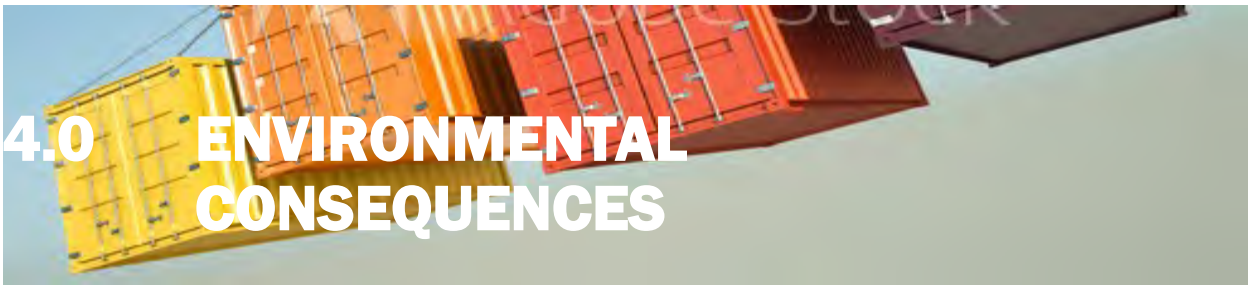


4.0 ENVIRONMENTAL CONSEQUENCES

Chapter 4, "Environmental Consequences," provides a description of potential impacts that could be expected for the human and natural environment as a result of Alternative 1 (Proposed Project) and the alternatives. Impact information is predominantly based on preliminary design provided by the Applicant. The Corps recognizes that Palmetto Railways is conducting voluntary cleanup and site preparation of the Project site, and that these activities will be required to redevelop the site regardless of whether the Department of the Army (DA) permit is issued. An evaluation and discussion of the potential impacts that could be expected from these activities are included within each resource section.

Resource areas discussed in this chapter include:

- Geology and Soils (Section 4.1)
- Hydrology (Section 4.2)
- Water Quality (Section 4.3)
- Vegetation and Wildlife (Section 4.4)
- Waters of the U.S. (Section 4.5)
- Protected Species (Section 4.6)
- Essential Fish Habitat (Section 4.7)
- Transportation (Section 4.8)
- Land Use and Infrastructure (Section 4.9)
- Cultural Resources (Section 4.10)
- Visual Resources and Aesthetics (Section 4.11)
- Noise and Vibration (Section 4.12)
- Air Quality (Section 4.13)
- Climate Change (Section 4.14)
- Hazardous, Toxic, and Radioactive Waste (Section 4.15)
- Socioeconomics and Environmental Justice (Section 4.16)
- Human Health and Safety (Section 4.17)
- Section 4(f)/6(f) Resources (Section 4.18)

NEPA requires that three types of impacts be evaluated: direct, indirect and cumulative impacts. Direct and indirect impacts are discussed in Chapter 4, while cumulative impacts are discussed in Chapter 5, as described below:

- **Direct effects** – Direct effects are caused by a proposed action and occur at the same time and place (40 C.F.R. 1508.8). Direct impacts may have both beneficial and adverse effects.
- **Indirect effects** – Indirect effects are caused by a proposed action but occur later in time or are farther removed in distance but still reasonably likely to occur. Indirect effects may include growth inducing effects and other effects related to "induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems" (40 C.F.R. 1508.8).
- **Cumulative effects** – Cumulative effects are additive or indirect effects that would result from the incremental impact of a proposed action when added to other past, present, and

reasonably foreseeable future actions (RFFAs), regardless of what agency or person undertakes such other actions (40 C.F.R. 1508.7). Examples of RFFAs that could interact with Proposed Project-related impacts to result in cumulative impacts are the Charleston Harbor Post 45 (the deepening of the Charleston Harbor to 50+ feet mean low water), construction of the HLT (formerly the Navy Base Marine Container Terminal at the Charleston Naval Complex), and expansion of commercial, institutional, and industrial facilities.

Direct and indirect impacts of Alternative 1 (Proposed Project) and alternatives are further evaluated for each resource in relation to context, duration, intensity, type, and potential to occur:

- Context (limited, local, or regional)
- Duration (temporary, short-term, long-term, or permanent)
- Intensity (negligible, minor, moderate, major, No Effect, No Adverse Effect, Adverse Effect)
- Type (beneficial or adverse)
- Potential to occur (unlikely, possible, or probable)

In the introduction for each resource section, the reader is provided a brief description of the methodology used for assessing and evaluating potential impacts, as well as definitions related to the intensity of potential impacts. With the exception of waters of the U.S., each resource section used the following definitions related to the duration of potential impacts:

- Temporary = Up to 1 week
- Short-Term = Up to 5 years
- Long-Term = Up to 10 years
- Permanent = Longer than 10 years

The definitions related to the duration of potential impacts associated with waters of the U.S are derived from the time limits associated with the Charleston District Regional Condition for the 2012 Nationwide Permits, which assigns an impact of less than 6 months as Temporary and an impact of greater than 6 months as Permanent.

Lastly, an impact summary, which takes into account the significance of impacts after mitigation implementation, is provided for each resource evaluated at the end of each resource section. When discussing impacts to action alternatives for any resource area, mitigation measures as presented for Alternative 1 (Proposed Project) would also be applicable to the action alternatives.

4.1 GEOLOGY AND SOILS

4.1.1 Methods and Impact Definitions

Impacts to geology and soils were evaluated through a review of site-specific geotechnical reports, conceptual development plans specific to the alternatives, and available literature on the regional

geology, as well as Geographic Information System (GIS) analysis and best professional judgment. The literature review was used to identify and assess potential alterations to topography; potential for soil erosion, soil compaction, and/or runoff; unique geologic features, such as paleontological resources, that could be disturbed or impacted; presence of a confining layer(s) above an aquifer; and sources/locations and volume of fill material that would be transported to meet fill requirements for Alternative 1 (Proposed Project) and alternatives.

Activities associated with the construction and operation of the ICTF that could impact the geology and soils within the study area include site preparation for the facility and roadway and rail improvements, and use of staging areas and buffers for construction. These activities can result in soil erosion and/or compaction, as well as modification to slopes and drainage patterns at the site. Long-term changes in soil type and cover across the study area resulting from changes in the landscape also could occur. Impact definitions for Geology and Soils are presented in Table 4.1-1.

Table 4.1-1
Impact Definitions, Geology and Soils

	Negligible	Minor	Major
Geology and Soils	No effect to unique geologic features; no visible soil erosion and/or loss of topsoil; fill requirements can be met by regional sources of fill material; no effect to confining layers overlaying an aquifer.	Unique geologic features are encountered and preserved; localized, short-term soil erosion and loss of topsoil.	Unique geologic features are encountered and not preserved; increased soil erosion and runoff that extends beyond the Project/alternative sites; fill requirements exceed availability of fill material from regional sources; and breaching of a confining layer overlying an aquifer.

4.1.2 No-Action Alternative

Under the No-Action Alternative, the proposed site would continue to be used for mixed-use industrial activities, which could result in new soil impacts, such as erosion. Any future residential, commercial, and/or industrial development in the area may result in minor soil erosion and loss of topsoil; however, these impacts could be mitigated through appropriate use of Best Management Practices (BMPs). The surface soils within the study area have already been significantly disturbed by development within the CNC and region, and former native soils in the study area have been replaced with Urban Land soils. Construction of new buildings and roads in open areas may result in new soil compaction; however, existing mixed-use development and roadways account for at least 40 acres of pavement (and existing soil compaction) within the facility footprint. While naturally occurring seismic (earthquake) events have the potential to produce unstable conditions that could directly affect existing and future facilities, it is not expected that existing or future mixed-use

development would impact the frequency or magnitude of seismic events in the region. The No-Action Alternative would likely have no impact to geologic features within the study area.

4.1.3 Alternative 1: Applicant's Proposed Project (South via Milford / North via Hospital District)

Alternative 1 (Proposed Project) would have no significant adverse impacts to the geology and soils in the study area. It is extremely unlikely that unique geologic features, such as paleontological resources, would be encountered during construction of Alternative 1 (Proposed Project) based on the descriptions of the fossils associated with the native soils, and the presence of substantial fill material throughout the CNC. The likelihood of encountering a unique geologic feature would be greater during the construction of portions of the drayage road near existing waters of the U.S. and bridge improvements areas that are less disturbed than other locations within the study area; however, recent investigations did not identify any archaeological sites within the Project site. Two archaeological sites were identified outside the study area (see Section 3.10 for additional information).

The depth to the top of the Ashley formation, which is part of a substantial confining unit that separates the unconfined aquifer from underlying aquifers, is located at 35 to 50 feet bls. This depth is greater than the expected excavation depth required during construction of Alternative 1 (Proposed Project), and as a result, the confining layer would not be expected to be intercepted or breached.

While naturally occurring seismic (earthquake) events have the potential to produce unstable conditions that could directly affect the proposed facilities, it is not expected that construction and/or operation of the Navy Base ICTF would impact the frequency or magnitude of seismic events in the region.

Excavation and construction activities associated with Alternative 1 (Proposed Project) would result in minor, short-term soil erosion; however, the use of BMPs, such as silt fencing, placement of hay, and other common soil retention practices would minimize this adverse impact. Topographical changes that result from construction activities, such as a change in elevation associated with the construction of the drayage road, may result in increased, short-term soil erosion and loss of topsoil, but the use of BMPs would minimize these adverse impacts to be minor. There would be a permanent increase in stormwater runoff resulting from topographical changes and new pavement within the study area (approximately 100 total acres would be paved after construction activities, including the more than 40 acres of existing impervious surface in the facility footprint), which would result in reduced infiltration of surface water through the soil; however, this adverse impact would be minor, and would be minimized by the proposed detention ponds associated with Alternative 1 (Proposed Project). Soil erosion and loss of topsoil would be localized near construction activities, and increased erosion would occur within the confines of the study area.

Short-term compaction of soil would occur within the staging locations of the study area, while permanent compaction would occur in open, pervious areas of the facility site, the drayage road, and new rail track where pavement and structures are built, and where fill material (surcharge) would be placed. Soil compaction resulting from construction activities would result in a minor adverse impact because the soil in the Project site is classified as Urban Land and there are no native soils present.

There are three local borrow sources within 28 miles of the Project site that can supply fill material requirements for the construction of the Navy Base ICTF (~105,000 cy). Given the large number of active sand and dirt mines in the region, Alternative 1 (Proposed Project) is expected to cause a relatively small demand in comparison to available resources, resulting in a negligible impact.

4.1.4 Alternative 2: Proposed Project Site (South via Milford / North via S-Line)

Impacts to geology and soils resulting from Alternative 2 would be the same as those described for Alternative 1 (Proposed Project) with the exception that adverse soil impacts related to the northern rail connection would shift from the Hospital District to those areas that connect to the existing CSX ROW along Spruill Avenue.

4.1.5 Alternative 3: Proposed Project Site (South via Kingsworth / North via Hospital District)

Impacts to geology and soils resulting from Alternative 3 would be the same as those described for Alternative 1 (Proposed Project) with the exception that adverse soil impacts related to the southern rail connection would shift from the areas associated with the Milford Street connection to areas associated with the Kingsworth Avenue connection.

4.1.6 Alternative 4: Proposed Project Site (South via Milford)

Impacts to geology and soils resulting from Alternative 4 would be the same as those described for Alternative 1 (Proposed Project) with the exception that adverse soil impacts related to the northern rail connection would stop short of the Noisette Creek bridge.

4.1.7 Alternative 5: River Center Project Site (South via Milford / North via Hospital District)

Under Alternative 5, impacts to the geology and soils would be similar to those described for Alternative 1 (Proposed Project). The majority of adverse soil impacts would occur at the River Center project site, and new soil disturbance would be minimal as approximately 85 percent of the River Center project site is already paved and/or contains an impervious surface.

4.1.8 Alternative 6: River Center Project Site (South via Kingsworth / North via Hospital District)

Impacts to geology and soils resulting from Alternative 6 would be the same as those described for Alternative 5 with the exception that soil impacts related to the southern rail connection would shift from the areas associated with the Milford Street connection to areas associated with the Kingsworth Avenue connection.

4.1.9 Alternative 7: River Center Project Site (South via Milford)

Impacts to geology and soils resulting from Alternative 7 would be the same as those described for Alternative 5 with the exception that soil impacts related to northern rail connection would stop short of the Noisette Creek bridge.

4.1.10 Related Activities

Geology and soils impacts associated with the Related Activities would result in minor adverse impacts to soils, because these activities would occur within existing CSX and NS ROWs where the Urban Land soil type has already been compacted and disturbed. Use of BMPs, such as silt fencing, would minimize the potential for soil erosion and loss of topsoil.

4.1.11 Summary of Impacts Table

Table 4.1-2 summarizes the environmental consequences to geology and soils from Alternative 1 (Proposed Project) and all the alternatives.

Table 4.1-2
Summary of Impacts, Geology and Soils

Alternative	Geology	Soils
No-Action	Negligible	Negligible effects to unique geologic features. Potential minor adverse impact resulting from a short-term increase in soil erosion, a loss of topsoil, soil compaction, and runoff
1: *Proposed Project: South via Milford / North via Hospital District*	Negligible	Negligible effects to unique geologic features. Potential minor adverse impact resulting from a short-term increase in soil erosion, a loss of topsoil, soil compaction, and runoff
2: *South via Milford / North via S-line*	Negligible	Similar to Alternative 1 (Proposed Project)
3: *South via Kingsworth / North via Hospital District*	Negligible	Similar to Alternative 1 (Proposed Project)
4: *South via Milford*	Negligible	Similar to Alternative 1 (Proposed Project)
5: *River Center Project Site: South via Milford / North via Hospital District*	Negligible	Negligible effects to unique geologic features. Potential minor adverse impact resulting from a short-term increase in soil erosion, a loss of topsoil, soil compaction, and runoff
6: *River Center Project Site: South via Kingsworth / North via Hospital*	Negligible	Similar to Alternative 5
7: *River Center Project Site: South via Milford*	Negligible	Similar to Alternative 5

Geology and Soils Impact Definitions

Negligible = No effect to unique geologic features; no visible soil erosion and/or loss of topsoil; fill requirements can be met by regional sources of fill material; no effect to confining layers overlaying an aquifer.

Minor = Unique geologic features are encountered and preserved; localized, short-term soil erosion and loss of topsoil.

Major = Unique geologic features are encountered and not preserved; increased soil erosion and runoff that extends beyond the Project/alternative sites; fill requirements exceed availability of fill material from regional sources; and breaching of a confining layer overlying an aquifer.

4.1.12 Mitigation

4.1.12.1 Applicant's Proposed Avoidance and Minimization Measures

The Applicant has committed to several measures that avoid and/or minimize potential impacts of Alternative 1 (Proposed Project). These measures are taken from Palmetto Railways Mitigation Plan provided in Appendix N. Some of these measures are required under federal, state, and local permits; others are measures that Palmetto Railways has incorporated into the design and operations of

Alternative 1 (Proposed Project). Each mitigation measure is also designated as one that either helps to avoid an impact or one that minimizes an impact.

- Implement an SWPPP as required by the National Pollutant Discharge Elimination System (NPDES) permit, including management of sediment and erosion control. (Minimization)
- Implement an SPCC plan for petroleum products. (Minimization)
- Use Best Management Practices (BMPs) and/or methods of managing sediment and erosion control during construction pursuant to the *South Carolina Stormwater Management Handbook* (South Carolina Department of Health and Environmental Control [SCDHEC] 2005). (Minimization)
- Capping contaminated sites within the ICTF to "seal" existing soil and groundwater contamination. (Minimization)
- Perform all land disturbance activities in compliance with the U.S. Navy Construction Process Document (Navy "Dig" Permit) which identifies the permit process and requirements for conducting construction or other land disturbing activities in Land Use Control (LUC) areas at the former Navy Base (Charleston Naval Complex). (Minimization)
- Develop a soil management plan during design to be implemented during construction. (Minimization)
- Use clean fill material. (Minimization)

These avoidance and minimization measures, except the items noted with an asterisk (*), have been considered in the preceding impact analysis. The complete list of Applicant-proposed avoidance and minimization measures for the Navy Base ICTF is provided in Chapter 6, Table 6.1.

4.1.12.2 Additional Potential Mitigation Measures

No additional mitigation measures are proposed for Geology and Soils by the Corps. Additional avoidance, minimization, and mitigation may be considered by the Corps in its decision-making process. Final mitigation measures may be adopted as conditions of the DA permit and documented in the Record of Decision (ROD).

4.2 HYDROLOGY

4.2.1 Methods and Impact Definitions

Impacts to hydrology within the study area were evaluated qualitatively and quantitatively using GIS, aerial photography, literature reviews, and best professional judgment. Factors that are addressed include impacts to surface water and groundwater flows, infiltration and stormwater runoff, and floodplains.

The City of North Charleston Stormwater Program Permitting Standards and Procedures Manual (City of North Charleston 2008b) requires that all hydrologic computations be completed using volume-based hydrograph methods. For estimating peak flows, the manual further requires the use of SCS Method TR-55 for land disturbances greater than one acre. Stage storage and discharge analysis is required. Computer models approved for use by the County include ICPR, Drain: Edge, PondPack/Civil Storm, HEC-HMS, and HYDRAFLOW.

Impact thresholds are defined and managed under the regulatory framework of municipal and state codes. Table 4.2-1 outlines the potential range of impacts and defines their severity for use in comparison of the alternatives.

Table 4.2-1
Impact Definitions, Hydrology

Negligible	Minor	Major
No change in surface water or groundwater flows or circulation. No change in impervious surface from pre- to post-construction. Percentage of impervious surface for the site remains below zoning limit and does not increase stormwater runoff. No base floodplain affected or changes in floodway areas or volume of fill in the floodplain.	Temporary or long-term change to surface water flows or circulation, but the changes do not alter the creek or river channel paths. Percentage of impervious surface for the site remains below zoning limit but increases stormwater runoff; base floodplain affected, but placement of fill in the floodplain does not result in flooding to adjacent areas.	Long-term change to surface water flow or circulation that results in alterations to creek and/or river configurations; reductions in groundwater that may impact their use for municipal water supplies. Percentage of impervious surface for the site exceeds zoning limit and increases stormwater runoff; base floodplain affected and placement of fill in the floodplain would result in flooding to adjacent areas.

4.2.2 No-Action Alternative

Under the No-Action Alternative, the study area would remain as a mixed industrial land use, where mixed use (residential and commercial) and industrial land uses occur. In light of Palmetto Railways' ownership of the properties, there would be the potential for redevelopment of these areas to include rail-served warehousing and distribution. These land uses could result in alterations to land cover, and, if adjacent to or within waterways, could have the potential to alter surface water flows and

circulation; however, adherence to local ordinances, including the conduct of requisite modeling, and the use of BMPs to control runoff, would likely result in a negligible impact to hydrology.

Under the existing zoning, a maximum impervious level of 82 percent would be allowable. If future development within the study area increased the percentage from the existing impervious surface of the Project site from 40 to 82 percent, the area would experience a permanent increase, but still below the zoning limit of 82 percent, resulting in a permanent, minor adverse impact. Increases in impervious surface can result in less water infiltration from precipitation, thus reducing groundwater recharge and increasing stormwater runoff. Higher frequency runoff volumes may cause increased flooding, scour, erosion, and the deposition of sediments within waterways. Compliance with current stormwater management requirements, potentially including the use of stormwater detention ponds, with future development would minimize the impact of any increase in stormwater runoff to adjacent water bodies, such as Noisette Creek and Shipyard Creek, and instead could provide a minor beneficial impact where no existing stormwater treatment measures exist. The River Center project site would essentially remain at its present 85 percent impervious surface, representing a negligible impact.

Increased impervious surfaces and soil compaction may result from the redevelopment of these areas to include rail-served warehousing and distribution. Soil compaction increases the bulk density of soil reducing its porosity. With fewer natural voids, the rate of infiltration is reduced and the movement of the water below is restricted. Localized groundwater recharge is expected to decrease in light of future development's increases in impervious surface; however, any impact to the aquifer's ability to recharge would be negligible based on the aerial extent of the aquifer and location.

The majority of the ICTF and River Center project sites lie within the 100-year floodplain (See Section 3.2.7). Future residential, commercial, and/or industrial development activities would likely result in the placement of fill and could potentially increase elevations within the study area; however, in light of the existing floodplain zone designations, the fact that the BFE would not change because it is based on coastal surge, and because development activities would conform to applicable state and/or local floodplain protection standards, the development would not increase the flood hazard to other properties. Impacts to floodplains would be negligible.

4.2.3 Alternative 1: Proposed Project (South via Milford / North via Hospital District)

Alternative 1 (Proposed Project) would involve activities that can affect hydrology, such as the construction of impervious surfaces associated with the Navy Base ICTF, and roadway and rail improvements adjacent to and/or within Noisette Creek and Shipyard Creek. Construction of the facility would also require grading of the facility site; however, this fill would be sourced both on-site and off-site. Permanent placement of additional bridge pilings within Shipyard Creek would introduce permanent obstructions into the waterways. Alternative 1 (Proposed Project) would

involve rehabilitating the existing railroad bridge across Noisette Creek by elevating the superstructure a foot to improve hydrology and sheathing existing piles to accommodate the arrival/departure tracks which would result in a negligible impact to surface water flows and circulation patterns. It is not expected that areas within these waterways would be subjected to a measurable change in tidal velocities or alteration in creek configuration as a result of the Alternative 1 (Proposed Project) elements.

Embankment construction through the tidal salt marsh for the arrival/departure tracks near the southwestern limits of the Project would result in the fragmentation of habitat and potential loss of a hydrologic connection to Shipyard Creek; however, the placement of culverts as proposed by the Applicant as a mitigation measure, which would be sized to minimize upchannel surcharge of runoff, would maintain tidal flushing to tidal salt marsh areas to the east of the arrival/departure tracks, and would ensure that any change in hydrology or potential for flooding upstream would be negligible.

Increases to impervious surfaces would be expected to be similar to a full build-out under the No-Action Alternative, resulting in a permanent, minor adverse impact, with the existing impervious surface of the Project site increasing from 40 to 82 percent; however, stormwater management improvements by Palmetto Railways, including placement of pipe of varying sizes, underdrains, construction of five dry detention ponds, and vegetated swales, as well as other BMPs associated with roadway and rail improvements, would collect and slowly release stormwater runoff. As a result, these mitigation measures would minimize the potential for adverse impacts to Noisette Creek, Shipyard Creek, and the Cooper River. Overall, stormwater runoff would be better captured and detained, and its discharge managed, to prevent downstream scour under Alternative 1 (Proposed Project) versus existing conditions, resulting in a minor beneficial impact because no such stormwater facilities currently exist.

Increased impervious surfaces and soil compaction may result from the construction of the proposed embankments and structures. Localized groundwater recharge is expected to decrease in light of the increase in impervious surface within the Project site; however, any impact to the aquifer's ability to recharge would be negligible based on the aerial extent of the aquifer and the Project site's location.

Most of the Project site lies within the Special Flood Hazard Area (SFHA), or 100-year floodplain. Approximately 58.5 percent of the site is within zone AE, 3.4 percent in zone VE, with the remainder in 0.2 percent annual chance flood hazard (24.6 percent) and zone X (13.5 percent) (Figure 4.2-1). Zone A and Zone AE represent those areas subject to inundation by the 1-percent-annual-chance flood event or the 100-year floodplain, with Zone AE including Base Flood Elevations (BFEs) and Zone A not including BFEs. Zone VE are coastal high-hazard areas where wave action and/or high-velocity water can cause structural damage during the 100-year flood. The 0.2 percent annual chance flood hazard is also known as the 500-year flood. Zone X is outside the 500-year floodplain.

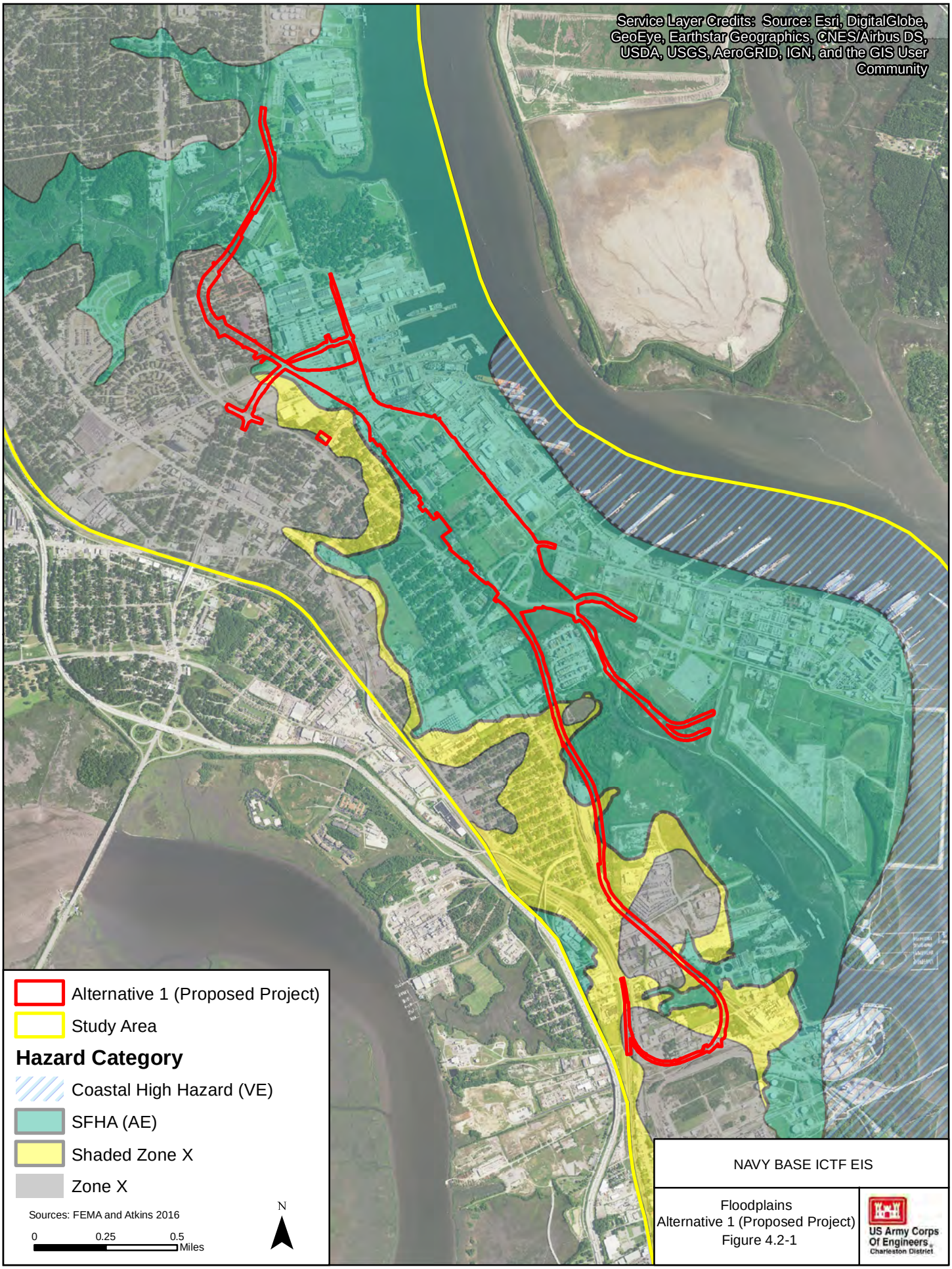
The ICTF design was based on the preliminary Flood Insurance Rate Map (FIRM) data at the time of the EIS, and the design requires the placement of fill within the Project site. Accordingly, surface elevations may increase in the Project site; however, similar to the No-Action Alternative, the BFEs would not change. Therefore, the ICTF would not increase the flood hazard to other properties, and impacts to floodplains would be negligible. If the floodplain zone(s) changes for the Project site as a result of upcoming updates to the FIRMs (but not the BFEs), then Palmetto Railways would need to coordinate with the local National Flood Insurance Program (NFIP) to obtain any necessary permits.

4.2.4 Alternative 2: Proposed Project Site (South via Milford / North via S-line)

Under Alternative 2, impacts to hydrology and impervious surfaces would be similar to those discussed under Alternative 1 (Proposed Project). Most of the Project site lies within the SFHA with 58.7 percent in zone AE, 3.3 percent in zone VE, with the remainder in 0.2 percent annual chance flood hazard (25.7 percent) and zone X (12.3 percent) (Figure 4.2-2). Due to construction activities associated with Alternative 2, surface elevations may increase in the Project site; however, similar to the No-Action Alternative, the BFEs would not change. Therefore, the development would not increase the flood hazard to other properties, and impacts to floodplains would be negligible. If the floodplain zone(s) changes for the Project site as a result of upcoming updates to the FIRM data (but not the BFEs), then Palmetto Railways would need to coordinate with the local NFIP to obtain any necessary permits.

4.2.5 Alternative 3: Proposed Project Site (South via Kingsworth / North via Hospital District)

Under Alternative 3, impacts to hydrology and impervious surfaces would be similar to those discussed under Alternative 1 (Proposed Project). The majority of the Project site lies within the SFHA with 63.8 percent in zone AE, 3.7 percent in zone VE, with the remainder in 0.2 percent annual chance flood hazard (21.5 percent) and zone X (11.0 percent) (Figure 4.2-3). Due to construction activities associated with Alternative 3, surface elevations may increase in the Project site; however, similar to the No-Action Alternative, the BFEs would not change. Therefore, the development would not increase the flood hazard to other properties, and impacts to floodplains would be negligible. If the floodplain zone(s) changes for the Project site as a result of upcoming updates to the FIRM data (but not the BFEs), then Palmetto Railways would need to coordinate with the local NFIP to obtain any necessary permits.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Alternative 1 (Proposed Project)
Study Area
Hazard Category
Coastal High Hazard (VE)
SFHA (AE)
Shaded Zone X
Zone X
Sources: FEMA and Atkins 2016
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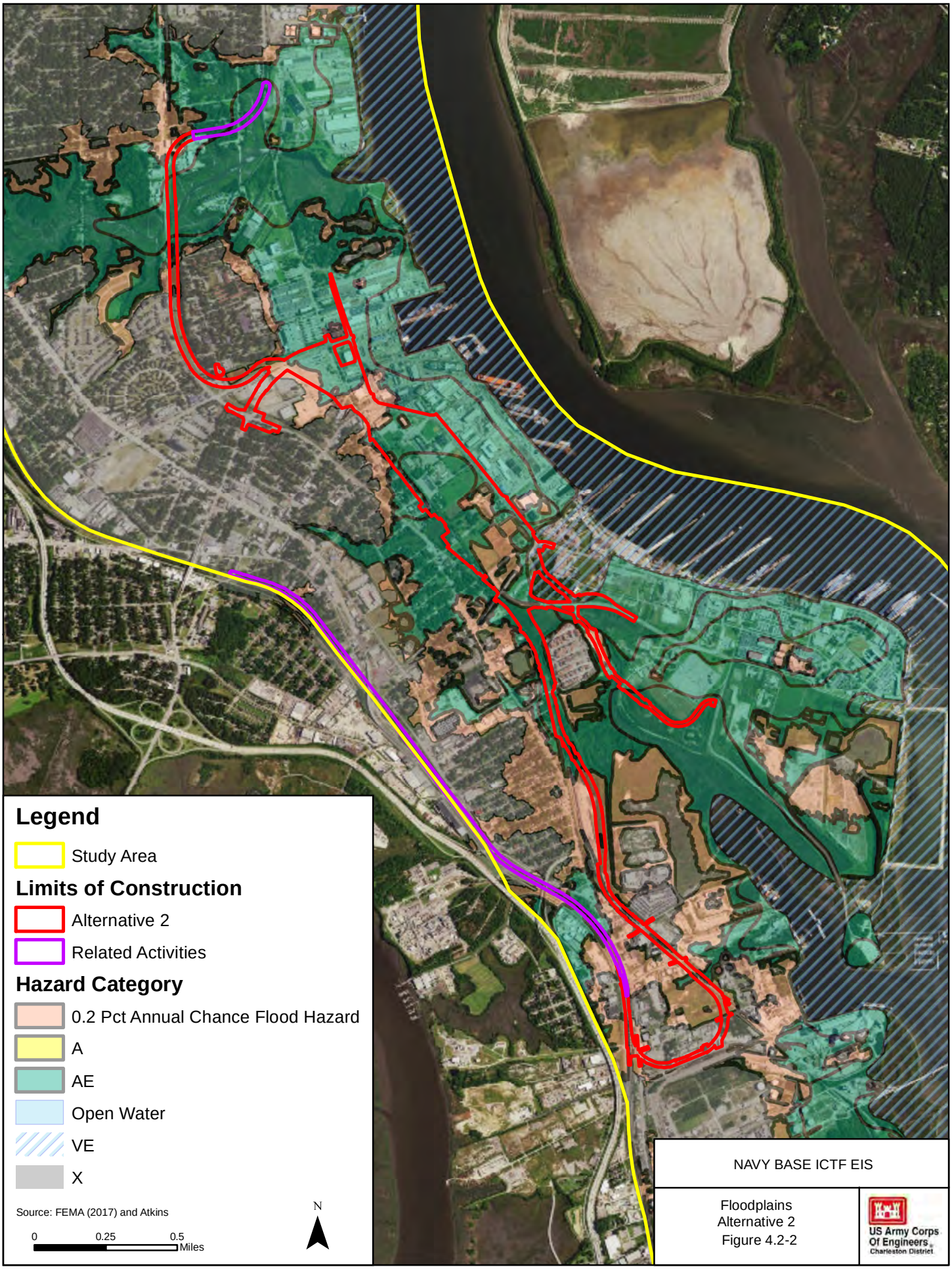
Floodplains
Alternative 1 (Proposed Project)
Figure 4.2-1
US Army Corps Of Engineers
Charleston District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Study Area
Limits of Construction
Alternative 2
Related Activities
Hazard Category
0.2 Pct Annual Chance Flood Hazard
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AE
Open Water
VE
X
Source: FEMA (2017) and Atkins
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NAVY BASE ICTF EIS
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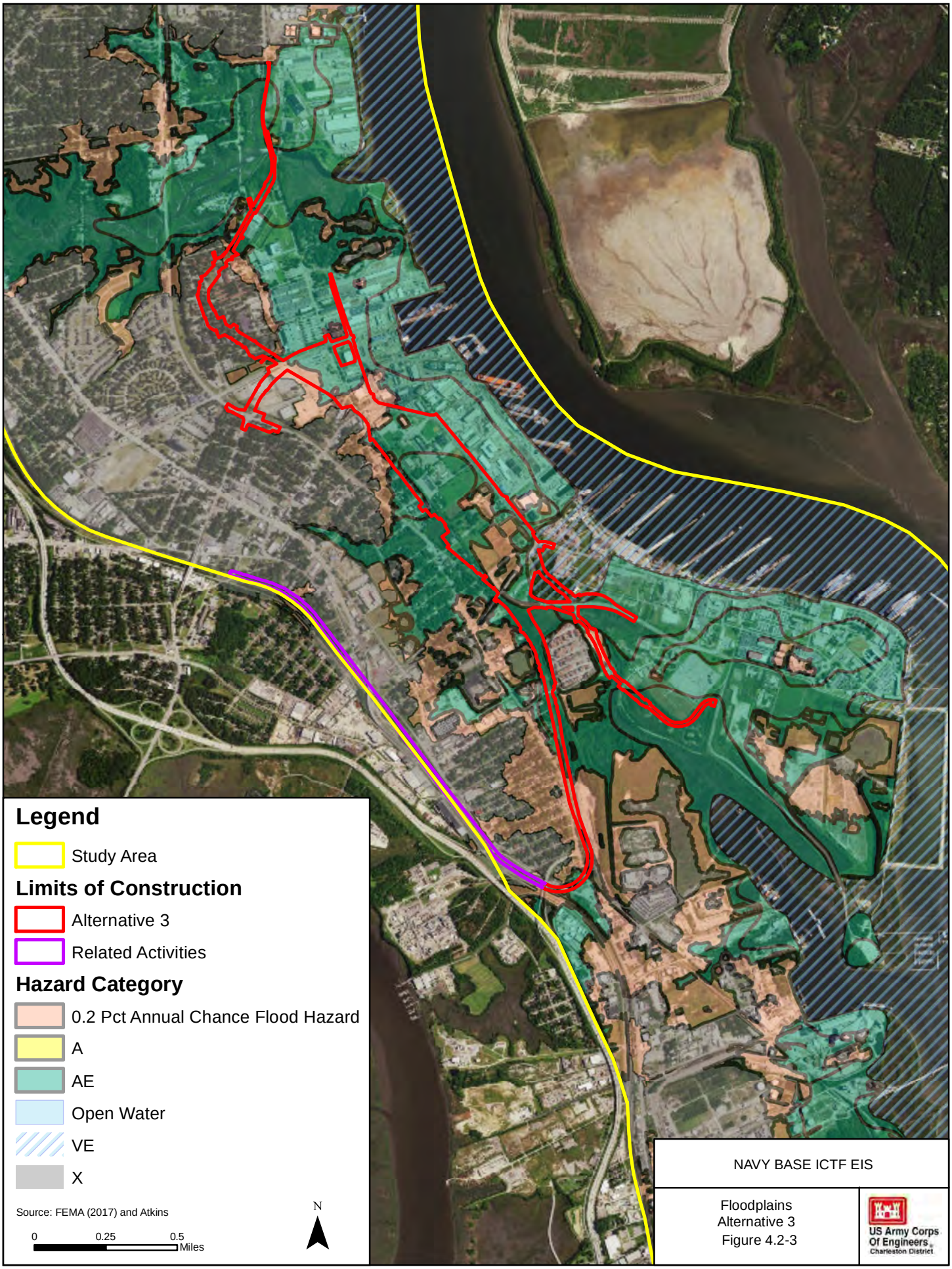
Alternative 2
Figure 4.2-2
US Army Corps Of Engineers
Charleston District


Legend
Study Area
Limits of Construction
Alternative 3
Related Activities
Hazard Category
0.2 Pct Annual Chance Flood Hazard
A
AE
Open Water
VE
X
Source: FEMA (2017) and Atkins
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0.25
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Miles
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NAVY BASE ICTF EIS
Floodplains
Alternative 3
Figure 4.2-3
US Army Corps
Of Engineers
Charleston District

4.2.6 Alternative 4: Proposed Project Site (South via Milford)

Under Alternative 4, impacts to hydrology and impervious surfaces would be similar to those discussed under Alternative 1 (Proposed Project); however, the superstructure of Noisette Creek bridge would not be elevated by a foot to improve hydrology. Most of the Project site lies within the SFHA with 57.0 percent in zone AE, 3.4 percent in zone VE, with the remainder in 0.2 percent annual chance flood hazard (25.1 percent) and zone X (14.6 percent) (Figure 4.2-4). Due to construction activities associated with Alternative 4, surface elevations may increase in the Project site; however, similar to the No-Action Alternative, the BFEs would not change. Therefore, the development would not increase the flood hazard to other properties, and impacts to floodplains would be negligible. If the floodplain zone(s) changes for the Project site as a result of upcoming updates to the FIRM data (but not the BFEs), then Palmetto Railways would need to coordinate with the local NFIP to obtain any necessary permits.

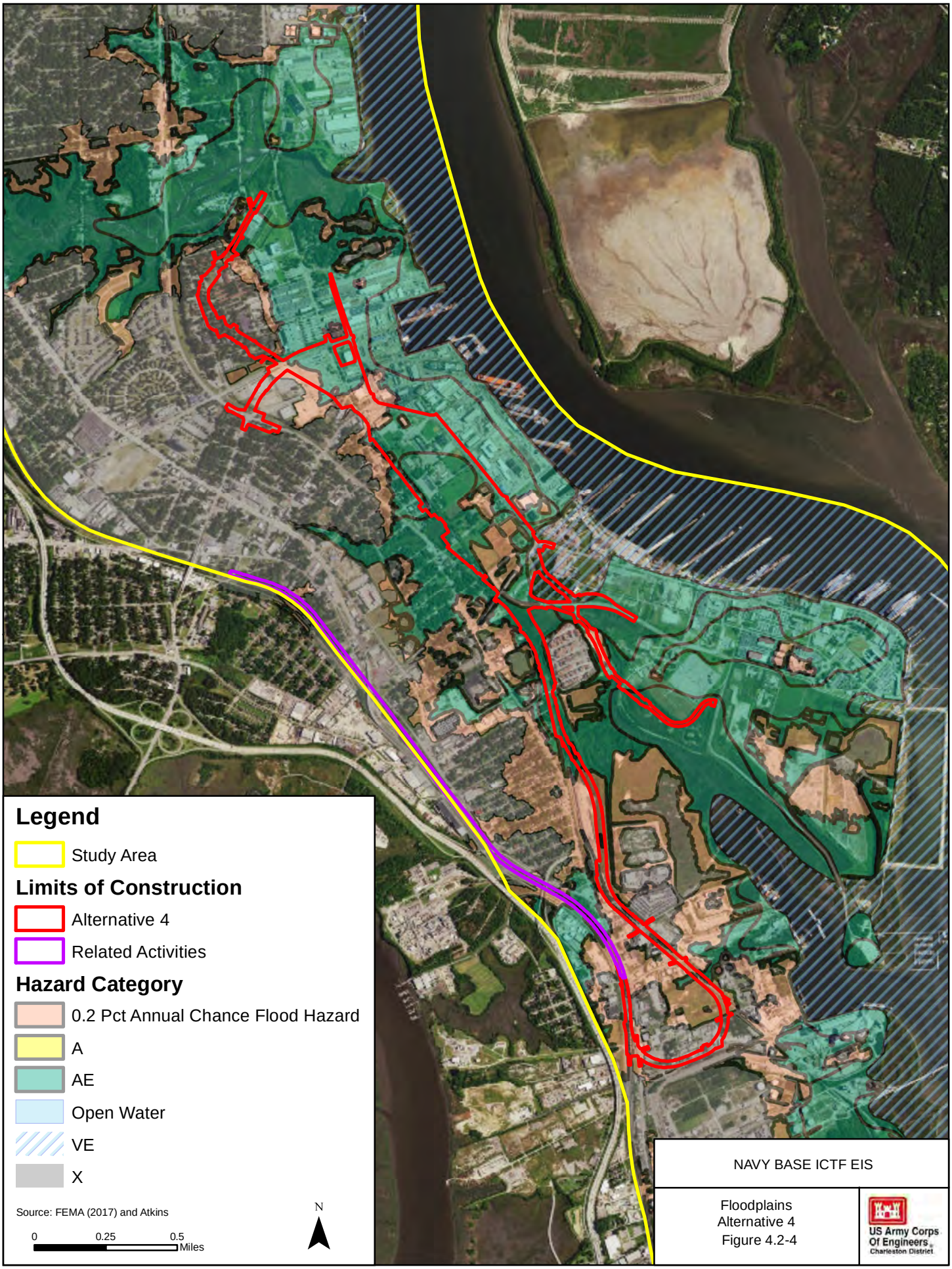
4.2.7 Alternative 5: River Center Project Site (South via Milford /North via Hospital District)

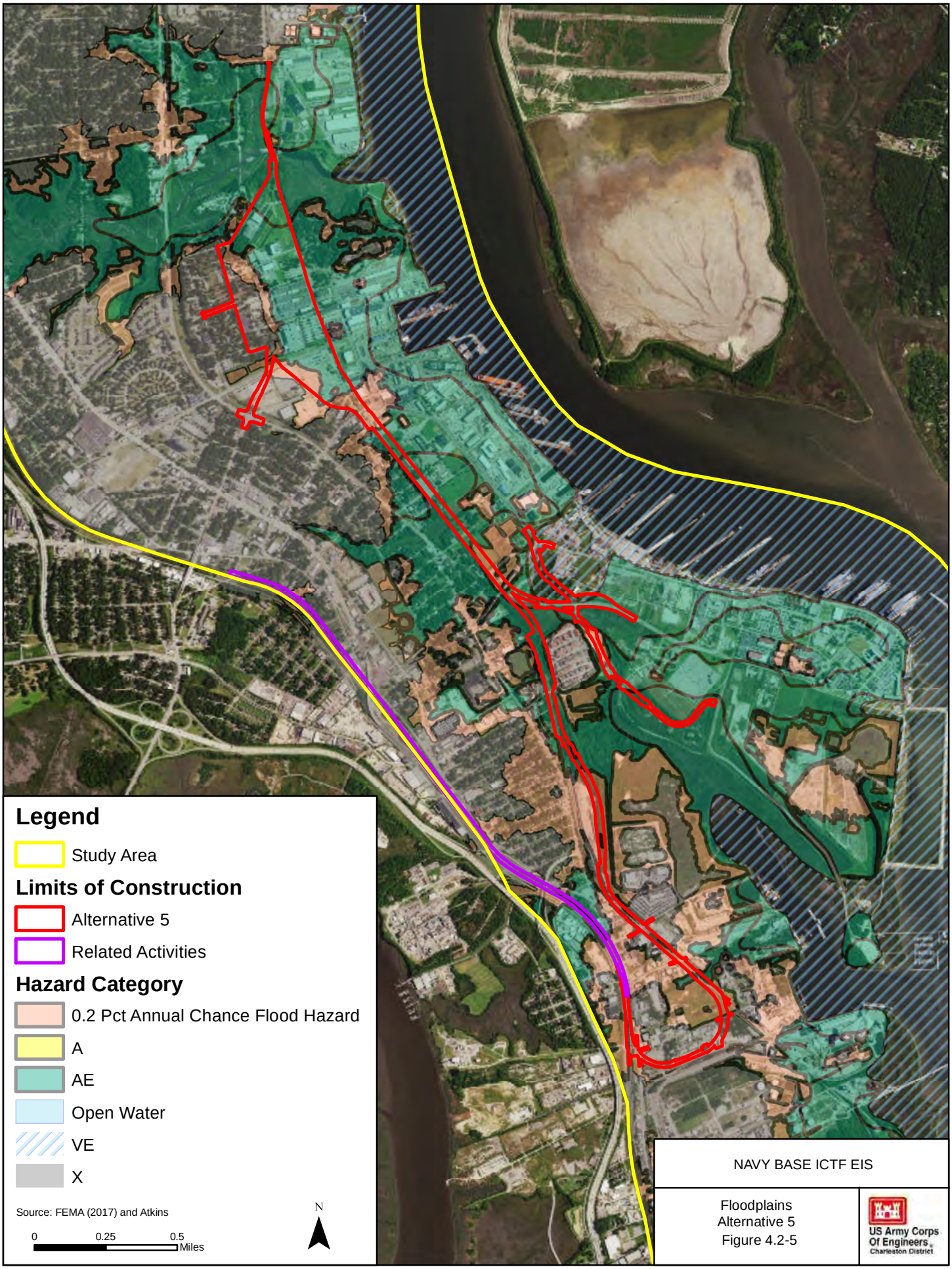
Under Alternative 5, impacts to hydrology would be similar to those discussed under Alternative 1 (Proposed Project). There would not be a notable increase in impervious surfaces under Alternative 5 because a majority of the River Center project site is already paved and contains an impervious surface (currently 85 percent). As a result, there would be a negligible impact to infiltration rates and groundwater recharge. The use of dry detention ponds associated with the River Center ICTF would instead result in a minor beneficial impact by improving the capture and treatment of stormwater runoff, where no such stormwater facilities currently exist.

A large portion of the River Center project site lies within the SFHA with 57.3 percent in zone AE, 3.0 percent in zone VE, with the remainder in 0.2 percent annual chance flood hazard (23.4 percent) and zone X (16.3 percent) (Figure 4.2-5). Due to construction activities associated with Alternative 5, surface elevations may increase in the Project site; however, similar to the No-Action Alternative, the BFEs would not change. Therefore, the development would not increase the flood hazard to other properties, and impacts to floodplains would be negligible. If the floodplain zone(s) changes for the Project site as a result of upcoming updates to the FIRM data (but not the BFEs), then Palmetto Railways would need to coordinate with the local NFIP to obtain any necessary permits.

