as fescue sedge (*Carex festucacea)*, panic grass (*Panicum)*, viper's bugloss (*Echium vulgare)*, Queen Anne's lace (*Daucus carota)*, common milkweed (*Asclepias syriaca)*, common mullein (*Verbascum Thapsus)*, ox-eye (*Leucanthemum vulgare)*, goldenrods (*Solidago)*, heath (*Erica)*, and Pringle's asters (*Aster alpinus)*. Fallow fields were present, which were under production recently but not currently, and were dominated by Canada Horseweed (*Erigeron canadensis)*, Common Mullein, Wrinkle-leaved Goldenrod (*Solidago rugosa)*, and Annual Ragweed (*Ambrosia artemisiifolia)*. Old fields were also present on site that have not been under production recently and were dominated by a mixture of forbs and grasses such as Yellow Foxtail (*Pennisetum glaucum)*, Grass-leaved Goldenrod (Euthamia graminifolia), Narrow False Foxglove (*Agalinis tenuifolia)*, and Alsike Clover *(Trifolium hybridum)*. Areas of mowed lawn were also present.

Non-agricultural upland habitats included upland shrubland and upland hardwood forest. Upland shrubland was found at the transition between meadow and forest, in recently cleared areas such as old fields, artificial berms, and utility corridors. These areas were dominated by invasive species including Shrubs Fly Honeysuckle (*Lonicera xylosteum)*, Autumn Olive (*Elaeagnus umbellata)*, Multiflora Rose, Common Buckthorn (*Rhamnus)*, and Oriental Bittersweet (*Celastrus orbiculatus)*. Native vegetation included Gray Dogwood (*Cornus racemosa)*, Riverbank Grape (*Vitis riparia)*, and saplings of Red Cedar (*Juniperus virginiana)*, ash (*Fraxinus sp.*), elm (*Ulmus sp.)*, and willow (*Salix sp.)*. The upland hardwood forest canopy was composed of Eastern Cottonwood (*Populus deltoids)*, Silver Maple, White Ash (*Fraxinus Americana)*, Black Locust (*Robinia pseudoacacia)*, American Elm (*Ulmus americana)*, Box Elder (*Acer negundo*), Green Ash, Red Pine (*Pinus resinosa)*, Northern Red Oak (*Quercus rubra)*, Eastern White Pine (*Pinus strobus)*, and Sugar Maple (*Acer saccharum)*. Shrubs and woody vines included Multiflora Rose, Bell's Honeysuckle, Japanese Barberry (*Berberis thunbergii)*, Common Buckthorn *(Rhamnus* spp*.),* Eastern Poison Ivy (*Toxicodendron radicans)*, Virginia Creeper *(Parthenocissus quinquefolia)*, and Riverbank Grape with an herbaceous understory of Canada Germander (*Teucrium canadense)*, Jumpseed (*Persicaria virginiana)*, White Snakeroot (*Ageratina altissima)*, Smooth Goldenrod (*Solidago gigantea)*, Common Violet (*Viola sororia)*, Eastern Narrow-leaved Sedge (*Carex grisea Wahlenb)*, Wood Nettle (*Laportea canadensis)* , Stinging Nettle (*Urtica dioica)*, and Sanicle (*Sanicula)*.

Invasive vegetation was widespread throughout the site, including Bell's Honeysuckle, Multiflora Rose, Common Reed, Reed Canary Grass, Japanese Barberry, Oriental Bittersweet, Canada Thistle (*Cirsium arvense)*, Moneywort, Yellow Iris (*Iris pseudacorus)*, Purple Loosestrife (*Lythrum salicaria)*, and Japanese Stiltgrass. However, the Binnen Kill site also hosted a number of New York State protected rare plants, including Delmarva Beggar-ticks (*Bidens bidentoides*), Long's Bittercress (*Cardamine longii*), Frank's Sedge (*Carex frankii*), Davis' Sedge (*Carex davisii*), Bush's Sedge (*Carex bushi*i), Red-rooted Flatsedge (*Cyperus erythrorhizos*), Kidney-leaved Mud-plantain (*Heteranthera reniformis*), Muenscher's Water Nymph (*Najas muenscheri*), and Awl-leaved Arrowhead (*Sagittaria subulata*).

1.1.10.1 Submerged Aquatic Vegetation

Submerged aquatic vegetation (SAV) provide food and refuge for fish and invertebrates, and improves water quality by trapping fine sediment and organic matter and adding oxygen to the water. The most common native species of SAV in the Hudson River watershed is Water Celery (*Vallisneria americana*); other native species include Clasping-leaved Pondweed (*Potamogeton perfoliatus*). Common non-native invasive species include Curly Pondweed (*Potamogeton crispus*), Eurasian Water Milfoil (*Myriophyllum spicatum*) and Water Chestnut (*Trapa natans*).

The site was included in Hudson River SAV inventories in 1997, 2002, 2007, and 2014. SAV mapping documents Water Celery present in the lower Binnen Kill, the mouth of the Binnen Kill, and along the shallows of the Hudson River shoreline. Significant SAV loss occurred between 1997 and 2014 especially along the mouth of the Binnen Kill, and the shallows of the Hudson River shoreline. This corresponds with a drastic decline in SAV throughout the Hudson River Estuary following Hurricanes Irene and Lee in 2011(NYSDEC, 2017). Further recovery may have occurred in this area since the 2014 inventory.

1.1.11 Fish and Wildlife Resources

1.1.11.1 Shellfish

No information regarding the presence, absence, or composition of shellfish communities on the site is readily available.

1.1.11.2 Finfish

The project area is within the designated Significant Coastal Fish and Wildlife Habitat of Shad and Schermerhorn Islands under the New York State Coastal Management Program. According to the Coastal Fish and Wildlife Rating Form associated with this designated habitat, the project area contains habitats serving as a nursery area for Blueback Herring (*Alosa aestivalis*), American Shad (*Alosa sapidissima*), Striped Bass (*Morone saxatilis*) as well as spawning and feeding areas for resident freshwater species in the Hudson River, including White Perch (*Morone americana*) (NYDOS, 2012).

Wildlife surveys performed by Louis Berger in 2017 found numerous species of fish typical of the Upper Hudson River Estuary (Louis Berger, 2017). Binnen Kill consisted primarily of species which inhabit shallow river margins. These were mostly White Perch (*Morone americana*), Golden Shiner (*Notemigonus crysoleucas*), Banded Killifish (*Fundulus diaphanus*), Mummichog (*Fundulus heteroclitus*), and American Eel (*Anguilla rostrata*). Juvenile American Eels were found in the soft sediment along the shallow edges of the mouth of the Binnen Kill. Interior pools in the project area contained Bluntnose Minnow (*Pimephales notatus*) and Yellow Perch (*Perca flavescens*); the size of these specimens suggested that the pools only support transient fish fauna, populated by larvae and juveniles stranded during high tides and/or storm event floods.

1.1.11.3 Benthic Resources

No information regarding the benthic resources on the site is readily available.

1.1.11.4 Reptiles and Amphibians

The project area is within the designated Significant Coastal Fish and Wildlife Habitat of Shad and Schermerhorn Islands under the New York State Coastal Management Program. According to the Coastal Fish and Wildlife Rating Form associated with this designated habitat, the project area supports a variety of amphibians and reptiles including Northern Map Turtle (*Graptemys geographica*), Painted Turtle (*Chrysemys picta*), Mudpuppy (*Necturus maculosus*), American Toad (*Bufo americanas*), Bullfrog (*Rana catesbeiana*) and Green Frog (*Rana clamitans*) (NYDOS, 2012).

Wildlife surveys performed by Louis Berger in 2017 found that the project area was somewhat species-poor in regards to herpetofauna noting that intertidal area offer limited habitat for herpetofauna and dredge spoils likely lack the soil structure conducive to burrowing species (Louis Berger, 2017). Hardwood swamps in the project area contained Blue-spotted Salamander (*Ambystoma laterale*). An abundance of Painted Turtles (*Chrysemys picta*) were found in the floodplain pools and Northern Map Turtles (*Graptemys geographica*) were found in the tidal shallows, which suggests that a concentration of turtle nesting may be present in the project area's uplands. Other species observed included American Toad (*Bufo americanas*), Spring Peeper (*Pseudacris crucifer*), Northern Gray Treefrog (*Hyla versicolor*), Wood Frog (*Lithobates sylvaticus*), Northern Leopard Frog (*Lithobates pipiens*), Green Frog (*Rana clamitans*), Bullfrog (*Rana catesbeiana*), Snapping Turtle (*Chelydra serpentina*), Eastern Garter Snake (*Thamnophis sirtalis*), and Northern Brown Snake (*Storeria dekayi*).

1.1.11.5 Birds

According to the USFWS Migratory Bird Program, the project area is located within the North America Atlantic Flyway for migratory birds, which is a critical corridor for migrating birds (USFWS, 2018). The nearby Schodack Island State Park has been designated a State Important Bird Area (IBA) by the National Audubon Society (National Audubon Society, 2018), and the New York State Bird Conservation Area Program similarly classifies Schodack Island State Park as a Bird Conservation Area (BCA; NYSDEC, 2002). According to the National Audubon Society and New York State Bird Conservation Area Program, the Island contains a concentration of wading birds, supports the roosting and perching of Osprey and Bald Eagle, contains a Great Blue Heron rookery with over 50 breeding pairs, and has been inhabited by Cerulean Warblers since 1965, including 18 Cerulean Warblers in 1997. Bald Eagles are federally protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668).

According to the eBird database, accessed on December 5, 2018, the world's largest biodiversity-related citizen science project, with more than 100 million bird sightings contributed each year, which is managed by Cornell Lab of Ornithology, 173 species of birds have been documented within or in the immediate vicinity of the Schodack Island IBA/BCA (eBird, 2012). The most common species that have been observed on the site include Snow Goose (*Chen caerulescens*), Brant (*Branta bernicla*), Canada Goose (*Branta canadensis*), Mute Swan (*Cygnus olor*), Wood Duck (*Aix sponsa*), and Mallard (*Anas platyrhynchos*).

Both the project area and Schodack Island State Park contain similar ecological communities, including freshwater tidal marsh, freshwater tidal marsh swamp,

freshwater intertidal mudflats, and intertidal shorelines. Therefore, the sites are expected to share similar species profiles. These ecological communities provide habitat to a significant number of bird species.

Additionally, as mentioned previously, the project area is within the designated Significant Coastal Fish and Wildlife Habitat of Shad and Schermerhorn Islands under the New York State Coastal Management Program. According to the Coastal Fish and Wildlife Rating Form associated with this designated habitat, the project area supports the spawning and foraging of Ruffed Grouse (*Bonasa umbellus*), American Bittern (*Botaurus lentiginosus*), and many passerine bird species (NYDOS, 2012).

1.1.11.6 Mammals

The project area is within the designated Significant Coastal Fish and Wildlife Habitat of Shad and Schermerhorn Islands under the New York State Coastal Management Program. According to the Coastal Fish and Wildlife Rating Form associated with this designated habitat, the project area supports mammal species including White-tailed Deer (*Odocoileus virginianus*) and Eastern Cottontail (*Sylvilagus floridanus*) (NYDOS, 2012).

Wildlife surveys performed by Louis Berger in 2017 found the occurrence of Virginia Opossum (*Didelphis marsupialis*), Mole (*Talpidae sp.*), Eastern Cottontail (*Sylvilagus floridanus*), Eastern Chipmunk *(Tamias striatus*), Gray Squirrel (*Sciurus carolinensis*), American Beaver (*Castor canadensis*), Meadow Vole (*Microtus pennsylvanicus*), Woodchuck (*Marmota monax*), Raccoon (*Procyon lotor*), Eastern Coyote (*Canis latrans var.*), and White-tailed Deer (*Odocoileus virginianus*) (Louis Berger, 2017). The 2017 Natural Resource Inventory also stated that Southern Flying Squirrel (*Glaucomys volans*), Common Muskrat (*Ondatra zibethicus*), and White-footed Mouse (*Peromyscus leucopus*) are likely present in the project area, and that the regionally rare Woodland Jumping Mouse (*Napaeozapus insignis*) was observed nearby several years prior to the survey.

1.1.12 Threatened and Endangered Species

1.1.12.1 Federal Species of Concern

Coordination with the USFWS (2019) identified the threatened Northern Long-eared Bat (*Myotis septentrionalis*) as potentially occurring at the site. The Northern Long-eared Bat is a medium-sized bat found across much of the eastern and north-central United States and is found state-wide in New York. The Northern Long-eared Bat predominantly overwinters in hibernacula that include caves and abandoned mines. During the summer, this species typically roosts singly or in colonies underneath bark or in cavities or crevices of both live trees and snags. Northern Long-eared Bats are also known to roost in human-made structures such as buildings, barns, sheds, and under eaves of windows (USFWS, 2014a). There are no reports of Northern Long-eared Bats at the Binnen Kill site. Coordination with Greater Atlantic Regional Fisheries Office (GARFO) identified the Shortnose sturgeon (*Acipenser brevirostrum*) and Atlantic Sturgeon (*Acipenser oxyriynchus oxyriynchus*) as potentially occur at the site.

1.1.12.2 State Species of Concern

The NYSDEC identified the endangered Shortnose sturgeon (*Acipenser brevirostrum*), endangered Peregrine Falcon (*Falco peregrinus*), and threatened Least Bittern (*Ixobrychus exilis*) as potentially occurring at the site. The Peregrine Falcon was observed at the Binnen Kill site in 2016 - 2017 (Kiviat & Samanns, 2017). On eBird there are reports of Peregrine Falcons observed near the 912M highway and the railroad bridge at the southern part of the Binnen Kill site. Observations included a Peregrine Falcon nesting the railroad bridge. During the Kiviat & Samanns (2017), Least Bittern playback calls were utilized with no response.

The NYSDEC also identified the endangered Hudson River Water Nymph (*Najas muenscheri*), rare Delmarva Beggar-ticks (*Bidens bidentoides*), and rare Heart-leaved Plantain (*Plantago cordata*) plants as observed at the Binnen Kill site. Kiviat & Samanns (2017) observed the Hudson River Water Nymph and Delmarva Beggar-ticks at the Binnen Kill site.

1.1.12.3 Designated Critical Habitat

The USFWS has not designated any critical habitat in the Binnen Kill site. The GARFO has identified the site as critical habitat for the Atlantic Sturgeon.

1.1.12.4 Essential Fish Habitat

Utilizing NMFS's essential fish habitat (EFH) designation and the EFH Mapper, the Binnen Kill site is potential essential fish habitat for various life stages of Winter Flounder (*Pseudopleuronectes americanus*), Little Skate (*Leucoraja erinacea*), Atlantic Herring (*Clupea harengus*), Red Hake (Urophycis chuss), Windowpane Flounder (*Scophthalmus aquosus*), Winter Skate (*Leucoraja ocellata*), and Clearnose Skate (*Raja eglanteria*). Kiviat & Samanns (2017) fish survey found none of the above species.

1.1.13 Cultural Resources

The Binnen Kill study area was subject to a review of existing data pertaining to historic and archaeological resources including local and regional histories, cultural resource surveys, and site files available on the New York State Cultural Resources Information System (CRIS), which is maintained by the NYSHPO and the Division for Historic Preservation within the Office of Parks, Recreation, and Historic Preservation (OPRHP). The resulting report is available in the Cultural Resources Appendix (see Appendix G5).

Much of the background information collected for the study area came from the Binnen Kill Natural Resource Inventory that was carried out on behalf of the New York State Department for Environmental Conservation. The survey included background research and a pedestrian reconnaissance/walkover survey of the study focus area to identify locations with potentially intact, undisturbed soils in areas of map-documented historic structures, or locations that may have been favorable for prehistoric human habitation (Miller et. al. 2017).

A Native American presence in the area has been documented in the archaeological record going back to the Paleoindian Period and historical accounts reference the existence of Native American villages throughout the Hudson Valley at the time of European contact. Historic maps indicate that the Binnen Kill site has remained largely undeveloped though most of its history. Historic use of the site is believed to have consisted primarily of light agriculture and ice harvesting. There are twelve prehistoric and 18 historic archaeological sites documented within 1 mile of the study area. One prehistoric archaeological site (00102.000198) is located directly within the study area. No specific details as to the type of cultural items recovered or their approximate date are available for this site. There is one National Register eligible resource within the study area, the ca. 1958 Castleton-on-Hudson Bridge (08313.000338) which crosses its southern portion. The Natural Resource Inventory identified the foundation ruins of a single historic site in the central portion of the study area along the former 1890s shoreline, the remains of the Baker's Ice House. A segment of a historic road was also identified just south of this location, between the former shoreline and Binnen Kill that may have been associated with historic use of the ice house and an un-maintained and unimproved gravel and crushed brick farm road with a deteriorated steel-framed bridge over the Binnen Kill was also identified bisecting the southern portion of the study area. Several areas within the study area were also determined archaeologically sensitive (Miller et. al. 2017).

The archaeological and historical record of the surrounding area and the results of the Natural Resource Inventory of the study area suggest that there is potential for both prehistoric and historic sites to exist within the dry and elevated areas of the study area especially within the vicinity of the historic islands and west of the historic shoreline.

1.1.14 Air Quality

The USEPA Green Book provides detailed information about area National Ambient Air Quality Standards (NAAQS) designations, classifications, and nonattainment statuses (USEPA, 2018). The site is classified as "in attainment" for all pollutants tracked under the NAAQS including ozone (O3), particulate matter (PM10 & PM2.5), sulfur dioxide (SO2), lead (Pb), carbon monoxide (CO), and nitrogen dioxide (NO2). There are no major sources of air pollutants (Title V facilities) on or in proximity to the site. Current on-site farming activities may contribute to local air pollution, but the effect is likely insignificant.

1.1.15 Noise

The site currently consists of naturalized areas and farm fields. In general, land uses near the site include low density residences and businesses. No known noise pollution monitoring stations are located in vicinity of the site. Potential sources of existing noise pollution on the site may include farming equipment used on the site, and local transportation infrastructure such as the NY Route 912M and the CSX Transportation Railroad located just south of the site. A small, single runway airport (South Albany Airport-4b0) is also located approximately 4 miles northeast of the site; planes passing above the site to or from this airport may also contribute to local noise pollution.

1.1.16 Recreation

Currently, there are no designated recreational areas located within the site. Initiatives such as Scenic Hudson's campaign for "Saving the Land that Matters Most" have recently protected parcels of land at Binnen Kill and could offer designated outdoor recreation in those areas in the future. The Binnen Kill and Shad and Schermerhorn Islands complex make up 63 acres of tidal wetlands, which give recreational opportunities for fishing, bird watching, and hunting, among other activities (NYSDEC, 2017). Freshwater wetlands in the Hudson River and Binnen Kill corridor are the largest and most biologically significant in the town of Bethlehem (NYSDEC, 2017).

The site has the potential to be a bird watching destination. It is home to rare bird species and a wide variety of migrating waterfowl (Scenic Hudson, 2016). As mentioned earlier, areas of preserved land at the site are part of Audubon-designated Important Bird Areas which aim to protect a variety of habitats including forests, shrub/scrub, grasslands, freshwater wetlands, saltwater wetlands, and bodies of water (National Audubon Society, 2018).

1.1.17 Aesthetics and Scenic Resources

The site is not designated as a Scenic Areas of Statewide Significance (SASS) under the New York Coastal Management Program. However, Policy 25 of the Coastal Management Program requires that state agencies must ensure proposed actions in the coastal zone "Protect, restore or enhance natural and man-made resources which are not identified as being of statewide significance, but which contribute to the overall scenic quality of the coastal area." (NYSDOS, 2017). Activities which could impair or degrade scenic quality include the modification of natural landforms, removal of vegetation, removal of existing structures, and the addition of structures that diminish scenic quality.

1.1.18 Hazardous, Toxic, and Radioactive Waste

A review of the databases yields no sites within or near the Binnen Kill site. There may be remnant agricultural chemicals at the site, as some areas have been used for agriculture since 1940 and older forms of pesticides can result in lead, arsenic, and other contamination.

1.1.19 Transportation and Other Infrastructure

The site can be accessed by car off I-87, Exit 22 of the New York State Thruway as well as Route 144, which runs parallel to I-87. Public transportation in the Binnen Kill area is limited, most transit stations are located further north in the City of Albany. The Rensselaer Train Station is approximately 11 miles north of the Binnen Kill site and has five Amtrak trains that service the local station, transporting travelers to Vermont, the Adirondack Mountains, Niagara Falls, and more (Albany County, 2018).

Albany International Airport is located 20 miles north of the Binnen Kill site via I-87 N. There are twelve major commercial airlines that provide service to Albany International, which functions as the major air center for the Capital Region, northeastern New York and western New England (Albany County, 2018).

1.2 Schodack Island State Park

1.2.1 Physical Setting

Schodack Island State Park sits off the eastern shore of the Hudson River approximately 10 miles south of Albany, New York. The park is located in the Town of Schodack (Rensselaer County), the Town of New Baltimore (Columbia County), and the Town of Stuyvesant (Greene County). The restoration site (hereafter referred to as "the site") where proposed actions would be implemented, is limited to an approximately 400 foot wide corridor within Schodack Island State Park between The Hudson River and Schodack Creek, just south of the park's boat launch parking area. The restoration site is entirely within the Town of Schodack, Rensselaer County portion of Schodack Island State Park

Prior to the 20th century, the area that would become the park originally consisted of Upper Schodack Island, Lower Schodack Island, and Houghtaling Island, as well as several smaller islands (NYS GIS Clearinghouse, 2018). The area known as Schodack Creek along the east side of the islands was in fact a branch of the Hudson River. The Muitzes Kill flowed from the east into the Hudson at the northern end of Upper Schodack Island, where Schodack Creek split off from the main flow of the Hudson River.

Beginning in the late 19th to early 20th century, dikes were constructed along the western edge of the islands (Friends of Schodack Island State Park, 2018). Dredging of the Hudson River deepwater channel began in the 1920s. Dredge spoils placed in the area caused the original islands to merge into a single landmass of approximately 2,000 acres (NYSDOS, 2012). This peninsula is connected to the eastern shore of the Hudson River at its upstream end and extends approximately seven miles downstream. Schodack Creek, along the east side of the peninsula, no longer has an upstream connection to the Hudson River. It is now fed by the Muitzes Kill as well as several small streams along the eastern shore, before joining the Hudson River at the downstream end of the peninsula.

The peninsula is now primarily occupied by Schodack Island State Park, including a boat launch, campground, and network of unpaved roads and trails. The south end, on what was originally Houghtaling Island, is occupied by a United States Army Corps of Engineers (USACE) dredge spoil disposal site in active use (USACE, 2014). The northern end of the Park is crossed by a railroad bridge and a highway bridge for Route 912M, both spanning the Hudson River. A set of railroad tracks are adjacent to the east side of Schodack Creek.

1.2.1.1 Geology and Physiography

The site is within the Hudson-Mohawk Lowlands physiographic region. The Hudson River flows from the southeastern Adirondacks, through a 15-20 mile wide lowland area, which is bounded by the Helderberg Plateau and the Catskill Mountains to the west, and the Taconic Mountains to the east. This section of the Hudson River Valley consists of a narrow inner valley with adjacent terraces approximately 100-200 feet high, bordered by gently rolling terrain and low hills. The valley is underlain by weak sedimentary rock, primarily formed during the Cambrian and Lower Ordovician periods (NYS DOT, 2013). Specifically, the Schodack Island site is mapped as the Normanskill Formation, which characterized as dark green to black argillaceous shale containing calcareous and chert

beds (Laberge Group, 2011). Post-deposition, the Normanskill shale was folded into a series of hills and valleys trending north-south (NYSDOS, 1995). In general, the surficial geology of the region is heavily influenced by its history of glaciation, including glacial till and lacustrine sediment deposited during the most recent glacial advance and retreat 70,000 to 16,000 years ago. The Hudson River has since reworked these sediments, and the site is currently mapped as alluvium (NYS Museum, 1991). Additionally, the area has been influenced by dredging, and deposited dredged material have filled in the areas between islands that historically existed at the site (Friends of Schodack Island State Park, 2018).

1.2.1.2 Topography

As discussed above, the area of the Hudson River Valley consists of a low-lying inner valley, bordered by steep slopes to terraces 100-200 feet high. The site is located within the inner valley on a peninsula that was previously multiple islands formed from alluvium. Based on a 2011–2012 LiDAR (Light Detection and Ranging) dataset developed by the New York State Department of Environmental Conservation (NYSDEC), the topography of the site is generally low-lying, with the highest elevations on the western edge reaching 22 feet. Portions of the dredge disposal area at the south end of the site reach as high as 50 feet (NYSDEC, 2011 - 2012).

1.2.1.3 Soils

Soils data and soils descriptions for Schodack Island Park were acquired from the National Resources Conservation Service (NRCS) Web Soil Survey for Rensselaer, Columbia, and Greene Counties, New York. The majority of the Park was mapped as one of eight soils: Udorthents (sandy), Limerick silt loam, Udipsamments (dredged), Medisaprists-Hydraquents (tidal marsh), Fluvaquents-Udifluvents complex, Saprists and Aquents (ponded), Middlebury silt loam, and Hamlin silt loam (NRCS, Web Soil Survey).

Udorthents, sandy, are composed of very gravelly loamy sand, typically dredged from the Hudson River. These soils are deep, excessively drained, with very high hydraulic conductivity.

Limerick silt loam soils are found in depressions on floodplains and are composed of silt loam derived from alluvium that is dominantly silt and very fine sand. These soils are deep, poorly drained, and rated as hydric.

Udipsamments, dredged, are made up of very deep, level areas of well drained sand and gravel, formed from soil material pumped from the Hudson River. Typically, sandy material containing up to 35% gravel is deposited in layers up to 10 feet thick on top of the original soil.

Medisaprists-Hydraquents, tidal marsh, are a complex of organic Medisaprists composed of deep layers of organic muck over silt loam and mineral Hydraquents, which are made up of silty clay loam over silt loam. They are both found in flat areas in marshes, are rated as hydric, and are very poorly drained.

Fluvaquents-Udifluvents complex soils are found in flat areas on floodplains. Fluvaquents are formed from silt loam over gravelly silt loam, located in low areas that flood frequently. They are poorly drained and rated as hydric. Udifluvents are found in

slightly higher areas and are composed of gravelly fine sandy loam over gravelly sandy loam. They are moderately well drained, with a typical depth to water of 36-72 inches, and are not rated as hydric. Both are formed from alluvium with a highly variable texture and have variable profiles.

Saprists and Aquents, ponded, are a complex of organic Saprists composed of deep layers of organic muck over fine sandy loam and mineral Aquents, which are made up of mucky silt loam over gravelly loamy sand. They are both found in flat areas in swamps and marshes, are rated as hydric, and are very poorly drained.

Middlebury silt loam is a moderately well drained soil found on flat floodplains, and it is composed of silt loam, sandy loam, and gravelly fine sand. This soil is derived from loamy alluvium predominantly from areas of shale and sandstone with some lime-bearing material. It is not rated as hydric.

Hamlin silt loam is a nearly level, very deep and well-drained soil found on floodplains along the Hudson River. It is formed from silty alluvium from areas of siltstone, shale, and limestone. Typical depth to the water table is 36-72 inches, and it is not considered hydric. The surface layer is typically dark brown silt loam, underlain by layers of dark grayish brown silt loam.

1.2.2 Climate and Weather

A National Weather Service (NWS) station is located approximately 7.8 miles west of the site, at the Alcove Dam. Records for this station are available between 1942 and 2018, via the Agricultural Applied Climate Information System (AgACIS). Records at this station indicate that between 1942 and 2018, Average monthly temperatures ranged for 21.1°F in January to 69.5°F in July (AgACIS, 2018). Average annual precipitation was 39.74 inches, with monthly averages ranges from 2.18 inches in February to 3.89 inches in June. Average annual snowfall was 29.5 inches, primarily occurring between December and March. The average number of days with 0.10 inches of precipitation or more was 76 days per year; such precipitation days occurred at a roughly equally rate per month (5-8 days per month).

1.2.2.1 Climate Resiliency

According to the Intergovernmental Panel on Climate Change's (IPCC) Special Report 15, released in October of 2018, human activities have caused approximately 1.0° C (1.8° F) of global warming above pre-industrial levels, causing many land and ocean ecosystems to change. The same report also stated that, "model-based projections of global sea level rise (relative to 1986-2005) suggest an indicative range of 0.26 to 0.77 m (0.85 to 2.5 ft.) by 2100 for 1.5° C (1.8° F)of global warming… Increasing warming amplifies the exposure of small islands, low-lying coastal areas and deltas to the risks associated with sea level rise for many human and ecological systems, including saltwater intrusion, flooding and damage to infrastructure" (IPCC, 2018).

Climate projections developed by New York State indicate a future increase in temperatures, precipitation, sea levels, and severity of flooding (NYSDEC, 2018b). The State's average annual temperature is expected to increase approximately four to six degrees Fahrenheit by mid-century and as much as 11 degrees Fahrenheit by 2100. The total annual precipitation is expected to increase as much as 11% by mid-century and

18% by 2100. Since 1900, sea level in the lower Hudson has risen 13 inches. Sea level rise along the Hudson River is projected to continue. The Hudson River is projected to rise a minimum of nine additional inches by 2050, with mid-range projections of approximately 10 to 20 inches by 2050. These changing climatic factors will likely alter flooding patterns in the Hudson River. It is projected that today's 1% storm will become 20 to 50% more likely by 2020 and as much as 610% more likely by 2100. Given its location along the Hudson River Shoreline, Schodack Island will likely be significantly affected by any changes in climate and hydrology patterns.

Neither Rensselaer County nor the Town of Schodack are participants in the NYS Climate Smart Communities Program (New York State, 2018).

1.2.3 Floodplains and Coastal Processes

1.2.3.1 Floodplains

The Rensselaer County portion of the site lies completely within the one percent floodplain (A13 Zone) with a base flood elevations of 15.2 to 17.2 feet (NAVD88), as shown on the FEMA Flood Insurance Rate Map (FIRM), effective as of August 15, 1984 (FIRM Panel No.: 3611690012A and 3611690014A)(FEMA, 1984a)(FEMA, 1984b). The Greene County portion of the site lies completely within the one percent floodplain (A Zone), as shown on the Flood Insurance Rate Map (FIRM), effective as of May 16, 2008 (FIRM Panel No.: 36039C0110F) (FEMA, 2008). Base flood elevations were not determined in this zone.

A United States Geological Survey (USGS) stream gage is located approximately 6 miles upstream of the project area on right bank of the Hudson River at the Port of Albany (NWIS Site No.: 01359165) (USGS, 2018). Records for this gage begin on September 30, 2016. The gage is under continuous operation as of December 5, 2018. During this period, the maximum water elevation was 7.41 feet (NAVD88) on April 7, 2017 and the minimum water elevation was -4.20 feet on February 14, 2017.

A USGS Short-Term Network (STN) Monitoring site is located across the Hudson River from the project site in Coeymans (STN Site No.: NYALB07392) (USGS, 2012). After Hurricane Sandy in 2012, a high water mark was recorded at elevation of approximately 10.2 feet (NAVD88) at this site.

1.2.4 Water Resources

1.2.4.1 Surface Waters

Located within the Middle Hudson Watershed (HUC-8 No.: 02020006), the Hudson River and Schodack Creek are the primary surface water bodies at the site (NYS GIS Clearinghouse, 2018). The Hudson River forms the western boundary of the site, while Schodack Creek delineates the eastern boundary. The Hudson River has a drainage area of approximately 8,690 square miles (USGS Streamstats, Accessed December 2018) to the confluence with Schodack Creek. Water levels in the Hudson River are in part controlled by the Federal Dam located in Troy, approximately 18 miles upstream. This dam marks the upstream extent of tidal influence in the Hudson River. The Schodack Creek drainage area is a small subset of the Hudson River drainage area, with an area of approximately 31.5 square miles (USGS Streamstats). The majority of the drainage

comes from the Muitzes Kill which flows into the northern end of Schodack Creek, while the remainder comes from small creeks along its eastern boundary.

1.2.4.2 Water Quality

Schodack Creek and the Hudson River are both classified as Class C water bodies, which support fisheries and are suitable for non-contact recreation (6 CRR-NY X B). The Hudson River in Albany County is on the 2016 USEPA 303(d) list as "impaired" due to fish consumption advisories from sediment contaminated with polychlorinated biphenyls (PCBs) (USEPA, 2016).

1.2.4.3 Regional Hydrogeology and Groundwater

In general, aquifers in the Hudson Valley are unconfined and related to thick layers of sediment glacially deposited over bedrock. One aquifer has been identified at the Schodack Island site by the New York State Department of Conservation Division of Water, Bureau of Water Resources Management. This aquifer is described as an unconfined, high yield aquifer with a yield of greater than 100 gallons per minute. The aquifer is composed of sand and gravel deposits with high transmissivity and a saturated thickness greater than 10 feet. The mapped aquifer generally follows the footprint of the Hudson River and associated alluvium deposits and overlaps with the western edge of the site. However, this aquifer was mapped at a 1:250,000 scale, based on published surficial and bedrock geology maps, and the boundaries of this aquifer indicate the general location only (NYS GIS Clearinghouse, 2018).

To the east of the Hudson River in Rensselaer and Columbia counties, there are several unconfined aquifers including a regional aquifer within the Schodack and Kinderhook terrace deposits. This aquifer was formed from glacially derived sediment deposited in a north to south strip approximately 3-5 miles east of the Hudson River. In some areas, the aquifer has a yield greater than 100 gallons per minute. Though not directly connected to the Hudson River, this aquifer is a source of water to the Muitzes Kill, and ultimately drains to Schodack Creek and the Hudson River (Reynolds, 1999).

1.2.4.4 Tidal Influences

The Hudson River Environmental Conditions Observing System (HRECOS) monitoring station and tide gauge are located on-site at the main boat launch on the Hudson River. At this station, the low and lower low tide levels are -1.42 and -1.63 feet, (NAVD88), respectively; while the high and higher high tide levels are 3.47 and 3.80 feet (NAVD88), respectively.

As part of this Hudson River Habitat Restoration Feasibility Study, two water level gauges were installed by the Project Development Team in Schodack Creek on the east side of the peninsula at approximately 2.7 miles and 4.2 miles upstream of the confluence with the Hudson River. Data collected from June to November of 2018 showed water surface levels ranging from below 0 feet in elevation to greater than 5 feet in elevation (NAVD88). Tide levels were similar at both locations and were similar to the levels recorded at the HRECOS gauge on the west side of Schodack Island, indicating little tidal variability between the Hudson River and monitored portions of Schodack Creek.

1.2.5 Land Use and Zoning

Schodack Island State Park is within the Town of Schodack and Town of New Baltimore protected open space. This open space consists of extensive forest and wetland areas throughout the southern and central portions of the island, and a recreational area which includes an access road, playgrounds, parking lots, and camping grounds in the northern portion of the island. This open space is owned and operated by the State of New York. Land uses in the vicinity of the site contain a mix of forested land and low-density residential properties. The southern end of Schodack Island (approximately 1.5 miles long) is not a part of the State Park. This section is owned and operated by the federal government as a dredged material disposal area.

Historically, there was not a single contiguous island in this area but a complex of islands and side channels within the Hudson River. Since European colonization, the historic islands underwent a variety of land uses including timber production, ice harvesting, industry, and agriculture. The channels were filled and islands connected through the placement of dikes and dredged material in the 1920s, resulting in a peninsula between the Hudson River and Schodack Creek and a relic side channel (Huey et al., 1997).

The site is located entirely Town of Schodack Residential/Agricultural (RA) zoning district. This zone is regulated under Chapter 219 of the Schodack municipal code. This districts generally zones for low-density residential or agricultural-oriented development. Habitat restoration/creation is not explicitly regulated under the town's municipal zoning code. Given that the site is protected as state park land, it is unlikely any residential or agricultural development will occur on the site in the foreseeable future.

Pursuant to §24-0501 of the New York State Freshwater Wetlands Act (Article 24 of the New York Environmental Conservation Law), the towns of New Baltimore and Schodack have fully accepted responsibility with regard to activities subject to regulation under the Act within officially designated freshwater wetlands.

