Biological Assessment for Proposed New Construction and Increased Visitor Use Impacts at The Jamestown Island Project Site

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EXECUTIVE SUMMARY

Jamestown Island is the site of the first permanent English colony in North America, and supports cultural and historic resources of great significance to United States history. It was at Jamestown that North American, African, and European cultures merged to form a new society, language, and customs.

The founding of Jamestown has been commemorated every fifty years since at least 1807. In 1957, Queen Elizabeth II visited Jamestown as festivities marked the 350th anniversary. Major improvements to the Colonial Parkway, and construction of the Jamestown Visitor Center and Jamestown Settlement all occurred at that time. New plans for expanded visitor access, enhanced research and educational opportunities, and protection of archival materials have been proposed in the Development Concept Plan (DCP) / Environmental Impact Statement (EIS) prepared for the Jamestown Project. This DCP/EIS was prepared jointly by the Association for Preservation of Virginia Antiquities (APVA) and the National Park Service (NPS). The purpose of the Jamestown Project is (as stated in the DCP/EIS) "for the APVA and NPS to jointly research, protect, and present to the public the resources at Jamestown."

As part of the EIS, the NPS and APVA submit this Biological Assessment (BA) in partial fulfillment of their responsibilities under Section 7(a)(2) of the Federal Endangered Species Act (ESA) of 1973, as amended (16 USC 1531-1543) Section 7 Handbook (March 1998), Chapter 4, Formal Consultation (Section 4.2 – Initiating Formal Consultation). This BA will be used by NPS and APVA to complete consultation with the U. S. Fish and Wildlife Service (USFWS) regarding impacts of the Proposed Action on federally listed species.

The DCP includes five alternatives including the "no action" Alternative A. Action alternatives B through E propose various changes that maintain and enhance artifact collections and archaeological sites, and are intended to improve and diversify public access opportunities and visitor experiences at Jamestown Island. A preferred alternative was selected and presented to the public in September 2002. Therefore, Alternative B (referred to as the Proposed Action throughout this BA) is the subject of this Biological Assessment and will proceed to formal consultation with the USFWS.

Jamestown Island is located along the north shore of the lower James River in Virginia's coastal plain. The Jamestown Project Area, which includes Jamestown Island, Back River Marsh, and Neck of Land supports two federally listed species. One is a plant of freshwater tidal marshes, sensitive joint-vetch (*Aeschynomene virginica*), and the other is the Bald Eagle (*Haliaeetus leucocephalus*). At present, sensitive joint-vetch is found in Back River Marsh along an abandoned road trace, and three breeding pairs of Bald Eagles nest on Jamestown Island.

The Island's vegetation is a mix of forests and marshes, and supports a large productive heron/egret rookery. Forested areas, comprising most of the northern and northwestern parts of the Island, consist of mesic and hydric woodlands with loblolly pine (*Pinus taeda*) as the most abundant dominant species. Herbaceous wetland communities, commonly called marshes, are a diverse mix of brackish and freshwater species. Salt tolerant species such as big cordgrass (*Spartina cynosuroides*) dominate the mouths of marsh creeks and guts, while species better

adapted to fresh or brackish water, such as arrow arum (*Peltandra virginica*), dominate interior creek heads.

Currently, sensitive joint-vetch is listed by the USFWS as threatened, and by the Virginia Department of Conservation and Recreation, Division of Natural Heritage (DCR-DNH) as state and globally rare. While the federally listed small whorled pogonia (*Isotria medeoloides*) has been found in the vicinity of Jamestown Island in the past, a recent survey found no occurrences or suitable habitat for this species within the project area.

Bald Eagles have been documented from Jamestown Island since the early 1960s and have been monitored regularly since that time. The Chesapeake Bay Bald Eagle population was listed as endangered in 1978, although the USFWS originally listed the Bald Eagle as endangered on March 11, 1967 under The Endangered Species Protection Act of 1966 (16 U.S.C. 668aa-668cc), and subsequently under The Endangered Species Act of 1973 (16 U.S.C. 1531 et seq). The Chesapeake Bay recovery region encompasses Virginia, Delaware, Maryland, the eastern half of Pennsylvania, the panhandle of West Virginia, and the southern two-thirds of New Jersey. In 1995, the Chesapeake Bay Bald Eagle population was reclassified from endangered to threatened. In 1999, the USFWS announced an "intent to delist." At this writing, the Bald Eagle remains federally listed as threatened.

In developing this BA, it was determined that one pair of nesting Bald Eagles on Jamestown Island is likely to be adversely affected by the Proposed Action unless steps are taken to avoid or minimize impacts.

The BA discusses these impacts and strategies for avoiding or minimizing adverse impacts to breeding Bald Eagles:

- Coordination of construction activities, timing, materials, and techniques with USFWS, Department of Game and Inland Fisheries (DGIF), Virginia Marine Resources Commission (VMRC), and the U.S. Coast Guard.
- Water transportation and tour services on Back River will begin no earlier than 10 am.
- Posting of no-stopping zones for boats on Back River from Sandy Bay to the new boat dock on Jamestown Island.
- Seasonal closure of facilities or activities which may directly impact nesting Bald Eagles or newly hatched eaglets if results of monitoring dictate that changes are necessary.
- Development and implementation of a monitoring plan for the biotic and abiotic resources of the Jamestown Project area environs, including listed species, effects on natural resources, visitor numbers, and use activities.
- The Park will monitor the Back River Marsh sensitive joint-vetch population to determine status and trends of the population, changes in vegetation and habitat, changes in erosion due to boat traffic, and spread of non-native, invasive plants.
- The Park will monitor the success of Bald Eagle nests near the Proposed Action. If monitoring shows that increased boat traffic or visitor use is negatively impacting listed species, the Park will modify management of these actions to reduce those impacts to acceptable levels.

- The Park has approved a Phragmites Management Plan and begun implementation of a common reed (*Phragmites australis*) control/mitigation project in October 2002, which will continue indefinitely.

Prior to NPS selection of the Preferred Alternative (i.e. Proposed Action), other potential action alternatives for the Jamestown Project development included designs that had the potential to adversely affect the sensitive joint-vetch and the Bald Eagle. Consultation and discussions with sensitive joint-vetch and Bald Eagle experts resulted in design changes to the Proposed Action.

Effects on Listed Species: Implementation of the Proposed Action (including actions that minimize effects on listed species) is anticipated to have the following effects:

- **Sensitive joint-vetch: No effect.** Actions to monitor vetch populations and habitat, when coupled with control of the non-native invasive common reed, and design changes and realignment of the marsh boardwalk, result in the action having no effect on sensitive joint-vetch.

- **Bald Eagle: Likely to adversely affect.** Scheduling of construction activities to avoid nesting periods will likely result in no effect upon nesting eagles. However, increased boat traffic because of this action is expected to result in increased disturbance of nesting and foraging Bald Eagles. Consequently, the Proposed Action is likely to adversely affect one Bald Eagle pair.

INTRODUCTION

The Jamestown Island Project Area, Colonial National Historical Park (COLO), is situated in the lower James River. The Island is a mix of forests, forested wetlands, and tidal marshes. Jamestown is the site of the first permanent English settlement in North America. Presently, the National Park Service (NPS) and the Association for the Preservation of Virginia Antiquities (APVA) maintain artifact collections, archaeological sites, various buildings, and visitor facilities on the Island (Figure 1). The Island and immediate vicinity are also home to a federally listed plant species, sensitive joint-vetch (*Aeschynomene virginica*), and Bald Eagles (*Haliaeetus leucocephalus*), a federally listed animal species.

Purpose and Need for Biological Assessment

The NPS and APVA have developed a long-standing partnership to jointly research, protect, and present to the public the resources at Jamestown Island. Under the National Environmental Policy Act of 1972 (NEPA), the NPS is required to prepare environmental documentation to assess potential impacts of a proposed plan. As part of the Environmental Impact Statement (EIS), the NPS and APVA submit this Biological Assessment (BA) in partial fulfillment of their responsibilities under Section 7(a)(2) of the Federal Endangered Species Act (ESA) of 1973, as amended (16 USC 1531-1543) Section 7 Handbook (March 1998), Chapter 4, Formal Consultation (Section 4.2 – Initiating Formal Consultation). The intent and scope of this document is for use by NPS to complete consultation with the U. S. Fish and Wildlife Service (USFWS) by evaluating potential impacts (both direct and indirect) of a Proposed Action on federally listed species or designated critical habitat within the project area. Upon completion of the BA, the Proposed Action, prepared as part of the Development Concept Plan (DCP) and EIS for the Jamestown Project, will proceed to formal consultation with the USFWS.

Description of Proposed Action

The DCP includes five alternatives, including a required “no action” option. Action alternatives B through E each propose various themes of recreation, visitor access, and artifact housing. With the exception of the “no action” alternative, all other options involve construction on and near the Island. Proposed action alternatives are summarized in The Jamestown Project: Draft Development Concept Plan & Environmental Impact Statement (NPS/APVA 2002). In September 2002, a Preferred Alternative (identified as Alternative B in the DCP/EIS) was selected and presented to the public. It is this alternative, referred to as the Proposed Action throughout the BA, that will proceed to formal consultation with the USFWS.

Components of the Proposed Action are based on multiple goals and objectives of the project, the interpretive concept, input from the public, continuing research, discussions with regulatory agencies, applicable Federal, State, and local laws and regulations, as well as APVA and NPS policies. The BA addresses potential impacts of the Proposed Action on breeding Bald Eagles on Jamestown Island and sensitive joint-vetch in Back River Marsh. As part of the Proposed Action, a new Visitor Center will be constructed in the existing visitor parking lot on Jamestown Island. The new Visitor Center will have classrooms, offices, visitor orientation, collection display, retail, food, and restrooms. Neck of Land construction will include a new gateway/orientation facility, modal transfer, a trailhead for a new hike/bicycle trail, and a new boat dock for water access to the Island (Figure 2). A hiking/bicycle trail will follow an existing road trace until

reaching the treeline-marsh interface, and will then traverse east, southeast through the marsh as an elevated boardwalk until reaching a new bridge, across the Back River, to Jamestown Island. A hiker or bicyclist could use the same route back to Neck of Land or continue off the Island on the Colonial Parkway. From the new Visitor Center location, visitors will cross a raised path/boardwalk to the Observation Building (Figure 3). This building will offer an elevated observation of the landscape and through virtual imaging visitors will have an opportunity to see how the landscape looked in the 17th century. Visitors will leave the Observation Building and have choices in experiencing the historic core of the Island. These choices include the Ludwell Site Interpretive anchor, the original Fort Site, Townsite, and the Ancient Planter interpretive anchor. The APVA and the NPS artifact collections will be jointly housed at an expanded Jamestown Rediscovery Center (NPS/APVA 2002).

Detailed Descriptions of Selected Components of the Proposed Action

Gateway/Orientation Facility at Neck of Land: The building size will be 2,000 sq. ft. This building will be closed from mid-November through mid-March. Outdoor signs and exhibits will give visitors information and options for transport when buildings are closed.

New Visitor Center/Educational Facility: This will be a new building located in the existing NPS Visitor Center parking lot. Site location was chosen to be out of the 100-year floodplain and within easy walking distance to the Jamestown Rediscovery Center and the Observation Building. Visitor use at Jamestown Island is expected to increase in coming years, peaking in the year 2007 (Huyck, pers. comm. 2001). The new Visitor Center will cover 19,000 sq. ft., comprised of single story buildings connected by walkways. All buildings will be outside of the 750’ protection zone for the Bald Eagle nest (VAJC-0101).

APVA and NPS Collections and Research Facility: This facility is an 8,000 sq. ft. expansion to the existing APVA Jamestown Rediscovery Center.

Observation Building: This facility is a modification of the existing Visitor Center. The existing building (presently 29,000 sq. ft.) will be substantially downsized with the pedestrian bridge and terrace access removed. The new Observation Building will be approximately 5,000 sq. ft.

Ludwell Exhibit Facility: The Ludwell Exhibit facility will be approximately 7,500 sq. ft. and will house artifacts from the historic site.

Restrooms: Restrooms will be provided at the Neck of Land transportation center, the new Visitor Center, the Observation Building, and the Ludwell exhibit facility. Water/sewer restrooms will also be provided at the east anchor of the historic site at the Ancient Planter exhibit area.

Entrance Booths / Ranger Station: The entrance booths to Jamestown Island will be removed, and the Ranger Station at the entrance to Jamestown Island will remain. An electronic gate, capable of closing the Island, will provide security.