4.2.8 Alternative 6: River Center Project Site (South via Kingsworth /North via Hospital District)

Under Alternative 6, impacts to hydrology and impervious surface area would be similar to those discussed under Alternative 5. Most of the Project site lies within the SFHA with 63.8 percent in zone AE, 3.4 percent in zone VE, with the remainder in 0.2 percent annual chance flood hazard (19.3

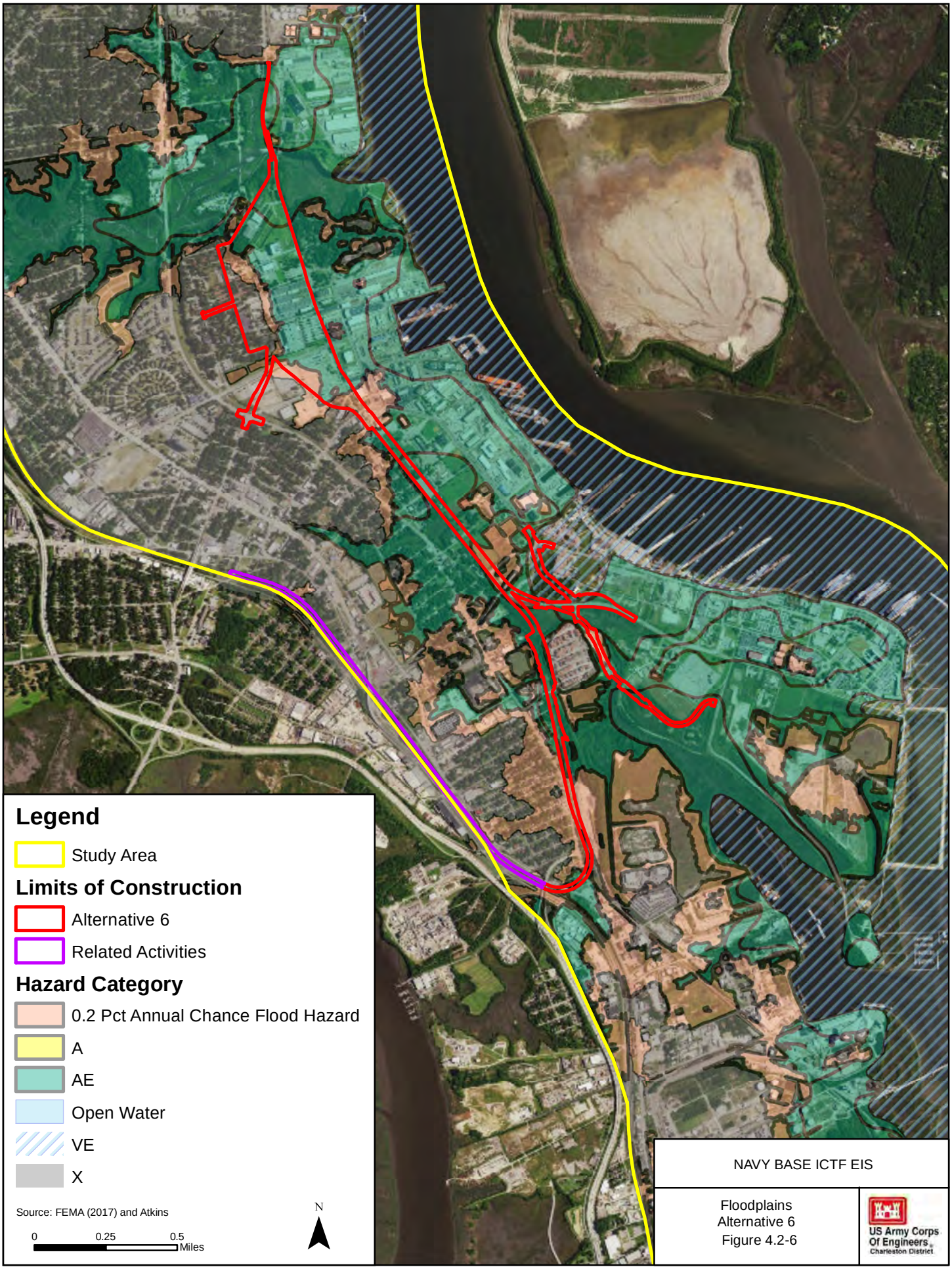

Legend
Study Area
Limits of Construction
Alternative 4
Related Activities
Hazard Category
0.2 Pct Annual Chance Flood Hazard
A
AE
Open Water
VE
X
Source: FEMA (2017) and Atkins
0
0.25
0.5
Miles
N
NAVY BASE ICTF EIS
Floodplains
Alternative 4
Figure 4.2-4
US Army Corps
Of Engineers
Charleston District



NAVY BASE ICTF EIS

Floodplains
Alternative 5
Figure 4.2-5

US Army Corps Of Engineers
Charleston District


Legend
Study Area
Limits of Construction
Alternative 6
Related Activities
Hazard Category
0.2 Pct Annual Chance Flood Hazard
A
AE
Open Water
VE
X
Source: FEMA (2017) and Atkins
0
0.25
0.5
Miles
N
NAVY BASE ICTF EIS
Floodplains
Alternative 6
Figure 4.2-6
US Army Corps
Of Engineers
Charleston District

percent) and zone X (13.4 percent) (Figure 4.2-6). Due to construction activities associated with Alternative 6, surface elevations may increase in the Project site; however, similar to the No-Action Alternative, the BFEs would not change. Therefore, the development would not increase the flood hazard to other properties, and impacts to floodplains would be negligible. If the floodplain zone(s) changes for the Project site as a result of upcoming updates to the FIRM data (but not the BFEs), then Palmetto Railways would need to coordinate with the local NFIP to obtain any necessary permits.

4.2.9 Alternative 7: River Center Project Site (South via Milford)

Under Alternative 7, impacts to hydrology and impervious surface area would be similar to those discussed under Alternative 5; however, the superstructure of Noisette Creek bridge would not be elevated by a foot to improve hydrology. The majority of the Project site lies within the SFHA with 55.8 percent in zone AE, 3.0 percent in zone VE, with the remainder in 0.2 percent annual chance flood hazard (23.8 percent) and zone X (17.4 percent) (Figure 4.2-7). Due to construction activities associated with Alternative 7, surface elevations may increase in the Project site; however, similar to the No-Action Alternative, the BFEs would not change. Therefore, the development would not increase the flood hazard to other properties, and impacts to floodplains would be negligible. If the floodplain zone(s) changes for the Project site as a result of upcoming updates to the FIRM data (but not the BFEs), then Palmetto Railways would need to coordinate with the local NFIP to obtain any necessary permits.

4.2.10 Related Activities

Each alternative's Related Activities fall mostly within zone X (outside the 500-year floodplain), with 80.1 percent for Alternatives 1 and 5, 63.6 percent for Alternative 2, 97.9 percent for Alternatives 3 and 6, and 80.4 percent for Alternatives 4 and 7. Zone AE makes up 3.7 percent of Alternative 1 (Proposed Project) and Alternatives 4, 5 and 7 Related Activities Project area. Alternative 2 Related Activities Project area consists of the highest proportion of Zone AE area with 23.5 percent. Alternatives 3 and 6 Related Activities Project area does not include the Zone AE areas. For each alternative's Related Activities, the 0.2 percent annual chance flood hazard comprised 16.3 percent of Alternative 1 (Proposed Project) and Alternative 5, 13.0 percent of Alternative 2, 2.1 percent of Alternative 3 and 6, 15.9 percent of Alternative 4, and 15.9 percent of Alternative 7.

4.2.11 Summary of Impacts Table

Table 4.2-2 summarizes the environmental consequences to hydrology from Alternative 1 (Proposed Project) and all the alternatives.

Table 4.2-2
Impacts Summary, Hydrology

Alternative	Surface water and groundwater flows and circulation	Impervious Surface/ Infiltration and Stormwater Runoff	Floodplains
No-Action	Negligible impact to surface water flows and circulation resulting from construction activities within and/or adjacent to waterways (e.g., bridges); negligible impact to groundwater	Permanent, minor adverse impact from potential increase in impervious surface; negligible or possibly minor beneficial impact from improved stormwater management	Negligible impact to base floodplain resulting from the placement of fill; negligible impact to flood hazard for adjacent areas
1: *Proposed Project: South via Milford / North via Hospital District*	Negligible impact to surface water flows and circulation resulting from roadway and rail improvements (e.g., arrival/departure tracks, bridges) across Noisette Creek and Shipyard Creek; negligible impact to groundwater	Permanent, minor adverse impact from increase in impervious surface; minor beneficial impact from improved stormwater management. Negligible effect on groundwater recharge.	Negligible impact to base floodplains resulting from the placement of fill; negligible impact to flood hazard for other adjacent areas
2: *South via Milford / North via S-line*	Similar to Alternative 1 (Proposed Project)	Similar to Alternative 1 (Proposed Project)	Similar to Alternative 1 (Proposed Project)
3: *South via Kingsworth / North via Hospital*	Similar to Alternative 1 (Proposed Project)	Similar to Alternative 1 (Proposed Project)	Similar to Alternative 1 (Proposed Project)
4: *South via Milford*	Similar to Alternative 1 (Proposed Project)	Similar to Alternative 1 (Proposed Project)	Similar to Alternative 1 (Proposed Project)
5: *River Center Project Site: South via Milford / North via Hospital District*	Negligible impact to surface water flows and circulation resulting from roadway and rail improvements (e.g., arrival/departure tracks, bridges) across Noisette Creek and Shipyard Creek; negligible impact to groundwater	Minor beneficial impact from improved stormwater management. Negligible effect on groundwater recharge.	Negligible impact to base floodplain resulting from the placement of fill; negligible impact to flood hazard for other adjacent areas
6: *River Center Project Site: South via Kingsworth / North via Hospital*	Similar to Alternative 5	Similar to Alternative 5	Similar to Alternative 5

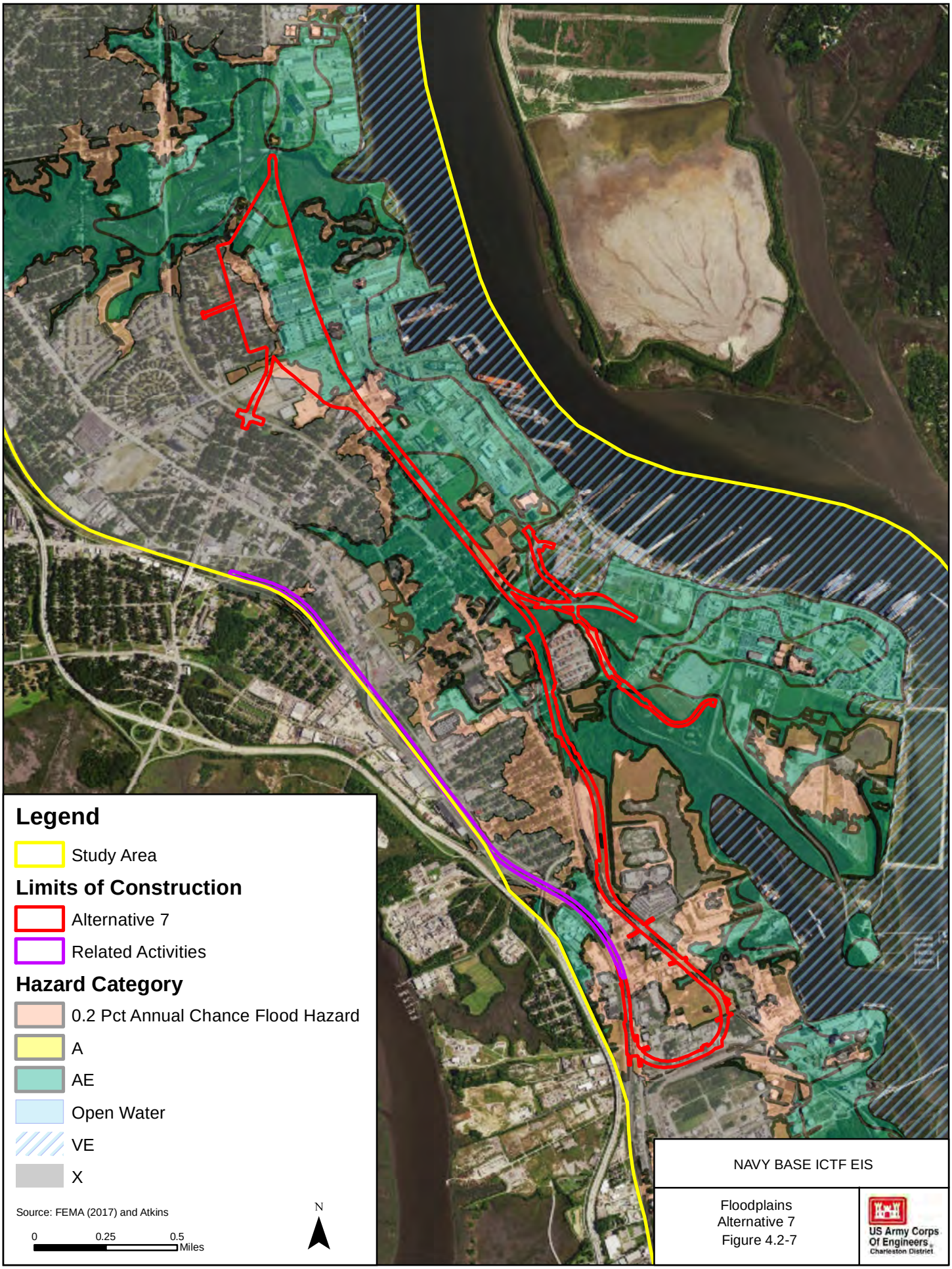
Alternative	Surface water and groundwater flows and circulation	Impervious Surface/ Infiltration and Stormwater Runoff	Floodplains
7: *River Center Project Site: South via Milford*	Similar to Alternative 5	Similar to Alternative 5	Similar to Alternative 5

Hydrology Impact Definitions

Negligible = No change in surface water or groundwater flows or circulation. No change in impervious surface from pre- to post-construction. Percentage of impervious surface for the site remains below zoning limit and does not increase stormwater runoff. No base floodplain affected or changes in floodway areas or volume of fill in the floodplain.

Minor = Temporary or long-term change to surface water flows or circulation, but the changes do not alter the creek or river channel paths. Percentage of impervious surface for the site remains below zoning limit but increases stormwater runoff; base floodplain affected, but placement of fill in the floodplain does not result in flooding to adjacent areas.

Major = Long-term change to surface water flow or circulation that results in alterations to creek and/or river configurations; reductions in groundwater that may impact their use for municipal water supplies. Percentage of impervious surface for the site exceeds zoning limit and increases stormwater runoff; base floodplain affected and placement of fill in the floodplain would result in flooding to adjacent areas.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Study Area
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Hazard Category
0.2 Pct Annual Chance Flood Hazard
A
AE
Open Water
VE
X
Source: FEMA (2017) and Atkins
0
0.25
0.5
Miles
N
NAVY BASE ICTF EIS
Floodplains
Alternative 7
Figure 4.2-7
US Army Corps
Of Engineers
Charleston District

4.2.12 Mitigation

4.2.12.1 Applicant's Proposed Avoidance and Minimization Measures

The Applicant has committed to several measures that avoid and/or minimize potential impacts of Alternative 1 (Proposed Project). These measures are taken from Palmetto Railways Mitigation Plan provided in Appendix N. Some of these measures are required under federal, state, and local permits; others are measures that Palmetto Railways has incorporated into the design and operations of Alternative 1 (Proposed Project). Each mitigation measure is also designated as one that either helps to avoid an impact or one that minimizes an impact.

- Design culverts and/or bridges to maintain existing surface drainage patterns and to prevent erosion. (Minimization)
- Where possible, limit the placement of pilings for bridges within waterways. (Avoidance)
- Use existing bridge over Noisette Creek to reduce impacts (Avoidance)
- Design culverts (e.g., under the arrival/departure tracks) and bridges to maintain existing flow and hydrology for wetland areas and to prevent flooding upstream. (Minimization)
- Provide stormwater capacity improvements by constructing new stormwater infrastructure where existing systems are failing from lack of maintenance. (Minimization)

These avoidance and minimization measures, except the items noted with an asterisk (*), have been considered in the preceding impact analysis. The complete list of Applicant-proposed avoidance and minimization measures is also provided in Chapter 6, Table 6-1.

4.2.12.2 Additional Potential Mitigation Measures

The Corps proposes as an additional mitigation measure for Hydrology that the pre-construction course, condition, capacity, and location of open waters must be maintained. Additional avoidance, minimization, and mitigation may be considered by the Corps in its decision-making process. Final mitigation measures may be adopted as conditions of the DA permit and documented in the Record of Decision (ROD).

4.3 WATER QUALITY

4.3.1 Methods and Impact Definitions

Impacts to the water quality of waterways and groundwater basins within the study area that could potentially be affected by stormwater runoff, erosion, or other methods of contaminant contribution were evaluated using literature review, GIS, loading estimates for Total Suspended Solids (TSS) and nutrients, and best professional judgment. Potential impacts of water quality constituents of concern (e.g., dissolved oxygen, nutrients, total suspended solids, bacteria, salinity, various metals, PAHs, and pesticides) were evaluated as part of the analysis. Average annual pollutant loads for TSS and nutrients (TN and TP) were estimated for the Project site, as outlined in the 60 percent design plans footprint (Figure 4.3-1), and the River Center project site using a GIS-based Pollutant Loading Model that utilizes existing and proposed land use, soils, BMPs, and contributing basin delineations (PBS&J 2010). GIS-based Pollutant Loading Model (Model) calculations for the Project site were based on the 60 percent design plans provided by the Applicant and did not include credit for any treatment of off-site infrastructure improvements (e.g., roadway improvements and modifications). Percent reduction calculations were based on the total basin area contributing to each site. Results were assessed in the context of the DO TMDL revision for the Charleston Harbor, Cooper River, Ashley River, and Wando River (SCDHEC 2013a). Potential interactions of new stormwater infrastructure (e.g., stormwater detention ponds) with contaminated soil or groundwater associated with existing contamination sites (e.g., nearby Superfund Site at the Macalloy property) were evaluated using GIS.

The impact evaluation considers both construction and operation activities associated with the Alternative 1 (Proposed Project) and alternatives. Impacts to water quality were characterized as negligible, minor, or major as defined in Table 4.3-1.

Table 4.3-1
Impact Definitions, Water Quality

Negligible	Minor	Major
Undetectable changes to surface water quality; undetectable change to groundwater recharge or quality.	Changes in surface water quality that do not exceed water quality standards. TMDL load reductions are not compromised. Changes in groundwater recharge and quality that require permitting, treatment, and proper disposal of dewatering effluent to prevent migration of contaminated groundwater into uncontaminated areas.	Changes in surface water quality that exceed regulatory standards. TMDL load reductions are compromised and adverse impacts are long-term. Changes in groundwater recharge that require additional, extensive permitting and federal/state oversight, or changes in water quality that exceed regulatory standards for groundwater and contaminated wells and/or municipal water supplies.

4.3.2 No-Action Alternative

4.3.2.1 Surface Waters

For the purposes of this EIS, the Corps assumes that the Project site and River Center project site would continue to include mixed use (residential and commercial) and industrial land uses, such as rail-served warehousing distribution. The current land uses on these sites are heavy industrial district, light industrial district, and planned development; therefore, there are no large-scale changes to land use anticipated; however, an increase in impervious surface, pollutant loading, or the likelihood for accidental spills could result in potential impacts to surface waters of Shipyard Creek, Noisette Creek, and the Lower Cooper River. Water quality constituents of concern would include DO, salinity, TSS, turbidity, nutrients, bacteria, heavy metals, and other toxic contaminants (VOCs, SVOCs, chlorinated pesticides/PCBs, PAHs, and dioxins). The fate of these pollutants is affected by currents, tides, and flow patterns. For example, pollutants entering surface waters downstream of the site may be transported upstream during incoming tides. Potential impacts to water quality would be evaluated with respect to the status of the current TMDL for DO (SCDHEC 2013a).

Dissolved Oxygen

Dissolved Oxygen (DO) concentrations in surface waters could be affected by the No-Action Alternative due to changes in: (1) circulation patterns that can impact re-aeration of the water column and residence time of biodegradable organic compounds, measured as biochemical oxygen demand (BOD), in the river and creeks; (2) pollutant loading that can increase the BOD, resulting in decreased DO; and (3) salinity, which can result in changes in the DO saturation level (oxygen solubility decreases as salinity increases). Under the No-Action Alternative, impacts to DO concentrations in surface waters are unlikely. Furthermore, stormwater facilities and other infrastructure would be required by federal, state, and local authorities for any new development on the site (see Section 8, Regulatory Environment Overview). Additionally, given that any new development on the site would discharge into the Cooper River, all design requirements would need to be in compliance with the TMDL for DO established for the Charleston Harbor, Cooper River, Ashley River, and Wando River (SCDHEC 2013a; City of North Charleston 2008b). Depending on the size of the project, the associated permitting process would go through the City of North Charleston (City of North Charleston 2008b) or the state (SCDHEC 2011). According to the City of North Charleston's Permitting Standards and Procedures Manual (2008b), compliance would require the installation and implementation of measures (structural or non-structural BMPs) that are expected to adequately reduce pollutant loads to levels required by the TMDL (currently expressed as percent reductions) or to prevent further impairment. If the site is greater than 25 acres, a quantitative and qualitative analysis would be performed as part of the stormwater application and would include, at a minimum, calculations that show:

- A site's pollutant load for all pollutants of concern;

- The trapping effectiveness of the chosen BMPs; and/or
- Runoff discharged through the last water quality BMP has a water quality level equal to or better than the in-stream standard, or as required by an applicable TMDL.

As a result, negligible (no) additional adverse impacts to DO would be anticipated under the No-Action Alternative; minor beneficial increases in runoff quality contributing to surface waters due to implementation of current stormwater BMP requirements would be possible.

Salinity

There would be no expected changes to existing salinity gradients under the No-Action Alternative.

Total Suspended Solids and Turbidity

Suspended sediments levels in surface waters may increase temporarily due to stormwater runoff from disturbed lands during upland construction activities and during construction in or adjacent to Shipyard Creek or Noisette Creek. Upland construction activities could potentially involve the disturbance and transport of large quantities of earth, resulting in a short-term increase in TSS and turbidity from stormwater runoff; however, all activities would be performed in compliance with state and local stormwater regulations. Construction within Shipyard or Noisette Creek may disturb the respective creek bottoms and banks, resulting in short-term increases in TSS and turbidity. Implementation of surface water monitoring and the use of appropriate temporary stormwater management/erosion and dust control BMPs (e.g., temporary silt fences and turbidity curtains, sprinkling/irrigation) would help control turbidity during construction and protect surface waters. As a result, impacts to surface waters resulting from stormwater runoff during construction would be negligible and localized.

Long-term changes in pollutant loading from stormwater runoff caused by an alteration of land topography, decreased soil permeability and vegetative cover, and increased impervious surface also may lead to increased TSS and turbidity levels in Shipyard and Noisette creeks and the Lower Cooper River. These impacts would be compounded by the already slightly increasing trend in TSS in Shipyard Creek; data are not available to determine potential trends in TSS in Noisette Creek (see Section 3.3.2.4). Although these types of land use changes would be expected to cause an increase in stormwater runoff suspended sediment concentrations, on-site stormwater management would be in compliance with current state and local stormwater regulations. In addition, adverse impacts would be reduced because the NPDES stormwater permitting process requires a SWPPP and Stormwater Master Plan. As stormwater treatment does not currently exist on the sites, the addition of stormwater management practices would result in a beneficial impact through minor to moderate reductions in suspended sediment concentrations in Shipyard Creek, Noisette Creek, and the Lower Cooper River.

Nutrients

Sources of nutrients in surface waters primarily include wastewater and fertilizers. Pollutant loading from stormwater runoff resulting from land use changes associated with the No-Action Alternative may lead to increased nutrient levels in surface waters of Shipyard Creek, Noisette Creek, and the Lower Cooper River. Potential increases in nutrient concentrations would be compounded by an already existing increasing trend in TP at Station MD-045 in the Lower Cooper River; data are not available to determine potential trends in nutrients in Noisette Creek (see Section 3.3.2.4). Despite the potential for increased nutrient concentrations in stormwater runoff, on-site stormwater management would be in compliance with state and local stormwater regulations and the site's SWPPP and Stormwater Master Plan. As there is currently no stormwater treatment provided on the Project site (Figure 4.3-1), based on available aerials, the addition of stormwater management practices and the implementation of the local TMDL for DO (SCDHEC 2013a) would be expected to result in a beneficial impact through minor to moderate reductions in nutrient concentrations in Shipyard Creek, Noisette Creek, and the Lower Cooper River.

Bacteria

Typical sources of bacteria and pathogens in surface waters include wastewater infrastructure, wildlife, and stormwater. Bacteria and pathogens primarily contribute to stormwater through illicit connections from wastewater infrastructure, poorly functioning septic systems, runoff from specific land uses (e.g., agricultural areas, dog parks), and animal wastes. The No-Action Alternative would not likely include any components or activities that would increase bacteria or pathogen levels above current concentrations. As a result, future activities under the No-Action Alternative should have a negligible effect regarding bacteria in the surface waters of Shipyard Creek, Noisette Creek, and the Lower Cooper River.

Heavy Metals and Other Toxic Contaminants

The No-Action Alternative may result in an increase in the number of trucks and locomotives operating on roads and railways throughout the study area. Oils and grease generated from leaks, heavy metals from vehicle exhaust, worn tires and engine parts, brake pads, or rust—as well as fertilizers, pesticides, and herbicides used alongside roads and railways—would contribute to stormwater runoff pollution (Wilkomirski et al. 2011, Nixon and Saphores 2007). The contribution of additional heavy metals would be compounded by already elevated levels of copper in Shipyard Creek; data are not available to determine potential trends in heavy metals in Noisette Creek (see Section 3.3.2.4). In addition, any potential construction activities within Noisette or Shipyard Creeks could result in the release of sequestered contaminants from sediments (see Section 3.3.3). Implementation of on-site stormwater management practices would be in compliance with state and local stormwater regulations and the site's SWPPP and Stormwater Master Plan. As there is no stormwater treatment currently on the Project site (Figure 4.3-1), the addition of these stormwater

management practices may result in a beneficial impact through minor reductions in concentrations of heavy metals and other toxic contaminants being contributed to Shipyard Creek, Noisette Creek, and the Lower Cooper River. In addition to stormwater management practices, special precautions, as discussed in Section 4.15 (Hazardous Waste and Materials), are also required when excavating or dewatering during construction projects in areas that have Land Use Controls (LUCs) and are part of the Voluntary Cleanup Contract (VCC) between Palmetto Railways and SCDHEC. Although there is potential for both minor adverse and major adverse impacts, compliance with permitting requirements and use of BMPs and spill prevention programs would minimize the potential for adverse impacts.

4.3.2.2 Accidental Spills

Development under the No-Action Alternative may require the use and maintenance of additional fueling facilities and storage of hazardous materials resulting in the potential for accidental spills. These facilities would be operated and maintained (and the chemicals used) in compliance with federal, state, and local regulations, including stormwater regulations and the associated SWPPP and Stormwater Master Plan, thus resulting in minimal to negligible adverse impacts. If more than 1,320 gallons of oil is stored for on-site use, a detailed plan designed to minimize impacts resulting from accidental spills would be provided in a Spill Prevention, Control, and Countermeasures (SPCC) Plan, which would be maintained on-site (40 C.F.R. Part 112.1). As a result of these measures, impacts to surface waters from accidental spills would be minor and localized. Impacts associated with the use and storage of fuel and hazardous materials are addressed in more detail in Section 4.15 – Hazardous, Toxic, and Radioactive Waste.

It is reasonable to assume that if there is additional truck and rail traffic associated with the No-Action Alternative, there may be an increased potential for accidental pollutant spills involving petroleum products or hazardous materials that could impact surface water quality. As a result, additional truck and rail traffic could result in the potential for minor and/or major (depending on location) direct impacts to surface water quality from accidental pollutant spills. However, there are BMPs, mandated requirements, and regulations that cover spills (Section 4.15.3.2); therefore, impacts to surface waters from accidental spills would be minor and localized.

4.3.2.3 Stormwater Runoff

Upland construction activities, as well as construction adjacent to Shipyard or Noisette creeks, could involve the disturbance and transport of large quantities of earth, resulting in a short-term increase in stormwater runoff (TSS and turbidity); however, all activities would be performed in compliance with state and local stormwater regulations. Temporary sediment basins and other temporary stormwater management/erosion control BMPs would be implemented to control runoff and protect surface waters during future construction activities. As a result, short-term impacts to water quality from stormwater runoff during construction would be negligible.

Increased impervious surface and other watershed alterations (e.g., decreased soil permeability and vegetative cover) that may result from the No-Action Alternative would increase runoff quantity and associated non-point source (nps) pollutant concentrations. For example, some of the existing permeable areas may be replaced with impermeable surfaces, resulting in increased stormwater runoff. Stormwater on the sites is currently transported primarily through a series of underground storm sewers that outfall into Shipyard Creek and the Lower Cooper River. Based on available aerials, there is currently no treatment of stormwater runoff on the existing sites within the Project site footprint (Figure 4.3-1) before being discharged through outfalls into Shipyard Creek or the Lower Cooper River. Although there could be an increase in impervious surface, there would also be the addition of stormwater management structures to detain and treat runoff, potentially improving water quality on the site.

A potential increase in vehicular or rail traffic and operating equipment associated with the No-Action Alternative may result in the contribution of various pollutants to stormwater runoff. Common pollutants associated with motor vehicles include used oils, grease, and heavy metals. Van Metre et al. (2000) showed that vehicles are a significant source of PAHs in waterbodies due to tire wear, engine oil leaks, and exhaust, while heavy metals such as zinc and copper are significant pollutants on roadways due to tire and brake wear, respectively (Adachi and Tainosho 2004), contributing to stormwater runoff loads. Similarly, PAHs and heavy metals are the two most important types of pollutants associated with railway transport (Wilkomirski et al. 2011). In addition to those pollutants that originate from the vehicles and locomotives themselves, nutrients, suspended solids, and organics that attach to the outer surfaces or undercarriage also contribute to stormwater runoff from roadway and railway surfaces during rain events. Stormwater management for runoff generated from additional roadways or railways would be in compliance with state and local stormwater regulations and the site's SWPPP and Stormwater Master Plan. As a result, impacts to water quality would be negligible.

4.3.2.4 Sediments

Potential construction activities within or adjacent to Shipyard and Noisette creeks may disturb the aquatic sediments in the respective waterways. Appropriate BMPs would be employed by Palmetto Railways and/or other developers to control the disturbance of sediments and any resulting erosion and sedimentation. Available sediment quality data from the turning basin of Shipyard Creek (Station RO00056; Figure 3.3-2) indicate elevated levels of arsenic, copper, chromium, and eight PAHs in 2000, and moderate levels of contamination (Station NOR09056; Figure 3.3-2) in 2009 (SCECAP 2014); no sediment quality data are available for Noisette Creek (see Section 3.3.3). Because contaminated sediments also are potentially present in areas farther upstream in Shipyard Creek, as well as in Noisette Creek, appropriate management actions may be required to control the potential release of pollutants into the water column during construction. Impacts to water quality would likely be short-term, localized, and minor.

A potential increase in vehicular or rail traffic and operating equipment associated with the No-Action Alternative may result in the contribution of various pollutants to sediments via stormwater runoff (see Section 4.3.2.3). As stormwater management for runoff generated from additional roadways or railways would be in compliance with state and local stormwater regulations and the site's SWPPP and Stormwater Master Plan, impacts to sediment quality would be negligible.

4.3.2.5 Groundwater Resources

The No-Action Alternative would result in a negligible impact with regard to groundwater recharge. Although there would be an increase in the impervious areas at the sites (Section 4.2 – Hydrology)—thereby reducing local infiltration and surficial aquifer recharge—there are no active groundwater wells utilizing the underlying aquifers for public potable water use within or near the sites. In addition, additional demands on groundwater resources would not likely occur under the No-Action Alternative. The two wells that are located within the Project site, CHN-2 and CHN-476, are indicated for industrial use and currently unused, respectively (SCDNR 2007). Both wells are at depths exceeding 300 feet. Surficial aquifers are shallow (typically less than 50 feet [USGS 2016]) and vulnerable to contamination associated with anthropogenic activities. As these wells are located outside of the surficial aquifer, protection is provided by the Cooper Formation, which functions as an effective confining unit, inhibiting downward movement of groundwater (Park 1985).

Groundwater resources could be impacted by fertilizers, pesticides, and spills or leaks at or near the land surface that can move quickly to the water table, especially in areas where sandy soils offer little opportunity for filtration or degradation of pollutants. Impacts resulting from accidental spills would be minimized through the use of a SPCC Plan. As a result, impacts to groundwater from accidental spills would be minor and localized. Excavation and use of stormwater infrastructure or ponds in areas that have LUCs and are part of the VCC would require permitting, treatment, and proper disposal of the dewatering effluent to prevent migration of contaminated groundwater into uncontaminated areas. Avoidance and minimization measures would help to keep impacts to a minimum; however, there would be the potential for both minor adverse and major adverse impacts. Potential groundwater contamination issues are addressed in more detail in Section 4.15 – Hazardous, Toxic, and Radioactive Waste.

4.3.3 Alternative 1: Proposed Project (South via Milford / North via Hospital District)

Construction and operation activities associated with the Navy Base ICTF under Alternative 1 (Proposed Project) would have the potential to impact water quality in Shipyard Creek, Noisette Creek, and the Cooper River. For Alternative 1 (Proposed Project), five dry detention ponds (A, B, C, D1, and D2) and two sediment forebays associated with pond A, along with a treatment swale and associated underdrains (hereafter the Stormwater Management System) would be used for on-site pollutant and sediment removal.

These proposed BMPs by Palmetto Railways were considered to provide treatment levels in compliance with local (City of North Charleston Standards and Procedures Manual 2008a) and state regulations (SCDHEC 2012c).

Stormwater treatment for off-site infrastructure (e.g., roadway improvement and modifications) will include:

- new inlets with permanent inlet filters;
- manufactured treatment devices (MTD) for major outlets where stormwater leaves the ROW with mildly sloped grassed shoulders and grass-lined ditches along roadways (e.g., segments of North Hobson Avenue, all of the relocated Bainbridge Avenue, portions of the drayage road that are not on ridge structures) to filter sheet flow for suspended pollutants before draining to the outfall; and
- enhanced riprap structures in three of the grass-lined ditches to create detention and allow for further pollutant removal and water quality treatment before draining to the outlet.

4.3.3.1 Surface Waters

Alternative 1 (Proposed Project) would result in impacts to surface waters of Shipyard Creek, Noisette Creek, and the Lower Cooper River that are similar to the No-Action Alternative, with a few exceptions. Potential impacts to water quality are discussed in the following subsections and are evaluated with respect to the status of the current TMDL for DO (SCDHEC 2013a).

Dissolved Oxygen

Palmetto Railways has committed to designing culverts and/or bridges to maintain existing surface drainage patterns and to prevent erosion, limit the placement of pilings for bridges within waterways (where possible), and to design culverts (e.g., under the arrival/departure tracks) and bridges to maintain existing flow and hydrology for wetland areas and to prevent flooding upstream. The addition of a new bridge over Shipyard Creek for the drayage road would be pile supported and not result in a hydrologic constriction that could adversely impact flow patterns in Shipyard Creek. The construction of arrival/departure tracks crossing tidal marsh habitat upstream of Shipyard Creek, however, may slightly reduce localized tidal flushing, resulting in the potential for negligible changes in the range of BOD and salinity levels of Shipyard Creek.

Pollutant loading, which can increase the BOD and result in decreased DO, may increase locally due to rail traffic crossing of respective sections of Noisette Creek. Short-term effects may be experienced upstream through the transport of pollutants during incoming tides. In addition, pollutant loading, including increased nutrient concentrations from stormwater runoff resulting from land use changes, is a possibility; however, the incorporation of the Stormwater Management System would provide pretreatment of stormwater runoff before it discharges to the primary water quantity and quality control. The Stormwater Management System would result in a reduction of TN, TP, and TSS as

compared to existing and future without-Project conditions. As with the No-Action Alternative, all design requirements would need to be in compliance with the TMDL for DO established for the Charleston Harbor, Cooper River, Ashley River, and Wando River (SCDHEC 2013a; City of North Charleston 2008b) and state regulations (SCDHEC 2012c). As a result, Alternative 1 (Proposed Project) is expected to cause negligible decreases in DO conditions throughout the study area, and minor direct beneficial increases in runoff quality contributing to surface waters due to implementation of current stormwater BMP requirements and the construction of the Stormwater Management System.

Salinity

Construction of the bridges associated with the drayage road over Shipyard Creek, as well as new arrival/departure tracks across the creek's associated tidal salt marsh, would not result in channel impacts that would significantly change circulation patterns. As a result, potential changes to existing salinity gradients within Shipyard Creek under Alternative 1 (Proposed Project) would be negligible.

Total Suspended Solids and Turbidity

As with the No-Action Alternative, TSS and turbidity levels in Shipyard and Noisette creeks may increase temporarily due to the deposition of dredge or fill material during construction and stormwater runoff from disturbed lands during upland construction activities under Alternative 1 (Proposed Project). Similarly, temporary increases in TSS and turbidity are expected due to the disturbance of the bottoms and banks of Shipyard and Noisette creeks during construction of the drayage road over Shipyard Creek and rehabilitation of the existing railroad bridge over Noisette Creek. Palmetto Railways' implementation of construction sequencing BMPs would include installation of a silt fence along the perimeter of the site, as well as the stabilization of construction entrances prior to commencing construction operations. Previously installed BMPs would be maintained and incorporated into subsequent construction phases. During grading operations and stormwater construction, inlet filters and inlet/outlet rip-rap would be installed as work progresses. Silt fencing would be used during the lifespan of all construction activities. Temporary and permanent seeding would also be used during the stabilization phase. Implementation of any required surface water monitoring and the use of the above appropriate temporary stormwater management/erosion control BMPs would reduce impacts, resulting in negligible to minor, direct short-term localized impacts to surface waters during construction.

Long-term impacts to TSS and turbidity levels in Shipyard Creek and the Lower Cooper River under Alternative 1 (Proposed Project) would be similar to those under the No-Action Alternative. An increase in impervious features may cause higher flows, which in turn may result in increased river bank erosion and elevated TSS and turbidity; however, per stormwater permit requirements, connection of the proposed stormwater management system to the existing or natural system would result in no net increase in the rate of discharge or associated riverbank erosion and TSS or turbidity

levels. The Model (PBS&J 2010) implemented specifically for this Project site indicates that the use of the Stormwater Management System, designed in compliance with state regulations (SCDHEC 2011, SCDHEC 2012c) would result in a 57 percent reduction in TSS at the Project site compared to existing conditions. In addition, potential adverse impacts would be reduced through use of a SWPPP and Stormwater Master Plan. As stormwater treatment does not currently exist on the Project site, the addition of the Stormwater Management System would result in a direct beneficial impact through minor reductions in suspended sediment concentrations in Shipyard Creek and the Lower Cooper River.

Nutrients

Impacts to nutrient concentrations in Shipyard Creek, Noisette Creek, and the Lower Cooper River as a result of Alternative 1 (Proposed Project) would be similar to those under the No-Action Alternative. The Model (PBS&J 2010) implemented for this site shows that the Stormwater Management System would reduce overall TN and TP concentrations from both treated and untreated areas within the Project site by approximately 28 and 36 percent, respectively, compared to existing conditions; as there is currently no stormwater treatment provided on the Project site (Figure 4.3-1), based on available aerials. The addition of these stormwater management practices and the implementation of the local TMDL for DO (SCDHEC 2013a) would result in a direct beneficial impact through minor reductions in nutrient concentrations in Shipyard Creek and the Lower Cooper River.

Bacteria

Typical sources of bacteria and pathogens in surface waters include wastewater infrastructure, wildlife, and stormwater. Bacteria and pathogens primarily contribute to stormwater through illicit discharges from wastewater infrastructure, poorly functioning septic systems, runoff from specific land uses (e.g., agricultural areas, dog parks), and animal wastes. Alternative 1 (Proposed Project) would likely not include any components or activities that would increase bacteria or pathogen levels above current concentrations. As a result, impacts to bacteria concentrations in Shipyard Creek, Noisette Creek, and the Lower Cooper River under Alternative 1 (Proposed Project) would be similar to those under the No-Action Alternative. In addition, the five dry detention ponds surrounding the Project site would be designed to remove between 20 and 50 percent of the bacteria and pathogens from stormwater entering the ponds before discharging to surface waters (SCDHEC 2005a). As a result, there would be a negligible effect of bacteria in the surface waters of Shipyard Creek and the Lower Cooper River.

Heavy Metals and Other Toxic Contaminants

Impacts to heavy metals and other toxic contaminants in Shipyard Creek, Noisette Creek, and the Lower Cooper River under Alternative 1 (Proposed Project) would be similar to those under the No-

Action Alternative. In addition, release of sequestered contaminants from sediments may occur during construction of the drayage road over Shipyard Creek and from rehabilitation of the existing railroad bridge over Noisette Creek. According to pollutant removal estimates for standard BMPs, the vegetated swale that would be used to treat runoff from the track and ballast sections of the Proposed Project would be designed to remove 40 to 50 percent of metals (SCDHEC 2005b) prior to discharge to the Lower Cooper River. Flow from the McMillan Avenue Bridge would be directed to nearby dry detention ponds; runoff from all other off-site infrastructure improvements (e.g., roadway improvement and modifications) would not contribute to the Stormwater Management System. Stormwater treatment for off-site infrastructure (e.g., roadway improvement and modifications) would include permanent inlet filters, MTDs, grassed shoulders and grass-lined ditches, and enhanced riprap structures as described in Section 4.3.3. Deck runoff from the drayage road bridges would be discharged via scuppers, with the exception of sections located over open waters, where runoff would be carried along the bridge length through a closed system to drainage inlets located outside of open water limits. The five proposed stormwater treatment ponds would each be designed to remove an average of 41 percent of the heavy metal pollutants (SCDHEC 2005b) entering the pond prior to discharge to the surface waters of the Lower Cooper River. Additionally, an oil/water separator would be employed at the locomotive shop, and light duty repairs in the vicinity of the "repair in place" tracks would include proper spill protection (e.g., spill kit, collector pans) to ensure treatment of oily waste from on-terminal equipment maintenance activities. Assuming the separator is part of the Stormwater Management System prior to discharge, it would be included in the Individual Section 402 NPDES permit for the facility. Adverse impacts also would be minimized through the actions identified in the mandatory SWPPP and Stormwater Master Plan. As there is no stormwater treatment currently on the Project site (Figure 4.3-1), only minor increases in the concentrations of heavy metals and other toxic contaminants contributed to Shipyard Creek and the Lower Cooper River would occur under Alternative 1 (Proposed Project), resulting in a negligible to minor direct adverse impact.

Construction in areas involving contaminated soils would require testing and proper disposal of the soils if regulatory thresholds are exceeded. This would minimize any resulting transport of contaminants to surface waters during rainfall events. In addition, runoff would be directed to on-site stormwater management facilities for treatment, in compliance with state and local stormwater regulations, before discharging to surface waters. Clean fill would be used on the Project site, which would then predominantly be capped with pavement to mitigate the spread of existing contaminants during operation activities.

4.3.3.2 Accidental Spills

Impacts to surface waters from accidental spills associated with the use and maintenance of fueling facilities and storage of hazardous materials under Alternative 1 (Proposed Project) are expected to

be similar to those under the No-Action Alternative; impacts to surface waters from accidental spills would be minor and localized.

4.3.3.3 Stormwater Runoff

Impacts from stormwater runoff during construction of Alternative 1 (Proposed Project) would be similar to those under the No-Action Alternative. The addition of impervious surface and other watershed alterations, which can decrease soil permeability and vegetative cover, would increase runoff quantity and associated nps pollutant concentrations. Although there would be an increase in impervious surface, Alternative 1 (Proposed Project) includes the addition of five stormwater treatment ponds (A, B, C, D1, and D2) as part of a Stormwater Management System to detain and treat runoff, thereby improving water quality on the site. Two sediment forebays would also be included in the Stormwater Management System to provide pretreatment of stormwater runoff before it discharges to pond A. A sediment forebay is a settling basin constructed at the incoming discharge points of a stormwater BMP. The purpose of a sediment forebay is to allow sediment to settle from the incoming stormwater runoff before it is delivered to the balance of the BMP. A sediment forebay helps to isolate the sediment deposition in an accessible area, which facilitates BMP maintenance efforts.

Increased vehicular and rail traffic and operating equipment associated with Alternative 1 (Proposed Project) would also contribute various pollutants to stormwater runoff, as described under the No-Action Alternative.

Stormwater Management at the Proposed Project

Under Alternative 1 (Proposed Project), stormwater from the proposed facility would be collected by a network of pipes and inlets and routed into the five dry detention ponds (A, B, C, D1, and D2) located at the topographical low points of the site and in close proximity to the existing outfalls; two sediment forebays would provide pretreatment of stormwater runoff before it discharges to pond A. Ponds A and B would be constructed along the east side of the facility, while Ponds D1, D2, and C would be constructed in the northern portion of the ICTF (Figure 4.3-1). Ponds would be sized to temporarily store the run-off volume to reduce the post-development peak flow to pre-development conditions and meet water quality requirements. Currently, according to available aerials, there is no treatment on the Project site (Figure 4.3-1); post-construction stormwater management facility treatment would exceed pre-development treatment levels. Load reduction estimates for the pond treatment were assumed consistent with state regulations (SCDHEC 2011, SCDHEC 2012c). The stormwater runoff would be temporarily detained as per state standards and released through outfall structures, each including a small orifice at the bottom pond elevation to sufficiently drain the dry detention pond. The treated water would then discharge into the existing box culvert that outfalls into the Lower Cooper River at the east end of Supply Street. Based on a review of historic


Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community
Noisette Creek
Detention Pond D1
N. Hobson Ave.
St. Johns Ave.
Detention Pond C
McMillan Ave.
Detention Pond D2
Detention Pond A
Spruill Ave.
Cosgrove Ave.
Rivers Ave.
Cooper River
Detention Pond B
Viaduct Rd.
Bainbridge Ave.
Stromboli Ave.
Shipyard Creek
Ashley River
Proposed Dry Dentention Ponds
Model Assessment Area
Source: Palmetto Railways, Atkins
0
2,900
5,800
Feet
N
NAVY BASE ICTF EIS
Locations of Dry Detention Sites and Pollutant Modeling Assessment Area
Alternative 1 (Proposed Project)
Figure 4.3-1
US Army Corps Of Engineers
Charleston District

groundwater elevations by Palmetto Railways, analysis determined that the proposed elevations for the dry detention ponds allow for sufficient elevations difference between groundwater and pond bottom. As a result, the ponds would not be lined (personal communication, Matthew Gehman, TranSystems, February 22, 2016).

At a minimum, each pond would be designed to store and release the first 1 inch of runoff from the Project site over a minimum period of 24 hours. As per City of North Charleston standards (2008b), the minimum designed sediment removal efficiency for each pond would be 80 percent suspended solids. The design storm event would be the 10-year, 24-hour design event. An emergency spillway would be included in the design to pass the 100-year storm event and to protect the area from damage during overtopping.

Stormwater management for runoff generated from the on-site roadways and railways would be provided by the Stormwater Management System. Water from tracks and ballast sections of the Project would filter through the ballast and be conveyed via sheet flow before being collected and transported to a vegetated swale on the west side of the Project site. Water in the swale would be collected at grated drop inlets and fed into a pipe that outlets into a junction box at the mouth of the culvert for discharge into the Lower Cooper River. Roadway runoff, including that from the McMillan Avenue Bridge, would primarily be directed to the five dry detention ponds and two sediment forebays associated with pond A; runoff from all other off-site roadway improvements would not contribute to the Stormwater Management System. Stormwater treatment for off-site infrastructure (e.g., roadway improvement and modifications) would include permanent inlet filters, MTDs, grassed shoulders and grass-lined ditches, and enhanced riprap structures as described in Section 4.3.3. Deck runoff from the drayage road bridges would be discharged via scuppers, with the exception of sections located over open waters, where runoff would be carried along the bridge length through a closed system to drainage inlets located outside of open water limits.

Palmetto Railways has committed to ensuring that all drainage infrastructure—including forebays, ponds, outlet control structures, and storm sewers—would be constructed as part of Phase I construction. Sediment basins would be used during construction with temporary diversion ditches to divert runoff to the sediment basins. Silt fencing and other appropriate erosion control BMPs also would be used where needed.

Pollutant Removal Efficiencies

The five (A, B, C, D1, and D2) dry detention ponds would serve to temporarily detain stormwater runoff from the facility and most associated roadways during and immediately following a storm event. Pollutants would be removed within the basins primarily through sedimentation during dewatering of the pond following the storm event, thereby reducing the amount of pollutants entering receiving waters. Pond A would include two upstream forebays to provide pretreatment for pollutant removal. Pre-treatment serves to decrease incoming velocities and allows for the capture

of coarser sediments, trash, and debris (SCDHEC 2005b). The vegetative/treatment swale would remove pollutants through filtration of particulate pollutants and infiltration of dissolved constituents. There is a range of removal efficiencies for dry detention for typical pollutants associated with stormwater; as the pollutant removal capability of vegetated filter strips (i.e., grass filters, grass filter strips, buffer strips, vegetated buffer zones, riparian vegetated buffer strips, constructed filter strips) depends upon the filter length (SCDHEC 2005b). Although removal efficiencies are not available for PAHs, it is anticipated that, because PAHs are often sediment-bound (Perrin 2012), some of these pollutants would be removed by the detention ponds and vegetative swales. Further pollution loading of stormwater would be reduced through the utilization of additional BMPs, such as wet detention. Per permit conditions, the changes in surface water quality would maintain in compliance with state water quality standards and impacts would be negligible.