1.2.6 Economics

Schodack Island State Park is located in upstate New York in the Saratoga/Capital District, the metropolitan area surrounding the state's capital city, Albany. The park spans portions of Rensselaer, Greene, and Columbia counties. The riverfront area within the site is generally undeveloped. The only developed area is the Village of Castleton-on-Hudson, in the Town of Schodack, which sits approximately in the center of the waterfront area. According to the Town of Schodack Comprehensive Plan, a quarter of the town's working residents are employed in the following industries: educational, health, and social services (Laberge Group, 2011).

Ecotourism is an important economic driver in this region, as the natural and scenic resources draw millions of visitors to New York's recreation areas (USFWS, 2006). Many people come from out of town to pursue wildlife-associated recreation, outdoor sporting, angling, hunting, and wildlife watching, bringing with them business for local restaurants, hotels, shops, etc. According to a report by the United States Fish and Wildlife Service (USFWS), 3.8 million people watch birds and other wildlife in New York State, generating approximately $1.6 billion in ecotourism revenue every year. In 2006, there was a total of $716 million in hunting-related expenditures in the state of New York (USFWS, 2006).

1.2.7 Socio-Economics

According to the US Census Bureau (USCB) American Community Survey 5-year survey for 2013-2017, the population in the Town of Schodack, NY is an estimated 12,794 people, and is predominantly white (USCB, 2013-2017). The median age in the Town of Schodack, NY is approximately 44.1 years of age and median household income is $79,740. An estimated 5,324 occupied housing units are present within the town, with a majority of structures being built in 1939 or earlier (1,273structures).

Approximately 93.5% of the population are high school graduates or higher while 31.4% of the population have a bachelor's degree or higher. The estimated number of companies in the Town of Schodack is 1,053. The civilian employed population 16 and over is an estimated 6,865 people. Of this employed population, an estimated 2,789 people work in management, business, science, and arts occupations, 990 people in service occupations, 1,859 in sales and office occupations, 491 in natural resources, construction, and maintenance occupations, and 736 in production, transportation, and material moving occupations.

1.2.7.1 Environmental Justice

According to the New York State Department of Environmental Conservation's Maps & Geospatial Information System (IGST) Tools for Environmental Justice data set, the site is not located within an Environmental Justice area (NYSDEC, 2018c).

1.2.8 Coastal Zone Management

The Hudson River, downstream of the Federal Dam in Troy, New York, is a designated Coastal Area, subject to regulation under the federal Coastal Zone Management Act and managed under the New York Coastal Management Program. The landward boundary of the coastal area is typically 1,000 feet inland from the shoreline.

The New York State Department of State (NYSDOS) has designated Schodack Island, Houghtaling Island, and Schodack Creek as a Significant Coastal Fish and Wildlife Habitat. Based on an evaluation by the New York State Department of Environmental Conservation (NYSDEC), this area is considered significant because it consists of a large undeveloped floodplain wetland ecosystem with diverse ecological communities, including floodplain forest, freshwater tidal wetlands, tidal creek, littoral zones, emergent marshes, and tidal swamp. Schodack Creek provides spawning, nursery, and feeding habitat for migratory and resident fish species, including white perch (*Morone americana*), American shad (*Alosa sapidissima*), blueback herring (*Alosa aestivalis*), largemouth bass (*Micropterus salmoides*), smallmouth bass (*Micropterus dolomieui*), shortnose sturgeon (*Acipenser brevirostrum*), American eel (*Anguilla rostrata*), and alewife *(Alosa pseudoharengus*). The Muitzes Kill additionally provides a spawning area for spottail shiners (*Notropis hudsonius*). Submerged aquatic vegetation provides food and cover for fish and macroinvertebrates and contributes to dissolved oxygen in the water. The wetland and upland areas also support various bird species and other wildlife.

1.2.9 Wetlands

The USFWS National Wetland Inventory (NWI) map indicates the presence of both freshwater emergent wetlands and freshwater forested/shrub wetlands at the Schodack

Island site. The Hudson River and Schodack Creek are mapped as riverine environments. Additionally, tidally influenced wetlands have been mapped by the NYSDEC's Hudson River Estuary Program as a separate effort in 2007 based off of aerial photographs. This dataset overlaps the NWI inventory and indicates the presence of multiple types of tidal environments including: submerged aquatic vegetation, wooded swamp, unvegetated flats, scrub shrub wetland, cattail (*Typha angustifolia)* dominated, common reed (*Phragmites australis)* dominated, intertidal mix, and open water. These are primarily mapped along the east side of the site along Schodack Creek (NYSDEC, 2007).

1.2.10 Vegetation

The Schodack Island site contains a variety of ecological communities including floodplain forests, wooded swamp, scrub shrub wetlands, and emergent wetlands (NYSDOS, 2012). All community descriptions were acquired from Ecological Communities of New York State, 2nd Edition (Edinger et al., 2014).

Floodplain forests in the Hudson River valley typically contain plants such as silver maple (*Acer saccharinum*), box elder (*Acer negundo*), sycamore (*Platanus occidentalis*), green ash (F*raxinus pensylvanicus*), cottonwood (*Populus deltoides*), slippery elm (*Ulma nigra*), black walnut (*Juglans nigra*), multiflora rose (*Rosa multiflora*), Virginia creeper (*Parthenocissus cinquefolia*), poison ivy (T*oxicodendron radicans*), spicebush (*Lindera benzoin*), and American hornbeam (*Carpinus caroliniana)*. In particular, invasive species such as mugwort (*Artemisia vulgaris*) were dominant in the forest understory.

Wooded swamps typically contain trees and shrubs including green ash, black ash (*Fraxinus nigra*), red maple (*Acer rubrum*), slippery elm, alders (*Alnus spp.*), spicebush, arrowwood (*Vibernum dentatum*), dogwoods (*Cornus spp.*), Virginia creeper and poison ivy. Common herbaceous species include rice cutgrass (*Leersia oryzoides*), sensitive fern (*Onoclea sensibilis*), spotted jewelweed (*Impatiens capensis*), and skunk cabbage (*Symplocarpus foetidus)*.

Scrub shrub wetlands may contain alder (*Alnus incana*), red osier dogwood (*Cornus sericea*), silky dogwood (*Cornus amomum*), or willows (*Salix spp.*). Also common are meadowsweet (*Spiraea spp*.), gray dogwood (*Cornus racemosa*), swamp azalea (*Rhododendron viscosum*), highbush blueberry (*Vaccinium corymbosum*), and spicebush (*Lindera benzoin*).

Emergent wetlands are characterized by cattails (*Typha spp*.), sedges (*Carex spp*.), marsh fern (*Thelypteris palustris*), spike rushes (*Eleocharis spp*.), bulrushes (*Scirpus spp*.), and sweetflag (*Acorus americanus*). The invasive common reed (*Phragmites australis*) is also common.

1.2.11 Fish and Wildlife Resources

1.2.11.1 Shellfish

No information regarding the presence, absence, or composition of shellfish communities on the site is readily available.

1.2.11.2 Finfish

The site is in vicinity designated as 'Significant Anadromous Fish Concentration Area' by the NYSDEC Environmental Resource Mapper (NYSDEC, Environmental Resource Mapper*)*. Schodack Island in its entirety is also designated as a Significant Coastal Fish and Wildlife Habitat under the New York State Coastal Management Program, known as 'Schodack and Houghtaling Islands and Schodack Creek'. According to the Coastal Fish and Wildlife Rating Form (NYDOS, 2012) associated with this designated habitat, Schodack Creek functions as a biologically productive backwater area that generally supports larger populations of fish, plankton, and rooted plants than the Hudson River.

The area contains a multitude of aquatic habitats including mudflats, littoral zones, submerged aquatic vegetation beds, and wetlands which are important in various life stages of many fish species. Schodack Creek is a significant spawning nursery and feeding area for American shad (*Alosa sapidissima*), white perch (*Morone americana*), alewife (*Alosa pseudoharengus*), blueback herring (*Alosa aestivalis*), largemouth bass (*Micropterus salmoides*), smallmouth bass (*Micropterus dolomieui*), American Eel (*Anguilla rostrata*) and other freshwater fish species.

1.2.11.3 Benthic Resources

According to Hudson River Estuary Program Benthic Mapping Project (NYSDEC, 2006), the bottom sediment of Schodack Creek is comprised of >90% mud (silt and clay mix) and is part of a thickly lain, depositional sediment region.

The bottom sediment of the Hudson River in this area is comprised of muddy sand (sand with >10% mud) and gravelly sand (sand with >10% gravel) along the shoreline. The Hudson River shoreline along the northern and southern portion of Schodack Island is primarily part of a thickly lain, depositional sediment region. The central portion of the Island, where the land separating the Hudson River and Schodack Creek is the thinnest, is within an erosional, non-depositional, sediment area.

The site contains a varied mix of benthic morphology including tidal creeks, freshwater intertidal mud flats, and submerged aquatic vegetation beds predominantly dominated by water celery (*Vallisneria americana*)*.*

1.2.11.4 Reptiles and Amphibians

No information regarding the presence, absence, or composition of reptile or amphibian communities on the site is readily available.

1.2.11.5 Birds

According to the USFWS Migratory Bird Program, the project area is located within the North America Atlantic Flyway for migratory birds, which is a critical corridor for migrating birds (USFWS, 2018). Schodack Island State Park contains a multitude of bird habitats, including freshwater tidal marsh, freshwater tidal marsh swamp, freshwater intertidal mudflats, and intertidal shorelines. Schodack Island State Park has been designated a State Important Bird Area (IBA) by the National Audubon Society (National Audubon Society, 2018), and the New York State Bird Conservation Area Program similarly classifies Schodack Island State Park as a Bird Conservation Area (BCA) (NYSDEC, 2002). According to the National Audubon Society and New York State Bird Conservation

Area Program, the Island contains a concentration of wading birds, supports the roosting and perching of Osprey and Bald Eagle, contains a Great Blue Heron rookery with over 50 breeding pairs, and has been inhabited by Cerulean Warblers since 1965, including 18 Cerulean Warblers in 1997. Bald Eagles are federally protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668).

According to the eBird database, managed by Cornell Lab of Ornithology, as of January 8, 2019, 173 species of birds have been documented within Schodack Island State Park (eBird, 2012). The most common species that have been observed on the site include Canada Goose (*Branta canadensis*), Tree Swallow (*Tachycineta bicolor),* American Tree Sparrow (*Spizella arborea),* American Robin (*Turdus migratorius),* Dark-eyed Junco (*Junco hyemalis),* and White-throated Sparrow (*Zonotrichia albicollis)*

As mentioned previously, the project area is within the designated Significant Coastal Fish and Wildlife Habitat of 'Schodack and Houghtaling Islands and Schodack Creek' under the New York State Coastal Management Program. According to the Coastal Fish and Wildlife Rating Form associated with this designated habitat (NYDOS, 2012), wetland areas around Schodack and Houghtaling Islands and Schodack Creek serve as nesting habitats for a variety of bird species such as Green Heron (*Butorides virescens*), Mallard (*Anas platyrhynchos*), Black Duck (*Anas rubripes*), Spotted Sandpiper (*Actitis macularia*), American Woodcock (*Scolopax minor*), Marsh Wren (*Cistothorus palustris*), and Swamp Sparrow (*Melospiza georgiana*). Upland habitats on the islands support Ruffed Grouse (*Bonasa umbellus*) and the area's floodplain forests contain unusual concentrations of nesting Wood Thrush (*Hylocichla mustelina*) and Cerulean Warblers (*Vermivora pinus*). During spring and fall migrations (March-May and September-November, generally), Schodack and Houghtaling Islands and Schodack Creek receive considerable use by concentrations of waterfowl, raptors, shorebirds, and passerines, including American Bittern (*Botaurus lentiginosus*), Cerulean Warbler (*Vermivora pinus*). Osprey (*Pandion haliaetus*) occur on Lower Schodack Island regularly during spring migration.

1.2.11.6 Mammals

No information regarding the presence, absence, or composition of mammals on the site is readily available. It is likely that the extensive and varied natural areas contained within Schodack Island State Park provide habitat for numerous mammalian species.

1.2.12 Threatened and Endangered Species

1.2.12.1 Federal Species of Concern

The USFWS iPac system identified the threatened Northern Long-eared Bat (*Myotis septentrionalis*) and the endangered Indiana Bat (*Myotis sodalis*) as potentially occurring at the site.

The Northern Long-eared Bat is a medium-sized bat found across much of the eastern and north-central United States and is found state-wide in New York. The Northern Long-eared Bat predominantly overwinters in hibernacula that include caves and abandoned mines. During the summer, this species typically roosts singly or in colonies underneath bark or in cavities or crevices of both live trees and snags. Northern Long-eared Bats are also known to roost in human-made structures such as buildings, barns, sheds, and under eaves of windows (USFWS, 2014a).

The Indiana bat is small, weighing only one-quarter of an ounce. In flight. It has a wingspan of 9 to 11 inches. The fur is dark-brown to black. It is found throughout New York. Indiana bats hibernate during winter in caves or, occasionally, in abandoned mines. After hibernation, Indiana bats migrate to their summer habitat in wooded areas where they usually roost under loose tree bark on dead or dying trees. There are no reports of the Northern Long-eared Bat or Indiana Bat at the site. Coordination with Greater Atlantic Regional Fisheries Office (GARFO) identified the Shortnose sturgeon and Atlantic Sturgeon as potentially occur at the site.

1.2.12.2 State Species of Concern

The NYSDEC identified the endangered Shortnose Sturgeon (*Acipenser brevirostrum*) and threatened Bald Eagle (*Haliaeetus leucocephalus*) as potentially occurring at the site. Report on eBird show Bald Eagles circling overhead at the site. There are no reports of Shortnose Sturgeon at the site.

1.2.12.3 Designated Critical Habitat

The USFWS has not designated any critical habitat in the site. The GARFO has identified the site as critical habitat for the Atlantic Sturgeon.

1.2.12.4 Essential Fish Habitat

Utilizing NMFS's essential fish habitat (EFH) designation and the EFH Mapper, the Binnen Kill site is potential essential fish habitat for various life stages of Summer Flounder (*Paralichthys dentatus*), Winter Flounder (*Pseudopleuronectes americanus*), Little Skate (*Leucoraja erinacea*), Atlantic Herring (*Clupea harengus*), Red Hake (Urophycis chuss), Windowpane Flounder (*Scophthalmus aquosus*), Winter Skate (*Leucoraja ocellata*), and Clearnose Skate (*Raja eglanteria*). Kiviat & Samanns (2017) fish survey found none of the above species.

1.2.13 Cultural Resources

The Schodack Island Park study area was subject to a review of existing data pertaining to historic and archaeological resources including local and regional histories, cultural resource surveys, and site files available on the New York State Cultural Resources Information System (CRIS), which is maintained by the NYSHPO and the Division for Historic Preservation within the Office of Parks, Recreation, and Historic Preservation (OPRHP). The resulting report is available in Appendix G5 – Cultural Resources.

Several cultural resources surveys have been conducted within the study area. Much of the historical background for Upper and Lower Schodack Island was compiled by Paul Huey of the New York State Office of Parks, Recreation and Historic Preservation (Huey 1997). In the 1990s Wendy Harris and Arnold Pickman of the U.S. Army Corps of Engineers conducted surveys to locate historic ice houses on the Schodack Islands as part of the Hudson River Habitat Restoration Study (Harris and Pickman 1997) and Hartgen Archaeological Associates (HAA) was retained by the NYSOPRHP between 1997 and 2002 to conduct a series of archaeological investigations in areas of construction for park facilities and mitigation areas that were considered to be sensitive for prehistoric and historic resources (HAA 1999, 2000, 2001a, and 2002c). These studies have formed the basis for the cultural resources evaluation.

Of the 93 archaeological sites listed on the CRIS database within a mile of the study area there are 15 prehistoric sites, 66 historic sites and 12 sites containing both prehistoric and historic components. One prehistoric archaeological site is listed within the study area, the Mahican Indian Village Site (08313.000238). The location of the site has not been confirmed through archaeological investigations but it appears on several historic maps of the area and is mentioned in historical accounts. Four historic archaeological sites are located within the boundaries of the study area as well. These are the Miller and Witbeck Ice House (08313.000242), Ziegler's Ice House (08313.000237), the J.N. Briggs Ice House (08313.000243), and the Horton and Company Ice House (03912.000109). There are no eligible or listed above-ground historic properties located within the study area.

The archaeological and historical record of the study area and the results of previous cultural resources surveys suggest that there is potential for both prehistoric and historic sites to exist within the dry and elevated areas of the study area especially within the vicinity of the historic islands.

1.2.14 Air Quality

The USEPA Green Book provides detailed information about area National Ambient Air Quality Standards (NAAQS) designations, classifications, and nonattainment statuses (USEPA, 2018). The site is located in a region classified as "in attainment" for all pollutants tracked under the NAAQS including ozone (O_3), particulate matter (PM10 & PM2.5), sulfur dioxide (SO_2), lead (Pb), carbon monoxide (CO), and nitrogen dioxide (NO_2). There are no major sources of air pollutants (Title V facilities) on or in proximity to the site. Current on-site trucking activities may contribute to local air pollution, but the effect is likely insignificant.

1.2.15 Noise

The site currently consists of dense forested park land and hiking trails. Potential sources of existing noise pollution on the site may include trucking activities, during times when dredged material is being transported for disposal at the southern tip of Schodack Island. Other local sources of noise pollution may include boating activities along the Hudson River and around the Port of Coeymans, which is located just across the river from the site.

1.2.16 Recreation

What was to become Schodack Island State Park was first acquired by the New York State Office of Parks, Recreation and Historic Preservation in the 1970s, and was originally known as Castleton Island State Park. It remained undeveloped until the early 2000s (Huey *et al.,* 1997).

Schodack Island State Park was opened in 2002 and was initially a day-use only park. In 2013, plans were proposed to add camping facilities to the park, representing the first new campground constructed by the New York State Office of Parks, Recreation and Historic Preservation in approximately 35 years. The campsites were made available to

the public in 2016 (Huey *et al.,* 1997). Prior to its designation as a State Park, Schodack Island was relatively inaccessible (National Audubon Society, 2018).

Currently, eight miles of multi-use trails wind through a variety of ecological communities. In addition, the park has 66 campsites for use, an improved bike trail, volleyball nets, horseshoe and a kayak/canoe launch site. Interpretive signage highlights the park's historic and environmental significance. According to a blog revolving around activities in the town of Schodack, many recreation events are hosted at the Schodack Island State Park, including a Winterfest with cross country ski racing, snow shoeing, nature hikes, ice skating, and dog sledding (Schodack Scene, 2015).

In addition to being a state park, Schodack Island has also been designated a State Estuary. As noted previously, a portion of the park shelters a BCA that is home to Bald Eagle and Cerulean Warbler, and Great Blue Heron rookery. Osprey also roost and forage in the BCA. The western side of the Island, along the Hudson River shoreline, is predominately floodplain forest, and is of particular importance in regard to its use by Bald Eagles. These species, and others noted above, draw bird watchers to the island.

Hunting is allowed in Schodack Island State Park for those holding a valid NYS hunting license, archery license, muzzle loading license, and/or turkey permit as required by Environmental Conservation Law. In addition, hunters must also be issued a special permit by the park itself (NYS Parks Recreation, and Historic Preservation, 2018).

1.2.17 Aesthetics and Scenic Resources

The site is located within a designated Scenic Area of Statewide Significance (SASS), specifically the Columbia-Greene North SASS, in the CGN-4 Islands subunit (NYSDOS, 1993). According to the Scenic Area Study associated with this SASS (NYSDOS, 1993), the Islands subunit is included in the Columbia-Greene North SASS because "...it links distinctive subunits. The subunit constitutes the middle ground and background of views to the Hudson River from distinctive subunits on both the west and east banks of the Hudson, including views from the trains on the eastern shore and from NY Routes 61 and 9J…"

As a SASS, Policy 24 of the Coastal Management Program requires that state agencies must ensure proposed actions "prevent impairment of scenic resources of statewide significance." (NYSDOS, 2017). Activities which could impair or degrade scenic quality include the modification of natural landforms, removal of vegetation, removal of existing structures, and the addition of structures that diminish scenic quality.

1.2.18 Hazardous, Toxic, and Radioactive Waste

A review of the databases yields no sites within or near the Schodack Island site.

1.2.19 Transportation and Other Infrastructure

Schodack Island State Park is located off of NY-9J, a motor-vehicle road that is also a bicycle route. There is no other infrastructure within the park boundary.

1.3 Henry Hudson Park

1.3.1 Physical Setting

Henry Hudson Park is a public open space located on a 64.2-acre property on the west shore of the Hudson River, owned by the Town of Bethlehem, Albany County, New York. The park serves as the only public access location to the Hudson River within the Town of Bethlehem. Lyons Road traverses the park connecting it to other local residential roads and to NY Route 144 - River Road. The park is bound to the east by the Hudson River, and Vloman Kill traverses the southern portion of the park draining to the Hudson River. The area of the park to the south of Vloman Kill is inaccessible by foot from the main area of the park. The Henry Hudson Park shoreline is approximately 2,680 feet in length and approximately 600 feet from the Hudson River's main navigation channel (Ocean and Coastal Consultants, 2011).

Approximately 15 acres of the park is managed as recreational open space, including parking areas, a pavilion, boat launches for motorized craft, kayaks, canoes and other hand-powered craft, picnic areas, a softball field, a playground, a volleyball court, and a floating fishing platform. The remaining area is primarily undisturbed, including upland forest and vegetated areas adjacent to Vloman Kill. The recreational area of the park is located immediately adjacent to Lyons Road, and in the area between Lyons Road and the Hudson River. This area is relatively flat, ranging in elevation from approximately 7 to 9 feet (NAVD88), and is primarily turf with large shade trees interspersed.

In general, this reach of the Hudson River is characterized by narrow widths, extensive shoals, and a relatively steep river bottom resulting in higher water velocities. The channel has been highly modified due to dredging of the deepwater navigational channel in the 19th and 20th centuries. Shorelines have also been modified from dredged sediment disposal as well as rock and timber cribs used to contain dredge spoils (Allen et al., 2006). At Henry Hudson Park, the site shoreline was built up beginning in the 1860's from dredged materials that were placed and contained through the use of timber cribs containing riprap stone. Based on historic topographic surveys, the site was underwater until 1925, when the navigation channel was dredged to a depth of 27 feet, later deepened to 32 feet in 1954 (Ocean and Coastal Consultants, 2011).

The park's shorelines vary in condition. The northern section of the Hudson River shoreline is lined with riprap. The riprap in this section is in good condition and no significant signs of erosion are present. This section also contains a boat ramp which, based on historic aerial imagery, was constructed between 1994 and 2004. The southern section of the Hudson River shoreline consists of a dilapidated timber cribbing structure built in the 1920s, filled with riprap between two timber crib walls, and capped with convex concrete segments. The majority of the structure has either partially or completely failed. The crib walls are severely decomposed, the concrete cap has detached and displaced, and riprap has moved from between the crib walls into the river. In sections of complete structural failure, upland areas show signs of erosion and are inundated during high tides. The cribbing structure extends southward and terminates along the mouth of Vloman Kill, sheltering a small cove. This cove contains an unvegetated, tidal mudflat area showing signs of erosion.

The restoration site (hereafter referred to as “the site”), where proposed actions would be implemented, is limited to the Park’s Hudson River shoreline area, and a 3.5-acre riparian area on the river left side of Vloman Kill approximately 1,900 feet upstream from its confluence with the Hudson River.

1.3.1.1 Geology and Physiography

The site is within the Hudson-Mohawk Lowlands physiographic region. The Hudson River flows from the southeastern Adirondacks, through a 15- to 20-mile-wide lowland area, which is bounded by the Helderberg Plateau and the Catskill Mountains to the west, and the Taconic Mountains to the east. This section of the Hudson River Valley consists of a narrow inner valley with adjacent terraces approximately 100-200 feet high, bordered by gently rolling terrain and low hills (NYSDOT, 2013). The valley is underlain by weak sedimentary rock, primarily formed during the Cambrian and Lower Ordovician periods. Specifically, the Henry Hudson site is mapped as underlain by the Austin Glen Formation, which consists of highly folded, interbedded greywacke sandstone and shale that formed in a deep marine setting from the erosion of pre-existing sedimentary rocks (NYS Museum, 1995). In general, the surficial geology of the region is heavily influenced by its history of glaciation, including glacial till and lacustrine sediment deposited during the most recent glacial advance and retreat 70,000 to 16,000 years ago. The Hudson River has since reworked these sediments, and the site is currently mapped as alluvium (NYS Museum, 1991).

1.3.1.2 Topography

As discussed above, the area of the Hudson River Valley consists of a low-lying inner valley, bordered by steep slopes to terraces 100-200 feet high. The site is located within the inner valley on a river terrace close in elevation to the Hudson River. Based on a 2011–2012 LiDAR (Light Detection and Ranging) dataset developed by the New York State Department of Environmental Conservation (NYSDEC), the topography of the site is generally low-lying and gently sloping, with the majority of the site sitting at an elevation of less than 10 feet (NAVD88) (NYSDEC, 2011 - 2012).

1.3.1.3 Soils

Soils data and soils descriptions for the Henry Hudson Park were acquired from the National Resources Conservation Service (NRCS) Web Soil Survey for Albany County, New York. The park was mapped as two soil types: Udipsamments, dredged and Teel silt loam (NRCS, Web Soil Survey).

Udipsamments, dredged soils are made up of very deep, level areas of well drained sand and gravel, formed from soil material pumped from the Hudson River. Typically, sandy material containing up to 35% gravel is deposited in layers up to 10 feet thick on top of the original soil. They are well drained, with a typical depth to water table of greater than 80 inches.

Teel silt loam soils are very deep, moderately well drained soils found on floodplains of major streams, formed from silty alluvium. The seasonal high-water table for these soils is 18 to 24 inches from February to April, and is occasionally flooded from November to May. It is not classified as hydric.

1.3.2 Climate and Weather

A National Weather Service (NWS) station is located approximately 10 miles southwest of the site, at the Alcove Dam. Records for this station are available between 1942 and 2018, via the Agricultural Applied Climate Information System (AgACIS). Records at this station indicate that between 1942 and 2018, average monthly temperatures ranged for 21.1°F in January to 69.5°F in July (AgACIS, 2018). Average annual precipitation was 39.74 inches, with monthly averages ranges from 2.18 inches in February to 3.89 inches in June. Average annual snowfall was 29.5 inches, primarily occurring between December and March. The average number of days with 0.10 inches of precipitation or more was 76 days per year; such precipitation days occurred at a roughly equally rate per month (5-8 days per month).

1.3.2.1 Climate Resiliency

According to the Intergovernmental Panel on Climate Change (IPCC) Special Report released in October of 2018, human activities have caused approximately 1.0°C of global warming above pre-industrial levels, causing many land and ocean ecosystems to change. The same report also stated that, "model-based projections of global sea level rise (relative to 1986-2005) suggest an indicative range of 0.26 to 0.77 m by 2100 for 1.5°C of global warming… Increasing warming amplifies the exposure of small islands, low-lying coastal areas and deltas to the risks associated with sea level rise for many human and ecological systems, including saltwater intrusion, flooding and damage to infrastructure" (IPCC, 2018).

Climate projections developed by New York State indicate a future increase in temperatures, precipitation, sea levels, and severity of flooding (NYSDEC, 2018b). The State's average annual temperature is expected to increase approximately four to six degrees Fahrenheit by mid-century and as much as 11 degrees Fahrenheit by 2100. The total annual precipitation is expected to increase as much as 11% by mid-century and 18% by 2100. Since 1900, sea level in the lower Hudson has risen 13 inches. Sea level rise along the Hudson River is projected to continue; the Hudson River is projected to rise a minimum of nine additional inches by 2050, with mid-range projections of approximately 10 to 20 inches by 2050. These changing climatic factors will likely alter flooding patterns in the Hudson River; it is projected that today's 1% storm will become 20% to 50% more likely by 2020 and as much as 610% more likely by 2100. Given its location along the Hudson River Shoreline, Henry Hudson will likely be significantly affected by any changes in climate and hydrology patterns.

Both Albany County and the Town of Bethlehem are participants in the NYS Climate Smart Communities Program, an interagency initiative of New York State which aims to engage and educate local governments in New York State, provide a robust framework to guide their climate action efforts, and recognize their achievements through a certification program (New York State, 2018). While neither governing body has implemented the required climate programs and policies to achieve certification from the program, both have been designated as Registered Climate Smart Communities after committing to such programs and policies via passing a Climate Smart Community pledge as a formal resolution.

The Town of Bethlehem has established a Local Waterfront Advisory Committee to aid in the development of a Local Waterfront Revitalization Plan (LWRP). The LWRP is still in development as of January 2019. A draft LWRP references Henry Hudson Park as a municipal asset that is vulnerable to the projected sea level rise (Town of Bethlehem, 2018). The final LWRP is expected to include a master plan for Henry Hudson Park and develop waterfront revitalization policies.

1.3.3 Floodplains and Coastal Processes

1.3.3.1 Floodplains

The site lies completely within the one percent floodplain (AE Zone) with a base flood elevation of 18 feet (NAVD88), as shown on the Flood Insurance Rate Map (FIRM), effective as of March 16, 2015 (Firm Panel No.: 36001C0317D) (FEMA, 2015). Additionally, the shoreline portion of the site, within approximately 30 feet of the Hudson River, is within the regulatory floodway. No habitable structures lie within the floodplain in vicinity the site.

A United States Geological Survey (USGS) stream gage is located approximately 6 miles upstream of the project area on right bank of the Hudson River at the Port of Albany (NWIS Site No.: 01359165) (USGS, 2018). Records for this gage begin on September 30, 2016 and the gage is under continuous operation as of December 5, 2018. During this period the maximum water elevation was 7.41 feet (NAVD88) on April 7, 2017, and the minimum water elevation was -4.20 feet on February 14, 2017.

A USGS Short-Term Network (STN) Monitoring site is located approximately one mile downstream of the project site in Castleton-on-Hudson (STN Site No.: NYCOL07401) (USGS, 2012). After Hurricane Sandy in 2012, a high-water mark was recorded at elevation of approximately 10 feet (NAVD88) at this site.

1.3.4 Water Resources

1.3.4.1 Surface Waters

Located within the Middle Hudson Watershed (HUC-8 No.: 02020006), the Hudson River and Vloman Kill are the primary surface water bodies at the site, with the Moordener Kill entering the Hudson River directly across from the site. The Hudson River forms the eastern boundary of the site, while Vloman Kill delineates the southern boundary. The Hudson River has a drainage area of approximately 8,530 square miles to the Henry Hudson site (USGS Streamstats, Accessed December 2018). Water levels in the Hudson River are in part controlled by the Federal Dam located in Troy, approximately 18 miles upstream. This dam marks the upstream extent of tidal influence in the Hudson River. The Vloman Kill drainage area is a small subset of the Hudson River drainage area, with an area of approximately 30.6 square miles (USGS Streamstats).

1.3.4.2 Water Quality

Vloman Kill and the Hudson River are both classified as Class C water bodies, which support fisheries and are suitable for non-contact recreation (6 CRR-NY X B). The Hudson River in Albany County is on the 2016 EPA 303(d) list as “impaired” due to fish consumption advisories from sediment contaminated with polychlorinated biphenyls (PCBs)(USEPA, 2016).

1.3.4.3 Regional Hydrogeology and Groundwater

In general, aquifers in the Hudson Valley are unconfined, and related to thick layers of sediment glacially deposited over bedrock. One aquifer has been identified at the Henry Hudson site by the New York State Department of Conservation Division of Water, Bureau of Water Resources Management (NYS GIS Clearinghouse, 2018). This aquifer is described as an unconfined, high yield aquifer with a yield of greater than 100 gallons per minute. The aquifer is composed of sand and gravel deposits, with high transmissivity and a saturated thickness greater than 10 feet. The mapped aquifer generally follows the footprint of the Hudson River and associated alluvium deposits, and overlaps with the western edge of the site. However, this aquifer was mapped at a 1:250,000 scale based on published surficial and bedrock geology maps, and the boundaries of this aquifer indicate the general location only.

1.3.4.4 Tidal Influences

A NOAA tide station is located in the Hudson River at the City of Albany, approximately 7.5 miles upstream of the site (Station: 8518995, Albany, Hudson River) (NOAA, 2011). At this station, the low and lower low tide levels are -1.59 and -1.81 feet (NAVD88), respectively; while the high and higher high tide levels are 3.4 and 3.78 feet (NAVD88), respectively.

1.3.5 Land Use and Zoning

Henry Hudson Park is within the Town of Bethlehem protected open space. This open space consists of upland forest, riparian habitat, and a recreational area which includes an access road, playground, baseball field, parking lots, and maintained turf. This open space is owned and operated by the Town of Bethlehem. Land uses in the vicinity of the site contain a mix of forested land and low-density residential properties. A water treatment plant is also located adjacent to the site, across the Vloman Kill.

Historically, the site was part of the Hudson River's open water. According to a Shoreline Stabilization Study prepared for the Town of Bethlehem (Ocean and Coastal Consultants, 2011), the site was constructed from dredged material in the 1860s.

The site is located within the Town of Bethlehem's Rural Riverfront (RR) zoning district. This zone is regulated under Chapter 128 of the Bethlehem municipal code. This district generally zones for low-density residential, or agricultural-oriented development. Habitat restoration/creation is not explicitly regulated under the town's municipal zoning code.

Pursuant to §24-0501 of the New York State Freshwater Wetlands Act (Article 24 of the New York Environmental Conservation Law), the towns of Bethlehem have fully accepted responsibility with regard to activities subject to regulation under the Act within officially designated freshwater wetlands.

1.3.6 Economics

The Town of Bethlehem has made a strong commitment to fostering economic development and diversification of the Town's tax base. The policy basis for this commitment is clear in the Town's 2005 Town Comprehensive Plan. In 2011, the Bethlehem 20/20 Committee prepared the Economic Development Strategy that included several elements to guide economic development initiatives. Several of these initiatives

have been addressed or are ongoing as a result of the hiring of an Economic Development Coordinator in 2014 (Town of Bethlehem, 2018).

Ecotourism is an important economic driver in this region, as the natural and scenic resources draw millions of visitors to New York's recreation areas (USFWS, 2006). Many people come from out of town to pursue wildlife-associated recreation, outdoor sporting, angling, hunting, and wildlife watching, bringing with them business for local restaurants, hotels, shops, etc. According to a report by the United States Fish and Wildlife Service (USFWS), 3.8 million people watch birds and other wildlife in New York State, generating approximately $1.6 billion in ecotourism revenue every year (USFWS, 2006).

1.3.7 Socio-Economics

According to the U.S. Census Bureau (USCB) American Community Survey 5-year survey for 2013-2017 (USCB, 2013-2017), the population in the Town of Bethlehem, NY is an estimated 33,656 people, and is predominantly white. The median age in the Town of Bethlehem, NY is approximately 42.8 years of age and median household income is $96,384. An estimated 14,485 occupied housing units are present within the town, with a majority of structures being built in 1990 to 1999 (2,154 structures).

Approximately 97.0% of the population are high school graduates or higher while 58.6% of the population have a bachelor's degree or higher. The estimated number of companies in the Town of Bethlehem is 3,119. The civilian employed population 16 and over is an estimated 18,384 people. Of this employed population, an estimated 10,719 people work in management, business, science, and arts occupations, 1,957 people in service occupations, 3,927 in sales and office occupations, 863 in natural resources, construction, and maintenance occupations, and 918 in production, transportation, and material moving occupations.

1.3.7.1 Environmental Justice

According to the New York State Department of Environmental Conservation's Maps & Geospatial Information System (IGST) Tools for Environmental Justice data set, the site is not located within an Environmental Justice area (NYSDEC, 2018c).

1.3.8 Coastal Zone Management

The entire Hudson River downstream of the Federal Dam, in Troy, New York, is a designated Coastal Area. Coastal areas are subject to regulation under the federal Coastal Zone Management Act, and managed under the New York Coastal Management Program. The landward boundary of the coastal area is typically 1,000 feet inland from the shoreline.