Parking: Parking will be split between the facility at Neck of Land and the Visitor Center at Jamestown Island. Neck of Land will ultimately have parking for 250 cars and 15 buses; the

Island will have parking for 150 cars and 25 buses. Parking on Neck of Land will be phased with capacity for 100 cars built first and an additional 150 spaces will be phased as expected visitation growth occurs.

Boat Docks and Water Travel: Three boat docks will be constructed to allow for boat transport. New docks will be at Neck of Land, at Jamestown Island, and at Powhatan Creek Overlook. The dock at Jamestown Island will be located at least 1,000 ft. downstream of the Bald Eagle nest (VAJC-0101) tree. Two boat taxis will operate continuously (from 10 am to 4 or 5 pm) from the Neck of Land dock, leaving approximately every 20 minutes. Tour boats will also operate from one of the three docks - proposed circumnavigation of the Island will take approximately 1.5 hrs (Aldrich pers. comm. 2002). The Jamestown Explorer would continue to operate much as it does currently, but possibly from one of the new NPS docks, or to include a stop at one of the new NPS docks. When constructed, new boat docks will be no larger than 2,000 sq. ft. Boats departing and arriving at new docks will begin daily operation no earlier than 10 am. The three proposed docks will be designated for use by NPS and concessionaire boats only, not for use as public docks.

Hike/bicycle Path: The hike/bicycle path will begin on Neck of Land at the new orientation/gateway facility and will follow the old (pre-1957) ferry road over Neck of Land. When reaching the forest/marsh edge, the path will begin a south, southeastern traverse across the marsh as an elevated boardwalk (see Figure 2).

Boardwalk Bridge over Back River: The marsh boardwalk will cross the Back River via a new bridge that will be located at least 950 ft. from the above nest tree used by the Bald Eagles. The bridge will be 14-14.5 ft. above mean high tide, the same height above the water as the Sandy Bay Bridge. The bridge is proposed to be 12-14 ft. wide. Design and construction of the boardwalk and bridge will minimize disturbance to marsh vegetation.

Pedestrian Bridge from new Visitors Center to Observation Building: A new pedestrian bridge will connect the Visitor Center and the Observation Building. Design and construction of this pedestrian bridge will reflect the character of the site and will use sustainable and site compatible materials and colors.

Description of Existing Physical and Biological Environment

Jamestown Island, COLO lies within Virginia's Southern Coastal Plain physiographic province. Colonial NHP occupies portions of Gloucester, James City, Surry, and York Counties as well as a portion of the City of Williamsburg. Much of the Park borders both the York and the James River. Jamestown Island lies at the upper limits of the current brackish intrusion in the James River, immediately southwest of the City of Williamsburg within James City County. Jamestown Island is approximately 3 miles long and 1.5 miles wide, and is covered by forest, and non-tidal forested and tidal herbaceous wetlands. Forested areas, which lie mostly on the northern and northwestern parts of the Island, consist of mesic and hydric woodlands with loblolly pine (*Pinus taeda*) as the dominant species. Herbaceous wetlands (marshes) are a diverse mix of brackish and freshwater species. Salt tolerant species such as big cordgrass (*Spartina cynosuroides*) dominate the mouths of marsh creeks and guts. Species better adapted to fresh or brackish water,

such as arrow arum (*Peltandra virginica*) and wild rice (*Zizania aquatica*), increase in abundance at the interior creek heads (Clark and Rafkind 1998; Van Alstine pers. comm. 2001).

Surficial deposits on Jamestown Island consist of the Lynnhaven and Poquoson members of the Tabb formation plus Holocene valley fills that overlie the Eastover formation (Johnson and Hobbs, 1994). The Eastover is composed of consolidated quartzose silty fine sand with scattered shells and is covered by younger sediments. Higher points of the Island are underlain by the Lynnhaven member of the Tabb formation. These deposits are composed of a basal gravelly sand, a middle sand, and upper very clayey silty fine sand. Emergent land south of Passmore Creek is underlain by a similar but younger sequence of the Poquoson member. A modern dune-beach complex borders the southwestern margin of the Island. Thick sequences of fluvial gravel, sand, and overlying estuarine muds occur below the herbaceous wetlands (Clark and Rafkind 1998).

In addition to breeding Bald Eagles, Jamestown Island also supports a mixed Great Blue Heron (*Ardea herodias*) and Great Egret (*Casmerodius albus*) rookery (Center for Conservation Biology 1998). While Great Blue Herons and Great Egrets are not federally listed, they are protected by other federal laws such as the Migratory Bird Treaty Act of 1918 and local regulations that protect colonial waterbirds. The presence of a heron rookery in close proximity to productive Bald Eagle nests is further indication of the high quality nesting and foraging habitat on and around Jamestown Island.

CONSULTATION HISTORIES

Consultation History-Sensitive Joint-vetch

Friday, September 20, 2002	Carlton Abbott and Partners; Department of Conservation and Recreation-Division of Natural Heritage (DCR-DNH); NPS; USFWS; Vanasse Hangen Brustlin, Inc. (VHB) - meeting to discuss completion of BA
Thursday, October 18, 2001	APVA; Carlton Abbott and Partners; DCR-DNH; NPS BRMD-Endangered Species; NPS, COLO; NPS, PHILSO; Univ. of MD; VHB - site visit to discuss sensitive joint-vetch and trail alignment.
Tuesday, October 2, 2001	NPS; USFWS; VHB - meeting to discuss trail alignment and boat dock locations and impacts to listed species
Monday, August 27, 2001	APVA; Carlton Abbot and Partners; DCR-DNH; NPS; USFWS; VHB - meeting to discuss comments on draft BA
Friday, July 27, 2001	Rouse Environmental Services - telephone consultation with Garrie Rouse
Wednesday, July 25, 2001	Virginia Institute of Marine Science (VIMS) - telephone consultation with Walter Priest
Tuesday, July 24, 2001	The Nature Conservancy (TNC) - telephone consultation with Judy Dunscomb
Friday, July 20, 200	VIMS - telephone consultation with Jim Perry
Thursday, July 12, 2001	VIMS - telephone consultation with Jim Perry
Tuesday, July 10, 2001	Rouse Environmental Services - telephone consultation with Garrie Rouse
Wednesday, May 2, 2001	APVA; Carlton Abbot and Partners; DCR-DNH; NPS; VHB - planning meeting at Visitor's Center on Jamestown Island, tour of project area
Thursday, February 22, 2001	NPS; USFWS; VHB - meeting to discuss Jamestown Project and guidelines/recommendations for Bald Eagles and sensitive joint-vetch
Tuesday, October 25, 2000	DCR-DNH; NPS; USFWS; VHB - meeting at newly discovered sensitive joint-vetch population

Table 1. Chronological listing - Federal Register notices - sensitive joint-vetch

(*Aeschynomene virginica*).

Date	Federal Register Citation	Action
09/02/1994	59 FR 45705	Notice Recovery Plan Available
05/20/1992	57 FR 21569 21574	Final Listing, Threatened
07/26/1991	56 FR 34162 34167	Proposed Listing, Threatened

Consultation History-Bald Eagle

Friday, September 20, 2002	Carlton Abbott and Partners; DCR-DNH; NPS; USFWS; VHB - meeting to discuss completion of BA
Tuesday, October 2, 2001	NPS; USFWS; VHB - meeting to discuss trail alignment and boat dock locations and impacts to listed species
Monday, August 27, 2001	APVA; Carlton Abbot and Partners; DCR-DNH; NPS; USFWS; VHB - meeting to discuss comments on draft BA
Friday, June 22, 2001	APVA; Carlton Abbot and Partners; Center for Conservation Biology (CCB); DCR-DNH; Department of Game and Inland Fisheries (DGIF); NPS; USFWS; VHB - meeting to discuss Jamestown Island Bald Eagles, possible impacts of increased visitor use/construction
Wednesday, May 2, 2001	APVA; Carlton Abbot and Partners; DCR-DNH; NPS; VHB - planning meeting at Visitor's Center on Jamestown Island, tour of project area.
Wednesday, April 11, 2001	Biological Opinion for Operations/Bald Eagle nest VAJC-0101
Monday, March 5, 2001	Carlton Abbot and Partners; DGIF; NPS; USFWS; VHB - meeting to discuss new eagle nest and implications for current operations and the project
Thursday, February 22, 2001	Carlton Abbott and Partners; NPS; USFWS; VHB - meeting to discuss Jamestown Project and guidelines/recommendations for Bald Eagles and sensitive joint-vetch

Table 2. Chronological listing - Federal Register notices - Bald Eagle **(Haliaeetus leucocephalus**).

Date	**Federal Register Citation**	Action
07/06/1999	64 FR 36453 36464	Proposed Delisting – Recovered
07/12/1995	60 FR 35999 36010	Final Reclassify – Downlist Threatened
03/23/1995	60 FR 15280 15281	Notice Reopen Comment
07/12/1994	59 FR 35584 35594	Proposed Reclassify, Downlist Threatened
01/21/1987	52 FR 2239 2242	Notice 90-day Petition Finding, Not Substantial
02/14/1987	43 FR 6230 6233	Final Special Rule
07/12/1976	41 FR 28525 28527	Proposed Reclassify, Downlist Threatened
03/11/1967	32 FR 4001	Final Listing, Endangered

LISTED SPECIES

The USFWS lists the following federally listed species for Jamestown Island, COLO, James City County, Virginia: *Aeschynomene virginica* (sensitive joint-vetch), and *Haliaeetus leucocephalus* (Bald Eagle). Table 3 lists the federal and state legal status, as well as Natural Heritage Rarity Ranks. Rarity ranks are further explained in the Appendix.

Table 3. Federally listed species known from Jamestown Island, James City County, VA.

Scientific Name	Common Name	Federal/State Status	Natural Heritage State/Global/National Rarity Ranks
Aeschynomene virginica	sensitive joint-vetch	LT / --	S2 G2 N2
Haliaeetus leucocephalus	Bald Eagle	LT / LT	S2 G4 N4B/N4N

(Townsend 2001; Roble 1996)

Plant Surveys

Sensitive joint-vetch was documented in 1939 at a site on COLO along the Back River (Fernald 1939). Several attempts were made during the 1990s to rediscover this species in Back River Marsh without success. In October 2000, a survey of the marshes conducted by boat at high tide (to allow maximum access) yielded no rediscovery. However, a ground-based survey (October 2000) into the interior of the marsh along an old road trace resulted in the rediscovery of sensitive joint-vetch plants at this site. The population consisted of 13 flowering/fruiting stems along the east edge of the old road. Surveys of tidal flats in this area yielded no other rare plant discoveries (Van Alstine, pers. comm. 2001). Subsequent visits in October 2001 and 2002 (Erdle pers. obs. 2001; Heffernan pers. obs. 2002) failed to locate the population of sensitive joint-vetch, although widely fluctuating population numbers is a species characteristic.

Historical documentation exists that places the federally listed small whorled pogonia in James City County (DCR-DNH 2001). The Neck of Land tract at COLO was searched for rare plant species in spring and late growing season of 2000 and 2001. One floral survey focused on upland hardwood stands with potential for small whorled pogonia occurrences, yet no discoveries of this plant were made within the project area (Van Alstine, pers. comm. 2001).

Sensitive Joint-vetch Natural History

A robust annual in the bean family, sensitive joint-vetch reaches 1 to 2 meters in height and bears yellow flowers with red veins. The pinnate leaves are touch-sensitive, a trait that gives the plant its common name. Germination occurs from May to early June (Davison and Bruderle 1984), and plants grow quickly, almost doubling in height every two weeks during the first six weeks. Flowering occurs from mid-July through October. Fruiting occurs from late July through senescence in late October. Seed maturation begins in August and continues through October (Rouse 1994). Fruits are legumes, 3.0-7.0 cm long, which break into 1-seeded segments (Davison and Bruderle 1984).

Sensitive joint-vetch is currently known from New Jersey, Maryland, Virginia, and North Carolina, with a historical range that once included Delaware and Pennsylvania. There are

currently 20 known extant populations of sensitive joint-vetch in Virginia (DCR-DNH 2001). Natural Heritage staff rediscovered the COLO population in Back River Marsh in 2000. Thirteen flowering and fruiting plants were found on a substrate slightly higher than the marsh, in an open area, 9 m by 3 m, between the berm of an old road trace and more densely vegetated marsh (Chazal and Van Alstine 2001)(Figure 4). Sensitive joint-vetch had not been seen in the Back River Marsh since first described by Fernald (1939).