Results of the Model (PBS&J 2010) for calculating overall TN, TP, and TSS loads from both treated and untreated areas within the Project site demonstrate that loads would be reduced by approximately 28, 36, and 57 percent, respectively, compared with the existing condition.

4.3.3.4 Sediments

The development of the drayage road under Alternative 1 (Proposed Project) would require bridge construction over Shipyard Creek and associated tidal marsh. Alternative 1 (Proposed Project) would also include rehabilitation of the existing rail bridge over Noisette Creek. Construction of pile supports for the proposed bridges in Shipyard Creek and rehabilitation of the existing rail bridge over Noisette Creek may disturb the aquatic sediments in the respective waterways. As described under the No-Action Alternative, appropriate BMPs would be employed to control the disturbance of sediments and any resulting erosion and sedimentation. Since contaminated sediments are currently present in the turning basin of Shipyard Creek and also are potentially present in areas farther upstream in Shipyard Creek and in Noisette Creek, appropriate BMPs (e.g., floating semi-permeable turbidity curtain) may be required to control the potential release of pollutants into the water column during construction. The Applicant will employ those BMPs, if necessary. Adverse impacts would be similar to those under the No-Action Alternative with the use of BMPs.

4.3.3.5 Groundwater Resources

Impacts to groundwater recharge and quality under Alternative 1 (Proposed Project) would be similar to those under the No-Action Alternative; however, multiple areas with groundwater monitoring would be impacted as well as more potentially contaminated sites. In addition, contaminated groundwater may be encountered in areas of deeper excavations (e.g., the 5 dry detention ponds, roadway and rail pilings) which would require permitting, treatment, and proper disposal of dewatering effluent as described in Section 4.15 (Hazardous, Toxic, and Radioactive Waste). With the use of avoidance and minimization measures, adverse direct and indirect impacts would be minor.

4.3.4 Alternative 2: Proposed Project Site (South via Milford / North via S-line)

Under Alternative 2, construction and operation of the Navy Base ICTF would alter the surface water, stormwater runoff, sediments, and groundwater resources in the study area and vicinity, resulting in a range of potential impacts on water-related resources that are similar to those described for Alternative 1 (Proposed Project). The construction of a new rail bridge over Noisette Creek under Alternative 2 may result in additional short-term negligible to minor direct impacts to TSS and turbidity as well as minor indirect impacts from heavy metals and other toxic contaminants due to the release of sequestered contaminants from sediments.

4.3.5 Alternative 3: Proposed Project Site (South via Kingsworth / North via Hospital)

Under Alternative 3, construction and operation of the Navy Base ICTF would alter the surface water, stormwater runoff, and sediments in the study area and vicinity, resulting in a range of potential impacts on water-related resources that are similar to those described for Alternative 1 (Proposed Project). Impacts to groundwater quality would be similar to the No-Action Alternative (see Section 4.15 – Hazardous, Toxic, and Radioactive Waste).

4.3.6 Alternative 4: Proposed Project Site (South via Milford)

Under Alternative 4, construction and operation of the Navy Base ICTF would alter the surface water, stormwater runoff, sediments, and groundwater resources in the study area and vicinity, resulting in a range of potential impacts on water-related resources that are similar to those described for Alternative 1 (Proposed Project); however, since the existing rail bridge over Noisette Creek would not be rehabilitated for this alternative, direct and indirect impacts to surface waters of Noisette Creek would be negligible to minor, and limited to those associated with a short-term increase in stormwater runoff from disturbed lands during upland construction activities.

4.3.7 Alternative 5: River Center Project Site (South via Milford / North via Hospital District)

4.3.7.1 Surface Waters

Under Alternative 5, construction and operation activities at the River Center project site would result in impacts to surface waters of Shipyard Creek, Noisette Creek, and the Lower Cooper River that are similar to the No-Action Alternative and Alternative 1 (Proposed Project), with a few exceptions. As with Alternative 1 (Proposed Project), stormwater treatment does not currently exist on the River Center project site. The addition of stormwater management practices under Alternative 5 would be similar to those under Alternative 1 (Proposed Project), including the use of pre-treatment and five dry detention ponds located at the topographical low points of the River Center

project site and in close proximity to the existing outfalls (Figure 4.3-2), along with a treatment swale and associated underdrains. In addition, like the Project site, the River Center project site would discharge either directly or indirectly into the Cooper River. As such, all design requirements would need to be in compliance with the TMDL for DO established for the Charleston Harbor, Cooper River, Ashley River, and Wando River (SCDHEC 2013a; City of North Charleston 2008b) and state regulations (SCDHEC 2012c). Potential impacts to water quality are discussed in the following sub-sections and are evaluated with respect to the status of the current TMDL for DO (SCDHEC 2013a).

Dissolved Oxygen, Salinity, and Bacteria

Construction and operation of the River Center ICTF at the River Center project site under Alternative 5 would not introduce any new elements that would appreciably change circulation patterns of, or pollutant loading to, surface waters as compared to Alternative 1 (Proposed Project). As a result, associated impacts to DO and salinity concentrations as well as bacteria in surface waters would be the same as those under Alternative 1 (Proposed Project).

Total Suspended Solids and Turbidity

Impacts to TSS and turbidity in Noisette and Shipyard creeks for the River Center project site under Alternative 5 would be similar to those under Alternative 1 (Proposed Project).

The Model (PBS&J 2010) implemented for the River Center project site indicates that the use of BMPs similar to those proposed for Alternative 1 (Proposed Project) during operation would result in a 76 percent reduction in TSS. Percent reduction levels at the River Center project site would be slightly higher than those at the Project site and the resulting discharge would have lower levels of TSS than the existing condition.

The increased distance of the drayage road and number of yard trucks required for the River Center project site would lead to increased quantities of stormwater runoff from the roadway and associated TSS and turbidity levels from off-site improvement areas, as compared to Alternative 1 (Proposed Project). Although these changes would cause a rise in stormwater runoff suspended sediment concentrations, the roadway runoff would be directed to on-site stormwater management facilities for treatment, in compliance with state and local stormwater regulations, before discharging to surface waters.


Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community
Noisette Creek
N. Hobson Ave.
St. Johns Ave.
McMillan Ave.
Spruill Ave.
Cosgrove Ave.
Rivers Ave.
Cooper River
Viaduct Rd.
Bainbridge Ave.
Stromboli Ave.
Shipyard Creek
Ashley River
Proposed Dry Detention Ponds
Model Assessment Area
Source: Palmetto Railways, Atkins
0
2,900
5,800
Feet
N
NAVY BASE ICTF EIS
Locations of Dry Detention Sites and Pollutant Modeling Assessment Area River Center Site
Figure 4.3-2
US Army Corps Of Engineers
Charleston District

Nutrients

Under Alternative 5, the River Center ICTF would generate approximately the same runoff nutrient load as that generated under Alternative 1 (Proposed Project). According to the Model (PBS&J 2010) implemented for the River Center project site, the use of BMPs on this site would reduce TN and TP concentrations by approximately 44 and 52 percent, respectively (see Section 4.3.4.3). Percent reduction levels at the River Center project site would be slightly higher than those at the Project site for both TN and TP. As with Alternative 1 (Proposed Project), a beneficial impact to water quality through minor reductions in nutrient concentrations in local surface waters would occur.

The drayage road required for the River Center project site under Alternative 5 would be approximately twice as long as that for Alternative 1 (Proposed Project). This increased length would generate greater stormwater runoff nutrient pollution loading to Shipyard Creek and the Lower Cooper River than Alternative 1 (Proposed Project); however, as with Alternative 1 (Proposed Project), appropriate stormwater measures would be implemented, resulting in minimal adverse impacts to surface water quality.

Heavy Metals and Other Toxic Contaminants

Impacts to heavy metals and other toxic contaminants in Noisette Creek for the River Center project site under Alternative 5 would be the same as those for Alternative 1 (Proposed Project). The River Center project site would involve a larger number of trucks operating along a longer drayage road. As a result, levels of oils, grease, and other toxic contaminants generated through vehicle operation—as well as fertilizers, pesticides, and herbicides used along the drayage road—would increase stormwater runoff pollution (Wilkomirski et al. 2011, Nixon and Saphores 2007). As a result, impacts to heavy metals and other toxic contaminants in Shipyard Creek and the Lower Cooper River would likely be higher than those under Alternative 1 (Proposed Project).

The use of pretreatment and stormwater treatment ponds similar to those described for Alternative 1 (Proposed Project), and other actions identified in the mandatory SWPPP, would minimize surface water impacts. As a result, impacts to water quality from concentrations of heavy metals and other toxic contaminants in surface waters for the River Center project site under Alternative 5 would be similar to those for Alternative 1 (Proposed Project).

4.3.7.2 Accidental Spills

The risk of accidental spills and associated impacts under Alternative 5 would be similar to those under the No-Action Alternative.

4.3.7.3 Stormwater Runoff

Construction of a longer drayage road under Alternative 5 would involve the disturbance and transport of larger quantities of earth and sediments, resulting in a temporary increase in stormwater runoff TSS and turbidity and suspended sediments; however, as with Alternative 1 (Proposed Project), all activities would be performed in compliance with state and local stormwater regulations. Temporary sediment basins and other temporary stormwater management/erosion control BMPs would be implemented to control runoff and protect surface waters during construction. As a result, impacts to water quality from stormwater runoff during construction should be similar to those under Alternative 1 (Proposed Project).

Increased impervious surface and vehicular traffic associated with the longer drayage road from the River Center project site would generate greater runoff quantity, suspended sediment runoff pollution, and associated nps pollutant concentrations (e.g., used oils, grease, and heavy metals) contributing to surface waters than Alternative 1 (Proposed Project). Stormwater along the drayage road would be conveyed to on-site detention basins for treatment prior to discharge to surface waters. As a result, impacts to water quality associated with stormwater runoff for the River Center project site under Alternative 5 would be similar to those under Alternative 1 (Proposed Project).

Results of the Model (PBS&J 2010) for calculating TN, TP, and TSS loads at the River Center project site demonstrate load reductions for the basin of approximately 44, 52, and 76 percent for TN, TP, and TSS, respectively. As a result, a beneficial impact to water quality would occur.

4.3.7.4 Sediments

Impacts to sediments in Noisette and Shipyard Creeks for the River Center project site under Alternative 5 would be the same as those under Alternative 1 (Proposed Project).

4.3.7.5 Groundwater Resources

Impacts to groundwater capacity and quality for the River Center project site under Alternative 5 would be similar to those under Alternative 1 (Proposed Project), but with fewer areas with existing groundwater contamination and monitoring wells (see Section 4.15.3, HTRW).

4.3.8 Alternative 6: River Center Project Site (South via Kingsworth / North via Hospital District)

Under Alternative 6, construction and operation of the River Center ICTF would alter the surface water, stormwater runoff, sediments, and groundwater resources in the study area and vicinity, resulting in a range of potential impacts on water-related resources that are similar to those described for Alternative 5.

4.3.9 Alternative 7: River Center Project Site (South via Milford)

Under Alternative 7, construction and operation of the River Center ICTF would alter the surface water, stormwater runoff, and sediments in the study area and vicinity, resulting in a range of potential impacts on water-related resources that are similar to those described for Alternative 4. Impacts to Shipyard Creek and the Lower Cooper River associated with the increased distance of the drayage road and number of yard trucks required for the River Center project site would be similar to those under Alternative 5. Impacts to groundwater resources as a result of the River Center ICTF under Alternative 7 would also be similar to those under Alternative 5.

4.3.10 Related Activities

New track would be constructed on a section of unimproved CSX ROW to accept intermodal trains at the proposed new at-grade crossing at Meeting Street under Alternatives 1, 2, 4, 5, and 7 and would result in negligible impacts to surface water, stormwater runoff, sediments, and groundwater resources in the study area and vicinity. Similarly, construction associated with Related Activities under Alternatives 3 and 6 would also result in negligible impacts to these resources.

The addition of a Related Activity involving reactivation of an out-of-service ROW and construction of a new railroad trestle bridge across a portion of marsh, which drains to Noisette Creek, under Alternative 2 would result in additional impacts to Noisette Creek surface waters. Temporary increases in TSS and turbidity are expected due to disturbance of the bottoms and banks of Noisette Creek during construction of the new railroad bridge. Release of sequestered contaminants from sediments in the Noisette Creek marsh may also occur during construction of the new railroad bridge. Since contaminated sediments are potentially present in Noisette Creek, appropriate BMPs may be required to control the potential release of pollutants into the water column during construction. Negligible decreases in DO conditions are also expected due to additional pollutant loading from increased rail traffic crossing Noisette Creek. Use of appropriate temporary stormwater management/erosion control BMPs by the North Charleston Terminal Company (NCTC) would result in negligible to minor, direct and indirect, short-term localized impacts to surface waters of Noisette Creek during construction.

The addition of a new railroad bridge would increase impervious surface resulting in increased stormwater runoff and associated nps pollutant concentrations into Noisette Creek; however, implementation of on-site stormwater management practices would be in compliance with state and local stormwater regulations, the SWPPP, and Stormwater Master Plan, resulting in negligible to minor direct adverse impacts.

The addition of a new railroad trestle bridge across the Noisette Creek marsh as a Related Activity under Alternative 2 would also impact sediments. Construction of pile supports for the bridge may disturb aquatic sediments in Noisette Creek. Appropriate BMPs would likely be employed by the

North Charleston Terminal Company (NCTC) to control the disturbance of sediments and any resulting erosion and sedimentation. Direct adverse impacts are expected to be localized and minor.

Impacts to groundwater recharge and quality as a result of the Related Activities under Alternative 2 would be negligible.

4.3.11 Summary of Impacts Table

Table 4.3-3 summarizes the environmental consequences to water quality from Alternative 1 (Proposed Project) and all the alternatives.

Table 4.3-2
Summary of Impacts, Water Quality

Alternative	Surface Water Quality Impacts	Stormwater Runoff Impacts	Sediment Quality Impacts	Groundwater Resources Impacts
No-Action	Negligible effect in vicinity of the project, downstream, and throughout tidal segments of on-site creeks from potential changes in runoff, watershed alterations, and increased vehicular and rail traffic. Possible beneficial effect on DO, TSS, and concentrations of nutrients, heavy metals and other toxic contaminants in downstream waters. Minor and/or major direct impacts from accidental spills.	Negligible effect on water quality from stormwater runoff with implementation of current stormwater management practices. Possible beneficial effect on DO, TSS, and concentrations of nutrients, heavy metals and other toxic contaminants in downstream waters.	Minor short-term effect during construction activities from disturbance of sediments and associated release of pollutants into the water column.	Negligible effect on groundwater recharge. Minor direct impact on groundwater quality from accidental spills. Minor effect on groundwater quality due to excavation and use of stormwater infrastructure and ponds in vicinity of contaminated groundwater.

Alternative	Surface Water Quality Impacts	Stormwater Runoff Impacts	Sediment Quality Impacts	Groundwater Resources Impacts
1: Proposed Project: South via Milford / North via Hospital District	Similar to the No-Action Alternative, with few exceptions. Negligible to minor short-term effect on TSS, turbidity and concentrations of heavy metals and other toxic contaminants due to disturbance of sediments in Shipyard Creek (during new bridge construction) and Noisette Creek (during bridge rehabilitation).	Similar to the No-Action Alternative. Beneficial effect on DO, TSS, and concentrations of nutrients, heavy metals and other toxic contaminants in downstream waters compared to the existing condition.	Similar to the No-Action Alternative	Similar to the No-Action Alternative. Multiple areas with groundwater monitoring that would be impacted and more potentially contaminated sites.
2: South via Milford / North via S-line	Similar to Alternative 1 (Proposed Project). Impacts to surface waters may be slightly increased as a new bridge would be constructed over Noisette Creek.	Similar to Alternative 1 (Proposed Project)	Similar to the Alternative 1 (Proposed Project)	Similar to Alternative 1 (Proposed Project)
3: South via Kingsworth / North via Hospital	Similar to Alternative 1 (Proposed Project)	Similar to Alternative 1 (Proposed Project)	Similar to Alternative 1 (Proposed Project)	Similar to the No-Action Alternative
4: South via Milford	Similar to Alternative 1 (Proposed Project). Impacts to surface waters of Noisette Creek would be negligible to minor and limited to those associated with a short-term increase in stormwater runoff from disturbed lands during upland construction activities.	Similar to Alternative 1 (Proposed Project)	Similar to Alternative 1 (Proposed Project)	Similar to Alternative 1 (Proposed Project)

Alternative	Surface Water Quality Impacts	Stormwater Runoff Impacts	Sediment Quality Impacts	Groundwater Resources Impacts
5: River Center Project Site: South via Milford / North via Hospital District	Similar to the No-Action Alternative, with few exceptions. Negligible to minor short-term effect on TSS, turbidity, and concentrations of heavy metals and other toxic contaminants due to disturbance of sediments in Shipyard Creek (during new bridge construction) and Noisette Creek (during bridge rehabilitation).	Similar to the No-Action Alternative with beneficial effect on DO, TSS, and concentrations of nutrients, heavy metals and other toxic contaminants in downstream waters.	Similar to the No-Action Alternative	Similar to the No-Action Alternative.
6: River Center Project Site: South via Kingsworth / North via Hospital	Similar to Alternative 5	Similar to Alternative 5	Similar to Alternative 5	Similar to Alternative 5 but with 12 fewer potentially contaminated sites impacted.
7: River Center Project Site: South via – Milford	Similar to Alternative 5. Impacts to surface waters of Noisette Creek would be negligible to minor and limited to those associated with a short-term increase in stormwater runoff from disturbed lands during upland construction activities.	Similar to Alternative 5	Similar to Alternative 5	Similar to Alternative 5

Water Quality Impact Definitions

Negligible = Undetectable changes to surface water quality; undetectable change to groundwater recharge or quality.

Minor = Changes in surface water quality that do not exceed water quality standards. TMDL load reductions are not compromised. Changes in groundwater recharge and quality that require permitting, treatment, and proper disposal of dewatering effluent to prevent migration of contaminated groundwater into uncontaminated areas.

Major = Changes in surface water quality that exceed regulatory standards. TMDL load reductions are compromised and adverse impacts are long-term. Changes in groundwater recharge that require additional, extensive permitting and federal/state oversight, or changes in water quality that exceed regulatory standards for groundwater and contaminated wells and/or municipal water supplies.

4.3.12 Mitigation

4.3.12.1 Applicant's Proposed Avoidance and Minimization Measures

The Applicant has committed to several measures that avoid and/or minimize potential impacts of Alternative 1 (Proposed Project). These measures are taken from Palmetto Railways Mitigation Plan provided in Appendix N. Some of these measures are required under federal, state, and local permits; others are measures that Palmetto Railways has incorporated into the design and operations of Alternative 1 (Proposed Project). Each mitigation measure is also designated as one that either helps to avoid an impact or one that minimizes an impact.

- Comply with requirements of the Individual Section 402 NPDES permit, including applicable groundwater and surface monitoring. (Minimization)
- Employ the use of oil-water separator at the locomotive shop and proper spill protection (e.g., spill kit, collector pans) for light duty repairs in the vicinity of the "repair in place" tracks to ensure treatment of any oily waste from on-terminal equipment maintenance activities. (Minimization)
- Implement a SWPPP and Stormwater Master Plan as required by the Individual Section 402 NPDES permit. (Minimization)
- Inclusion of forebay in stormwater management system to provide pretreatment of stormwater runoff before it discharges to Pond A. (Minimization)
- Construct five stormwater detention ponds located at the topographical low points of the site and in close proximity to the existing outfalls to contain and manage stormwater runoff. (Minimization)
- Implement sediment and erosion control measures to mitigate sediment and sediment-associated pollutant loading from disturbed areas. (Minimization)
- Cap much of the Project site with pavement to mitigate spread of existing contaminants. (Minimization)
- Implement dust control measures for roads and construction areas. (Minimization)
- Use clean fill material. (Minimization)
- Design for the facility includes approximately 83,375 linear feet of new pipe or underdrain and five dry detention ponds (A, B. C, D1, and D2), including one forebay, totaling approximately 1,527,000 CF. (Minimization)
- A SWPPP and Best Management Practices (BMPs) will be implemented to manage stormwater on-site during construction of the intermodal facility. (Avoidance and Minimization)

These avoidance and minimization measures, except the items noted with an asterisk (*), have been considered in the preceding impact analysis. The complete list of Applicant-proposed avoidance and minimization measures related to water quality is also provided in Chapter 6.

4.3.12.2 Additional Potential Mitigation Measures

No additional mitigation measures are proposed for Water Quality by the Corps. Additional avoidance, minimization, and mitigation may be considered by the Corps in its decision-making process. Final mitigation measures may be adopted as conditions of the DA permit and documented in the Record of Decision (ROD).

4.4 VEGETATION AND WILDLIFE

This section describes the potential impacts of Alternative 1 (Proposed Project) and all the alternatives on terrestrial vegetation and wildlife resources in the Vegetation and Wildlife study area. Impacts on terrestrial vegetation include clearing and removal of natural and previously disturbed land cover types and direct and indirect impacts on wildlife and/or their habitat during construction and operation of the Navy Base ICTF.

4.4.1 Methods and Impact Definitions

Impacts to vegetation and wildlife were evaluated through GIS analyses of land cover types and species richness that were verified during the field surveys. The impact evaluation considers both construction and operation activities for the Navy Base ICTF within the Vegetation and Wildlife study area, and evaluates potential impacts related to habitat loss; alteration, and/or fragmentation; displacement and/or mortality of wildlife species; and the introduction of invasive, noxious weeds, and non-native species. The type and severity of impacts on terrestrial resources depend on the characteristics of the disturbance (type, timing, and duration), where the disturbance occurs (the habitat type present and existing site characteristics), the species present, their sensitivity, habituation, and resilience to disturbance (Table 4.4-1).

Anticipated changes in the existing conditions for terrestrial resources in the Vegetation and Wildlife study area under each alternative were identified and assessed quantitatively for resources for which quantitative data were available, including land cover types, wildlife habitat, and raptor nests. For terrestrial resources where no quantitative data were available, impacts are described qualitatively.

Table 4.4-1
Impact Definitions, Vegetation and Wildlife

	Negligible	Minor	Major
Vegetation	No impacts to vegetation or plant communities	Alteration in vegetation or plant communities (habitat) that sustain animal populations; fragmentation of habitat that impairs existing plant communities; localized occurrences of invasive, noxious weeds.	Loss of vegetation or plant communities (habitat) that degrade the stability of animal populations; fragmentation of habitat that results in the loss of plant communities; widespread occurrences of invasive, noxious weeds.
Wildlife	No impacts to wildlife	Short-term displacement of wildlife species; mortality of individuals of common wildlife species; fragmentation of populations of distinct wildlife species; short-term impairment to animal migratory paths; localized occurrences of non-native wildlife species.	Permanent impairment to animal migratory paths; mortality of a distinct population of common wildlife species; destruction of wildlife breeding grounds/nesting areas (e.g., rookeries); introduction and uncontrollable spread of non-native wildlife species.

4.4.2 No-Action Alternative

Under the No-Action Alternative, the Corps would not issue a DA permit, and construction and operation of the Navy Base ICTF would not occur. For the purposes of this EIS, the Corps assumes that the Project site and the River Center project site would continue to include mixed use (residential and commercial) and industrial land uses. In light of Palmetto Railways' ownership of the properties, there would be the potential for redevelopment of these areas to include rail-served warehousing and distribution. While future land uses and human activities may occur adjacent to and/or within the vegetation cover types and wildlife habitat within the study area, it would be speculative to attempt to estimate the acreage of impacts to vegetation at this time.

Under the No-Action Alternative, the existing habitat conditions for terrestrial wildlife in the study area generally would be expected to continue (Figure 3.4-1). The existing habitats in the study area are fragmented due to the CNC and adjacent mixed residential and commercial land uses within portions of both the City of North Charleston and the City of Charleston. Habitat fragmentation refers to the division of large, contiguous blocks of habitat into smaller, more isolated parcels that are less suitable for wildlife.

Upland areas within the study area generally are fragmented and disturbed, and are inhabited by plant and animal species that are adapted to these conditions. Additional upland fragmentation is

likely to continue as a result of additional growth and re-development of existing fallow areas over time. Routine maintenance (mowing and cutting) throughout the study area results in a lack of regeneration of vegetation. Without any comprehensive development plans, the No-Action Alternative would assume these areas to be unchanged.

While there are numerous wildlife species that may inhabit the terrestrial and aquatic habitats within the study area (invertebrates, insects, reptiles, amphibians, birds, fishes, marine mammals, and mammals), existing and future land uses proposed under the No-Action Alternative are not expected to directly (or indirectly) result in the displacement and/or mortality of these species and/or their associated habitats. As a result, there would be no major adverse impacts to wildlife species under the No-Action Alternative.

4.4.3 Alternative 1: Applicant's Proposed Project (South via Milford / North via Hospital District)

4.4.3.1 Construction Impacts

Construction of Alternative 1 (Proposed Project) would permanently disturb approximately 233.71 acres of vegetation (vegetative land cover classes as described in Section 3.4) within the limits of construction of the Vegetation and Wildlife study area due to clearing and grading activities. Approximately 95.5 percent of the total area to be disturbed (223.19 acres) would affect previously disturbed communities. Developed areas lack any significant natural vegetation communities. Approximately 4.5 percent (10.52 acres of the total area to be disturbed) would affect natural communities, including marsh and marine water. As shown in Figure 4.4-1, Alternative 1 (Proposed Project) would permanently alter approximately 223.19 acres of upland terrestrial habitat and 10.52 acres of aquatic habitat (Table 4.4-2).

Table 4.4-2
Land Cover Impacts for Alternative 1: Proposed Project

Impact Location		Impacts on Land Cover (acres)					
	Impact Type	Marsh	Marine Water	Urban Development (high intensity)	Urban Development (low intensity)	Total	% of Total
Cosgrove/McMillan Overpass	Shading	–	–	4.75	–	4.75	2.03
Cosgrove/McMillan/ Hobson Realignment	Fill	–	–	18.69	3.65	22.35	9.56
Drayage Road	Fill	0.32	–	4.37	–	4.69	2.01
Drayage Road Bridges	Shading	3.36	–	0.84	–	4.20	1.80
Hobson/Bainbridge Realignment	Fill	0.63	–	10.87	–	11.50	4.92
ICTF	Fill	3.28	–	117.24	11.59	132.11	56.53

Impact Location		Impacts on Land Cover (acres)					
	Impact Type	Marsh	Marine Water	Urban Development (high intensity)	Urban Development (low intensity)	Total	% of Total
Northern Connection	Fill	0.28	0.01	18.00	0.00	18.29	7.83
Noisette Bridge	Shading	–	0.16	0.03	–	0.19	0.08
Southern Connection	Fill	2.48	–	33.15	–	35.63	15.25
Total*		**10.35**	**0.17**	**207.95**	**15.24**	**233.71**	**100.00**

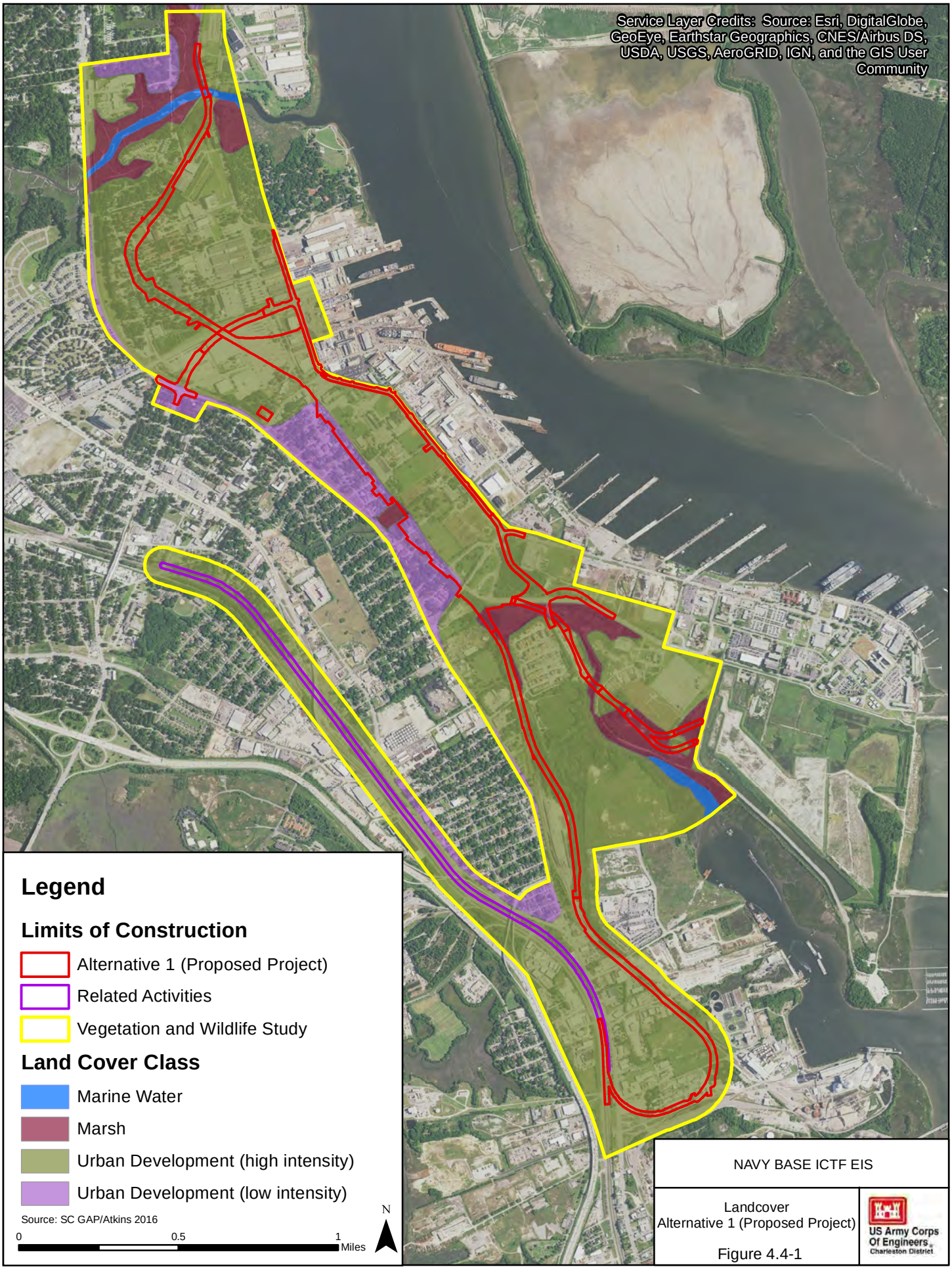
*The sum of individual items may not equal totals due to rounding.

Source: Atkins 2018.

Where feasible, all road and rail improvements would be made in upland habitat to avoid and minimize impacts to aquatic plant communities. Access bridges and approaches would result in some fill, pile driving, and shading impacts to open marine waters and marshes (Figure 4.4-1). The drayage road for Alternative 1 (Proposed Project) would result in direct loss of aquatic habitat where the roadway corridor traverses marshes. All other impacts are to disturbed/maintained uplands. In most instances, bridges and roadways would be elevated to avoid impacts to aquatic habitat and other natural resources. Where the road and rail bridges are at low elevations relative to the existing ground, direct impacts due to shading and loss of aquatic resource functions would occur. Additional truck and rail traffic could result in the potential for minor and/or major indirect impacts to aquatic plant communities from accidental pollutant spills. However, there are BMPs, mandated requirements, and regulations that cover spills (Section 4.15.3.2); therefore, impacts to aquatic plant communities from accidental spills would be minor and localized.

Construction of the Proposed Project would require placement of fill and structures in tidal and non-tidal wetlands and direct impacts to terrestrial habitat. By locating the ICTF at a previously disturbed area, impacts to undeveloped land are reduced. The same approach is applied to redeveloping roadways and railways within fallow areas previously used in development that are no longer in service. The construction of this alternative would impact mostly urban developed areas (industrial areas and existing road and rail ROW) (Figure 4.4-1).

Potential exists for direct and indirect short-term species displacement during construction; common species are relatively abundant and adapted to living in close association with human activity and infrastructure and would therefore be minor adverse. Specific activities associated with Alternative 1 (Proposed Project) could result in short-term displacement of individuals and/or permanent alterations to habitat including the construction of the drayage road and arrival/departure tracks in nearby marshes of Shipyard and Noisette creeks (permanent physical alterations to habitat and fragmentation), bridge improvements in Noisette Creek (short-term shading, noise, and sedimentation), and bridge construction in Shipyard Creek (permanent shading, short-term noise and sedimentation).


Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Legend
Limits of Construction
Alternative 1 (Proposed Project)
Related Activities
Vegetation and Wildlife Study
Land Cover Class
Marine Water
Marsh
Urban Development (high intensity)
Urban Development (low intensity)
Source: SC GAP/Atkins 2016
0
0.5
1
Miles
N
NAVY BASE ICTF EIS
Landcover
Alternative 1 (Proposed Project)
Figure 4.4-1
US Army Corps Of Engineers
Charleston District

The removal of vegetation can cause increased erosion of soil on areas without the vegetative material to intercept rainfall, reduce runoff and stabilize soil, as addressed in Section 4.1 – Geology and Soils. Areas without well-established vegetation would be susceptible to an indirect impact of invasion by weeds, including invasive or noxious species, because these species are typically adapted to primary succession on bare soil.

Construction and operation of Alternative 1 (Proposed Project) would generate dust that could be dispersed beyond the areas cleared of vegetation. Dust settling on vegetation close to dust-generating activities (e.g., roads) may reduce cover and productivity of the vegetation through disruption of photosynthesis and reproduction processes; however, this potential impact would be a temporary impact and would be reduced through the use of dust suppression BMPs as proposed by Palmetto Railways (see Section 4.13 – Air Quality, for additional information on dust generation and dispersion).

Habitat fragmentation would result from removal of vegetation and loss of habitat during construction of the ICTF facilities and from human disturbance during operation of the Navy Base ICTF. Because the existing habitat in the study area is already fragmented, additional fragmentation during construction of Alternative 1 (Proposed Project) would cause a minor short-term impact on wildlife.

Vegetation clearing would result in direct minor impacts on avian habitat by eliminating existing vegetation, including habitat for birds protected under the Migratory Bird Treaty Act (MBTA). Of all habitats surveyed, the highest number of bird species was observed in the previously disturbed habitat type, which was dominated by American crow, Carolina wren, and laughing gull. These species also were dominant in all other habitats surveyed in the Vegetation and Wildlife study area. Similar-quality habitat will redevelop within temporary disturbance footprints at the completion of the construction of the Project. Raptors, such as red-shouldered hawks and turkey vultures, were observed hunting in the Vegetation and Wildlife study area. The presence of adjacent suitable habitats will likely mean Alternative 1 (Proposed Project) will have minimal impact to these raptors. Given the lack of suitable nesting and foraging habitat throughout the Vegetation and Wildlife study area, and no observations of raptors or their nests during the field surveys, potential impacts on raptors and other large birds would be short-term and minor.

Indirect impacts on birds may include disturbance from human activities such as noise. Birds are expected to avoid construction areas and are highly mobile, able to move quickly away from disturbance. The distance avoided would depend on many factors, including the type, timing, season, and duration of human activity; the type of habitat adjacent to the activity; and the sensitivity and tolerance of the birds affected. The majority of bird species currently present (American crow, northern cardinal, northern mockingbird, mourning dove, blue jay, Carolina wren, buntings, and sparrows) commonly inhabit previously disturbed habitats. These common species are relatively abundant, and are adapted to living in close association with human activity and infrastructure. As such, indirect impacts on birds from human disturbance are expected to be short-term and minor.

Vegetation clearing would result in direct minor impacts on wildlife habitat by eliminating existing vegetation. The species currently present are those that have adapted to using previously disturbed habitats, as demonstrated by their presence in these areas. Because most mammals observed (white-tailed deer, beaver, raccoon, opossum, eastern gray squirrel, and eastern cottontail rabbit) during surveys in the Vegetation and Wildlife study area were found in the previously disturbed vegetation types, the impact would be minor, given the relative abundance of suitable habitat in the surrounding area compared to the availability of such habitat in the study area.

Indirect impacts on mammals may include disturbance from human activities such as noise. Most of the species present in the Vegetation and Wildlife study area occupy previously disturbed habitats, are relatively abundant common species, and are adapted to living in close association with human activity and infrastructure. As such, indirect impacts on wildlife from human disturbance are expected to be short-term and minor.

Aquatic species known to occur in the Vegetation and Wildlife study area include sea worms, small crustaceans, snails, shellfish, shrimp, squid, blue crab, finfish, reptiles, and amphibians. Short-term impacts on these species from construction of Alternative 1 (Proposed Project) include turbidity, sedimentation, and potential chemical contamination from spills or mobilization due to disturbance of sediments. Potential long-term impacts include the permanent loss of open marine waters and associated marshes that provide nesting and foraging habitat. Existing reptiles and amphibians expected to inhabit the Vegetation and Wildlife study area are abundant and common species, so any decrease in their abundance due to reduction of habitat from construction of Alternative 1 (Proposed Project) would not threaten the general population of these species or their predators.

Finfish have high mobility and are capable of avoiding direct construction impacts (excavation and filling). Elevated suspended sediment levels could potentially indirectly impact foraging during construction. Most non-schooling fish are attracted to structures for cover/shelter, as well as substrate from which to forage for invertebrates, algae, etc. Therefore, some fish species would likely be positively impacted by the installation of pilings and structures as part of Alternative 1 (Proposed Project) and the associated sessile epifauna that will be attracted to them.

Injury or mortality of mammals, birds, and other small animals could occur through direct contact with construction equipment, traffic, and toxic materials. Wildlife would likely move away from the limits of construction in the presence of human activity, which would decrease the potential for direct contact with construction equipment and traffic. In addition, large equipment would move slowly through the area, which would reduce the potential for collisions with wildlife. Direct impacts would occur only in the areas directly affected by construction activities. Although individuals could be affected, entire populations would not, resulting in minor temporary impacts on wildlife from contact with construction equipment.

Due to the potential impacts to nesting and foraging habitat for fishes, marine reptiles, and marine mammals, adverse impacts resulting from construction of Alternative 1 (Proposed Project) could be minimized by adhering to environmental work windows that are established by the Corps, which restrict construction to periods when wildlife are least abundant or least likely to be affected by filling and pile installation activities. The environmental work windows for in-water construction have targeted winter months, because wildlife abundance is dramatically reduced during colder water temperatures. Potential impacts to federal- and state-listed threatened and endangered species and mitigation are discussed in Sections 4.6 and 4.7.

4.4.3.2 Operation and Maintenance Impacts

Long-term impacts associated with Alternative 1 (Proposed Project) include maintenance of vegetation that would be removed during construction and long-term increases in road and rail traffic. Alternative 1 (Proposed Project) would increase future rail traffic, thereby increasing the chance of an indirect impact from an accidental introduction of exotic species into the environment. Impacts to the Project site are anticipated to be minimal due to the existing upland habitats at the site supporting many introduced invasive plant and animal species, including Japanese privet, Japanese honeysuckle, kudzu, red fire ants, and the Asian long-horned beetle.

4.4.4 Alternative 2: Proposed Project Site (South via Milford / North via S-line)

Alternative 2 is a variation of Alternative 1 (Proposed Project) where the northern rail connection would be relocated along Spruill Avenue within existing CSX ROW to the S-line, and turn east along Aragon Avenue to the existing NCTC rail line. Road and rail improvements would be adjusted accordingly to facilitate rail and road traffic as a result of the northern rail connection alignment. Alternative 2 would require a bridge crossing of Noisette Creek adjacent to Spruill Avenue, rather than near Noisette Boulevard (Figure 4.4-2).

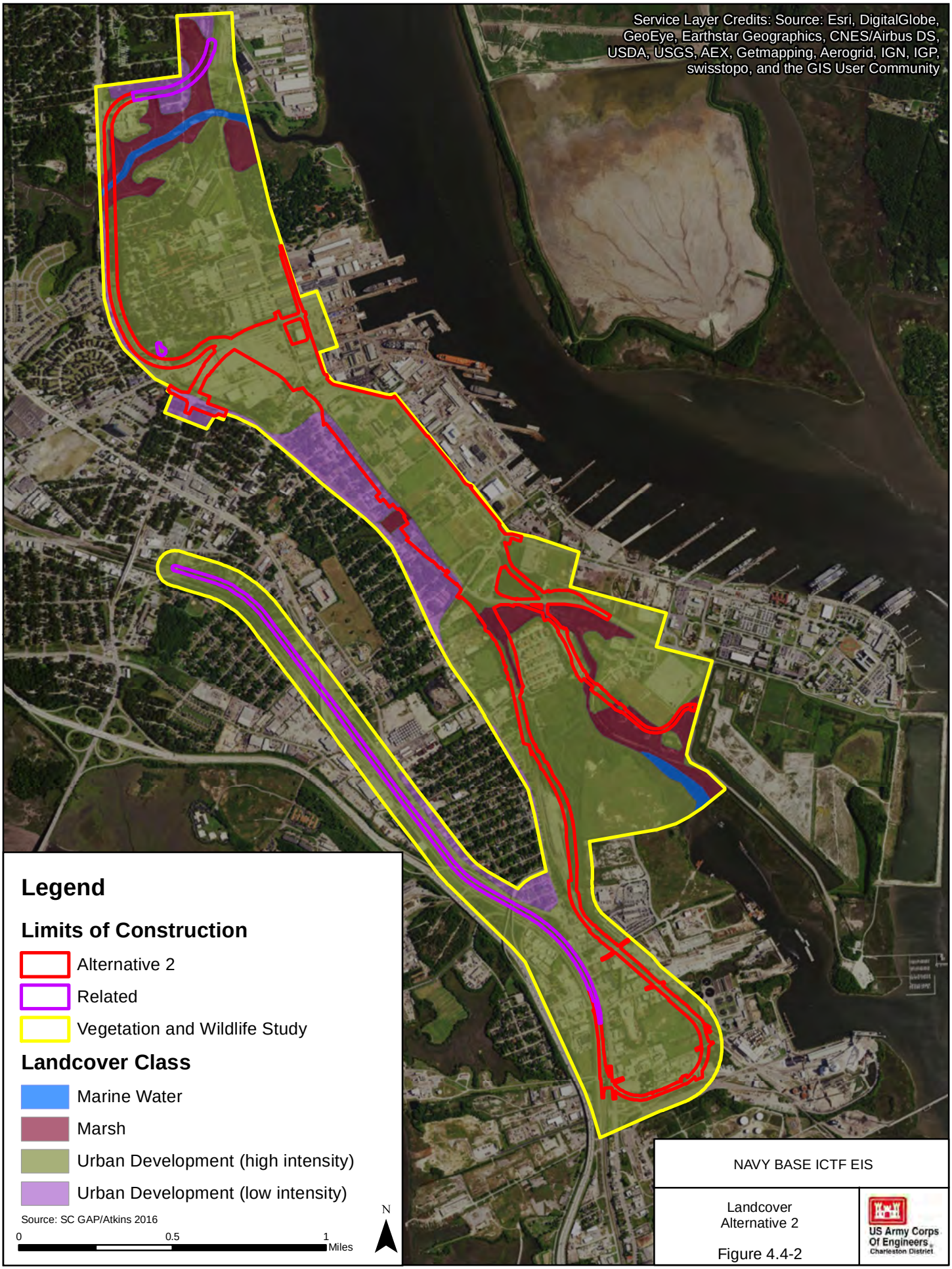
Habitat alteration, habitat fragmentation, introduction of invasive/noxious species, species displacement, and species mortality impacts to vegetation and wildlife under Alternative 2 are expected to be minor which is similar to those discussed under Alternative 1 (Proposed Project); however, the exception would be additional fill, pile driving, and shading impacts to aquatic species and marine and tidal salt marsh habitat associated with the construction of the rail bridge crossing Noisette Creek along Spruill Avenue. Construction of Alternative 2 would permanently disturb approximately 236.83 acres of vegetation within the limits of construction of the Vegetation and Wildlife study area. As shown in Figure 4.4-2, Alternative 2 would permanently alter approximately 223.54 acres of upland terrestrial habitat and 13.28 acres of tidal aquatic habitat (Table 4.4-3).

Table 4.4-3
Land Cover Impacts for Alternative 2

Impact Location		Impacts on Land Cover (acres)					
	Impact Type	Marsh	Marine Water	Urban Development (high intensity)	Urban Development (low intensity)	Total	% of Total
Cosgrove/McMillan Overpass	Shading	–	–	4.75	–	4.75	2.01
Cosgrove/McMillan/ Hobson Realignment	Fill	–	–	18.69	3.65	22.35	9.44
Drayage Road	Fill	0.32	–	4.37	–	4.69	1.98
Drayage Road Bridges	Shading	3.36	–	0.84	–	4.20	1.77
Hobson/Bainbridge Realignment	Fill	0.63	–	10.87	–	11.50	4.85
ICTF	Fill	3.28	–	117.24	11.59	132.11	55.78
Northern Connection	Fill	2.59	–	17.63	0.24	20.47	8.64
Noisette Bridge	Shading	0.27	0.35	–	–	0.62	0.26
Southern Connection	Fill	2.48	–	33.15	–	35.63	15.05
St. Johns cul-de-sac	Fill	–	–	0.51	–	0.51	0.22
Total*		**12.93**	**0.36**	**208.06**	**15.48**	**236.83**	**100.00**

*The sum of individual items may not equal totals due to rounding.

Source: Atkins 2018.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Legend
Limits of Construction
Alternative 2
Related
Vegetation and Wildlife Study
Landcover Class
Marine Water
Marsh
Urban Development (high intensity)
Urban Development (low intensity)
Source: SC GAP/Atkins 2016
0
0.5
1
Miles
N
NAVY BASE ICTF EIS
Landcover
Alternative 2
Figure 4.4-2
US Army Corps Of Engineers
Charleston District

4.4.5 Alternative 3: Proposed Project Site (South via Kingsworth / North via Hospital District)

Alternative 3 is a variation of Alternative 1 (Proposed Project) where the southern rail connection would connect to an existing CSX rail line near Kingsworth Avenue. Road and rail improvements would be adjusted accordingly to facilitate rail and road traffic as a result of the southern rail connection alignments (Figure 4.4-3).

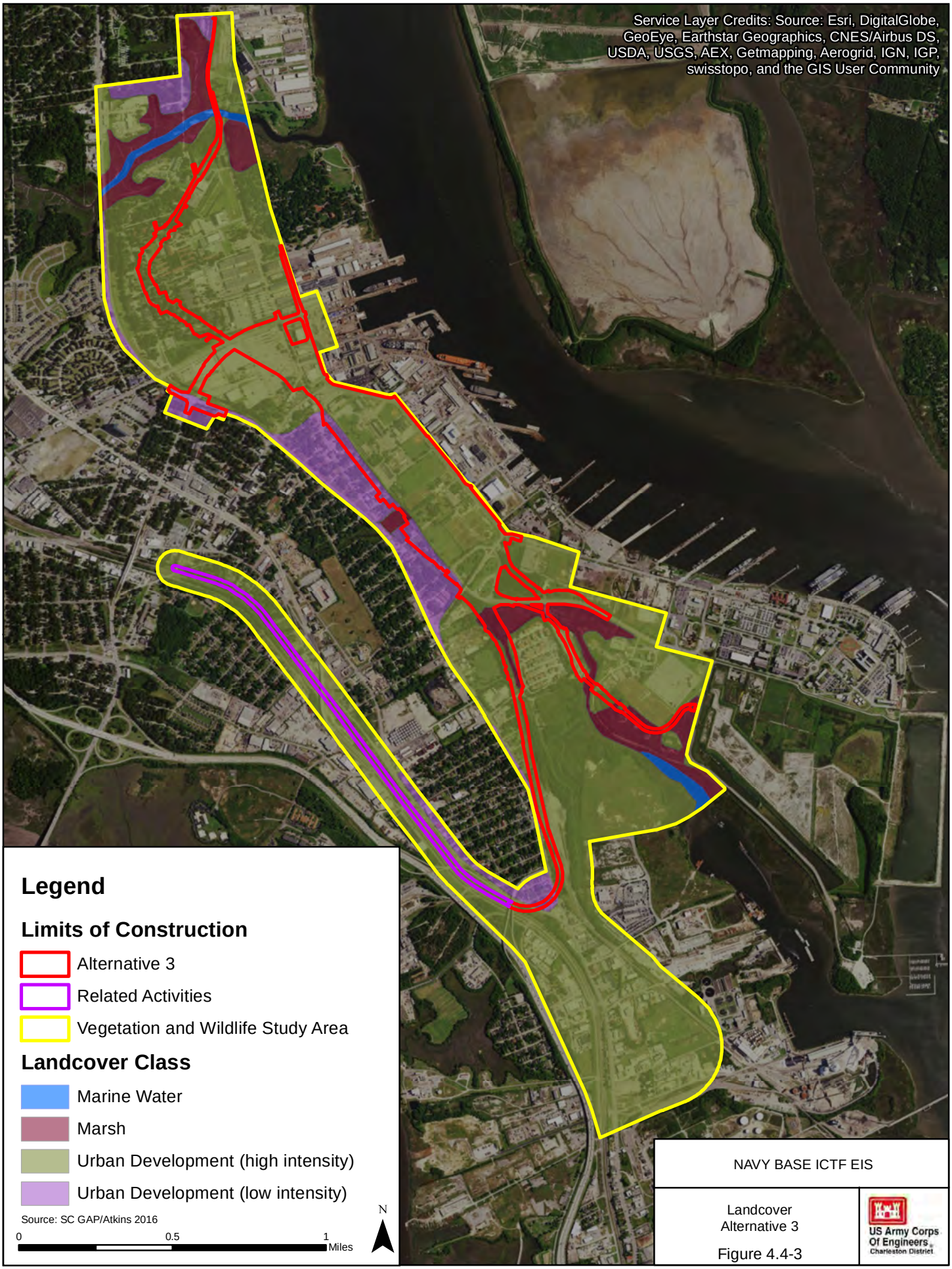
Habitat alteration, habitat fragmentation, introduction of invasive/noxious species, species displacement, and species mortality impacts to vegetation and wildlife under Alternative 3 are expected to be minor which is similar to those discussed under Alternative 1 (Proposed Project); however, the exception would be small additional fill impacts to aquatic species and marsh habitat associated with the Kingsworth Avenue southern rail connection. Construction of Alternative 3 would permanently disturb approximately 214.27 acres of vegetation within the limits of construction of the Vegetation and Wildlife study area. As shown in Figure 4.4-3, Alternative 3 would permanently alter approximately 203.75 acres of upland terrestrial habitat and 10.52 acres of tidal aquatic habitat (Table 4.4-4).