Henry Hudson Park is adjacent to an area designated as a Significant Coastal Fish and Wildlife Habitat (SCFWH) under the New York State Coastal Management Program, known as 'Shad and Schermerhorn Islands'. Vloman Kill serves as a shared boundary between the park and the designated SCFWH (NYSDOS, 2012).

The Town of Bethlehem is in the process of developing a LWRP, currently in draft stage (Town of Bethlehem, 2018), which provide more detailed implementation of the state Coastal Zone Management Program. Upon approval of the LWRP, state and federal actions within the town would be required to be consistent, to the maximum extent

practicable, with the approved LWRP, and the town would become eligible for waterfront revitalization grants.

1.3.9 Wetlands

The USFWS National Wetland Inventory (NWI) map indicates the presence of both freshwater emergent wetlands and freshwater forested/shrub wetlands at the Henry Hudson site. The Hudson River and Vloman Kill are mapped as riverine environments. Additionally, tidally influenced wetlands have been mapped by the NYSDEC's Hudson River Estuary Program as a separate effort in 2007 based off of aerial photographs (NYSDEC, 2007). This program did not identify any tidally influenced wetlands at the Henry Hudson site.

1.3.10 Vegetation

Approximately 15 acres of the park is managed as recreational open space, containing turf areas, picnic areas, playgrounds, and athletic fields. The remaining area is primarily undisturbed, and have been mapped as emergent wetlands, scrub shrub wetlands, forested wetland, upland deciduous forest, and upland evergreen forest (NYS GIS Clearinghouse, 2018). All community descriptions were acquired from Ecological Communities of New York State, 2nd Edition (Edinger et al., 2014).

Emergent wetlands are characterized by cattails (*Typha spp*.), sedges (*Carex spp*.), marsh fern (*Thelypteris palustris*), spike rushes (*Eleocharis spp*.), bulrushes (*Scirpus spp*.), and sweetflag (*Acorus americanus*). The invasive common reed (*Phragmites australis*) is also present (Edinger et al., 2014).

Scrub shrub wetlands may contain alder (*Alnus incana*), red osier dogwood (*Cornus sericea*), silky dogwood (*Cornus amomum*), or willows (*Salix spp.*). Also common are meadowsweet (*Spiraea spp*.), gray dogwood (*Cornus racemosa*), swamp azalea (*Rhododendron viscosum*), highbush blueberry (*Vaccinium corymbosum*), and spicebush (*Lindera benzoin*).

Forested wetlands typically contain trees and shrubs including green ash (F*raxinus pensylvanicus*), black ash (*Fraxinus nigra*), red maple (*Acer rubrum*), slippery elm, alders (*Alnus spp.*), spicebush, arrowwood (*Vibernum dentatum*), dogwoods (*Cornus spp.*), Virginia creeper (*Parthenocissus cinquefolia*) and poison ivy (T*oxicodendron radicans*). Common herbaceous species include rice cutgrass (*Leersia oryzoides*), sensitive fern (*Onoclea sensibilis*), spotted jewelweed (*Impatiens capensis*), and skunk cabbage (*Symplocarpus foetidus)*.

Deciduous and evergreen forests commonly contain trees such as sugar maple, red maple, yellow birch (*Betula alleghaniensis*), black birch (*Betula lenta*), red oak (*Quercus rubra*), American beech (*Fagus grandifolia*), white ash (*Fraxinus americana*), chestnut oak (*Quercus montana*), white oak (*Quercus alba*), white pine (*Pinus strobus*), red pine (*Pinus resinosa*), and eastern hemlock (*Tsuga canadensis*).

1.3.11 Fish and Wildlife Resources

1.3.11.1 Shellfish

No information regarding the presence, absence, or composition of shellfish communities on the site is readily available.

1.3.11.2 Finfish

Henry Hudson Park is adjacent to the area designated as a SCFWH under the New York State Coastal Management Program, known as 'Shad and Schermerhorn Islands'. According to the Coastal Fish and Wildlife Rating Form (NYSDOS, 2012) associated with this SCFWH, Shad and Schermerhorn Islands contains habitats serving as a nursery area for Blueback Herring (*Alosa aestivalis*), American Shad (*Alosa sapidissima*), Striped Bass (*Morone saxatilis*) as well as spawning and feeding areas for resident freshwater species in the Hudson River, including White Perch (*Morone americana*). Given Henry Hudson Park's proximity to this area, these species may also occur in the waters surrounding the park, especially in sheltered Vloman Kill.

1.3.11.3 Benthic Resources

According to Hudson River Estuary Program Benthic Mapping Project (NYSDEC, 2006), the bottom sediment of Vloman Kill is comprised of sandy mud (mud with >10% sand). The bottom sediment of the Hudson River in this area is comprised of muddy sand (sand with >10% mud) along the shoreline, and is part of a thickly lain, depositional sediment region.

1.3.11.4 Reptiles and Amphibians

According to the Coastal Fish and Wildlife Rating Form associated with the designated SCFWH (NYSDOS, 2012), Shad and Schermerhorn Islands supports a variety of amphibians and reptiles including Northern Map Turtle (*Graptemys geographica*), Painted Turtle (*Chrysemys picta*), Mudpuppy (*Necturus maculosus*), American Toad (*Bufo americanas*), Bullfrog (*Rana catesbeiana*) and Green Frog (*Rana clamitans*). Given Henry Hudson Park's proximity to this area, these species may also occur in the waters and wetlands within the park, especially in the sheltered Vloman Kill.

1.3.11.5 Birds

According to the USFWS Migratory Bird Program, the project area is located within the North America Atlantic Flyway for migratory birds, which is a critical corridor for migrating birds (USFWS, 2018).

According to the eBird database, managed by Cornell Lab of Ornithology, as January 8, 2019, 155 species of birds have been documented within Henry Hudson Park (eBird, 2012). The most common species that have been observed on the site include Brant (*Branta bernicla*), Common Grackle (*Quiscalus quiscula*), Canada Goose (*Branta canadensis*), American Robin (*Turdus migratorius*), American Crow (*Corvus brachyrhynchos*), and Red-winged Blackbird (*Agelaius phoeniceus*).

According to the Coastal Fish and Wildlife Rating Form associated with the designated SCFWH (NYSDOS, 2012), Shad and Schermerhorn Islands support the breeding and foraging of Ruffed Grouse (*Bonasa umbellus*), American Bittern (*Botaurus lentiginosus*),

and many passerine bird species. Given Henry Hudson Park's proximity to this area, these species may also occur in the Park.

1.3.11.6 Mammals

According to the Coastal Fish and Wildlife Rating Form associated with the designated SCFWH (NYSDOS, 2012), Shad and Schermerhorn Islands supports mammal species including White-tailed Deer (*Odocoileus virginianus*) and Eastern Cottontail (*Sylvilagus floridanus*). Given Henry Hudson Park's proximity to this area, these species may also occur in the park.

1.3.12 Threatened and Endangered Species

1.3.12.1 Federal Species of Concern

The USFWS iPac system identified the threatened Northern Long-eared Bat (*Myotis septentrionalis*) as potentially occurring at the site. There are no reports of Northern Long-eared Bat at the site. Coordination with Greater Atlantic Regional Fisheries Office (GARFO) identified the Shortnose sturgeon and Atlantic Sturgeon as potentially occur at the site.

1.3.12.2 State Species of Concern

The NYSDEC identified the endangered Shortnose Sturgeon (*Acipenser brevirostrum*) and threatened Bald Eagle (*Haliaeetus leucocephalus*) as potentially occurring at the site. Report on eBird show Bald Eagles circling overhead at the site. There are no reports of Shortnose Sturgeon at the site.

1.3.12.3 Designated Critical Habitat

The USFWS has not designated any critical habitat in the site. The GARFO has identified the site as critical habitat for the Atlantic Sturgeon.

1.3.12.4 Essential Fish Habitat

Utilizing NMFS's essential fish habitat (EFH) designation and the EFH Mapper, the site is potential essential fish habitat for various life stages of Summer Flounder (*Paralichthys dentatus*), Winter Flounder (*Pseudopleuronectes americanus*), Little Skate (*Leucoraja erinacea*), Atlantic Herring (*Clupea harengus*), Red Hake (Urophycis chuss), Windowpane Flounder (*Scophthalmus aquosus*), Winter Skate (*Leucoraja ocellata*), and Clearnose Skate (*Raja eglanteria*). There are no reports of the above EFH species at the site.

1.3.13 Cultural Resources

The Henry Hudson Park study area was subject to a review of existing data pertaining to historic and archaeological resources including local and regional histories, cultural resource surveys, and site files available on the New York State Cultural Resources Information System (CRIS), which is maintained by the NYSHPO and the Division for Historic Preservation within the Office of Parks, Recreation, and Historic Preservation (OPRHP). The resulting report is available in the Cultural Resources Appendix (Appendix G5).

Several cultural resources investigations have been carried out in the vicinity of the study area that help to characterize the study area and its potential for cultural resources. From 2001 to 2003 Hartgen Archaeological Associates, Inc. conducted surveys in connection with improvements to the nearby Bethlehem Waste Water Treatment Plant which is located on the south side of the Vloman Kill. Archaeological testing was carried out for groundwater test wells in the vicinity of the proposed stabilization measures on the north side of the Vloman Kill and Hudson River confluence. Testing on both the north and south side of the Vloman Kill along the Hudson River shoreline confirmed the existence of deep dredge material deposits (HAA 2002 and 2003).

Of the eleven archaeological sites listed on the CRIS database within 1 mile of the Henry Hudson Park study area, three are prehistoric. Of special note in the vicinity of the study area is the Bethlehem Ancestral Repatriation Site (00102.000892), a Native American burial that was discovered near a historic period cemetery approximately 0.2 miles southwest of the study area. Remote sensing detected additional possible burials in the vicinity of the find (CITY/SCAPE: Cultural Resources Consultants 2013).

The Cedar Hill site (NYSM Site 6013), is documented within the study area at its northern boundary. No information is available on the CRIS database for this site, however, it likely corresponds to the Cedar Hill Landing, a dock depicted on historic maps (Beers 1891). The Nicoll-Sill House Site (00102.000004; NYSM Site 5781) is listed on the NRHP and is located directly across the Vloman Kill from the western tidal wetland area on the south bank.

The proximity to the historic Cedar Hill Landing site and the presence of several documented prehistoric sites in the vicinity suggest that there is a moderate potential for prehistoric and historic archaeological remains to exist within the study area, however, the shoreline has been built up using dredged material from the Hudson River over the course of the twentieth century and therefore any remains along the shoreline would be deeply buried.

1.3.14 Air Quality

The USEPA Green Book provides detailed information about area National Ambient Air Quality Standards (NAAQS) designations, classifications, and nonattainment statuses (USEPA, 2018). The site is located in a region classified as “in attainment” for all pollutants tracked under the NAAQS including ozone (O_3), particulate matter (PM10 & PM2.5), sulfur dioxide (SO_2), lead (Pb), carbon monoxide (CO), and nitrogen dioxide (NO_2). There are no major sources of air pollutants (Title V facilities) on or in proximity to the site. Current on-site boating activities may contribute to local air pollution, but the effect is likely insignificant.

The LWRP also noted that the Dinmore Road Wastewater Treatment Plant located immediately south of the Henry Hudson Park can detract from the experience at the park, particularly on weekends and holidays; offensive odor emissions associated with the treatment process can cause a nuisance to the enjoyment of the park (Town of Bethlehem, 2018).

1.3.15 Noise

The site currently consists of recreational park land. Land in vicinity of the site is largely undeveloped but include some low-density residences and a water treatment plant. Potential sources of existing noise pollution on the site may include recreational activities, such as baseball and boating activities around the site's boat launches. A small, single runway airport (South Albany Airport-4b0) is also located approximately 4 miles northwest of the site; planes passing above the site to or from this airport may also contribute to local noise pollution.

1.3.16 Recreation

The Henry Hudson Park has many recreation facilities including a boat launch for motorized craft, a boat launch for kayaks, canoes, and other hand-powered craft, picnic areas with grills, a softball field, a playground, a volleyball court, horseshoes area, a gazebo, a pavilion, and an accessible fishing area all for public, recreational use (Town of Bethlehem, 2015). A handicap accessible floating fishing platform structure is available in the spring through fall seasons; in the winter the platforms are taken out of the water and stored on land to protect them from damages due to the harsh winter conditions along the Hudson River (Ocean and Coastal Consultants, 2011). Large vessel wakes have caused damage to docks and bulkheads along the shoreline of the park in the past (Ocean and Coastal Consultants, 2011).

The motorized boat launch is located at the north end of the park and is operated in cooperation with NYSDEC. On the south end of the park, with access on the Vloman Kill, is a boat launch designed for kayaks, canoes, and other hand-powered boats. The park's boat launch is the only public boat launch site in the Town of Bethlehem, and one of only three Hudson River public boat launch sites in Albany County (NYSDEC, 2018a). The park also has the largest parking capacity of any of Albany County's public Hudson River boat launch sites, able to accommodate approximately 35 vehicles and trailers.

The Town's draft LWRP generally describes Henry Hudson Park as a valuable recreational resource, providing the community with opportunities to fish, launch boats, picnic, recreate, and enjoy scenic view (Town of Bethlehem, 2018).

1.3.17 Aesthetics and Scenic Resources

The Town of Bethlehem's LWRP identified Henry Hudson Park, being the primary local access point to the Hudson River, as a scenic resource (Town of Bethlehem, 2018). The site is not designated as a Scenic Areas of Statewide Significance (SASS) under the New York Coastal Management Program. However, Policy 25 of the Coastal Management Program requires that state agencies must ensure proposed actions in the coastal zone "Protect, restore or enhance natural and man-made resources which are not identified as being of statewide significance, but which contribute to the overall scenic quality of the coastal area." (NYSDOS, 2017). Activities which could impair or degrade scenic quality include the modification of natural landforms, removal of vegetation, removal of existing structures, and the addition of structures that diminish scenic quality.

1.3.18 Hazardous, Toxic, and Radioactive Waste

A review of the databases yields no sites within or near the Binnen Kill site. There may be remnant agricultural chemicals at the site, as some areas have been used for agriculture since 1940 and older forms of pesticides can result in lead, arsenic, and other contamination.

1.3.19 Transportation and Other Infrastructure

Lyons Road loops through Henry Hudson Park, serving as the park's main access road. The park's closest major roadway connections are State Route 114 and Interstate 87. The Town's draft LWRP recommends pedestrian and bicyclist accommodations, such as reduced speed limits and enhanced road crossing, along Route 114 to support access to Henry Hudson Park (Town of Bethlehem, 2018). As mentioned above, a small, single runway airport (South Albany Airport-4b0) is also located approximately 4 miles northwest of the site.

As previously discussed, Henry Hudson Park serves as the town's primary public access to the Hudson River Waterfront. The Town's draft LWRP recommends a policy of encouraging and enhancing the access to the Hudson River via the Henry Hudson Park (Town of Bethlehem, 2018).

1.4 Charles Rider Park

1.4.1 Physical Setting

Charles Rider Park is a 29.6-acre public open space in the Town of Ulster, located on the west shore of the Hudson River about a half mile downstream of the Kingston-Rhinecliff Bridge. The park's amenities include a paved access road, parking areas, a picnic area, and a boat ramp/docking structure. The only access road to the park is Charles Rider Park Road which runs east from Ulster Landing Road. Approximately 5.5 acres of the park is actively managed, while the remaining area is primarily forested. The actively managed area of the park is located immediately adjacent to the Hudson River and is relatively flat, ranging in elevation from approximately five to seven feet (NAVD88). The actively managed area is bounded to the west by forested steep slopes, quickly rising to elevations of 30 to 65 feet (NAVD88).

Charles Rider Park is dedicated in honor of Charles Rider, Town Supervisor from 1978 to 1987. Before becoming a park, the site contained a brick factory with a number of structures including a bulkhead, docks, and multiple buildings. The structures are documented in USGS topographic maps published from 1934 to 1970. Historic aerial imagery and topographic maps indicate that the site transitioned to a park sometime between 1970 and 1995.

The park contains approximately 1,200 feet of shoreline, which varies in condition. The paved areas of the park run close to the shoreline, separated from the shoreline edge by 15 to 50 feet of turf. The Hudson River is tidal in this area, and the exposed shoreline width ranges from approximately five to 25 feet at mean high tide and approximately 20 to 50 feet at mean low tide. The northern most shoreline is part of a small cove sheltered by large rock material. This area has a gradual slope and the substrate is sandy. The eastern shoreline, along the Hudson River north of the boat ramp, consists of a stone filled timber cribbing which is dilapidated and has predominantly failed. A steep drop-off is present at the riverward face of the cribbing, and riverbed elevations at the base of the cribbing reach -6.7 to -9.7 feet (NAVD88). The eastern shoreline, south of the boat ramp, consists of a stone filled timber cribbing which is dilapidated. However, the shoreline appears to be recently stabilized by large boulders. Unlike the area north of the boat ramp, there is a gradual transition from shoreline to riverbed. Sparse riprap extends riverward of the timber cribbing, mixed with a natural cobble substrate. Heavily worn bricks and water chestnut seeds, are common throughout the shoreline. A remnant boat ramp structure is also present approximately 100 feet south of the active boat ramp.

The restoration site (hereafter referred to as "the site"), where proposed actions would be implemented, is limited to the shoreline area of Charles Rider Park and unpaved surfaces adjacent to the shoreline.

1.4.1.1 Geology and Physiography

The site is within the Hudson-Mohawk Lowlands physiographic region. The Hudson River flows from the southeastern Adirondacks through a 15- to 20-mile-wide lowland area, which is bounded by the Helderberg Plateau and the Catskill Mountains to the west, and the Taconic Mountains to the east. This section of the Hudson River Valley

consists of a narrow inner valley with adjacent terraces approximately 100-200 feet high, bordered by gently rolling terrain and low hills. The valley is underlain by weak sedimentary rock, primarily formed during the Cambrian and Lower Ordovician periods (NYS DOT, 2013). Specifically, the site is mapped as underlain by the Austin Glen Formation, which consists of highly folded, interbedded greywacke sandstone and shale that formed in a deep marine setting from the erosion of pre-existing sedimentary rocks (NYS Museum, 1995). In general, the surficial geology of the region is heavily influenced by its history of glaciation, including glacial till and lacustrine sediment deposited during the most recent glacial advance and retreat 70,000 to 16,000 years ago. The surface geology of the site is mapped as lacustrine silt and clay (NYS Museum, 1991). These sediments were deposited in glacial Lake Albany which was created from meltwater from the retreating glaciers flooding the Hudson Valley 15,000 to 12,600 years ago. These sediments are generally laminated and calcareous, with low permeability and variable thickness (De Simone et al., 2008).

1.4.1.2 Topography

As discussed above, this area of the Hudson River Valley consists of a low-lying inner valley, bordered by steep slopes to terraces 100-200 feet high. Charles Rider Park spans both the narrow inner valley and adjacent steep slopes. Based on a 2011–2012 LIDAR (Light Detection and Ranging) dataset developed by the New York State Department of Environmental Conservation (NYSDEC), the site is relatively flat within approximately 250 feet of the Hudson River, ranging in elevation from approximately 0 to 7 feet. This area is bounded by steep slopes to the west, which reach elevations of 30 to 65 feet (NAVD88) (NYSDEC, 2011 - 2012).

1.4.1.3 Soils

Soil mapping data and soils descriptions for Charles Rider Park were acquired from the National Resources Conservation Service (NRCS) Web Soil Survey for Ulster County, NY. Most of Charles Rider Park's soils are classified as Made land with the exception of Clay Pit occurring around the park's entrance, as well as small areas of Nassau-Bath-Rock outcrop complex and Riverhead fine sandy loam (NRCS, Web Soil Survey, Accessed December 2018).

The **Clay Pit** map unit has very little information available. Given that the site previously housed a brick factory, it is likely that this area provided raw materials to the factory. The map unit is moderately well drained, not hydric, and generally has a depth of 40 to 60 inches to lithic bedrock. Minor components within the map unit include Hudson, Madalin, Rhinebeck, and Odessa soils, all of which range in composition from silty clay to silt loam, and are formed from clayey and silty glaciolacustrine deposits.

Made Land soils are composed of Udorthents and similar soils, which are described at this location as having a surface layer of channery loam over very gravelly sandy loam. It is somewhat excessively drained, and is not rated as hydric. As indicated by the name, they are made up of soil altered or transported by humans, such as fill or dredge spoils. The specific source of the Made Land soil is not known.

The **Nassau-Bath-Rock outcrop complex** map unit is composed of a mixture of Nassau soil, Bath soil, and unweathered rock outcrops. The Nassau soil is shallow, with

10-20 inches to bedrock, and is composed of channery silt loam over very channery silt loam. It is formed from channery loamy till derived from local slate or shale, and is found on ridges, till plains, and benches. It is somewhat excessively drained, and not rated as hydric.

Riverhead fine sandy loam is composed of fine sandy loam and sandy loam over sand. These soils are located on deltas and terraces, and were formed from loamy glaciofluvial deposits overlying stratified sand and gravel. It is deep and well drained, and is not considered hydric.

1.4.2 Climate and Weather

A National Weather Service (NWS) station is located approximately 17.5 miles southwest of the site, at Mohonk Lake, New York. Records for this station are available between 1896 and 2018, via the Agricultural Applied Climate Information System (AgACIS). Records at this station indicate that between 1896 and 2018, Average monthly temperatures ranged for 24.9 °F in January to 71.0 °F in July (AgACIS, 2018). Average annual precipitation was 48.4 inches, with monthly averages ranges from 3.30 inches in February to 4.57 inches in July. Average annual snowfall was 61.5 inches, primarily occurring between December and March. The average number of days with 0.10 inches of precipitation or more was 80 days per year; such precipitation days occurred at a roughly equally rate per month (6-8 days per month).

1.4.2.1 Climate Resiliency

According to the Intergovernmental Panel on Climate Change's (IPCC) Special Report 15, released in October of 2018, human activities have caused approximately 1.0° C (1.8° F) of global warming above pre-industrial levels, causing many land and ocean ecosystems to change. The same report also stated that, "model-based projections of global sea level rise (relative to 1986-2005) suggest an indicative range of 0.26 to 0.77 m (0.85 to 2.5 ft.) by 2100 for 1.5° C (1.8° F)of global warming… Increasing warming amplifies the exposure of small islands, low-lying coastal areas and deltas to the risks associated with sea level rise for many human and ecological systems, including saltwater intrusion, flooding and damage to infrastructure" (IPCC, 2018).

Climate projections developed by New York State indicate a future increase in temperatures, precipitation, sea levels, and severity of flooding (NYSDEC, 2018b). The State's average annual temperature is expected to increase approximately four to six degrees Fahrenheit by mid-century and as much as 11 degrees Fahrenheit by 2100. The total annual precipitation is expected to increase as much as 11% by mid-century and 18% by 2100. Since 1900, sea level in the lower Hudson has risen 13 inches. Sea level rise along the Hudson River is projected to continue; The Hudson River is projected to rise a minimum of nine additional inches by 2050, with mid-range projections of approximately 10 to 20 inches by 2050. These changing climatic factors will likely alter flooding patterns in the Hudson River; it is projected that today's 1% storm will become 20 to 50% more likely by 2020 and as much as 610% more likely by 2100. Given its location along the Hudson River Shoreline, Charles Rider Park will likely be significantly affected by any changes in climate and hydrology patterns.

Ulster County is a participant in the NYS Climate Smart Communities Program, an interagency initiative of New York State which aims to engage and educate local governments in New York State, provide a robust framework to guide their climate action efforts, and recognize their achievements through a certification program (New York State, 2018). The county's implementation of climate programs and policies, including commitments to reduce vulnerability to natural hazards, conserve natural habitats, and support green infrastructure, have led the county to be awarded with a 'silver certified' status by the NYSDEC office of climate change.

1.4.3 Floodplains and Coastal Processes

1.4.3.1 Floodplains

The site lies completely within the one percent floodplain (AE Zone) with a base flood elevation of eight feet (NAVD88), as shown on the FEMA Flood Insurance Rate Map (FIRM), effective as of September 25, 2009 (Firm Panel No.: 3611C0480E) (FEMA, 2009). No habitable structures lie within the floodplain in vicinity the site.

A USGS Short-Term Network (STN) monitoring site is located approximately three miles downstream of the project site in Kingston Point (STN Site No.: NYULS07660) (USGS, 2012). After Hurricane Sandy in 2012, multiple high-water marks were recorded at this monitoring site ranging in elevation from 9.2 to 9.3 feet (NAVD88).

1.4.4 Water Resources

1.4.4.1 Surface Waters

The site is located within the Middle Hudson Watershed (HUC-8 No.: 02020006). The Hudson River is the primary surface water body at the site, and forms the eastern boundary of Charles Rider Park. A small unnamed tributary to the Hudson River is located to the west and south of the park as well. The Hudson River has a drainage area of approximately 10,500 square miles (USGS Streamstats) to the site. Water levels in the Hudson River are, in part, controlled by the Federal Dam located in Troy, approximately 60 miles upstream. This dam also marks the upstream extent of tidal influence in the Hudson River.

1.4.4.2 Water Quality

The Hudson River is classified as Class C water bodies, which support fisheries and are suitable for non-contact recreation (6 CRR-NY X B). The Hudson River in Ulster County is listed in the 2016 EPA 303(d) list as "impaired" due to fish consumption advisories from sediment contaminated with polychlorinated biphenyls (PCBs)(USEPA, 2016).

1.4.4.3 Regional Hydrogeology and Groundwater

In general, aquifers in the Hudson Valley are unconfined, and related to thick layers of sediment glacially deposited over bedrock. However, no aquifers were mapped in the area of the Charles Rider Park site. In general, silt and clay deposits laid down in glacial lakes, such as at the site, are not aquifers because of very low permeability (Frimpter, 1985). Additionally, the site is surrounded by bedrock outcrops, and there are no significant areas of unconsolidated deposits in the vicinity.

1.4.4.4 Tidal Influences

A NOAA tide station is located at Hyde Park, approximately 14 miles downstream of the site (Station: 8518951, Hyde Park, NY). At this station, the low and lower low tide levels are -1.78 and -1.58 feet (NAVD88), respectively; while the high and higher high tide levels are 1.93 and 2.32 feet (NAVD88), respectively.

1.4.5 Land Use and Zoning

Charles Rider Park is within the Town of Ulster's protected open space. This open space consists of upland forest and a recreational area which includes parking lots and maintained turf. This open space is owned and operated by the Town of Ulster. Land use in the vicinity of the site contain a mix of forested land and low-density residential properties.

Historically, the site contained a brick factory with a number of structures including a bulkhead, docks, and multiple buildings. The structures are documented in USGS topographic maps published from 1934 to 1970. Based on historic aerial imagery and topographic maps, the site transitioned to a park sometime between 1970 and 1995.

The site is located entirely within the Town of Ulster's 30,000 square foot minimum lot area, residence zoning district (R-30). This district generally zones for low-density, residential or agricultural-oriented development. Zoning is regulated under Chapter 190 of the Town of Ulster's municipal codes. Habitat restoration/creation is not explicitly regulated under the town's municipal zoning code.

1.4.6 Economics

The Town of Ulster is known as the "Business Hub" of Ulster County and the "Hudson Valley's Gateway to Beauty and Business," since it offers a variety of activities year-round (Town of Ulster, 2019c). Ulster is situated in the Hudson Valley in the Catskill Mountains and also touches the south side of the Rhinecliff Bridge. Rhinebeck, Red Hook, Saugerties, Woodstock, and Hurley are also easily accessible from Ulster. Several hamlets including East Kingston, Whittier, Eddyville, Glenerie Lake Park, Lake Katrine, Lincoln Park, Ruby, and Ulster Land which offer residential neighborhoods; private, country homes; townhouses; and farm land.

The Town of Ulster has economic development projects underway in proximity to Charles Rider Park, including The Hudson Landing Project, located approximately 1.5 miles south of the park, and Tech City Project, located approximately 1.9 miles west of the park. The Route 9W corridor which houses the Tech City campus also contains a variety of retailers including the Hudson Valley Mall. The Hudson Landing Project proposes a mixed-use housing development along the Hudson River waterfront, and is currently under construction (Town of Ulster, 2018b). The Tech City Project is a plan for the redevelopment of the East Campus of Tech City, formerly the IBM manufacturing property (Town of Ulster, 2009). The Tech City Project proposes a multi-use development which will include light assembly, office, research and development, educational, wellness, neighborhood retail, entertainment and multi-family residential uses, along with accessory parking. Each of these developments are within reasonable travel distance (<10 minutes by car) to Charles Rider Park.

Ecotourism is an important economic driver in this region, as the natural and scenic resources draw millions of visitors to New York's recreation areas (USFWS, 2006). Many people come from out of town to pursue wildlife-associated recreation, outdoor sporting, angling, hunting, and wildlife watching, bringing with them business for local restaurants, hotels, shops, etc. According to a report by the United States Fish and Wildlife Service (USFWS), 3.8 million people watch birds and other wildlife in New York State, generating approximately $1.6 billion in ecotourism revenue every year (USFWS, 2006).

1.4.7 Socio-Economics

According to the US Census Bureau (USCB) American Community Survey 5-year survey for 2013-2017 (USCB, 2013-2017), the population in the Town of Ulster, NY is an estimated 12,327 people, and is predominantly white. The median age in the Town of Ulster, NY is approximately 47.7 years of age and median household income is $50,941. An estimated 5,056 occupied housing units are present within the town, with a majority of structures being built between 1940 and 1959 (1,441 structures).

Approximately 89.2% of the population are high school graduates or higher while 25.2% of the population have a bachelor's degree or higher. The estimated number of companies in the Town of Ulster is 979. The civilian employed population 16 and over is an estimated 5,424 people. Of this employed population, an estimated 2,001 people work in management, business, science, and arts occupations, 1,008 people in service occupations, 1,420 in sales and office occupations, 496 in natural resources, construction, and maintenance occupations, and 499 in production, transportation, and material moving occupations.

1.4.7.1 Environmental Justice

According to the New York State Department of Environmental Conservation's Maps & Geospatial Information System (IGST) Tools for Environmental Justice data set, the site is not located within an Environmental Justice area (NYSDEC, 2018c).

1.4.8 Coastal Zone Management

The entire Hudson River downstream of the Federal Dam, in Troy, New York, is a designated Coastal Area. Coastal areas are subject to regulation under the federal Coastal Zone Management Act, and managed under the New York Coastal Management Program. The landward boundary of the coastal area is typically 1,000 feet inland from the shoreline.

The site is not located within any areas designated by the New York State Department of State (NYSDOS) as Significant Coastal Fish and Wildlife Habitat (SCFWH). However, a SCFWH designated site known as 'The Flats' is located across river from the site in the waters of the Hudson River extending approximately 4 miles from the town of Red Hook to Kingston (NYSDOS, 2012).

Additionally, the site is located adjacent to a designated Scenic Area of Statewide Significance (SASS), specifically the Estates District SASS, in the ED-10 Astor Cove subunit (NYSDOS, 1993).

1.4.9 Wetlands

The USFWS National Wetland Inventory (NWI) map does not indicate the presence of wetlands at the site. Tidal wetland mapping performed by the NYSDEC's Hudson River Estuary Program also did not identify any tidally influenced wetlands at the site (NYSDEC, 2007).

1.4.10 Vegetation

Part of Charles Rider Park is managed as recreational open space, containing turf areas, picnic areas, and impervious surfaces. The undeveloped areas of the park contain upland deciduous forest and upland scrub-shrub habitat (NYS GIS Clearinghouse, 2018). All community descriptions were acquired from Ecological Communities of New York State, 2nd Edition (Edinger et al., 2014).

Upland deciduous forests commonly contain trees such as sugar maple, red maple, yellow birch (*Betula alleghaniensis*), black birch (*Betula lenta*), red oak (*Quercus rubra*), American beech (*Fagus grandifolia*), white ash (*Fraxinus americana*), chestnut oak (*Quercus montana*), white oak (*Quercus alba*), white pine (*Pinus strobus*), red pine (*Pinus resinosa*), and eastern hemlock (*Tsuga canadensis*).

Upland scrub-shrub communities typically contain gray dogwood (*Cornus racemosa*), eastern red cedar (*Juniperus virginiana*), raspberries (*Rubus spp.*), serviceberries (*Amelanchier spp.*), choke-cherry (*Prunus virginiana*), wild plum *(Prunus americana*), sumac (*Rhus glabra*), and arrowwood (*Viburnum dentatum*). Invasive species include multiflora rose (*Rosa multiflora*), Russian and autumn olive (*Elaeagnus angustifolia, E. umbellat*a), buckthorns (*Rhamnus cathartica, Frangula alnus*), and shrubby honeysuckles (*Lonicera tatarica, L. morrowii, L. maacckii*).

1.4.11 Fish and Wildlife Resources

1.4.11.1 Shellfish

No information regarding the presence, absence, or composition of shellfish communities on the site is readily available.

1.4.11.2 Finfish

The portion of the Hudson River adjacent to the site is classified as a 'Significant Anadromous Fish Concentration Area' by the NYSDEC Environmental Resource Mapper (NYSDEC, Environmental Resource Mapper, Accessed December 2018). As noted above, the site is located in close proximity to a portion of Hudson River designated as a SCFWH under the New York State Coastal Management Program, known as 'The Flats'. According to the Coastal Fish and Wildlife Rating Form associated with this designated habitat, The Flats is a primary Hudson River spawning grounds for American shad (*Alosa sapidissima*) between mid-March and June, and also serves as spawning, nursery, and feeding habitat for striped bass (*Morone saxatilis*), white perch (*Morone americana*), and various resident freshwater species (NYSDOS, 2012).

1.4.11.3 Benthic Resources

According to Hudson River Estuary Program Benthic Mapping Project, the bottom sediment adjacent to the site is composed of >90% mud (silt and clay mix) and is part of a dynamic sediment region, where it is possible that both erosional and depositional processes are active (NYSDEC, 2006).

Adjacent to the site, The Flats contain a varied mix of benthic morphology including 580 acres of contiguous shallow, freshwater, tidal flats, 820 acres of undisturbed deepwater channel habitat, freshwater intertidal mud flats, and submerged aquatic vegetation beds predominantly dominated by water celery (*Vallisneria americana*).

1.4.12 Reptiles and Amphibians

No information regarding the presence, absence, or composition of reptile or amphibian communities on the site is readily available.

1.4.13 Birds

According to the USFWS Migratory Bird Program, the project area is located within the North America Atlantic Flyway for migratory birds, which is a critical corridor for migrating birds (USFWS, 2018).

According to the eBird database, managed by Cornell Lab of Ornithology, as January 8, 2019, 68 species of birds have been documented within or in the immediate vicinity of the Charles Rider Park (eBird, 2012). The most common species that have been observed on the site include Ring-billed Gull (*Larus delawarensis*), Canada Goose (*Branta canadensis*), Horned Grebe (*Podiceps auritus*), Long-tailed Duck (*Clangula hyemalis*), and European Starling (*Sturnus vulgaris*).

The adjacent Flats contain significant concentrations of waterfowl, likely due to dense growths of wild celery (*Vallisneria americana*), which provides valuable feeding areas for many species of duck. The Flats are especially important during spring (March-April) and fall (mid-September - early December) migrations when concentrations of diving ducks such as scaups (*Aythya marila; Aythya affinis*), Common Goldeneye (*Bucephala clangula*) and mergansers (*Lophodytes cucullatus; Mergus merganser*) regularly utilize the area. During calm weather this open river area is also used by dabbling ducks, including Mallard (*Anas platyrhynchos*), American Black Duck (*Anas rubripes*) and Blue-winged Teal (*Anas discors*) (NYSDOS, 2012).

1.4.14 Mammals

No information regarding the presence, absence, or composition of mammals on the site is readily available. It is likely that the upland forest areas of Charles Rider Park provide habitat for mammalian species.

1.4.15 Threatened and Endangered Species

1.4.15.1 Federal Species of Concern

The USFWS iPac system identified the threatened Northern Long-eared Bat (*Myotis septentrionalis*) and the endangered Indiana Bat (*Myotis sodalis*) as potentially occurring at the site.