The number of plants in sensitive joint-vetch populations is known to fluctuate widely from year to year (Bruderle and Davison 1984; Schultz 1995; Rouse 1998). One population in New Jersey increased from 50 to 2000 plants over a three-year period (Schultz 1995). However, over time, large populations tend to remain large and small populations tend to remain small (Rouse 1998).

Populations consistently reappear in the same place, which may indicate limited seed dispersal (Davison and Bruderle 1984) or very specific habitat requirements (Rouse 1998). A recent study reported that seed dispersal ability of sensitive joint-vetch is related to the plant's position in the marsh (Griffith 2002). As many as 75% of the seeds from plants located adjacent to a stream dispersed from the patch. Seeds were able to move as far as 2,600 m upstream or downstream from their maternal plant if access to open water is available. Therefore, location of the population in the interior of Back River Marsh probably limits seed dispersal.

Sensitive joint-vetch tolerates a narrow range of salinity levels and occupies fresh to slightly brackish tidal marshes (Belden 1994; Rouse 1995). The largest and most viable populations of sensitive joint-vetch occur in estuarine meander zones of tidal rivers where sediments transported from upriver settle out to form extensive marshes (Belden 1994). Sensitive joint-vetch usually grows within 2 m of the low water mark on raised banks where populations are flooded twice daily (Davison and Bruderle 1984; Schulz 1995). Plants are usually found in sparsely vegetated microhabitat, such as accreting point bars or areas of nutrient deficiencies. Dynamic natural processes such as sedimentation, diurnal tidal fluctuations, ice scour, wave action, severe storm events, and muskrat "eat-outs" may play a role in creating habitat (Schulz 1995). Local nutrient deficiencies in the soil of some interior marsh populations may also create favorable conditions for sensitive joint-vetch by maintaining habitat with low vegetative cover (Caljouw et al. 1995).

Sensitive joint-vetch occurs in marshes that often support a high diversity of plant species, many of which are annuals (Davison and Bruderle1984). Associated species frequently include wild rice (*Zizania aquatica*), arrow arum (*Peltandra virginica*), pickerelweed (*Pontederia cordata*), large bur marigold (*Bidens laevis*), halberd-leaved tearthumb (*Polygonum arifolium*), arrow-leaved tearthumb (*P. sagittatum*), and rice cut-grass (*Leersia oryzoides*) (Davison and Bruderle 1984).

Sensitive joint-vetch was federally listed as threatened in June 1992. The sensitive joint-vetch recovery plan (Schulz 1995) identifies natural and human-caused threats to this species. Natural disturbances include wave action associated with severe storms, interspecific competition, herbivory, channel migration, sea-level rise, and natural sedimentation processes. Human-caused threats include competition from invasive species, boating activities, shoreline stabilization and

structural development, road and bridge construction, changes in water quality, and over-visitation to sensitive joint-vetch sites (Schulz 1995).

Known Threats to Sensitive Joint-Vetch

The population of sensitive joint-vetch located in the interior of Back River Marsh currently faces threats from (1) degradation of habitat by invasive plant species, (2) predation by pest insects, (3) degradation of marsh health, and (4) sea-level rise.

The highly invasive plant, common reed (*Phragmites australis*), occurs in Back River Marsh and on Jamestown Island across Back River from the marsh, posing a serious threat to sensitive joint-vetch. Common reed is a tall, emergent wetland grass, and grows in dense monospecific stands in fresh to brackish environments. Once established, this species can spread rapidly by vegetative growth and displace most other marsh species (Marks et al. 1993). Common reed is well known to quickly establish itself on disturbed soil by seed or rhizome fragments (Marks et al. 1993; Ailstock et al. 2001). Treatment regimes of herbicide-prescribed fire-herbicide are often required for several years for effective control (Marks et al. 1993). The Park has targeted common reed for control, and funds have been allocated. A long-term management and monitoring plan/program for common reed has been approved and control/mitigation implemented in October 2002.

Larvae of two agricultural pests, corn earworm (*Heliocoverpa zea*) and tobacco budworm (*Heliocoverpa virescens*), are documented predators of sensitive joint-vetch in Virginia (Rouse 1994). A study of a sensitive joint-vetch population on the Mattaponi River in Virginia indicated that 43% of 2,000 randomly collected seeds were predated by larvae of these species (Rouse 1994, 1998). There are no known control methods for corn earworm or tobacco budworm on sensitive joint-vetch.

The Sensitive Joint-vetch Recovery Plan (Schultz 1995) identifies negative impacts on freshwater tidal systems from motorboat traffic. Many impacts on aquatic ecosystems have been associated with recreational motorboat traffic. Wave action may erode mudflats and banks (Liddle and Scorgie 1980; Johnson 1994; Asplund and Cook 1999). Fuel leaks may have a toxic effect on plants (Liddle and Scorgie 1980; Stople 1992; Jeffries and Mills 1990). The interior marsh location of the sensitive joint-vetch population should protect it from adverse impacts of boat wakes (Dunscomb, pers. comm. 2001). Increased boat traffic may lead to accelerated marsh edge erosion and associated soil loss. Boat wake size is dependent upon many factors, including hull shape, draft, water depth, channel width, currents, and vessel speed, and slowly moving boats may produce larger wakes than faster boats (Ayers, pers. comm. 2002; Myers, pers. comm. 2002).

Sea level in the mid-Atlantic is projected to rise approximately 0.5 ft. in the next fifty years (Titus and Narayanan 1995). Because the Back River Marsh sensitive joint-vetch population is the furthest downstream of all known James River populations, it will likely be the first to experience adverse sea-level rise effects. While rising water will eventually submerge this population, increased salinity may be the first factor to make this site unsuitable to sensitive joint-vetch (Rouse 1998).

Schultz (1995) recommends semi-annual monitoring for all sensitive joint-vetch populations, since population size can vary widely from year to year (Davison and Bruderle 1984; Rouse 1998). Therefore, several years of data are required to determine population vigor. A monitoring protocol should minimize observer trampling and include measures of plant abundance, descriptions of flowering and fruiting condition, signs of predation, appearance of exotic plants, along with water quality and salinity. Measurements of water salinity could provide useful information since there may be a link between germination and salinity levels. Rouse (1998) observed that higher salinity corresponded to lower plant counts and reduced seed production.

Animal Surveys

The Neck of Land tract at COLO was searched for rare animal species in spring and fall of 2000. Annually, in the months of March and May, CCB staff at the College of William and Mary conducts aerial surveys of coastal Virginia to document new Bald Eagle nests and to confirm and verify the status of existing nests. On March 1, 2001, CCB documented a new Bald Eagle nest (VAJC-0101) on Jamestown Island, approximately 600 feet northwest of the visitor's parking lot (Rafkind, pers. comm. 2001). The addition of this new nest brings the number to three active Bald Eagle nests on Jamestown Island (Figure 5). Two other active nests are located in the southern and northeastern portions of Jamestown Island. DCR-DNH zoologists surveyed the project area on several different occasions during 2000 and 2001 and found no additional rare, threatened, or endangered animal species.

Historically, Jamestown Island was known to have supported several active Bald Eagle nests. Since 1986, at least one pair of Bald Eagles has been active on Jamestown Island. CCB-College of William and Mary, in cooperation with DGIF, has monitored eagle nest sites annually. Jamestown Island eagles have occupied their territory each year and nest JC87-01 has produced young 11 of the past 14 years. The two more recent nests have each been active only 1 and 2 years, and both nests produced young (Bradshaw, pers. comm. 2001; Rafkind, pers. comm. 2001; Watts, pers. comm. 2001). On October 14, 2002, an eagle was observed feeding on a fish below nest VAJC-0101 (Rafkind pers. comm. 2002).

Bald Eagle Natural History

Bald Eagles are the largest species of raptor found regularly in Virginia, with a wingspan that often reaches 6 ½ feet. Immature birds are brown with varying amounts of white mottling for four or five years before achieving the distinctive white head and tail of the adult. They begin to breed at about the same time adult plumage appears (4 – 5 years) and most often mate for life (Byrd 1991; Watts, pers. comm. 2001).

Virginia supports a resident breeding population of Bald Eagles, as well as five Bald Eagle "concentration areas" where sub-adults and non-breeding adults congregate. These concentration areas are used for foraging, perching, and roosting during one or more seasons of the year (Buehler et al. 1991; USFWS 2001; Watts and Whalen 1997). The lower James River (which includes Jamestown Island) supports the largest known concentration of summering eagles in eastern North America (Watts and Whalen 1997) - eagles congregated during the summer season as they forage and roost are referred to as summering.

In addition to extensive forested areas required for nesting and roosting, Bald Eagles also need substantial stretches of forested shoreline for foraging and loafing. During the day, eagles may spend as much as 94% of their time perching (Gerrard et al. 1980). The primary food source for these large birds is fish, although they also prey upon other birds and small mammals, and will scavenge carrion when available. In Virginia, Bald Eagles eat primarily shad, carp, catfish, perch, menhaden, and eels. In the fall and winter, eagles shift their foraging to waterfowl, with a higher dependence upon carrion (Clark 1992; Watts and Whalen 1997). Foraging is a key activity, and timing appears to be influenced by tidal fluctuations, time of day, and season.

Bald Eagles normally mate for life and usually nest in the same area each year. Mated pairs may use two or more alternate nest sites in the same area from year to year, and in Virginia, approximately 28% of breeding pairs build new nests each year (Bradshaw, pers. comm. 2001; Watts, pers. comm. 2001). Although different pairs of eagles show different degrees of sensitivity to human activity, all Bald Eagles are vulnerable to human disturbance, especially if normal human activity patterns to which eagles have become habituated are suddenly changed or increased (Bradshaw, pers. comm. 2001; Davis, pers. comm. 2001). Breeding eagles are most sensitive to disturbance when nest building and immediately after laying eggs (Bradshaw, pers. comm. 2001; Watts, pers. comm. 2001). In Virginia, this is generally from around November 15 through January 30. During this time, eagles are especially intolerant of disturbance and may readily abandon a newly built or readied nest or a nest with eggs. After breeding, Bald Eagles have committed to a nesting location and young are hatched, adults are vigilant parents until young eagles (eaglets) are on their own. Fledging usually occurs from around June 1 through July 15. Immediately prior to fledging (from May 15 through July 15) eaglets are very skittish and sensitive to disturbance. During this sensitive time, eaglets have been known to leap from nests when startled or harassed (Bradshaw, pers. comm. 2001; DGIF 1994; Watts, pers. comm. 2001), resulting in death, injury, or exposure to predation and elements. Visual screening and distance buffers from human activity are essential to Bald Eagle reproductive and foraging success (Bradshaw, pers. comm. 2001; Byrd 1991; Davis, pers. comm. 2001). Bald Eagles at Jamestown Island nest and breed earlier than any others in Virginia (Bradshaw, pers. comm. 2001; Davis, pers. comm., 2001), and the USFWS and DGIF concur on a protection season from November 15 through June 30 (Davis, pers. comm. 2001). Depending upon individual breeding pairs, the period of protection could extend to July 15, or until all eaglets have fledged (Davis, pers. comm. 2001). During October 2002 because of eagle activity around the different Jamestown Island environs nest, the USFWS pushed forward the protection period to begin October 22, 2002.

Known Threats to Bald Eagles

Jamestown Island currently supports three active Bald Eagle nests (Figure 5). Of the three nests, only one nest (VAJC-0101) is likely to be affected by the Proposed Action. Eagles at this nest (VAJC-0101) already face significant threats under current circumstances. Indeed, prior to discovery of the nest, these Bald Eagles were subjected to construction and excavation activities, nearby road resurfacing, and ever-present Park visitors. Additionally, this nest may be threatened by disturbance generated by steadily increasing amounts of water traffic along Back River.

Presently, there is no evidence that nesting eagles are disturbed by air traffic, and in fact, some breeding birds tolerate large amounts of traffic over and around their nests (Watts, pers. comm.

2001). However, if air traffic in the area increases in the future, it is possible that it could reach levels that could adversely affect nesting eagles. To avoid potential problems, USFWS, NPS, and DGIF staff have communicated with nearby military air stations, airports, and military bases to encourage pilots of helicopters, jets and small planes to observe the mandatory minimum 1000-foot vertical buffer near nesting Bald Eagles when flying in the area.