Table 4.4-4
Land Cover Impacts Alternative 3

Impact Location		Impacts on Land Cover (acres)					
	Impact Type	Marsh	Marine Water	Urban Development (high intensity)	Urban Development (low intensity)	Total	% of Total
Cosgrove/McMillan Overpass	Shading	–	–	4.75	–	4.75	2.22
Cosgrove/McMillan/ Hobson Realignment	Fill	–	–	18.69	3.65	22.35	10.43
Drayage Road	Fill	0.32	–	4.37	–	4.69	2.19
Drayage Road Bridges	Shading	3.36	–	0.84	–	4.20	1.96
Hobson/Bainbridge Realignment	Fill	0.63	–	10.87	–	11.50	5.37
ICTF	Fill	3.28	–	117.24	11.59	132.11	61.66
Northern Connection	Fill	0.28	0.01	18.00	–	18.29	8.54
Noisette Bridge	Shading	–	0.16	0.03	–	0.19	0.09
Southern Connection	Fill	2.48	–	12.85	0.86	16.19	7.56
Total*		**10.35**	**0.17**	**187.64**	**16.10**	**214.27**	**100.00**

*The sum of individual items may not equal totals due to rounding.

Source: Atkins 2018.


Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community
Legend
Limits of Construction
Alternative 3
Related Activities
Vegetation and Wildlife Study Area
Landcover Class
Marine Water
Marsh
Urban Development (high intensity)
Urban Development (low intensity)
Source: SC GAP/Atkins 2016
0
0.5
1
Miles
N
NAVY BASE ICTF EIS
Landcover
Alternative 3
Figure 4.4-3
US Army Corps Of Engineers
Charleston District

4.4.6 Alternative 4: Proposed Project Site (South via Milford)

Alternative 4 is a variation of Alternative 1 (Proposed Project) where trains would enter and exit the Navy Base ICTF from a southern rail connection. Proposed rail for the northern rail connection through the Hospital District would stop short of Noisette Creek (Figure 4.4-4).

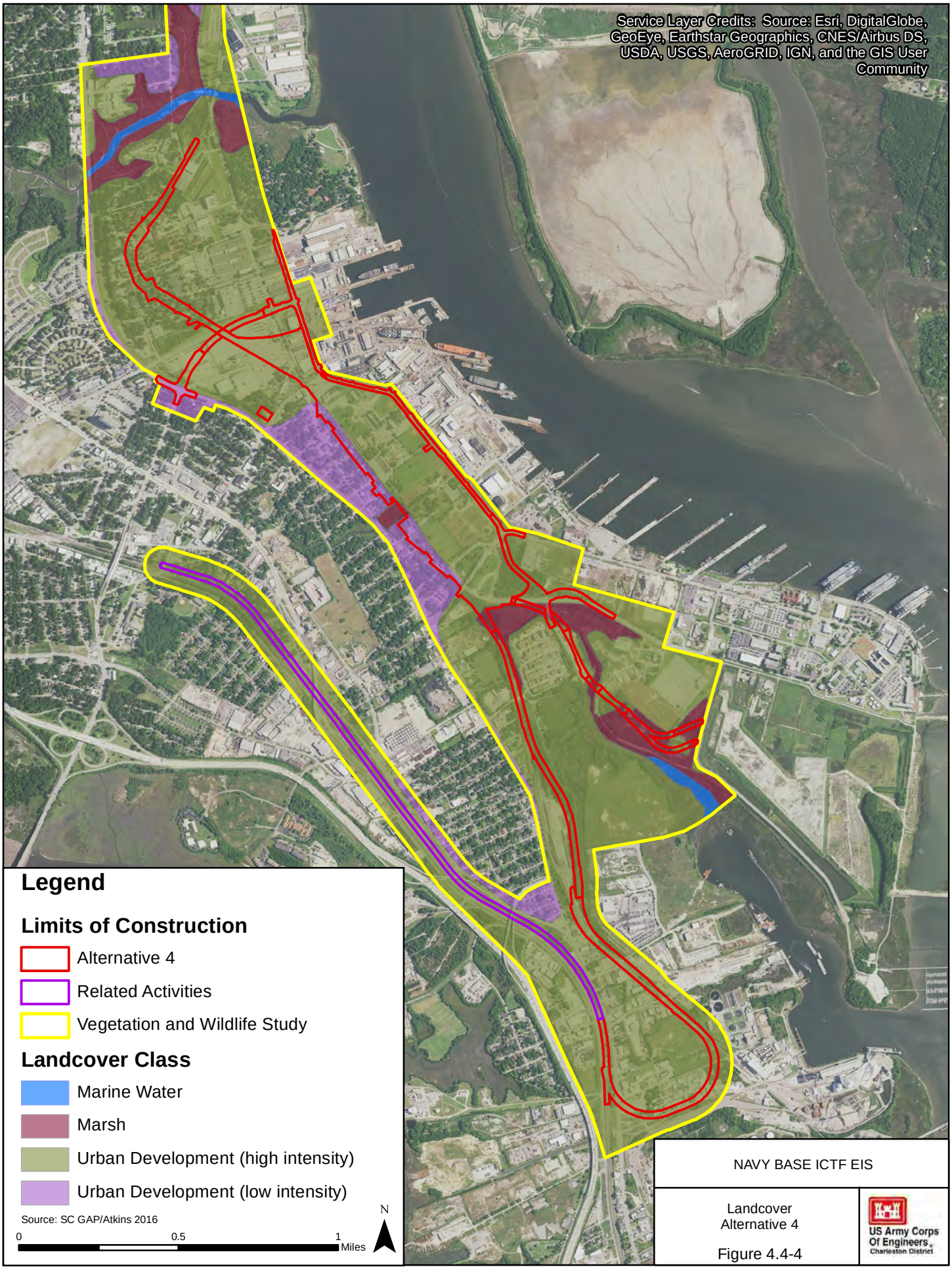
Habitat alteration, habitat fragmentation, introduction of invasive/noxious species, species displacement, and species mortality impacts to vegetation and wildlife under Alternative 4 are expected to be minor which is similar to those discussed under Alternative 1 (Proposed Project); however, there would be no impacts to open marine water habitat and fewer fill and shading impacts to the aquatic species and habitat of Noisette Creek. Construction of Alternative 4 would permanently disturb approximately 235.89 acres of vegetation within the limits of construction of the Vegetation and Wildlife study area. As shown in Figure 4.4-4, Alternative 4 would permanently alter approximately 225.82 acres of upland terrestrial habitat and 10.07 acres of tidal aquatic habitat (Table 4.4-5).

Table 4.4-5
Land Cover Impacts for Alternative 4

Impact Location		Impacts on Land Cover (acres)					
	Impact Type	Marsh	Marine Water	Urban Development (high intensity)	Urban Development (low intensity)	Total	% of Total
Cosgrove/McMillan Overpass	Shading	–	–	4.75	–	4.75	2.01
Cosgrove/McMillan/ Hobson Realignment	Fill	–	–	18.69	3.65	22.34	9.47
Drayage Road	Fill	0.32	–	4.37	–	4.69	1.99
Drayage Road Bridges	Shading	3.36	–	0.84	–	4.20	1.78
Hobson/Bainbridge Realignment	Fill	0.63	–	10.87	–	11.50	4.87
ICTF	Fill	3.28	–	117.24	11.59	132.11	56.00
Northern Track Lead	Fill	–	–	16.11	–	16.11	6.83
Southern Connection	Fill	2.48	–	37.70	–	40.18	17.03
Total*		**10.07**	**0.00**	**210.58**	**15.24**	**235.89**	**100.00**

*The sum of individual items may not equal totals due to rounding.

Source: Atkins 2018.


Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Legend
Limits of Construction
Alternative 4
Related Activities
Vegetation and Wildlife Study
Landcover Class
Marine Water
Marsh
Urban Development (high intensity)
Urban Development (low intensity)
Source: SC GAP/Atkins 2016
0
0.5
1
Miles
N
NAVY BASE ICTF EIS
Landcover
Alternative 4
Figure 4.4-4
US Army Corps Of Engineers
Charleston District

4.4.7 Alternative 5: River Center Site (South via Milford / North via Hospital District)

Alternative 5 is a variation of Alternative 1 (Proposed Project) with the Project site being moved to the River Center project site. Road and rail improvements would be adjusted accordingly to facilitate rail and road traffic at the new site. The northern rail connection is truncated by the River Center project site, but the plans for rehabilitating the rail bridge crossing Noisette Creek at Noisette Boulevard are the same as those under Alternative 1 (Proposed Project). The Cosgrove Road/ McMillan Avenue Overpass in Alternative 1 (Proposed Project) would be replaced with an ICTF Access Road for OTR trucks in the same general vicinity. The Hobson Road/Bainbridge Avenue realignment, Viaduct Road removal, and drayage road construction are the same as described under Alternative 1 (Proposed Project).

Like Alternative 1 (Proposed Project), most of the road and rail improvements under Alternative 5 would be made to upland habitat to avoid and minimize impacts to aquatic habitat, where feasible. Access bridges would result in the direct loss of aquatic habitat due to pile driving activities and shading impacts. All other impacts are to disturbed/maintained upland habitat.

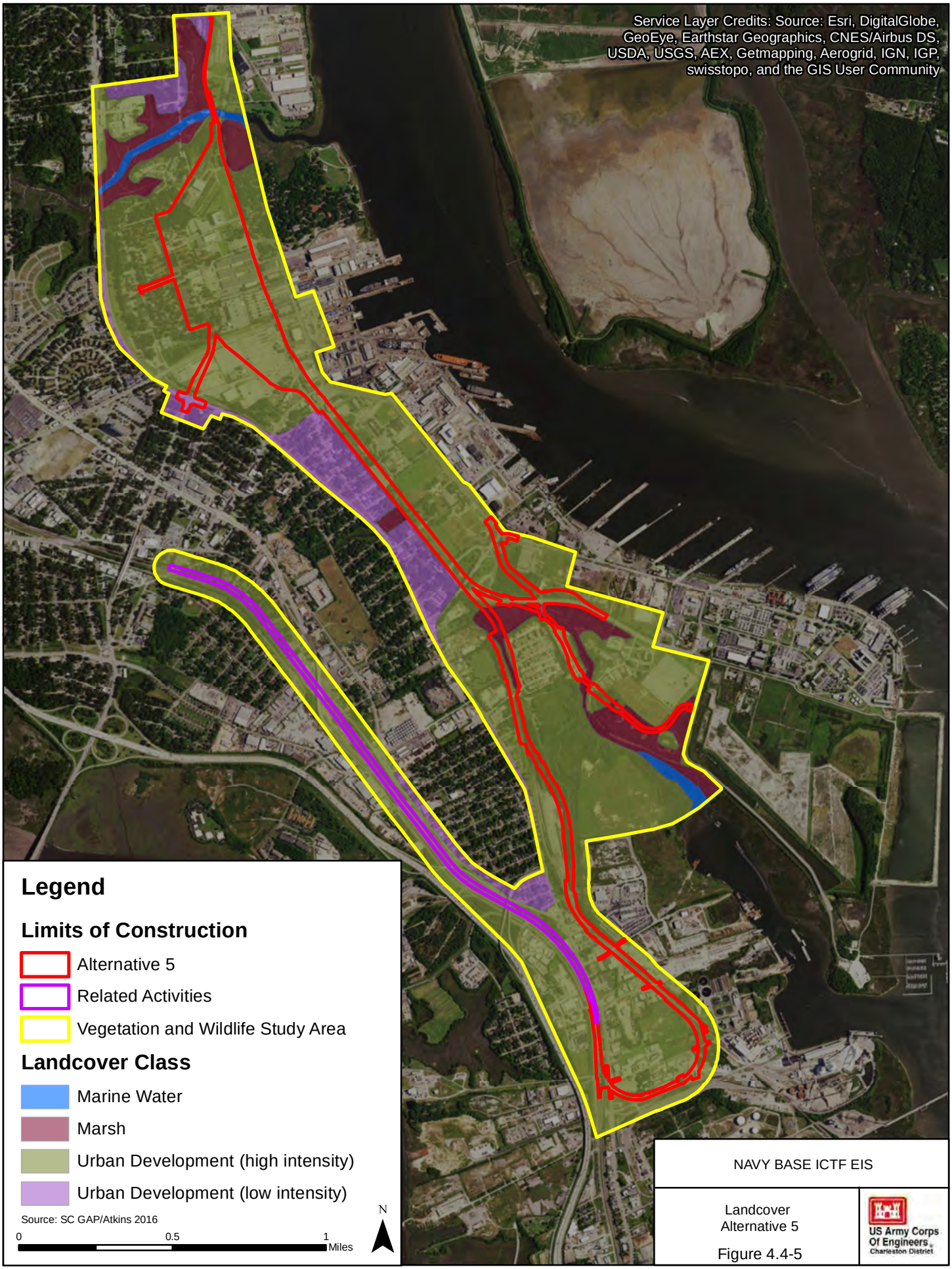
Habitat alteration, habitat fragmentation, introduction of invasive/noxious species, species displacement, and species mortality impacts to vegetation and wildlife under Alternative 5 are expected to be minor which is similar to those discussed under Alternative 1 (Proposed Project); however, under Alternative 5, there would be fewer impacts to upland habitat, because the River Center project site would be smaller in size than Alternative 1 (Proposed Project). Construction of Alternative 5 would permanently disturb approximately 194.32 acres of vegetation within the limits of construction of the study area. As shown in Figure 4.4-5, Alternative 5 would permanently alter approximately 185.86 acres of upland terrestrial habitat and 8.45 acres of tidal aquatic habitat (Table 4.4-6).

Table 4.4-6
Land Cover Impacts for Alternative 5

Impact Location	Impact Type	Impacts on Land Cover (acres)					
		Marsh	Marine Water	Urban Development (high intensity)	Urban Development (low intensity)	Total	% of Total
Drayage Road	Fill	0.32	–	13.39	–	13.71	7.05
Drayage Road Bridges	Shading	3.36	–	0.84	–	4.20	2.16
Hobson/Bainbridge Realignment	Fill	0.63	–	10.87	–	11.50	5.92
ICTF	Fill	–	–	113.08	0.05	113.12	58.22
ICTF Access Roads	Fill	–	–	4.11	1.83	5.94	3.06
Noisette Bridge	Shading	–	0.16	0.03	–	0.19	0.10
Northern Connection	Fill	0.28	0.01	0.60	–	0.90	0.46
Southern Connection	Fill	3.70	–	40.89	0.17	44.75	23.03
Total*		**8.28**	**0.17**	**183.81**	**2.05**	**194.32**	**100.00**

*The sum of individual items may not equal totals due to rounding.

Source: Atkins 2018.


Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community
Legend
Limits of Construction
Alternative 5
Related Activities
Vegetation and Wildlife Study Area
Landcover Class
Marine Water
Marsh
Urban Development (high intensity)
Urban Development (low intensity)
Source: SC GAP/Atkins 2016
0
0.5
1
Miles
N
NAVY BASE ICTF EIS
Landcover
Alternative 5
Figure 4.4-5
US Army Corps Of Engineers
Charleston District

4.4.8 Alternative 6: River Center Site (South via Kingsworth / North via Hospital District)

Alternative 6 is a variation of Alternative 1 (Proposed Project) with the Project site being moved to the River Center project site. Under Alternative 6, the southern rail connection would connect to an existing CSX rail line near Kingsworth Avenue, as described in Alternative 3. Road and rail improvements would be adjusted accordingly to facilitate rail and road traffic at the new site. Under Alternative 6, the northern rail connection, ICTF Access Road, River Center project site, Hobson Road/Bainbridge Avenue realignment, Viaduct Road removal, and drayage road are the same as those described under Alternative 5.

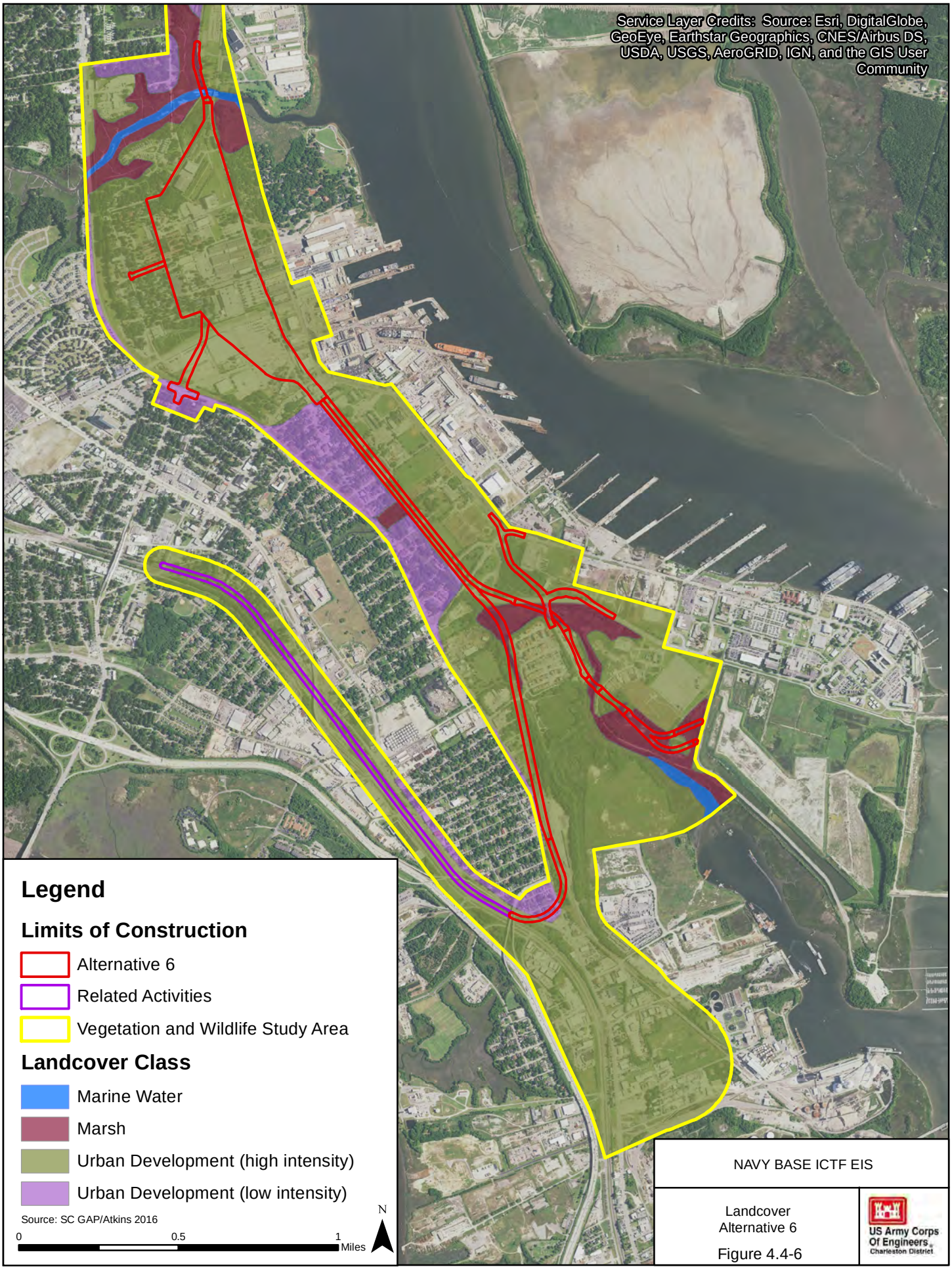
Habitat alteration, habitat fragmentation, introduction of invasive/noxious species, species displacement, and species mortality impacts to vegetation and wildlife under Alternative 6 are expected to be minor, which is similar to those discussed under Alternative 1 (Proposed Project); however, similar to Alternative 5, there would be fewer impacts to upland habitat, because the River Center project site would be smaller than the Project site footprint. Construction of Alternative 6 would permanently disturb approximately 175.15 acres of vegetation within the limits of construction of the Vegetation and Wildlife study area. As shown in Figure 4.4-6, Alternative 6 would permanently alter approximately 166.70 acres of upland terrestrial habitat and 8.45 acres of tidal aquatic habitat (Table 4.4-7).

Table 4.4-7
Land Cover Impacts for Alternative 6

Impact Location		Impacts on Land Cover (acres)					
	Impact Type	Marsh	Marine Water	Urban Development (high intensity)	Urban Development (low intensity)	Total	% of Total
Drayage Road	Fill	0.32	–	13.39	–	13.71	7.83
Drayage Road Bridges	Shading	3.36	–	0.84	–	4.20	2.40
Hobson/Bainbridge Realignment	Fill	0.63	–	10.87	–	11.50	6.56
ICTF	Fill	–	–	113.08	0.05	113.12	64.59
ICTF Access Roads	Fill	–	–	4.11	1.83	5.94	3.39
Noisette Bridge	Shading	–	0.16	0.03	–	0.19	0.11
Northern Connection	Fill	0.28	0.01	0.60	–	0.90	0.51
Southern Connection	Fill	3.70	–	17.65	0.17	25.59	12.28
Total*		**8.28**	**0.17**	**163.79**	**2.91**	**175.15**	**100.00**

*The sum of individual items may not equal totals due to rounding.

Source: Atkins 2018.


Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Legend
Limits of Construction
Alternative 6
Related Activities
Vegetation and Wildlife Study Area
Landcover Class
Marine Water
Marsh
Urban Development (high intensity)
Urban Development (low intensity)
Source: SC GAP/Atkins 2016
0
0.5
1
Miles
N
NAVY BASE ICTF EIS
Landcover
Alternative 6
Figure 4.4-6
US Army Corps Of Engineers
Charleston District

4.4.9 Alternative 7: River Center Site (South via Milford)

Alternative 7 is a variation of Alternative 1 (Proposed Project) with the Project site being moved to the River Center project site. Under Alternative 7, trains would enter and exit the Navy Base ICTF from a southern rail connection as described under Alternative 4. Road and rail improvements would be adjusted accordingly to facilitate rail and road traffic at the new site. Under Alternative 7, the ICTF Access Road, River Center project site, Hobson Road/Bainbridge Avenue realignment, Viaduct Road removal, and drayage road are the same as those described under Alternative 5.

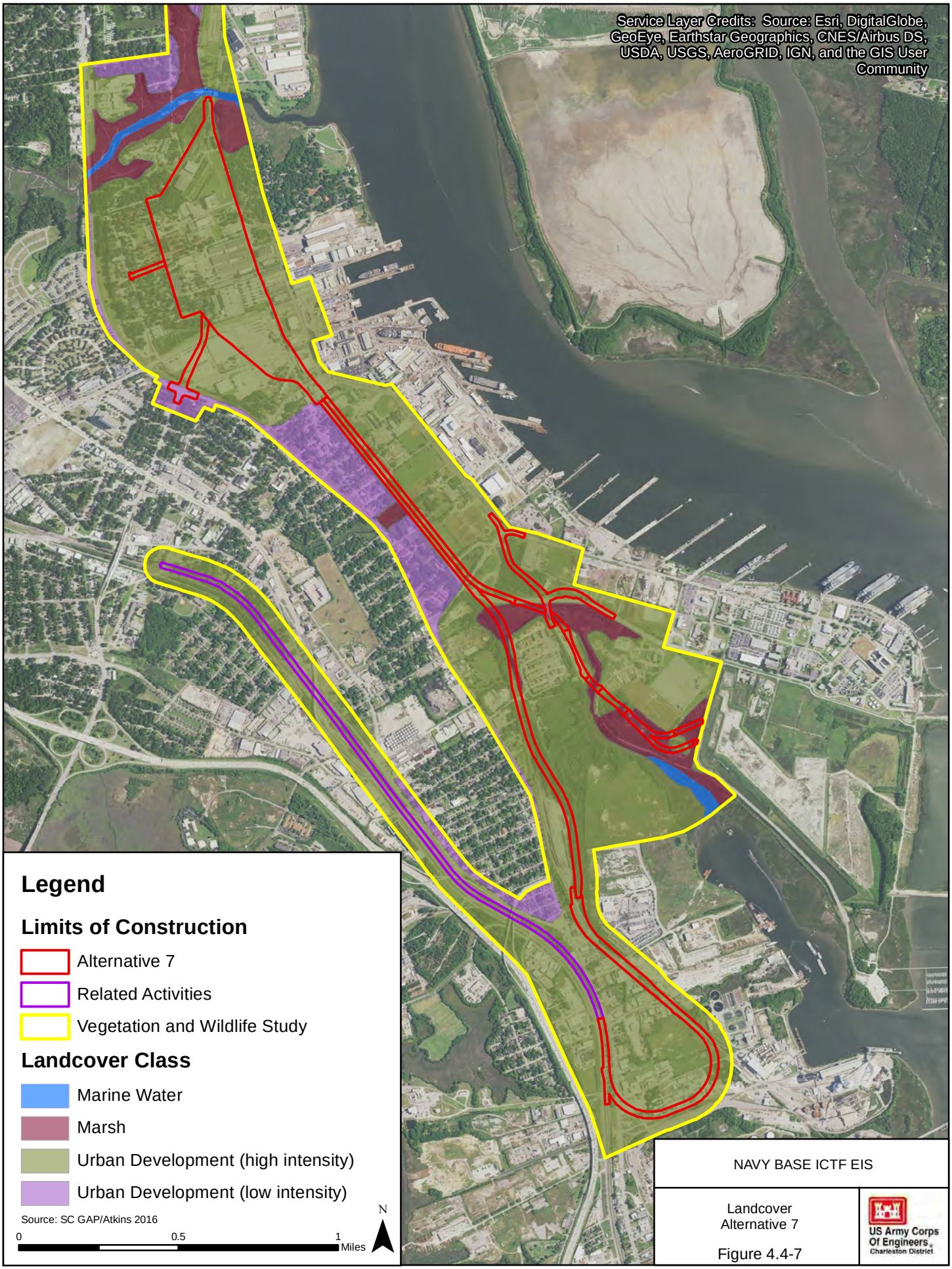
Habitat alteration, habitat fragmentation, introduction of invasive/noxious species, species displacement, and species mortality impacts to vegetation and wildlife under Alternative 7 are expected to be minor, which is similar to those discussed under Alternative 1 (Proposed Project); however, under Alternative 7, there would be no impacts to marine habitat and fewer fill and shading impacts to the aquatic species and habitat of Noisette Creek. There would also be fewer impacts to upland habitat, because the River Center project site footprint would be smaller than the Project site footprint. Construction of Alternative 7 would permanently disturb approximately 197.98 acres of vegetation within the limits of construction of the Vegetation and Wildlife study area. As shown in Figure 4.4-7, Alternative 7 would permanently alter approximately 189.98 acres of upland terrestrial habitat and 8.00 acres of tidal aquatic habitat (Table 4.4-8).

Table 4.4-8
Land Cover Impacts for Alternative 7

Impact Location		Impacts on Land Cover (acres)					
	Impact Type	Marsh	Marine Water	Urban Development (high intensity)	Urban Development (low intensity)	Total	% of Total
Drayage Road	Fill	0.32	–	13.39	–	13.71	6.92
Drayage Road Bridges	Shading	3.36	–	0.84	–	4.20	2.12
Hobson/Bainbridge Realignment	Fill	0.63	–	10.87	–	11.50	5.81
ICTF	Fill	–	–	113.28	0.05	113.33	57.24
ICTF Access Roads	Fill	–	–	4.11	1.83	5.94	3.00
Southern Connection	Fill	3.70	–	45.43	0.17	49.30	24.90
Total*		**8.00**	**0.00**	**187.93**	**2.05**	**197.98**	**100.00**

*The sum of individual items may not equal totals due to rounding.

Source: Atkins 2018.


Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Legend
Limits of Construction
Alternative 7
Related Activities
Vegetation and Wildlife Study
Landcover Class
Marine Water
Marsh
Urban Development (high intensity)
Urban Development (low intensity)
Source: SC GAP/Atkins 2016
0
0.5
1
Miles
N
NAVY BASE ICTF EIS
Landcover
Alternative 7
Figure 4.4-7
US Army Corps Of Engineers
Charleston District

4.4.10 Related Activities

If Alternative 1 (Proposed Project) was constructed, a section of unimproved CSX ROW would have to be activated with rail lines that would accept intermodal trains at the proposed new at-grade crossing at Meeting Street in the vicinity of Discher Street and would terminate in the vicinity of Accabee Road. This Related Activity would apply to Alternatives 1, 2, 4, 5, and 7. Under Alternatives 3 and 6, the Related Activity construction would begin at the proposed new at-grade crossing at Meeting Street in the vicinity of Kingsworth Avenue and would terminate in the vicinity of Accabee Road. Under Alternative 2, an additional Related Activity would be required to connect the northern rail from the Project site, crossing a portion of marsh that drains to Noisette Creek, to the existing NCTC track along Virginia Avenue.

The impacts on vegetation associated with construction of the Related Activity for each alternative including Alternative 1 (Proposed Project) are summarized in Table 4.4-9. As described above, construction of the Related Activity associated with Alternative 2 would involve impacts to marsh habitat, otherwise most of the impacts from construction of the Related Activity would be to upland, disturbed habitat.

Table 4.4-9
Land Cover Impacts from Related Activities

Alternative		Impacts on Land Cover (acres)				
	Impact Type	Marsh	Marine Water	Urban Development (high intensity)	Urban Development (low intensity)	Total
Proposed Project	Fill	–	–	21.80		**21.80**
Alternative 2	Fill	2.14	–	22.70	2.62	**27.46**
Alternative 3	Fill	–	–	16.83		**16.83**
Alternative 4	Fill	–	–	21.45		**21.45**
Alternative 5	Fill	–	–	21.80		**21.80**
Alternative 6	Fill	–	–	16.83		**16.83**
Alternative 7	Fill	–	–	21.45		**21.45**

Source: Atkins 2018.

4.4.11 Summary of Impacts Table

Table 4.4-10 summarizes the environmental consequences to Vegetation and Wildlife from Alternative 1 (Proposed Project) and all the alternatives.

Table 4.4-10
Summary of Impacts, Vegetation and Wildlife

Alternative	Habitat	Introduction of Invasive/Noxious Species	Species Displacement	Species Mortality
No-Action	Negligible effect on vegetative land cover classes from habitat alteration and fragmentation due to the continuation of mixed use and industrial land uses.	Minor adverse. Routine maintenance (cutting and mowing) of vegetation could result in the proliferation of invasive/noxious plants present within the study area	Negligible. Existing and future land uses are not expected to directly or indirectly displace the wildlife species inhabiting the study area	Negligible. Existing and future land uses are not expected to result in the mortality of species inhabiting the study area
1: *Proposed Project: South via Milford / North via Hospital District*	Minor adverse. Loss of habitat from removal of vegetation during construction but would not degrade the stability of animal populations; approximately 233.71 acres of vegetation would be removed, of which 95.5 percent would consist of previously disturbed communities and 4.5 percent of natural communities (10.35 acres of marsh and 0.17 acre of marine open water); increase in habitat fragmentation	Minor adverse. Routine maintenance (cutting and mowing) of vegetation could result in the proliferation of invasive/noxious plants present within the study area	Minor adverse. Potential exists for direct and indirect short-term species displacement during construction; common species are relatively abundant and adapted to living in close association with human activity and infrastructure	Minor adverse. Potential exists for mortality of species during construction; wildlife would likely move away in the presence of human activity
2: *South via Milford / North via S-line*	Same as Alternative 1 (Proposed Project) but approximately 236.83 acres of vegetation would be removed, of which 94.4 percent would consist of previously disturbed communities and 5.6 percent of natural communities (12.93 acres of marsh and 0.36 acre of marine open water)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)
3: *South via Kingsworth / North via Hospital*	Same as Alternative 1 (Proposed Project), but approximately 214.27 acres of vegetation would be removed, of which 95.1 percent would consist of previously disturbed communities and 4.9 percent of natural communities (10.34 acres of marsh and 0.17 acre of marine open water)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)
4: *South via Milford*	Same as Alternative 1 (Proposed Project) but approximately 235.89 acres of vegetation would be removed, of which 95.7 percent would consist of previously disturbed communities and 4.3 percent of natural communities (10.07 acres of marsh); no marine open water would be impacted	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)

Alternative	Habitat	Introduction of Invasive/Noxious Species	Species Displacement	Species Mortality
5: *River Center Site: South via Milford / North via Hospital District*	Minor adverse loss of habitat from removal of vegetation during construction but would not degrade the stability of animal populations; approximately 194.32 acres of vegetation would be removed, of which 95.7 percent would consist of previously disturbed communities and 4.35 percent of natural communities (8.28 acres of marsh and 0.17 acre of marine open water); increase in habitat fragmentation	Minor adverse. Routine maintenance (cutting and mowing) of vegetation could result in the proliferation of invasive/noxious plants present within the study area	Minor adverse. Potential exists for direct and indirect short-term species displacement during construction; common species are relatively abundant and adapted to living in close association with human activity and infrastructure	Minor adverse. Potential exists for mortality of species during construction; wildlife would likely move away in the presence of human activity
6: *River Center Site: South via Kingsworth / North via Hospital*	Same as Alternative 5 but approximately 175.15 acres of vegetation would be removed, of which 95.2 percent would consist of previously disturbed communities and 4.83 percent of natural communities (8.28 acres of marsh and 0.17 acre of marine open water)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)
7: *River Center Site: South via Milford*	Same as Alternative 5 but approximately 197.98 acres of vegetation would be removed, of which 96.0 percent would consist of previously disturbed communities and 4.0 percent of natural communities (8.00 acres of marsh); no marine open water would be impacted	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)

Vegetation Impact Definitions

Negligible = No impacts to vegetation or plant communities.

Minor = Alteration in vegetation or plant communities (habitat) that sustain animal populations; fragmentation of habitat that impairs existing plant communities; localized occurrences of invasive, noxious weeds.

Major = Loss of vegetation or plant communities (habitat) that degrade the stability of animal populations; fragmentation of habitat that results in the loss of plant communities; widespread occurrences of invasive, noxious weeds.

Wildlife Impact Definitions

Negligible = No impacts to wildlife.

Minor = Short-term displacement of wildlife species; mortality of individuals of common wildlife species; fragmentation of populations of distinct wildlife species; short-term impairment to animal migratory paths; localized occurrences of non-native wildlife species.

Major = Permanent impairment to animal migratory paths; mortality of a distinct population of common wildlife species; destruction of wildlife breeding grounds/nesting areas (e.g., rookeries); introduction and uncontrollable spread of non-native wildlife species.

In summary, the land cover types and wildlife habitat within the Vegetation and Wildlife study area were divided into four categories: marsh, marine water, urban development (high intensity) and urban development (low intensity). There are no impacts to marine open water from Alternatives 4 and 7. All alternatives, including Alternative 1 (Proposed Project), would impact 95.5 percent of previously disturbed habitat within the limits of proposed construction of the Vegetation and Wildlife study area. Alternatives 5 through 7 would remove and disturb less vegetation and wildlife habitat than Alternative 1 (Proposed Project) due to the smaller River Center project site footprint.

4.4.12 Mitigation

4.4.12.1 Applicant's Proposed Avoidance and Minimization Measures

The Applicant has committed to several measures that avoid and/or minimize potential impacts of Alternative 1 (Proposed Project). These measures are taken from Palmetto Railways Mitigation Plan provided in Appendix N. Some of these measures are required under federal, state, and local permits; others are measures that Palmetto Railways has incorporated into the design and operations of Alternative 1 (Proposed Project). Each mitigation measure is also designated as one that either helps to avoid an impact or one that minimizes an impact.

- Redevelopment of an existing industrial site that minimizes impacts to undeveloped land. (Avoidance and Minimization)
- Plant native vegetation and trees on the earthen berm within a 100-foot buffer along the western property boundary. (Minimization)

These avoidance and minimization measures, except the items noted with an asterisk (*), have been considered in the preceding impact analysis. The complete list of Applicant-proposed avoidance and minimization measures for the Navy Base ICTF is also provided in Chapter 6, Table 6.1.

4.4.12.2 Additional Potential Mitigation Measures

No additional mitigation measures are proposed for vegetation and wildlife by the Corps. Additional avoidance, minimization, and mitigation may be considered by the Corps in its decision-making process. Final mitigation measures may be adopted as conditions of the DA permit and documented in the Record of Decision (ROD).

4.5 WATERS OF THE U.S.

4.5.1 Methods and Impact Definitions

In this section, all jurisdictional waters, including Traditionally Navigable Waters (TNWs) and wetlands, are referred to collectively as waters of the U.S. Using GIS, the Corps evaluated waters of the U.S. to determine comprehensive impact estimates to the location, extent, and character of jurisdictional resources. As described in Section 3.5 and Appendix D, outside of Alternative 1 (Proposed Project) the boundaries of waters of the U.S. were estimated within the waters of the U.S. study area. Regardless of the source of the waters of the U.S. data, impacts were then quantified using GIS by overlaying limits of construction that were developed for each alternative (Appendix L) against the waters of the U.S. resources within the waters of the U.S. study area. Impacts are reported using linear feet for freshwater creeks (tributaries) and acreages for all other waters of the U.S.

Tributaries and wetlands within the waters of the U.S. study area would be affected in varying amounts by all the potential Project alternatives. These impacts would result from placement of fill, installation of pilings, temporary construction, or other methods of degradation (such as clearing and/or shading) to jurisdictional areas. The regulatory threshold for placement of fill in non-tidal waters of the U.S., tidal waters of the U.S., and creek beds (permanent or temporary) is based on the maximum impacts allowed under the Corps' Nationwide Permits. If impacts to waters of the U.S exceed the impact limits for the available Nationwide Permits, an Individual Permit would be required in order to construct Alternative 1 (Proposed Project). Impact definitions for waters of the U.S. are presented in Table 4.5-1. Any loss of waters of the U.S. would require compensatory mitigation, which is further discussed in Chapter 6. The Corps anticipates that there will be temporary impacts (such as temporary clearing and temporary construction areas), but sufficient detail to evaluate these impacts is not available. Therefore, all impacts to waters of the U.S. within the limits of construction for each alternative have been evaluated as permanent impacts.

Table 4.5-1
Impact Definitions, Waters of the U.S.

Negligible	Minor	Major
No direct or indirect impact to waters of the U.S.	Permanent impact to waters of the U.S. (under 0.5 acre of non-tidal waters of the U.S.; under 0.33 acre of tidal waters of the U.S.)	Permanent impact to waters of the U.S. (greater than 0.5 acre of non-tidal waters of the U.S.; greater than 0.33 acre of tidal waters of the U.S.)

4.5.2 No-Action Alternative

Under the No-Action Alternative, the Corps would not issue a DA permit[70], and construction and operation of the Navy Base ICTF would not occur. For the purposes of this EIS, the Corps assumes that the Project site and the River Center project site would continue to include mixed use (residential and commercial) and industrial land uses. In light of Palmetto Railways' ownership of the properties, there would be the potential for redevelopment of these areas to include rail-served warehousing and distribution. Future construction and/or other human activities that may occur within the waters of the U.S. study area could adversely impact to waters of the U.S.; however, any permanent or temporary impacts would require a permit from the Corps. Since there would be no single, specific project associated with the No-Action Alternative, it would be speculative to quantify the extent of potential permanent or temporary impacts to waters of the U.S. Therefore, potential future adverse impacts cannot be classified as either minor or major.

4.5.3 Alternative 1: Applicant's Proposed Project (South via Milford / North via Hospital District)

Under Alternative 1 (Proposed Project), approximately 15.84 acres of waters of the U.S. would be directly impacted by placement of fill and/or shading activities (Table 4.5-2). Figure 4.5-1 depicts the location of impacts to waters of the U.S. from implementation of Alternative 1 (Proposed Project). Avoidance and minimization measures incorporated into Project site design to reduce impacts to waters of the U.S. include bridging tidelands and reducing side slopes to a 2:1 ratio where practicable. While the construction of the ICTF would be the largest land disturbance associated with Alternative 1 (Proposed Project), the roadway and rail improvements have the largest overall impact to waters of the U.S. Improvements that would result in direct impacts include the drayage road, the Hobson/Bainbridge realignment, the ICTF, the northern rail connection, the bridge over Noisette Creek, and the southern rail connection.

Construction of Alternative 1 (Proposed Project) would impact 8.01 acres of freshwater wetlands followed by 6.65 acres of tidal salt marsh, 1.14 acres of tidal open waters, and 0.04 acre of Other Open Water. The majority of impacts to tidal salt marsh are associated with construction of the bridges for the drayage road. The largest impact to freshwater wetlands is associated with the southern rail connection. Tidal open waters would be directly impacted in six impact locations, with the largest impact occurring to tidally influenced ditches near the Hobson/Bainbridge Road realignment. Direct permanent impacts to Other Open Water (e.g., freshwater ditches) would total 0.04 acre, and occur at the drayage road and ICTF.

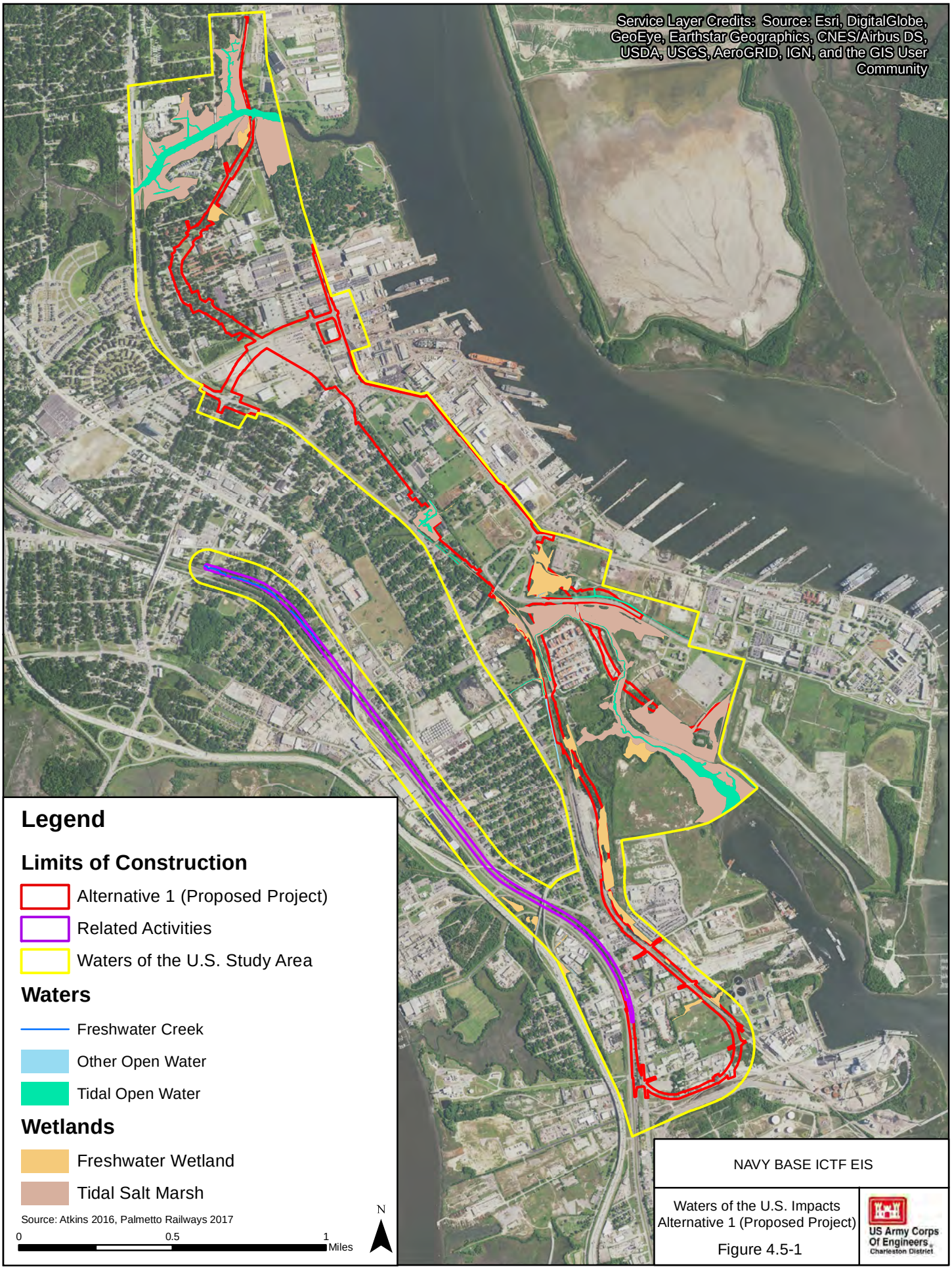
[70] 33 C.F.R. Parts 321.1(b) prescribe the statutory authorities, and general and special policies and procedures applicable to the review of applications for Department of the Army (DA) permits for controlling certain activities in waters of the United States or the oceans. 33 C.F.R. Parts 321.1(c) describes the various forms of authorization. 33 C.F.R. Parts 320.2 describes the authorities to issue permits.

Potential mitigation measures incorporated into Project site design to reduce impacts to waters of the U.S., including wetlands, include measures such as bridging tidal salt marsh where possible and reducing side slopes to a 2:1 ratio where practicable. Temporary impacts would be minimized with the removal of dredge/fill material deposited during construction and the restoration of natural grades. Pursuant to Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 403), Sections 401 and 404 of the Clean Water Act (33 U.S.C. 1344), and the South Carolina Coastal Zone Management Act (48-39-10 et seq.), a joint permit application was submitted to the Department of the Army (DA) and the S.C. Department of Health and Environmental Control (SCDHEC) in October 2016. The Applicant's permit application included a Wetland Mitigation Plan. This plan proposes for the Applicant to purchase 86.3 wetland mitigation credits from Pigeon Pond Mitigation Bank to compensate for freshwater impacts, as well as a permittee responsible mitigation plan to restore and protect approximately 40.6 acres of tidal marsh at the former Kings Grant Country Club and Golf Course in North Charleston, Dorchester County, SC. Final calculation of the required wetland mitigation credits will be based on approved and final plans. A complete list of mitigation measures is included in the Applicant's Community Mitigation Plan in Appendix N.

4.5.4 Alternative 2: Proposed Project Site (South via Milford / North via S-line)

Impacts to waters of the U.S. under Alternative 2 would be similar to those under Alternative 1 (Proposed Project), with roadway and rail improvements having the largest overall impact to waters of the U.S. Construction of Alternative 2 would directly impact approximately 17.92 acres of waters of the U.S., including 8.86 acres of tidal salt marsh, 7.64 acres of freshwater wetlands, 1.35 acres of tidal open waters, and 0.07 acre of Other Open Waters (Table 4.5-3). Figure 4.5-2 depicts the location of impacts to waters of the U.S. from implementation of Alternative 2. Improvements that would result in direct impacts include the drayage road, the Hobson/Bainbridge realignment, the ICTF, the northern rail connection, the bridge over Noisette Creek, and the southern rail connection.