The Northern Long-eared Bat is a medium-sized bat found across much of the eastern and north-central United States and is found state-wide in New York. The Northern Long-eared Bat predominantly overwinters in hibernacula that include caves and abandoned mines. During the summer, this species typically roosts singly or in colonies underneath bark or in cavities or crevices of both live trees and snags. Northern Long-eared Bats are also known to roost in human-made structures such as buildings, barns, sheds, and under eaves of windows (USFWS, 2014a).

The Indiana bat is small, weighing only one-quarter of an ounce. In flight. It has a wingspan of 9 to 11 inches. The fur is dark-brown to black. It is found throughout New York. Indiana bats hibernate during winter in caves or, occasionally, in abandoned mines. After hibernation, Indiana bats migrate to their summer habitat in wooded areas where they usually roost under loose tree bark on dead or dying trees. There are no reports of the Northern Long-eared Bat or Indiana Bat at the site.

Coordination with Greater Atlantic Regional Fisheries Office (GARFO) identified the Shortnose sturgeon and Atlantic Sturgeon as potentially occur at the site.

1.4.15.2 State Species of Concern

The NYSDEC identified the endangered Shortnose Sturgeon (*Acipenser brevirostrum*), threatened Bald Eagle (*Haliaeetus leucocephalus*), and threatened Northern Long-eared Bat (*Myotis septentrionalis*) as potentially occurring at the site. There are no reports of Shortnose Sturgeon, Bald Eagles, or Northern Long-eared Bat at the Charles Rider site.

1.4.15.3 Designated Critical Habitat

The USFWS has not designated any critical habitat in the Charles Rider Park site. The GARFO has identified the site as critical habitat for the Atlantic Sturgeon.

1.4.15.4 Essential Fish Habitat

Utilizing NMFS's essential fish habitat (EFH) designation and the EFH Mapper, the site is potential essential fish habitat for various life stages of Summer Flounder (*Paralichthys dentatus*), Winter Flounder (*Pseudopleuronectes americanus*), Little Skate (*Leucoraja erinacea*), Atlantic Herring (*Clupea harengus*), Red Hake (Urophycis chuss), Windowpane Flounder (*Scophthalmus aquosus*), Winter Skate (*Leucoraja ocellata*), and Clearnose Skate (*Raja eglanteria*). There are no reports of the above EFH species at the site.

1.4.16 Cultural Resources

The Charles Rider Park study area was subject to a review of existing data pertaining to historic and archaeological resources including local and regional histories, cultural resource surveys, and site files available on the New York State Cultural Resources Information System (CRIS), which is maintained by the NYSHPO and the Division for Historic Preservation within the Office of Parks, Recreation, and Historic Preservation (OPRHP). The resulting report is available in the Cultural Resources Appendix (see Appendix G5).

There are no previously documented archaeological sites or historic properties located within the study area, however, the New York State Historic Preservation Office lists ten archaeological sites within 1 mile of the study area, seven sites are prehistoric and three are historic. There are four historic properties within a mile of the study area that are NR listed. These are the Kingston-Rhinecliff Bridge (U.S. Route 199), the Benjamin Ten Broeck House (05NR05471), the Sixteen Mile District (90NR00219) on the east bank of the Hudson River, and the Hudson River Historic District (92NR00302).

Evidence of a Native American presence from all major periods, from Paleoindian to Woodland has been documented on the western banks and terraces of the Hudson River in Ulster County including several large fluted points and unfluted lanceolate points, indicative of Paleoindian occupation (Ritchie 1994). Few sites dating to the Early and Middle Archaic have been found in the area but several Late Archaic camps are known to have existed and range from small upland camps to large villages near the confluences of major streams (Funk 1991). A large Late Woodland/contact period Esopus village was identified north of the City of Kingston just over a mile south of the study area. Before becoming a park, the study area contained a brick factory with a number of structures including a bulkhead, docks, and multiple buildings. The structures are documented on USGS topographic maps published from 1934 to 1970 and historic aerial imagery and topographic maps indicate that the site transitioned to a park sometime between 1970 and 1995.

The presence of prehistoric and historic sites within 1 mile of the study area and the history of the site as a brick factory indicates that the study area has a moderate to high sensitivity for archaeological sites where the construction of the park has not caused significant disturbance.

1.4.17 Air Quality

The USEPA Green Book provides detailed information about area National Ambient Air Quality Standards (NAAQS) designations, classifications, and nonattainment statuses (USEPA, 2018). The site is located in a region classified as “in attainment” for all pollutants tracked under the NAAQS including ozone (O_3), particulate matter (PM10 & PM2.5), sulfur dioxide (SO_2), lead (Pb), carbon monoxide (CO), and nitrogen dioxide (NO_2). There are no major sources of air pollutants (Title V facilities) on or in proximity to the site. Current on-site boating activities may contribute to local air pollution, but the effect is likely insignificant.

1.4.18 Noise

The site currently consists of recreational park land. Land in vicinity of the site contains low density development of mixed use, including single family residences, a fire and rescue technician training center, and a recycling center. These facilities may occasionally contribute to on-site noise pollution. A two-runway airport (Kingston–Ulster Airport) is also located approximately 4,000 feet northwest of the site; planes passing above the site to or from this airport may also contribute to local noise pollution. Potential sources of existing noise pollution originating on the site may include boating activities, around the site’s boat launch.

1.4.19 Recreation

Charles Rider Park contains 90.2 acres of preserved open space. The park is located on the shore of the Hudson River and contains a boat ramp, picnic tables and restrooms (Town of Ulster Comprehensive Plan Committee & Planit Main Street Inc., 2007). This park is open year-round but operates seasonally with an attendant on site from mid-April through Labor Day. The park provides access to the Hudson River waterfront as well as recreational opportunities, such as fishing, paddling, and kayaking. The park's boat launch is the only public boat launch site in the Town of Ulster, and one of only five Hudson River public boat launch sites in Ulster County (NYSDEC, 2018a). The park also has the largest parking capacity of any of the County's public boat launch sites, able to accommodate approximately 50 cars and trailers.

Charles Rider Park is part of the Hudson River Greenway Water Trail that extends from Battery Park in the village of Waterford, Saratoga County to Battery Park in Manhattan. The trail extends 156 miles (Hudson River Greenway Water Trail, 2018). Charles Rider Park starts at mile 94.7 on the West Bank (41.9728° - 73.9550°) of the Hudson River Greenway Water Trail. The Hudson River Greenway Water Trail program classifies the park as a 'Day Use Site', providing access to attractions usually of interest to paddlers and boaters, such as wildlife marshes, islands and swamps, historic sites, downtowns and hiking trails.

1.4.20 Aesthetics and Scenic Resources

The site is not designated as a Scenic Areas of Statewide Significance (SASS) under the New York Coastal Management Program. However, Policy 25 of the Coastal Management Program requires that state agencies must ensure proposed actions in the coastal zone "Protect, restore or enhance natural and man-made resources which are not identified as being of statewide significance, but which contribute to the overall scenic quality of the coastal area." (NYSDOS, 2017). Activities which could impair or degrade scenic quality include the modification of natural landforms, removal of vegetation, removal of existing structures, and the addition of structures that diminish scenic quality.

1.4.21 Hazardous, Toxic, and Radioactive Waste

A review of the databases yields no sites within or near the Charles Rider Park.

1.4.22 Transportation and Other Infrastructure

Charles Rider Park can be accessed by car via Route 32, also known as Flatbush Road, North from Route 199/209 overpass and South from Ulster Landing Road which leads to the park. The Highway Department in Ulster is responsible for taking care of 73 miles of Town roads as well as maintaining Charles Rider Park and its boat launch (Town of Ulster, 2018a).

A two-runway, privately owned, public use airport (Kingston–Ulster Airport) is also located approximately 4,000 feet northwest of the site. The airport provides access to the cities of Kingston and Saugerties, and the Hunter Mountain and Belleayre ski resorts (Richmor Aviation, 2014). Kingston-Ulster Airport is used for corporate as well as private aviation, providing hanger rentals for private pilots who fly recreationally. The

Town of Ulster Comprehensive Plan recognized the airport as an advantage for area businesses and resident aviators (Town of Ulster Comprehensive Plan Committee & Planit Main Street Inc., 2007).

1.5 Rondout Creek

1.5.1 Physical Setting

The restoration site (hereafter referred to as “the site”), where proposed actions would be implemented, is limited to the Eddyville Dam and its adjacent waters. The site is located in Rondout Creek along the border of the Towns of Ulster and Esopus, in Ulster County, New York. Rondout Creek is a major tributary to the Hudson River and the dam is located approximately 3.6 miles upstream of the confluence with the Hudson River. The dam is 220 feet long and 12 feet high, with a spillway on the left bank. The dam is constructed from stone masonry capped with concrete and is classified as a Class A – Low Hazard dam, indicating that a dam failure is unlikely to result in major damage.

1.5.1.1 Geology and Physiography

The site is within the Hudson-Mohawk Lowlands physiographic region, in the Wallkill River valley. The lowlands in this area are underlain by weak sedimentary rock, primarily formed during the Cambrian and Lower Ordovician periods. Specifically, the Rondout Creek site is mapped as underlain by the Austin Glen Formation, which consists of highly folded, interbedded greywacke sandstone and shale that formed in a deep marine setting from the erosion of pre-existing sedimentary rocks (NYS Museum, 1995). The lower Rondout Creek and Wallkill River valley are bounded by the Catskill Mountains to the west\ and the Marlboro Mountains to the east (USGS, 2003).

In general, the surficial geology of the region is heavily influenced by its history of glaciation, including glacial till and lacustrine sediment deposited during the most recent glacial advance and retreat 70,000 to 16,000 years ago. The Rondout and Wallkill valleys generally contain lacustrine silt and clay soils (NYSDOT, 2013). However, these sediments have been reworked by stream flow and the site is currently mapped as alluvium (NYS Museum, 1991). The area to the east of creek is mapped as till and the area to the west of the site is mapped as lacustrine silt and clay and till.

1.5.1.2 Topography

Eddyville Dam is situated in a narrow valley with steep bedrock walls. The dam is built on a bedrock ledge, with the dam crest at an elevation of 4 feet (NAVD88). The river bed is highly irregular in the vicinity of the dam, with bed elevations ranging from -45 feet to -14 feet below the dam, and -25 to -6 feet above the dam (FEMA, 2016b). Several pools with water depths up to 48 feet are present above and below the dam, which have been attributed to excavation of rock for use in construction of the nearby Delaware and Hudson Canal. The dam is located at a sharp bend in the river, though the Rondout channel was significantly altered during the period when the canal was developed, and the dam location is likely not the original channel for the creek (D. Miller, personal communication, 2018).

1.5.1.3 Soils

Soils data and soils descriptions for the Rondout Creek site were acquired from the National Resources Conservation Service (NRCS) Web Soil Survey. The area around the dam at the Rondout Creek site is composed of various complexes of rock outcrops, Bath gravelly silt loam, and Nassau shaly silt loam soils (NRCS, Web Soil Survey).

The **Bath** series consists of very deep, well drained, gravelly loam and silt loam soils. They are formed from loamy till derived mainly from gray and brown siltstone, sandstone, and shale, and are found on hills, ridges, and till plains. A fragipan is typically present at a depth of 26-38 inches, limiting root growth.

The **Nassau** series consists of somewhat excessively drained channery silt loam soils formed from channery loamy till derived mainly from local slate or shale. They are found on summits, shoulders, and back slopes of ridges and hills on glaciated uplands. The soil is shallow, with 10-20 inches to bedrock.

1.5.2 Climate and Weather

A National Weather Service (NWS) station is located approximately 10 miles southwest of the site, at Mohonk Lake, New York. Records for this station are available between 1896 and 2018, via the Agricultural Applied Climate Information System (AgACIS). Records at this station indicate that between 1896 and 2018, Average monthly temperatures ranged for 24.9°F in January to 71.0°F in July (AgACIS, 2018). Average annual precipitation was 48.4 inches, with monthly averages ranges from 3.30 inches in February to 4.57 inches in July. Average annual snowfall was 61.5 inches, primarily occurring between December and March. The average number of days with 0.10 inches of precipitation or more was 80 days per year; such precipitation days occurred at a roughly equally rate per month (6-8 days per month).

1.5.2.1 Climate Resiliency

According to the Intergovernmental Panel on Climate Change's (IPCC) Special Report 15, released in October of 2018, human activities have caused approximately 1.0°C of global warming above pre-industrial levels, causing many land and ocean ecosystems to change. The same report also stated that, "model-based projections of global sea level rise (relative to 1986-2005) suggest an indicative range of 0.26 to 0.77 m by 2100 for 1.5°C of global warming… Increasing warming amplifies the exposure of small islands, low-lying coastal areas and deltas to the risks associated with sea level rise for many human and ecological systems, including saltwater intrusion, flooding and damage to infrastructure" (IPCC, 2018).

Climate projections developed by New York State indicate a future increase in temperatures, precipitation, sea levels, and severity of flooding (NYSDEC, 2018a). The State's average annual temperature is expected to increase approximately four to six degrees Fahrenheit by mid-century and as much as 11 degrees Fahrenheit by 2100. The total annual precipitation is expected to increase as much as 11% by mid-century and 18% by 2100. Since 1900, sea level in the lower Hudson has risen 13 inches. Sea level rise along the Hudson River is projected to continue; The Hudson River is projected to rise a minimum of nine additional inches by 2050, with mid-range projections of approximately 10 to 20 inches by 2050. Given that the lower Rondout Creek is subject to the Hudson River's tidal influence, water levels in the Rondout Creek will likely also rise These changing climatic factors will likely alter flooding patterns in Rondout Creek; it is projected that today's 1% storm will become 20 to 50% more likely by 2020 and as much as 610% more likely by 2100.

Ulster County is a participant in the NYS Climate Smart Communities Program, an interagency initiative of New York State which aims to engage and educate local governments in New York State, provide a robust framework to guide their climate action efforts, and recognize their achievements through a certification program (New York State, 2018). The county's implementation of climate programs and policies, including commitments to reduce vulnerability to natural hazards, conserve natural habitats, and support green infrastructure, have led the county to be awarded with a 'silver certified' status by the NYSDEC office of climate change.

1.5.3 Floodplains and Coastal Processes

1.5.3.1 Floodplains

The site lies completely within the one percent floodplain (AE Zone) with a base flood elevations of 17 to 18 feet (NAVD88) above the dam structure and 13 feet below the dam structure, as shown on the FEMA Flood Insurance Rate Map (FIRM), effective as of November 18, 2016 (Firm Panel No.: 36111C0470F)(FEMA, 2016a). Additionally, the site lies completely within the regulatory floodway. No habitable structures lie within the floodplain in vicinity the site.

A USGS real-time stream gage is located approximately six miles upstream of the site in Rosendale, NY (USGS-01367500 Rondout Creek and Rosendale, NY). Records for this gage begin in July 1901 and the gage is under continuous operation as of December 5, 2018. During this period the maximum water discharge was 36,500 ft^3/s on August 28, 2011, the minimum water discharge was 2.2 ft^3/s on July 16, 1965, and the maximum water elevation was 36.8 feet (NAVD88) on October 16, 1955. According to this gage's data report, flows have been regulated by Rondout Reservoir, located approximately 32 miles upstream, since October 1950.

1.5.4 Water Resources

1.5.4.1 Surface Waters

Located within the Rondout Watershed (HUC-8 No.: 02020007), Rondout Creek is the primary surface water body at the site. The site is located approximately 3.5 miles downstream of the confluence of Rondout Creek and the Wallkill River, and approximately 3.6 miles upstream of the Hudson River. Rondout Creek has a drainage area of approximately 1180 square miles (USGS, Streamstats) to the Eddyville Dam site. The dam marks the upstream extent of tidal influence in Rondout Creek.

1.5.4.2 Water Quality

Rondout Creek is classified as a Class C water body, which support fisheries and are suitable for non-contact recreation (6 CRR-NY X B). Rondout Creek is not listed as impaired on the 2016 EPA 303(d) list (USEPA, 2016).

1.5.4.3 Regional Hydrogeology and Groundwater

In general, aquifers in the Hudson Valley are unconfined, and related to thick layers of sediment glacially deposited over bedrock. An unconfined aquifer has been identified at the Rondout Creek site by the New York State Department of Conservation Division of Water, Bureau of Water Resources Management (NYS GIS Clearinghouse, 2018). This

aquifer is described as an unconfined, mid-yield aquifer with a yield of 10-100 gallons per minute. The mapped aquifer generally follows the footprint of the Rondout Creek and associated alluvium deposits. Additionally, the site is mapped as a carbonate rock aquifer, part of a large aquifer system extending up the Hudson and Mohawk River valleys (USGS, 1998).

1.5.4.4 Tidal Influences

No tidal stations are located directly in Rondout Creek. A NOAA tide station is located at Hyde Park in the Hudson River, approximately 11 miles downstream of the of the confluence of Rondout Creek and the Hudson River (Station: 8518951, Hyde Park, NY) (NOAA, 2014). At this station, the low and lower low tide levels are -1.78 and -1.58 feet (NAVD88), respectively; while the high and higher high tide levels are 1.93 and 2.32 feet (NAVD88), respectively. Eddyville Dam serves as the upstream limit of tidal influence in Rondout Creek. Tidal influence would likely extend further upstream if the Eddyville Dam were not present.

1.5.5 Land Use and Zoning

The site lies primarily within the open waters adjacent to Eddyville Dam, along the border of the Town of Ulster and Town of Esopus. Land uses in the vicinity of the site primarily contain a mix of forested land and low-density residential properties. Additionally, an agricultural area and a quarry are located approximately 3,000 feet upstream of the site, on river right and river left respectively, and a number of backwater ponds and wetlands are located downstream of the site

Historically, the Eddyville Dam served to provide hydro mechanical power to an adjacent mill site. It is not known when the Dam was constructed, but Historic USGS topographic mapping documents the dam structure and its associated canal as far back as 1903.

The site is located partially within the Town of Ulster's 10,000 square foot minimum lot area, residence zoning district (R-10) and partially within Town of Esopus suburban density residential (R-40) zoning district. These zones are regulated under Chapter 190 and Chapter 123 of the Ulster and Esopus municipal codes, respectively. Both of these districts generally zone for low-density residential, or agricultural-oriented development. Habitat restoration/creation and dam removals are not explicitly regulated under either town's municipal code.

1.5.6 Economics

The Town of Ulster has economic development projects underway in proximity to the site, including The Hudson Landing Project, located approximately 5 miles northeast of the site, and Tech City Project, located approximately 5 miles north of the site. The Route 9W corridor which houses the Tech City campus also contains a variety of retailers including the Hudson Valley Mall. The Hudson Landing Project proposes a mixed-use housing development along the Hudson River waterfront, and is currently under construction (Town of Ulster, 2018b). The Tech City Project is a plan for the redevelopment of the East Campus of Tech City, formerly the IBM manufacturing property (Town of Ulster, 2009). The Tech City Project proposes a multi-use development which will include light assembly, office, research and development,

educational, wellness, neighborhood retail, entertainment and multi-family residential uses, along with accessory parking (Town of Ulster, 2009).

The Town of Esopus is in the midst of revising their town comprehensive plan (Kemble, 2018) to help address certain issues and reach new goals such as taking advantage of the Hudson River shoreline. Officials of the Town of Esopus have requested residents weigh in on which waterfront projects to prioritize along Rondout Creek. Among the goals included are to evaluate potential public access on the Rondout Creek in Sleighsburgh and Connelly, including but not limited to a new waterside park and designated area for restaurant dining and recreation.

Ecotourism is an important economic driver in this region, as the natural and scenic resources draw millions of visitors to New York's recreation areas (USFWS, 2006). Many people come from out of town to pursue wildlife-associated recreation, outdoor sporting, angling, hunting, and wildlife watching, bringing with them business for local restaurants, hotels, shops, etc. According to a report by the United States Fish and Wildlife Service (USFWS), 3.8 million people watch birds and other wildlife in New York State, generating approximately $1.6 billion in ecotourism revenue every year (USFWS, 2006).

1.5.7 Socio-Economics

According to the US Census Bureau (USCB) American Community Survey 5-year survey for 2013-2017 (USCB, 2013-2017), the population in the Town of Esopus, NY is an estimated 9,041 people, and is predominantly white. The median age in the Town of Esopus, NY is approximately 43.3 years of age and median household income is $69,777. An estimated 3,745 occupied housing units are present within the town, with a majority of structures being built in 1939 or earlier (1,043 structures).

Approximately 89.9% of the Town of Esopus population are high school graduates or higher while 26.9% of the population have a bachelor's degree or higher. The estimated number of companies in the Town of Esopus is 776. The civilian employed population 16 and over is an estimated 4,917 people. Of this employed population, an estimated 1,749 people work in management, business, science, and arts occupations, 853 people in service occupations, 1,437 in sales and office occupations, 518 in natural resources, construction, and maintenance occupations, and 360 in production, transportation, and material moving occupations.

The population in the Town of Ulster, NY is an estimated 12,327 people, and is predominantly white. The median age in the Town of Ulster, NY is approximately 47.7 years of age and median household income is $50,941. An estimated 5,056 occupied housing units are present within the town, with a majority of structures being built between 1940 and 1959 (1,441 structures).

Approximately 89.2% of the Town of Ulster population are high school graduates or higher while 25.2% of the population have a bachelor's degree or higher. The estimated number of companies in the Town of Ulster is 979. The civilian employed population 16 and over is an estimated 5,424 people. Of this employed population, an estimated 2,001 people work in management, business, science, and arts occupations, 1,008 people in service occupations, 1,420 in sales and office occupations, 496 in natural resources,

construction and maintenance occupations, and 499 in production, transportation, and material moving occupations.

1.5.7.1 Environmental Justice

According to the New York State Department of Environmental Conservation's Maps & Geospatial Information System (IGST) Tools for Environmental Justice data set, the site is not located within an Environmental Justice area (NYSDEC, 2018b).

1.5.8 Coastal Zone Management

The tidal portion of Rondout Creek downstream of the Eddyville Dam is located within a designated Coastal Area, subject to regulation under the federal Coastal Zone Management Act, and managed under the New York Coastal Management Program.

The New York State Department of State (NYSDOS) has designated the tidal portion of Rondout Creek as a Significant Coastal Fish and Wildlife Habitat. Based on an evaluation by the New York State Department of Environmental Conservation (NYSDEC), this area is considered significant because it consists of a major freshwater tributary to the Hudson River that is accessible to migratory fishes (NYSDOS, 2012).

The Town of Esopus has developed a Local Waterfront Revitalization Program (LWRP) which was approved by the state Coastal Zone Management Program in 1987 (Town of Esopus, 1987). Due to the adoption of this LWRP, state and federal actions within the town are required to be consistent, to the maximum extent practicable, with the approved LWRP and the town is eligible for waterfront revitalization grants. The LWRP puts forward a policy to protect and preserve the habitats of Rondout Creek and suggested the construction of a fish passage facility at Eddyville Dam.

1.5.9 Wetlands

The USFWS National Wetland Inventory (NWI) map indicates the presence of a small freshwater emergent wetland located directly upstream of the dam on the east bank of Rondout Creek.

1.5.10 Vegetation

The area surrounding the Rondout Creek site is mapped as a mixture of upland deciduous forest and upland evergreen forest (NYS GIS Clearinghouse, 2018), in addition to the freshwater emergent wetland noted in the National Wetland Inventory. All community descriptions were acquired from Ecological Communities of New York State, 2nd Edition (Edinger et al., 2014).

Deciduous and evergreen forests commonly contain trees such as sugar maple, red maple, yellow birch (*Betula alleghaniensis*), black birch (*Betula lenta*), red oak (*Quercus rubra*), American beech (*Fagus grandifolia*), white ash (*Fraxinus americana*), chestnut oak (*Quercus montana*), white oak (*Quercus alba*), white pine (*Pinus strobus*), red pine (*Pinus resinosa*), and eastern hemlock (*Tsuga canadensis*).

Emergent wetlands are characterized by cattails (*Typha spp*.), sedges (*Carex spp*.), marsh fern (*Thelypteris palustris*), spike rushes (*Eleocharis spp*.), bulrushes (*Scirpus spp*.), and sweetflag (*Acorus americanus*). The invasive common reed (*Phragmites australis*) is also present.

1.5.11 Fish and Wildlife Resources

1.5.11.1 Shellfish

No information regarding the presence, absence, or composition of shellfish communities on the site is readily available.

1.5.11.2 Finfish

The tidal portion of Rondout creek, downstream of Eddyville Dam, is designated as a Significant Coastal Fish and Wildlife Habitat under the New York State Coastal Management Program. According to the Coastal Fish and Wildlife Rating Form (NYSDOS, 2012) associated with this designated habitat, Rondout Creek has historically supported large concentrations of coastal migratory and resident freshwater fish species. Given its height, Eddyville Dam prevents the upstream migration of most fish except for American eels (Leviton and Waldman 2006, Schmidt 1996).

The creek is an important spawning area for alewife (*Alosa pseudoharengus*), rainbow smelt (*Osmerus mordax*), blueback herring *(Alosa aestivalis*), white perch (*Morone americana*), yellow perch (*Perca flavescens*), and striped bass (*Morone saxatilis*) between March and June, and for tomcod (*Microgadus tomcod*) between December and January. American shad (*Alosa sapidissima*) spawn in shallow water areas at the mouth of Rondout Creek. Substantial populations of brown bullhead (*Ameiurus nebulosus*), yellow perch (*Perca flavescens*), American eel (*Anguilla rostrata*), smallmouth bass (*Micropterus dolomieui*) and largemouth bass (*Micropterus salmoides*) occur in the creek throughout the year. The deepwater area near the mouth of the Rondout Creek is one of five known important overwintering areas for largemouth and smallmouth bass.

1.5.11.3 Benthic Resources

In September of 2003, NYSDEC performed sediment sampling in Rondout Creek to quantify sediment contamination as part of an assessment for any modifications to Eddyville Dam (NYSDEC, 2003). Sediment cores collected just upstream of Eddyville Dam found contamination above the threshold effect concentration (TEC), below which adverse effects are not expected to occur, for mercury, nickel, zinc, pyrene, benzo[a]anthracene, benzo[a]pyrene, and dichlorodiphenyltrichloroethane (DDT) metabolites (i.e. dichlorodiphenyldichloroethane [DDD] and dichlorodiphenyldichloroethylene [DDE]). Additionally, contamination above the probable effect concentration (PEC), above which adverse effects are expected to frequently occur, was detected for phenanthrene.

No information regarding the presence, absence, or composition of benthic resources in Moodna Creek is readily available.

1.5.11.4 Reptiles and Amphibians

According to the Coastal Fish and Wildlife Rating Form associated with the designated Significant Coastal Fish and Wildlife Habitat (NYSDOS, 2012), the banks of Rondout Creek provides habitat for common snapping turtles (*Chelydra serpentina*), common

map turtles (*Graptemys geographica*), water snake (*Nerodia s. sipedon*), red-spotted newt (*Notophthalmus v. viridescens*), redback salamander (*Plethodon cinereus*), common mudpuppy (*Necturus maculosus*), American toad (*Bufo americanas*), gray treefrog *(Hyla versicolor*), spring peeper (*Pseudoacris crucifer*), bullfrog (*Rana catesbeiana*), green frog (*Rana clamitans*), and wood frog (*Rana sylvatica*).

1.5.11.5 Birds

According to the USFWS Migratory Bird Program, the project area is located within the North America Atlantic Flyway for migratory birds, which is a critical corridor for migrating birds (USFWS, 2018). According to the Coastal Fish and Wildlife Rating Form associated with the designated Significant Coastal Fish and Wildlife Habitat (NYSDOS, 2012), the wetlands located at the mouth of Rondout Creek are productive feeding areas for a variety of waterfowl species during spring and fall migrations including American Bittern (*Botaurus lentiginosus*) and Osprey (*Pandion haliaetus*). No information regarding the presence, absence, or composition of bird species further upstream, around Eddyville Dam, is readily available.

1.5.11.6 Mammals

No information regarding the presence, absence, or composition of mammals on the site is readily available. It is likely that the floodplains, wetlands, and forested land in vicinity of the site provide habitat for numerous mammalian species.

1.5.12 Threatened and Endangered Species

1.5.12.1 Federal Species of Concern

The USFWS iPac system identified the threatened Northern Long-eared Bat (*Myotis septentrionalis*) and the endangered Indiana Bat (*Myotis sodalis*), and threatened Bog Turtle (*Clemmys muhlenbergii*) as potentially occurring at the site.

Bog Turtles usually occur in small, discrete populations, generally occupying open-canopy, herbaceous sedge meadows and fens bordered by wooded areas. Bog Turtles inhabit open, unpolluted emergent and scrub/shrub wetlands such as shallow spring-fed fens, sphagnum bogs, swamps, marshy meadows, and wet pastures. These habitats are characterized by soft muddy bottoms, interspersed wet and dry pockets, vegetation dominated by low grasses and sedges, and a low volume of standing or slow-moving water.

For Indiana Bat and Northern Long-eared Bat descriptions please see Schodack Island site assessment. There are no reports of the above species occurring at the site.

Coordination with Greater Atlantic Regional Fisheries Office (GARFO) identified the Shortnose sturgeon and Atlantic Sturgeon as potentially occur at the site.

1.5.12.2 State Species of Concern

The NYSDEC identified the endangered Indiana Bat as potentially occurring at the site.

1.5.12.3 Designated Critical Habitat

The USFWS has not designated any critical habitat in the site. The GARFO has identified the site as critical habitat for the Atlantic Sturgeon.

1.5.12.4 Essential Fish Habitat

Utilizing NMFS's essential fish habitat (EFH) designation and the EFH Mapper, the site is potential essential fish habitat for various life stages of Winter Flounder (*Pseudopleuronectes americanus*), Little Skate (*Leucoraja erinacea*), Atlantic Herring (*Clupea harengus*), Red Hake (Urophycis chuss), Windowpane Flounder (*Scophthalmus aquosus*), Winter Skate (*Leucoraja ocellata*), and Clearnose Skate (*Raja eglanteria*). There are no reports of the above EFH species at the site.

1.5.13 Cultural Resources

The Rondout Creek study area was subject to a review of existing data pertaining to historic and archaeological resources including local and regional histories, cultural resource surveys, and site files available on the New York State Cultural Resources Information System (CRIS), which is maintained by the NYSHPO and the Division for Historic Preservation within the Office of Parks, Recreation, and Historic Preservation (OPRHP). The resulting report is available in the Cultural Resources Appendix (Appendix G5).

A review of the New York State Cultural Resources Information System (CRIS) lists five cultural resources surveys within a mile of the study area. No surveys have been carried out to date for the immediate study area and vicinity.

Five archaeological sites are documented within 1 mile of the study area. Of these five sites, two are identified as prehistoric, one is historic and two are listed as unknown. Settlement began in the area in the early 1600's when the Dutch established a small fortification at the mouth of the Rondout Creek in what is today the City of Kingston. The City of Kingston was first chartered in 1661 and farming was the primary industry in the area during the 17th, 18th and 19th Centuries. Several mills were operated along the Rondout Creek in the 1800s and the community engaged in commercial trade along the Hudson River. The construction of the D&H Canal in the 1820s brought more goods and raw materials, mainly coal, from Pennsylvania. The canal emptied into the Hudson River at Kingston (HAA 2002). The Eddyville Dam takes its name from the historic community of Eddyville that was situated along the Rondout upstream from Kingston. The Eddyville Dam was a component of the D&H Canal as it created the impoundment that fed the canal carrying it out to the Hudson River. There is one NRHP eligible historic resource on file within 1 mile of the project area. This is the Route 213 bridge over the Rondout Creek (BIN 1041200) (DOE 11/20/2014). The bridge was built in 1957 and is of half-through steel arch construction, one of few examples of its type. The bridge is within the view shed of the Eddyville Dam.

There is evidence of a Native American presence in the project vicinity, however, there is also historical evidence suggesting that the study area has been disturbed by earth moving relating to the construction of the Eddyville Dam and D&H Canal and related industrial features constructed at the site of the dam over time. Therefore, the study area is believed to have a low potential for prehistoric archaeological sites and a high potential for historic archaeological remains. In addition, the Eddyville Dam itself is potentially eligible for the National Register as a contributing element to the D&H Canal.

1.5.14 Air Quality

The USEPA Green Book provides detailed information about area National Ambient Air Quality Standards (NAAQS) designations, classifications, and nonattainment statuses (USEPA, 2018). The site is located in a region classified as “in attainment” for all pollutants tracked under the NAAQS including ozone (O_3), particulate matter (PM10 & PM2.5), sulfur dioxide (SO_2), lead (Pb), carbon monoxide (CO), and nitrogen dioxide (NO_2). There are no major sources of air pollutants (Title V facilities) on or in proximity to the site.

1.5.15 Noise

The site currently consists of a dam and its associated impoundment. Land in vicinity of the site contains low density residential development. Local noise is likely limited to the flow of water over the dam structure, and ambient sounds from the surrounding residential community.

1.5.16 Recreation

The Rondout Creek area has a number of recreation activities available such as bird watching, fishing, kayaking and boating as well as educational spots to visit like the Rondout National Historical District, the Rondout Lighthouse, and the Hudson River Maritime Museum (REConnect, 2018). There are also private recreational opportunities for residents such as the Rondout Bay Marina & Restaurant on the Rondout Creek in Eddyville (Town of Ulster Comprehensive Plan Committee & Planit Main Street Inc., 2007). The Marina & Restaurant has seventy-five wet slips, a launch ramp, and public restrooms.

Also located in Kingston near Lincoln Park is Green Acres Golf Club and Alapaha Golf Links (REConnect, 2018). Both 9-hole courses, located in Kingston and short drive from the Rondout Creek area.

1.5.17 Aesthetics and Scenic Resources

According to the New York State Department of State: Division of Coastal Resources and Waterfront Revitalization, the mouth of Rondout Creek is within a designated Scenic Area of Statewide Significance (SASS) under the New York Coastal Management Program (NYSDOS, 2004). The mouth of Rondout Creek is included in the Estates District Scenic Area, specifically of the ED-15 Rhinecliff Subunit, and in the Espous - Lloyd Scenic Area.

The Eddyville Dam Site itself is not located within a SASS. However, Policy 25 of the Coastal Management Program requires that state agencies must ensure proposed actions in the coastal zone “Protect, restore or enhance natural and man-made resources which are not identified as being of statewide significance, but which contribute to the overall scenic quality of the coastal area.” (NYSDOS, 2017). Activities which could impair or degrade scenic quality include the modification of natural landforms, removal of vegetation, removal of existing structures, and the addition of structures that diminish scenic quality.

1.5.18 Hazardous, Toxic, and Radioactive Waste

A review of the databases yields four Brownfield sites, five New York state Superfund sites, and one NYSDCE sampling report. One of the Brownfield sites has been remediated. Of the remaining three Brownfield sites, one has conducted a Phase II Environmental Site Assessment and has identified heavy metals, semi-volatile organic compounds (SVOCs) and petroleum related volatile organic compounds in the soils. The other two Brownfield sites contain heavy metals and SVOCs as well. All of the Brownfield sites are downstream of the Eddyville Dam.

New York State Superfund Site Code: 356030 is listed for PCB and other contaminants. The site is approximately 4 miles downstream of Eddyville Dam. An interim remedial measure (IRM) was completed in May 2016. The IRM eliminated the potential for contact with, and migration of contaminated soil from the site, and has reduced groundwater contamination in monitored locations within and downgradient of the target area.

New York State Superfund Site Code: 356028 was listed for PCBs but site assessment determined PCB levels are below the established hazardous waste threshold and, as such, do not meet the definition of hazardous waste. Site has been removed from the Registry.

The State of New York completed a Site Characterization in September 2010 of Superfund Site Code: 356040. The site does not qualify for addition to the Registry of Inactive Hazardous Waste Disposal Sites Current Actions. Based on information gathered to date the site does not qualify for placement on the registry.

New York State Superfund Site Code: 356052 is approximately 4 miles downstream of the site and is listed for tetrachloroethene (PCE). Groundwater and soil samples offsite did not detect PCE.