Water traffic on Back River is seasonal in nature, with increased traffic in the spring and summer months. Recent years have seen a marked increase in the number of jet skis and motorboats using Back River, Mill Creek, Sandy Bay, the Thorofare, and Powhatan Creek (Nash, pers. comm. 2001; Rafkind, pers. comm. 2001). Back River is narrow, and to adequately navigate the river, watercraft are forced to use the deeper center of the channel, placing them approximately 250 – 300 ft. from the eagle nest, well within the 750 ft. no-disturbance buffer recommended by the USFWS (Davis, pers. comm. 2001; Rafkind, pers. comm. 2001; Watts, pers. comm. 2001). Studies and personal observations have documented a strong disturbance impact when boats approach and stop close to nesting and roosting eagles (within approx. 65 – 70 ft.) along the shoreline (Knight and Knight 1984; Watts, pers. comm. 2001). Eagles at nest VAJC-0101 are obviously habituated to some routine boat traffic along Back River, however, boat traffic will be escalating with the Jamestown Project Proposed Action, and with increasing development in the area. To offer the eagles as much protection as possible, on the recommendation of Dr. Bryan Watts of CCB (pers. comm. 2001), posting of watercraft “no-stopping” signs is suggested for this stretch of Back River especially during crucial “no-disturbance times” (such as early nest building and immediately prior to fledging, when eaglets are most susceptible to disturbance (Bradshaw, pers. comm. 2001).

An observation log from March 14 through June 14, 2002 documented many instances of boat traffic in Back River, and vehicular traffic on Jamestown Island, with little reaction from the nesting eagles or their eaglets. Adult eagles appeared to be most aware of disturbance (both water and land) when eaglets were moving about and nearing fledging. As discussed in the Life History section, this is when eaglets are especially vulnerable. Noteworthy observations that appeared several times was that adult eagles were particularly agitated or vigilant when multiple jet skis passed the nest at the same time. These eagles seemed relatively undisturbed by most noise, so the “visual size” of combined jet skis (appearing perhaps like a very large boat) may be the disturbing factor. The adult eagles also appeared disturbed occasionally by particularly loud vehicles as they passed in the parking lot. Most events and vehicles causing the adult eagles to become agitated occurred when the eaglets were moving about and were very close to fledging.

Bald Eagles are uncommon throughout parts of their range and are considered threatened in Virginia. Presently, the species is listed as threatened by the Federal Endangered Species Act and endangered pursuant to the Virginia Endangered Species Act (Code of Virginia 1977; USFWS 1990; USFWS 2001). Under the Federal Endangered Species Act, “take” of federally-listed species is prohibited; and is defined as “ … to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such conduct” (50 C.F.R. §§ 17.31, 17.21). Bald Eagle populations have made a steady recovery since the ban on use of certain persistent pesticides in the United States and the USFWS has announced an “intent to delist.” Delisting may occur in 2002, but an exact date is unknown (Davis, pers. comm. 2001). While federal regulations will be lifted when the Bald Eagle is delisted, state laws and regulations will still

apply. It is likely that the Bald Eagle will remain State-listed as either Endangered or Threatened (Cooper, pers. comm. 2001). Although Bald Eagle numbers in Virginia are stable, the species continues to be threatened by habitat loss and human disturbance.

DIRECT AND INDIRECT ADVERSE EFFECTS OF PROPOSED ACTION

Sensitive Joint-vetch

Direct: There are no direct adverse effects of the Proposed Action on sensitive joint-vetch in Back River Marsh. One original boardwalk alignment placed the elevated marsh boardwalk in close proximity to the sensitive joint-vetch population (Figure 6). The elevated boardwalk was re-aligned after meetings involving the Endangered Species Coordinator for the US Fish and Wildlife Service, Virginia Field Office; Virginia Department of Conservation and Recreation, Division of Natural Heritage; National Park Service Endangered Species Coordinator; and Researchers from the Department of Biology, University of Maryland. The alignment presented in the Proposed Action avoids the sensitive joint-vetch population, as well as "high probability potential habitat" (refer to Figure 2).

Indirect: Construction of the trail and boardwalk through the marsh will result in removal or displacement of existing vegetation and soil disturbance in the marsh. A primary threat from this construction is establishment of new stands of common reed, which readily take advantage of soil disturbance (Marks et al. 1993; Ailstock et al. 2001). Expansion of common reed in Back River Marsh is a threat to sensitive joint-vetch. The Park has targeted common reed for control and funds have been set aside for the approved and recently implemented management and control/mitigation plan. Regional Science has approved funding for year two and three, but the Park will need to make a long-term commitment. The National Capitol Region Exotic Pest Management Team (NCREPMT) starting in October 2002, and the Virginia Exotic Pest Management Team starting in FY2003 will assist in meeting this goal.

Boardwalk materials and construction methods will adhere to best management practices (BMPs) designed to minimize impacts to the marsh during and after construction. Additionally, many types of recycled plastic materials are available which are durable, non-toxic, and specifically designed for marine environments (Perry, pers. comm. 2001; Priest, pers. comm. 2001; Rafkind, pers. comm. 2001). Alternative construction methods that minimize disturbance to the marsh, such as the screw, or "helical anchor system" (e.g. http://www.abchance.com/ch_app/boardwalk.html), "build-as-you-go" or "top down" methods (working from existing structure to minimize impacts to marsh vegetation and soils) (Priest, pers. comm. 2001) will be used.

Potential Adverse Effects on Sensitive Joint-vetch

When construction and implementation plans for the Proposed Action are completed, they will be reviewed by subject/discipline experts such as the VIMS Wetlands Advisory Board, sensitive joint-vetch experts, design and construction experts from other National Parks, the USFWS and VMRC. The Park will use these reviews to ensure that construction methods are designed to minimize soil disturbance, vegetation mortality, and the spread of non-native, invasive species.

- Control of non-native, invasive marsh vegetation: The Park will continue with a recently implemented management, monitoring and control/mitigation program for common reed. Areas disturbed by construction of the boardwalk will be specifically monitored for colonization by common reed or other non-native, invasive species. Incipient colonies of

common reed or other non-native, invasive species will be controlled immediately upon discovery.

- Monitoring: The Park will monitor the Back River marsh sensitive joint-vetch population to determine status and trends of the population, changes in vegetation and habitat, changes in water quality and salinity, changes in erosion due to boat traffic, and the spread of non-native, invasive plants. If monitoring shows that increased boat traffic or visitor use/activity is negatively impacting sensitive joint-vetch, the Park will modify management to reduce impacts to acceptable levels.

Because the Proposed Action avoids impacts to the sensitive joint-vetch, establishes a monitoring and control program for non-native, invasive plants, commits to managing increased boat traffic and visitor use if needed to prevent unacceptable impacts to Back River Marsh, the Proposed Action is not likely to adversely affect the sensitive joint-vetch.

Bald Eagle

Direct: The Proposed Action contains several components with potential negative effects on nesting eagles at nest VAJC-0101. One component with potential for adverse effects is the hiking/bicycle boardwalk from Neck of Land, across Back River Marsh and Back River, joining with a new modal transfer location on Jamestown Island (Figure 6). The boardwalk is routed to avoid most impacts on eagles, but construction of the boardwalk could potentially disturb nesting birds. To minimize these potential effects, construction timing and practices will be implemented in close coordination with USFWS and DGIF (Bradshaw, pers. comm. 2001; Cooper, pers. comm. 2001; Davis, pers. comm. 2001). When construction and implementation plans for the Proposed Action are completed, they will be reviewed by subject/discipline experts such as the Center for Conservation Biology, VIMS Wetlands Advisory Board, Department of Game and Inland Fisheries, design and construction experts from other National Parks, the USFWS and the VMRC. The Park will use these reviews to ensure that construction methods are designed to minimize disturbance effects on Bald Eagles.

Indirect: Increased activity at the modal transfer station on the Island may directly or indirectly affect nesting eagles (Figure 7). New tour boats and construction of three new docks will significantly increase watercraft traffic. Presently, nesting eagles are acclimated to and tolerate existing levels of boat traffic on Back River. Increases in water traffic and general disturbance near the nest are types of activities that can cause eagles to abandon nests and/or offspring, prohibit a return the following year, and interrupt foraging and roosting behavior (Bradshaw, pers. comm. 2001). Plans for multimodal access to Jamestown Island include tour boats, which will begin daily operation no earlier than 10 am, and will depart from the Neck of Land dock for 1 to 2 hour trips (Figure 8) around Jamestown Island. Tour boats will make 3 to 4 trips daily, from April to October. These boats are proposed to be similar in size and style to the Jamestown Explorer. Two boat taxis will also run every 20 minutes, daily from 10 am to 4 or 5 pm. Boat taxis will originally leave from the Neck of Land dock, proceed up the Back River to the Jamestown Island dock, then to the Powhatan Creek Overlook dock, and will return down Back River to make a complete loop (Aldrich, pers. comm. 2002). These boats are proposed to be similar in size and style to the Jamestown Explorer. Boat taxis will pass on each run, but locations (of pass points) are presently unknown. The Proposed Action suggests that the Jamestown Explorer may leave from one of the new NPS docks, or may include one of the new

docks as a stop on the regularly scheduled tours, although this would alter the current route. Prior to the 2002 tourist season, the Jamestown Explorer followed a route down Back River to The Thorofare, and under the isthmus bridge into the James River (Figure 9). With the start of the 2002 tourist season the Explorer route was changed (Figure 10) and the boat now runs 3 to 4 daily trips through Sandy Bay and into the James River and back.

Potential Adverse Effects on Nesting Bald Eagles

The increase in Park-related water traffic (from 3 to 4 scheduled boat trips currently [Jamestown Explorer- which only passes through Sandy Bay and not directly past nest VAJC-0101], to approximately 48 trips past the eagle's nest [tour boats, boat taxis, perhaps a changed Jamestown Explorer route], is likely to adversely affect nesting Bald Eagles by directly disturbing nesting eagles and indirectly by disrupting foraging opportunities on Back River.

To minimize these potential impacts, dock construction timing and practices will be implemented in close coordination with USFWS and DGIF (Bradshaw, pers. comm. 2001; Cooper, pers. comm. 2001; Davis, pers. comm. 2001). When construction and implementation plans for the Proposed Action are completed, they will be reviewed by subject/discipline experts such as the CCB, VIMS Wetlands Advisory Board, Department of Game and Inland Fisheries, design and construction experts from other National Parks, the USFWS and the VMRC. Consequently, after construction, the new dock facilities on Back River (on the Island, at Neck of Land, and at Powhatan Creek Overlook) should not affect nesting eagles.

The new Visitor Center and other proposed changes in the area currently serving as the Island parking lot will not likely affect nesting eagles after completion (Figure 11). To minimize potential effects during construction, construction timing and practices will be implemented in close coordination with USFWS and DGIF (Bradshaw, pers. comm. 2001; Cooper, pers. comm. 2001; Davis, pers. comm. 2001). When construction and implementation plans for the Proposed Action are completed, they will be reviewed by subject/discipline experts such as the CCB, VIMS Wetlands Advisory Board, DGIF, design and construction experts from other National Park, the USFWS and VMRC. The Park will use these reviews to ensure that construction methods are designed to minimize disturbance effects on Bald Eagles. Once new buildings and renovations are "under roof," construction should present no potential negative effects to the eagles.

The Proposed Actions at Neck of Land and Jamestown Island are unlikely to affect nesting eagles after completion. Construction and activities associated with changes to the raised access road to Jamestown Rediscovery Center will be implemented in close coordination with USFWS and DGIF (Bradshaw, pers. comm. 2001; Cooper, pers. comm. 2001; Davis, pers. comm. 2001).

Bald eagles are individuals, and as such, react to situations in a variety of ways. It is not possible to predict how much disturbance a pair of breeding Bald Eagles may tolerate before nesting success is affected.

Construction activities associated with the Proposed Action will be designed to minimize disturbance effects on Bald Eagles. Construction will occur outside of the breeding and fledging seasons or outside the 750 ft. buffer zones around nests. Nesting habitat will not be affected.

Post-construction activities and visitor use is likely to adversely affect Bald Eagles. The increase in Park-related water traffic from 3 to 4 boat trips per day to 48 boat trips per day may adversely effect nesting Bald Eagles by disturbing them while on the nest and/or may disrupt foraging opportunities on Back River. Visitor use of the boardwalk and other areas of the Park are expected to have no effect on Bald Eagles.

- The Park will monitor the success of Bald Eagle nests near the Proposed Action. If monitoring shows that increased boat traffic or visitor use is negatively impacting nesting success of the eagles, the Park will modify management of these actions to reduce impacts to acceptable levels.