The impacts to waters of the U.S. would occur at seven different impact locations (Table 4.5-3). The largest impact to freshwater wetlands is associated with the southern rail connection. Tidal open waters would be directly impacted in six impact locations, with the largest impact occurring to tidally influenced ditches near the Hobson/Bainbridge Road realignment. Direct permanent impacts to Other Open Water (e.g., freshwater ditches) would total 0.07 acre, and occur at the southern rail connection, drayage road, and ICTF.


Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Legend
Limits of Construction
Alternative 1 (Proposed Project)
Related Activities
Waters of the U.S. Study Area
Waters
Freshwater Creek
Other Open Water
Tidal Open Water
Wetlands
Freshwater Wetland
Tidal Salt Marsh
Source: Atkins 2016, Palmetto Railways 2017
0
0.5
1
Miles
N
NAVY BASE ICTF EIS
Waters of the U.S. Impacts Alternative 1 (Proposed Project)
Figure 4.5-1
US Army Corps Of Engineers
Charleston District

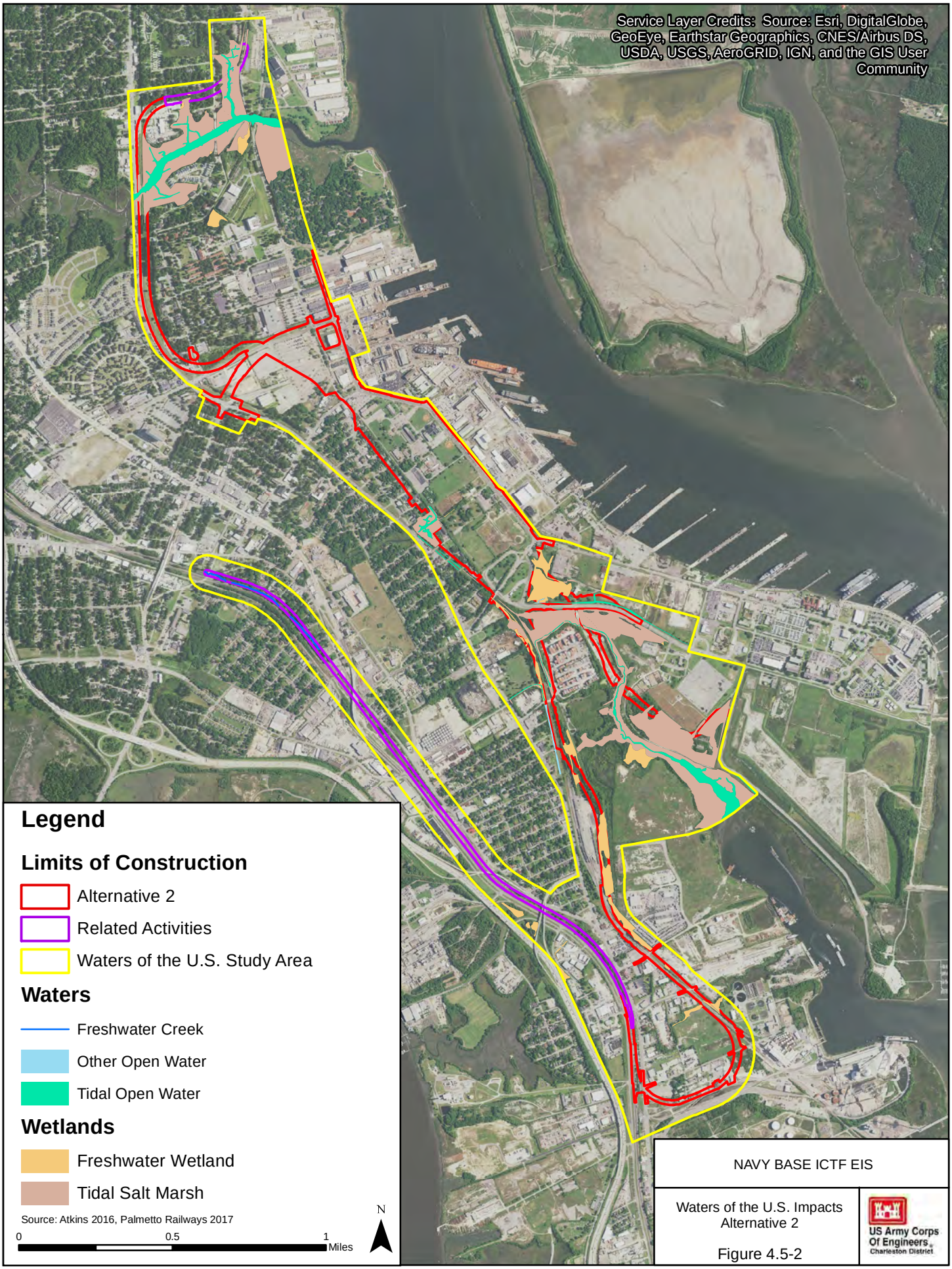

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Legend
Limits of Construction
Alternative 2
Related Activities
Waters of the U.S. Study Area
Waters
Freshwater Creek
Other Open Water
Tidal Open Water
Wetlands
Freshwater Wetland
Tidal Salt Marsh
Source: Atkins 2016, Palmetto Railways 2017
0
0.5
1
Miles
N
NAVY BASE ICTF EIS
Waters of the U.S. Impacts Alternative 2
Figure 4.5-2
US Army Corps Of Engineers
Charleston District

Table 4.5-2
Waters of the U.S. Impacts for Alternative 1 (Proposed Project)

Impact Location	Impacts to Waters of the U.S.						
	Impact Type	Tidal Salt Marsh	Tidal Open Waters	Freshwater Wetlands	Open Water	Total	% of Total
Drayage Road	Fill	0.14	–	0.02	0.02	**0.18**	**1.14**
Drayage Road Bridges	Shading	3.23	0.06	–	–	**3.29**	**20.77**
Hobson/Bainbridge Realignment	Fill	0.01	0.61	1.87	–	**2.49**	**15.72**
ICTF	Fill	1.97	0.13	0.98	0.02	**3.10**	**19.57**
Northern Rail Connection	Fill	–	0.02	0.35	–	**0.37**	**2.34**
Noisette Bridge	Shading	–	0.09	–	–	**0.09**	**0.57**
Southern Rail Connection	Fill	1.30	0.23	4.79	–	**6.32**	**39.90**
Total		**6.65**	**1.14**	**8.01**	**0.07**	**15.84**	**100.00**

*The sum of individual items may not equal totals due to rounding.

Source: Atkins 2018.

Table 4.5-3
Waters of the U.S. Impacts for Alternative 2

Impact Location	Impacts to Waters of the U.S.						
	Impact Type	Tidal Salt Marsh	Tidal Open Waters	Freshwater Wetlands	Open Water	Total	% of Total
Drayage Road	Fill	0.14	–	0.02	0.02	**0.18**	**1.00**
Drayage Road Bridges	Shading	3.24	0.06	–	–	**3.30**	**18.42**
Hobson/Bainbridge Realignment	Fill	0.01	0.61	1.87	–	**2.49**	**13.90**
ICTF	Fill	1.97	0.13	0.98	0.02	**3.10**	**17.30**
Northern Rail Connection	Fill	1.93	0.01	–	–	**1.94**	**10.83**
Noisette Bridge	Shading	0.27	0.31	–	–	**0.58**	**3.24**
Southern Rail Connection	Fill	1.30	0.23	4.77	0.03	**6.33**	**35.53**
Total		**8.86**	**1.35**	**7.64**	**0.07**	**17.92**	**100.00**

*The sum of individual items may not equal totals due to rounding.

Source: Atkins 2018.

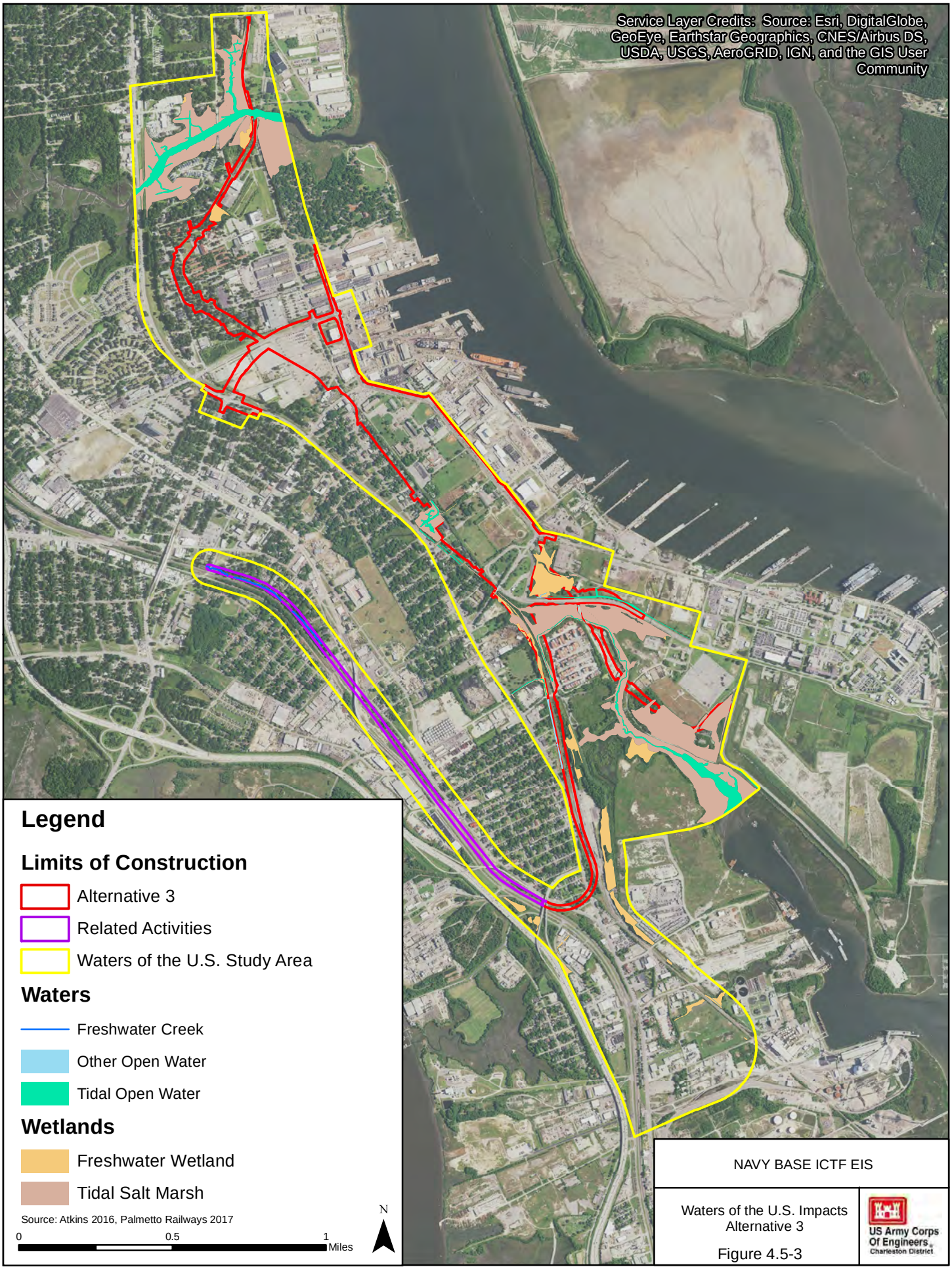
4.5.5 Alternative 3: Proposed Project Site (South via Kingsworth / North via Hospital District)

Impacts to waters of the U.S. under Alternative 3 would be similar to those under Alternative 1 (Proposed Project), with roadway and rail improvements having the largest overall impact to waters of the U.S. Construction of Alternative 3 would directly impact approximately 11.81 acres of waters of the U.S., including 6.66 acres of tidal salt marsh, 3.86 acres of freshwater wetlands, 1.14 acres of tidal open waters, and 0.15 acre of Other Open Waters (Table 4.5-4). Figure 4.5-3 depicts the location of impacts to waters of the U.S. from implementation of Alternative 3. Improvements that would result in direct impacts to waters of the U.S. include the drayage road and bridges, the Hobson/ Bainbridge realignment, the ICTF, the northern rail connection, the bridge over Noisette Creek, and the southern rail connection.

The impacts to waters of the U.S. would occur at seven different impact locations (Table 4.5-4). The largest impact to freshwater wetlands is associated with construction of the Hobson/Bainbridge realignment. Tidal open waters would be directly impacted in six impact locations, with the largest impact occurring to tidally influenced ditches near the Hobson/Bainbridge Road realignment. Direct permanent impacts to Other Open Water (e.g., freshwater ditches) would total 0.15 acre, and occur at the southern rail connection, drayage road, and ICTF.

4.5.6 Alternative 4: Proposed Project Site (South via Milford)

Impacts to waters of the U.S. under Alternative 4 would be similar to those discussed under Alternative 1 (Proposed Project), with roadway and rail improvements having the largest overall impact to waters of the U.S. Construction of Alternative 4 would directly impact approximately 15.98 acres of waters of the U.S., including 6.66 acres of tidal salt marsh, 8.22 acres of freshwater wetlands, 1.03 acres of tidal open waters, and 0.07 acre of Other Open Waters (Table 4.5-5). Figure 4.5-4 depicts the location of impacts to waters of the U.S. from implementation of Alternative 4. Improvements that would result in direct impacts include the drayage road and associated bridges, the Hobson/ Bainbridge realignment, the ICTF, the northern rail connection, and the southern rail connection.


Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Legend
Limits of Construction
Alternative 3
Related Activities
Waters of the U.S. Study Area
Waters
Freshwater Creek
Other Open Water
Tidal Open Water
Wetlands
Freshwater Wetland
Tidal Salt Marsh
Source: Atkins 2016, Palmetto Railways 2017
0
0.5
1
Miles
N
NAVY BASE ICTF EIS
Waters of the U.S. Impacts Alternative 3
Figure 4.5-3
US Army Corps Of Engineers
Charleston District

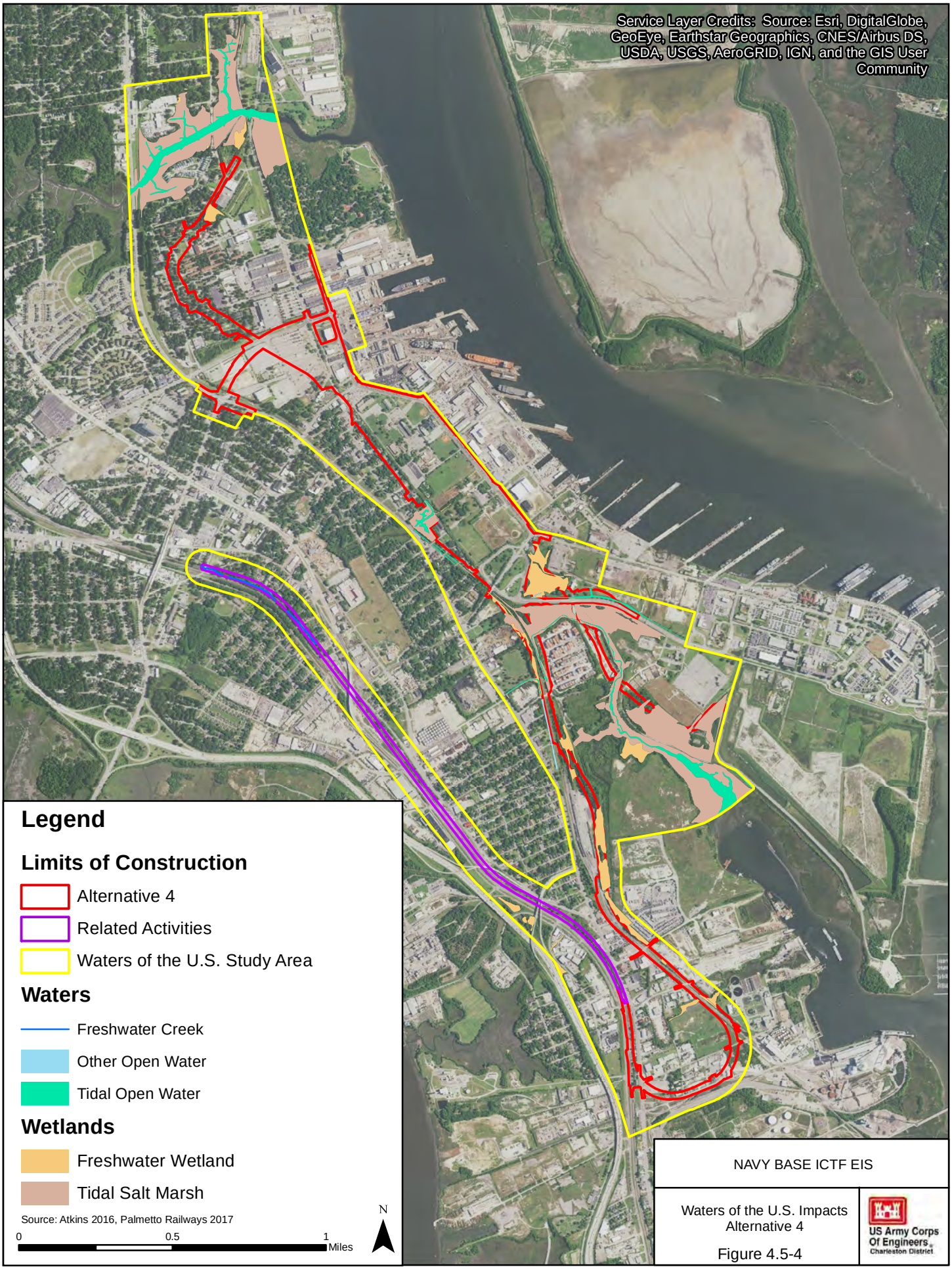

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Legend
Limits of Construction
Alternative 4
Related Activities
Waters of the U.S. Study Area
Waters
Freshwater Creek
Other Open Water
Tidal Open Water
Wetlands
Freshwater Wetland
Tidal Salt Marsh
Source: Atkins 2016, Palmetto Railways 2017
0
0.5
1
Miles
N
NAVY BASE ICTF EIS
Waters of the U.S. Impacts Alternative 4
Figure 4.5-4
US Army Corps Of Engineers
Charleston District

Table 4.5-4
Waters of the U.S. Impacts for Alternative 3

Impact Location	Impacts to Waters of the U.S.						
	Impact Type	Tidal Salt Marsh	Tidal Open Waters	Freshwater Wetlands	Open Water	Total	% of Total
Drayage Road	Fill	0.14	–	0.02	0.02	**0.18**	**1.52**
Drayage Road Bridges	Shading	3.24	0.06	–	–	**3.30**	**27.94**
Hobson/Bainbridge Realignment	Fill	0.01	0.61	1.87	–	**2.49**	**21.08**
ICTF	Fill	1.97	0.13	0.98	0.02	**3.10**	**26.25**
Northern Rail Connection	Fill	–	0.02	0.35	–	**0.37**	**3.13**
Noisette Bridge	Shading	–	0.09	–	–	**0.09**	**0.76**
Southern Rail Connection	Fill	1.30	0.23	0.64	0.11	**2.28**	**19.31**
Total		**6.66**	**1.14**	**3.86**	**0.15**	**11.81**	**100.00**

*The sum of individual items may not equal totals due to rounding.

Source: Atkins 2018.

Table 4.5-5
Waters of the U.S. Impacts for Alternative 4

Impact Location	Impacts to Waters of the U.S.						
	Impact Type	Tidal Salt Marsh	Tidal Open Waters	Freshwater Wetlands	Open Water	Total	% of Total
Drayage Road	Fill	0.14	–	0.02	0.02	**0.18**	**1.13**
Drayage Road Bridges	Shading	3.24	0.06	–	–	**3.30**	**20.65**
Hobson/Bainbridge Realignment	Fill	0.01	0.61	1.87	–	**2.49**	**15.58**
ICTF	Fill	1.97	0.13	0.98	0.02	**3.10**	**19.40**
Northern Rail Connection	Fill	–	–	0.29	–	**0.29**	**1.81**
Southern Rail Connection	Fill	1.30	0.23	5.06	0.03	**6.62**	**41.43**
Total		**6.66**	**1.03**	**8.22**	**0.07**	**15.98**	**100.00**

*The sum of individual items may not equal totals due to rounding.

Source: Atkins 2018.

The impacts to waters of the U.S. would occur at six different impact locations (Table 4.5-5). The largest impact to freshwater wetlands is associated with construction of the southern rail connection. Tidal open waters would be directly impacted in four impact locations, with the largest impact occurring to tidally influenced ditches near the Hobson/Bainbridge Road realignment. Direct permanent impacts to Other Open Water (e.g., freshwater ditches) would total 0.07 acre, and occur at the southern rail connection, drayage road, and ICTF.

4.5.7 Alternative 5: River Center Project Site (South via Milford / North via Hospital District)

Impacts to waters of the U.S. under Alternative 5 would be similar to those discussed under Alternative 1 (Proposed Project), with roadway and rail improvements having the largest overall impact to waters of the U.S. Construction of Alternative 5 would directly impact approximately 14.75 acres of waters of the U.S., including 5.29 acres of tidal salt marsh, 8.36 acres of freshwater wetlands, 1.01 acres of tidal open waters, and 0.09 acre of Other Open Waters (Table 4.5-6). Figure 4.5-5 depicts the location of impacts to waters of the U.S. from implementation of Alternative 5. Improvements that would result in direct impacts include the drayage road and associated bridges, the Hobson/ Bainbridge realignment, the ICTF, the northern rail connection, the bridge over Noisette Creek, and the southern rail connection.

The impacts to waters of the U.S. would occur at seven different impact locations (Table 4.5-6). The largest impact to freshwater wetlands is associated with the southern rail connection. Tidal open waters would be directly impacted in six locations, with the largest impact occurring to tidally influenced ditches near the Hobson/Bainbridge Road realignment. Direct permanent impacts to Other Open Water (e.g., freshwater ditches) would total 0.09 acre, and occur at the southern rail connection and the drayage road.

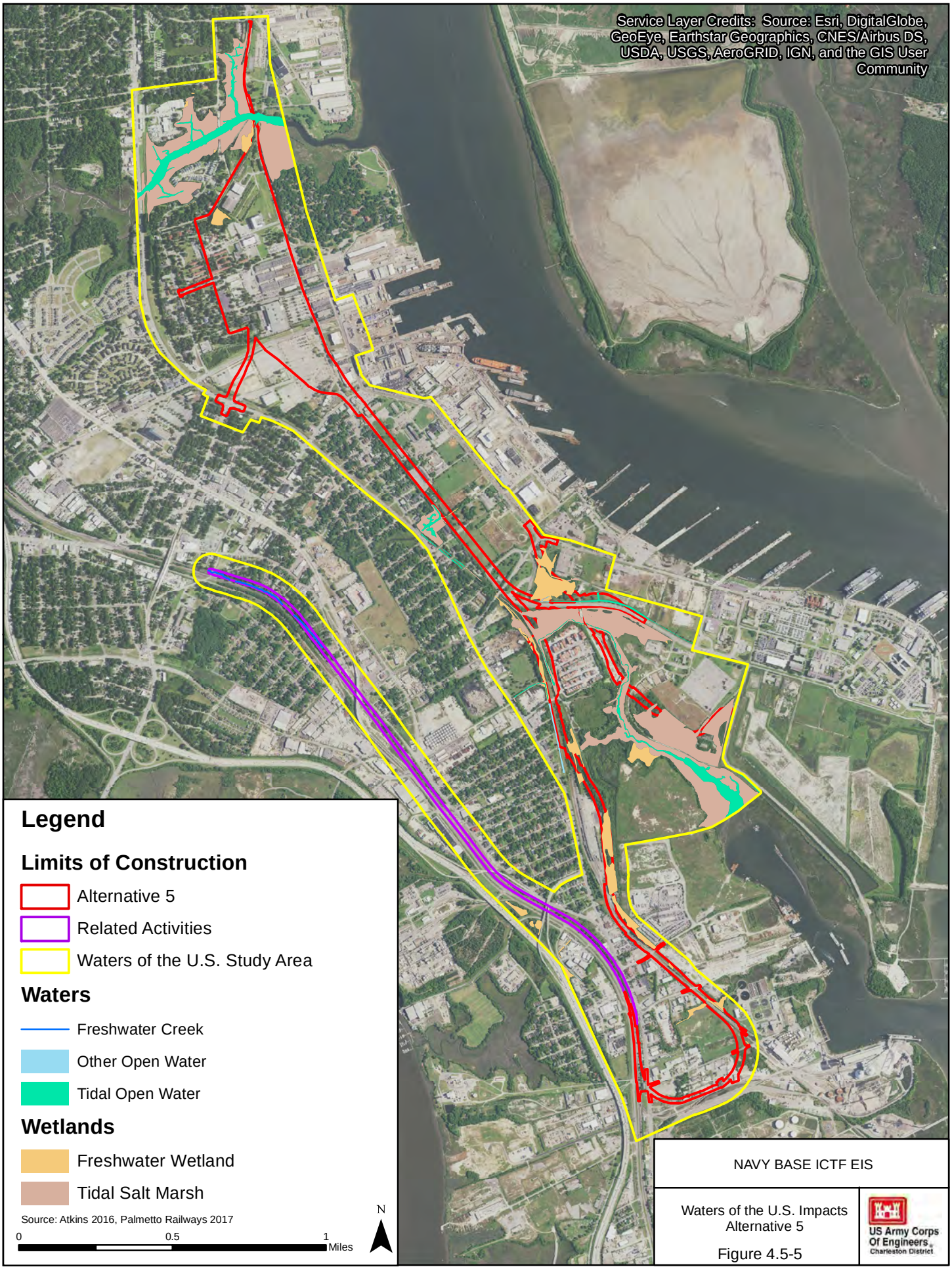

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Legend
Limits of Construction
Alternative 5
Related Activities
Waters of the U.S. Study Area
Waters
Freshwater Creek
Other Open Water
Tidal Open Water
Wetlands
Freshwater Wetland
Tidal Salt Marsh
Source: Atkins 2016, Palmetto Railways 2017
0
0.5
1
Miles
N
NAVY BASE ICTF EIS
Waters of the U.S. Impacts Alternative 5
Figure 4.5-5
US Army Corps Of Engineers
Charleston District

Table 4.5-6
Waters of the U.S. Impacts for Alternative 5

Impact Location	Impacts to Waters of the U.S.						
	Impact Type	Tidal Salt Marsh	Tidal Open Waters	Freshwater Wetlands	Open Water	Total	% of Total
Drayage Road	Fill	0.14	0.004	0.23	0.06	**0.43**	**2.92**
Drayage Road Bridges	Shading	3.24	0.06	–	–	**3.30**	**22.37**
Hobson/Bainbridge Realignment	Fill	0.01	0.61	1.87	–	**2.49**	**16.88**
ICTF	Fill	0.04	–	1.49	–	**1.53**	**10.37**
Noisette Bridge	Shading		0.09	–	–	**0.09**	**0.61**
Northern Rail Connection	Fill	–	0.02	0.004	–	**0.02**	**0.14**
Southern Rail Connection	Fill	1.86	0.23	4.77	0.03	**6.89**	**46.71**
Total		**5.29**	**1.01**	**8.36**	**.09**	**14.75**	**100.00**

*The sum of individual items may not equal totals due to rounding.

Source: Atkins 2018.

4.5.8 Alternative 6: River Center Project Site (South via Kingsworth / North via Hospital District)

Impacts to waters of the U.S. under Alternative 6 would be similar to those discussed under Alternative 1 (Proposed Project), with roadway and rail improvements having the largest overall impact to waters of the U.S. Construction of Alternative 6 would directly impact approximately 10.82 acres of waters of the U.S., including 5.29 acres of tidal salt marsh, 4.35 acres of freshwater wetlands, 1.01 acres of tidal open waters, and 0.17 acre of other open waters (Table 4.5-7). Figure 4.5-6 depicts the location of impacts to waters of the U.S. from implementation of Alternative 6. Improvements that would result in direct impacts include the drayage road, the Hobson/Bainbridge realignment, the ICTF, the northern rail connection, the bridge over Noisette Creek, and the southern rail connection.

The impacts to waters of the U.S. would occur at seven different impact locations, see Table 4.5-7. The largest impact to freshwater wetlands is associated with construction of the Hobson/Bainbridge Road realignment. Tidal open waters would be directly impacted in six impact locations, with the largest impact occurring to tidally influenced ditches near the Hobson/Bainbridge Road realignment. Direct permanent impacts to Other Open Water (e.g., freshwater ditches) would total 0.17 acre, and occur at the southern rail connection and the drayage road.

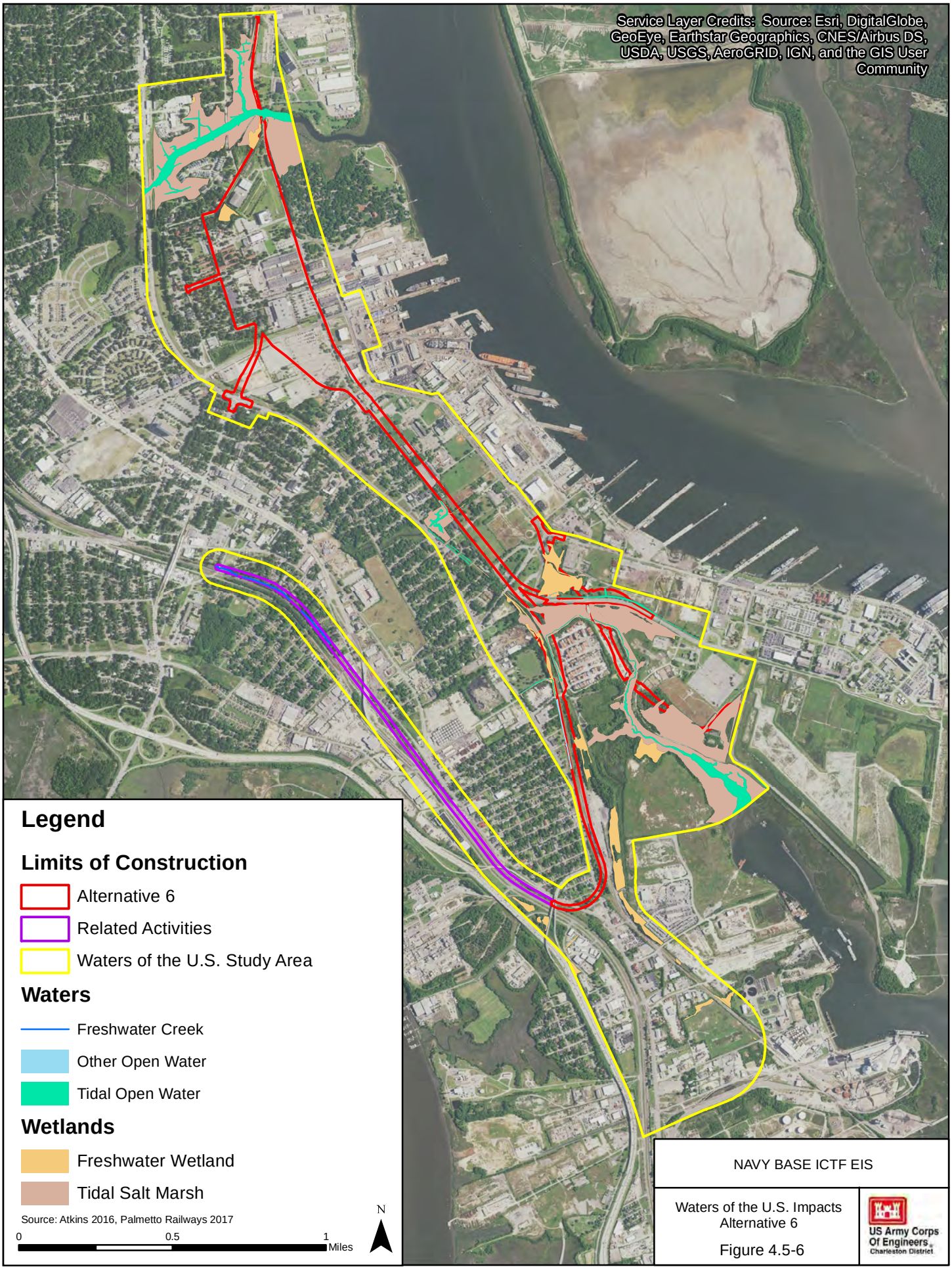

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Legend
Limits of Construction
Alternative 6
Related Activities
Waters of the U.S. Study Area
Waters
Freshwater Creek
Other Open Water
Tidal Open Water
Wetlands
Freshwater Wetland
Tidal Salt Marsh
Source: Atkins 2016, Palmetto Railways 2017
0
0.5
1
Miles
N
NAVY BASE ICTF EIS
Waters of the U.S. Impacts Alternative 6
Figure 4.5-6
US Army Corps Of Engineers
Charleston District

Table 4.5-7
Waters of the U.S. Impacts for Alternative 6

Impact Location	Impacts to Waters of the U.S.						
	Impact Type	Tidal Salt Marsh	Tidal Open Waters	Freshwater Wetlands	Open Water	Total	% of Total
Drayage Road	Fill	0.14	0.004	0.23	0.06	**0.43**	**3.97**
Drayage Road Bridges	Shading	3.24	0.06	–	–	**3.30**	**30.50**
Hobson/Bainbridge Realignment	Fill	0.01	0.61	1.87	–	**2.49**	**23.01**
ICTF	Fill	0.04	–	1.49	–	**1.53**	**14.14**
Noisette Bridge	Shading	–	0.09	–	–	**0.09**	**0.83**
Northern Rail Connection	Fill	–	0.02	0.004	–	**0.02**	**0.18**
Southern Rail Connection	Fill	1.86	0.23	0.76	0.11	**2.96**	**27.36**
Total		**5.29**	**1.01**	**4.35**	**0.17**	**10.82**	**100.00**

*The sum of individual items may not equal totals due to rounding.

Source: Atkins 2018.

4.5.9 Alternative 7: River Center Project Site (South via Milford)

Impacts to waters of the U.S. under Alternative 7 would be similar to those discussed under Alternative 1 (Proposed Project), with roadway and rail improvements having the largest overall impact to waters of the U.S. Construction of Alternative 7 would directly impact approximately 15.01 acres of waters of the U.S., including 5.32 acres of tidal salt marsh, 8.68 acres of freshwater wetlands, 0.92 acre of tidal open waters, and 0.09 acre of Other Open Waters (Table 4.5-8). Figure 4.5-7 depicts the location of impacts to waters of the U.S. from implementation of Alternative 7. Improvements that would result in direct impacts include the drayage road, the Hobson/Bainbridge realignment, the ICTF, the northern rail connection, and the southern rail connection.

The impacts to waters of the U.S. would occur at five different impact locations (Table 4.5-8). The largest impact to freshwater wetlands is associated with the southern rail connection. Tidal open waters would be directly impacted in five impact locations, with the largest impact occurring to tidally influenced ditches near the Hobson/Bainbridge Road realignment. Direct permanent impacts to Other Open Water (e.g., freshwater ditches) would total 0.09 acre, and occur at the southern rail connection and the drayage road.

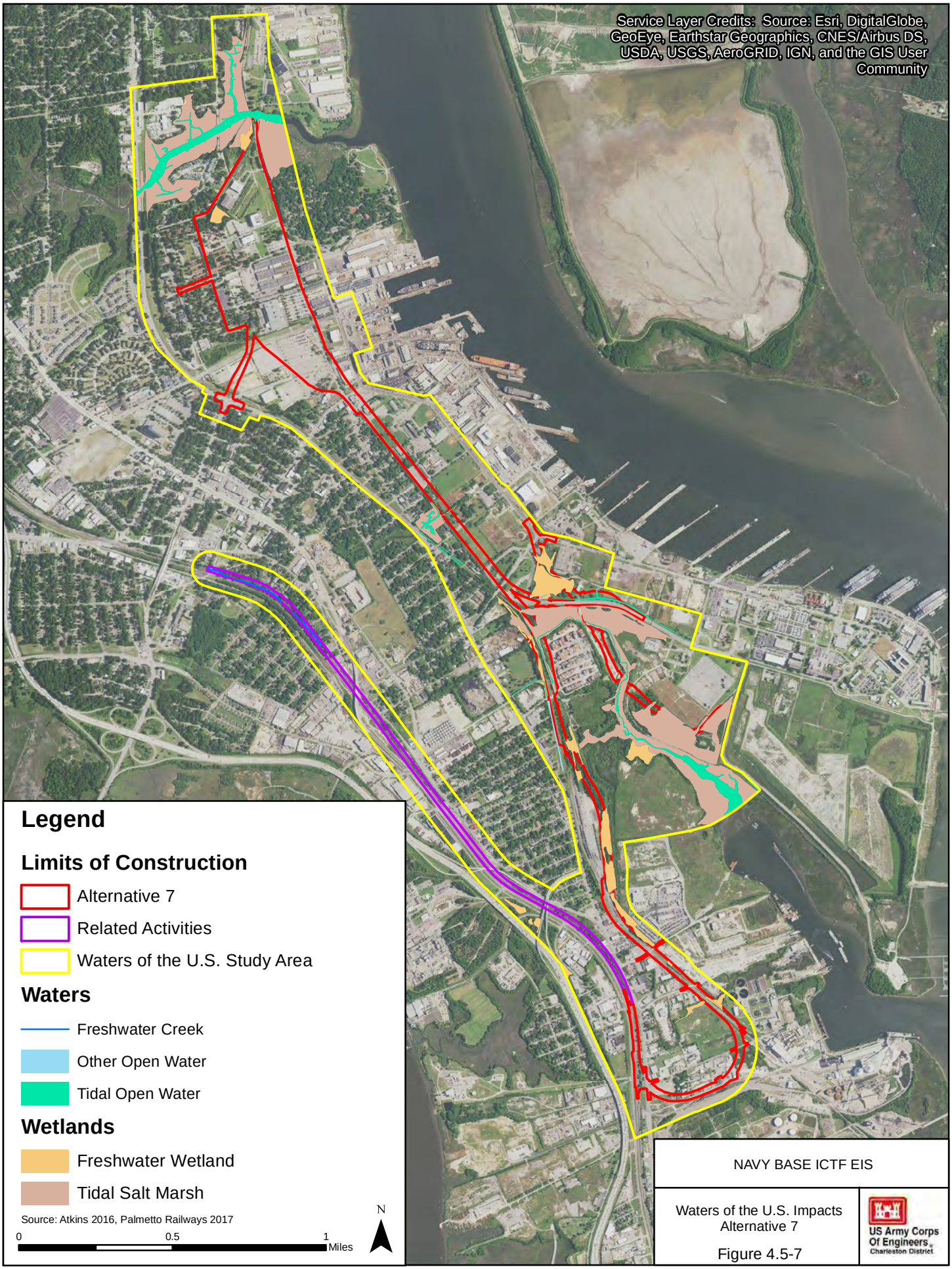

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Legend
Limits of Construction
Alternative 7
Related Activities
Waters of the U.S. Study Area
Waters
Freshwater Creek
Other Open Water
Tidal Open Water
Wetlands
Freshwater Wetland
Tidal Salt Marsh
Source: Atkins 2016, Palmetto Railways 2017
0
0.5
1
Miles
N
NAVY BASE ICTF EIS
Waters of the U.S. Impacts Alternative 7
Figure 4.5-7
US Army Corps Of Engineers
Charleston District

Table 4.5-8
Waters of the U.S. Impacts for Alternative 7

Impact Location	Impacts to Waters of the U.S.						
	Impact Type	Tidal Salt Marsh	Tidal Open Waters	Freshwater Wetlands	Open Water	Total	% of Total
Drayage Road	Fill	0.14	0.004	0.23	0.06	**0.43**	**2.86**
Drayage Road Bridges	Shading	3.24	0.06	–	–	**3.30**	**21.99**
Hobson/Bainbridge Realignment	Fill	0.01	0.61	1.87	–	**2.49**	**16.59**
ICTF	Fill	0.07	0.02	1.52	–	**1.61**	**10.73**
Northern Rail Connection	Fill	–	–	–	–	**0.00**	**0.00**
Southern Rail Connection	Fill	1.86	0.23	5.06	0.03	**7.18**	**47.83**
Total		**5.32**	**0.92**	**8.68**	**0.09**	**15.01**	**100.00**

*The sum of individual items may not equal totals due to rounding.

Source: Atkins 2018.

4.5.10 Related Activities

The Related Activities include two components, the southern rail connection, which occurs for all alternatives, but has unique alignments for Alternatives 3 and 6, and the northern rail connection which is only proposed for Alternative 2. For all seven alternatives, Related Activities associated with the southern rail connection would result in fill impacts to approximately 2,190 linear feet of freshwater creeks. Related Activities of the northern rail connection associated with Alternative 2 would require an additional 1.99 acres of impacts to waters of the U.S. associated with Noisette Creek (Table 4.5-9).

Impacts to waters of the U.S. associated with Related Activities for all of the alternatives would require a separate 404/401 permit, since ownership of the rail track for these related activities is different than the components of Alternative 1 (Proposed Project). Cumulative impacts to waters of the U.S. would be greater for Alternative 2 due to the crossing of Noisette Creek to tie into the NCTC tracks as part of the Related Activity.

Table 4.5-9. Summary of Impacts on Waters of the U.S. Impacts for Related Activities

Impact Location	Impacts to Waters of the U.S.						
	Impact Type	Tidal Salt Marsh	Tidal Open Waters	Freshwater Wetlands	Open Water	Total	% of Total
Alternative 2 Related Activity (Northern Connection)	Fill	1.77	0.20	0.02	--	1.99	--

Source: Atkins 2018.

4.5.11 Summary of Impacts Table

Table 4.5-10 summarizes the environmental consequences to waters of the U.S. from Alternative 1 (Proposed Project) and all the alternatives.

Table 4.5-10
Summary of Impacts, Waters of the United States

Alternative	Impacts to Waters of the U.S.
No-Action	Future construction and/or other human activities could adversely impact waters of the U.S. within the waters of the U.S. study area; any permanent or temporary impacts would require a permit from the Corps.
1: *Proposed Project: South via Milford / North via Hospital District*	Major adverse. Direct impacts from fill/shading activities during construction would result in the permanent impact to approximately 15.84 acres of waters of the U.S., including 6.65 acres of tidal salt marsh, 8.01 acres of freshwater wetlands, and 1.14 acres of tidal open waters. Non-tidal open-water impacts total 0.04 acre.
2: South via *Milford / North via S-line*	Major adverse. Similar to Alternative 1 (Proposed Project) but would result in the permanent impact to approximately 17.92 acres of waters of the U.S., including 8.86 acres of tidal salt marsh, 7.64 acres of freshwater wetlands, and 1.35 acres of tidal open waters. Non-tidal open-water impacts total 0.07 acre.
3: South via *Kingsworth / North via Hospital*	Major adverse. Similar to Alternative 1 (Proposed Project) but would result in the permanent impact to approximately 11.81 acres of waters of the U.S., including 6.66 acres of tidal salt marsh, 3.86 acres of freshwater wetlands, and 1.14 acres of tidal open waters. Non-tidal open-water impacts total 0.15 acre.
4: *South via Milford*	Major adverse. Similar to Alternative 1 (Proposed Project) but would result in the permanent impact to approximately 15.98 acres of waters of the U.S., including 6.66 acres of tidal salt marsh, 8.22 acres of freshwater wetlands, and 1.03 acres of tidal open waters. Non-tidal open-water impacts total 0.07 acre.
5: *River Center Project Site: South via Milford / North via Hospital District*	Major adverse. Would result in the permanent impact to approximately 14.75 acres of waters of the U.S., including 5.29 acres of tidal salt marsh, 8.36 acres of freshwater wetlands, and 1.01 acres of tidal open waters. Non-tidal open-water impacts total 0.09 acre.
6: *River Center Project Site: South via Kingsworth / North via Hospital District*	Major adverse. Similar to Alternative 5 but would result in the permanent impact to approximately 10.82 acres of waters of the U.S., including 5.29 acres of tidal salt marsh, 4.35 acres of freshwater wetlands, and 1.01 acres of tidal open waters. Non-tidal open-water impacts total 0. 17 acre.

Alternative	Impacts to Waters of the U.S.
7: *River Center Project Site: South via Milford*	Major adverse. Similar to Alternative 5 but would result in the permanent impact to approximately 15.01 acres of waters of the U.S., including 5.32 acres of tidal salt marsh, 8.68 acres of freshwater wetlands, and 0.92 acre of tidal open waters. Non-tidal open-water impacts total 0.09 acre.

Waters of the U.S. Impact Definitions

Negligible = No direct or indirect impact to waters of the U.S.

Minor = Permanent impact to waters of the U.S. (under 0.5 acre of non-tidal waters of the U.S.; under 0.33 acre of tidal waters of the U.S.).

Major = Permanent impact to waters of the U.S. (greater than 0.5 acre of non-tidal waters of the U.S.; greater than 0.33 acre of tidal waters of the U.S.)

Source: Atkins 2018.

4.5.12 Mitigation

4.5.12.1 Applicant's Proposed Avoidance and Minimization Measures

Each alternative would require review by the Corps under an Individual Section 404 permit, as well as Section 10 of the RHA and Section 401 of the CWA in consideration for water quality and impacts to Noisette and Shipyard creeks. After avoidance and minimization efforts are complete, all waters of the U.S. impacts can be mitigated, which would be a consideration during permit review and evaluation of the compensatory mitigation alternatives consistent with 33 C.F.R. 332.

The Applicant has committed to several measures that avoid and/or minimize potential impacts of Alternative 1 (Proposed Project). These measures are taken from Palmetto Railways Mitigation Plan provided in Appendix N. Some of these measures are required under federal, state, and local permits; others are measures that Palmetto Railways has incorporated into the design and operations of Alternative 1 (Proposed Project). Each mitigation measure is also designated as one that either helps to avoid an impact or one that minimizes an impact.

- Site the ICTF on previously disturbed land (with industrial uses) that is mostly comprised of uplands, thereby minimizing impacts to waters of the U.S. in the Cooper River watershed. (Minimization, Avoidance)
- Design the ICTF and roadway and rail improvements to minimize impacts to waters of the U.S., such as the drayage road placement that reduces impacts to waters of the U.S. associated with Shipyard Creek. (Minimization, Avoidance)
- Where possible, limit the placement of pilings for bridges within waterways. (Minimization)
- Use 2:1 side slopes in areas that are not bridged to minimize the amount of fill material. (Minimization)
- Rehabilitate existing bridge over Noisette Creek to reduce impacts. (Minimization)
- Design culverts and bridges to maintain existing flow/exchange and hydrology for wetland areas and marshes. (Minimization)

- Replacement of earthen berm with a sound attenuation and security wall, where appropriate, in areas adjacent to waters of the U.S. to avoid filling of wetlands. (Avoidance and Minimization)
- Submit application for Section 404 Permit as promulgated by Clean Water Act (CWA) and comply with any requirements as determined by the Corps. (Avoidance, Minimization, and Compensatory Mitigation)
- Removal of dredge/fill and restoration natural grades to minimize temporary impacts during construction. (Minimization)
- Develop and execute wetland mitigation plan (Appendix N) to ensure any wetland impacts have been minimized and that compensation (restoration and purchase of mitigation credits) will be provided for all remaining unavoidable impacts. Final calculation of the required wetland mitigation credits will be based on approved and final plans. (Minimization and Compensatory Mitigation).

These avoidance and minimization measures, except the items noted with an asterisk (*), have been considered in the preceding impact analysis. The complete list of Applicant-proposed avoidance and minimization measures for Alternative 1 (Proposed Project) is also provided in Chapter 6, Table 6-1.

4.5.12.2 Additional Potential Mitigation Measures

No additional mitigation measures for Waters of the U.S. have been identified by the Corps. Additional avoidance, minimization, and mitigation may be considered by the Corps in its decision-making process. Final mitigation measures may be adopted as conditions of the DA permit and documented in the Record of Decision (ROD).

4.6 PROTECTED SPECIES

4.6.1 Methods and Impact Definitions

Impacts to Protected Species, which includes all federal and state-listed threatened, endangered, at-risk, and candidate species, were evaluated using literature review, GIS, presence/absence, and best professional judgment. The NMFS Pile Driving Calculator Model (NMFS 2015) was used to assess the potential underwater noise impacts to Protected Species from pile driving activities for Alternative 1 (Proposed Project) and alternatives. This model is based on data from similar piles, installation, and water depth and requires an estimate of the total number of strikes per day to install the piles. Assumptions for input into the NMFS model for Alternative 1 (Proposed Project) were based on the number of strikes by an impact hammer for the 24-inch diameter pre-cast concrete piles and 14-inch steel H-piles, and a vibratory hammer for the 84-inch CISS piles. Reference noise levels were selected from the Compendium of Pile Driving Sound Data, updated in October 2012, provided as Appendix I to Caltran's Final Technical Guidance for Assessment and Mitigation of the Hydroacoustic Effects of Pile Driving on Fish (February 2009) to represent Alternative 1 (Proposed Project) (Caltrans 2012).