New York Superfund Site Code: 356050 is approximately about 5 miles upstream of the Eddyville Dam. Volatile organic compounds are of concern for the site. Downgradient wells that were installed during the Remedial Investigation showed no impacts of the VOCs in the vicinity of the creek. Soil contamination is limited to the site.

On September 11, 2003, the NYSDEC (2003) conducted soil sampling in the Rondout Creek. One core and two surficial samples were collected behind the Eddyville Dam and upstream in the Rondout Creek. Samples were analyzed for metals, organics and grain size. Two guidelines were established for each chemical, the threshold effect concentration (TEC) and the probable effect concentration (PEC). The TEC represents the level of concentration at which a chemical of concern will rarely to be observed to cause toxicity. The PEC represents the concentration at which a chemical of concern will frequently be observed to cause toxicity. The metals data from the core sample at R1 indicate that the top five centimeters of sediments had no levels exceeding the TEC. No metals were at concentrations greater than the PEC at any of the sampling sites or depths. The sample from site R3 had lower concentrations of metals than site R2, which may be due to the lower organic carbon content of this site. R3 also had much higher solids than the core sample.

Metals were detected at very low concentrations, mostly below the conservative Threshold Effect Concentration (TEC) and none in excess of the Probable Effect Concentration (PEC). PCBs (Aroclors) were not detected in any sample; however, detection limits for some samples exceeded the TEC but were well below the PEC.

1.5.19 Transportation and Other Infrastructure

The transportation system in Ulster County is Ulster County Area Transit or UCAT. UCAT offers reliable transportation services throughout the County (Ulster County, 2018). An attraction is the Catskill Mountain Railroad which is a heritage railroad location in Kingston, New York (Catskill Mountain Railroad, 2018). It was formerly known as the New York Central Railroad Catskill Mountain branch from Kingston to Highmount, NY, where it connects with the Delaware & Ulster Railroad tourist operation. The railroad now hosts a list of excursions such as the Great Train Robbery, Peace Train, Polar Express and many more. The railroad is an estimated 15-minute drive to Rondout Creek.

A two-runway, privately owned, public use airport (Kingston–Ulster Airport) is also located approximately 7 miles northeast of the site. The airport provides access to the cities of Kingston and Saugerties, and the Hunter Mountain and Belleayre ski resorts (Richmor Aviation, 2014). Kingston-Ulster Airport is used for corporate as well as private aviation, providing hanger rentals for private pilots who fly recreationally. The Town of Ulster Comprehensive Plan recognized the airport as an advantage for area businesses and resident aviators (Town of Ulster Comprehensive Plan Committee & Planit Main Street Inc., 2007).

1.6 Moodna Creek

1.6.1 Physical Setting

Three proposed restoration sites lie along Moodna Creek, in Orange County, New York. These restoration sites (hereafter referred to as AOP1, AOP2, and AOP3), where proposed actions would be implemented, are each limited to a barrier structure and its adjacent waters. AOP1, AOP2, and AOP3 lie approximately 1.8, 3.0, and 3.7 miles upstream, respectively, from the confluence of Moodna Creek and the Hudson River.

AOP1 lies on the border between the towns of Cornwall and New Windsor. AOP1 contains a concrete encased, decommissioned sewer line which forms a weir that creates a vertical drop of water approximately 2 feet in height. A deep scour hole is present on the downstream side of this structure.

AOP2 lies within the Town of Cornwall and contains a dam structure known as Firth Cliff Dam, which stands 9 feet high, and 162 feet long. This dam once provided hydro mechanical power to a former textile manufacturing factory, which has since been demolished. The remains of this industrial property lie adjacent to the AOP2 site, on river right. Due to the narrow riverine impoundment and steep confining valley walls, this dam impounds mainly bedload sediment (sand, gravel, cobble, and boulder); most finer grain sizes (silt and clay), pass through to downstream reaches.

AOP3 lies within the Town of Cornwall and contains a dam structure known as Orr's Mill Dam, which stands 10 feet tall and 18 feet long. The Orr's Mill Dam is located directly upstream of the State Route 32 crossing. The dam is in poor condition as suggested by the cracks and holes in its spillway.

1.6.1.1 Geology and Physiography

Moodna Creek is located at the transition between the Hudson-Mohawk Lowlands and Hudson Highlands physiographic provinces. The lowlands area situated to the north of Moodna Creek is underlain by weak sedimentary rock, primarily formed during the Cambrian and Lower Ordovician periods (NYSDOT, 2013). This area is mapped as the Normanskill Formation, which is characterized as dark green to black argillaceous shale containing calcareous and chert beds (NYS Museum, 1995). Post-deposition, the Normanskill shale was folded into a series of hills and valleys trending north-south (Laberge Group, 2011). The Hudson Highlands to the south of Moodna Creek are rugged mountainous terrain with ridges and valleys trending northeast to southwest. Bedrock is dominantly crystalline and has been metamorphosed. These rocks were originally emplaced during the Proterozoic period and have been since undergone several episodes of deformation associated with continental collisions, including extensive folding and metamorphism (NYSDOT, 2013). The area to the south of Moodna Creek is mapped as various granitis, gneisses, and paragneisses (NYS Museum, 1995).

Additionally, the surficial geology of the region is heavily influenced by its history of glaciation, including glacial till and lacustrine sediment deposited during the most recent glacial advance and retreat 70,000 to 16,000 years ago. Moodna Creek itself is mapped

as alluvium, with surrounding areas mapped primarily as till and includes areas of outwash sand and gravel, lacustrine deltas, and kame deposits (NYS Museum, 1991).

1.6.1.2 Topography

The main stem of Moodna Creek is generally characterized by moderate gradient, cobble-boulder riffles and rapids, extended pools, and narrow floodplains confined by steep, erodible valley walls. As discussed above, the creek is located in an area where the lower relief and broader floodplains of the Hudson Valley lowlands are transitioning to the more rugged topography and narrow valleys of the Hudson Highlands. AOP1 is at an elevation of approximately 50 feet (NAVD88), with AOP2 and AOP3 at an elevation of 117 and 163 feet, respectively (NYSDEC, 2011 - 2012).

1.6.1.3 Soils

Soils data and soils descriptions for the Moodna Creek site were acquired from the National Resources Conservation Service (NRCS) Web Soil Survey for Orange County, NY. The three barriers at the Moodna Creek site are associated with six different soil types: Mardin gravelly silt loam, Middlebury silt loam, Otisville, Hoosic gravelly sandy loam, Swartswood, and the Udifluvents-Fluvaquents complex (frequently flooded) (NRCS, Web Soil Survey).

Mardin gravelly silt loam soils are very deep, moderately well drained soils formed from loamy till on glaciated uplands. They have a dense fragipan starting at a depth of 14 to 26 inches, and typically have a perched water table during wet periods.

Middlebury silt loam is a moderately well drained soil found on flat floodplains, and is composed of silt loam, sandy loam, and gravelly fine sand. This soil is derived from loamy alluvium predominantly from areas of shale and sandstone with some lime-bearing material. It is not rated as hydric.

The **Otisville** series are very deep, excessively drained soils consisting of gravelly sandy loam over very gravelly sand. These soils are formed on outwash plains and terraces, from sandy and gravelly glaciofluvial deposits, and have high permeability.

Hoosic gravelly sandy loam soils are formed from sandy and gravelly glaciofluvial deposits on deltas, outwash plains, and terraces. They are very deep and somewhat excessively well drained, with rapid permeability.

The **Swartswood** series are deep, well drained soils consisting of gravelly loam over gravelly fine sandy loam. They are found on hills and till plains and are formed rom till derived primarily from gray and brown quartzite, conglomerate, and sandstone.

Udifluvents-Fluvaquents complex soils are found in flat areas on floodplains. Fluvaquents are formed from silt loam over gravelly silt loam, located in low areas that flood frequently. They are poorly drained, and rated as hydric. Udifluvents are found in slightly higher areas and are composed of gravelly fine sandy loam over gravelly sandy loam. They are moderately well drained, with a typical depth to water of 24-72 inches, and are not rated as hydric. Both are formed from alluvium with a highly variable texture and have variable profiles.

1.6.2 Climate and Weather

A National Weather Service (NWS) station is located approximately 6.5 miles southwest of the site, in West Point, New York. Records for this station are available between 1890 and 2018 via the Agricultural Applied Climate Information System (AgACIS). Records at this station indicate that between 1890 and 2018, average monthly temperatures ranged for 27.8°F in January to 74.5°F in July (AgACIS, 2018). Average annual precipitation was 47.07 inches, with monthly averages ranges from 3.09 inches in February to 4.35 inches in July. Average annual snowfall was 38.3 inches, primarily occurring between December and March. The average number of days with 0.10 inches of precipitation or more was 79 days per year; such precipitation days occurred at a roughly equally rate per month (6-8 days per month).

1.6.2.1 Climate Resiliency

According to the Intergovernmental Panel on Climate Change's (IPCC) Special Report 15, released in October of 2018, human activities have caused approximately 1.0° C (1.8° F) of global warming above pre-industrial levels, causing many land and ocean ecosystems to change. The same report also stated that, "model-based projections of global sea level rise (relative to 1986-2005) suggest an indicative range of 0.26 to 0.77 m (0.85 to 2.5 ft.) by 2100 for 1.5° C (1.8° F)of global warming… Increasing warming amplifies the exposure of small islands, low-lying coastal areas and deltas to the risks associated with sea level rise for many human and ecological systems, including saltwater intrusion, flooding and damage to infrastructure" (IPCC, 2018).

Climate projections developed by New York State indicate a future increase in temperatures, precipitation, sea levels, and severity of flooding (NYSDEC, 2018a). The State's average annual temperature is expected to increase approximately four to six degrees Fahrenheit by mid-century and as much as 11 degrees Fahrenheit by 2100. The total annual precipitation is expected to increase as much as 11% by mid-century and 18% by 2100. Since 1900, sea level in the lower Hudson has risen 13 inches. Sea level rise along the Hudson River is projected to continue; The Hudson River is projected to rise a minimum of nine additional inches by 2050, with mid-range projections of approximately 10 to 20 inches by 2050. These changing climatic factors will likely alter flooding patterns in the Hudson River; it is projected that today's 1% storm will become 20 to 50% more likely by 2020 and as much as 610% more likely by 2100.

Orange County is a participant in the NYS Climate Smart Communities Program, an interagency initiative of New York State which aims to engage and educate local governments in New York State, provide a robust framework to guide their climate action efforts, and recognize their achievements through a certification program (New York State, 2018). The county's implementation of climate programs and policies, including commitments to reduce vulnerability to natural hazards, conserve natural habitats, and support green infrastructure, have led the county to be awarded with a 'silver certified' status by the NYSDEC office of climate change.

1.6.3 Floodplains and Coastal Processes

1.6.3.1 Floodplains

All three sites lie primarily within one percent floodplain (AE Zone) and partially in the 0.2 percent floodplain (X Zone) as shown on Flood Insurance Rate Maps (FIRM), effective as of August 3, 2009 (FIRM Panel No.: 36071C0333E and 36071C0341E) (FEMA, 2009a)(FEMA, 2009b). AOP 1 and AOP 2 also lie within the regulatory floodplain. Base flood elevations range from 53 to 59 feet (NAVD88) at AOP 1, 119 to 124 feet (NAVD88) at AOP 2, and 162 to 170 feet (NAVD88) at AOP 3. No habitable structures lie within the Moodna Creek floodplain in vicinity of any of the sites.

1.6.4 Water Resources

1.6.4.1 Surface Waters

Located within the Hudson-Wappinger Watershed (HUC-8 02020008), Moodna Creek is the primary surface water body at the three sites. Moodna Creek is a tributary to the Hudson River, and has a total drainage area of approximately 180 square miles (USGS, Streamstats). AOP1 is located approximately 1.7 miles above the confluence with the Hudson River, and AOP2 and AOP3 are located 2.9 and 3.5 miles upstream of the confluence respectively. Several smaller tributaries join Moodna Creek throughout this reach.

The Moodna Creek Watershed is the only major watershed located entirely within Orange County (other large watersheds, such as the Wallkill and Ramapo, extend into adjoining counties and states). The watershed includes parts of 22 towns and villages in Orange County (OCWA, 2010b).

1.6.4.2 Water Quality

Moodna Creek is classified as a Class C water body, which support fisheries and are suitable for non-contact recreation (6 CRR-NY X B). Moodna Creek is not listed as impaired on the 2016 USEPA 303(d) list (USEPA, 2016).

1.6.4.3 Regional Hydrogeology and Groundwater

This area of Moodna Creek is not associated with any major aquifer. Upper Moodna Creek and its tributary Woodbury Creek have extensive confined and unconfined aquifers. However, the reach associated with this project has small pockets of unconfined aquifers associated with glacial surface deposits in the vicinity, but are disconnected from the stream (OCWA, 2010a).

1.6.5 Land Use and Zoning

Each site lies primarily within the open waters of Moodna Creek. AOP1 lies within the Town of New Windsor, while AOP2 and AOP3 lie within the Town of Cornwall. Land uses in the vicinity of the sites primarily contain a mix of forested land and low to moderate density residential properties. Additionally, there is a vacant, ex-industrial site adjacent to AOP2.

Historically, the Firth Cliff and Orr's Mill dams served to provide hydro mechanical power to adjacent industrial sites. It is not known when the dams were constructed, but historic USGS topographic mapping document both dam structures as far back as 1930.

AOP1 is located within the Town of New Windsor's Suburban Residential (R-3) zoning district. This zone is regulated under Chapter 300 of the New Windsor municipal codes and generally zones for low to moderate density residential development.

AOP2 is split between two zones within the Town of Cornwall, the planned commercial district (PCD) on river right, and suburban residence (SR-1) zoning district on river left. These zones are regulated under Chapter 158 of the Cornwall municipal codes. The planned commercial district zones for light agricultural, recreational, institutional, or commercial development. The suburban residence district zones for low-density residential or light agricultural development.

AOP3 lies entirely within the Town of Cornwall suburban residence (SR-1) zoning district. The zoning transitions to the mountain and conservation residence (MCR) zoning district approximately 200 feet upstream of the site. The mountain and conservation residence (MCR) district zones for low-density residential, light agricultural, or timber production development.

Habitat restoration/creation and dam removals are not explicitly regulated under either town's municipal code.

1.6.6 Economics

Although much of what was once farmland has since regrown into forest or been developed into urban or suburban uses, agriculture remains a vital component of the economic, scenic, and ecological fabric of the watershed. Today, farmland is largely clustered in the central, western, and northern reaches of the watershed where the topography is more inviting for grazing of livestock or cultivation of crops. The appealing farm views within the Towns of Goshen, Hamptonburgh, Blooming Grove, Chester, Cornwall, and New Windsor attract many tourists and residents and improve the quality of life. Five of the County's Special Scenic Areas are within the watershed and two of these are agricultural views: Oxford Depot (Blooming Grove) and Kings Highway (Chester) (OCWA, 2010b).

Ecotourism is an important economic driver in this region, as the natural and scenic resources draw millions of visitors to New York's recreation areas (USFWS, 2006). Many people come from out of town to pursue wildlife-associated recreation, outdoor sporting, angling, hunting, and wildlife watching, bringing with them business for local restaurants, hotels, shops, etc. According to a report by the United States Fish and Wildlife Service (USFWS), 3.8 million people watch birds and other wildlife in New York State, generating approximately $1.6 billion in ecotourism revenue every year (USFWS, 2006).

1.6.7 Socio-Economics

All three sites are located within the town boundaries of Cornwall and one site is also partially located in the Town of New Windsor, New York in Orange County. According to the US Census Bureau (USCB) American Community Survey 5-year survey for 2013-2017 (USCB, 2013-2017), the population in the Town of Cornwall, NY is an estimated 12,646 people, and is predominantly white. The median age in the Town of Cornwall, NY is approximately 42.8 years of age and median household income is $89,520. An

estimated 5,071 occupied housing units are present within the town, with a majority of structures being built in 1939 or earlier (1,664 structures).

Approximately 94.3% of the population are high school graduates or higher while 47.6% of the population have a bachelor's degree or higher. The estimated number of companies in the Town of Cornwall is 805. The civilian employed population 16 and over is an estimated 6,250 people. Of this employed population, an estimated 2,987 people work in management, business, science, and arts occupations, 840 people in service occupations, 1,693 in sales and office occupations, 313 in natural resources, construction, and maintenance occupations, and 417 in production, transportation, and material moving occupations.

The population in the Town of New Windsor, NY is an estimated 26,799 people and is predominantly white. The median age in the Town of New Windsor, NY is approximately 38.6 years of age and median household income is $77,210. An estimated 10,426 occupied housing units are present within the town, with a majority of structures being built in 1960 to 1969 (1,666 structures).

Approximately 94.2% of the population are high school graduates or higher while 30.9% of the population have a bachelor's degree or higher. The estimated number of companies in the Town of New Windsor is 1,962. The civilian employed population 16 and over is an estimated 13,586 people. Of this employed population, an estimated 5,273 people work in management, business, science, and arts occupations, 2,423 people in service occupations, 3,438 in sales and office occupations, 887 in natural resources, construction, and maintenance occupations, and 1,565 in production, transportation, and material moving occupations.

1.6.7.1 Environmental Justice

According to the New York State Department of Environmental Conservation's Maps & Geospatial Information System (IGST) Tools for Environmental Justice data set, none of the sites are located within an Environmental Justice area (NYSDEC, 2018b).

1.6.8 Coastal Zone Management

Moodna Creek downstream of the Orr's Mill Dam is located within a designated Coastal Area, subject to regulation under the federal Coastal Zone Management Act, and managed under the New York Coastal Management Program.

The New York State Department of State (NYSDOS) has designated Moodna Creek downstream of the Orr's Mill Dam as a Significant Coastal Fish and Wildlife Habitat. Based on an evaluation by the New York State Department of Environmental Conservation (NYSDEC), this area is considered significant because it consists of a major freshwater tributary to the Hudson River that is accessible to migratory fishes (NYSDOS, 2012).

1.6.9 Wetlands

The USFWS National Wetland Inventory (NWI) map does not indicate the presence of wetlands at the Moodna Creek sites. The area around AOP3 is mapped as a freshwater pond. AOP1 and AOP2 are mapped as riverine environments.

1.6.10 Vegetation

The area around the Moodna Creek sites is mapped as a mixture of upland deciduous forest and upland evergreen forest (NYS GIS, 2018).

Deciduous and evergreen forests commonly contain trees such as sugar maple (*Acer saccharum*), red maple (*Acer rubrum*), yellow birch (*Betula alleghaniensis*), black birch (*Betula lenta*), red oak (*Quercus rubra*), American beech (*Fagus grandifolia*), white ash (*Fraxinus americana*), chestnut oak (*Quercus montana*), white oak (*Quercus alba*), white pine (*Pinus strobus*), red pine (*Pinus resinosa*), and eastern hemlock (*Tsuga canadensis*)(Edinger et al., 2014).

1.6.11 Fish and Wildlife Resources

1.6.11.1 Shellfish

No information regarding the presence, absence, or composition of shellfish communities on the site is readily available.

1.6.11.2 Finfish

The tidal portion of Moodna Creek is classified as a 'Significant Anadromous Fish Concentration Area' by the NYSDEC Environmental Resource Mapper (NYSDEC, Environmental Resource Mapper). The tidal portion of Moodna Creek is also designated as a Significant Coastal Fish and Wildlife Habitat under the New York State Coastal Management Program. According to the Coastal Fish and Wildlife Rating Form (NYSDOS, 2012) associated with this designated habitat, Moodna Creek is an important spawning area for alewife (*Alosa pseudoharengus*), blueback herring (*Alosa aestivalis*), bay anchovy (*Anchoa mitchilli*), American eel (*Anguilla rostrata*), and striped bass (*Morone saxatilis*) between April and June, and for tomcod (*Microgadus tomcod*) between December and January. American shad (*Alosa sapidissima*) spawn in areas at the mouth of Moodna Creek. The barriers contained within the AOP sites likely impede or prevent the upstream migration of fish.

A substantial warmwater fish community occurs in the lower portion of Moodna Creek throughout the year including bluegill (*Lepomis macrochirus*), brown bullhead (*Ameiurus nebulosus*), channel catfish (*Ictalurus punctatus*), common carp (*Cyprinus carpio*), golden shiner (*Notemigonus crysoleucas*), largemouth bass (*Micropterus salmoides*), pumpkinseed (*Lepomis gibbosus*), smallmouth bass (*Micropterus dolomieu*), white catfish (*Ameiurus catus*), yellow perch (*Perca flavescens*), and white perch (*Morone americana*). As the salt front moves up the Hudson during dry periods, bluefish (*Pomatomus saltatrix*), anchovy (*Anchoa mitchilli*), weakfish (*Cynoscion regalis*), silversides (*Menidia menidia*), hogchoker (*Trinectes maculatus*), and blue crab (*Callinectes sapidus*) may enter the area to feed.

1.6.11.3 Benthic Resources

No information regarding the presence, absence, or composition of benthic resources in Moodna Creek is readily available.

1.6.11.4 Reptiles and Amphibians

According to the Coastal Fish and Wildlife Rating Form associated with the designated Significant Coastal Fish and Wildlife Habitat (NYSDOS, 2012), the banks of Moodna Creek provide habitat for common snapping turtle (*Chelydra serpentina*), water snake (*Nerodia s. sipedon*), red-spotted newt (*Notophthalmus v. viridescens*), redback salamander (*Plethodon cinereus*), American toad (*Bufo americanas*), gray treefrog (*Hyla versicolo*r), spring peeper (*Pseudoacris crucifer*), bullfrog (*Rana catesbeiana*), green frog (*Rana clamitans*) and wood frog (*Rana sylvatica*).

1.6.11.5 Birds

The tidal portion of Moodna Creek is classified as a 'Significant Waterfowl Winter Concentration Area' by the NYSDEC Environmental Resource Mapper (NYSDEC, Environmental Resource Mapper, Accessed December 2018). According to the Coastal Fish and Wildlife Rating Form associated with the designated Significant Coastal Fish and Wildlife Habitat (NYSDOS, 2012), Moodna Creek provides valuable habitats for many species of shorebirds, wading birds, waterfowl, and songbirds, and is reported to be a major crossing point for raptors migrating through the Hudson Valley.

Probable or confirmed breeding bird species in the area include Green Heron (*Butorides virescens*), American Bittern (*Botaurus lentiginosus*), Canada Goose (*Branta canadensis*), Mallard (*Anas platyrhynchos*), American Black Duck (*Anas rubripes*), Wood Duck (*Aix sponsa*), Virginia Rail (*Rallus limicola*), Spotted Sandpiper (*Actitis macularia*), Belted Kingfisher (*Ceryle alcyon*), Fish Crow (*Corvus ossifragu*s), Marsh Wren (*Cistothorus palustris*), Common Yellowthroat (*Geothlypis tricha*s), Hooded Warbler (*Wilsonia citrina*), Red-winged Blackbird (*Agelaius phoeniceus*), Downy Woodpecker (*Picoides pubescens*), Northern Flicker (*Colaptes auratus*), Eastern Kingbird (*Tyrannus tyrannus*), and Swamp Sparrow (*Melospiza georgiana*). The wetlands located at the mouth of Moodna Creek are productive feeding areas for significant concentrations of herons, waterfowl, and shorebirds during spring and fall migrations such as Osprey (*Pandion haliaetus*).

1.6.11.6 Mammals

No information regarding the presence, absence, or composition of mammals on the site is readily available. It is likely that the floodplains, wetlands, and forested land in vicinity of the site provide habitat for numerous mammalian species.

1.6.12 Threatened and Endangered Species

1.6.12.1 Federal Species of Concern

The USFWS iPac system identified the threatened Northern Long-eared Bat (*Myotis septentrionalis*) and the endangered Indiana Bat (*Myotis sodalis*), endangered Dwarf Wedgemussel (*Alasmidonta heterodon*), and threatened Small Whorled Pogonia (*Isotria medeoloides*) as potentially occurring at the site.

The Dwarf Wedgemussel is a small (1.5 in) freshwater mussel that spends the majority of its life buried almost completely in the bottom of streams and rivers. The mussel has a dark brown to yellow-brown ovate, bivalve shell with a blue, to silvery white inside. Typical habitat for this mussel includes running waters of all sizes, from small brooks to

large rivers. The only location in Orange County where the Dwarf Wedgemussel has been identified is in the lower reaches of the Neversink River (NYSDEC 2019).

The Small-whorled Pogonia is a member of the orchid family. It usually has a single grayish-green stem that grows about 10 inches tall when in flower and about 14 inches when bearing fruit. The Small-whorled Pogonia favors open, dry, deciduous forests with low nutrient, acidic soils that are very stony, fine sandy loams and contain a thick layer of dead leaves. They require filtered sunlight and sparse shrub and herbaceous layers. They often grow on slopes near small streams. This species has been located only seven times in New York State, with only two recent records in 1976 in Onondaga County and again in Schunnemunk Mountain State Park in Orange County in 2010 (NYSDEC 2019).

For Indiana Bat and Northern Long-eared Bat descriptions please see Schodack Island site assessment.

There are no reports of the Northern Long-eared Bat, Indiana Bat, Dwarf Wedgemussel or Small Whorled Poginia at the site.

Coordination with Greater Atlantic Regional Fisheries Office (GARFO) identified the Shortnose sturgeon and Atlantic Sturgeon as potentially occur at the site.

1.6.12.2 State Species of Concern

The NYSDEC identified the endangered Indiana Bat (*Myotis sodalis*) as potentially occurring at the site.

1.6.12.3 Designated Critical Habitat

The USFWS has not designated any critical habitat in the site. The GARFO has identified the site as critical habitat for the Atlantic Sturgeon.

1.6.12.4 Essential Fish Habitat

Utilizing NMFS's essential fish habitat (EFH) designation and the EFH Mapper, the site is potential essential fish habitat for various life stages of Winter Flounder (*Pseudopleuronectes americanus*), Little Skate (*Leucoraja erinacea*), Atlantic Herring (*Clupea harengus*), Red Hake (Urophycis chuss), Windowpane Flounder (*Scophthalmus aquosus*), Winter Skate (*Leucoraja ocellata*), and Clearnose Skate (*Raja eglanteria*). There are no reports of the above EFH species at the site.

1.6.13 Cultural Resources

The Moodna Creek study area was subject to a review of existing data pertaining to historic and archaeological resources including local and regional histories, cultural resource surveys, and site files available on the New York State Cultural Resources Information System (CRIS), which is maintained by the NYSHPO and the Division for Historic Preservation within the Office of Parks, Recreation, and Historic Preservation (OPRHP). The resulting report is available in the Cultural Resources Appendix (Appendix G5).

1.6.13.1 AOP 1

The AOP 1 study area has not been subject to a cultural resources survey however several surveys have been conducted in the vicinity. There are 14 archaeological sites listed within 1 mile of the AOP 1 study area. Five of the sites are prehistoric and several of the prehistoric sites (07115.000704; 07115.000705; and 07115.000028) are located within the Moodna Creek corridor on dry elevated ground overlooking the Creek. Most of the prehistoric sites within 1 mile of the APE have not been associated with a particular period or cultural affiliation. The two nearest prehistoric archaeological sites consist of a single flake at each location and were recovered during a cultural resources survey for the proposed Cornwall Commons Development project (Oberon 2006). The Nicoll Farm Site (07115.000018) and a Woodland period village (NYSM 4381) are both located roughly 1 mile from the study area.

The New York State CRIS lists six historic properties that are listed or eligible for listing on the NRHP within 1 mile of AOP 1. There are no historic properties within the study area however the boundaries of the Knox's Headquarters/John Ellison House (90NR02311) grounds are adjacent to the study area. The John Ellison House was built in 1754 and served as the headquarters for Major Generals John Knox, Nathanael Greene, Fredrich von Steuben, and Horatio Gates during various encampments of the Continental Army at New Windsor. The site consists of approximately 50 acres and while the grounds lie adjacent to the current study area there are no structures associated with the site that are located within 100 feet of the study area.

There is documentation of prehistoric and historic sites within 1 mile of the study area however, the sensitivity for archaeological sites within the study are is low due to the prior ground disturbance associated with installation of the pipeline.

1.6.13.2 AOP 2 – Firthcliff Dam

Several surveys have been conducted within the vicinity of the Firthcliff Dam, however, none have been carried out for the current AOP 2 study area. There are two archaeological sites in the CRIS system within 1 mile of AOP 2. These are the Woodward Historic Site (07103.000253) and the Cornwall Commons Stray #2 (07115.000705), a prehistoric site. There are no eligible or listed historic properties located within the AOP 2 study area.

A large factory complex associated with the dam was once situated directly east of the dam but was recently demolished (07149.000103). The factory was known as the Firth Carpet Company complex. The complex was located between the Moodna Creek and Mill Street. When the site was documented as a historic resource in 1982 it contained a wood framed administration building, brick wool washing and storage building, two large factory buildings and several smaller buildings including a machine shop, dye house and pump house. The mill was situated on the site of the former Townsend Mill built in the 1840's and the Broadhead's woolen mill, built in the 1860's. In the 1880's Percy Firth adapted the existing mill structures to establish his carpet manufacturing company. The last phase of construction is believed to have been completed in 1928. In the early part of the twentieth century the Firth Co. began acquiring property off Willow Avenue to build duplexes for their employees. Many of those homes remain along Willow Avenue today. In 1960 the Firth operation was moved to North Carolina and the Majestic Weaving Company used the facility until 1982. A fire destroyed the complex in 2012 forcing the demolition of the buildings.

The Firthcliff Dam has not yet been evaluated as a historic structure. The factory complex it was once associated with no longer exists however the individual structure is of an age that it has the potential to be eligible for the National Register. Furthermore the structure may overlie earlier dam structures and the area surrounding the dam is sensitive for archaeological remains associated with three successive factory complexes.

1.6.13.3 AOP 3

Several cultural resources investigations have documented the historic mill features along Moodna Creek. Surveys carried out in connection with the West Point Pipeline Project and the Catskill Aqueduct Connection Phase II Transmission Line Project along NYS Route 32 identified the historic structures in the vicinity of the Orrs Mills Road and Route 32 intersection including the Moodna Mansion/William Orr House, the Orr's Summer House and Orrs Mill as well as the historic dam, raceway, stone walls, and culverts (Sandy and Schneiderman 2017). Several Orr's Mills historic properties were originally documented as historic properties in the 1970s. The Moodna Mansion (07103.000060), Orr's Summerhouse (07103.000059), Orr's Mill (07103.000063), and William Orr House (07103.000246) have individual listing in the CRIS database. A 1997 eligibility determination on file with the NYSOPRHP states the following:

"Based on limited information provided for the project, the collection of residential, industrial, and engineering structures and sites associated with the former Orr's Mill are eligible for inclusion in New York State and National Registers of Historic Places. The district includes several features associated with the development and evolution of this site. These features include the home of William Orr (Moodna Mansion, 1870); the Orr "Summerhouse" (ca. 1750 core, enlarged ca. 1870); the ruin of the 40 by 80 foot, three story Orr's Mill (ca. 1866); a nineteenth century wood frame mill worker's cottage; a late nineteenth century outbuilding (formerly used as an industrial building); boathouse; mid-nineteenth century bridge remnants (abutments); early twentieth century stone foot bridge; and extant waterpower features including the impound area and dam.

Collectively, the components of this district chronicle the evolution of this site from the earliest days of settlement in the area, through the initial industrial development of William Townsend, to the acquisition of the site by Englishman, William Orr. During his tenure on the property Orr established a prosperous Cornwall Mill complex on the site. The mill continued to operate into the twentieth century. Associated with the industrial aspect of the district are several houses that in their size and style recall the prosperous era of the mill. The significance of the complex is further enhanced by the rural setting and water features associated with the district."

There are no archaeological sites listed in the CRIS database within 1 mile of AOP 3. There are twenty-six previously documented NRHP eligible or listed sites within 1 mile. A limited walkover survey of the area confirmed the existence of many of the structures and features previously documented, however, it was not possible to confirm the existence of all of the features. The Route 32 Bridge which crosses the Moodna Creek just downstream of the dam has been evaluated and determined not eligible for the NRHP.

Several structures associated with the historic hamlet of Orr's Mills have been determined eligible for the National Register. The grouping of historic structures centering on the mill pond and the Orr's Mills Dam have the potential to make up a historic district however additional research and an updated evaluation of the structures and features in the area must be completed to determine the current status of the potentially contributing structures and features.

1.6.14 Air Quality

The USEPA Green Book provides detailed information about area National Ambient Air Quality Standards (NAAQS) designations, classifications, and nonattainment statuses (USEPA, 2018). All three sites are located in a region classified as "in attainment" for all pollutants tracked under the NAAQS including ozone (O_3), particulate matter (PM10 & PM2.5), sulfur dioxide (SO_2), lead (Pb), carbon monoxide (CO), and nitrogen dioxide (NO_2). There are no major sources of air pollutants (Title V facilities) on or in proximity to the sites.

1.6.15 Noise

The Moodna Creek site currently consists of a series of barriers along Moodna Creek. Land in vicinity of the sites mostly consists of low to medium density residential development. Additionally, the State Route 32 crossing over Moodna Creek is located immediately downstream of AOP3. Local noise is likely limited to the flow of water over the dam structure and ambient sounds from the surrounding residential community. AOP3 is also likely subject to traffic noise from the Route 32 crossing.

1.6.16 Recreation

Moodna Creek and its watershed offer a plethora of recreation opportunities for visitors. There are miles of hiking trails, as well as paved trails for walking and biking. In the vicinity, municipal parks are equipped with ballparks and other related amenities. There are 6 known public access points to lakes or streams within the watershed, all of which are located within the town boundaries of Cornwall and New Windsor (OCWA, 2010).

There are abundant recreational opportunities located in the Moodna Watershed. About 1.75 miles of the renowned Appalachian Trail crosses through the southwest portion of the Watershed, where it connects to the Highlands Trail. The Highlands Trail crosses through the greater portion of the Watershed, north over Schunnemunk Mountain, through Black Rock Forest, and to the top of Storm King Mountain. The Long Path travels up from New Jersey and crosses northwest, through the central portion of the Watershed. Black Rock Forest is located in the eastern part of the Watershed, in the Town of Cornwall. The Museum of the Hudson Highlands, also located in Cornwall, offers many activities, including the Outdoor Discovery Center. The more urbanized, paved Heritage Trail passes through the southwest portion of the Watershed and provides access to developed areas of the County in a vegetated, natural setting (OCWA, 2010).

There are many parks and nature preserves for recreational activities, bird watching, horseback riding, and some hunting. Moodna Creek Park, in the Town of New Windsor and in the shadow of Storm King Mountain, is available for several activities including

creek access to the Hudson River. Hamptonburgh Preserve in the Town of Hamptonburgh is a 130-acre property and is prime nesting habitat for many species of birds. Seventy-four of these acres are wildflower meadow, farmland and riverine forest along the Wallkill River. Stewart State Forest in New Windsor, located at the northeastern tip of the Watershed, is a wildlife management area with semi-paved lanes for biking and walking. Schunnemunk Preserve in Cornwall, located at the northwest edge of Schunnemunk Ridge, contains several trails with rocky summits for Hudson River views.

Adjacent is Schunnenunk Mountain in Mountainville, with 6 marked trails and excellent views that include those from the highest point in the Lower Hudson Valley. Goosepond Mountain, in the Town of Chester, is largely wooded and undeveloped, but contains hiking areas and horseback riding by permit. Finally, the Kowawese Unique Area at Plum Point in New Windsor is a 102acre park directly on the Hudson River with vistas of the Hudson Valley gorge and 2,000 feet of sandy beach (OCWA, 2010).