SUMMARY OF STRATEGIES TO AVOID AND MINIMIZE ADVERSE EFFECTS TO LISTED SPECIES

Known potential effects have been considered and can be mitigated and/or minimized. All construction actions are likely to have no effect on Bald Eagles because they will be undertaken either outside the breeding season or outside protective disturbance buffers. No Bald Eagle nesting habitat will be negatively affected. Post-construction activities may affect Bald Eagles to a limited degree. Increases in boat traffic anticipated in the Proposed Action may disturb and disrupt nesting and foraging activity. Consequently, boat traffic is likely to have an adverse affect on Bald Eagles.

The table below summarizes project components that are likely to affect nesting Bald Eagles at Jamestown Island.

Table 4. Jamestown Island 400 Proposed Action components with potential adverse impacts to nesting Bald Eagles.

Project Component	Potential adverse impact	Actions to alleviate potential adverse impacts	Overall effect of Proposed Action
Construction of marsh boardwalk and bridge	Construction activities could disturb nesting eagles or pre-fledging eaglets causing nest abandonment or loss of eaglets.	Adhere to scheduling and construction guidelines determined by USFWS and DGIF.	No effect.
Subsequent use of marsh boardwalk and bridge	Hikers and cyclists may disturb nesting eagles, eaglets or could disrupt foraging.	Modify activities if monitoring results show adverse impacts to nesting and foraging success.	No effect.
Increased water traffic on Back River	Increased boat traffic could disturb nesting eagles/eaglets causing nest abandonment or loss of eaglets; increased water traffic could also disrupt foraging.	Post watercraft no-stopping areas; begin boat taxi service no earlier than 10 am. Modify use activities if monitoring results show adverse impacts to nesting and foraging success	May affect, likely to adversely affect.
Construction of buildings/ facilities on Jamestown Island	Construction activities could disturb nesting eagles or eaglets.	Adhere to scheduling and construction guidelines determined by USFWS and DGIF.	No effect.
Construction of new docks	Construction activities could disturb nesting eagles/eaglets, causing nest abandonment or loss of eaglets.	Adhere to scheduling and construction guidelines determined by USFWS and DGIF.	No effect.

The Park is committed to implementing strategies to avoid or minimize effects on the eagles. These strategies are based on the advice and experience of many individuals and organizations, including: the Endangered Species Coordinator for the USFWS, Virginia Field Office; the College of William and Mary Center for Conservation Biology; the Statewide Eagle Coordinator for DGIF; and the NPS Endangered Species Coordinator. Strategies are listed below:

- Coordination of construction activities, timing, materials, and techniques with USFWS, DGIF, VMRC, and the U.S. Coast Guard.
- Water transportation and tour services on Back River will begin no earlier than 10 am.
- Posting of watercraft no-stopping zones on Back River from Sandy Bay to the new boat dock on Jamestown Island.
- Seasonal closure of facilities or activities directly affecting nesting Bald Eagles or newly hatched eaglets if results of continued monitoring dictate that closures are necessary.
- Development and implementation of a monitoring plan for the biotic and abiotic resources of the Jamestown Project area environs, including listed species, effects on natural resources, visitor numbers, and use activities. A comprehensive monitoring plan will address listed species and other natural resources before, during, and after implementation of any activities presented previously, and should establish and provide for funding and staffing needs.

CONCLUSIONS

The Proposed Action is not likely to adversely affect the sensitive joint-vetch population at Back River Marsh, but is likely to adversely affect one pair of breeding Bald Eagles on Jamestown Island (nest VAJC-0101). The Proposed Action includes construction of new boat docks, which will subsequently result in increased boat traffic on Back River. Increased boat traffic in such close proximity to the nesting Bald Eagles is considered a significant threat (USFWS 2002). Strategies to avoid or minimize effects to eagles are detailed in the document and are listed above.

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Appendix A – List of Figures