Impacts to Protected Species would be considered adverse if actions associated with the Proposed Project would result in the taking of a species. Impacts to species habitat and critical habitat would be considered adverse if direct physical alterations to a species habitat impacts their ability to live. (Table 4.6-1).

Table 4.6-1
Impact Definitions, Protected Species

	Negligible	Minor	Major
Species	Very small impact to Protected Species	Small impact (in number, quantity, or extent) to Protected Species but not resulting in much trouble or damage	Large impact (in number, quantity, or extent) to Protected Species resulting in serious damage
Critical Habitat	Very small alteration to critical habitat	Small alteration (in quantity or extent) to critical habitat that does not impair a Protected Species' ability to live	Large alteration that appreciably diminishes the value of critical habitat for survival of Protected Species

4.6.2 No-Action Alternative

Under the No-Action Alternative, the Corps would not issue a DA permit, and construction and operation of the Navy Base ICTF would not occur. For the purposes of this EIS, the Corps assumes that the Project site and the River Center project site would continue to include mixed use (residential and commercial) and industrial land uses. In light of Palmetto Railways' ownership of the properties, there would be the potential for redevelopment of these areas to include rail-served warehousing and distribution. The Corps also assumes that available habitat for Protected Species in the Protected Species study area (Figure 3.6-1) would be similar to existing conditions. The natural resources throughout the region would likely change as a result of other urban growth and development projects.

Under the No-Action Alternative, there is the potential for impacts to some of the Protected Species and/or their habitat identified in Tables 3.6-2, 3.6-4, 3.6-6, and 3.6-7 from future construction and development activities associated with the Project site and River Center project site. Although the extent of potential impacts to Protected Species is unknown, the Corps assumes that future actions under the No-Action Alternative could have a negligible impact on Protected Species and/or their habitat as a result of future construction activities.

4.6.3 Alternative 1: Applicant's Proposed Project (South via Milford / North via Hospital District)

Construction of Alternative 1 (Proposed Project) has the potential to affect several Protected Species and/or their habitat (see Table 4.6-2). No critical habitat for any of the Protected Species in Table 4.6-2 occurs within the Protect Species study area (Figure 3.6-1). Potential short-term and permanent direct and indirect impacts are described in general below and then discussed with respect to certain Protected Species with the potential to occur in the Protected Species study area.

The majority of impacts to Protected Species anticipated as a result of Alternative 1 (Proposed Project) would be short-term in nature. Specific activities associated with Alternative 1 (Proposed Project) that could result in short-term displacement of individuals and/or alterations to habitat include the construction of the drayage road and arrival/departure tracks near tidal salt marsh and Shipyard Creek (physical alterations to habitat and fragmentation) and bridge improvements, including any temporary construction work areas, in Noisette Creek (shading and sedimentation).

Table 4.6-2
Protected Species Impacts for Alternative 1 (Proposed Project)

Species Common Names	Species Scientific Name	Habitat Quality within the Study Area	Potential Impacts	Summary of Impacts with BMPs and Mitigation Measures
Reptiles				
Green sea turtle	*Chelonia mydas*	marginally suitable foraging habitat	minor habitat removal; short-term indirect effects during construction if present	Negligible
Kemp's ridley sea turtle	*Lepidochelys kempii*	marginally suitable foraging habitat	minor habitat removal; short-term indirect effects during construction if present	Negligible
Loggerhead sea turtle	*Caretta caretta*	suitable foraging habitat	minor habitat removal; short-term indirect effects during construction if present	Negligible
Spotted turtle	*Clemmys guttata*	marginal shallow aquatic habitat	minor habitat removal; short-term indirect effects during construction if present	Negligible
Mammals				
Northern Long-Eared Bat	*Myotis septentrionalis*	marginally suitable habitat	minor habitat removal; short-term indirect effects during construction if present	Negligible
West Indian manatee	*Trichechus manatus*	suitable estuarine habitat	minor habitat removal; short-term indirect effects during construction if present	Negligible

Species Common Names	Species Scientific Name	Habitat Quality within the Study Area	Potential Impacts	Summary of Impacts with BMPs and Mitigation Measures
Fish				
American eel	*Anguilla rostrata*	suitable foraging habitat	minor habitat removal; short-term indirect effects during construction if present	Negligible
Atlantic sturgeon	*Acipenser oxyrinchus*	marginally suitable spawning habitat for adults; suitable foraging habitat for juveniles, sub-adults, and adults	minor habitat removal; short-term indirect effects during construction if present	Negligible
Blueback herring	*Alosa aestivalis*	suitable foraging habitat	minor habitat removal; short-term indirect effects during construction if present	Negligible
Shortnose sturgeon	*Acipenser brevirostrum*	overwintering habitat for juveniles and adults	minor habitat removal; short-term indirect effects during construction if present	Negligible
Insects				
Rare skipper	*Problema bulenta*	suitable foraging habitat	minor habitat removal; short-term indirect effects during construction if present	Negligible
Birds				
Bald eagle	*Haliaeetus leucocephalus*	suitable foraging habitat	minor habitat removal; short-term indirect effects during construction if present	Negligible

Species Common Names	Species Scientific Name	Habitat Quality within the Study Area	Potential Impacts	Summary of Impacts with BMPs and Mitigation Measures
Black rail	*Laterallus jamaicensis*	suitable habitat	minor habitat removal; short-term indirect effects during construction if present	Negligible
Least tern	*Sterna antillarum*	suitable habitat	minor habitat removal; short-term indirect effects during construction if present	Negligible
MacGillivray's seaside sparrow	*Ammodramus maritimus macgillivraii*	suitable habitat	minor habitat removal; short-term indirect effects during construction if present	Negligible
Red knot	*Calidris canutus rufa*	suitable foraging habitat for overwintering migrants	minor habitat removal; short-term indirect effects during construction if present	Negligible
Wilson's plover	*Charadrius wilsonia*	suitable foraging habitat	minor habitat removal; short-term indirect effects during construction if present	Negligible

Species Common Names	Species Scientific Name	Habitat Quality within the Study Area	Potential Impacts	Summary of Impacts with BMPs and Mitigation Measures
Wood stork	*Mycteria americana*	suitable foraging habitat	minor habitat removal; short-term indirect effects during construction if present	Negligible

[1] *Federally Endangered* refers to a taxon "in danger of extinction throughout all or a significant portion of its range." *Federally Threatened* refers to a taxon "likely to become endangered within the foreseeable future throughout all or a significant portion of its range."

[2] *Federally* At-Risk Species (ARS) refers to species that a) are proposed for listing under the ESA by the USFWS, b) are candidates for listing under the ESA, or c) have be been petitioned for listing under the ESA. Information is provided only for conservation actions as no federal protections currently exist.

[3] Green turtles are listed as threatened, except for breeding populations in Florida and on the Pacific Coast of Mexico, which are listed as endangered.

[4] Critical habitat refers to a specific geographic area(s) that contains features essential for the conservation of a threatened or endangered species, and that may require special management and protection (a more complete definition can be found in the ESA of 1973). There is no critical habitat for the loggerhead sea turtle within the study area.

[5] *State Endangered* refers to "any species or subspecies of wildlife whose prospects of survival or recruitment within the state are in jeopardy or are likely within the foreseeable future to become so."

State Threatened refers to "a species that is likely to become endangered and in need of management."

Under Alternative 1 (Proposed Project), construction and/or improvements to the rail bridges and drayage road and arrival/departure tracks could affect the aquatic Protected Species that may inhabit the tidal open waters within the Protected Species study area. As summarized in Table 4.6-2, the tidal open waters of the Protected Species study area provide marginally suitable foraging habitat for the green, loggerhead, and Kemp's ridley sea turtles; suitable estuarine habitat for the West Indian manatee; suitable spawning habitat for adult Atlantic sturgeon due to the presence of flow, salinity, and certain substrates, and suitable foraging habitat for juveniles, sub-adults, and adults and potential overwintering habitat for shortnose sturgeon. The Protected Species study area may contain marginal habitat for the spotted turtle in freshwater wetlands and ditches and nearby terrestrial habitats. Potential short-term indirect impacts on these species if present during construction include turbidity, sedimentation, and chemical contamination. Potential permanent direct impacts include the permanent loss of open marine waters that provide suitable foraging habitat for species. Accidentally spilled liquids onsite should be intercepted and temporarily contained by the storm sewer system to prevent draining directly into onsite or nearby surface waters. Off-site truck and rail traffic could result in the potential for minor and/or major (depending on location) indirect impacts to protected aquatic species from accidental pollutant spills. However, there are BMPs, mandated requirements, and regulations that cover spills (Section 4.15.3.2); therefore, construction and operation activities within or adjacent to Shipyard and Noisette creeks may result in negligible effects to these aquatic Protected Species.

To reduce potential construction-related impacts to the manatee to discountable and insignificant levels, the Corps recommends implementing the USFWS Standard Manatee Construction Conditions (Fish and Wildlife Commission 2005) during project construction. Additionally, with implementation of the other BMPs and/or mitigation measures discussed in Section 4.6.12 as part of Alternative 1 (Proposed Project), the construction impacts to these aquatic Protected Species would be negligible.

There is the potential for bald eagles to inhabit or traverse the Protected Species study area, but the lack of extensive areas of forest needed for nesting and perching near the Cooper River or Shipyard and Noisette creeks minimizes the potential for a major adverse impact to the bald eagle. Additionally, according to the SCDNR database (SCDNR 2014c), there are no documented bald eagle nest sites in the immediate vicinity of the Protected Species study area. The Protected Species study area contains suitable habitat for the least tern due to the presence of graveled rooftops; however, nest surveys in 2014 showed no active nests within the Protected Species study area; thus, the potential for adverse impacts to this species would be minor.

The Protected Species study area contains the presence of suitable foraging habitat for overwintering or migrating red knots and Wilson's plover due to the presence of mud flats within the tidal salt marsh and tidal open water vegetation communities. The Protected Species study area also contains potentially suitable habitat for the black rail and MacGillivray's seaside sparrow due to the presence of salt marshes and shallow freshwater marshes. The tidal salt marsh and tidal open water vegetation communities also provide suitable foraging habitat for the wood stork and rare skipper. Potential short-term indirect impacts on these species if present during construction include turbidity, sedimentation, and chemical contamination. Potential long-term direct impacts include the permanent loss of tidal salt marsh and tidal open water that provide suitable foraging habitat. Accidentally spilled liquids onsite should be intercepted and temporarily contained by the storm sewer system to prevent draining directly into onsite or nearby surface waters. Off-site truck and rail traffic could result in the potential for minor and/or major (depending on location) indirect impacts to protected bird species from accidental pollutant spills. However, to ensure the safest handling of materials there are mandated requirements for rail, roadway, and intermodal facilities that must be followed (Section 4.15.3.2).

Short-term impacts on these species if present during construction include disturbance from human activities such as noise. However, these species would most likely depart the area of potential disturbance, thus resulting in a negligible impact from short-term displacement. Potential long-term impacts include the removal of vegetation that provides suitable habitat for these species. Similar quality habitat will redevelop within temporary disturbance footprints at the completion of the construction. Therefore, potential impacts on these Protected Species would be short-term and minor.

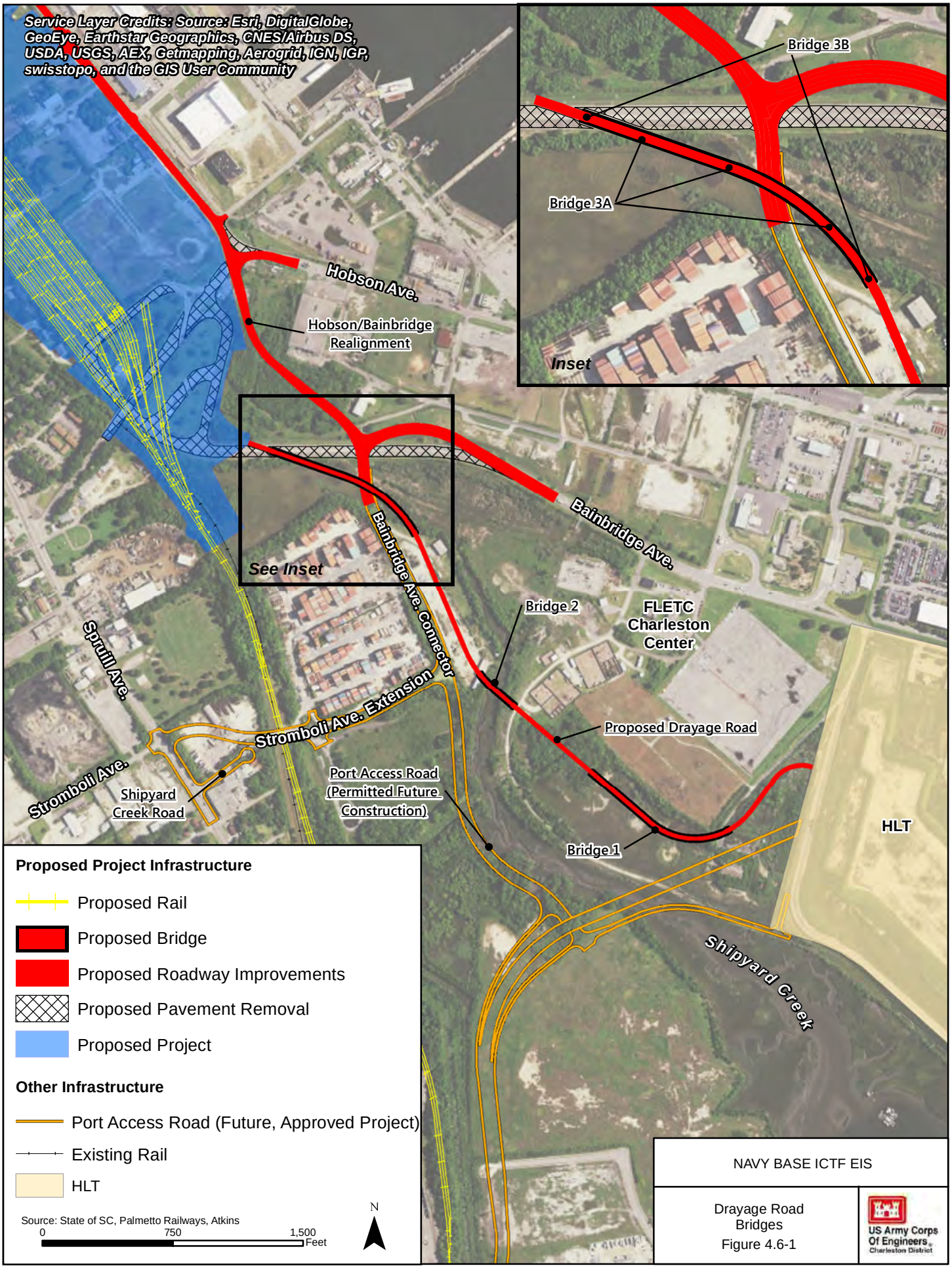
Underwater Noise

In-water construction activities associated with Alternative 1 (Proposed Project) would result in underwater noise from pile installation. As discussed in Section 3.6.6, during pile-driving activities, noise is produced when the energy from the hammer is transferred to the pile and released as pressure waves into the surrounding water and sediments. Depending on the type and location of the pile-driving activity, pile-driving noise can result in potential effects ranging from behavioral effects (caused by the animal hearing the noise) to physiological effects, with very extreme cases resulting in death (NMFS 2014).

Exposure criteria are used to assess whether noise from construction projects may affect a listed species. If an animal is likely to be exposed to noise levels that exceed the injury threshold levels, injury is expected and measures to avoid or minimize the potential for harmful exposure should be required (NMFS 2014). Injurious levels are expressed in units of peak pressure level or sound exposure level (SEL). Sound exposure level can be expressed as a single strike or cumulative, sSEL or cSEL, respectively for exposure to pile-driving noise over time. The cumulative exposure is based on the amount of time an animal may be exposed to noise from repeated strikes of impact hammers. For any given set of conditions (source level, type of transmission loss, strikes/pile) over some period of time, cumulative exposure may result in some risk of hearing loss, even if the sSEL is below the threshold for injury. Animal hearing is characterized by the root mean square (RMS) dB level and is used as the criteria for the auditory detection and resulting behavioral reactions to a noise (NMFS 2014).

Alternative 1 (Proposed Project) includes the installation of three bridges along the drayage road that span over Shipyard Creek and associated marsh (Figure 4.6-1). The following assumptions were used for all bridges described below. During construction of the Alternative 1 (Proposed Project), the work day hours are estimated to be approximately 10 hours per day, with the actual pile driving activity to be an average of 8 hours per day.

The drayage road begins at the exit of the HLT, then continues across a broad stretch of inter-tidal marsh associated with Shipyard Creek. This 1,537-foot bridge (Drayage Road over Shipyard Creek marsh, Bridge 1 on Figure 4.6-1) would require the installation of 264, 24-inch pre-cast concrete piles with an impact hammer. The proposed installation plan estimates driving a maximum of 10 piles per day for a total of 4,000 strikes per day in approximately 0-1 foot water depth. Assuming one installation rig was used, it would take approximately 26 days to complete the Drayage Road over Shipyard Creek marsh bridge pile installation.


Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community
Bridge 3B
Bridge 3A
Inset
Hobson Ave.
Hobson/Bainbridge Realignment
See Inset
Bainbridge Ave.
Bainbridge Ave. Connector
Bridge 2
FLETC Charleston Center
Sprull Ave.
Stromboli Ave. Extension
Stromboli Ave.
Shipyard Creek Road
Port Access Road (Permitted Future Construction)
Proposed Drayage Road
Bridge 1
HLT
Shipyard Creek
Proposed Project Infrastructure
Proposed Rail
Proposed Bridge
Proposed Roadway Improvements
Proposed Pavement Removal
Proposed Project
Other Infrastructure
Port Access Road (Future, Approved Project)
Existing Rail
HLT
Source: State of SC, Palmetto Railways, Atkins
0
750
1,500
Feet
N
NAVY BASE ICTF EIS
Drayage Road Bridges
Figure 4.6-1
US Army Corps Of Engineers
Charleston District

The drayage road continues north through FLETC property to the second bridge crossing (Drayage road over Shipyard Creek, Bridge 2 on Figure 4.6-1). This 240-foot bridge would require the installation of 40, 24-inch pre-cast concrete piles with an impact hammer. The proposed installation plan estimates driving a maximum of 10 piles per day for a total of 4,000 strikes per day in approximately 0–6 feet water depth. Assuming one installation rig was used, it would take approximately 4 days to complete the Drayage Road over Shipyard Creek bridge pile installation.

After crossing Shipyard Creek, the drayage road continues north across an area of upland parallel to the Bainbridge Avenue Connector (aka Local Access Road), then is elevated over the Bainbridge Avenue Connector. This 942-foot bridge (Drayage Road over Bainbridge Avenue Connector) would require different installation methods for the end bents and interior bents of the bridge. The interior bents would require the installation of 14, 84-inch cast in steel shell (CISS) piles with a vibratory hammer (interior bents, Bridge 3a on Figure 4.6-1). The proposed installation plan for interior bent piles estimates driving a maximum of 2 piles per day for a total of 1,000 strikes per day in approximately 0-4 feet water. Assuming one installation rig was used, it would take approximately 7 days to complete the interior bent piles for the Drayage Road over Bainbridge Avenue Connector bridge. The end bents would require the installation of 12, 14-inch steel H-piles into upland locations near the marsh edge with an impact hammer (end bents, Bridge 3b on Figure 4.6-1). The proposed installation plan for end bent piles estimates driving a maximum of 10 piles per day for a total of 4,000 strikes per day in an upland location (zero water depth). Assuming one installation rig was used, it would take approximately 1.2 days to complete the end bent piles for the Drayage Road over Bainbridge Avenue Connector bridge.

An analysis of the potential underwater noise impacts from pile driving activities for the Alternative 1 (Proposed Project) was completed. Detailed methods and results are included in Appendix E. The modeling results for Alternative 1 (Proposed Project) are provided in Table 4.6-3 and summarized below.

Table 4.6-3
Underwater Noise Analysis of Pile Driving Activities for Alternative 1 (Proposed Project)

Map (Figure 4.6-1) Id	Location	Pile Type	Source sound at 10 meters			Estimated Number of Strikes per day (total) and impact type	Cumulative SEL (dB)	Distance (meters) to threshold			
								Onset of Physical Injury			Behavior
								Peak dB (206)	Cumulative SEL dB*		RMS dB (150)
			Peak sound dB	SEL, single strike dB	RMS dB				Fish ≥2 grams (187)	Fish <2 grams (183)	
1	Drayage road over Shipyard Creek Marsh	24-inch-diameter pre-cast concrete	185	155	166	4,000 impact hammer	191	0	19	22	117
2	Drayage road over Shipyard Creek	24-inch-diameter pre-cast concrete	185	155	166	4,000 impact hammer	191	0	19	22	117
3a	Drayage Road over Bainbridge Avenue Connector Interior Bents	84-inch-wide cast in steel shell (CISS)	183	170	170	1,000 vibratory hammer	200	0	74	136	215
3b	Drayage Road over Bainbridge Avenue Connector End Bents	14-inch wide steel H-pile	179	144	154	4,000 impact hammer	180	0	3	4	18

* This calculation assumes that single strike SELs < 150 dB do not accumulate to cause injury (Effective Quiet)

Source: Atkins 2017.

As summarized in Table 4.6-3, the underwater noise levels generated during pile-driving activities of unattenuated piles for any of the bridges over Shipyard Creek would not exceed the adopted 206 dB peak criteria for injury to fish (exceeded nowhere). For bridge sites 1 and 2 on Figure 4.6-1, the estimated distance at which the adverse behavioral effects on fish are attenuated is 117 meters from the pile, per the NMFS calculator (Table 4.6-3). For bridge site 3a, the estimated distance at which the adverse behavioral effects on fish are attenuated is 215 meters from the pile. For bridge site 3b, the estimated distance at which the adverse behavioral effects on fish are attenuated is 18 meters from the pile.

Sturgeon are hearing generalists that do not have specialized hearing structures or use sound as part of their behavior, and therefore sturgeon are less sensitive to noise than hearing specialist species of fish. Based on a study of lake sturgeon (a reasonable surrogate for shortnose and Atlantic sturgeon), sturgeon have comparatively poor hearing sensitivity (Meyer et al. 2010 and 2011 as cited in Parsons Brinckerhoff 2015), and it is likely that many of the sounds which are audible to most species are not audible to sturgeon (AKRF et al. 2012, as cited in Parsons Brinckerhoff 2015).

Krebs et al. (2013 as cited in Parsons Brinckerhoff 2015) evaluated pile driving effects on sturgeon for the Tappan Zee Pile Installation Demonstration project and found that sturgeon exhibited avoidance behavior by staying in the project vicinity for a shorter time period during pile driving activities than during silent control periods. In the Biological Opinion (BO) for the Tappan Zee Pile Installation Demonstration project, NMFS deduced that sturgeon would avoid pile driving noise and would not remain in proximity of the proposed construction area long enough to accumulate sufficient sound energy to reach the cumulative criterion. As such, given the avoidance behavior of sturgeon, cumulative exposure to pile-driving noise from that project would not affect sturgeon.

Additionally, as part of Alternative 1 (Proposed Project), the following minimization measures would be implemented to reduce potential impacts on sturgeon to a negligible effect:

- The contractor will use air bubble curtains and/or sleeve piles during pile installation. Depending on the type of bubble curtain (e.g. confined or unconfined air bubble curtains or multiple-stage unconfined air bubble curtains) and considering the velocity of the current/tidal flow, a range of 5 to 20 dB of noise reduction could be achieved (Caltrans 2015).
- The contractor will utilize soft-start techniques for pile driving activities. This will consist of a series of taps at 25–40 percent of the pile driver's energy, followed by a one-minute waiting period.

In the BO for the Tappan Zee Pile Installation Demonstration project, NMFS (2012) concurred that soft-start techniques for pile driving activities is expected to cause fish to leave the area prior to full energy pile driving, and that a soft-start method will facilitate avoidance of physical injury. Aside from Noisette and Shipyard creeks, other areas in the Cooper River provide adequate foraging and overwintering habitat that sturgeon can move into during pile driving operations.

The location of pile driving is in inter-tidal areas with depths ranging from 0-6 feet (depending on tidal conditions). Sturgeon have poor hearing sensitivity compared to other fish species, and sturgeon have documented avoidance behavior. Due to the habitat and low water depth in the location of proposed pile driving activities, poor hearing sensitivity, and avoidance behavior, there is low potential for sturgeon to be present in proposed pile driving areas. Additionally, minimization measures (i.e., air bubble curtains and/or sleeve piles and soft-start techniques) would decrease the potential for injury if a sturgeon was present. Potential impacts such as physical injury from peak, sSEL, and cSEL noise levels, to sturgeon would be negligible; therefore, Alternative 1 (Proposed Project) will have no effect on sturgeon.

The use of vibratory pile driving is non-impulsive, which is not known to cause injury to marine mammals and may be used along with other underwater noise mitigation measures to reduce noise exposure to marine species. While some underwater noise exposure would be unavoidable, the following minimization measures would be implemented as part of Alternative 1 (Proposed Project) to reduce potential impacts on manatees to a negligible effect:

- During in-water work, a floating semi-permeable turbidity curtain will be deployed around areas where pile driving is taking place.
- Adherence to USFWS's standard manatee guidelines during construction (listed in Section 4.6.12).
- The contractor will hire a qualified marine biologist to be on-site during in-water construction activities to avoid potential impacts to aquatic Protected Species.

Similar to sturgeon, manatees are expected to avoid the Project site during pile driving activities. The semi-permeable turbidity curtain will act as a physical barrier between manatees and the Project site as well as preventing suspended sediment from migrating offsite during the placement of the pilings. Therefore, the Corps does not anticipate that manatees would be adversely affected by physical injury from in-water construction activities with the implementation of the USFWS manatee guidelines and proposed use of turbidity curtains as part of Alternative 1 (Proposed Project).

Like manatees, sea turtles are expected to avoid the Project site during pile driving activities. As discussed above for the manatee, during in-water work, should sea turtles be present, a floating semi-permeable turbidity curtain will be deployed around areas where pile driving is taking place. The turbidity curtain will act as a physical barrier between sea turtles and the Project site. Noise associated with the construction work and location of work will likely deter any animals from remaining in the area extensively. If a Protected Species is observed in the work area, the contractor would issue a stop-work order until the Protected Species had vacated the area.

Additionally, potential impacts resulting from construction activities associated with Alternative 1 (Proposed Project) could be further minimized by adhering to environmental in-water work windows that are established by the Corps, which restricts construction activities to periods when

turtles are least abundant or least likely to be affected by such activities. The environmental work windows for sea turtles typically target the winter months, because sea turtle abundance is dramatically reduced during colder water temperatures. Therefore, the Corps does not anticipate that sea turtles would be adversely affected by in-water construction activities with implementation of the above-mentioned avoidance and minimization measures; thus, potential impacts on sea turtles from Alternative 1 (Proposed Project) would be negligible.

Turbidity/Siltation

Construction and pile driving activities will cause temporary increases in the turbidity and siltation of the water column, but the duration of these activities will be brief and a semi-permeable turbidity curtain will be used to minimize sedimentation around areas where pile driving is taking place. Piles compress the sediment around them when they are driven (Parsons Brinckerhoff 2015). This temporary increase in turbidity would only cause minimal effects to Noisette Creek, Shipyard Creek, and the Cooper River localized at the Project site, since tidally influenced water bodies, such as the Cooper River, exhibit naturally high turbidity levels. Therefore, turbidity impacts on the aquatic Protected Species should be minimal and would be limited to the immediate area of construction.

During construction activities, temporary siltation may occur in Noisette Creek, Shipyard Creek, and the Cooper River. Temporary siltation may cause indirect impacts by effecting thermal loading in the environment. Alterations in light attenuation in the water column can cause decreased visibility for organisms, effecting feeding, movement, and predator avoidance. Redistribution of sediments can alter nutrient distribution, dissolved oxygen (DO) levels, and primary productivity locally and throughout the estuarine waters (Parsons Brinckerhoff 2015). As described above, these sediment changes should be minimal and short-term and will not adversely impact the sediment budget in the overall Cooper River system. The use of the semi-permeable turbidity curtain around areas where pile driving is taking place would further reduce the potential for siltation.

4.6.4 Alternative 2: Proposed Project Site (South via Milford / North via S-line)

The impacts to Protected Species under Alternative 2 would be similar to those under Alternative 1 (Proposed Project). The exception would be the location of pile driving impacts to aquatic species associated with the construction of the rail bridge crossing of Noisette Creek along Spruill Avenue. The exact number of piles required for the rail bridge in this alternative is unknown; however, the underwater noise impacts from the pile drivings would be similar to the impacts for Noisette Creek, as outlined in Table 4.6-3.

4.6.5 Alternative 3: Proposed Project Site (South via Kingsworth / North via Hospital District)

The impacts to Protected Species under Alternative 3 would be similar to those under Alternative 1 (Proposed Project).

4.6.6 Alternative 4: Proposed Project Site (South via Milford)

The impacts to Protected Species under Alternative 4 would be similar to those under Alternative 1 (Proposed Project); however, there would be no pile driving impacts to fish species, marine mammals, and sea turtles in Noisette Creek.

4.6.7 Alternative 5: River Center Site (South via Milford / North via Hospital District)

The impacts to Protected Species under Alternative 5 would be similar to those discussed under Alternative 1 (Proposed Project).

4.6.8 Alternative 6: River Center Site (South via Kingsworth / North via Hospital District)

The impacts to Protected Species under Alternative 6 would be similar to those under Alternative 1 (Proposed Project).

4.6.9 Alternative 7: River Center Site (South via Milford)

The impacts to Protected Species under Alternative 7 would be similar to those under Alternative 1 (Proposed Project).

4.6.10 Related Activities

The Related Activities include two components, the southern rail connection, which occurs for all alternatives, but has unique alignments for Alternatives 3 and 6, and the northern rail connection, which is only proposed for Alternative 2. Despite the unique rail alignments for Alternatives 3 and 6, no additional impacts to available habitat for Protected Species would occur from the Related Activity. Under Alternative 2, an additional Related Activity would be required to connect the arrival/departure tracks from the Project site, crossing a portion of tidal salt marsh and tidal open water that drains to Noisette Creek, to the existing NCTC track along Virginia Avenue. Impacts to Protected Species associated with the Related Activity for each of these alternatives will be similar to those discussed under Alternative 1 (Proposed Project); however, the exception would be for the Related Activity associated with Alternative 2, which involves additional pile driving activities and underwater noise impacts to aquatic species associated with the construction of the rail bridge

crossing a small tributary to Noisette Creek (Figure 4.5-2). The exact number of piles required for the rail bridge is unknown at this time; however, water depths in this tributary to Noisette Creek are similar to conditions modeled for Shipyard Creek. Therefore, underwater noise levels generated during pile driving of unattenuated piles would be similar to those for Shipyard Creek as presented in Table 4.6-3 and discussed in Section 4.6.3.

4.6.11 Summary of Impacts Table

Table 4.6-4 summarizes the environmental consequences and final determinations of effect to Protected Species from Alternative 1 (Proposed Project) and all the alternatives. The final determination effect considers the use of the mitigation measures listed below to avoid and/or minimize potential impacts to aquatic species during construction.

4.6.12 Mitigation

4.6.12.1 Applicant's Proposed Avoidance and Minimization Measures

The Applicant has committed to several measures that avoid and/or minimize potential impacts of Alternative 1 (Proposed Project). These measures are taken from Palmetto Railways Mitigation Plan provided in Appendix N. Some of these measures are required under federal, state, and local permits; others are measures that Palmetto Railways has incorporated into the design and operations of Alternative 1 (Proposed Project). Each mitigation measure is also designated as one that either helps to avoid an impact or one that minimizes an impact.

- Where possible, limit the placement of pilings for bridges within waterways, ensuring channels are not blocked. (Minimization)
- Reconstruct the existing superstructure of the rail trestle bridge of Noisette Creek to reduce impacts. (Avoidance and Minimization)
- Contractors will be required to use bubble curtains or sleeve piles to mitigate underwater noise while driving piling in essential fish habitat (EFH) areas. (Minimization)
- The contractor will utilize soft-start techniques for pile driving activities. This will consist of a series of taps at 25 to 40 percent of the pile driver's energy followed by a one-minute waiting period. (Minimization)
- The contractor will hire a qualified marine biologist to be onsite during in-water construction activities to avoid potential impacts to marine resources and EFH. (Avoidance and Minimization)
- Implement an SPCC plan to minimize the impact of a potential spill on protected species. (Minimization)
- Permanent loss of EFH habitat will be mitigated through the mitigation plan and efforts described above. (Mitigation)

Table 4.6-4
Summary of Impacts, Protected Species

Alternative	Habitat Alteration/ Fragmentation	Species Displacement
No-Action	Negligible effect on habitat alteration/ fragmentation with implementation of avoidance and minimization measures due to the continuation of mixed use and industrial land uses	Potential exists for direct and indirect short-term species displacement during future land use activities but minor effects with implementation of avoidance and minimization measures in consultation with NMFS and USFWS as applicable
1: *Proposed Project: South via Milford / North via Hospital District*	Negligible effect on habitat alteration/ fragmentation of Protected Species with implementation of avoidance and minimization measures during construction activities	Potential exists for direct and indirect short-term effects during construction; but negligible with implementation of Applicant's prescribed avoidance and minimization measures in combination with the additional Corps mitigation measures listed in Section 4.6.12
2: *South via Milford / North via S-line*	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)
3: *South via Kingsworth / North via Hospital District*	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)
4: *South via Milford*	Same as Alternative 1 (Proposed Project)	Similar to Alternative 1 (Proposed Project) but in-water construction activities would be limited to Shipyard Creek
5: *River Center Site: South via Milford / North via Hospital District*	Negligible effect on habitat alteration/fragmentation of Protected Species with implementation of avoidance and minimization measures during construction	Potential exists for direct and indirect effects during construction, but minor effects with implementation of Applicant's prescribed avoidance and minimization measures in combination with the additional potential mitigation measures listed in Section 4.6.12
6: *River Center Site: South via Kingsworth / North via Hospital District*	Same as Alternative 5 (Proposed Project)	Same as Alternative 5 (Proposed Project)
7: *River Center Site: South via Milford*	Same as Alternative 5 (Proposed Project)	Similar to Alternative 5, but in water construction activities would be limited to Shipyard Creek

Species Impact Definitions

Negligible = Very small impact to Protected Species.

Minor = Small impact (in number, quantity, or extent) to Protected Species but not resulting in much trouble or damage.

Major = Large impact (in number, quantity, or extent) to Protected Species resulting in serious damage.

Critical Habitat Impact Definitions

Negligible = Very small alteration to critical habitat.

Minor = Small alteration (in quantity or extent) to critical habitat that does not impair a Protected Species ability to live.

Major = Large alteration that appreciably diminishes the value of critical habitat for survival of Protected Species.

- During in-water work, a floating semi-permeable turbidity curtain will be deployed around areas where pile driving is taking place. (Minimization)
- Adherence to environmental windows for construction during the winter months when sea turtles are less abundant. (Avoidance and Minimization)

These avoidance and minimization measures, except the items noted with an asterisk (*), have been considered in the preceding impact analysis. The complete list of Applicant-proposed avoidance and minimization measures for the Navy Base ICTF is provided in Chapter 6, Table 6-1.

4.6.12.2 Additional Potential Mitigation Measures

The following additional mitigation measures as recommended by the Corps would further minimize and/or reduce potential effects of Alternative 1 (Proposed Project) on Protected Species.

- Adherence to the following USFWS Manatee Guidelines during in-water construction:
  - The permittee will stop work if a manatee is seen near the Project site.
  - The Project Manager shall instruct all personnel associated with the Project of the potential presence of manatees and the need to avoid collisions with manatees. All construction personnel must monitor water-related activities for the presence of manatee(s) during May 15 through October 15.
  - The Project Manager shall advise all construction personnel that there are civil and criminal penalties for harming, harassing, or killing manatees which are protected under the MMPA of 1972 and the ESA of 1973.
  - Any siltation barriers used during the Project shall be made of material in which manatees cannot become entangled and must be properly secured, and regularly monitored to avoid manatee entrapment.
  - All vessels associated with the Project shall operate a “no wake/idle” speeds at all times while in the construction area and while in water where the draft of the vessel provides less than a four-foot clearance from the bottom. All vessels will follow routes of deep water whenever possible.
  - If manatee(s) are see within 100 yards of the active construction area all appropriate precautions shall be implemented to ensure protection of the manatee. These precautions shall include the operation of all moving equipment no closer than 50 feet to a manatee. Operation of any equipment closer than 50 feet to a manatee shall necessitate immediate shutdown of that equipment. Activities will not resume until the manatee(s) has departed the Project area of its own volition.
  - Any collision with and/or injury to a manatee shall be reported immediately to Jim Valade of the U.S. Fish and Wildlife Service, North Florida Field Office, at (904) 731-3116.
- The permittee will also stop work if a turtle or sturgeon is seen near the Project site during construction.

- Adherence to environmental windows for construction during the winter months when sea turtles are less abundant.
- The contractor will hire a qualified marine biologist to be on-site during in-water construction activities to avoid potential impacts to aquatic Protected Species.
- Time of year and methods for preconstruction surveys for protected bird species will be coordinated with the USFWS.

Additional avoidance, minimization, and mitigation may be considered by the Corps in its decision-making process. Final mitigation measures may be adopted as conditions of the DA permit and documented in the Record of Decision (ROD).

4.7 ESSENTIAL FISH HABITAT

4.7.1 Methods and Impact Definitions

Potential impacts to EFH were addressed in the context of EFH species and habitat based on research, field observations, and best professional judgement. The level of detail to document existing resources within the study area is intended to provide data to analyze potential impacts to existing marine resources identified by NMFS and the field surveys. These data were used as a baseline to further analyze the alternatives through the process of minimization and avoidance. Impacts could include direct, indirect, site specific, or habitat impacts, including individual, cumulative, or synergistic consequences of actions.

Table 4.7-1
Impact Definitions, Essential Fish Habitat

	Negligible	Minor	Major
EFH	Very small alteration to EFH, or to federally managed and/or common fishery species.	A small alteration (in quantity or extent) to EFH that does not impair a species' ability to live.	A large alteration that appreciably diminishes the value of EFH for survival of a species.

4.7.2 No-Action Alternative

Under the No-Action Alternative, the Project site and the River Center project site would continue to be used for mixed use industrial activities. While future land uses and human activities may occur adjacent to and/or within aquatic environments within the study area, it would be speculative to attempt to estimate the acreage of impacts to EFH at this time. Therefore, the acreage of impacts to EFH is unknown, but EFH habitat could experience an adverse impact if these future activities resulted in a reduction in quantity and/or quality of EFH habitat. While population assessments and trends of EFH species are evaluated regularly by NMFS, and the species response to management

plans varies widely, future actions under the No-Action Alternative would likely result in a negligible adverse impact to EFH and federally managed and common fishery species (listed in Table 3.7-1).

4.7.3 Alternative 1: Applicant's Proposed Project (South via Milford / North via Hospital District)

EFH located within the study area includes estuarine emergent marsh, oyster reefs/shell banks, intertidal flats, and estuarine water column. For the assessment of potential impacts, the intertidal flats and estuarine water column EFH types occupy the same areas of land; thus, the acreages are combined to avoid an impacted acreage total greater than the actual area described. The types and quality of EFH and all impacts associated with Alternative 1 (Proposed Project) on EFH are described in detail in Appendix E (EFH Assessment). The following sections provide a brief summary of the impacts described in the EFH Assessment.

Under Alternative 1 (Proposed Project), construction of the drayage road and arrival/departure tracks near tidal salt marsh and Shipyard Creek and bridge improvements, including any temporary construction work areas, in Noisette Creek would directly impact EFH within the study area. As such, construction activities could affect multiple life history stages of all the federally managed species identified in Table 3.7-1. The placement of fill and pilings associated with construction of Alternative 1 (Proposed Project) would directly impact 6.65 acres of estuarine emergent marsh and 1.14 acres of intertidal flats/estuarine water column (Figure 4.7-1).

Other sources that could indirectly impact EFH include shading from bridges, noise resulting from construction and operation activities, and temporary physical barriers from the use of BMPs (e.g., floating semi-permeable turbidity curtains) outlined in Section 4.7.12 from pile installation in Shipyard Creek. The NMFS Pile Driving Calculator Model was used to assess the potential underwater noise impacts from pile driving activities on federally managed species (NMFS 2015). Underwater noise impacts to federally managed species associated with Alternative 1 (Proposed Project) are described in detail in Section 4.6 – Protected Species, and Appendix E.

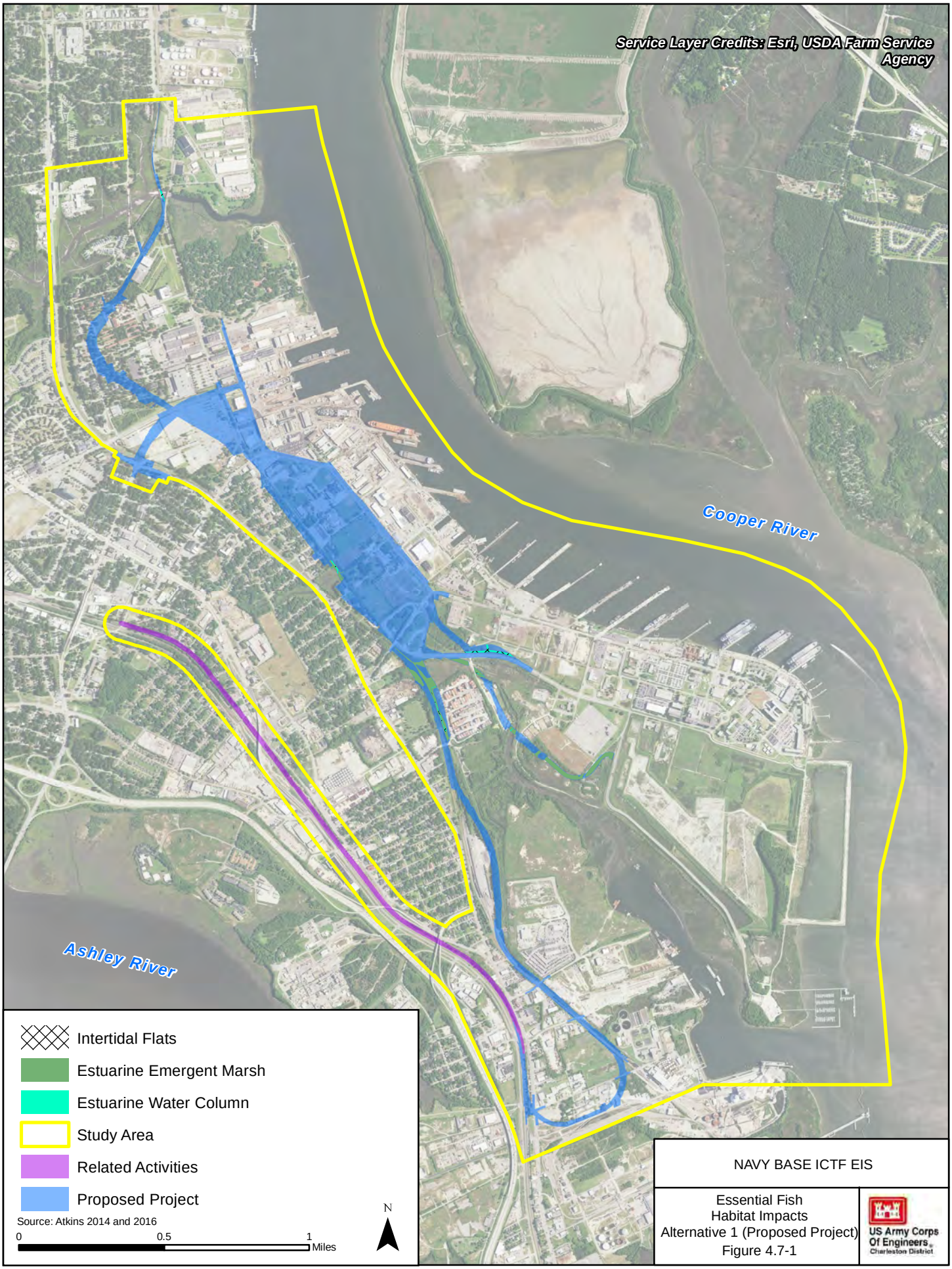
Additionally, potential spills of contaminants may occur during construction and operation activities; however, the implementation of a SPCC Plan (Section 4.15.12.1) may minimize the impact of a potential spill event on EFH. Off-site truck and rail traffic could result in the potential for minor and/or major (depending on location) indirect impacts to EFH and federally managed species from accidental pollutant spills. However, there are BMPs, mandated requirements, and regulations that cover spills (Section 4.15.3.2); therefore, impacts to EFH from accidental spills would be minor and localized.

Circulation patterns within Noisette Creek and Shipyard Creek are not expected to be altered. In summary, construction of Alternative 1 (Proposed Project) would have minor impacts to EFH and federally managed species.

Construction of Alternative 1 (Proposed Project) would result in the permanent loss of estuarine emergent marsh EFH. The loss of habitat reduces nursery areas and refuge for the federally managed and fish species (e.g., white and brown shrimp). A reduction in marsh habitat can reduce prey opportunities, while at the same time increase predation due to the loss/reduction of cover and refuge areas. The presence of construction equipment adjacent to and/or within the EFH, and the resulting noise, may also result in the temporary displacement of federally managed species residing in this area; however, impacts to federally managed fish species that use estuarine emergent marsh EFH would be minor, since Alternative 1 (Proposed Project) would not affect federally managed species at the population level. The potential for an indirect, temporary water quality impact (e.g. sedimentation, turbidity) to estuarine emergent marsh EFH in the study area would be reduced to a negligible effect with the use of applicable BMPs, such as silt fence, sediment ponds, inlet protection, and check dams. Where feasible, a 25-foot vegetated buffer will be placed between development and marsh habitat.

Because of the distance between proposed construction activities under Alternative 1 (Proposed Project) and the location of oyster reefs/shell banks in the study area, there would be no direct impact on this EFH type. Oyster clusters that are located on bridge pilings may be directly impacted during bridge improvements in Noisette Creek; however, this impact would be a short-term impact on EFH, as these structures would provide for future oyster settlement and propagation. The potential for an indirect, temporary water quality impact (e.g., sedimentation, turbidity) to the oyster reefs/shell banks EFH in the study area would be reduced to a negligible effect with the use of applicable BMPs, such as silt fence, sediment ponds, inlet protection, and check dams.

The direct impact to intertidal flats EFH would be minor due to the amount of available intertidal habitat that would not be impacted by Alternative 1 (Proposed Project) within the study area. These impacts would result from the construction of the drayage road and arrival/departure tracks and bridge improvements and include the potential for localized, temporary increases in sedimentation; permanent physical barriers to species movement from new piling installation in Shipyard Creek; and temporary physical barriers to species movement from the implementation of BMPs (e.g., floating semi-permeable turbidity curtains) during construction. The potential for an indirect, temporary water quality impact (e.g. sedimentation, turbidity) to intertidal flats EFH in the study area would be reduced to a negligible effect with the use of applicable BMPs, such as silt fence, sediment ponds, inlet protection, and check dams. Loss of habitat could result in a minor impact to federally managed and common fishery species that use the EFH for foraging and refuge. Noise impacts, and the presence of nearby human activity, could also result in the temporary displacement of federally managed fish species that inhabit the intertidal flats EFH.