The Moodna Creek and its tributaries have long suffered from a low public profile as a recreational resource. A few public access points within the watershed today include:

- Kowawesee Unique Area at Plum Point, New Windsor – This County Park is open to the public and permits many activities including swimming, fishing, boating (car-top boats only), picnicking and grilling, and also has a visitor center and a beach.
- Earl Reservoir, Town of Woodbury – This town-owned park (available to residents of Woodbury only) allows swimming and diving, fishing and has paddleboats.
- NYS Route 32, Town of Cornwall – Along this stretch of road, there are three well known access points for fishing and hiking on the Moodna Creek. This area has been classified by the State of New York as a Class A Trout Stream, which is stocked with fish annually.
- Town of New Windsor Water Treatment Facility, New Windsor – There is a small boat launch open to the public at the Town of New Windsor Water Treatment Facility off of Route 9W just upstream from the Mouth of the Moodna. Additionally, the Otter Kill and Moodna and Woodbury Creeks (and possibly others) provide great kayaking opportunities when water levels allow. There are limited designated and legal access points to these waterways (Orange County Water Authority, 2010).

1.6.17 Aesthetics and Scenic Resources

The site is not designated as a Scenic Areas of Statewide Significance (SASS) under the New York Coastal Management Program. However, Policy 25 of the Coastal Management Program requires that state agencies must ensure proposed actions in the coastal zone “Protect, restore or enhance natural and man-made resources which are not identified as being of statewide significance, but which contribute to the overall scenic quality of the coastal area.” (NYSDOS, 2017). Activities which could impair or degrade scenic quality include the modification of natural landforms, removal of

vegetation, removal of existing structures, and the addition of structures that diminish scenic quality.

The aesthetic and scenic resources provided by the Moodna Creek are locally recognized by stewardship groups. During the 1960's, Consolidated Edison (Con-Ed) proposed a pumped storage hydroelectric plant at the base of Storm King Mountain, which would significantly impact aesthetic and scenic resources. The stewardship group Scenic Hudson opposed and ultimately defeated the development in court (OCWA, 2010).

1.6.18 Hazardous, Toxic, and Radioactive Waste

A review of the databases yields two state Superfund sites. The New York State Superfund Site Number: 336028 is just below AOP 2 for metals, chlorocarbons, and hydrocarbons. Remediation at the site is complete and have removed contamination from the site. The site was delisted in September 2016.

The New York State Superfund Site Number: 336008 is located upstream of AOP 3 about 3 miles near Woodbury Creek which flows into Moodna Creek. The site was the subject of numerous environmental investigations and remedial activities, between 1985 and 1997, including a Phase I Investigation of a former landfill and RCRA Facility Assessments and Investigations of several other on-site and off-site release areas. The site was never remediated. Contaminants of concern are lead, chlorinated VOCs, and petroleum hydrocarbons. According to the State, the concern is with groundwater and well water contamination.

There is a decommissioned sewer utility line at AOP 1. This utility line was used by the former textile manufacturing factory site adjacent to AOP 2 on the south side of the Moodna Creek. It has not been used in many years. The town has no concerns with removing the pipe.

1.6.19 Transportation and Other Infrastructure

An important node in the Moodna Watershed is Vails Gate, which consists of the five-point intersection of NYS Routes 32, 300 and 94, and the surrounding area. Along with being a dense commercial and residential area, there are many historic and recreational attractions within a very short distance of the intersection, including trail access to the Moodna itself at Knox's Headquarters State Historic Site. Other attractions include the historic Edmonston House, the Last Encampment of the Continental Army, the National Purple Heart Hall of Honor, and the New Windsor Cantonment State Historic Site. Also, nearby is Schunnemunk Shadow Stables, off of Route 94, and the regionally renowned Storm King Art Center in Mountainville (Orange County Water Authority, 2010).

It is also important to mention that two commuter rail stations are located within the Watershed. There is one in Salisbury Mills between Vails Gate and Washingtonville and one in the aforementioned Hamlet of Campbell Hall. Also noteworthy is Hudson Valley Biking, based in Monroe, which gives guided, customized bicycle tours through rural roads to local attractions (Orange County Water Authority, 2010).

CHAPTER 2: Environmental Effects

2.1 Binnen Kill

2.1.1 Physical Setting

2.1.1.1 Geology and Physiography

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on geology or physiography.

Tentatively Selected Plan (Proposed Action Alternative)

Construction activities under the Tentatively Selected Plan (TSP) would occur at shallow depths. Therefore, the TSP would have no impact on geology or physiography.

2.1.1.2 Topography

Future without Project Conditions (No Action Alternative)

Under the No Action Alternative, the site would could to be susceptible to topographic change by erosion due to wave and tidal action, and the projected increase in storm frequency and intensity with climate change (NYSDEC, 2018b).

Tentatively Selected Plan (Proposed Action Alternative)

Excavation and re-grading under the TSP would result in permanent alterations to on-site topography. Approximately 15.5 acres of land would be excavated to create forested wetland, 4.3 acres to create emergent wetland, and 27 acres to create a side channel/tidal wetland corridor between Binnen Kill and the Hudson River. Diffuse pools and a 3,700 linear foot channel would also be excavated to enhance existing emergent wetlands. Implementing the TSP would result in major beneficial impacts to site topography by removing dredged material fill and restoring the historic connection between Binnen Kill and the Hudson River.

2.1.1.3 Soils

Future without Project Conditions (No Action Alternative)

Under the No Action Alternative, the soils would be subject to minor adverse impacts from soil erosion due to wave and tidal action, and the projected increase in storm frequency and intensity with climate change (NYSDEC, 2018b).

Tentatively Selected Plan (Proposed Action Alternative)

In the short-term, the TSP would result in negligible adverse impacts on soil resources due to soil erosion during the construction phase of the project. Erosion and sediment control practices would be implemented to minimize soil erosion and the deposition of sediment into surface waters. An Erosion and Sediment Control Plan would be prepared and approved before any construction activities would commence.

In the long term, implementing the TSP would result in minor beneficial impacts to soil resources through the creation of wetlands, which reduce shoreline erosion by stabilizing sediments and absorbing and dissipating wave energy (Hammer, 1992).

2.1.2 Climate and Weather

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on the climate no weather at the site.

Tentatively Selected Plan (Proposed Action Alternative)

The TSP would have no impact on the climate or weather at the site.

2.1.2.1 Climate Resiliency

Future without Project Conditions (No Action Alternative)

Under the No Action Alternative, predicted sea level rise, and increasing storm frequency and intensity may result in moderate adverse impacts to the site (NYSDEC, 2018b).

Tentatively Selected Plan (Proposed Action Alternative)

Implementing the TSP would result in a moderate beneficial impact to climate resiliency by increasing flood storage along the Hudson River floodplain through the conversion of uplands to tidal wetlands, and excavation of a side channel/tidal wetland corridor between Binnen Kill and the Hudson River. This will enhance the site's capacity to hold larger flood water volumes associated with climate change (NYSDEC, 2018b).

2.1.3 Floodplains and Coastal Processes

2.1.3.1 Floodplains

Future without Project Conditions (No Action Alternative)

Under the No Action Alternative, the site would continue to be subject to flooding given its location within the Hudson River's one percent floodplain. New York State projects that the one percent storm may be 1.5 to 3.3 inches higher by 2100 (NYSDEC, 2018b), resulting in negligible adverse impacts to the sites.

Tentatively Selected Plan (Proposed Action Alternative)

Under the TSP, the site would remain within the Hudson River's one percent floodplain. Implementing the TSP would result in a moderate beneficial impact to floodplains by increasing flood storage along the Hudson River floodplain during precipitation events through the conversion of uplands to tidal wetlands, and excavation of a side channel/tidal wetland corridor between Binnen Kill and the Hudson River.

2.1.4 Water Resources

2.1.4.1 Surface Waters

Future without Project Conditions (No Action Alternative)

Under the No Action Alternative, the Hudson River and Binnen Kill would continue to constitute the site's only surface water bodies. The projected sea level rise of 1.07 feet by 2075 would slightly increase the extent of the intertidal zone on the site. Therefore, the No Action Alternative would have minor impacts on surface waters.

Tentatively Selected Plan (Proposed Action Alternative)

Implementing the TSP would result in moderate impacts to the site's surface waters. Surface water area on the site would be expanded due to excavation associated with the conversion of uplands to tidal wetlands, and excavation of a side channel/tidal wetland corridor between Binnen Kill and the Hudson River.

2.1.4.2 Water Quality

Future without Project Conditions (No Action Alternative)

Under the No Action Alternative, soil erosion on the site would occur due to wave and tidal action, and the projected increase in storm frequency and intensity with climate change (NYSDEC, 2018b). It would increase turbidity in the Hudson River and Binnen Kill, resulting in negligible adverse impacts to water quality.

Tentatively Selected Plan (Proposed Action Alternative)

In the short-term, implementing the TSP would result in negligible adverse impacts on water quality due to increases in turbidity during the construction phase of the project. Erosion and sediment control practices would be implemented to minimize the deposition of sediment into surface waters. The risk of potential fuel spills and machinery leakage would be minimized by restricting maintenance, refueling, and storage of construction equipment to an upland staging area.

In the long term, implementing the TSP would result in moderate beneficial impacts to water quality through the creation of approximately 46.8 acres of wetlands and restoration of approximately 106.3 acres of wetland. Wetlands improve local water quality through their ability to efficiently fix nitrogen, store phosphorous, retain sulfur, promote sediment deposition, and immobilize and decrease the bioavailability of metals in inundated sediments (Gosselink, Odum & Pope, 1974; Mitsch & Gosselink, 1993; Novotny & Olem, 1994; Carter, 1997).

2.1.5 Regional Hydrogeology and Groundwater

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on the hydrogeology or the groundwater.

Tentatively Selected Plan (Proposed Action Alternative)

Implementing the TSP may result in minor impacts on local shallow groundwater flows due to alterations to topography and surface water flow.

2.1.5.1 Tidal Influences

Future without Project Conditions (No Action Alternative)

Sea level rise is projected to occur in the tidal Hudson River and Binnen Kill, which would shift the intertidal areas landward of their current extents. According to Scenic Hudson's Sea level Rise Mapper, the waters of the Hudson River and Vloman Kill during mean higher high tide, would begin to inundate approximately half of the site under 24 inches of sea level rise, and completely inundate the site under 48 inches of sea level rise (Scenic Hudson, 2018). The projected sea level rise of 1.07 feet by 2075

would slightly increase the extent of the intertidal zone on the site. Therefore, the No Action Alternative would have minor impacts on tidal influences.

Tentatively Selected Plan (Proposed Action Alternative)

The TSP would result in moderate beneficial impacts to tidal influence by restoring historically tidal areas that were filled with dredged materials. Intertidal areas of the site would increase by approximately 27 acres through the excavation of a side channel/tidal wetland corridor between Binnen Kill and the Hudson River.

2.1.6 Land Use and Zoning

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on the land use or zoning at the site. Given the site's status as a privately protected reserve, it is unlikely that the area would be significantly developed in the future.

Tentatively Selected Plan (Proposed Action Alternative)

Implementing the TSP would have no impact on the land use or zoning at the site.

2.1.7 Economics

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on local economic conditions.

Tentatively Selected Plan (Proposed Action Alternative)

Implementing the TSP would have no impact on local economic conditions.

2.1.7.1 Socio-Economics

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on local socio-economic conditions.

Tentatively Selected Plan (Proposed Action Alternative)

Implementing the TSP would have no impact on local socio-economic conditions.

2.1.8 Environmental Justice

Future without Project Conditions (No Action Alternative)

There are no environmental justice populations in proximity to this site. Therefore, the No Action Alternative would have no effect on environmental justice populations.

Tentatively Selected Plan (Proposed Action Alternative)

There are no environmental justice populations in proximity to this site. Therefore, implementing the TSP would have no impact on environmental justice populations.

2.1.9 Coastal Zone Management

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on any areas regulated under the New York Coastal Zone Management Program. State and/or municipal entities may initiate a

project at the site in the future. Any state agency action performed at the site (i.e. direct undertaking, financial assistance, or permitting) would require review by the Coastal Zone Management Program to ensure consistency with coastal policies established in Department of State regulations 19 NYCRR Part 600.

Tentatively Selected Plan (Proposed Action Alternative)

Proposed actions under the TSP would occur in areas regulated under the New York Coastal Zone Management Program. The proposed actions would be consistent with the overall objectives of the Coastal Management Program. In particular, implementing the TSP would promote Coastal Policy 7, through the restoration of a Significant Coastal Fish and Wildlife Habitat, and Coastal Policy 44, through the creation of approximately 46.8 acres, and restoration of approximately 106.3 acres of tidal wetland, resulting in moderate beneficial impacts on coastal resources.

2.1.10 Wetlands

Future without Project Conditions (No Action Alternative)

Under the No Action Alternative, sea level rise is projected to occur in the tidal Hudson River and Binnen Kill, which would shift intertidal areas landward of their current extents. As this shift occurs, some of the site's existing non-tidal wetlands would become inundated by daily tides and eventually convert to tidal-wetland habitat. Therefore, while there would be no impact to the extent of wetlands on the site, the plant communities of those wetlands would likely shift.

Tentatively Selected Plan (Proposed Action Alternative)

In the short-term, construction activities associated with implementing the TSP would result in moderate adverse impacts to existing wetlands due to site clearing, grading, and the movement of personnel and equipment across the site during construction. These areas would be restored and replanted as necessary post-construction.

In the long-term, implementing the TSP would result in major beneficial impacts to wetlands through the creation of approximately 46.8 acres, and restoration of approximately 106.3 acres of tidal wetland.

2.1.11 Vegetation

Future without Project Conditions (No Action Alternative)

Under the No Action Alternative, sea level rise is projected to occur in the tidal Hudson River and Binnen Kill, which would shift intertidal areas landward of their current extents. As this shift occurs, some of the site's existing non-tidal wetlands would become inundated by daily tides and eventually convert to tidal-wetland habitat. Therefore, while there would be no impact to the extent of vegetation on the site, the vegetation communities would likely shift.

Tentatively Selected Plan (Proposed Action Alternative)

In the short-term, construction activities associated with implementing the TSP would result in moderate adverse impacts to vegetation due to site clearing, grading, and the movement of personnel and equipment across the site during construction. These areas would be restored and replanted as necessary post-construction. Tree protection and

high visibility fencing would be installed during construction to reduce the risk of unnecessary damage to trees and other vegetation.

In the long-term, implementing the TSP would result in a moderate beneficial impact on vegetation due to the restoration of 106.3 acres of wetland, where non-native invasive vegetation would be replaced with native vegetation. Additionally, approximately 46.8 acres of upland vegetation would be replaced by an equivalent area of wetland vegetation as a result of wetland creation.

2.1.12 Fish and Wildlife Resources

2.1.12.1 Shellfish

Future without Project Conditions (No Action Alternative)

Under the No Action Alternative, the site's existing ratio of intertidal and upland area would change slightly with projected sea level rise. The net increase in the extent of intertidal areas with projected sea level rise would result in negligible beneficial impacts to shellfish, as more areas become accessible to shellfish inhabitation.

Tentatively Selected Plan (Proposed Action Alternative)

In the short term, temporary reductions in water quality due to construction activities associated with implementing the TSP would result in negligible adverse impacts to shellfish, if present.

In the long-term, improvements to water quality and the expansion of intertidal areas on the site would result in moderate beneficial impacts to shellfish, as more areas become accessible to shellfish inhabitation.

2.1.12.2 Finfish

Future without Project Conditions (No Action Alternative)

Under the No Action Alternative, the site's existing ratio of intertidal and upland area would change slightly with projected sea level rise. The net increase in the extent of intertidal areas with projected sea level rise would result in negligible beneficial impacts to finfish, as more areas become accessible to finfish inhabitation.

Tentatively Selected Plan (Proposed Action Alternative)

In the short term, temporary reductions in water quality due to construction activities associated with implementing the TSP would result in negligible adverse impacts to finfish, if present.

In the long-term, improvements to water quality and the expansion of intertidal areas on the site and restoration of the historic connection between Binnen Kill and the Hudson River would result in major beneficial impacts to finfish, as more areas become accessible to fish inhabitation. The side channel/tidal wetland corridor would also provide a velocity refuge for fish during storm events.

2.1.12.3 Benthic Resources

Future without Project Conditions (No Action Alternative)

Under the No Action Alternative, the site's existing ratio of intertidal and upland area would change slightly with projected sea level change. The net increase in the extent of intertidal areas with projected sea level change would have negligible beneficial impacts to benthic resources.

Tentatively Selected Plan (Proposed Action Alternative)

Under the TSP, the conversion of approximately 46.8 acres of upland habitat to intertidal habitat on the site would increase the extent of benthic habitat, and therefore provide moderate beneficial impacts to benthic resources.

2.1.12.4 Reptiles and Amphibians

Future without Project Conditions (No Action Alternative)

Under the No Action Alternative, the site's existing ratio of intertidal and upland area would change slightly with projected sea level rise. The net increase in the extent of intertidal areas with projected sea level rise would have mixed impacts on reptiles and amphibians, resulting in negligible beneficial impacts to intertidal reptile and amphibian species and negligible adverse impacts to non-tidal wetland reptile and amphibian species.

Tentatively Selected Plan (Proposed Action Alternative)

In the short-term, temporary disturbances to vegetation and reductions in water quality due to construction activities associated with implementing the TSP would result in negligible adverse impacts to reptiles and amphibians, if present.

In the long-term, improvements to water quality and the conversion of approximately 46.8 acres of upland habitat to intertidal habitat on the site would result in moderate beneficial impacts to intertidal reptile and amphibian species and moderate adverse impacts to upland reptile and amphibian species.

2.1.12.5 Birds

Future without Project Conditions (No Action Alternative)

Under the No Action Alternative, the site's existing ratio of intertidal and upland area would change slightly with projected sea level rise. The net increase in the extent of intertidal areas with projected sea level rise would have mixed impacts on birds, resulting in negligible beneficial impacts to intertidal bird species and negligible adverse impacts to non-tidal wetland bird species.

Tentatively Selected Plan (Proposed Action Alternative)

In the short term, temporary disturbances to vegetation and reductions in water quality due to construction activities associated with implementing the TSP would result in negligible adverse impacts to birds, if present.

In the long-term, improvements to water quality and the conversion of approximately 46.8 acres of upland habitat to intertidal habitat on the site would result in moderate beneficial impacts to intertidal bird species and moderate adverse impacts to upland bird species.

2.1.12.6 Mammals

Future without Project Conditions (No Action Alternative)

Under the No Action Alternative, the site's existing ratio of intertidal and upland area would change slightly with projected sea level rise. The net increase in the extent of intertidal areas with projected sea level rise would have mixed impacts on mammals, resulting in negligible beneficial impacts to intertidal mammalian species and negligible adverse impacts to non-tidal wetland mammalian species.

Tentatively Selected Plan (Proposed Action Alternative)

In the short term, temporary disturbances to vegetation and reductions in water quality due to construction activities associated with implementing the TSP would result in negligible adverse impacts to mammals, if present.

In the long-term, improvements to water quality and the conversion of approximately 46.8 acres of upland habitat to intertidal habitat on the site would result in moderate beneficial impacts to aquatic and subaquatic mammalian species and moderate adverse impacts to upland mammalian species.

2.1.13 Threatened and Endangered Species

2.1.13.1 Federal Species of Concern

Future without Project Conditions (No Action Alternative)

Under the No Action Alternative, there will be no impacts to the Northern Long-eared Bat

Tentatively Selected Plan (Proposed Action Alternative)

There are no known hibernaculum within ¼ mile of the site. Tree clearing will occur outside the June 1 – July 31 time frame. With these two measures in place there will be no impacts to Northern Long-eared Bats through the implementation of the TSP. Implementation of the TSP would have positive benefits to both sturgeon species as it will provide habitat in the side channel for foraging and safety.

2.1.13.2 State Species of Concern

Future without Project Conditions (No Action Alternative)

Under the No Action Alternative, there will be no impacts to state species of concern.

Tentatively Selected Plan (Proposed Action Alternative)

The TSP will have positive impacts on Shortnose Sturgeon as the side channel will provide feeding and nursery habitat for the sturgeon. Peregrine Falcons Surveys for the listed state plant and avian species will be conducted prior to any construction activities. Coordination with NYSDEC will determine how to proceed if any listed species are found. Vegetation removal will occur during the non-breeding season for avian species to avoid any disturbances to the listed bird species.

2.1.13.3 Designated Critical Habitat

Future without Project Conditions (No Action Alternative)

The no action alternative will have no impact on Atlantic Sturgeon critical habitat.

Tentatively Selected Plan (Proposed Action Alternative)

Implementation of the TSP would have positive impacts to Atlantic Sturgeon critical habitat as it will provide more habitat with the creation of the side channel.

2.1.13.4 Essential Fish Habitat

Future without Project Conditions (No Action Alternative)

Under the No Action Alternative, the site's existing ratio of intertidal and upland area would change slightly with projected sea level rise. The net increase in the extent of intertidal areas with projected sea level rise would result in negligible beneficial impacts to EFH, as more areas become EFH.

Tentatively Selected Plan (Proposed Action Alternative)

In the short term, temporary reductions in water quality due to construction activities associated with implementing the TSP would result in negligible adverse impacts to EFH, if present.

In the long-term, improvements to water quality and the expansion of intertidal areas on the site and restoration of the historic connection between Binnen Kill and the Hudson River would result in major beneficial impacts to EFH, as more areas become accessible to fish inhabitation. The side channel/tidal wetland corridor would also provide a velocity refuge for fish during storm events.

2.1.14 Cultural Resources

Future without Project Conditions (No Action Alternative)

The no action alternative will have no adverse impact on cultural resources.

Tentatively Selected Plan (Proposed Action Alternative)

A review of existing information suggests that portions of the project area have a moderate to high probability for prehistoric and historic archaeological resources due to the presence of previously recorded prehistoric sites on similar landforms in the project vicinity, as well as several nineteenth-century map-documented structures in the vicinity of the APE. The remains of a nineteenth century ice house has been identified within the Area of Potential Effect (APE) for the proposed restoration measures and a prehistoric site is documented within 100 feet of the APE at its northernmost extent. Additional cultural resources surveys are recommended to address areas not previously investigated and to test archaeologically sensitive area to determine the presence or absence of historic properties and archaeological sites within the APE. Geotechnical investigations will be useful in confirming the depth of dredge material and the potential for deeply buried prehistoric archaeological sites to exist within the APE. As plans are further developed additional areas may be considered for staging and access roads and should be assessed for cultural resources.

2.1.15 Air Quality

Future without Project Conditions (No Action Alternative)

There are no significant sources of air pollution present on the site. Therefore, the No Action Alternative would have no impact on air quality.

Tentatively Selected Plan (Proposed Action Alternative)

In the short-term, negligible adverse impacts on local air quality from construction vehicles would occur temporarily during the construction period, which would have a projected duration of approximately two years. Temporary impacts associated with construction emissions would be mitigated through the implementation of air quality best management practices. Ultra-low sulfur diesel fuel would be used for all construction-related vehicles and non-road construction equipment, limiting SOx emissions. Fugitive dust control measures such as speed limit reductions, water or other dust suppressant application, and regular vehicle rinsing would be managed according to proper standards and procedures.

In the long-term, implementing the TSP would have no impact on air quality.

2.1.16 Noise

Future without Project Conditions (No Action Alternative)

There are no significant sources of noise pollution present on the site. Therefore, the No Action Alternative would have no impact on noise levels.

Tentatively Selected Plan (Proposed Action Alternative)

In the short-term, minor adverse impacts on local noise levels from construction activities would occur temporarily during the construction period, which would have a projected duration of approximately two years. Construction activities would be limited to times of the day specified by local noise and construction ordinances.

In the long-term, implementing the TSP would have no impact on local noise levels.

2.1.17 Recreation

Future without Project Conditions (No Action Alternative)

There are no designated recreational areas present on the site. Therefore, the No Action Alternative would have no impact on recreation.

Tentatively Selected Plan (Proposed Action Alternative)

In the short-term, no impacts to recreation would occur as there are no designated recreational areas present on the site.

In the long-term, Scenic Hudson may make efforts in the future to expand the site's recreational function, such as by constructing hiking trails. If some recreational function were established at the site, implementing the TSP would result in minor beneficial impacts to recreation through the restoration of habitat.

2.1.18 Aesthetics and Scenic Resources

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on aesthetics and scenic resources.

Tentatively Selected Plan (Proposed Action Alternative)

In the short-term, minor adverse impacts to aesthetic and scenic resources would occur during the construction phase of the project due to the presence of heavy equipment, material piles, staging areas, traffic control signs, disturbed land, and high visibility fencing.

In the long-term, implementing the TSP would result in minor beneficial impacts to the site's aesthetic and scenic resources through the restoration of wetland habitat.

2.1.19 Hazardous, Toxic, and Radioactive Waste

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on HTRW.

Tentatively Selected Plan (Proposed Action Alternative)

There are no identified HTRW at the site, therefore implementation of the TSP will not be impacted by HTRW.

2.1.20 Transportation and Other Infrastructure

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on transportation or infrastructure.

Tentatively Selected Plan (Proposed Action Alternative)

In the short-term, minor adverse impacts to local traffic conditions would occur during the construction phase of the project due to the transport of material and heavy equipment.

In the long-term, implementing the TSP would involve the construction of a road crossing over the proposed side channel/tidal wetland connection. However, this road crossing will replace an existing access road and therefore have no impact on transportation and site access.

2.2 Schodack Island State Park

2.2.1 Physical Setting

2.2.1.1 Geology and Physiography

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on geology or physiography.

Tentatively Selected Plan (Proposed Action Alternative)

Construction activities under the Tentatively Selected Plan (TSP) would occur at shallow depths. Therefore, the Tentatively Selected Plan would have no impact on geology or physiography.

2.2.1.2 Topography

Future without Project Conditions (No Action Alternative)

Under the No Action Alternative, the site would could to be susceptible to topographic change by erosion due to wave and tidal action, and the projected increase in storm frequency and intensity with climate change (NYSDEC, 2018b).

Tentatively Selected Plan (Proposed Action Alternative)

Excavation and regrading under the TSP would result in permanent alterations to on-site topography. Approximately nine acres of land would be excavated to create a side channel/tidal wetland corridor between Schodack Creek and the Hudson River. Regrading would also occur on existing wetlands on either end of the proposed corridor to facilitate water flow through the new hydrological connection. Implementing the TSP would result in major beneficial impacts to site topography by removing dredged material fill and restoring the historic connection between Schodack Creek and the Hudson River.

2.2.1.3 Soils

Future without Project Conditions (No Action Alternative)

Under the No Action Alternative, the soils would be subject to minor adverse impacts from soil erosion due to wave and tidal action, and the projected increase in storm frequency and intensity with climate change (NYSDEC, 2018b).

Tentatively Selected Plan (Proposed Action Alternative)

In the short-term, the TSP would result in negligible adverse impacts on soil resources due to soil erosion during the construction phase of the project. Erosion and sediment control practices would be implemented to minimize soil erosion and the deposition of sediment into surface waters. An Erosion and Sediment Control Plan would be prepared and approved before any construction activities would commence.

In the long-term, implementing the TSP would result in minor beneficial impacts to soil resources through the creation of wetlands, which reduce shoreline erosion by stabilizing sediments and absorbing and dissipating wave energy (Hammer, 1992).

2.2.2 Climate and Weather

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on the climate or weather at the site.

Tentatively Selected Plan (Proposed Action Alternative)

The TSP would have no impact on the climate or weather at the site.

2.2.2.1 Climate Resiliency

Future without Project Conditions (No Action Alternative)

Under the No Action Alternative, predicted sea level rise and increasing storm frequency and intensity may result in moderate adverse impacts to the site (NYSDEC, 2018b).

Tentatively Selected Plan (Proposed Action Alternative)

Implementing the TSP would result in a moderate beneficial impact to climate resiliency by increasing flood storage along the Hudson River floodplain through the conversion of uplands to tidal wetlands, and excavation of a side channel/tidal wetland corridor between Schodack Creek and the Hudson River. This would enhance the site's capacity to hold larger flood water volumes associated with climate change (NYSDEC, 2018b).

2.2.3 Floodplains and Coastal Processes

2.2.3.1 Floodplains

Future without Project Conditions (No Action Alternative)

Under the No Action Alternative, the site would continue to be subject to flooding given its location within the Hudson River's one percent floodplain. New York State projects that the one percent storm may be 1.5 to 3.3 inches higher by 2100 (NYSDEC, 2018b), resulting in negligible adverse impacts to the sites.

Tentatively Selected Plan (Proposed Action Alternative)

Under the TSP, the site would remain within the Hudson River's one percent floodplain. Implementing the TSP would result in a moderate beneficial impact to floodplains by increasing flood storage along the Hudson River floodplain during precipitation events through the conversion of uplands to tidal wetlands, and excavation of a side channel/tidal wetland corridor between Schodack Creek and the Hudson River.

2.2.4 Water Resources

2.2.4.1 Surface Waters

Future without Project Conditions (No Action Alternative)

Under the No Action Alternative, the Hudson River and Schodack Creek would continue to constitute the site's only surface water bodies. The projected sea level rise of 1.07 feet by 2075 would slightly increase the extent of the intertidal zone on the site. Therefore, the No Action Alternative would have minor impacts on surface waters.

Tentatively Selected Plan (Proposed Action Alternative)

Implementing the TSP would result in moderate impacts to the site's surface waters. Surface water area on the site would be expanded due the excavation of a side channel/tidal wetland corridor between Schodack Creek and the Hudson River.

2.2.4.2 Water Quality

Future without Project Conditions (No Action Alternative)

Under the No Action Alternative, soil erosion on the site, due to wave and tidal action, and the projected increase in storm frequency and intensity with climate change (NYSDEC, 2018b) would increase turbidity in the Hudson River and Schodack Creek, resulting in negligible adverse impacts to water quality

Tentatively Selected Plan (Proposed Action Alternative)

In the short-term, implementing the TSP would result in negligible adverse impacts on water due to increases in turbidity during the construction phase of the project. Erosion and sediment control practices would be implemented to minimize the deposition of sediment into surface waters. The risk of potential fuel spills and machinery leakage would be minimized by restricting maintenance, refueling, and storage of construction equipment to an upland staging area.

In the long term, implementing the TSP would result in moderate beneficial impacts to water quality through the creation of an approximately nine-acre side channel/tidal wetland corridor, and restoration of approximately 19.8 acres of tidal wetland. Wetlands improve local water quality through their ability to efficiently fix nitrogen, store phosphorous, retain sulfur, promote sediment deposition, and immobilize and decrease the bioavailability of metals in inundated sediments (Gosselink, Odum & Pope, 1974; Mitsch & Gosselink, 1993; Novotny & Olem, 1994; Carter 1997).

2.2.4.3 Regional Hydrogeology and Groundwater

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on the hydrogeology or the groundwater.

Tentatively Selected Plan (Proposed Action Alternative)

Implementing the TSP may result in minor impacts on local shallow groundwater flows due to alterations to topography and surface water flow.

2.2.4.4 Tidal Influences

Future without Project Conditions (No Action Alternative)

Sea level rise is projected to occur in the tidal Hudson River and Schodack Creek, which would shift the intertidal areas landward of their current extents. According to Scenic Hudson's Sea Level Rise Mapper, the waters of the Hudson River and Schodack Creek, during mean higher high tide, would begin to inundate the site's low-lying areas under 12 inches of sea level rise and completely inundate these areas under 30 inches of sea level rise (Scenic Hudson, 2018). The projected sea level rise of 1.07 feet by 2075 would slightly increase the extent of the intertidal zone on the site. Therefore, the No Action Alternative would have minor impacts on tidal influences.

Tentatively Selected Plan (Proposed Action Alternative)

The TSP would result in moderate beneficial impacts to tidal influence by restoring historically tidal areas that were filled with dredged materials. Intertidal areas of the site by increased by approximately nine acres through the excavation of a side channel/tidal wetland corridor between Schodack Creek and the Hudson River.

2.2.5 Land Use and Zoning

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on the land use or zoning at the site. Given the site's status as a protected open space, it is unlikely that the area would be significantly developed in the future outside of recreational land uses.

Tentatively Selected Plan (Proposed Action Alternative)

Implementing the TSP would have no impact on the land use or zoning at the site.

2.2.6 Economics

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on local economic conditions.

Tentatively Selected Plan (Proposed Action Alternative)

Implementing the TSP would have no impact on local economic conditions.

2.2.6.1 Socio-Economics

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on local socio-economic conditions.

Tentatively Selected Plan (Proposed Action Alternative)

Implementing the TSP would have no impact on local socio-economic conditions.

2.2.6.2 Environmental Justice

Future without Project Conditions (No Action Alternative)

There are no environmental justice populations in proximity to this site. Therefore, the No Action Alternative would have no impact on environmental justice populations.

Tentatively Selected Plan (Proposed Action Alternative)

There are no environmental justice populations in proximity to this site. Therefore, implementing the TSP would have no impact on environmental justice populations.

2.2.7 Coastal Zone Management

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on any areas regulated under the New York Coastal Zone Management Program. State and/or municipal entities may initiate a project at the site in the future. Any state agency action performed at the site (i.e. direct undertaking, financial assistance, or permitting) would require review by the Coastal

Zone Management Program to ensure consistency with coastal policies established in Department of State regulations 19 NYCRR Part 600.

Tentatively Selected Plan (Proposed Action Alternative)

Proposed actions under the TSP would occur in areas regulated under the New York Coastal Zone Management Program. The proposed actions would be consistent with the overall objectives of the Coastal Management Program. In particular, implementing the TSP would promote Coastal Policy 7, through the restoration of a Significant Coastal Fish and Wildlife Habitat, and Coastal Policy 44, through the creation of approximately 46.8 acres, and restoration of approximately 106.3 acres of tidal wetland, resulting in moderate beneficial impacts on coastal resources.

2.2.8 Wetlands

Future without Project Conditions (No Action Alternative)

Under the No Action Alternative, sea level rise is projected to occur in the tidal Hudson River and Schodack Creek which would shift intertidal areas landward of their current extents. As this shift occurs, some of the site's existing non-tidal wetlands would become inundated by daily tides and eventually convert to tidal-wetland habitat. Therefore, while there would be no impact to the extent of wetlands on the site as the plant communities of those wetlands would likely shift.

Tentatively Selected Plan (Proposed Action Alternative)

In the short-term, construction activities associated with implementing the TSP would result in moderate adverse impacts to existing wetlands due to site clearing, grading, and the movement of personnel and equipment across the site during construction. These areas would be restored and replanted as necessary post-construction.

In the long-term, implementing the TSP would result in major beneficial impacts to wetlands through the creation of an approximately nine-acre side channel/tidal wetland corridor and restoration of approximately 19.8 acres of tidal wetland.

2.2.9 Vegetation

Future without Project Conditions (No Action Alternative)

Under the No Action Alternative, sea level rise is projected to occur in the tidal Hudson River and Schodack Creek, which would shift intertidal areas landward of their current extents. As this shift occurs, some of the site's existing non-tidal wetlands would become inundated by daily tides and eventually convert to tidal-wetland habitat. Therefore, while there would be no impact to the extent of vegetation on the site, the vegetation communities would likely shift.

Tentatively Selected Plan (Proposed Action Alternative)

In the short-term, construction activities associated with implementing the TSP would result in moderate adverse impacts to vegetation due to site clearing, grading, and the movement of personnel and equipment across the site during construction. These areas would be restored and replanted as necessary post-construction. Tree protection and high visibility fencing would be installed during construction to reduce the risk of unnecessary damage to trees and other vegetation.

In the long-term, implementing the TSP would result in a moderate beneficial impact on vegetation due to the restoration of 19.8 acres of wetland. Non-native invasive vegetation would be replaced with native vegetation. Additionally, approximately nine acres of upland vegetation would be replaced by an equivalent area of wetland vegetation as a result of wetland creation.

2.2.10 Fish and Wildlife Resources

2.2.10.1 Shellfish

Future without Project Conditions (No Action Alternative)

Under the No Action Alternative, the site's existing ratio of intertidal and upland area would change slightly with projected sea level rise. The net increase in the extent of intertidal areas with projected sea level rise would result in negligible beneficial impacts to shellfish, as more areas become accessible to shellfish inhabitation.

Tentatively Selected Plan (Proposed Action Alternative)

In the short-term, temporary reductions in water quality due to construction activities associated with implementing the TSP would result in negligible adverse impacts to shellfish, if present.

In the long-term, improvements to water quality and the expansion of intertidal areas on the site would result in minor beneficial impacts to shellfish, as more areas become accessible to shellfish inhabitation.