Figure 1. Existing Conditions

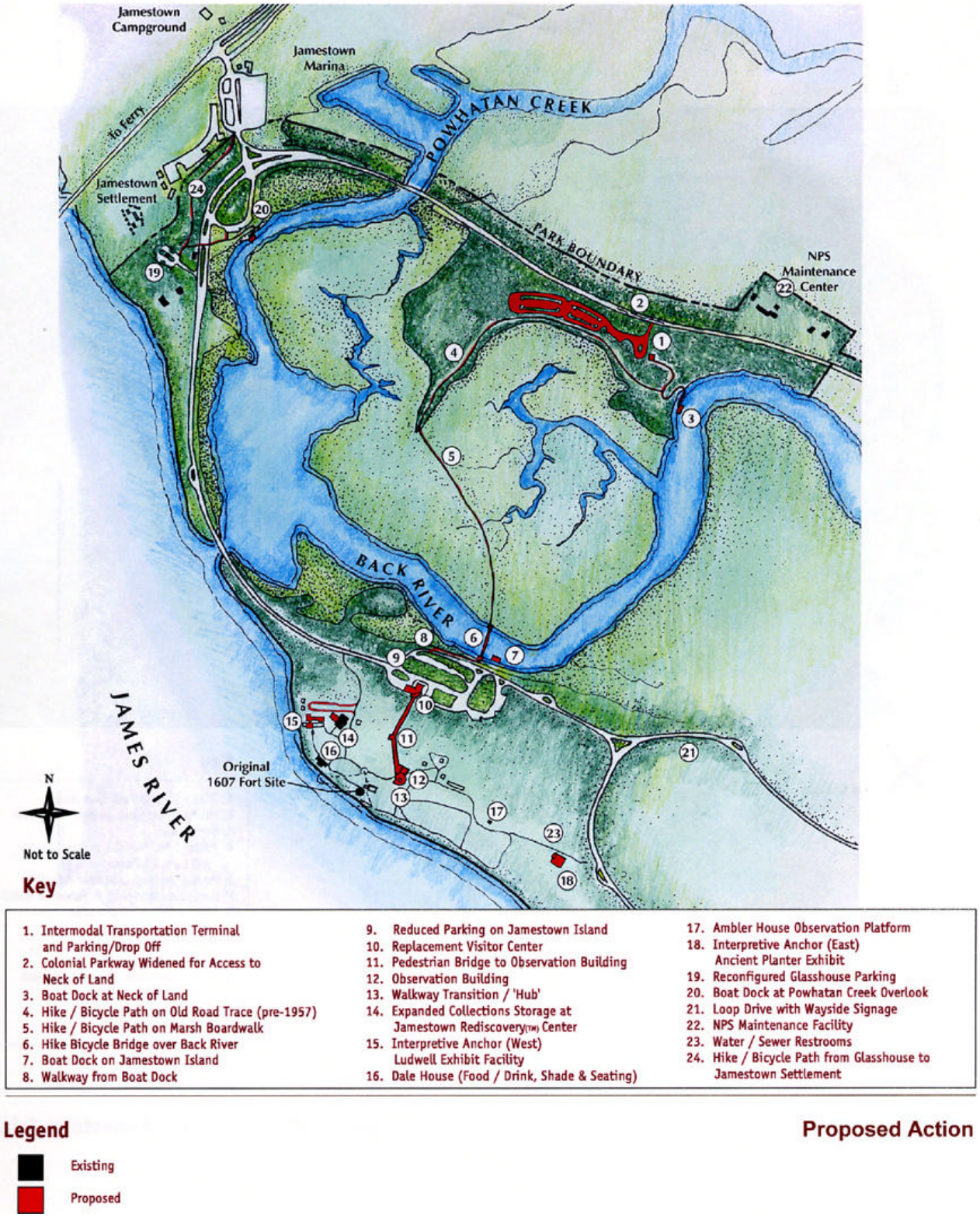

Figure 2. Jamestown Island 400 – Proposed Action

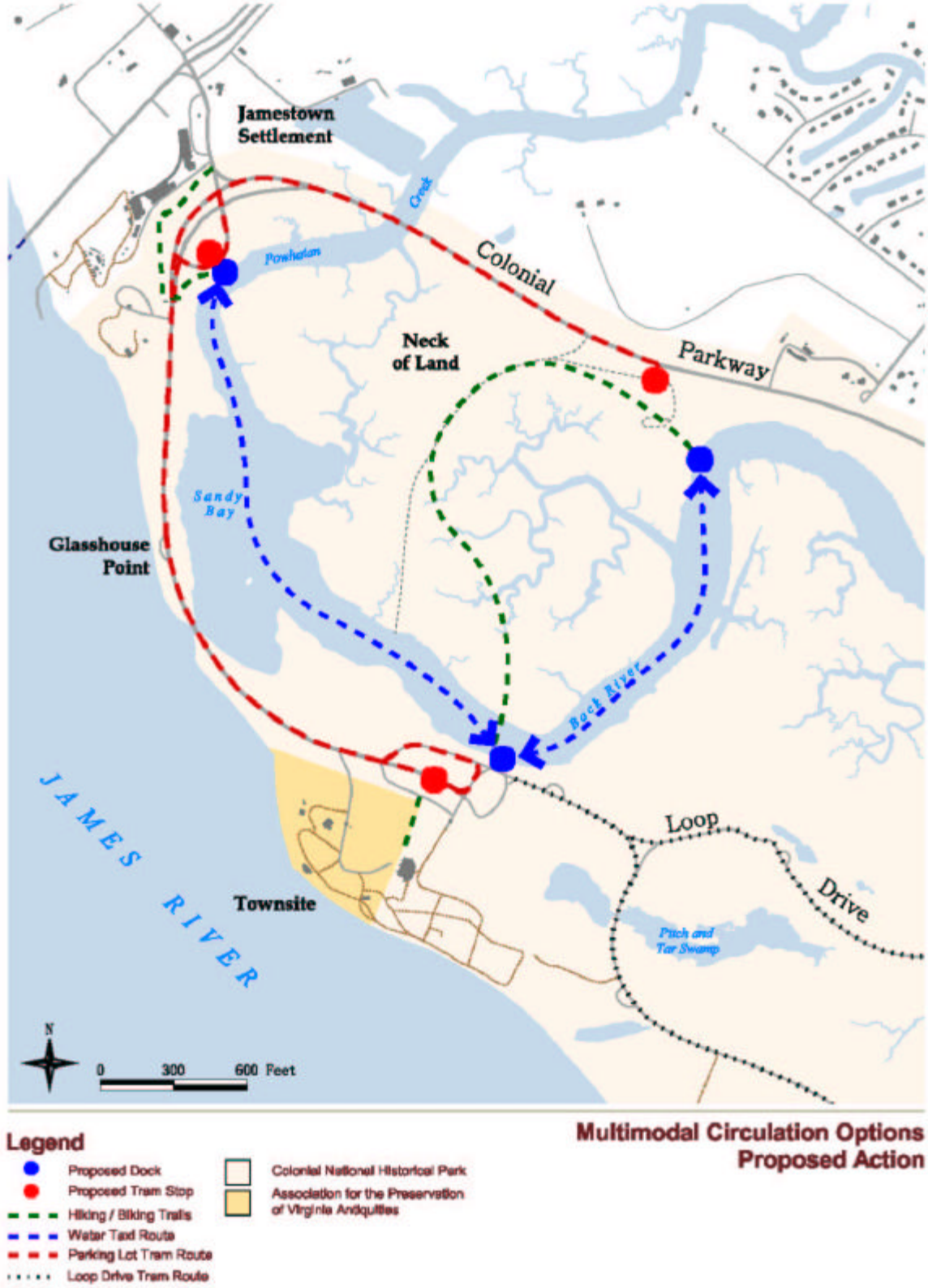

Figure 3. Multimodal Circulation Options – Proposed Action

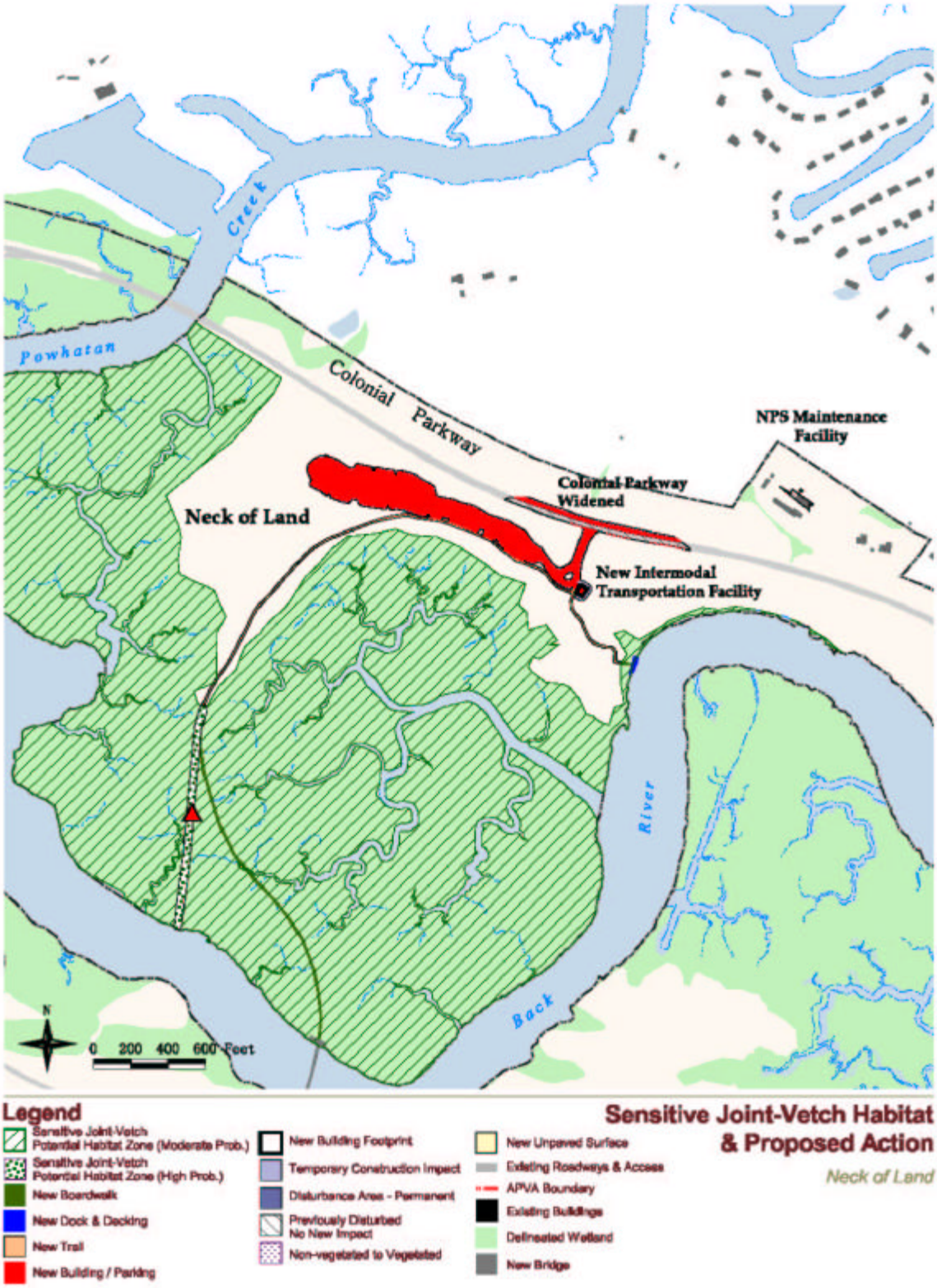

Figure 4. Sensitive Joint-Vetch Habitat – Proposed Action

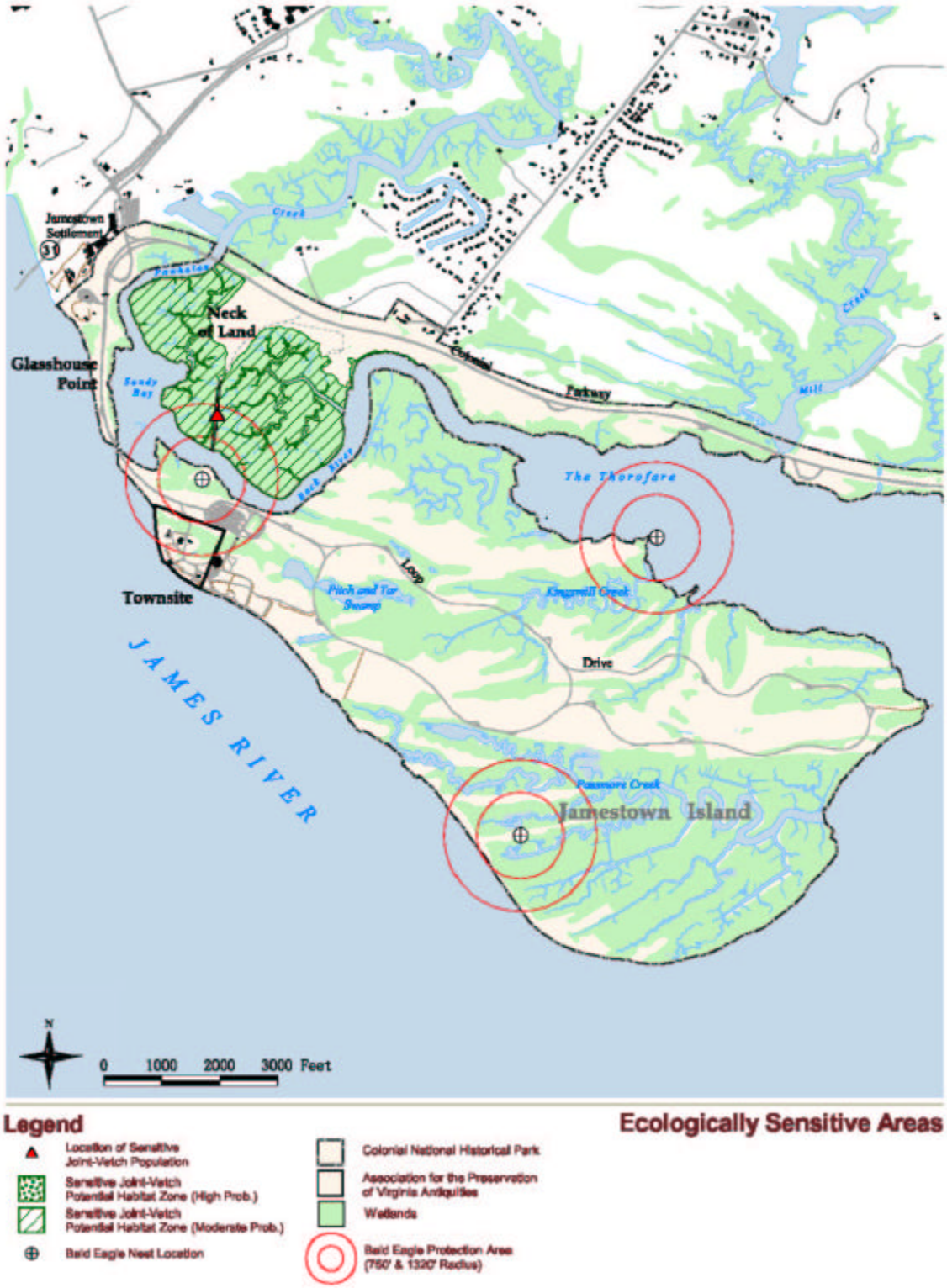

Figure 5. Ecologically Sensitive Areas

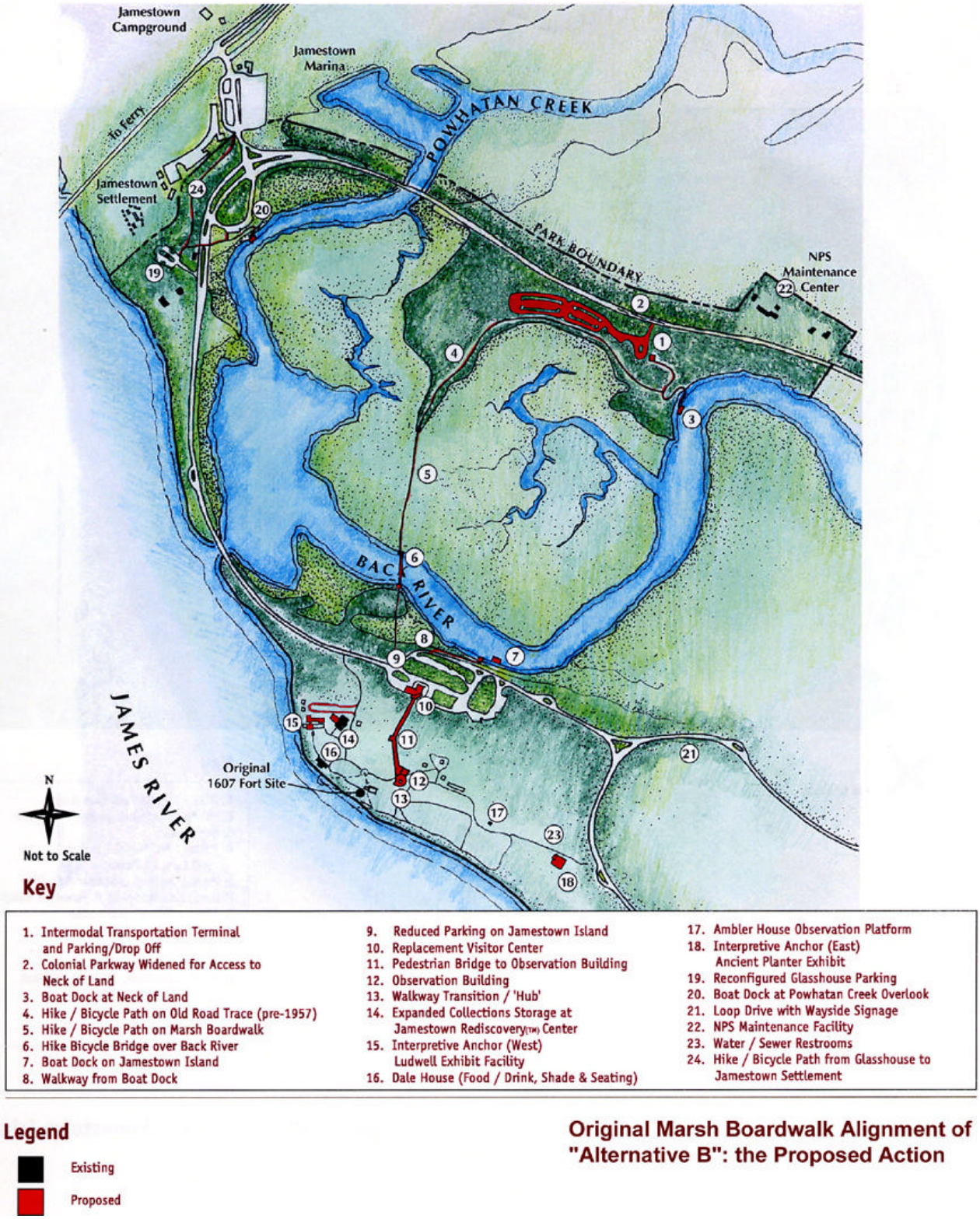

Figure 6. Original boardwalk alignment (presented in Alternative B)