NAVY BASE ICTF EIS

Essential Fish Habitat Impacts
Alternative 1 (Proposed Project)
Figure 4.7-1

US Army Corps Of Engineers
Charleston District

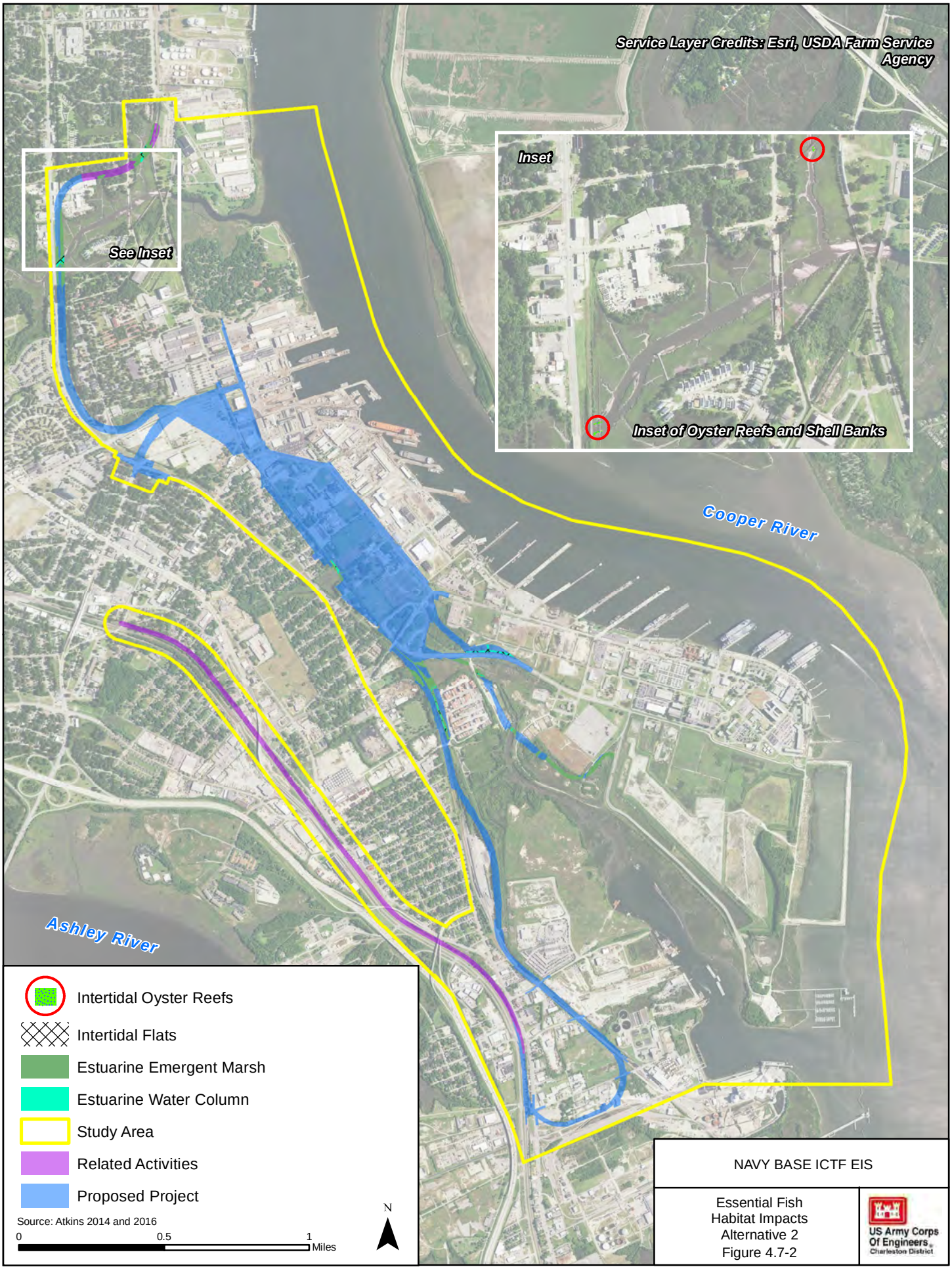
The direct impact to estuarine water column EFH would be minor due to the amount of available estuarine water column that would not be impacted by Alternative 1 (Proposed Project) within the study area. Other impacts to this EFH associated with construction of Alternative 1 (Proposed Project) include the potential for localized, temporary increases in sedimentation (and turbidity); reduced dissolved oxygen (DO) levels; permanent physical barriers to species movement from new piling installation in Shipyard Creek; and temporary physical barriers to species movement from the implementation of BMPs (e.g., floating turbidity curtains) during construction. Increases in sedimentation and turbidity may result in a minor impact to federally managed fish species and the estuarine food chain, but any adverse impacts would be minimized through the use of BMPs, such as silt fence, sediment ponds, inlet protection, and check dams.

4.7.4 Alternative 2: Proposed Project Site (South via Milford / North via S-line)

Alternative 2 is a variation of Alternative 1 (Proposed Project), where the Northern Rail Connection for NS would be relocated along Spruill Avenue within existing CSX ROW to the S-line, and turn east along Aragon Avenue to the existing NCTC rail line. Alternative 2 would require a bridge crossing over Noisette Creek adjacent to Spruill Avenue, rather than near Noisette Boulevard. The placement of fill and pilings associated with construction of Alternative 2 would directly impact 8.86 acres of estuarine emergent marsh, 0.03 acre of oyster reefs/shell banks, and 1.35 acres of intertidal flats/estuarine water column (Figure 4.7-2).

4.7.5 Alternative 3: Proposed Project Site (South via Kingsworth / North via Hospital District)

Under Alternative 3, the intermodal facility would include all of the facility components of Alternative 1 (Proposed Project), with the same road improvements. The arrival/departure design would be the same as described in Alternative 1 (Proposed Project); however, the southern rail connection would connect to an existing rail line near Kingsworth Avenue (and adjacent to existing NS rail and ROW), which would require acquisition of a new ROW. The placement of fill and pilings associated with construction of Alternative 3 would directly impact 6.66 acres of estuarine emergent marsh and 1.14 acres of intertidal flats/estuarine water column (Figure 4.7-3).


Service Layer Credits: Esri, USDA Farm Service Agency
See Inset
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Cooper River
Ashley River
Intertidal Oyster Reefs
Intertidal Flats
Estuarine Emergent Marsh
Estuarine Water Column
Study Area
Related Activities
Proposed Project
Source: Atkins 2014 and 2016
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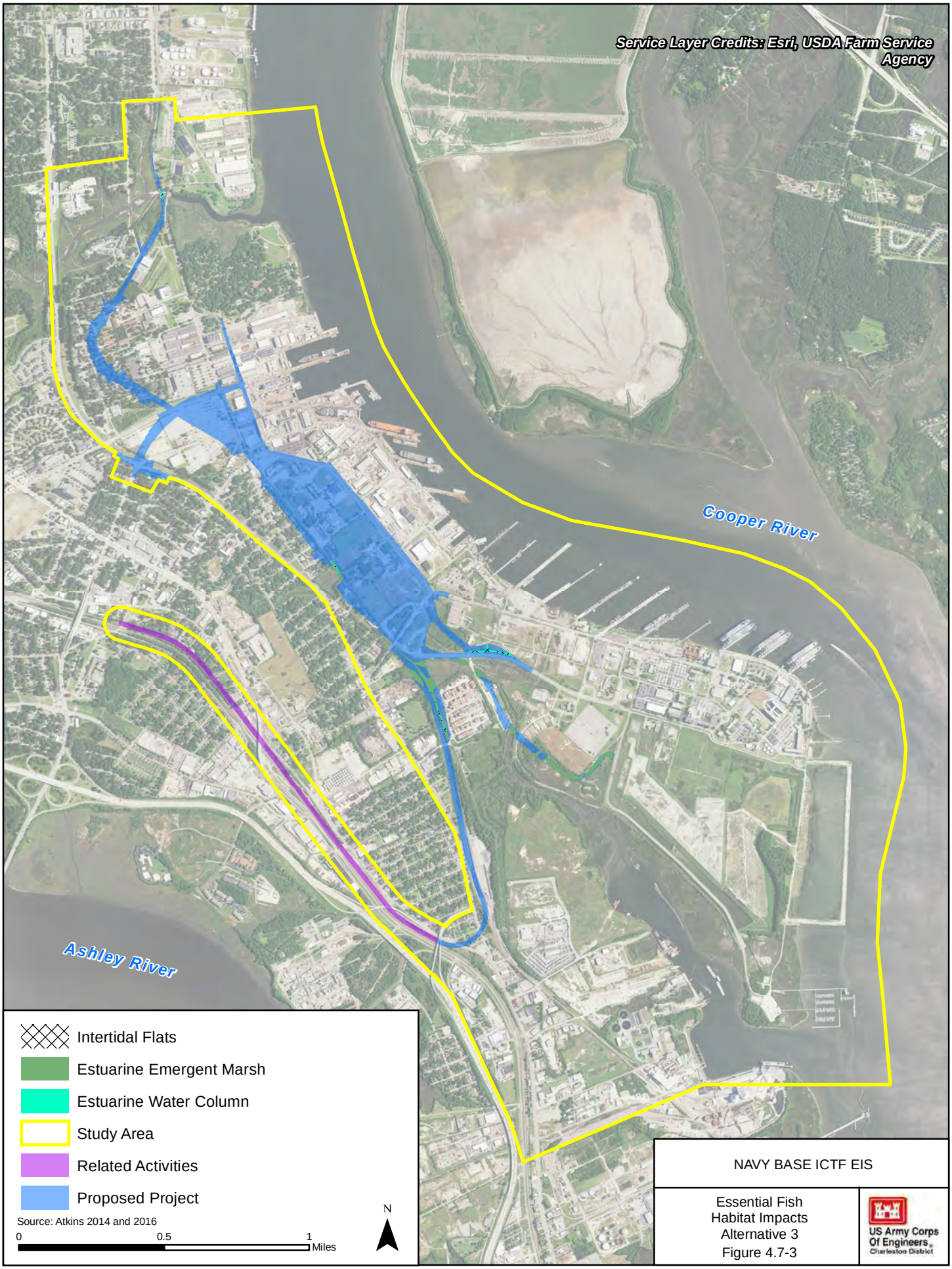
Essential Fish Habitat Impacts Alternative 2 Figure 4.7-2
US Army Corps Of Engineers
Charleston District


Service Layer Credits: Esri, USDA Farm Service Agency
Cooper River
Ashley River
Intertidal Flats
Estuarine Emergent Marsh
Estuarine Water Column
Study Area
Related Activities
Proposed Project
Source: Atkins 2014 and 2016
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NAVY BASE ICTF EIS
Essential Fish Habitat Impacts Alternative 3
Figure 4.7-3
US Army Corps Of Engineers
Charleston District

4.7.6 Alternative 4: Proposed Project Site (South via Milford)

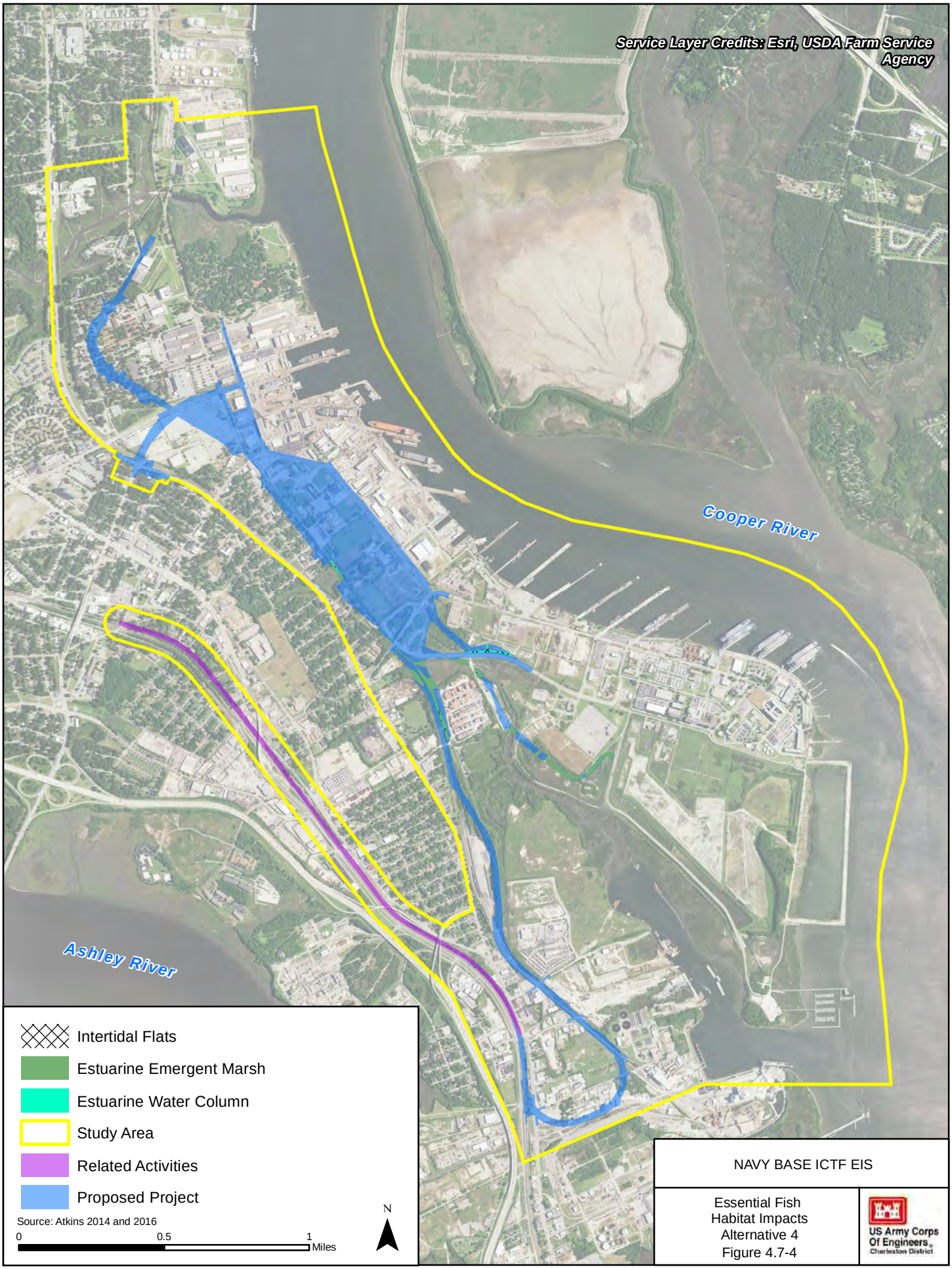
Under Alternative 4, the intermodal facility would include all of the facility components of Alternative 1 (Proposed Project), with the same road improvements. Rail improvements would be similar to those described for the southern rail connection as part of Alternative 1 (Proposed Project), with the exception that a second track would need to be constructed, which would then tie into the existing rail lines. To the north of the intermodal facility, a rail spur or tail track would extend from the facility through the Hospital District but would stop short of Noisette Creek. The placement of fill and pilings associated with construction of Alternative 4 would directly impact 6.66 acres of estuarine emergent marsh and 1.03 acres of intertidal flats/estuarine water column (Figure 4.7-4).

4.7.7 Alternative 5: River Center Site (South via Milford / North via Hospital District)

Alternative 5 is a variation of Alternative 1 (Proposed Project) with the ICTF being moved to the River Center project site. The intermodal facility would include all of the facility components of Alternative 1 (Proposed Project), with the exception of a sound attenuation and security wall that would be constructed adjacent to Noisette Boulevard along the length of the eastern boundary of the facility site. To accommodate NS rail access, a new rail bridge would be constructed, similar to the one described under Alternative 1 (Proposed Project). The NS rail connection would cross Noisette Creek and tie into the existing NCTC tracks along Virginia Avenue. The placement of fill and pilings associated with the construction of Alternative 5 would directly impact 5.29 acres of estuarine emergent marsh and 1.01 acres of intertidal flats/estuarine water column (Figure 4.7-5).

4.7.8 Alternative 6: River Center Site (South via Kingsworth / North via Hospital District)

Under Alternative 6, the intermodal facility would include all of the facility components, road improvements, and northern rail connection as described in Alternative 5. Rail improvements would be similar to those described for the southern rail connection in Alternative 5, with the exception that the southern rail connection would connect to an existing rail line near Kingsworth Avenue (and adjacent to existing NS rail and ROW) and would require acquisition of new ROW. The placement of fill and pilings associated with the construction of Alternative 6 would directly impact 5.29 acres of estuarine emergent marsh and 1.01 acres of intertidal flats/estuarine water column (Figure 4.7-6).


Service Layer Credits: Esri, USDA Farm Service Agency
Cooper River
Ashley River
Intertidal Flats
Estuarine Emergent Marsh
Estuarine Water Column
Study Area
Related Activities
Proposed Project
Source: Atkins 2014 and 2016
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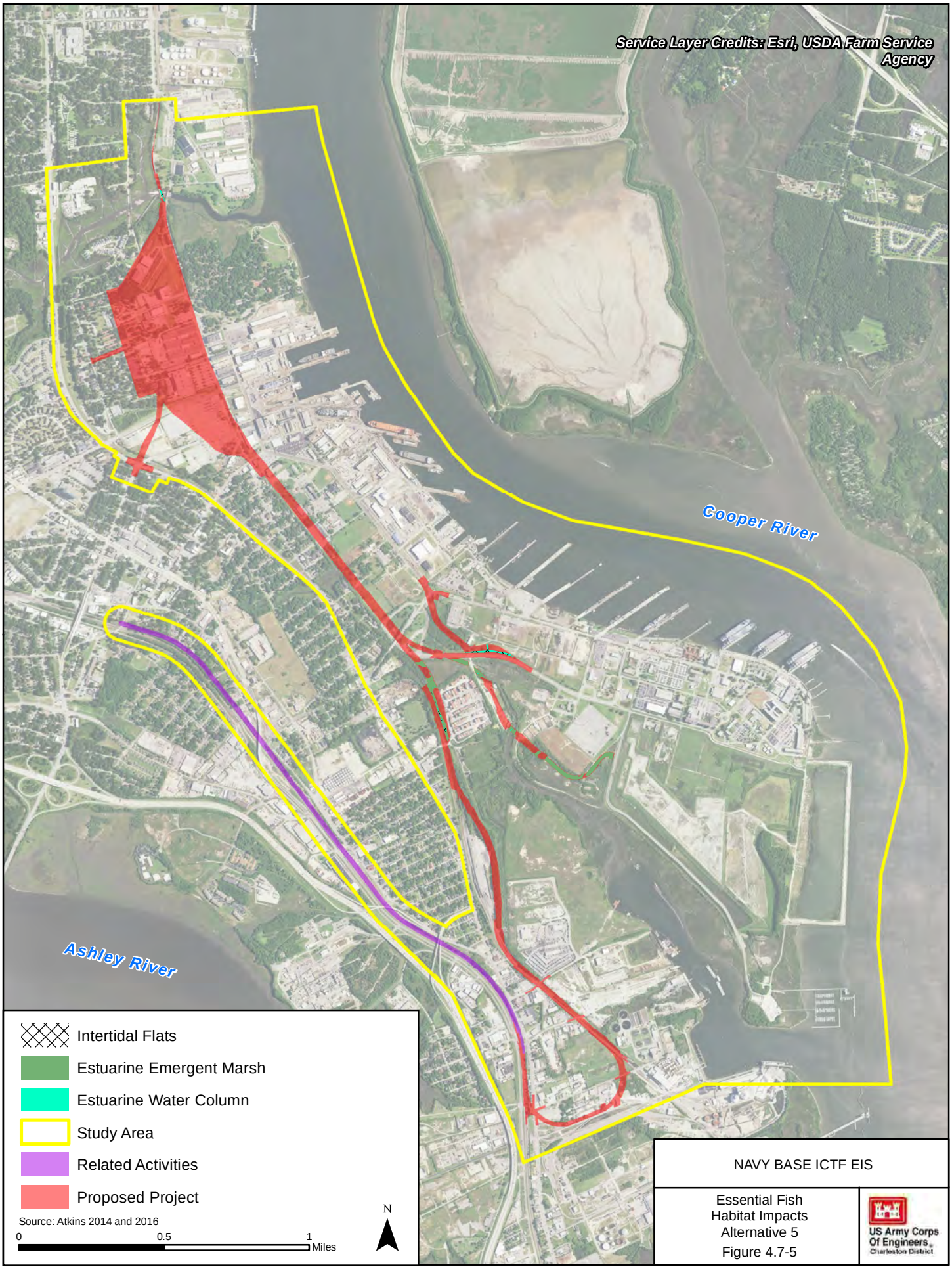
Essential Fish Habitat Impacts
Alternative 4
Figure 4.7-4
US Army Corps Of Engineers
Charleston District


Service Layer Credits: Esri, USDA Farm Service Agency
Cooper River
Ashley River
Intertidal Flats
Estuarine Emergent Marsh
Estuarine Water Column
Study Area
Related Activities
Proposed Project
Source: Atkins 2014 and 2016
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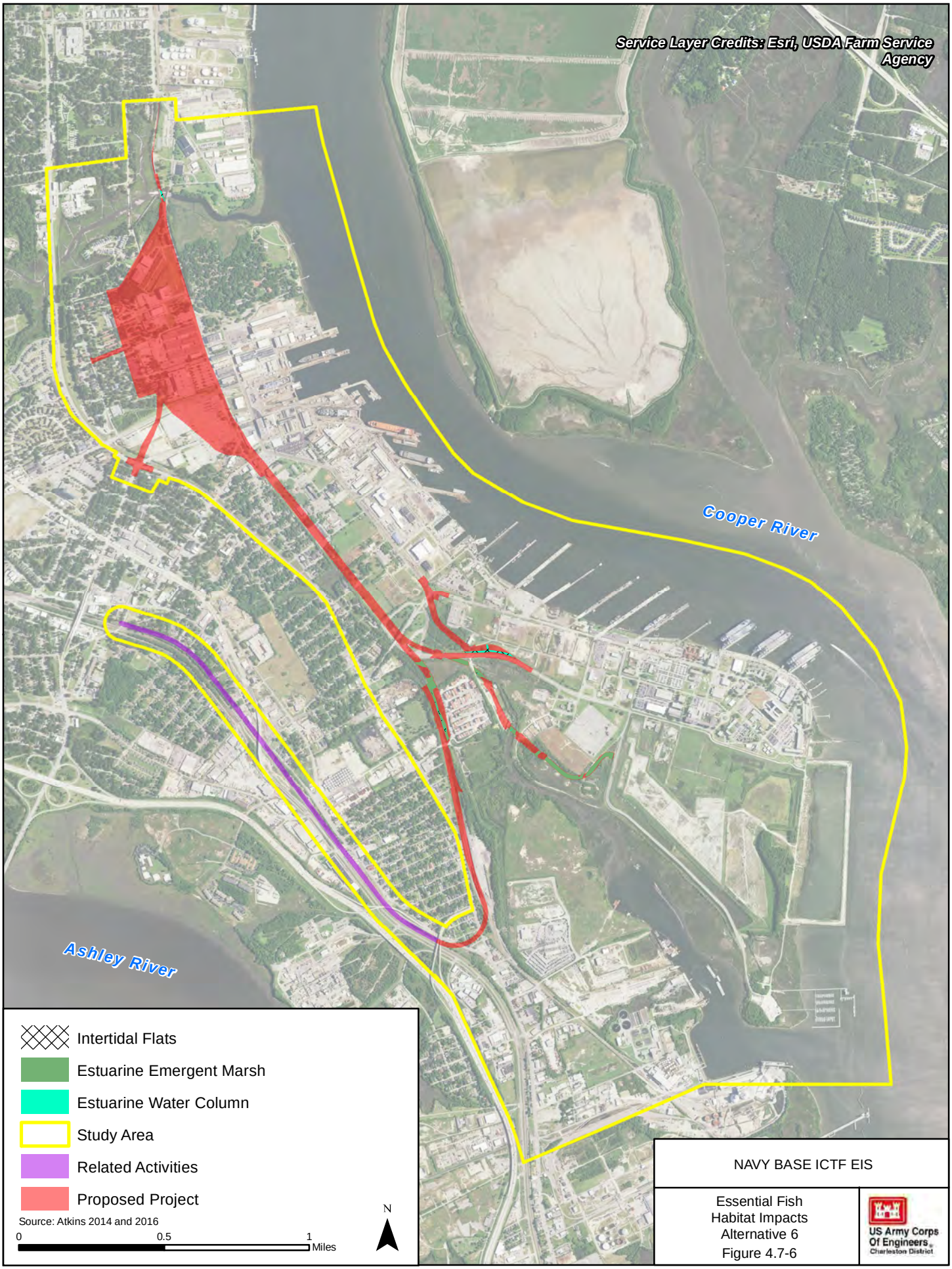
Essential Fish Habitat Impacts
Alternative 5
Figure 4.7-5
US Army Corps Of Engineers
Charleston District


Service Layer Credits: Esri, USDA Farm Service Agency
Cooper River
Ashley River
Intertidal Flats
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Study Area
Related Activities
Proposed Project
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NAVY BASE ICTF EIS
Essential Fish Habitat Impacts Alternative 6
Figure 4.7-6
US Army Corps Of Engineers
Charleston District

4.7.9 Alternative 7: River Center Site (South via Milford)

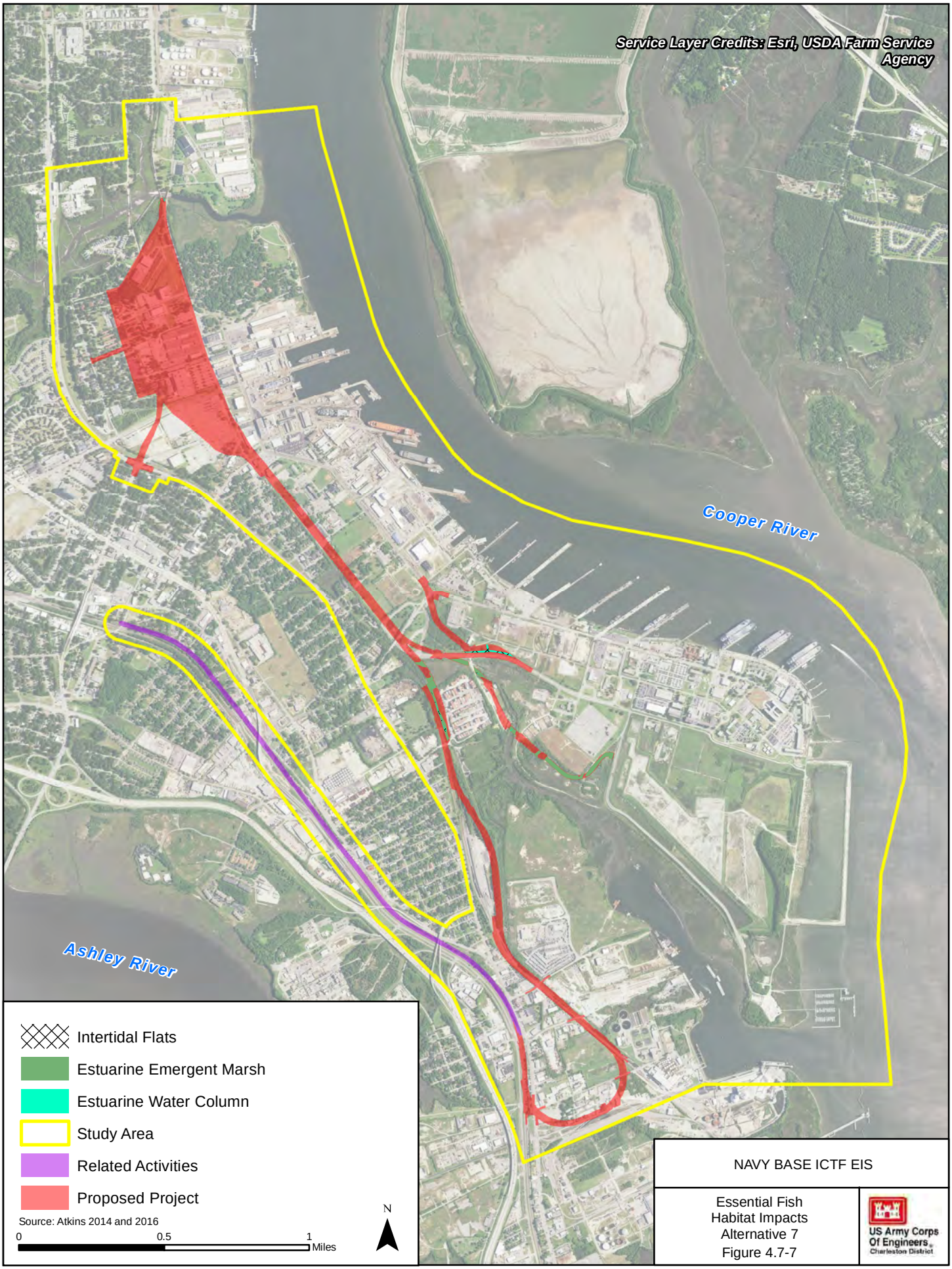
Under Alternative 7, the intermodal facility would include all of the facility components of Alternative 1 (Proposed Project), with the exception that the sound attenuation and security wall would be constructed adjacent to Noisette Boulevard along the length of the eastern boundary of the site. Operational activities and roadway improvements for Alternative 7 would be the same as those described under Alternative 5 with the exception of the northern rail access which would enter and exit the Navy Base ICTF from a second southern rail connection. Rail improvements and modifications would be similar to those described under Alternative 5. The placement of fill and pilings associated with the construction of Alternative 7 would directly impact 5.32 acres of estuarine emergent marsh and 0.92 acre of intertidal flats/estuarine water column (Figure 4.7-7).

4.7.10 Related Activities

The Related Activities include two components, the southern rail connection, which occurs for all alternatives, but has unique alignments for Alternatives 3 and 6, and the northern rail connection, which is only proposed for Alternative 2. Despite the unique rail alignments for Alternatives 3 and 6, impacts to EFH for those sections have been successfully avoided. Under Alternative 2, the placement of pilings associated with construction of the Related Activity (a new railroad bridge across a portion of marsh that drains Noisette Creek) would directly impact 1.77 acres of estuarine emergent marsh, 0.007 acre of oyster reefs/shell banks, and 0.20 acre of intertidal flats/estuarine water column. There would be no other impacts to EFH from construction of the Related Activity associated with each of the other Project alternatives.

4.7.11 Summary of Impacts Table

Table 4.7-2 summarizes the environmental consequences to EFH from Alternative 1 (Proposed Project) and all the alternatives.


Service Layer Credits: Esri, USDA Farm Service Agency
Cooper River
Ashley River
Intertidal Flats
Estuarine Emergent Marsh
Estuarine Water Column
Study Area
Related Activities
Proposed Project
Source: Atkins 2014 and 2016
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NAVY BASE ICTF EIS
Essential Fish Habitat Impacts Alternative 7
Figure 4.7-7
US Army Corps Of Engineers
Charleston District

Table 4.7-2
Summary of Impacts, Essential Fish Habitat

Alternative	Habitat Loss	Federally Managed and Common Fishery Species Displacement
No-Action	Negligible effect on EFH that currently exists within the study area.	Negligible Potential exists for a small short-term impact (in number, quantity, or extent) to federally managed species during construction, such as brown and white shrimp, which are relatively abundant and adapted to living in close association with human activity and infrastructure.
1: *Proposed Project: CSX – Milford / NS – North via Hospital District*	Minor Approximately 7.79 acres of EFH, including 6.65 acres of EEM and 1.14 acres of IF/EWC, would be impacted.	Minor Potential exists for a small short-term impact to federally managed species during construction, such as brown and white shrimp, which are relatively abundant and adapted to living in close association with human activity and infrastructure. Negligible short-term impact to oysters with the implementation of water quality BMPs and the potential for future oyster settlement and propagation with the new pilings.
2: *CSX – Milford / NS – S-line*	Minor Approximately 10.24 acres of EFH, including 8.86 acres of EEM, 0.03 acre of OR/SB, and 1.35 acres of IF/EWC, would be impacted.	Same as Alternative 1
3: *CSX – Kingsworth / NS – Hospital*	Minor Approximately 7.80 acres of EFH, including 6.66 acres of EEM and 1.14 acres of IF/EWC, would be impacted.	Same as Alternative 1
4: *CSX & NS – Milford*	Minor Approximately 7.69 acres of EFH, including 6.66 acres of EEM and 1.03 acres of IF/EWC, would be impacted.	Same as Alternative 1
5: *River Center Site: CSX – Milford / NS – North via Hospital District*	Minor Approximately 6.30 acres of EFH, including 5.29 acres of EEM and 1.01 acres of IF/EWC, would be impacted.	Minor Potential exists for a small short-term impact to federally managed species during construction, such as brown and white shrimp, which are relatively abundant and adapted to living in close association with human activity and infrastructure.
6: *River Center Site: CSX – Kingsworth / NS – Hospital*	Minor Approximately 6.30 acres of EFH, including 5.29 acres of EEM and 1.01 acres of IF/EWC, would be impacted.	Same as Alternative 5

Alternative	Habitat Loss	Federally Managed and Common Fishery Species Displacement
7: *River Center Site: CSX & NS – Milford*	Minor Approximately 6.24 acres of EFH, including 5.32 acres of EEM and 0.92 acre of IF/EWC, would be impacted.	Same as Alternative 5

Source: Atkins 2017.

EEM = Estuarine Emergent Marsh; OR/SB = Oyster Reefs/Shell Banks; IF/EWC = Intertidal Flats/Estuarine Water Column

EFH Impact Definitions

Negligible = Very small alteration to EFH, or to federally managed and/or common fishery species.

Minor = A small alteration (in quantity or extent) to EFH that does not impair a species' ability to live.

Major = A large alteration that appreciably diminishes the value of EFH for survival of a species.

4.7.12 Mitigation

4.7.12.1 Applicant's Proposed Avoidance and Minimization Measures

The Applicant has committed to several measures that avoid and/or minimize potential impacts of Alternative 1 (Proposed Project). These measures are taken from Palmetto Railways Mitigation Plan provided in Appendix N. Some of these measures are required under federal, state, and local permits; others are measures that Palmetto Railways has incorporated into the design and operations of Alternative 1 (Proposed Project). Each mitigation measure is also designated as one that either helps to avoid an impact or one that minimizes an impact.

- Where possible limit the placement of pilings for bridges within waterways, ensuring channels are not blocked (including use of the existing bridge over Noisette Creek). (Minimization)
- Contractors will be required to use bubble curtains or sleeve piles to mitigate underwater noise while driving piling in EFH areas. (Minimization)
- The contractor will utilize soft-start techniques for pile driving activities. This will consist of a series of taps at 25 to 40 percent of the pile driver's energy followed by a one-minute waiting period. (Minimization)
- During in-water work, a floating semi-permeable turbidity curtain will be deployed around areas where pile driving is taking place. (Minimization)
- Adherence to environmental windows for construction during the winter months when sea turtles are less abundant. (Avoidance)
- The contractor will hire a qualified marine biologist to be on-site during in-water construction activities to avoid potential impacts to marine resources and EFH. (Avoidance)

- Implement an SPCC plan to minimize the impact of a potential spill on EFH. (Minimization)
- Permanent loss of EFH habitat will be mitigated through the mitigation plan and efforts described above. (Mitigation)

These avoidance and minimization measures, except the items noted with an asterisk (*), have been considered in the preceding impact analysis. The complete list of Applicant-proposed avoidance and minimization measures for Alternative 1 (Proposed Project) is provided in Chapter 6, Table 6.1.

4.7.12.2 Additional Potential Mitigation Measures

The following additional mitigation measures as recommended by the Corps would further minimize and/or reduce potential effects of Alternative 1 (Proposed Project) on EFH.

- The contractor will utilize soft-start techniques for pile driving activities. This will consist of a series of taps at 25–40 percent of the pile driver's energy, followed by a one-minute waiting period.
- During in-water work, a floating semi-permeable turbidity curtain will be deployed around areas where pile driving is taking place.
- Adherence to environmental windows for construction during the winter months when sea turtles are less abundant.
- The contractor will hire a qualified marine biologist to be on-site during in-water construction activities to avoid potential impacts to marine resources and EFH.
- Implement an SPCC plan to minimize the impact of a potential spill event on EFH.

Additional avoidance, minimization, and mitigation may be considered by the Corps in its decision-making process. Final mitigation measures may be adopted as conditions of the DA permit and documented in the Record of Decision (ROD).

4.8 TRAFFIC AND TRANSPORTATION

Alternative 1 (Proposed Project) would alter vehicular and rail traffic patterns within the TSA. Section 3.8 describes the existing transportation system infrastructure and operations. The purpose of this environmental consequences section is to document potential beneficial or adverse impacts to the transportation system that would result from construction and operation of Alternative 1 (Proposed Project) and the alternatives.

Transportation projects included in the No-Action and Project alternatives analysis are consistent with the following local transportation plans:

- 2035 Charleston Area Transportation Study (CHATS) Long Range Transportation Plan (LRTP)
- SCDOT Statewide Transportation Improvement Program (STIP) 2014-2019, May 2014 Revision

Within the TSA, the Port Access Road project is the only committed roadway project included in the future year analysis. The Port Access Road project will replace the existing I-26 directional interchange at Spruill Avenue with a full movement interchange connecting to the future Port Access Road. The Port Access Road will connect to the future HLT and include a half-diamond interchange with a local access roadway providing connectivity to Hobson Avenue, Bainbridge Avenue, and Spruill Avenue. Roadway improvements associated with the Port Access Road are shown in Figure 4.8-1.

The I-526 improvements project from I-26 west to SC 7 (Sam Rittenberg Boulevard) was not included in the future year analysis, despite being partially funded for construction in the FY 2014-2019 CHATS TIP financial statement. The I-526 improvements project was not included due to uncertainties with what improvements will be made as part of the project. Also, the proposed Airport Connector Road on new alignment between Montague Avenue and Michaux Parkway was not included due to uncertainties with the design.

In addition, Partnership for Prosperity: A Master Plan for the Neck Area of Charleston and North Charleston (Neck Area Plan) is being developed by the Berkeley-Charleston-Dorchester Council of Governments (BCDCOG). The Neck Area Plan will provide a clear, community-based vision for growth and redevelopment of key sites in the area and future transportation networks, while providing economic opportunity and preserving the historic fabric of those neighborhoods. Focusing on the transportation component, the plan is to develop a transportation system that provides options in mode of travel for both people and goods. The plan will increase safety, mobility and access through the use of access management, directing truck traffic, planning for transit and creating more pedestrian friendly roadways.

Local Jurisdictions

Alternative 1 (Proposed Project) is located within two municipal jurisdictions - the City of Charleston and the City of North Charleston. In accordance with 40 C.F.R. 1506.2, both of these municipalities have been involved throughout the EIS process and have raised concerns regarding the potential impacts to the surrounding communities; specifically, with regards to transportation.

City of North Charleston

The City of North Charleston and the Applicant reached a Settlement Agreement in 2012 (see Section 1.5.1 for details) regarding mitigation for the ICTF. The Settlement Agreement included a commitment to prepare a Surface Transportation Impact Study (in cooperation with the City of North Charleston, South Carolina Ports Authority, and SCDOT) to identify impacts of rail and highway traffic related to state port and rail operations throughout North Charleston and to formulate mitigation and management of such impacts. The Settlement Agreement also required the Applicant to compensate the City of North Charleston with a mitigation payment of $8 million for rail access impacts. In addition to the mitigation payment, the Applicant also assumed responsibility for the repayment of $6.5 million in Tax Increment Financing (TIF) as part of the agreement. A copy the Settlement Agreement can be found in the Community Mitigation Plan in Appendix N.

City of Charleston

Specific coordination between the Applicant and the City of Charleston has been ongoing since spring 2015 when the Applicant changed the Proposed Project to include a southern rail connection which is in the northern limits of the City of Charleston. The City of Charleston provided scoping comments in a November 25, 2015, letter (Appendix C), comments on the Draft EIS in a July 8, 2016, letter (Appendix O) and comments on the joint permit application in a letter dated November 16, 2016. The City of Charleston's letters expressed concerns with the negative impacts within its municipal jurisdiction from the southern rail connection of Alternative 1 (Proposed Project); specifically, traffic impacts that would result at the southern rail connection with the addition of the new at-grade crossing at Meeting Street, mobility, access restrictions, property impacts, and the relocation of the proposed Public Service and Safety Operations Center. The City of Charleston's letters also detailed requested mitigation actions to lessen negative impacts.

Numerous coordination meetings and actions have transpired since spring 2015, and are detailed in an April 24, 2018, letter from the Applicant to the Corps (Appendix B). The Applicant contracted with a third-party firm (HDR, Inc.) to evaluate the City of Charleston's requested mitigation, analyze the feasibility of the infrastructure improvements requested, and provide supplementary recommendations for infrastructure or other improvements. The City of Charleston also contracted with a different third-party firm (Bihl Engineering) to analyze impacts from Alternative 1 (Proposed Project) and to study potential mitigation options. Mitigation proposed as part of this report

estimated the costs for the improvements between $40 and $55 million. As a result, a meeting was held between Applicant, the South Carolina Department of Commerce, and the City of Charleston to discuss the information presented in the City of Charleston's engineering study. According to the Applicant, "at that meeting, PR [Palmetto Railways] agreed to increase the amount of mitigation funding to $4.5 million for mitigation efforts and infrastructure the City could prioritize based on its assessment of immediate needs" (Appendix B).

In an effort to reach an agreement concerning the impacts and potential mitigation options for the City of Charleston, the Applicant prepared a draft Transportation Memorandum of Agreement (draft Transportation MOA) between the Applicant, South Carolina Department of Transportation (SCDOT), the South Carolina Department of Commerce, and the City of Charleston. This draft Transportation MOA was prepared to address transportation and safety impacts; specifically, with ICTF-related grade crossings within the City of Charleston. The draft Transportation MOA recognizes the importance of the ICTF to facilitate and enhance economic growth and development in the region, while ensuring an adequate and functioning transportation system in the surrounding jurisdictions. The draft Transportation MOA identifies the scope of evaluation activities, sources of funding, and roles and responsibilities of the parties. As part of the draft Transportation MOA, the parties will conduct a Crossing Analysis (funded by the Applicant) to examine conditions at the crossings and identify potential improvements, where warranted. The draft Transportation MOA does not specifically identify, or commit the Applicant to construct, any new grade separated crossings; however, it proposes to study the impacts and needs for these improvements. In addition to the Crossing Analysis, the Applicant also proposes in the draft Transportation MOA to provide funds up to $4.5 million to the City of Charleston (or another government body) for its use on mitigation measures for transportation improvements. The draft Transportation MOA is included in Appendix N. Although the Applicant and the City of Charleston have not reached a final agreement on the specific terms of mitigation for the City of Charleston, the Applicant has represented by letter dated December 6, 2017, that it is "committed to fulfilling the items in Section 2 of the MOA as mitigation for the [ICTF] impact on the City [of Charleston]" (Appendix B).

4.8.1 Methods and Impact Definitions

The following section describes the methodology used to evaluate and define impacts to the transportation network.

Methods: Traffic forecasts were developed using the 2012 version of the BCDCOG/CHATS 2010-2035 travel demand model. A travel demand model estimates traffic demand on regional transportation infrastructure based on the magnitude and location of population and employment in the region. Mathematical parameters within the travel demand model are initially estimated and calibrated to ensure the model accurately represents existing travel characteristics when given existing population and employment, inputs and existing infrastructure. Then future traffic demands

are estimated by applying the model using regional forecasts of the future magnitude and location of population and employment, and planned future infrastructure.

Atkins developed a traffic forecast for each future year alternative as documented in Appendix F. In summary, traffic forecasts were developed by first estimating the movement of heavy trucks to and from port terminals and intermodal rail facilities for each alternative. These externally estimated trips were introduced into the BCDCOG/CHATS 2010-2035 travel demand model, along with population and employment inputs associated with each alternative, as well as transportation network revisions associated with each alternative. Alternative specific inputs were used in travel demand model applications to generate the regional travel flows associated with each alternative. Since existing North Charleston truck restrictions, which are shown in Figure 4.8-1, are important in the TSA but are not currently included in the regional travel demand model, travel flows estimated for each alternative were used in refined travel demand model traffic assignments that included truck restrictions that are enforced in North Charleston. The resulting traffic volumes were used to generate the final traffic forecasts.

The traffic forecast volumes were used to evaluate the operations of the roadway network for each of the future year alternatives. The future year operations analysis is documented in Appendix F. The methodology used to perform the operations analysis and definitions of LOS is provided in Section 3.8.1.

Impact Definitions: Adverse and beneficial impacts to the freeway and local roadway network were determined by comparing the operations of the No-Action and Project alternatives. LOS was determined based on guidance from the Highway Capacity Manual (HCM) 2010 (Transportation Research Board 2010) to estimate impacts to freeways, intersections and at-grade rail crossings as defined in Table 4.8-1. LOS A to C is considered Good, LOS D Fair, and LOS E or F Poor. In addition, for at-grade rail crossings, an impact was major if an interstate off-ramp queue would spillback to the mainline in a Project alternative as a result of a Navy Base ICTF intermodal train occurrence but would not in the No-Action Alternative as a result of another commodity train. An off-ramp would be impacted by a train occurrence at an at-grade rail crossing, if the queue on the roadway backs up to the off-ramp. This queue hinders traffic from being able to turn onto the roadway from the off-ramp.

Table 4.8-1
Impact Definitions, Traffic and Transportation

Negligible	Minor	Moderate	Major
No change in LOS. No perceivable impacts to the intersection delay, at-grade rail crossing delay or freeway density.	LOS changes one LOS grade. Impacts cause slightly perceptible change in intersection delay, at-grade rail crossing delay or freeway density.	LOS changes two LOS grades or LOS degrades (adverse impact) to LOS E or improves (beneficial impact) from LOS E to LOS D. Impacts cause perceptible change in intersection delay, at-grade rail crossing delay or freeway density.	LOS changes three or more LOS grades or LOS degrades (adverse impact) to LOS F or improves (beneficial impact) from LOS F to LOS E or LOS D. Additionally, for at-grade rail crossings, if off-ramp queue impacts interstate mainline. Impacts cause very noticeable change in intersection delay, at-grade rail crossing delay or freeway density.

4.8.2 No-Action Alternative

The following sections describe the transportation impacts associated with No-Action Alternative, which is described in detail in Section 2.4.1 The operations analysis was performed for the year in which the proposed ICTF would open, 2018, and the design year 2038. The No-Action Alternative impacts are summarized in Section 4.8.11.

Existing traffic patterns within the TSA would change due to the Port Access Road project. While the proposed HLT would not be opened in 2018, the Port Access Road project is expected to be completed. The Port Access Road project would alter traffic patterns in 2018 with the addition of the Port Access Road and Local Access Road and the replacement of the directional I-26 Spruill Avenue ramps, which provide movements to and from downtown Charleston only with the Port Access Road interchange. With the HLT open by the design year 2038, traffic volumes on the Port Access Road increase substantially. The existing year 2013 and No-Action Alternative daily volumes for the major roadways within the TSA are shown in Appendix F. The average annual growth rate for the No-Action Alternative would be a little under 2 percent on the major roadways between the existing year 2013 and opening year 2018. Traffic growth slows down to less than 1 percent from the opening year 2018 to the design year 2038.

Interstate 26

Consistent with the existing conditions, most of the congestion would occur in the eastbound direction in the morning and westbound in the evening for the opening year 2018 under the No-

Action Alternative. Approximately 12 percent of the total analyzed segments would operate at Poor LOS and 26 percent would operate at Fair LOS, which is nearing unstable traffic flow.

By the design year 2038, the number of I-26 freeway segments over capacity would double from the opening year 2018. The additional segments operating over capacity would occur in the peak direction of travel, which is eastbound in the AM peak hour and westbound in the PM peak hour. Approximately 23 percent of the total analyzed segments would operate at Poor LOS and 27 percent would operate at Fair LOS, which is nearing unstable traffic flow.

A summary of the opening year 2018 and design year 2038 No-Action Alternative I-26 freeway segment LOS by direction and peak hour is shown in Table 4.8-2.

Table 4.8-2
I-26 Operations, No-Action Alternative

LOS	Eastbound				Westbound			
	AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
	2018	2038	2018	2038	2018	2038	2018	2038
Good	15 Segments (36%)	13 Segments (31%)	37 Segments (88%)	29 Segments (69%)	35 Segments (92%)	29 Segments (76%)	13 Segments (34%)	10 Segments (26%)
Fair	18 Segments (43%)	10 Segments (24%)	3 Segments (7%)	10 Segments (24%)	1 Segment (3%)	7 Segments (19%)	19 Segments (50%)	16 Segments (42%)
Poor	9 Segments (21%)	19 Segments (45%)	2 Segments (5%)	3 Segments (7%)	2 Segments (5%)	2 Segments (5%)	6 Segments (16%)	12 Segments (32%)

Note: Segments were developed based on guidance from the *Highway Capacity Manual (HCM) 2010* (Transportation Research Board 2010) and include basic freeway, weave, and ramp merge and diverge locations, which may vary in number between eastbound and westbound I-26.

Source: Appendix F.

Interstate 526

By the year 2018, congestion would occur on a greater portion of the corridor due to growth in traffic, in part due to the proposed Boeing Aircraft plant expansion (see description in Chapter 5). The majority of the congestion along I-526 would occur between Paul Cantrell Boulevard and Long Point Road. Approximately 23 percent of the total analyzed segments would operate at Poor LOS and 40 percent would operate at Fair LOS, which is nearing unstable traffic flow.

By the design year 2038, the number of I-526 freeway segments over capacity would increase by approximately one-third from the opening year 2018. The majority of the congestion along I-526 would still occur between Paul Cantrell Boulevard and Long Point Road. Approximately 31 percent of the total analyzed segments would operate at Poor LOS and 36 percent would operate at Fair LOS, which is nearing unstable traffic flow.