2.2.10.2 Finfish

Future without Project Conditions (No Action Alternative)

Under the No Action Alternative, the site's existing ratio of intertidal and upland area would change slightly with projected sea level rise. The net increase in the extent of intertidal areas with projected sea level rise would result in negligible beneficial impacts to finfish, as more areas become accessible to finfish inhabitation.

Tentatively Selected Plan (Proposed Action Alternative)

In the short-term, temporary reductions in water quality due to construction activities associated with implementing the TSP would result in negligible adverse impacts to finfish, if present.

In the long-term, improvements to water quality, the expansion of intertidal areas on the site, and restoration of the historic connection between Schodack Creek and the Hudson River would result in major beneficial impacts to finfish, as more areas become accessible to fish inhabitation. The side channel/tidal wetland corridor would also provide a velocity refuge for fish during storm events.

2.2.10.3 Benthic Resources

Future without Project Conditions (No Action Alternative)

Under the No Action Alternative, the site's existing ratio of intertidal and upland area would change slightly with projected sea level change. The net increase in the extent of

intertidal areas with projected sea level change would have negligible beneficial impacts to benthic resources.

Tentatively Selected Plan (Proposed Action Alternative)

Under the TSP, the conversion of approximately nine acres of upland habitat to intertidal habitat on the site would increase the extent of benthic habitat, and therefore provide minor beneficial impacts to benthic resources.

2.2.10.4 Reptiles and Amphibians

Future without Project Conditions (No Action Alternative)

Under the No Action Alternative, the site's existing ratio of intertidal and upland area would change slightly with projected sea level rise. The net increase in the extent of intertidal areas with projected sea level rise would have mixed impacts on reptiles and amphibians, resulting in negligible beneficial impacts to intertidal reptile and amphibian species and negligible adverse impacts to non-tidal wetland reptile and amphibian species.

Tentatively Selected Plan (Proposed Action Alternative)

In the short-term, temporary disturbances to vegetation and reductions in water quality due to construction activities associated with implementing the TSP would result in negligible adverse impacts to reptiles and amphibians, if present.

In the long-term, improvements to water quality and the conversion of approximately nine acres of upland habitat to intertidal habitat on the site would result in minor beneficial impacts to intertidal reptile and amphibian species and minor adverse impacts to upland reptile and amphibian species.

2.2.10.5 Birds

Future without Project Conditions (No Action Alternative)

Under the No Action Alternative, the site's existing ratio of intertidal and upland area would change slightly with projected sea level rise. The net increase in the extent of intertidal areas with projected sea level rise would have mixed impacts on birds, resulting in negligible beneficial impacts to intertidal bird species and negligible adverse impacts to non-tidal wetland bird species.

Tentatively Selected Plan (Proposed Action Alternative)

In the short-term, temporary disturbances to vegetation and reductions in water quality due to construction activities associated with implementing the TSP would result in negligible adverse impacts to birds, if present.

In the long-term, improvements to water quality and the conversion of approximately nine acres of upland habitat to intertidal habitat on the site would result in minor beneficial impacts to intertidal bird species and minor adverse impacts to upland bird species.

2.2.10.6 Mammals

Future without Project Conditions (No Action Alternative)

Under the No Action Alternative, the site's existing ratio of intertidal and upland area would change slightly with projected sea level rise. The net increase in the extent of intertidal areas with projected sea level rise would have mixed impacts on mammals, resulting in negligible beneficial impacts to intertidal mammalian species and negligible adverse impacts to non-tidal wetland mammalian species.

Tentatively Selected Plan (Proposed Action Alternative)

In the short-term, temporary disturbances to vegetation and reductions in water quality due to construction activities associated with implementing the TSP would result in negligible adverse impacts to mammals, if present.

In the long-term, improvements to water quality and the conversion of approximately nine acres of upland habitat to intertidal habitat on the site would result in minor beneficial impacts to aquatic and subaquatic mammalian species and minor adverse impacts to upland mammalian species.

2.2.11 Threatened and Endangered Species

2.2.11.1 Federal Species of Concern

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on federal species of concern at the site.

Tentatively Selected Plan (Proposed Action Alternative)

The site is suitable summer habitat for Indiana and Northern Long-eared Bats. Therefore summer presence absence surveys will be conducted prior to construction, according to USFWS protocol. If either species is present, the District will coordinate with USFWS and proceed from there. If there is no presence of either bat, construction of the TSP can begin. With this measure in place the construction of the TSP is not likely to affect the federal species of concern. Implementation of the TSP would have positive benefits to both sturgeon species as it will provide habitat in the side channel for foraging and safety.

2.2.11.2 State Species of Concern

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on state species of concern at the site.

Tentatively Selected Plan (Proposed Action Alternative)

Implementation of the TSP would have positive benefits to the Shortnose Sturgeon as it will provide habitat in the side channel for foraging and safety. Surveys for Bald Eagles will occur prior to construction. If Bald Eagles are found near the construction site coordination with NYSDEC will determine the path forward which will include but not limited to no construction during the breeding season.

2.2.11.3 Designated Critical Habitat

Future without Project Conditions (No Action Alternative)

The no action alternative will have no impact on Atlantic Sturgeon critical habitat.

Tentatively Selected Plan (Proposed Action Alternative)

Implementation of the TSP would have positive impacts to Atlantic Sturgeon critical habitat as it will provide more habitat with the creation of the side channel.

2.2.11.4 Essential Fish Habitat

Future without Project Conditions (No Action Alternative)

Under the No Action Alternative, the site's existing ratio of intertidal and upland area would change slightly with projected sea level rise. The net increase in the extent of intertidal areas with projected sea level rise would result in negligible beneficial impacts to EFH, as more areas become accessible to finfish inhabitation.

Tentatively Selected Plan (Proposed Action Alternative)

In the short-term, temporary reductions in water quality due to construction activities associated with implementing the TSP would result in negligible adverse impacts to EFH species, if present.

In the long-term, improvements to water quality, the expansion of intertidal areas on the site, and restoration of the historic connection between Schodack Creek and the Hudson River would result in beneficial impacts to EFH, as more areas become accessible to fish inhabitation. The side channel/tidal wetland corridor would also provide a velocity refuge for fish during storm events.

2.2.12 Cultural Resources

Future without Project Conditions (No Action Alternative)

The no action alternative will have no adverse effect on cultural resources.

Tentatively Selected Plan (Proposed Action Alternative)

Of the five sites identified within the study area one is located within the APE for the recommended plan, the map documented Mahican Indian Village (08313.000238). Proposed measures are primarily located within the historic channel that once divided the Islands and archaeological testing within a portion of the APE in 1999 confirmed that the area contains fill deposits to an undetermined depth (Hartgen 1999). A review of previous surveys and other background data indicates that the potential for prehistoric and historic archaeological sites to exist within most of the APE is low, however, the northern portion of the APE overlies the historic Island of Mull's Plaat which is the likely location of the Mahican Indian Village Site. Geotechnical surveys of the APE will be helpful in determining the potential for the proposed project to reach depths below dredge material deposits and additional surveys including limited subsurface testing is recommended once plans are further developed to determine the presence or absence of archaeological sites within the APE. Additional areas identified for staging and access should also be evaluated for impacts to cultural resources.

2.2.13 Air Quality

Future without Project Conditions (No Action Alternative)

There are no significant sources of air pollution present on the site. Therefore, the No Action Alternative would have no impact on air quality.

Tentatively Selected Plan (Proposed Action Alternative)

In the short-term, negligible adverse impacts on local air quality from construction vehicles would occur temporarily during the construction period, which would have a projected duration of approximately two years. Temporary impacts associated with construction emissions would be mitigated through the implementation of air quality best management practices. Ultra-low sulfur diesel fuel would be used for all construction-related vehicles and non-road construction equipment, limiting SOx emissions. Fugitive dust control measures such as speed limit reductions, water or other dust suppressant application, and regular vehicle rinsing would be managed according to proper standards and procedures.

In the long-term, implementing the TSP would have no impact on air quality.

2.2.14 Noise

Future without Project Conditions (No Action Alternative)

There are no significant sources of noise pollution present on the site. Therefore, the No Action Alternative would have no impact on noise levels.

Tentatively Selected Plan (Proposed Action Alternative)

In the short-term, minor adverse impacts on local noise levels from construction activities would occur temporarily during the construction period, which would have a projected duration of approximately two years. Construction activities would be limited to times of the day specified by local noise and construction ordinances.

In the long-term, implementing the TSP would have no impact on local noise levels.

2.2.15 Recreation

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on the recreation at the site.

Tentatively Selected Plan (Proposed Action Alternative)

In the short-term, minor adverse impacts to recreation would occur during the construction phase of the project. While none of the park's recreational facilities would be closed during the construction phase, increases in local noise levels and reduced aesthetics associated with construction activities may hinder recreational activities.

In the long-term, implementing the TSP would result in minor beneficial impacts to the site's recreational resources. The creation and restoration of intertidal wetland would support fish and bird populations, expanding recreational opportunities for fishing and bird watching.

2.2.16 Aesthetics and Scenic Resources

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on aesthetics and scenic resources.

Tentatively Selected Plan (Proposed Action Alternative)

In the short-term, minor adverse impacts to aesthetic and scenic resources would occur during the construction phase of the project due to the presence of heavy equipment, material piles, staging areas, traffic control signs, disturbed land, and high visibility fencing.

In the long-term, implementing the TSP would result in minor beneficial impacts to the site's aesthetic and scenic resources through the restoration of wetland habitat.

2.2.17 Hazardous, Toxic, and Radioactive Waste

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on HTRW.

Tentatively Selected Plan (Proposed Action Alternative)

There are no identified HTRW at the site, therefore implementation of the TSP will not be impacted by HTRW.

2.2.18 Transportation and Other Infrastructure

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on transportation or infrastructure.

Tentatively Selected Plan (Proposed Action Alternative)

In the short-term, minor adverse impacts to local traffic conditions would occur during the construction phase of the project due to the transport of material and heavy equipment.

In the long-term, implementing the TSP would involve the construction of a road crossing over the proposed side channel/tidal wetland connection. However, this road crossing would replace an existing access road and therefore have no impact on transportation and site access.

2.3 Henry Hudson Park

2.3.1 Physical Setting

2.3.1.1 Geology and Physiography

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on geology or physiography.

Tentatively Selected Plan (Proposed Action Alternative)

Construction activities under the Tentatively Selected Plan (TSP) would occur at shallow depths. Therefore, the TSP would have no impact on geology nor physiography.

2.3.1.2 Topography

Future without Project Conditions (No Action Alternative)

Under the No Action Alternative, the shoreline at the site would continue to be susceptible to topographic change by erosion due to wave and tidal action, the continued deterioration of existing shoreline structures, and the projected increase in storm frequency and intensity with climate change (NYSDEC, 2018b).

Tentatively Selected Plan (Proposed Action Alternative)

Excavation and re-grading under the TSP would permanently alter on-site topography. Overall, implementing the TSP would result in moderate impacts to topography. Topographic changes along the shoreline would be minimal. The existing concrete cap would be removed and replaced with vegetated riprap and graded to achieve a 1V:3H slope. These modifications would enhance the shoreline's stability by dissipating erosive forces. More extensive topographic changes would occur in the proposed western tidal wetland creation along the Vloman Kill. Approximately 3.6 acres of existing upland would be excavated to an average depth of five feet below existing grade to achieve tidal wetland hydrology.

2.3.1.3 Soils

Future without Project Conditions (No Action Alternative)

Under the No Action Alternative, the soils along the site's shoreline would be subject to moderate adverse impacts from soil erosion due to wave and tidal action, the continued deterioration of existing shoreline structures, and the projected increase in storm frequency and intensity with climate change (NYSDEC, 2018b).

Tentatively Selected Plan (Proposed Action Alternative)

In the short-term, the TSP would result in negligible adverse impacts on soil resources due to soil erosion during the construction phase of the project. Erosion and sediment control practices would be implemented to minimize soil erosion and the deposition of sediment into surface waters. An Erosion and Sediment Control Plan would be prepared and approved before any construction activities would commence.

In the long term, implementing the TSP would result in moderate beneficial impacts to soil resources through the placement of riprap and creation of wetlands, which reduce

shoreline erosion by stabilizing sediments and absorbing and dissipating wave energy (Hammer, 1992).

2.3.2 Climate and Weather

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on the climate or weather at the site.

Tentatively Selected Plan (Proposed Action Alternative)

Implementing the TSP would have no impact on the climate or weather at the site.

2.3.2.1 Climate Resiliency

Future without Project Conditions (No Action Alternative)

Under the No Action Alternative, predicted sea level rise, and increasing storm frequency and intensity may result in moderate adverse impacts to the site (NYSDEC, 2018b).

Tentatively Selected Plan (Proposed Action Alternative)

Stabilization of the shoreline under the TSP would result in a minor beneficial impact to climate resiliency by enhancing the shoreline's resistance to greater erosive forces associated with climate change.

2.3.3 Floodplain and Coastal Processes

2.3.3.1 Floodplains

Future without Project Conditions (No Action Alternative)

Under the No Action Alternative, the site would continue to be subject to flooding given its location within the Hudson River's one percent floodplain. New York State projects that the one percent storm may be 1.5 to 3.3 inches higher by 2100 (NYSDEC, 2018b), resulting in negligible adverse impacts to the site's floodplain.

Tentatively Selected Plan (Proposed Action Alternative)

Under the TSP, the site would remain within the Hudson River's one percent floodplain. Excavation along the northern banks of Vloman Kill, associated with tidal wetland creation, would slightly increase local flood storage during precipitation events, resulting in negligible beneficial impacts to the site's floodplain.

2.3.4 Water Resources

2.3.4.1 Surface Waters

Future without Project Conditions (No Action Alternative)

Under the No Action Alternative, the Hudson River would continue to constitute the site's only surface water body. The projected sea level rise of 1.07 feet by 2075 would not inundate Henry Hudson Park. Therefore, the No Action Alternative would have no impact on surface waters.

Tentatively Selected Plan (Proposed Action Alternative)

Implementing the TSP would result in minor impacts to the site's surface waters. Surface water area on the site would be expanded due to excavation along the northern banks of Vloman Kill, associated with tidal wetland creation.

2.3.4.2 Water Quality

Future without Project Conditions (No Action Alternative)

Under the No Action Alternative, the shoreline at the site would continue to be susceptible to soil erosion due to wave and tidal action, and the continued deterioration of existing shoreline structures. Soil erosion along the shoreline would increase turbidity in the Hudson River, resulting in negligible adverse impacts to water quality.

Tentatively Selected Plan (Proposed Action Alternative)

In the short-term, implementing the TSP would result in negligible adverse impacts on water quality due to increases in turbidity during the construction phase of the project. Erosion and sediment control practices would be implemented to minimize the deposition of sediment into surface waters. The risk of potential fuel spills and machinery leakage would be minimized by restricting maintenance, refueling, and storage of construction equipment to an upland staging area.

In the long-term, implementing the TSP would result in minor beneficial impacts to water quality through the reduction of soil erosion along the shoreline and the creation of approximately 3.6 acres of tidal wetland. Wetlands improve local water quality through their ability to efficiently fix nitrogen, store phosphorous, retain sulfur, promote sediment deposition, and immobilize and decrease the bioavailability of metals in inundated sediments (Gosselink, Odum & Pope, 1974; Mitsch & Gosselink, 1993; Novotny & Olem, 1994; Carter 1997).

2.3.4.3 Regional Hydrogeology and Groundwater

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on the hydrogeology or the groundwater.

Tentatively Selected Plan (Proposed Action Alternative)

Implementing the TSP would have no impact on the hydrogeology or the groundwater.

2.3.4.4 Tidal Influences

Future without Project Conditions (No Action Alternative)

Sea level rise is projected to occur in the tidal Hudson River, which would shift the intertidal areas landward of their current extents. According to Scenic Hudson's Sea level Rise Mapper, during mean higher high tide and under 30 inches of sea level rise, the waters of the Hudson River and Vloman Kill would begin to inundate the recreational areas of Henry Hudson Park. And, under 60 inches of sea level rise, Vloman Kill would completely inundate this area (Scenic Hudson, 2018). However, the projected sea level rise of 1.07 feet by 2075 would not inundate Henry Hudson Park. Therefore, the No Action Alternative would have no impact on tidal influences.

Tentatively Selected Plan (Proposed Action Alternative)

Implementing the TSP would result in minor impacts to tidal influence by increasing the intertidal areas of the park by approximately 3.6 acres through the excavation along the northern banks of Vloman Kill, associated with tidal wetland creation.

2.3.5 Land Use and Zoning

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on the land use or zoning at the site. Given the site's status as a protected open space, it is unlikely that the area would be significantly developed in the future, outside of recreational land uses.

Tentatively Selected Plan (Proposed Action Alternative)

Implementing the TSP would have no impact on the land use or zoning at the site.

2.3.6 Economics

Future without Project Conditions (No Action Alternative)

Under the No Action Alternative, Henry Hudson Town Park would continue to serve as an open space to local residences. However, the shoreline of the park would continue to degrade over time, and the park's recreational functions may become compromised as a result. Reduced recreational capacity over time would likely lower the parks economic value and reduce its local economic benefits, resulting in a minor adverse impact on local economic conditions.

Tentatively Selected Plan (Proposed Action Alternative)

Implementing the TSP would have no impact on local economic conditions.

2.3.6.1 Socio-Economics

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on local socio-economic conditions.

Tentatively Selected Plan (Proposed Action Alternative)

Implementing the TSP would have no impact on local socio-economic conditions.

2.3.6.2 Environmental Justice

Future without Project Conditions (No Action Alternative)

There are no environmental justice populations in proximity to this site. Therefore, the No Action Alternative would have no impact on environmental justice populations.

Tentatively Selected Plan (Proposed Action Alternative)

There are no environmental justice populations in proximity to this site. Therefore, implementing the TSP would have no impact on environmental justice populations.

2.3.7 Coastal Zone Management

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on any areas regulated under the New York Coastal Zone Management Program. State and/or municipal entities may initiate a

project at the site in the future. Any state agency action performed at the site (i.e. direct undertaking, financial assistance, or permitting) would require review by the Coastal Zone Management Program to ensure consistency with coastal policies established in Department of State regulations 19 NYCRR Part 600.

Tentatively Selected Plan (Proposed Action Alternative)

Proposed actions under the TSP would occur in areas regulated under the New York Coastal Zone Management Program. The proposed actions would be consistent with the overall objectives of the Coastal Management Program. In particular, implementing the TSP would promote Coastal Policy 44 through the creation of approximately 3.6 acres of freshwater tidal wetland, resulting in minor beneficial impacts on coastal resources.

2.3.8 Wetlands

Future without Project Conditions (No Action Alternative)

The No Action Alternative would not impact wetlands at the site.

Tentatively Selected Plan (Proposed Action Alternative)

In the short-term, construction activities associated with implementing the TSP would have no impact on any wetlands.

In the long term, the TSP would result in moderate beneficial impacts to wetlands through the creation of approximately 3.6 acres of tidal wetland habitat.

2.3.9 Vegetation

Future without Project Conditions (No Action Alternative)

Under the No Action Alternative, sea level rise is projected to occur in the tidal Hudson River, which would shift intertidal areas landward of their current extents. As this shift occurs, some of the trees proximate to the sites shoreline may be lost due to increasing groundwater saturation, resulting in negligible adverse impacts to vegetation.

Tentatively Selected Plan (Proposed Action Alternative)

In the short-term, construction activities associated with implementing the TSP would result in minor adverse impacts to vegetation due to site clearing, grading, and the movement of personnel and equipment across the site during construction. These areas would be restored and replanted as necessary post-construction. Tree protection and high visibility fencing will be installed during construction to reduce the risk of unnecessary damage to trees and other vegetation.

In the long-term, implementing the TSP would result in a moderate beneficial impact to vegetation due to the conversion of approximately 0.2 acres of mudflat to tidal wetland at the confluence of Vloman Kill, and the addition of vegetated riprap along the Hudson River shoreline. Additionally, some areas of mowed turf grass and non-native invasive vegetation would be replaced with native vegetation as part of the tidal wetland creation along the northern banks of Vloman Kill

2.3.10 Fish and Wildlife Resources

2.3.10.1 Shellfish

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on shellfish or their habitat.

Tentatively Selected Plan (Proposed Action Alternative)

In the short-term, temporary reductions in water quality due to construction activities associated with implementing the TSP would result in negligible adverse impacts to shellfish, if present.

In the long-term, improvements to water quality and the expansion of intertidal areas on the site would result in negligible beneficial impacts to shellfish, as more areas become accessible to shellfish inhabitation.

2.3.10.2 Finfish

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on finfish or their habitat.

Tentatively Selected Plan (Proposed Action Alternative)

In the short-term, temporary reductions in water quality due to construction activities associated with implementing the TSP would result in negligible adverse impacts to finfish, if present.

In the long-term, improvements to water quality and the expansion of intertidal areas on the site would result in negligible beneficial impacts to finfish, as more areas become accessible to fish inhabitation.

2.3.10.3 Benthic Resources

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on benthic resources.

Future without Project Conditions (No Action Alternative)

Under the TSP, the conversion of approximately 3.6 acres of upland habitat to intertidal habitat would increase the extent of benthic habitat, and therefore provide minor beneficial impacts to benthic resources.

2.3.10.4 Reptiles and Amphibians

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on reptiles, amphibians, or their respective habitats.

Tentatively Selected Plan (Proposed Action Alternative)

In the short term, temporary disturbances to vegetation and reductions in water quality due to construction activities associated with implementing the TSP would result in negligible adverse impacts to reptiles and amphibians, if present.

In the long-term, improvements to water quality and the conversion of approximately 3.6 acres of upland habitat to intertidal habitat on the site would result in minor beneficial impacts to intertidal reptile and amphibian species and minor adverse impacts to upland reptile and amphibian species.

2.3.10.5 Birds

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on birds or their habitat.

Tentatively Selected Plan (Proposed Action Alternative)

In the short-term, temporary disturbances to vegetation and reductions in water quality due to construction activities associated with implementing the TSP would result in negligible adverse impacts to birds, if present.

In the long-term, improvements to water quality and the conversion of approximately 3.6 acres of upland habitat to intertidal habitat on the site would result in minor beneficial impacts to intertidal bird species and minor adverse impacts to upland bird species.

2.3.10.6 Mammals

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on mammals or their habitat.

Tentatively Selected Plan (Proposed Action Alternative)

In the short term, temporary disturbances to vegetation and reductions in water quality due to construction activities associated with implementing the TSP would result in negligible adverse impacts to mammals, if present.

In the long-term, improvements to water quality and the conversion of approximately 3.6 acres of upland habitat to intertidal habitat on the site would result in minor beneficial impacts to aquatic mammalian species and minor adverse impacts to upland mammalian species.

2.3.11 Threatened and Endangered Species

2.3.11.1 Federal Species of Concern

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on federal species of concern.

Tentatively Selected Plan (Proposed Action Alternative)

There are no known hibernaculum within ¼ mile of the site. There is no plan to remove large tree however if necessary tree clearing will occur outside the June 1 – July 31 time frame. With these two measures in place there will be no impacts to Northern Long-eared Bats through the implementation of the TSP. Implementation of the TSP would have positive benefits to both sturgeon species as it will provide habitat in the shoreline with the rocky habitat and the creation of the wetlands.

2.3.11.2 State Species of Concern

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on state species of concern.

Tentatively Selected Plan (Proposed Action Alternative)

During construction of the TSP any sturgeon that may be near the site would be able to vacate the area and would not be impacted. There would be positive benefits to the sturgeon with the rocky habitat and the creation of the wetlands. Bald Eagles observed at site are presumably flyovers. However prior to construction a survey for Bald Eagle nesting will be conducted. If a nesting Bald Eagle is observed within ¼ mile of the construction the District will coordinate with the NYSDEC on how to proceed. With these measures in place, the implementation of the TSP will not impact any state species of concern.

2.3.11.3 Designated Critical Habitat

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on Designated Critical Habitat.

Tentatively Selected Plan (Proposed Action Alternative)

Implementation of the TSP would have positive impacts to Atlantic Sturgeon critical habitat as it will provide more habitat with the creation of the rocky habitat and the creation of the wetlands.

2.3.11.4 Essential Fish Habitat

Future without Project Conditions (No Action Alternative)

Under the No Action Alternative, the site's existing ratio of intertidal and upland area would change slightly with projected sea level rise. The net increase in the extent of intertidal areas with projected sea level rise would result in negligible beneficial impacts to EFH, as more areas become EFH.

Tentatively Selected Plan (Proposed Action Alternative)

In the short term, temporary reductions in water quality due to construction activities associated with implementing the TSP would result in negligible adverse impacts to EFH, if present.

In the long-term, improvements to water quality and the expansion of intertidal areas on the shoreline Hudson River and the Vloman Kill would result in minor beneficial impacts to EFH, as more areas become accessible to fish inhabitation. The side tidal wetland habitat would also provide a velocity refuge for fish during storm events.

2.3.12 Cultural Resources

Future without Project Conditions (No Action Alternative)

The no action alternative will have no adverse effect on cultural resources.

Tentatively Selected Plan (Proposed Action Alternative)

There are no structures located within the APE that have the potential to be determined eligible for the NRHP, however, there is one New York State Museum Site 6013 "Cedar Hill" located directly adjacent to the study area at its northern limit, no details were

available in the CRIS database however this site likely corresponds to a dock labeled "Cedar Hill Landing" on historic maps (Beers 1891). The presence of several previously documented historic and prehistoric archaeological sites in the vicinity suggests that the area was utilized heavily both in precontact and contact periods. Considering that the shoreline portion of the study area contains deep dredge material deposits, however, the potential for historic archaeological remains to exist within the area of proposed shoreline stabilization measures is low. The 3.6 acre proposed wetland area along the bank of the Vloman Kill, however, is believed to have a moderate to high potential for historic and prehistoric remains due to its proximity to a river confluence and the discovery of several historic and prehistoric sites in the vicinity. A pedestrian survey and archaeological testing is recommended for the proposed wetland area to determine the presence or absence of archaeological sites and a geomorphological study is recommended to understand the depositional profile of the shoreline. Additionally, as plans are developed, additional areas including staging and access areas should be subject to a cultural resources assessment.

2.3.13 Air Quality

Future without Project Conditions (No Action Alternative)

There are no significant sources of air pollution present on the site. Therefore, the No Action Alternative would have no impact on air quality.

Tentatively Selected Plan (Proposed Action Alternative)

In the short-term, negligible adverse impacts on local air quality from construction vehicles would occur temporarily during the construction period, which would have a projected duration of approximately one year. Temporary impacts associated with construction emissions would be mitigated through the implementation of air quality best management practices. Ultra-low sulfur diesel fuel would be used for all construction-related vehicles and non-road construction equipment, limiting SOx emissions. Fugitive dust control measures such as speed limit reductions, water, or other dust suppressant application, and regular vehicle rinsing would be managed according to proper standards and procedures.

In the long-term, Implementing the TSP would have no impact on air quality. The TSP would slightly increase vegetation cover on the site, but not at a level that would significantly alter local air quality.

2.3.14 Noise

Future without Project Conditions (No Action Alternative)

There are no significant sources of noise pollution present on the site. Therefore, the No Action Alternative would have no impact on noise levels.

Tentatively Selected Plan (Proposed Action Alternative)

In the short-term, minor adverse impacts on local noise levels from construction activities would occur temporarily during the construction period, which would have a

projected duration of approximately one year. Construction activities would be limited to times of the day specified by local noise and construction ordinances.

In the long-term, implementing the TSP would have no impact on local noise levels.

2.3.15 Recreation

Future without Project Conditions (No Action Alternative)

As previously stated, under the No Action Alternative the site would remain vulnerable to the deterioration of existing shoreline structures and may be subject to the effects of climate change such as sea level rise. These factors could comprise the site's recreational facilities, resulting in a minor adverse impact to recreational resources.

Tentatively Selected Plan (Proposed Action Alternative)

In the short-term, minor adverse impacts to recreation would occur during the construction phase of the project. While none of the park's recreational facilities would be closed during the construction phase, increases in local noise levels and reduced aesthetics associated with construction activities may hinder recreational activities.

In the long-term, implementing the TSP would result in minor beneficial impacts to the site's recreational resources. Stabilization of the shoreline would reduce the risk of erosive forces impacting the park's recreational infrastructure and the creation of approximately 3.6 acres of intertidal wetland would support fish and bird populations, expanding recreational opportunities for fishing and bird watching.

2.3.16 Aesthetics and Scenic Resources

Future without Project Conditions (No Action Alternative)

Under the No Action Alternative, the site's shoreline would be subject erosion and the continued deterioration of existing shoreline structures due to wave and tidal action resulting in a minor adverse impact to the shoreline's aesthetics.

Tentatively Selected Plan (Proposed Action Alternative)

In the short-term, minor adverse impacts to aesthetic and scenic resources would occur during the construction phase of the project due to the presence of heavy equipment, material piles, staging areas, traffic control signs, disturbed land, and high visibility fencing.

In the long-term, implementing the TSP would result in minor beneficial impacts to the site's aesthetic and scenic resources through the replacement of the dilapidated concrete capping along the shoreline with vegetated riprap.

2.3.17 Hazardous, Toxic, and Radioactive Waste

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on HTRW.

Tentatively Selected Plan (Proposed Action Alternative)

There are no identified HTRW at the site, therefore implementation of the TSP will not be impacted by HTRW.

2.3.18 Transportation and Other Infrastructure

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on transportation or infrastructure.

Tentatively Selected Plan (Proposed Action Alternative)

In the short-term, minor adverse impacts to local traffic conditions would occur during the construction phase of the project due to the transport of material and heavy equipment.

In the long-term, implementing the TSP would have no impact on transportation or infrastructure.

2.4 Charles Rider Park

2.4.1 Physical Setting

2.4.1.1 Geology and Physiography

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on geology or physiography.

2.4.1.2 Topography

Future without Project Conditions (No Action Alternative)

Under the No Action Alternative, the shoreline at the site would continue to be susceptible to topographic change by erosion due to wave and tidal action, the continued deterioration of existing shoreline structures, and the projected increase in storm frequency and intensity with climate change.

2.4.1.3 Soils

Future without Project Conditions (No Action Alternative)

Under the No Action Alternative, the soils along the site's shoreline would be subject to minor adverse impacts from soil erosion due to wave and tidal action, and the continued deterioration of existing shoreline structures.

2.4.2 Climate and Weather

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on the climate or weather at the site.

2.4.2.1 Climate Resiliency

Future without Project Conditions (No Action Alternative)

Under the No Action Alternative, predicted sea level rise, and increasing storm frequency and intensity may result in moderate adverse impacts to the site (NYSDEC, 2018b).

2.4.3 Floodplains and Coastal Processes

2.4.3.1 Floodplains

Future without Project Conditions (No Action Alternative)

Under the No Action Alternative, the site would continue to be subject to flooding given its location within the Hudson River's one percent floodplain. New York State projects that the one percent storm may be 1.5 to 3.3 inches higher by 2100 (NYSDEC, 2018b), resulting in negligible adverse impacts to the sites.

2.4.4 Water Resources

2.4.4.1 Floodplains

Future without Project Conditions (No Action Alternative)

Under the No Action Alternative, the Hudson River would continue to constitute the site's only surface water body. The projected sea level rise of 1.07 feet by 2075 would

not inundate Charles Rider Park. Therefore, the No Action Alternative would have no impact on surface waters.

2.4.4.2 Water Quality

Future without Project Conditions (No Action Alternative)

Under the No Action Alternative, the shoreline at the site would continue to be susceptible to soil erosion due to wave and tidal action, and the continued deterioration of existing shoreline structures. Soil erosion along the shoreline would increase turbidity in the Hudson River, resulting in negligible adverse impacts to the water quality.

2.4.4.3 Regional Hydrogeology and Groundwater

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on the hydrogeology or the groundwater.

2.4.4.4 Tidal Influences

Future without Project Conditions (No Action Alternative)

Sea level rise is projected to occur in the tidal Hudson River, which would shift the intertidal areas landward of their current extents. According to Scenic Hudson's Sea level Rise Mapper, under 30 inches of sea level rise and during mean higher high tide, the waters of the Hudson would begin to inundate the recreational areas of Charles Rider Park. And, under 54-60 inches of sea level rise, the waters of the Hudson would completely inundate this area (Scenic Hudson, 2018). However, the projected sea level rise of 1.07 feet by 2075 would not inundate Charles Rider Park. Therefore, the No Action Alternative would have no impact on tidal influences.

2.4.5 Water Resources

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on the land use or the zoning at the site. Given the site's status as a protected open space, it is unlikely that the area would be significantly developed in the future outside of recreational land uses.

2.4.6 Economics

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on local economic conditions. Charles Rider Park would continue to serve as an open space to local residents, which may boost their property values. If further development occurs in vicinity to the park, the property

2.4.6.1 Socio-Economics

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on local socio-economic conditions.

2.4.6.2 Environmental Justice

Future without Project Conditions (No Action Alternative)

There are no Environmental Justice populations in proximity to this site. Therefore, the No Action Alternative would have no impact on Environmental Justice populations.

2.4.7 Coastal Zone Management

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on any areas regulated under the New York Coastal Zone Management Program. State and/or municipal entities may initiate a project at the site in the future. Any state agency action performed at the site (i.e. direct undertaking, financial assistance, or permitting) would require review by the Coastal Zone Management Program to ensure consistency with coastal policies established in Department of State regulations 19 NYCRR Part 600.

2.4.8 Wetlands

Future without Project Conditions (No Action Alternative)

There are no wetlands present on the site. Therefore, the No Action Alternative would have no impact on wetlands.

2.4.9 Vegetation

Future without Project Conditions (No Action Alternative)

Under the No Action Alternative, sea level rise is projected to occur in the tidal Hudson River, which would shift intertidal areas landward of their current extents. As this shift occurs, some of the trees proximate to the sites shoreline may be lost due to increasing groundwater saturation associated with sea level rise, resulting in negligible adverse impacts to vegetation.

2.4.10 Fish and Wildlife Resources

2.4.10.1 Shellfish

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on shellfish or their habitat.

2.4.10.2 Finfish

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on finfish or their habitat.

2.4.10.3 Benthic Resources

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on benthic resources.

2.4.10.4 Reptiles and Amphibians

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on reptiles, amphibians, or their respective habitats.

2.4.10.5 Birds

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on birds or their respective habitats.

2.4.10.6 Mammals

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on mammals or their habitat.

2.4.11 Threatened and Endangered Species

2.4.11.1 Federal Species of Concern

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on any federal species of concern

2.4.11.2 State Species of Concern

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on any state species of concern

2.4.11.3 Designated Critical Habitat

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on any designated critical habitat

2.4.11.4 Essential Fish Habitat

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on any EFH

2.4.12 Cultural Resources

Future without Project Conditions (No Action Alternative)

The No Action Alternative will have no adverse effect on cultural resources.

2.4.13 Air Quality

Future without Project Conditions (No Action Alternative)

There are no significant sources of air pollution present on the site. Therefore, the No Action Alternative would have no impact on air quality.

2.4.14 Noise

Future without Project Conditions (No Action Alternative)

There are no significant sources of noise pollution present on the site. Therefore, the No Action Alternative would have no impact on noise levels.

2.4.15 Recreation

Future without Project Conditions (No Action Alternative)

As previously stated, under the No Action Alternative, the site would remain vulnerable to the deterioration of existing shoreline structures which could comprise the site's recreational facilities, resulting in a minor adverse impact to recreational resources.

2.4.16 Aesthetics and Scenic Resources

Future without Project Conditions (No Action Alternative)

Under the No Action Alternative, the site's shoreline would be subject erosion and the continued deterioration of existing shoreline structures due to wave and tidal action resulting in a minor adverse impact to the shoreline's aesthetics.

2.4.17 Hazardous, Toxic, and Radioactive Waste

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on HTRW.

2.4.18 Transportation and Other Infrastructure

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on transportation and/or infrastructure.

2.5 Rondout Creek

2.5.1 Physical Setting

2.5.1.1 Geology and Physiography

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on geology or physiography.