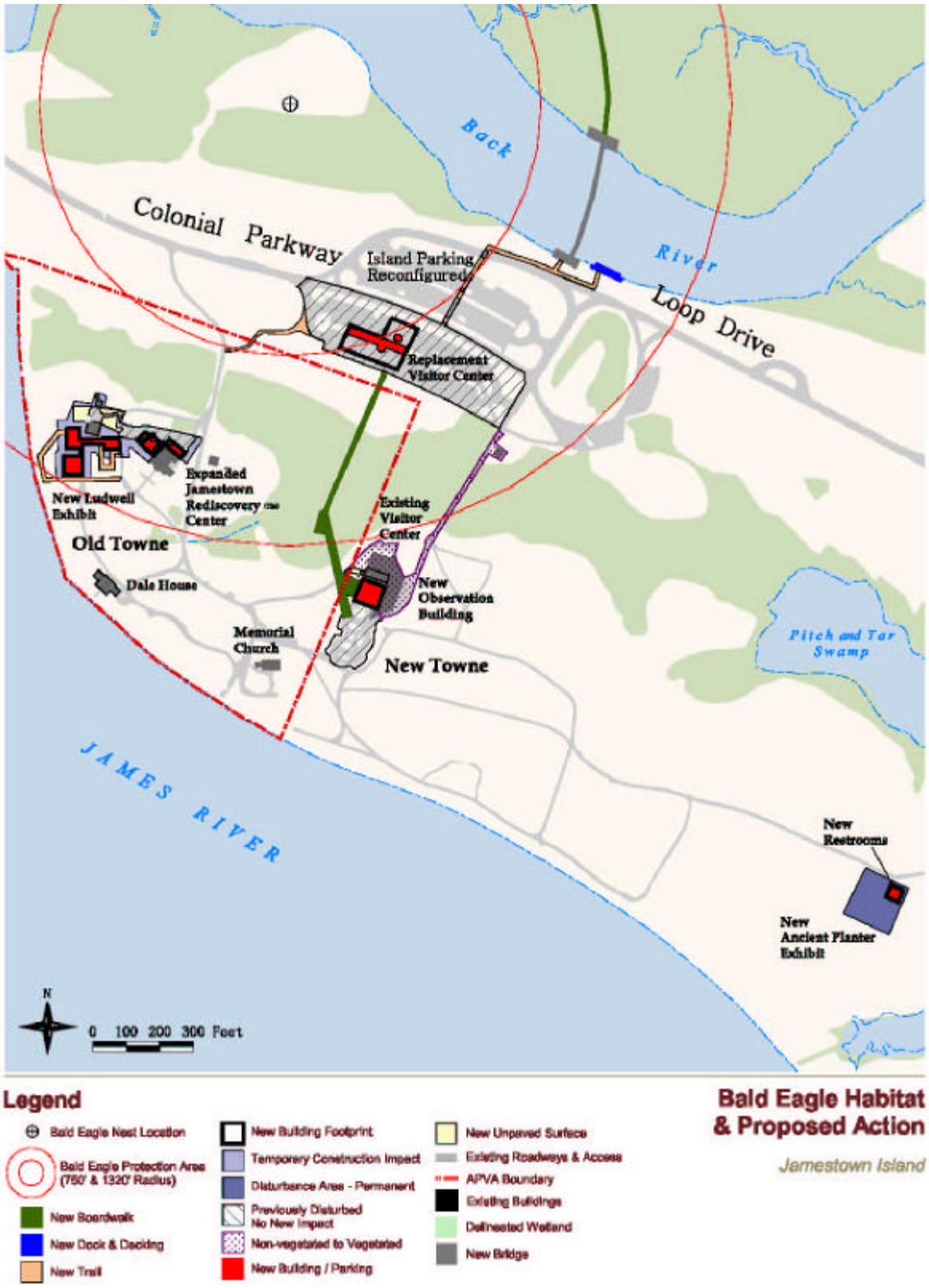

Figure 7. Bald Eagle Habitat and Proposed Action

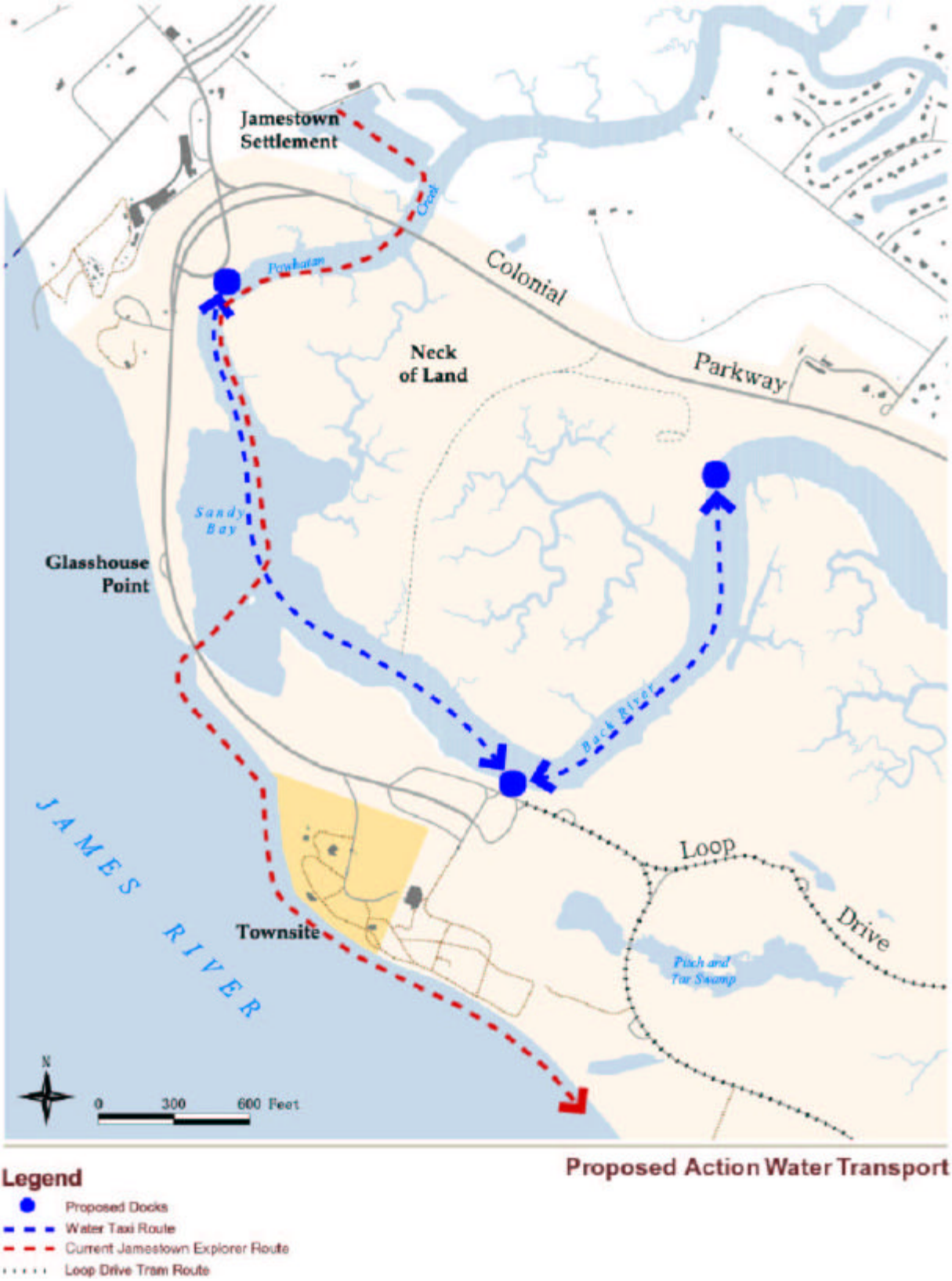

Figure 8. Proposed Acton Water Transportation

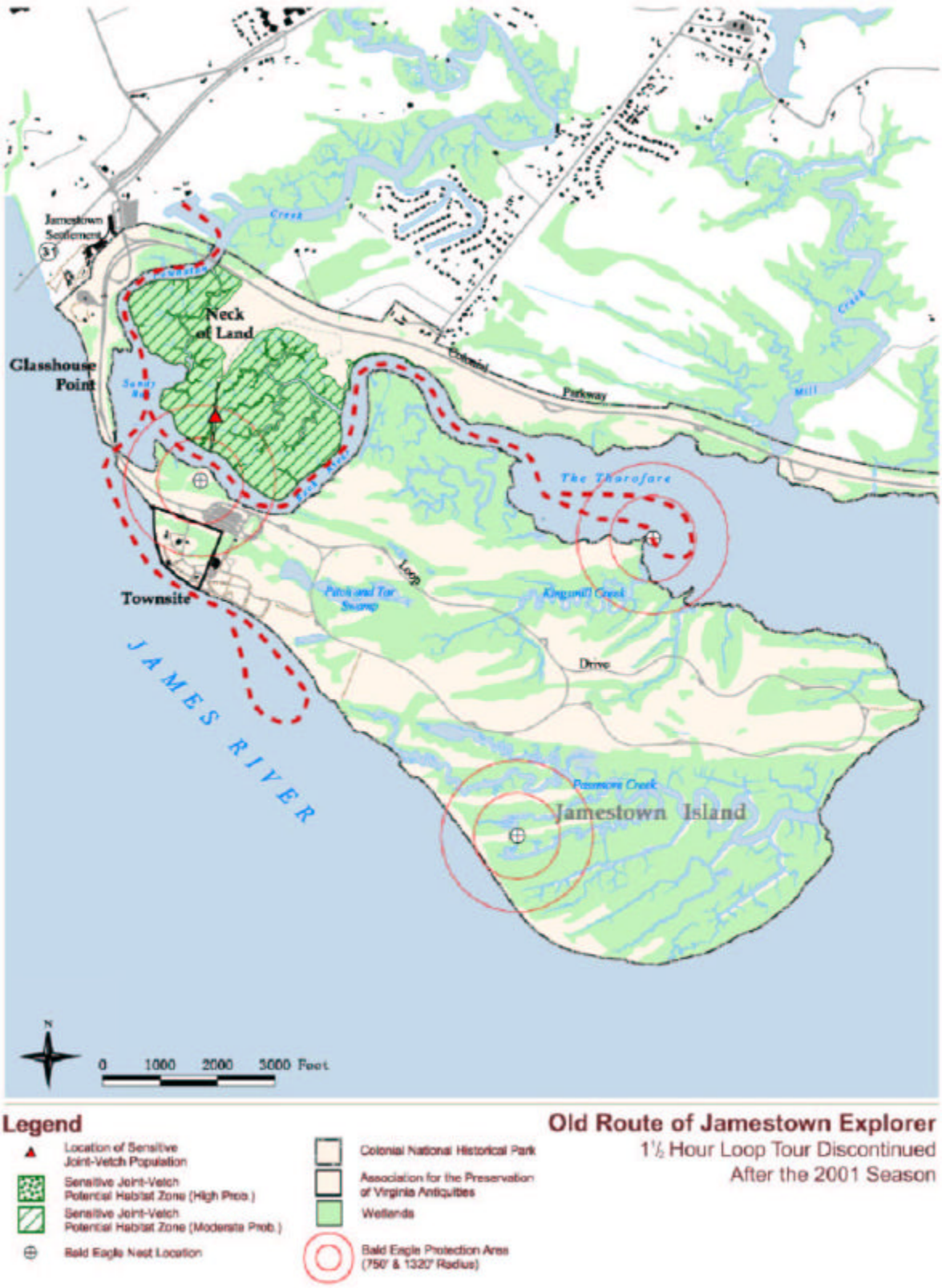

Figure 9. Old Route of Jamestown Explorer

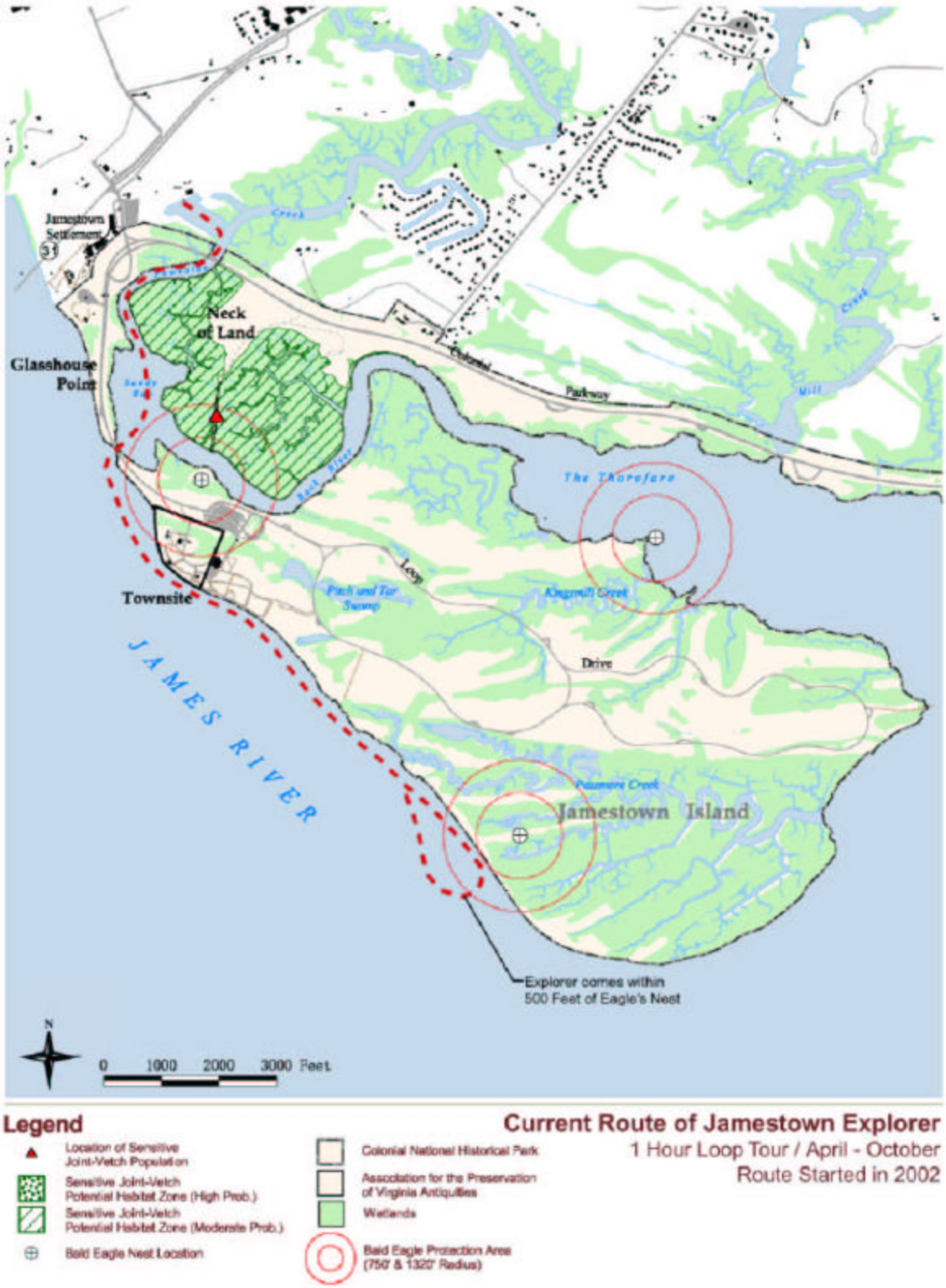

Figure 10. Current Route of Jamestown Explorer

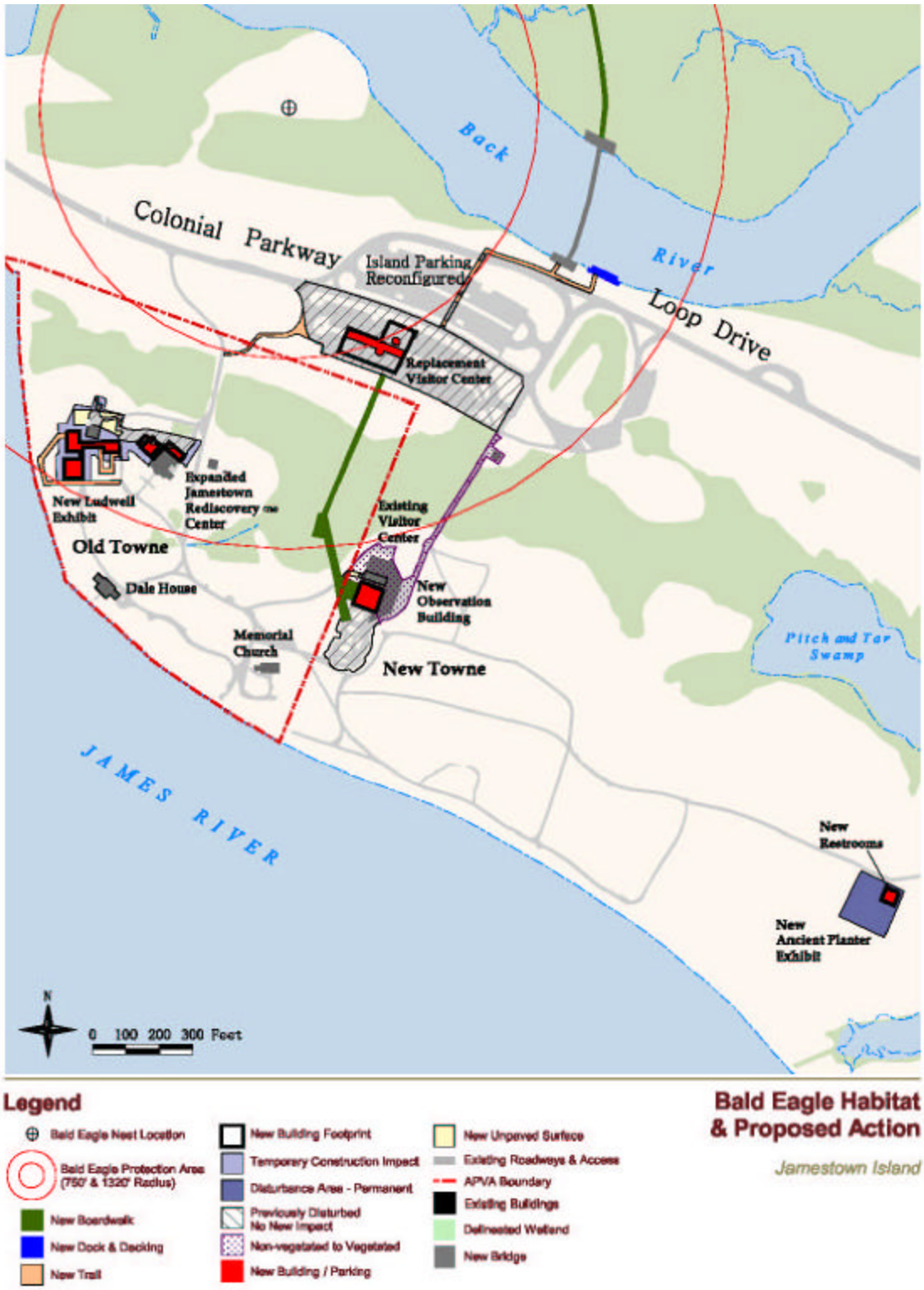

Figure 11. Proposed Action Construction

Appendix B - Explanation of Natural Heritage and USFWS Rarity Ranks

Natural Heritage Rarity Ranking System:
Each of the significant natural features (species, community type, etc.) monitored by DCR-DNH is considered an element of natural diversity, or simply an element. Each element is assigned a rank that indicates its relative rarity on a five-point scale (1 = extremely rare; 5 = abundant; Table 1). The primary criterion for ranking elements is the number of occurrences, i.e., the number of known distinct localities or populations. Also of great importance is the number of individuals at each locality or, for highly mobile organisms, the total number of individuals. Other considerations include the condition of the occurrences, the number of protected occurrences, and threats. However, the emphasis remains on the number of occurrences, so that ranks essentially are an index of known biological rarity. These ranks are assigned in terms of the element's rarity within Virginia (its State or S-rank), the element's rarity within a Nation (its National or N-rank), and the element's rarity across its entire range (its Global or G-rank). Subspecies and varieties are assigned a Taxonomic (T-) rank in addition to their G-rank. A Q indicates taxonomic uncertainty. Taken together, these ranks give an instant picture of an element's rarity. For example, a designated rank of G5S1 indicates an element which is abundant and secure range-wide, but rare in Virginia. In some cases, ranks are provisional or lacking, due to ongoing efforts by the Natural Heritage network to classify community syntaxa and cryptic plants or animals. Rarity ranks used by DCR-DNH are not legal designations, and they are continuously updated to reflect new information.

Table 1. Definition of Natural Heritage state rarity ranks. Global ranks are similar to state ranks, but refer to a species' range-wide status. Note that GA and GN are not used and GX means extinct. GM and GW are ranks used only for communities, and refer to highly modified (GM) and ruderal (GW) vegetation respectively. National ranks are similar as well, and refer to a species' rarity within a nation, such as the United States or Canada. Sometimes ranks are combined (e.g., S1S2) to indicate intermediate or somewhat unclear status. Elements with uncertain taxonomic validity are denoted by the letter Q, after the global rank. These ranks should not be interpreted as legal designations.

S1 Extremely rare; usually 5 or fewer occurrences in the state, or in the case of communities, covering less than 50 hectares in aggregate; or may have a few remaining individuals; often especially vulnerable to extirpation.

S2 Very rare; usually between 5 and 20 occurrences, or in the case of communities, covering less than 250 hectares in aggregate; or few occurrences with many individuals; often susceptible to becoming endangered.

S3 Rare to uncommon; usually between 20 and 100 occurrences; may have fewer occurrences, but with a large number of individuals in some populations; may be susceptible to large-scale disturbances.

S4 Common; usually more than 100 occurrences, but may be fewer with many large populations; may be restricted to only a portion of the state; usually not susceptible to immediate threats.

S5 Very common; demonstrably secure under present conditions.

SA Accidental in the state.

SH Historically known from the state, but not verified for an extended period, usually more than 15 years; this rank is used primarily when inventory has been attempted recently.

SM Applied to vegetation extensively modified by disturbance but considered recoverable by management, time, or restoration of ecological processes.

SN Regularly occurring migrants or transient species which are non-breeding, seasonal residents. (Note that congregation and staging areas are monitored separately).

SU Status uncertain, often because of low search effort or cryptic nature of the element.

SW Applied to vegetation dominated by ruderal or exotic species.

SX Apparently extirpated from the state.

The spot on the landscape that supports a natural heritage resource is an element occurrence. DCR-DNH has mapped over 7,500 element occurrences in Virginia. Information on the location and quality of these element occurrences is computerized within the Division's BCD system, and additional information is recorded on maps and in manual files.

In addition to ranking each element's rarity, each element occurrence is ranked to differentiate large, outstanding occurrences from small, vulnerable ones. In this way, protection efforts can be aimed not only at the rarest elements, but also at the best examples of each. Species occurrences are ranked in terms of quality (size, vigor, etc.) of the population; the condition (pristine to disturbed) of the habitat; the viability of the population; and the defensibility (ease or difficulty of protecting) of the occurrence. Community occurrences are ranked according to their size and overall natural condition. These element occurrence ranks range from A (excellent) to D (poor). Sometimes these ranks are combined to indicate intermediate or somewhat unclear status, (e.g., AB or CD). In a few cases, especially those involving cryptic animal elements, field data may not be sufficient to reliably rank an occurrence. In such cases a rank of E (extant) may be given. A rank of H (historical) is used to indicate an historical occurrence that could not be relocated by recent survey. Element occurrence ranks reflect the current condition of the species' population or community. A poorly-ranked element occurrence can, with time, become highly-ranked because of successful management or restoration.

Element ranks and element occurrence ranks form the basis for ranking the overall significance of sites. Site biodiversity ranks (B-ranks) are used to prioritize protection efforts, and are defined in Table 2.

Table 2. Biodiversity ranks used to indicate site significance.

B1 Outstanding Significance: only site known for an element; an excellent occurrence of a G1 species; or the world's best example of a community type.

B2 Very High Significance: excellent example of a rare community type; good occurrence of a G1 species; or excellent occurrence of a G2 or G3 species.

B3 High Significance: excellent example of any community type; good occurrence of a G3 species.

B4 Moderate Significance: good example of a community type; excellent or good occurrence of state-rare species.

B5 General Biodiversity Significance: good or marginal occurrence of a community type or state-rare species.

USFWS Rarity Ranking System:
The U.S. Fish and Wildlife Service (USFWS) is responsible for the listing of endangered and threatened species under the Endangered Species Act of 1973, as amended. Federally listed species (including subspecific taxa) are afforded a degree of legal protection under the Act, and therefore sites supporting these species need to be highlighted. USFWS also maintains a review listing of potential endangered and threatened taxa known as candidate species. Table 3 illustrates the various status categories used by USFWS and followed in this report. The status category of candidate species is based largely on the Service's current knowledge about the biological vulnerability and threats to a species.

As of February 27, 1996, species formerly referred to as Category 2 (C2) candidates for listing as threatened or endangered are no longer considered "candidates" under the Endangered Species Act. The USFWS no longer maintains a formal, comprehensive list of such species. However, the Virginia Field Office of the USFWS intends to maintain an informal list of these and other "Species of Concern" that may warrant future consideration as candidates. These "Species of Concern" can be regarded as species for which the Service has insufficient scientific information to support a listing proposal. Former Category 1 (C1) species are now considered "candidates" (C) for listing. "Candidate" species are species for which the USFWS has enough scientific information to warrant a proposal for listing. The designation of Category 3 species (3A, 3B, 3C) has been discontinued. However, the USFWS will continue to maintain its files on these species in case new information indicates a need for reevaluation.

Table 3. U.S. Fish and Wildlife Service species status codes, with abbreviated definitions

LE	Listed endangered
LT	Listed threatened
PE	Proposed to be listed as endangered
PT	Proposed to the listed as threatened
C	Candidate: status data supports listing of taxon as endangered or threatened
SOC	Species of Concern: no official status, evidence of vulnerability, but insufficient data exists.

In Virginia, two acts have authorized the creation of official state endangered and threatened species lists. One act (Code of Virginia ' 29.1-563 through 570), administered by the Virginia Department of Game and Inland Fisheries (DGIF), authorizes listing of fish and wildlife species, not including insects. The other act (Code of Virginia ' 3.1-1020 through 1030), administered by the Virginia Department of Agriculture and Consumer Services (VDACS), allows for listing of plant and insect species. In general, these acts prohibit or regulate taking, possessing, buying, selling, transporting, exporting, or shipping of any endangered or threatened species appearing on the official lists. Species protected by these acts are indicated as either listed endangered (LE) or listed threatened (LT). Species under consideration for listing are indicated as candidates (C). (November 2000)