Tentatively Selected Plan (Proposed Action Alternative)

Construction activities under the Tentatively Selected Plan (TSP) would occur at shallow depths. Therefore, the TSP would have no impact on geology or physiography.

2.5.1.2 Topography

Future without Project Conditions (No Action Alternative)

Under the No Action Alternative, the site could to be susceptible to topographic change by erosion due to wave and tidal action and the projected increase in storm frequency and intensity with climate change (NYSDEC, 2018a).

Tentatively Selected Plan (Proposed Action Alternative)

Implementing the TSP would result in negligible impacts to the topography of the site. Direct manipulation of topography would be limited to what is minimally required to remove the dam. Passive topographic changes to the riverbed may occur over time under altered hydraulic conditions. However, the extensive presence of bedrock in this area, including the bedrock ledge upon which the dam is founded and the bedrock valley walls, limit the potential for channel instability and topographic adjustment.

2.5.1.3 Soils

Future without Project Conditions (No Action Alternative)

Under the No Action Alternative, the soils may be subject to minor adverse impacts from soil erosion due to the projected increase in storm frequency and intensity with climate change (NYSDEC, 2018a).

Tentatively Selected Plan (Proposed Action Alternative)

In the short-term, the TSP would result in negligible adverse impacts on soil resources due to soil erosion during the construction phase of the project. Erosion and sediment control practices would be implemented to minimize soil erosion and the deposition of sediment into surface waters. An Erosion and Sediment Control Plan would be prepared and approved before any construction activities would commence.

In the long-term, The TSP would have no impact on soils at the site.

2.5.2 Climate and Weather

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on the climate or weather at the site.

Tentatively Selected Plan (Proposed Action Alternative)

Implementing the TSP would have no impact on the climate or weather at the site.

2.5.2.1 Climate Resiliency

Future without Project Conditions (No Action Alternative)

Under the No Action Alternative, increasing storm frequency and intensity may result in moderate adverse impacts to the site (NYSDEC, 2018a).

Tentatively Selected Plan (Proposed Action Alternative)

Implementing the TSP may result in a beneficial impact to climate resiliency by reducing flood elevations upstream of the Eddyville Dam, mitigating the effects of increasing precipitation and storm intensity associated with climate change (NYSDEC, 2018a). Detailed hydrologic and hydraulic analysis would be required to affirm the extent and magnitude of this effect. As a run-of-river dam that is not designed for flood control, the removal of the dam is not anticipated to adversely affect flooding in the downstream reaches.

2.5.3 Floodplains and Coastal Processes

2.5.3.1 Floodplains

Future without Project Conditions (No Action Alternative)

Under the No Action Alternative, the site would continue to be subject to flooding given its location within the Hudson River's one percent floodplain. New York State projects that the one percent storm may be 1.5 to 3.3 inches higher by 2100 (NYSDEC, 2018a), resulting in negligible adverse impacts to the sites.

Tentatively Selected Plan (Proposed Action Alternative)

Under the TSP, the site would remain within the Rondout Creek's one percent floodplain. Implementing the TSP would result in a beneficial impact to the floodplain by increasing flood storage along the Rondout Creek floodplain during precipitation and reducing flood elevations upstream of the Eddyville Dam. A detailed hydrologic and hydraulic analysis would be required to affirm the extent and magnitude of this effect. Because it is a run-of-river dam not designed for flood control, the removal of the dam is not anticipated to adversely affect flooding in the downstream reaches.

2.5.4 Water Resources

2.5.4.1 Surface Waters

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on surface waters at the site.

Tentatively Selected Plan (Proposed Action Alternative)

Implementing the TSP would result in moderate beneficial impacts to the site's surface waters through the removal of Eddyville Dam. Surface water hydrology would be restored to a more natural condition. Normal water surface elevation would drop approximately 10 feet in the upstream vicinity of the dam and tidal fluctuation would extend upstream into the impoundment.

2.5.4.2 Water Quality

Future without Project Conditions (No Action Alternative)

Under the No Action Alternative, Rondout Creek would continue to be impounded by the Eddyville Dam. Impounded waters typically have elevated temperatures, decreased oxygen levels, and can trapped sediments and nutrients (Gregory et al., 2002). Therefore, the No Action Alternative would result in minor adverse impacts to water quality.

Tentatively Selected Plan (Proposed Action Alternative)

In the short-term, implementing the TSP would result in negligible adverse impacts on water due to increases in turbidity during the construction phase of the project. Erosion and sediment control practices would be implemented to minimize the deposition of sediment into surface waters. The risk of potential fuel spills and machinery leakage would be minimized by restricting maintenance, refueling, and storage of construction equipment to an upland staging area.

2.5.4.3 Regional Hydrogeology and Groundwater

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on hydrogeology or groundwater.

Tentatively Selected Plan (Proposed Action Alternative)

Implementing the TSP may result in minor impacts on local shallow groundwater flows due to alterations to surface water elevations and surface water flow.

2.5.4.4 Tidal Influences

Future without Project Conditions (No Action Alternative)

Under the No Action Alternative, sea level rise is projected to occur in the tidal portion of the Rondout River. Eddyville Dam would continue to limit the extent of tidal influence in Rondout Creek as the dam's height is well above projected sea level rise (NYSDEC, 2018a). Therefore, the No Action Alternative would have no impact on tidal influences.

Tentatively Selected Plan (Proposed Action Alternative)

Implementing the TSP and restoring historic tidal flow in Rondout Creek upstream of the Eddyville Dam would have major beneficial impacts to tidal influences at the site. Removal of the dam would extend the head of tide 3.6 miles upstream (Alderson and Rosman, 2012) and increase tidal flushing of Rondout Creek.

2.5.5 Land Use and Zoning

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on the land use or zoning at the site.

Tentatively Selected Plan (Proposed Action Alternative)

Implementing the TSP would have no impact on the land use or zoning at the site.

2.5.6 Economics

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on local economic conditions.

Tentatively Selected Plan (Proposed Action Alternative)

Implementing the TSP would have no impact on local economic conditions.

2.5.6.1 Socio-Economics

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on local socio-economic conditions.

Tentatively Selected Plan (Proposed Action Alternative)

Implementing the TSP would have no impact on local socio-economic conditions.

2.5.6.2 Environmental Justice

Future without Project Conditions (No Action Alternative)

There are no environmental justice populations in proximity to this site. Therefore, the No Action Alternative would have no impact on environmental justice populations.

Tentatively Selected Plan (Proposed Action Alternative)

There are no environmental justice populations in proximity to this site. Therefore, implementing the TSP would have no impact on environmental justice populations.

2.5.7 Coastal Zone Management

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on any areas regulated under the New York Coastal Zone Management Program. State and/or municipal entities may initiate a project at the site in the future; any state agency action performed downstream of Eddyville Dam (i.e. direct undertaking, financial assistance, or permitting) would require review by the Coastal Zone Management Program to ensure consistency with coastal policies established in Department of State regulations 19 NYCRR Part 600.

Tentatively Selected Plan (Proposed Action Alternative)

Proposed actions under the TSP would occur in areas regulated under the New York Coastal Zone Management Program. The proposed actions would be consistent with the overall objectives of the Coastal Management Program. In particular, implementing the TSP would promote Coastal Policy 7, through the restoration of a Significant Coastal Fish and Wildlife Habitat by removing a barrier to the upstream migration of aquatic organisms, resulting in major beneficial impacts on coastal resources. Dam removal would also be consistent with the Town of Esopus Local Waterfront Revitalization Program, which puts forward a policy to protect and preserve the habitats of Rondout Creek.

2.5.8 Wetlands

Future without Project Conditions (No Action Alternative)

The No Action Alternative would not impact wetlands at the site.

Tentatively Selected Plan (Proposed Action Alternative)

In the short-term, construction activities associated with implementing the TSP would have no impact on any wetlands as no wetlands are present in the immediate vicinity of Eddyville Dam.

In the long-term, the TSP would result in moderate beneficial impacts to wetlands as existing shallow areas in the impoundment area are expected to naturally revert back to wetlands after the Eddyville Dam is removed.

2.5.9 Vegetation

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on the vegetation of the site.

Tentatively Selected Plan (Proposed Action Alternative)

In the short-term, construction activities associated with implementing the TSP may result in negligible adverse impacts to vegetation along the banks of Rondout Creek in the immediate vicinity of Eddyville Dam. Tree protection and high visibility fencing would be installed during construction to reduce the risk of unnecessary damage to trees and other vegetation.

In the long-term, implementing the TSP would result in a moderate beneficial impact on vegetation due to exposure to previously impounded lands, which are expected to naturally revegetate.

2.5.10 Fish and Wildlife Resources

2.5.10.1 Shellfish

Future without Project Conditions (No Action Alternative)

The Eddyville Dam currently acts as a barrier to aquatic organism passage between the upper Rondout Creek and the lower Rondout Creek/Hudson River, resulting in moderate adverse impacts to shellfish. Under the No Action Alternative, the barrier would remain and this impact would continue into the foreseeable future.

Tentatively Selected Plan (Proposed Action Alternative)

In the short-term, temporary reductions in water quality due to construction activities associated with implementing the TSP would result in negligible adverse impacts to shellfish, if present.

In the long-term, the restoration of aquatic organism passage to Rondout Creek upstream of Eddyville Dam would result in moderate beneficial impacts to shellfish as more areas become accessible to shellfish inhabitation.

2.5.10.2 Finfish

Future without Project Conditions (No Action Alternative)

The Eddyville Dam currently acts as a barrier to aquatic organism passage between the upper Rondout Creek and the lower Rondout Creek/Hudson River, resulting in major

adverse impacts to finfish. Under the No Action Alternative, the barrier would remain and this impact would continue into the foreseeable future.

Tentatively Selected Plan (Proposed Action Alternative)

In the short-term, temporary reductions in water quality due to construction activities associated with implementing the TSP would result in negligible adverse impacts to finfish, if present.

In the long-term, the restoration of aquatic organism passage to Rondout Creek upstream of Eddyville Dam would result in major beneficial impacts to finfish.

2.5.10.3 Benthic Resources

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on benthic resources.

Future without Project Conditions (No Action Alternative)

Implementing the TSP would have no impact on benthic resources.

2.5.10.4 Reptiles and Amphibians

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on reptiles, amphibians, or their respective habitats.

Tentatively Selected Plan (Proposed Action Alternative)

In the short-term, temporary reductions in water quality due to construction activities associated with implementing the TSP would result in negligible adverse impacts to reptiles and amphibians, if present.

In the long-term, removing the impoundment would convert previously impounded areas to floodplain wetlands, while reducing surface water area and increasing flow speeds. This may result in minor beneficial impacts to wetland reptile and amphibian species and minor adverse impacts to reptile and amphibian species which inhabit slow moving water bodies.

2.5.10.5 Birds

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on birds or their habitat.

Tentatively Selected Plan (Proposed Action Alternative)

In the short-term, temporary reductions in water quality due to construction activities associated with implementing the TSP would result in negligible adverse impacts to birds, if present.

In the long-term, removing the impoundment would convert previously impounded areas to floodplain wetlands, while reducing surface water area and increasing flow speeds. This may result in minor beneficial impacts to wetland bird species and minor adverse impacts to bird species which inhabit or forage in slow moving water bodies.

2.5.10.6 Mammals

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on mammals or their habitat.

Tentatively Selected Plan (Proposed Action Alternative)

In the short-term, temporary reductions in water quality due to construction activities associated with implementing the TSP would result in negligible adverse impacts to mammals, if present.

In the long-term, removing the impoundment would convert previously impounded areas to floodplain wetlands, while reducing surface water area and increasing flow speeds. This may result in minor beneficial impacts to subaquatic mammalian species and minor adverse impacts to aquatic mammalian species which inhabit slow moving water bodies.

2.5.11 Threatened and Endangered Species

2.5.11.1 Federal Species of Concern

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on federal species of concern at the site.

Tentatively Selected Plan (Proposed Action Alternative)

The TSP is the removal of the Eddyville Dam in the Rondout Creek. There is no habitat for the Indiana and Northern Long-eared Bats at or near the site. Therefore the TSP will have no impacts on the Indiana and Northern Long-eared Bats. The Bog Turtle is found in wetland and there are no wetlands near the site and therefore the TSP will not impact the Bog Turtle. Implementation of the TSP would have positive benefits to both sturgeon species as it will provide more habitat upstream with the removal of the dam.

2.5.11.2 State Species of Concern

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on state species of concern at the site.

Tentatively Selected Plan (Proposed Action Alternative)

As identified above in Federal Species of Concern, the TSP will not impact the Indiana Bat and will provide more habitat for sturgeon.

2.5.11.3 Designated Critical Habitat

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on federal species of concern at the site.

Tentatively Selected Plan (Proposed Action Alternative)

Implementation of the TSP would have positive impacts to Atlantic Sturgeon critical habitat as it will provide more habitat with the removal of the dam opening up more habitat.

2.5.11.4 Essential Fish Habitat

Future without Project Conditions (No Action Alternative)

Under the No Action Alternative, the site's existing ratio of intertidal and upland area would change slightly with projected sea level rise. The net increase in the extent of intertidal areas with projected sea level rise would result in negligible beneficial impacts to EFH, as more areas become accessible to finfish inhabitation.

Tentatively Selected Plan (Proposed Action Alternative)

In the short-term, temporary reductions in water quality due to construction activities associated with implementing the TSP would result in negligible adverse impacts to EFH species, if present.

In the long-term, the restoration of aquatic organism passage to Rondout Creek upstream of Eddyville Dam would result in major beneficial impacts to EFH, as more habitat will be accessible.

2.5.12 Cultural Resources

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no adverse effect on cultural resources.

Tentatively Selected Plan (Proposed Action Alternative)

The study area is believed to have a high potential for prehistoric archaeological sites due to the presence of precontact archaeological sites in the vicinity and proximity to the Rondout Creek and confluence with the Hudson River however the Area of Potential Effect (APE) for the removal of the Eddyville Dam is likely to have been heavily disturbed as a result of several phases of construction and manipulation of the creek over time. An architectural and historical survey of the Eddyville Dam is recommended to document the development of the area and the construction and use of the dam over the years and to determine whether the dam is eligible for the NRHP either individually or as part of a larger historic district including the historic D&H Canal.

2.5.13 Air Quality

Future without Project Conditions (No Action Alternative)

There are no significant sources of air pollution present on the site. Therefore, the No Action Alternative would have no impact on air quality.

Tentatively Selected Plan (Proposed Action Alternative)

In the short-term, negligible adverse impacts on local air quality from construction vehicles would occur temporarily during the construction period, which would have a projected duration of approximately three months. Temporary impacts associated with construction emissions would be mitigated through the implementation of air quality best management practices. Ultra-low sulfur diesel fuel would be used for all construction-

related vehicles and non-road construction equipment, limiting SOx emissions. Fugitive dust control measures such as speed limit reductions, water or other dust suppressant application, and regular vehicle rinsing would be managed according to proper standards and procedures.

In the long-term, implementing the TSP would have no impact on air quality.

2.5.14 Noise

Future without Project Conditions (No Action Alternative)

There are no significant sources of noise pollution present on the site. Therefore, the No Action Alternative would have no impact on noise levels.

Tentatively Selected Plan (Proposed Action Alternative)

In the short-term, minor adverse impacts on local noise levels from construction activities would occur temporarily during the construction period, which would have a projected duration of approximately three months. Construction activities would be limited to times of the day specified by local noise and construction ordinances.

In the long-term, implementing the TSP would have no impact on local noise levels.

2.5.15 Recreation

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on recreational resources. The impoundment would remain accessible to boating and fishing via a gravel ramp boat launch located off of Creek Locks Road located 0.75 mile upstream of Eddyville Dam.

Tentatively Selected Plan (Proposed Action Alternative)

In the short-term, the No Action Alternative would have no impact on recreational resources.

In the long-term, implementing the TSP would result in minor impacts to the site's potential recreational uses. The removal of the impoundment would inhibit activities involving water craft designed for slow-moving waters but enhance recreational activities associated with riverine environments. The restoration of aquatic organism passage and riverine flow upstream of the Eddyville Dam would likely alter the species availability to fisherman and birders.

2.5.16 Aesthetics and Scenic Resources

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on aesthetics and scenic resources.

Tentatively Selected Plan (Proposed Action Alternative)

In the short-term, minor adverse impacts to aesthetic and scenic resources would occur during the construction phase of the project due to the presence of heavy equipment, material piles, staging areas, traffic control signs, disturbed land, and high visibility fencing.

In the long-term, implementing the TSP would result in minor beneficial impacts to the site's aesthetic and scenic resources through the restoration of historic riverine conditions.

2.5.17 Hazardous, Toxic, and Radioactive Waste

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on aesthetics and scenic resources.

Tentatively Selected Plan (Proposed Action Alternative)

All of the Brownfield sites are downstream of the Eddyville Dam and do not present a HTRW concern for the Rondout Creek restoration site.

New York State Superfund Site Code: 356030 is 4 miles downstream from the dam and does not present a HTRW concern for the Rondout Creek restoration site. New York State Superfund Site Code: 356028 has been removed from the Registry and therefore does no present a HTRW concern for the Rondout Creek restoration site. Based on information gathered to date New York State Superfund Site Code: 356040 does not qualify for placement on the registry. Therefore the site does not present a HTRW concern for the Rondout Creek restoration site. New York State Superfund Site Code: 356052 is approximately 4 miles downstream of the site and does not present a HTRW concern for the site. New York Superfund Site Code: 356050 is approximately about 5 miles upstream of the Eddyville Dam and does not present a HTRW concern for the site.

Based on the NYSDEC data the potential for contaminants behind the Eddyville Dam are low however, more soil testing prior to any construction work should be conducted. If HTRW is detected and it presents a potential to be transported with the removal of the dam the Project Partner will be responsible to clean the site. With this testing HTRW will not be a concern with the implementation of the TSP.

2.5.18 Transportation and Other Infrastructure

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on transportation or infrastructure.

Tentatively Selected Plan (Proposed Action Alternative)

In the short-term, minor adverse impacts to local traffic conditions would occur during the construction phase of the project due to the transport of material and heavy equipment.

In the long-term, implementing the TSP would have no impact on transportation or infrastructure.

2.6 Moodna Creek

2.6.1 Physical Setting

2.6.1.1 Geology and Physiography

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on geology or physiography.

Tentatively Selected Plan (Proposed Action Alternative)

Construction activities under the Tentatively Selected Plan (TSP) would occur at shallow depths. Therefore, the TSP would have no impact on geology or physiography.

2.6.1.2 Topography

Future without Project Conditions (No Action Alternative)

Under the No Action Alternative, the site could to be susceptible to topographic change by erosion due to wave and tidal action, and the projected increase in storm frequency and intensity with climate change (NYSDEC, 2018a).

Tentatively Selected Plan (Proposed Action Alternative)

Implementing the TSP would result in minor impacts to the topography of each site. At all sites, direct manipulation of riverbed and bank topography, in addition to the placement of boulders in the case of AOP1 and AOP3, would occur to stabilize channels and allow potential fish passage under altered flow conditions after barrier removal. Passive topographic changes to the riverbed may also occur over time under altered hydraulic conditions.

2.6.1.3 Soils

Future without Project Conditions (No Action Alternative)

Under the No Action Alternative, the soils may be subject to minor adverse impacts from soil erosion due to the projected increase in storm frequency and intensity with climate change (NYSDEC, 2018b).

Tentatively Selected Plan (Proposed Action Alternative)

In the short-term, the TSP would result in negligible adverse impacts on soil resources due to soil erosion during the construction phase of the project. Erosion and sediment control practices would be implemented to minimize soil erosion and the deposition of sediment into surface waters. An Erosion and Sediment Control Plan would be prepared and approved before any construction activities would commence.

In the long-term, The TSP would have no impact on soils at the sites.

2.6.2 Climate and Weather

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on the climate nor weather at any of the three sub-sites.

Tentatively Selected Plan (Proposed Action Alternative)

The TSP would have no impact on the climate nor weather at the sites.

2.6.3 Climate Resiliency

Future without Project Conditions (No Action Alternative)

Under the No Action Alternative, increasing storm frequency and intensity may result in moderate adverse impacts to the sites (NYSDEC, 2018b).

Tentatively Selected Plan (Proposed Action Alternative)

Implementing the TSP may result in a beneficial impact to climate resiliency by reducing flood elevations upstream of AOP2 and AOP3, mitigating the effects of increasing precipitation and storm intensity associated with climate change (NYSDEC, 2018a). Detailed hydrologic and hydraulic analysis would be required to affirm the extent and magnitude of this effect.

2.6.4 Floodplains and Coastal Processes

Future without Project Conditions (No Action Alternative)

Under the No Action Alternative, the site would continue to be subject to flooding given its location within the Hudson River's one percent floodplain. New York State projects that the one percent storm may be 1.5 to 3.3 inches higher by 2100 (NYSDEC, 2018b), resulting in negligible adverse impacts to the sites.

Tentatively Selected Plan (Proposed Action Alternative)

Under the TSP, the sites would remain within the Moodna Creek's one percent floodplain. Implementing the TSP would result in a beneficial impact to floodplains upstream of AOP2 and AOP3 by increasing flood storage along the Moodna Creek floodplain during precipitation and reducing flood elevations. Detailed hydrologic and hydraulic analysis would be required to affirm the extent and magnitude of this effect. Implementing the TSP would have no impact on floodplain in the vicinity of AOP1, as AOP1 does not form a significant impoundment on Moodna Creek.

2.6.5 Water Resources

2.6.5.1 Surface Waters

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on surface waters at the sites.

Tentatively Selected Plan (Proposed Action Alternative)

Implementing the TSP would result in moderate beneficial impacts to the site's surface waters through the removal of barriers along Moodna Creek. Surface water hydrology would be restored to a more natural condition and normal water surface elevation would drop the upstream vicinity of the AOP2 and AOP3.

2.6.5.2 Water Quality

Future without Project Conditions (No Action Alternative)

Under the No Action Alternative, Moodna Creek would continue to be impounded by AOP2 and AOP3. Impounded waters typically have elevated temperatures, decreased

oxygen levels, and can trap sediments and nutrients (Gregory et al., 2002). Therefore, the No Action Alternative would result in minor adverse impacts to water quality.

Tentatively Selected Plan (Proposed Action Alternative)

In the short-term, implementing the TSP would result in negligible adverse impacts on water quality due to increases in turbidity during the construction phase of the project. Erosion and sediment control practices would be implemented to minimize the deposition of sediment into surface waters. The risk of potential fuel spills and machinery leakage would be minimized by restricting maintenance, refueling, and storage of construction equipment to an upland staging area.

In the long-term, implementing the TSP would result in moderate beneficial impacts to water quality in the vicinity of AOP2 and AOP3, decreasing water temperatures and increasing dissolved oxygen levels, through the removal of the impoundments. Implementing the TSP would have no impact on water quality in the vicinity of AOP1, as AOP1 does not form a significant impoundment on Moodna Creek.

2.6.5.3 Regional Hydrogeology and Groundwater

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on hydrogeology nor groundwater.

Tentatively Selected Plan (Proposed Action Alternative)

Implementing the TSP may result in minor impacts on local shallow groundwater flows in the vicinity of AOP2 and AOP3 due to alterations to surface water elevations and surface water flow. Implementing the TSP would have no impact on groundwater flows in the vicinity of AOP1.

2.6.6 Land Use and Zoning

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on the land use or zoning at the site.

Tentatively Selected Plan (Proposed Action Alternative)

Implementing the TSP would have no impact on the land use or zoning at the site.

2.6.7 Economics

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on local economic conditions.

Tentatively Selected Plan (Proposed Action Alternative)

Implementing the TSP would have no impact on local economic conditions.

2.6.8 Socio-Economics

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on local socio-economic conditions.

Tentatively Selected Plan (Proposed Action Alternative)

Implementing the TSP would have no impact on local socio-economic conditions.

2.6.9 Environmental Justice

Future without Project Conditions (No Action Alternative)

There are no environmental justice populations in proximity to this site. Therefore, the No Action Alternative would have no impact on Environmental Justice populations.

Tentatively Selected Plan (Proposed Action Alternative)

There are no environmental justice populations in proximity to this site. Therefore, implementing the TSP would have no impact on environmental justice populations.

2.6.10 Coastal Zone Management

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on any areas regulated under the New York Coastal Zone Management Program. State and/or municipal entities may initiate a project at any of the sites in the future. Any state agency action performed downstream of AOP1 (i.e. direct undertaking, financial assistance, or permitting) would require review by the Coastal Zone Management Program to ensure consistency with coastal policies established in Department of State regulations 19 NYCRR Part 600.

Tentatively Selected Plan (Proposed Action Alternative)

Proposed actions under the TSP would occur in areas regulated under the New York Coastal Zone Management Program. The proposed actions would be consistent with the overall objectives of the Coastal Management Program. In particular, implementing the TSP would promote Coastal Policy 7, through the restoration of a Significant Coastal Fish and Wildlife Habitat by removing barriers to the upstream migration of aquatic organisms, resulting in major beneficial impacts on coastal resources.

2.6.11 Wetlands

Future without Project Conditions (No Action Alternative)

There are no wetlands present on any of the sites. Therefore, the No Action Alternative would have no impact on wetlands.

Tentatively Selected Plan (Proposed Action Alternative)

In the long-term, implementing the TSP would result in a negligible beneficial impact on wetlands at AOP2 and AOP3 due to exposure previously impounded lands which may naturally revert to wetlands. Since Moodna Creek is generally characterized by narrow floodplains confined by steep valley walls, it is likely that these areas would not be extensive. Implementing the TSP would have no impact on wetlands at AOP1.

2.6.12 Vegetation

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on vegetation located at any of the sites.

Tentatively Selected Plan (Proposed Action Alternative)

In the short-term, construction activities associated with implementing the TSP may result in negligible adverse impacts to vegetation along the banks of Moodna Creek in the immediate vicinity of the barriers. Tree protection and high visibility fencing would be installed during construction to reduce the risk of unnecessary damage to trees and other vegetation.

In the long-term, implementing the TSP would result in a negligible beneficial impact on vegetation at AOP2 and AOP3, due to exposure previously impounded lands which are expected to naturally revegetate. Since Moodna Creek is generally characterized by narrow floodplains confined by steep valley walls, it is likely that these areas would not be extensive. Implementing the TSP would have no impact on vegetation at AOP1.

2.6.13 Fish and Wildlife Resources

2.6.13.1 Shellfish

Future without Project Conditions (No Action Alternative)

AOP1, AOP2, and AOP3 each currently act as barriers to aquatic organism passage between the upper Moodna Creek and the lower Moodna Creek/Hudson River, resulting in moderate adverse impacts to shellfish. Under, the No Action Alternative, these barriers would remain and these impacts would continue into the foreseeable future.

Tentatively Selected Plan (Proposed Action Alternative)

In the short-term, temporary reductions in water quality due to construction activities associated with implementing the TSP would result in negligible adverse impacts to shellfish, if present.

In the long-term, the restoration of aquatic organism passage to Moodna Creek upstream of the barriers would result in moderate beneficial impacts to shellfish, as more areas become accessible to shellfish inhabitation.

2.6.13.1.1 Finfish

Future without Project Conditions (No Action Alternative)

AOP1, AOP2, and AOP3 each currently act as barriers to aquatic organism passage between the upper Moodna Creek and the lower Moodna Creek/Hudson River, resulting in major adverse impacts to finfish. Under, the No Action Alternative, these barriers would remain and these impacts would continue into the foreseeable future.

Tentatively Selected Plan (Proposed Action Alternative)

In the short-term, temporary reductions in water quality due to construction activities associated with implementing the TSP would result in negligible adverse impacts to finfish, if present.

In the long-term, the restoration of aquatic organism passage to Moodna Creek upstream of the barriers would result in major beneficial impacts to finfish.

2.6.13.2 Benthic Resources

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on benthic resources.

Future without Project Conditions (No Action Alternative)

Implementing the TSP would have no impact on benthic resources.

2.6.13.3 Reptiles and Amphibians

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on reptiles, amphibians, or their respective habitats.

Tentatively Selected Plan (Proposed Action Alternative)

In the short-term, temporary reductions in water quality due to construction activities associated with implementing the TSP would result in negligible adverse impacts to reptiles and amphibians, if present.

In the long-term, removing the impoundment would de-water previously impounded areas upstream of AOP2 and AOP3, reducing surface water area and increasing flow speeds. This may result in negligible beneficial impacts, upstream of AOP2 and AOP3, to riverine reptile and amphibian species and negligible adverse impacts to reptile and amphibian species which inhabit slow moving water bodies. Implementing the TSP would have no impact on reptile or amphibian species in the vicinity of AOP1, as AOP1 does not form a significant impoundment on Moodna Creek.

2.6.13.4 Birds

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on birds or their habitat.

Tentatively Selected Plan (Proposed Action Alternative)

In the short-term, temporary reductions in water quality due to construction activities associated with implementing the TSP would result in negligible adverse impacts to birds, if present.

In the long-term, removing the impoundment would de-water previously impounded areas upstream of AOP2 and AOP3, reducing surface water area and increasing flow speeds. This may result in negligible beneficial impacts, upstream of AOP2 and AOP3, to riverine bird species and negligible adverse impacts to bird species which inhabit slow moving water bodies. Implementing the TSP would have no impact on bird species in the vicinity of AOP1, as AOP1 does not form a significant impoundment on Moodna Creek.

2.6.13.5 Mammals

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on mammals or their habitat.

Tentatively Selected Plan (Proposed Action Alternative)

In the short-term, temporary reductions in water quality due to construction activities associated with implementing the TSP would result in negligible adverse impacts to mammals, if present.

In the long-term, removing the impoundment would de-water previously impounded areas upstream of AOP2 and AOP3, reducing surface water area and increasing flow speeds. This may result in negligible beneficial impacts, upstream of AOP2 and AOP3, to riverine mammalian species and negligible adverse impacts to mammalian species which inhabit slow moving water bodies. Implementing the TSP would have no impact on mammalian species in the vicinity of AOP1, as AOP1 does not form a significant impoundment on Moodna Creek.

2.6.14 Threatened and Endangered Species

2.6.14.1 Federal Species of Concern

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on federal species of concern at the site.

Tentatively Selected Plan (Proposed Action Alternative)

The TSP is the removal of two dams and one utility line within the Moodna Creek. There is no habitat for the Indiana and Northern Long-eared Bats at or near the site. Therefore the TSP will have no impacts on the Indiana and Northern Long-eared Bats. As well there is no habitat for the Small Whorled Pogonia at the site and therefore no impact.

The Dwarf Wedgemussel has not be observed in the Moodna Creek. However since the TSP is the removal of dams, surveys for the mussel will be conducted prior to construction activities. If the Dwarf Wedgemussel if observed the District will coordinate with USFWS on how to proceed. Therefore, the TSP may impact but unlikely to adversely affect the Dwarf Wedgemussel.

Implementation of the TSP would have positive benefits to both sturgeon species as it will provide more habitat upstream with the removal of the dams.

2.6.14.2 State Species of Concern

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on state species of concern at the site.

Tentatively Selected Plan (Proposed Action Alternative)

As identified above in Federal Species of Concern, the TSP will not impact the Indiana Bat and a positive impact to sturgeon with the increase of available habitat.

2.6.14.3 Designated Critical Habitat

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on federal species of concern at the site.

Tentatively Selected Plan (Proposed Action Alternative)

Implementation of the TSP would have positive impacts to Atlantic Sturgeon critical habitat as it will provide more habitat with the removal of the dams.

2.6.14.4 Essential Fish Habitat

Future without Project Conditions (No Action Alternative)

Under the No Action Alternative, the site's existing ratio of intertidal and upland area would change slightly with projected sea level rise. The net increase in the extent of intertidal areas with projected sea level rise would result in negligible beneficial impacts to EFH, as more areas become accessible to finfish inhabitation.

Tentatively Selected Plan (Proposed Action Alternative)

In the short-term, temporary reductions in water quality due to construction activities associated with implementing the TSP would result in negligible adverse impacts to EFH species, if present.

In the long-term, the restoration of aquatic organism passage to Moodna Creek upstream of the barriers would result in major beneficial impacts to EFH by increasing available habitat.

2.6.15 Cultural Resources

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no adverse effect on cultural resources.

Tentatively Selected Plan (Proposed Action Alternative)

The study area is believed to have a high potential for prehistoric archaeological sites due to the presence of precontact archaeological sites in the vicinity and proximity to the Rondout Creek and confluence with the Hudson River however the Area of Potential Effect (APE) for the removal of the Eddyville Dam is likely to have been heavily disturbed as a result of several phases of construction and manipulation of the creek over time. An architectural and historical survey of the Eddyville Dam is recommended to document the development of the area and the construction and use of the dam over the years and to determine whether the dam is eligible for the NRHP either individually or as part of a larger historic district including the historic D&H Canal.

2.6.16 Air Quality

Future without Project Conditions (No Action Alternative)

There are no significant sources of air pollution present on the site. Therefore, the No Action Alternative would have no impact on air quality.

Tentatively Selected Plan (Proposed Action Alternative)

In the short-term, negligible adverse impacts on local air quality from construction vehicles would occur temporarily during the construction period, which would have a projected duration of approximately three months at AOP1 and six months at AOP2 and AOP3. Temporary impacts associated with construction emissions would be mitigated through the implementation of air quality best management practices. Ultra-low sulfur diesel fuel would be used for all construction-related vehicles and non-road construction equipment, limiting SOx emissions. Fugitive dust control measures such as speed limit reductions, water or other dust suppressant application, and regular vehicle rinsing would be managed according to proper standards and procedures.

In the long-term, implementing the TSP would have no impact on air quality.

2.6.17 Noise

Future without Project Conditions (No Action Alternative)

There are no significant sources of noise pollution present on the site. Therefore, the No Action Alternative would have no impact on noise levels.

Tentatively Selected Plan (Proposed Action Alternative)

In the short-term, minor adverse impacts on local noise levels from construction activities would occur temporarily during the construction period, which would have a projected duration of approximately three months at AOP1 and six months at AOP2 and AOP3. Construction activities would be limited to times of the day specified by local noise and construction ordinances.

In the long-term, implementing the TSP would have no impact on local noise levels.

2.6.18 Recreation

Future without Project Conditions (No Action Alternative)

There are no designated recreational areas present on any of the sites. Therefore, the No Action Alternative would have no impact on recreation.

Tentatively Selected Plan (Proposed Action Alternative)

In the short-term, the No Action Alternative would have no impact on recreational resources.

In the long-term, implementing the TSP would result in minor impacts to the site's potential recreational uses. Upstream of AOP2 and AOP3, the removal of the impoundment would inhibit activities involving water craft designed for slow-moving waters but enhance recreational activities associated with riverine environments. The restoration of aquatic organism passage and riverine flow upstream of all the barriers at each site would likely alter the species availability to fishermen and birders.

2.6.19 Aesthetics and Scenic Resources

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on aesthetics and scenic resources.

Tentatively Selected Plan (Proposed Action Alternative)

In the short-term, minor adverse impacts to aesthetic and scenic resources would occur during the construction phase of the project due to the presence of heavy equipment, material piles, staging areas, traffic control signs, disturbed land, and high visibility fencing.

In the long-term, implementing the TSP would result in minor beneficial impacts to the site's aesthetic and scenic resources through the restoration of historic riverine conditions.

2.6.20 Hazardous, Toxic, and Radioactive Waste

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on aesthetics and scenic resources.

Tentatively Selected Plan (Proposed Action Alternative)

The New York State Superfund Site Number: 336028 has been remediated and has been delisted and will not impact the TSP. The New York State Superfund Site Number: 336008 is more than three miles from AOP 3 and not in the Moodna Creek the site does not present a HTRW concern with the implementation of the TSP. The utility line at AOP 1 presents no concerns of contaminants, as it has not been used in many years.

2.6.21 Transportation and Other Infrastructure

Future without Project Conditions (No Action Alternative)

The No Action Alternative would have no impact on transportation or infrastructure.

Tentatively Selected Plan (Proposed Action Alternative)

In the short-term, minor adverse impacts to local traffic conditions would occur during the construction phase of the project due to the transport of material and heavy equipment.

In the long-term, implementing the TSP would have no impact on transportation or infrastructure.

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