A summary of the opening year 2018 and design year I-526 freeway segment LOS by direction and peak hour is shown in Table 4.8-3.

Table 4.8-3
I-526 Operations, No-Action Alternative

LOS	Eastbound				Westbound			
	AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
	2018	2038	2018	2038	2018	2038	2018	2038
Good	17 Segments (38%)	15 Segments (33%)	13 Segments (29%)	14 Segments (31%)	16 Segments (37%)	14 Segments (33%)	19 Segments (44%)	15 Segments (35%)
Fair	17 Segments (38%)	13 Segments (29%)	22 Segments (49%)	18 Segments (40%)	15 Segments (35%)	13 Segments (30%)	16 Segments (37%)	19 Segments (44%)
Poor	11 Segments (24%)	17 Segments (38%)	10 Segments (22%)	13 Segments (29%)	12 Segments (28%)	16 Segments (37%)	8 Segments (19%)	9 Segments (21%)

Note: Segments include basic freeway, weave, and ramp merge and diverge locations, which may vary in number between eastbound and westbound I-526.

Source: Appendix F.

U.S. Highway 17

Although congestion is projected to increase on US 17 from existing levels, the majority of the corridor would still operate at Good or Fair levels. Only one freeway segment and one intersection (4 percent of the total analyzed elements) would operate at Poor LOS in either the AM or PM peak hour.

By the design year 2038, the number of freeway segments and intersections over capacity would more than double along US 17 from the opening year 2018. However, because few locations operated over capacity in 2018, the majority of the corridor would still operate at Good or Fair levels in the design year 2038. Only two freeway segments and three intersections (10 percent of the total analyzed elements) would operate at Poor LOS in either the AM or PM peak hour.

A summary of the opening year 2018 and design year 2038 US 17 freeway segment LOS by direction and peak hour is shown in Table 4.8-4. A summary of the opening year 2018 and design year 2038 US 17 signalized intersection operations is shown in Table 4.8-5. The worst of the No-Action Alternative AM or PM peak hour LOS for the opening year 2018 is shown in Figure 4.8-2 and the design year 2038 in Figure 4.8-3.

Table 4.8-4
US 17 Freeway Operations, No-Action Alternative

LOS	Northbound				Southbound			
	AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
	2018	2038	2018	2038	2018	2038	2018	2038
Good	9 Segments (90%)	9 Segments (90%)	8 Segments (80%)	5 Segments (50%)	10 Segments (91%)	8 Segments (73%)	11 Segments (100%)	10 Segments (91%)
Fair	1 Segment (10%)	1 Segment (10%)	1 Segment (10%)	3 Segments (30%)	1 Segment (9%)	3 Segments (27%)	0 Segments (0%)	1 Segment (9%)
Poor	0 Segments (0%)	0 Segments (0%)	1 Segment (10%)	2 Segments (20%)	0 Segments (0%)	0 Segments (0%)	0 Segments (0%)	0 Segments (0%)

Note: Segments include basic freeway, weave, and ramp merge and diverge locations, which may vary in number between northbound and southbound US 17.

Source: Appendix F.

Table 4.8-5
US 17 Intersection Operations, No-Action Alternative

LOS	AM Peak Hour		PM Peak Hour	
	2018	2038	2018	2038
Good	3 Intersections (60%)	2 Intersections (40%)	2 Intersections (40%)	2 Intersections (40%)
Fair	1 Intersection (20%)	2 Intersections (40%)	3 Intersections (60%)	1 Intersection (20%)
Poor	1 Intersection (20%)	1 Intersection (20%)	0 Intersections (0%)	2 Intersections (40%)

Source: Appendix F.

North Charleston Intersections

The opening year 2018 No-Action Alternative analyzed 32 signalized intersections and 15 stop-controlled intersections within North Charleston, which are shown in Figure 4.8-2. The proposed Port Access Road project would create additional intersections as well as modify existing intersections with the addition of turn lanes and traffic signals. Along the proposed Local Access Road, two new signalized intersections are created at Bainbridge Avenue and the Stromboli Avenue Extension and two unsignalized intersections at the Port Access Road on- and off-ramps. Additionally, Alternative 1 (Proposed Project) would extend Stromboli Avenue converting the two existing stop-controlled intersections of Spruill Avenue at Stromboli Avenue and Carner Avenue and Meeting Street (future Stromboli Avenue Extension) to signalized intersections. Meeting Street would no longer connect to Carner Avenue as part of the Port Access Road project.

Similar to existing conditions, within North Charleston, the majority of the analyzed intersections operate with little delay. During the AM peak hour, all 32 signalized intersections and 11 stop-controlled intersections would operate at Good LOS (92 percent of total intersections), one stop-controlled intersection would operate at Fair LOS (2 percent of total intersections), and three stop-

controlled intersections would operate at Poor LOS (6 percent of total intersections). During the PM peak hour, 30 signalized intersections and 14 stop-controlled intersections would operate at Good LOS (94 percent of total intersections), two signalized intersections and one stop-controlled intersection would operate at Fair LOS (6 percent of total intersections), and none would operate at Poor LOS (0 percent of total intersections). The stop-controlled intersections of Avenue B at Virginia Avenue, the I-526 Eastbound Off-Ramp at Virginia Avenue, and the ramps from Viaduct Road at Bainbridge Road are the only intersections that would operate with a Poor LOS. The worst of the AM and PM peak hour intersection LOS for the opening year 2018 No-Action Alternative is shown in Figure 4.8-2.

In the design year 2038 No-Action Alternative, the majority of the intersections within North Charleston would continue to operate with little delay. During the AM peak hour, 30 signalized intersections and 11 stop-controlled intersections would operate at Good LOS (87 percent of total intersections), one signalized intersection would operate at Fair LOS (2 percent of total intersections), and one signalized and four stop-controlled intersections would operate at Poor LOS (11 percent of total intersections). During the PM peak hour, 27 signalized intersections and 13 stop-controlled intersections would operate at Good LOS (85 percent of total intersections), three signalized intersections and one stop-controlled intersection would operate at Fair LOS (9 percent of total intersections), and two signalized and one stop-controlled intersections would operate at Poor LOS (6 percent of total intersections).

In addition to the three, opening year 2018 No-Action stop-controlled intersections that operate at Poor LOS, four other intersections would also operate at Poor LOS in the design year 2038. The four additional intersections are the signalized intersections of Rivers Avenue at Cosgrove Avenue, Spruill Avenue at McMillan Avenue, and Cosgrove Avenue at Azalea Avenue, and the stop-controlled intersection of Noisette Boulevard at McMillan Avenue. The worst of the AM and PM peak hour intersection LOS for the design year 2038 No-Action Alternative is shown in Figure 4.8-3.

A summary of the opening year 2018 and design year 2038 North Charleston intersection LOS by traffic control type and peak hour is shown in Table 4.8-6.

Table 4.8-6
North Charleston Intersection Operations, No-Action Alternative

LOS	Signalized Intersections				Stop-Controlled Intersections			
	AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
	2018	2038	2018	2038	2018	2038	2018	2038
Good	32 (100%)	30 (94%)	30 (94%)	27 (85%)	11 (73%)	11 (73%)	14 (93%)	13 (86%)
Fair	0 (0%)	1 (3%)	2 (6%)	3 (9%)	1 (7%)	0 (0%)	1 (7%)	1 (7%)
Poor	0 (0%)	1 (3%)	0 (0%)	2 (6%)	3 (20%)	4 (27%)	0 (0%)	1 (7%)

Source: Appendix F.

The I-26 ramp terminal intersections at Cosgrove Avenue and I-26 Eastbound ramp terminal intersection at Montague Avenue are neither signalized nor stop-controlled. The ramp terminal intersections act as merge, diverge or weave elements along Cosgrove Avenue and Montague Avenue. All ten of the elements would operate at Good LOS during both the AM and PM peak hours in the opening year 2018 and design year 2038 No-Action Alternative, with the exception of the weave section on southbound Cosgrove Avenue during the PM peak hour in the design year 2038, which would operate at Fair LOS.

In the opening year 2018, the Corps analyzed two freeway elements on the Port Access Road. The HLT would not be open to traffic in the year 2018, so all eastbound Port Access Road traffic would be destined to the Local Access Road and all westbound Port Access Road traffic would come from the Local Access Road. The two analyzed elements were the eastbound Port Access Road merge from the eastbound and westbound I-26 ramps and the split of the westbound Port Access Road to eastbound and westbound I-26. Both of these elements would operate at Good LOS during both the AM and PM peak hours in the opening year.

In the design year 2038, the analysis also included the on- and off- ramps from the Port Access Road to the Local Access Road. The HLT would be open and the Port Access Road would serve most of the traffic to and from the facility along with the traffic destined to the Local Access Road. All four freeway elements on the Port Access Road would operate at Good LOS during both the AM and PM peak hours in the design year 2038.

At-Grade Rail Crossings

Over time, due to an increase in train lengths, the Corps anticipates that roadways would be blocked for longer periods of times at most at-grade rail crossings. The daily combined total rail occupancy time at the analyzed roadway crossings, which is defined by the number of occurrences multiplied by the average duration of each occurrence, would increase approximately 8 percent from the year 2013 existing conditions to opening year 2018 No-Action Alternative. The daily combined total rail occupancy time would continue to increase, nearly 30 percent, from the opening year 2018 to design year 2038 under the No-Action Alternative. Same as the year 2013 existing conditions, the at-grade rail crossing of Avenue B east of Virginia Avenue would be the only location to operate with a Poor LOS in the opening year 2018 No-Action Alternative. By the design year 2038, three additional at-grade crossings would operate with a Poor LOS. These three additional at-grade locations are North Rhett Avenue south of I-526, Hackemann Avenue between Meeting Street and King Street, and Discher Street between Meeting Street and King Street. In both the opening year 2018 and design year 2038, the at-grade rail crossing of Virginia Avenue north of Empire Avenue would operate LOS D, slightly better than the Poor LOS.

Several at-grade crossings would have substantial queuing during other commodity train occurrences in the opening year 2018 and design year 2038 No-Action Alternative. The queue at two of these locations, Virginia Avenue north of Empire Avenue and North Rhett Avenue south of I-526, would impact the I-526 interstate mainline. The mainline would be impacted by the queue from the at-grade crossing backing up through the intersection with the off-ramp, which would cause additional queueing on the off-ramp that impacts the I-526 mainline. In the design year 2038, the queue from the at-grade crossing at Rivers Avenue north of I-526 would also impact the I-526 interstate mainline.

The opening year 2018 and design year 2038 No-Action Alternative at-grade rail crossing analysis results, which are used to determine impacts for the respective year proposed action alternatives, are shown in Table 4.8-7 and Table 4.8-8, respectively. The at-grade rail crossing daily LOS for the opening year 2018 and design year 2038 No-Action Alternative is shown in Figure 4.8-4.

Table 4.8-7
Opening Year 2018 At-Grade Rail Crossings Analysis Results for the No-Action Alternative

Map ID[1]	Roadway Segment at Rail Crossing	Daily Volume (vehicles per day)	Daily Other Commodity Trains		Max Queue (feet)	Impact to Interstate Mainline	Roadway Network Delay per Vehicle (seconds per vehicle)	LOS
			Number of Train Crossings	Average Duration of Crossing (min:sec)				
1	Rivers Avenue (US 78)	31,900	2.2	04:09	2,300	No	7.7	A
2	Attaway Street	4,500	4.9	03:47	600	No	6.3	A
3	North Rhett Avenue	16,300	4.9	07:16	>5,280	Yes	43.9	D
4	Virginia Avenue	8,600	1.1	26:07	3,750	Yes	50.9	D
5	Avenue B	7,100	1.1	34:36	>5,280	No	81.8	F
6	Dorchester Road (SC 642)	16,700	5.3	04:01	1,525	No	10.3	B
7	Accabee Road	3,100	5.3	03:09	225	No	3.9	A
8	Misroon Street	500	5.3	03:09	50	No	6.2	A
9	Hackemann Avenue	1,500	3.1	04:06	2,650	No	21.3	C
10	Discher Street	3,100	5.3	03:09	1,275	No	16.4	B
11	Pittsburgh Avenue	2,000	0.0	00:00	0	No	0.0	A

1. Analyzed at-grade crossing locations are shown in Figure 4.8-4.

Source: Appendix F.

Table 4.8-8
Design Year 2038 At-Grade Rail Crossings Analysis Results for the No-Action Alternative

Map ID[1]	Roadway Segment at Rail Crossing	Daily Volume (vehicles per day)	Daily Other Commodity Trains		Max Queue (feet)	Impact to Interstate Mainline	Roadway Network Delay per Vehicle (seconds per vehicle)	LOS
			Number of Train Crossings	Average Duration of Crossing (min:sec)				
1	Rivers Avenue (US 78)	36,400	2.2	05:14	4,525	Yes	11.3	B
2	Attaway Street	6,200	4.9	06:21	1,150	No	18.1	B
3	North Rhett Avenue	24,700	4.9	09:44	>5,280	Yes	100.4	F
4	Virginia Avenue	9,900	1.1	27:10	4,275	Yes	53.4	D
5	Avenue B	8,500	1.1	35:29	>5,280	No	84.9	F
6	Dorchester Road (SC 642)	17,400	5.3	05:13	1,925	No	18.6	B
7	Accabee Road	3,100	5.3	05:13	350	No	8.7	A
8	Misroon Street	500	5.3	04:13	50	No	9.3	A
9	Hackemann Avenue	1,500	3.1	05:29	>5,280	No	72.3	E
10	Discher Street	3,200	5.3	04:12	4,500	No	75.9	E
11	Pittsburgh Avenue	2,100	0.0	00:00	0	No	0.0	A

1. Analyzed at-grade crossing locations are shown in Figure 4.8-4.

Source: Appendix F.

4.8.3 Alternative 1: Applicant's Proposed Project (South via Milford / North via Hospital District)

The following sections describe the transportation impacts associated with Alternative 1 (Proposed Project), which is described in detail in Section 1.7 and shown in Figures 1.7-1 through 1.7-8. Potential impacts discussed in this section include both temporary construction impacts and permanent impacts resulting from operations of the facility. The permanent operations analysis was performed for the year in which the proposed ICTF would open, 2018, and the design year 2038. The impacts are summarized in Section 4.8.11.

As mentioned in Section 1.7.1.2.3, Alternative 1 (Proposed Project) creates a new at-grade rail crossing at the intersection of Meeting Street (US 52) and Herbert Street. This analyzed at-grade rail crossing network is identified by ID 12 in Tables 4.8-18 and 4.8-19.

The distribution of truck traffic between the ICTF and the four container terminals along with other regional sites would change from the opening year 2018 to the design year 2038. In the opening year 2018, the Wando Welch and North Charleston port facilities would handle a higher percentage of the containers, because the HLT would not be open. Additionally, the other regional sites, which include local distribution centers and routes out of the region such as I-26 and US 17, would decrease from

15 percent in the opening year 2018 to 9 percent in the design year 2038. The year 2018 and 2038 distribution of the ICTF truck traffic is shown in Exhibit 4.8-1.

Exhibit 4.8-1: Build Proposed Project ICTF Truck Distributions

Source: Appendix F.

Traffic patterns around the ICTF would change compared to the No-Action Alternative due to the ICTF and modifications to the roadway network. In its opening year 2018, the ICTF would handle 1,100 trucks per day and 500 employee and visitor vehicles per day with access via North Hobson Avenue. By the design year 2038, the ICTF would handle 3,900 trucks and 1,100 employee and visitor vehicles per day. Of the 3,900 trucks per day, 1,400 would be on the drayage road between the ICTF and the HLT, effectively removing 1,400 trucks from public roadways. In the No-Action Alternative, the 1,400 truck trips would be on public roadways. All trucks exiting the ICTF would turn right onto North Hobson Avenue heading towards the Local Access Road and Port Access Road. Roadway modifications including the Cosgrove Avenue / McMillan Avenue realignment and overpass and the removal of Viaduct Road between Spruill Avenue and North Hobson Avenue lead to increased volumes on Noisette Boulevard, Cosgrove Avenue, and the Local Access Road compared to the No-Action Alternative. The opening year 2018 and design year 2038 Alternative 1 (Proposed Project) daily volumes are shown in Appendix F.

4.8.3.1 Construction

During construction of the ICTF and associated roadway improvements, Alternative 1 (Proposed Project) would have a negligible impact on I-26, I-526, and US 17 and a minor adverse impact on North Charleston intersections. The Corps anticipates that at the peak of construction, up to 200 trips

per day would be generated. The construction traffic would primarily use major arterial roadways such as I-26, I-526, Cosgrove Avenue, McMillan Avenue, Viaduct Road, North Hobson Avenue, Rivers Avenue and Spruill Avenue. The 200 construction trips per day would only be a small fraction of the daily volumes on these roadways, especially the interstates. A maintenance of traffic (MOT) plan has not been developed but may include detours and temporary lane closures. MOTs are typically developed once final design is complete, prior to construction, and the applicant will develop a MOT at that time.

4.8.3.2 Operations

Interstate 26

Consistent with the opening year 2018 No-Action Alternative, the morning congestion on I-26 occurs in the eastbound direction, and the evening congestion occurs in the westbound direction for Alternative 1 (Proposed Project). Approximately 13 percent of the total analyzed segments (AM and PM peak hours for eastbound and westbound I-26) would operate at Poor LOS and 25 percent would operate at Fair LOS. By the design year 2038, approximately 21 percent of the total analyzed segments would operate at Poor LOS and 24 percent would operate at Fair LOS. A summary of the I-26 freeway segment LOS by direction and peak hour is shown in Table 4.8-9.

Table 4.8-9
I-26 Operations, Alternative 1 (Proposed Project)

LOS	Eastbound				Westbound			
	AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
	2018	2038	2018	2038	2018	2038	2018	2038
Good	15 Segments (36%)	13 Segments (31%)	36 Segments (86%)	31 Segments (74%)	35 Segments (92%)	33 Segments (87%)	14 Segments (37%)	11 Segments (29%)
Fair	17 Segments (40%)	11 Segments (26%)	4 Segments (9%)	8 Segments (19%)	1 Segment (3%)	3 Segments (8%)	18 Segments (47%)	16 Segments (42%)
Poor	10 Segments (24%)	18 Segments (43%)	2 Segments (5%)	3 Segments (7%)	2 Segments (5%)	2 Segments (5%)	6 Segments (16%)	11 Segments (29%)

Note: Segments include basic freeway, weave, and ramp merge and diverge locations, which may vary in number between eastbound and westbound I-26.

Source: Appendix F.

In the opening year 2018 and design year 2038, Alternative 1 (Proposed Project) would have a negligible impact on the majority of the I-26 corridor in comparison with the No-Action Alternative. Alternative 1 (Proposed Project) would have a beneficial or adverse impact on a few segments due to a LOS change. The LOS change is a result of the segments having a density near a LOS threshold. All segments would only have a slight increase or decrease in density. A summary of the opening year 2018 and design year 2038 I-26 freeway impacts by direction and peak hour is shown in Table 4.8-10.

Table 4.8-10
I-26 Freeway Segment Impacts for Alternative 1 (Proposed Project)

Impact		Eastbound				Westbound			
		AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
		2018	2038	2018	2038	2018	2038	2018	2038
Beneficial	Major	0	2	0	0	0	0	0	0
	Moderate	1	2	0	0	0	0	0	1
	Minor	2	2	0	2	0	4	2	1
Negligible		36	35	41	40	38	33	35	36
Adverse	Minor	1	0	1	0	0	1	1	0
	Moderate	2	1	0	0	0	0	0	0
	Major	0	0	0	0	0	0	0	0

Note: Segments include basic freeway, weave, and ramp merge and diverge locations, which may vary in number between eastbound and westbound I-26.

Source: Appendix F.

Interstate 526

Similar to the opening year 2018 No-Action Alternative, the majority of the congestion along I-526 would occur between Paul Cantrell Boulevard and Long Point Road. Approximately 25 percent of the total analyzed segments (AM and PM peak hours for eastbound and westbound I-526) would operate at Poor LOS and 39 percent would operate at Fair LOS. By the design year 2038, approximately 32 percent of the total analyzed segments would operate at Poor LOS and 37 percent would operate at Fair LOS. A summary of the I-526 freeway segment LOS by direction and peak hour is shown in Table 4.8-11.

Table 4.8-11
I-526 Operations, Alternative 1 (Proposed Project)

LOS	Eastbound				Westbound			
	AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
	2018	2038	2018	2038	2018	2038	2018	2038
Good	18 Segments (40%)	14 Segments (31%)	13 Segments (29%)	13 Segments (29%)	15 Segments (34%)	12 Segments (28%)	18 Segments (42%)	15 Segments (35%)
Fair	15 Segments (33%)	14 Segments (31%)	23 Segments (51%)	19 Segments (42%)	14 Segments (33%)	15 Segments (35%)	17 Segments (39%)	18 Segments (42%)
Poor	12 Segments (27%)	17 Segments (38%)	9 Segments (20%)	13 Segments (29%)	14 Segments (33%)	16 Segments (37%)	8 Segments (19%)	10 Segments (23%)

Note: Segments include basic freeway, weave, and ramp merge and diverge locations, which may vary in number between eastbound and westbound I-526.

Source: Appendix F.

In the opening year 2018 and design year 2038, Alternative 1 (Proposed Project) would have a negligible impact on the majority of the I-526 corridor in comparison with the No-Action Alternative. Alternative 1 (Proposed Project) would have a beneficial or adverse impact on a few segments due to a LOS change. The LOS change is a result of the segments having a density near a LOS threshold. All segments would only have a slight increase or decrease in density. A summary of the opening year 2018 and design year 2038 I-526 freeway impacts by direction and peak hour is shown in Table 4.8-12.

Table 4.8-12
I-526 Freeway Segment Impacts for Alternative 1 (Proposed Project)

Impact		Eastbound				Westbound			
		AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
		2018	2038	2018	2038	2018	2038	2018	2038
Beneficial	Major	1	0	0	2	0	0	0	0
	Moderate	0	0	1	1	0	0	0	0
	Minor	1	0	0	0	0	0	0	0
Negligible		42	44	44	40	39	40	42	41
Adverse	Minor	0	1	0	1	2	3	1	1
	Moderate	1	0	0	1	1	0	0	1
	Major	0	0	0	0	1	0	0	0

Note: Segments include basic freeway, weave, and ramp merge and diverge locations, which may vary in number between eastbound and westbound I-526.

Source: Appendix F.

U.S. Highway 17

Similar to the opening year 2018 No-Action Alternative, the majority of the US 17 corridor would operate at Good or Fair levels for Alternative 1 (Proposed Project). Only one freeway segment and one intersection would operate at Poor LOS in either the AM or PM peak hour. By the design year 2038, one additional freeway segment and two additional intersections would operate at Poor LOS in either the AM or PM peak hour. A summary of the US 17 freeway segment LOS by direction and peak hour is shown in Table 4.8-13. A summary of the US 17 signalized intersection operations is shown in Table 4.8-14.

Table 4.8-13
US 17 Freeway Operations, Alternative 1 (Proposed Project)

LOS	Eastbound				Westbound			
	AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
	2018	2038	2018	2038	2018	2038	2018	2038
Good	9 Segments (90%)	9 Segments (90%)	7 Segments (70%)	5 Segments (50%)	10 Segments (91%)	8 Segments (73%)	11 Segments (100%)	10 Segments (91%)
Fair	1 Segment (10%)	1 Segment (10%)	2 Segments (20%)	3 Segments (30%)	1 Segment (9%)	3 Segments (27%)	0 Segments (0%)	1 Segment (9%)
Poor	0 Segments (0%)	0 Segments (0%)	1 Segment (10%)	2 Segments (20%)	0 Segments (0%)	0 Segments (0%)	0 Segments (0%)	0 Segments (0%)

Note: Segments include basic freeway, weave, and ramp merge and diverge locations, which may vary in number between northbound and southbound US 17.

Source: Appendix F.

Table 4.8-14
US 17 Intersection Operations, Alternative 1 (Proposed Project)

LOS	AM Peak Hour		PM Peak Hour	
	2018	2038	2018	2038
Good	3 Intersections (60%)	2 Intersections (40%)	2 Intersections (40%)	2 Intersections (40%)
Fair	1 Intersection (20%)	2 Intersections (40%)	3 Intersections (60%)	1 Intersection (20%)
Poor	1 Intersection (20%)	1 Intersection (20%)	0 Intersections (0%)	2 Intersections (40%)

Source: Appendix F.

In the opening year 2018, Alternative 1 (Proposed Project) would have a negligible impact on the majority of the US 17 corridor in comparison with the No-Action Alternative, including all five of the signalized intersections. Alternative 1 (Proposed Project) would not have a beneficial impact on any of the US 17 segments in either the AM or PM peak hour. Alternatively, Alternative 1 (Proposed

Project) would have an adverse impact on three of the US 17 segments (7 percent of the total segments) in either the AM or PM peak hour, all of which are categorized as minor. In the design year 2038, Alternative 1 (Proposed Project) would have a negligible impact on all of the analyzed US 17 freeway segments and intersections. A summary of the opening year 2018 and design year 2038 US 17 freeway impacts by direction and peak hour is shown in Table 4.8-15. A table of impacts is not shown for the US 17 intersections, because Alternative 1 (Proposed Project) would result in a negligible impact on all intersections in both opening year 2018 and design year 2038.

Table 4.8-15
US 17 Freeway Segment Impacts for Alternative 1 (Proposed Project)

Impact		Northbound				Southbound			
		AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
		2018	2038	2018	2038	2018	2038	2018	2038
Beneficial	Major	0	0	0	0	0	0	0	0
	Moderate	0	0	0	0	0	0	0	0
	Minor	0	0	0	0	0	0	0	0
Negligible		8	10	9	10	11	11	11	11
Adverse	Minor	2	0	1	0	0	0	0	0
	Moderate	0	0	0	0	0	0	0	0
	Major	0	0	0	0	0	0	0	0

Note: Segments include basic freeway, weave, and ramp merge and diverge locations, which may vary in number between northbound and southbound US 17.

Source: Appendix F.

North Charleston Intersections

Alternative 1 (Proposed Project) included the analysis of 32 signalized intersections and 14 stop-controlled intersections within North Charleston. The ICTF employee and visitor driveway and truck driveway created two new stop-controlled intersections along North Hobson Avenue. As part of the Alternative 1 (Proposed Project), McMillan Avenue is realigned and grade separated from the new ICTF railroad tracks, which eliminated the stop-controlled intersection of St. Johns Avenue at McMillan Avenue. Additionally, the removal of Viaduct Road eliminates two stop-controlled intersections, which are at the ramps connecting Viaduct Road and Bainbridge Avenue. The existing stop-controlled Viaduct Road intersection at North Hobson Avenue and South Hobson Avenue is replaced with a stop-controlled intersection, where the Local Access Road, North Hobson Avenue and South Hobson Avenue meet. Finally, Bainbridge Avenue would be slightly realigned and "T" into the Local Access Road as a signalized intersection.

The worst of the AM and PM peak hour intersection LOS for the Alternative 1 (Proposed Project) opening year 2018 and design year 2038 are shown in Figure 4.8-5 and Figure 4.8-6, respectively. A summary of the North Charleston intersection operations is shown in Table 4.8-16.

Consistent with the opening year 2018 No-Action Alternative, within North Charleston, the majority of the analyzed intersections operate with little delay. The stop-controlled intersections of Noisette Boulevard at McMillan Avenue, Avenue B at Virginia Avenue, and the I-526 Eastbound Off-Ramp at Virginia Avenue are the only intersections that would operate with a Poor LOS in the opening year 2018.

By the design year 2038, a few additional intersections would operate with Poor LOS, but the majority of the intersections would still operate with little delay. The signalized intersections of Cosgrove Avenue at Rivers Avenue, Cosgrove Avenue at Spruill Avenue, and Cosgrove Avenue at Azalea Drive and the stop-controlled intersections of Avenue B at Virginia Avenue, the I-526 Eastbound Off-Ramp at Virginia Avenue, Turnbull Avenue at Noisette Boulevard, and Noisette Boulevard at McMillan Avenue are the only intersections that would operate with a Poor LOS in the design year 2038.

Table 4.8-16
North Charleston Intersection Operations, Alternative 1 (Proposed Project)

LOS	Signalized Intersections				Stop-Controlled Intersections			
	AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
	2018	2038	2018	2038	2018	2038	2018	2038
Good	31 (97%)	29 (91%)	29 (91%)	28 (88%)	11 (79%)	10 (71%)	13 (93%)	12 (86%)
Fair	1 (3%)	2 (6%)	3 (9%)	1 (3%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Poor	0 (0%)	1 (3%)	0 (0%)	3 (9%)	3 (21%)	4 (29%)	1 (7%)	2 (14%)

Source: Appendix F.

A summary of the opening year 2018 and design year 2038 Alternative 1 (Proposed Project) North Charleston intersection impacts by peak hour is shown in Table 4.8-17. Two intersections, the ICTF truck driveway at North Hobson Avenue and ICTF employee and visitor driveway at North Hobson Avenue, did not exist in the No-Action Alternative, so were only analyzed in Alternative 1 (Proposed Project). An impact cannot be defined for these intersections because they were not analyzed in the No-Action Alternative. However, both intersections are projected to operate at Good LOS in the opening year 2018 and design year 2038 Alternative 1 (Proposed Project) for both the AM and PM peak hours.

In the opening year 2018, Alternative 1 (Proposed Project) would have a negligible impact on the majority of the analyzed intersections in North Charleston compared with the No-Action Alternative. Alternative 1 (Proposed Project) would have a beneficial impact on three intersections (3 percent of the total intersections) in either the AM or PM peak hour. All of the three intersections would have a

minor beneficial impact, which equates to an improvement of one LOS grade. Alternatively, Alternative 1 (Proposed Project) would have an adverse impact on 12 intersections (14 percent of the total intersections) in either the AM or PM peak hour. Eight of the 12 intersections would have a minor adverse impact, which equates to a degradation of one LOS grade. Moderate adverse impacts would occur at the signalized Spruill Avenue at McMillan Avenue/ Cosgrove Avenue Realignment intersection in the PM peak hour and the stop-controlled Noisette Boulevard at McMillan Avenue intersection in both the AM and PM peak hours.

The stop-controlled Avenue B at Virginia Avenue intersection would have a major adverse impact in the AM peak hour, as the LOS degrades from LOS E to LOS F. The traffic volume at the intersection is projected to increase, as Avenue B and Noisette Boulevard would potentially serve as part of a route between the ICTF and I-526 for employees. Trucks would not use this route as they are restricted on Noisette Boulevard. Additionally, traffic patterns in the area would shift due to roadway modifications such as the connection of St. Johns Avenue with McMillan Avenue being severed. The stop-controlled left-turn movement that would operate at LOS F is a low volume movement, less than 20 vehicles in the AM peak hour.

In the design year 2038, similar to the opening year 2018, Alternative 1 (Proposed Project) would have a negligible impact on the majority of the analyzed intersections in North Charleston compared with the No-Action Alternative. Alternative 1 (Proposed Project) would have a beneficial impact on seven intersections (8 percent of the total intersections) in either the AM or PM peak hour. Five of the seven intersections would have a minor beneficial impact, which equates to an improvement of one LOS grade. A moderate beneficial impact would be experienced by the signalized intersection of Spruill Avenue at McMillan Avenue in the AM peak hour and the stop-controlled intersection of North Hobson Avenue at McMillan Avenue in the PM peak hour. Alternative 1 (Proposed Project) would remove McMillan Avenue from St. Johns Avenue to Kephart Street, which would improve the Spruill Avenue at McMillan Avenue intersection operations, by reducing the volumes on McMillan Avenue. The North Hobson Avenue at McMillan Avenue intersection would have a moderate beneficial impact in the PM peak hour due to mitigation measures including lane geometry improvements.

Alternatively, Alternative 1 (Proposed Project) would have an adverse impact on ten intersections (11 percent of the total intersections) in either the AM or PM peak hour. Four of the 10 intersections would have a minor adverse impact, which equates to a degradation of one LOS grade. The four-way stop-controlled Noisette Boulevard at Turnbull Avenue intersection would have an adverse moderate impact in both the AM and PM peak hours, while the signalized intersection of Spruill Avenue at McMillan Avenue/ Cosgrove Avenue Realignment would have an adverse moderate impact in the AM peak hour.

The signalized intersection of Spruill Avenue at McMillan Avenue/ Cosgrove Avenue Realignment would have a major adverse impact in the PM peak hour. Alternative 1 (Proposed Project) would degrade the LOS at this intersection due to higher volumes on Cosgrove Avenue as a result of the

proposed ICTF and McMillan Avenue/ Cosgrove Avenue Realignment. Details on LOS changes are included in Appendix F.

The stop-controlled intersection of Noisette Boulevard and McMillan Avenue would have a major adverse impact in both the AM and PM peak hours as the LOS degrades from LOS E to LOS F. Alternative 1 (Proposed Project) would degrade the LOS at this intersection due to higher volumes on McMillan Avenue and Noisette Boulevard as a result of the proposed ICTF and McMillan Avenue/ Cosgrove Avenue Realignment.

The I-26 ramp terminal intersections at Cosgrove Avenue and I-26 Eastbound ramp terminal intersection at Montague Avenue are neither signalized nor stop-controlled. The ramp terminal intersections act as merge, diverge or weave elements along Cosgrove Avenue and Montague Avenue. All ten of the elements would operate at Good LOS during both the AM and PM peak hours in the opening year 2018 and design year 2038 Alternative 1 (Proposed Project) with the exception of the weave section on southbound Cosgrove Avenue during the PM peak hour in the design year 2038, which would operate at Fair LOS.

Table 4.8-17
North Charleston Intersection Impacts for Alternative 1 (Proposed Project)

Impact		AM Peak Hour		PM Peak Hour	
		2018	2038	2018	2038
Beneficial	Major	0	0	0	0
	Moderate	0	1	0	1
	Minor	1	3	2	2
Negligible		36	36	37	35
Adverse	Minor	5	1	3	3
	Moderate	1	2	2	1
	Major	1	1	0	2

Source: Atkins 2017 (Appendix F).

In the opening year 2018, two freeway elements were analyzed on the Port Access Road. The HLT would not be open to traffic in the year 2018, so all eastbound Port Access Road traffic would be destined to the Local Access Road and all westbound Port Access Road traffic would come from the Local Access Road. The two analyzed elements were the eastbound Port Access Road merge from the eastbound and westbound I-26 ramps and the split of the westbound Port Access Road to eastbound and westbound I-26. Same as the No-Action Alternative, both of these elements would operate at Good LOS during both the AM and PM peak hours in the opening year.

In the design year 2038, the analysis also included the on- and off- ramps from the Port Access Road to the Local Access Road. The HLT would be open, and the Port Access Road would serve most of the traffic to and from the facility, along with the traffic destined to the Local Access Road. Same as the No-Action Alternative, all four freeway elements on the Port Access Road would operate at Good LOS during both the AM and PM peak hours in the design year.

At-Grade Rail Crossings

The design of Alternative 1 (Proposed Project), and the presence of two separate arrival/departure tracks that allow connectivity to both CSX and NS rail lines, provides the opportunity for equal access by the Class I rail carriers. The Proposed Project's design allows it to manage and switch two trains at the same time. Assumptions for the number of train occurrences and average crossing time was based on a rail simulation model provided by Palmetto Railways and its consultants at the request of the Corps and included certain assumptions of Class I rail carrier service design that are outside the control of Palmetto Railways. In the initial years of operation, the analysis assumed that the facility would load/unload up to eight trains (i.e., two inbound and two outbound trains for NS and CSX for a total of eight train movements) every day. However, depending on capacity needs and service designs at facility opening and through initial years of operation, the distribution of arrival/departure trains connecting to NS or CSX rail lines may vary. Average train lengths may be less than 8,000 feet considering the TEU throughput that would occur at the ICTF. By the year 2038 (full build-out), the facility is expected to load/unload approximately eight trains (i.e., two inbound and two outbound trains for NS and CSX for a total of eight train movements) every day (based on assumed service design which may vary), although the average train lengths would be greater than 8,000 feet.

The opening year 2018 and design year 2038 Alternative 1 (Proposed Project) at-grade rail crossing analysis results are shown in Table 4.8-18 and Table 4.8-19, respectively. The number of train occurrences and average crossing time in Table 4.8-18 and Table 4.8-19 was based on a rail simulation model provided by Palmetto Railways and included certain assumptions of Class I rail carrier service design that are outside the control of Palmetto Railways. The rail model data provided the average number of trains and duration of occurrences for both intermodal and other commodity trains. The number of daily ICTF trains analyzed as passing each rail crossing is four as four trains were anticipated in the rail simulation model to arrive or depart from the southern rail connection and the northern rail connection. The at-grade rail crossing daily LOS for the opening year 2018 and design year 2038 of Alternative 1 (Proposed Project) is shown in Figure 4.8-7.

Compared with the No-Action Alternative, Alternative 1 (Proposed Project) would reroute approxi mately 1.2 other commodity trains per day from the Reads Branch line to the Park Circle and Bexley corridors. The impact Alternative 1 (Proposed Project) would have on the at-grade crossings along the Park Circle and Bexley corridors was not analyzed, because no ICTF trains would use these corridors.

Alternative 1 (Proposed Project) would have an impact on several of the at-grade rail crossings in North Charleston due to changing train and vehicular volumes and routes. The daily combined total rail occupancy time at the analyzed roadway crossings, which is defined by the number of occurrences multiplied by the average duration of each occurrence, would increase nearly 120 percent from the opening year 2018 No-Action Alternative to Alternative 1 (Proposed Project). In the design year 2038, the daily combined total rail occupancy time would increase over 180 percent.

In the opening year 2018, four at-grade crossings would operate with a Poor LOS. These four locations are the at-grade crossings of Virginia Avenue north of Empire Avenue, Avenue B east of Virginia Avenue, Hackemann Avenue between Meeting Street and King Street, and Discher Street between Meeting Street and King Street. Only the at-grade rail crossing of Discher Street would have a major adverse impact, as the LOS would degrade from LOS B in the No-Action Alternative to LOS E in Alternative 1 (Proposed Project). The at-grade rail crossing of Avenue B would have a negligible impact, because it would operate with a LOS F in both the No-Action Alternative and Alternative 1 (Proposed Project) and the average vehicle delay would increase less than 10 percent. The at-grade rail crossings of Virginia Avenue and Hackemann Avenue would have moderate adverse impacts as the LOS would degrade from a LOS D and a LOS C in the No-Action Alternative, respectively, to a LOS E in Alternative 1 (Proposed Project). None of the at-grade rail crossings would create a queue from an ICTF train occurrence that impacts an interstate mainline in the opening year 2018.

By the design year 2038, the average ICTF train crossing duration time would approximately double from the opening year 2018 value. The longer ICTF train crossing durations, as well as higher roadway volumes and longer other commodity train crossing durations, would lead to seven of the 12 at-grade crossing locations operating with a Poor LOS and eight of the twelve analyzed at-grade rail crossings having a major adverse impact in the design year 2038. Additionally, the at-grade rail crossings of Rivers Avenue north of Taylor Street, North Rhett Avenue south of I-526, and Dorchester Road west of Meeting Street would create a queue from an ICTF train occurrence that impacts an interstate mainline in the design year 2038. However, in the No-Action Alternative, only the Dorchester Road at-grade crossing would not impact an interstate mainline.

Table 4.8-18
Opening Year 2018 At-Grade Rail Crossings Analysis Results for Alternative 1 (Proposed Project)

ID[1]	Roadway Segment at Rail Crossing	Daily Volume (vehicles per day)	Number of Daily Train Crossings		Average Crossing Duration (min:sec)		Max ICTF Train Queue (feet)	ICTF Train Impact to Interstate Mainline	Roadway Network Delay per Vehicle (seconds per vehicle)	LOS	Impact	No-Action LOS
			Other	ICTF	Other	ICTF						
1	Rivers Avenue (US 78)	32,800	2.2	4.0	04:07	05:34	2,850	No	19.7	B	Minor	A
2	Attaway Street	4,500	3.7	4.0	03:47	05:38	800	No	14.5	B	Minor	A
3	North Rhett Avenue	16,200	3.7	4.0	07:16	05:38	>5,280	No	47.4	D	Negligible	D
4	Virginia Avenue	9,100	1.1	4.0	26:09	05:42	900	No	59.8	E	Moderate	D
5	Avenue B	9,000	1.1	4.0	34:34	05:40	2,500	No	89.2	F	Negligible	F
6	Dorchester Road (SC 642)	17,400	5.3	4.0	03:57	05:33	1,975	No	21.9	C	Minor	B
7	Accabee Road	3,100	5.3	4.0	03:10	05:32	450	No	14.4	B	Minor	A
8	Misroon Street	500	5.3	4.0	03:10	05:32	75	No	13.5	B	Minor	A
9	Hackemann Avenue	1,500	3.1	4.0	04:06	05:32	3,700	No	55.4	E	Moderate	C
10	Discher Street	3,100	5.3	4.0	03:09	05:31	2,950	No	64.2	E	Major	B
11	Pittsburgh Avenue	2,000	0.0	4.0	00:00	05:32	400	No	9.0	A	Negligible	A
12	Meeting Street & Herbert Street	19,700 & 900	0.0	4.0	00:00	05:32	2,800	No	9.1	A	Negligible	--

1. Analyzed at-grade crossing locations are shown in Figure 4.8-7.

Source: Appendix F.

Table 4.8-19
Design Year 2038 At-Grade Rail Crossings Analysis Results for Alternative 1 (Proposed Project)

ID[1]	Roadway Segment at Rail Crossing	Daily Volume (vehicles per day)	Number of Daily Train Crossings		Average Crossing Duration (min:sec)		Max ICTF Train Queue (feet)	ICTF Train Impact to Interstate Mainline	Roadway Network Delay per Vehicle (seconds per vehicle)	LOS	Impact	No-Action LOS
			Other	ICTF	Other	ICTF						
1	Rivers Avenue (US 78)	37,000	2.1	4.0	05:13	10:52	>5,280	Yes	65.9	E	Major	B
2	Attaway Street	6,200	3.7	4.0	06:21	10:52	2,150	No	49.5	D	Moderate	B
3	North Rhett Avenue	24,200	3.7	4.0	09:44	10:52	>5,280	Yes	170.0	F	[2]Negligible	F
4	Virginia Avenue	10,400	1.1	4.0	27:22	10:51	2,075	No	81.3	F	Major	D
5	Avenue B	10,100	1.1	4.0	35:38	10:50	>5,280	No	120.2	F	[2]Negligible	F
6	Dorchester Road (SC 642)	18,400	5.2	4.0	05:05	11:34	5,000	Yes	84.3	F	Major	B
7	Accabee Road	3,100	5.2	4.0	05:05	11:34	875	No	33.4	C	Moderate	A
8	Misroon Street	500	5.2	4.0	04:13	11:31	125	No	42.6	D	Major	A
9	Hackemann Avenue	1,500	3.1	4.0	05:29	11:31	>5,280	No	367.3	F	Major	E
10	Discher Street	3,200	5.2	4.0	04:12	10:46	>5,280	No	334.6	F	Major	E
11	Pittsburgh Avenue	2,100	0.0	4.0	00:00	10:46	875	No	44.1	D	Major	A
12	Meeting Street & Herbert Street	24,900 & 2,800	0.0	4.0	00:00	10:46	>5,280	No	36.6	D	Major	--

1. Analyzed at-grade crossing locations are shown in Figure 4.8-7.

2. Although the relative impact as compared to the No-Action is negligible the average delay per vehicle increased >20%.

Source: Appendix F.

4.8.4 Alternative 2: Proposed Project Site (South via Milford / North via S-line)

The following sections describe the transportation impacts associated with Alternative 2, which is described in detail in Section 2.4.3 and shown in Figure 2.4-1. Potential impacts discussed in this section include both temporary construction impacts and permanent impacts resulting from operations of the facility. The permanent operations analysis was performed for the year in which the proposed ICTF would open, 2018, and the design year 2038. Alternative 2 impacts are summarized in Section 4.8.11.

Alternative 2 would be a variation of Alternative 1 (Proposed Project) where the Northern Rail Connection would be relocated along Spruill Avenue within existing CSX ROW to the S-line, and turn east along Aragon Avenue to the existing NCTC rail line. As a result of the rail alignment, a cul-de-sac would be constructed at the southern end of St. Johns Avenue. The former Charleston Naval Complex gate at Turnbull Avenue will be open to provide future access between St. Johns Avenue and Noisette Boulevard. Due to these roadway changes, the Alternative 2 daily volumes on Spruill Avenue, St. Johns Avenue, and the proposed Cosgrove Avenue/ McMillan Avenue Bypass would differ from Alternative 1 (Proposed Project). The opening year 2018 and design year 2038 Alternative 2 daily volumes are shown in Appendix F.

Same as Alternative 1 (Proposed Project), Alternative 2 creates a new at-grade rail crossing at the intersection of Meeting Street (US 52) and Herbert Street. This analyzed at-grade rail crossing is identified by ID 12 in the tables. Additionally, Alternative 2 creates a new at-grade rail crossing of O-Hear Avenue south of Bexley Street, which is identified by ID 13 in the tables.

Construction, Interstate 26, Interstate 526 and U.S. Highway 17

Alternative 2 would have the same impacts during construction in opening year 2018 and design year 2038 to I-26, I-526 and US 17 as Alternative 1 (Proposed Project), which is described in Section 4.8.3.

North Charleston Intersections

Alternative 2 included the analysis of 32 signalized intersections and 15 stop-controlled intersections within North Charleston. All of the same intersections analyzed for Alternative 1 (Proposed Project) were analyzed for Alternative 2, plus the stop-controlled Turnbull Avenue at St. Johns Avenue intersection. The intersection operations and impacts described for Alternative 1 (Proposed Project) in Section 4.8.3 would be the same for Alternative 2 except for two intersections. The signalized intersection of Spruill Avenue at McMillan Avenue and the stop-controlled intersection of Turnbull Avenue at St. Johns Avenue would differ.

The worst of the AM and PM peak hour intersection LOS for the Alternative 2 opening year 2018 and design year 2038 are shown in Figure 4.8-8 and Figure 4.8-9, respectively. A summary of the North Charleston Alternative 2 intersection operations is shown in Table 4.8-20. A summary of the opening year 2018 and design year 2038 Alternative 2 North Charleston intersection impacts by peak hour is shown in Table 4.8-21.

The new stop-controlled intersection of Turnbull Avenue at St. Johns Avenue would operate at LOS A in opening year 2018 and design year 2038 AM and PM peak hours. An impact cannot be defined for the intersection because it did not exist in the No-Action Alternative.

In the opening year 2018 AM and PM peak hours, Spruill Avenue at McMillan Avenue would operate with the same LOS in both Alternative 1 (Proposed Project) and Alternative 2, as the No Action Alternative. Both Alternatives would have a negligible impact on this intersection. In the design year 2038 AM peak hour, the intersection would improve one LOS grade, compared to the No Action Alternative, to LOS D. Both Alternative 1 (Proposed Project) and Alternative 2 would have a moderate beneficial impact since the LOS improved from LOS E in the No Action Alternative. In the design year 2038 PM peak hour, compared to the No Action Alternative, the intersection would improve one LOS grade to LOS C. Alternative 1 (Proposed Project) and Alternative 2 would both have a minor beneficial impact.

Table 4.8-20
North Charleston Intersection Operations, Alternative 2

LOS	Signalized Intersections				Stop-Controlled Intersections			
	AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
	2018	2038	2018	2038	2018	2038	2018	2038
Good	31 (97%)	29 (91%)	29 (91%)	28 (88%)	12 (80%)	11 (73%)	14 (93%)	13 (87%)
Fair	1 (3%)	2 (6%)	3 (9%)	1 (3%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Poor	0 (0%)	1 (3%)	0 (0%)	3 (9%)	3 (20%)	4 (27%)	1 (7%)	2 (13%)

Source: Appendix F.

Table 4.8-21
North Charleston Intersection Impacts for Alternative 2

Impact		AM Peak Hour		PM Peak Hour	
		2018	2038	2018	2038
Beneficial	Major	0	0	0	0
	Moderate	0	1	0	1
	Minor	1	3	2	2
Negligible		36	36	37	35
Adverse	Minor	5	1	3	3
	Moderate	1	2	2	1
	Major	1	1	0	2

Source: Appendix F.

The I-26 ramp terminal intersections at Cosgrove Avenue and I-26 Eastbound ramp terminal intersection at Montague Avenue, along with the Port Access Road freeway elements, would operate the same and have the same impacts as Alternative 1 (Proposed Project).

At-Grade Rail Crossings

Alternative 2 would have the same operations and impacts to ten of the 12 at-grade rail crossings analyzed in Alternative 1 (Proposed Project). The at-grade rail crossing of Attaway Street south of Greenbay Drive and North Rhett Avenue south of I-526 would differ in Alternative 2. The at-grade rail crossings of Attaway Street and North Rhett Avenue would differ in Alternative 2 because it reroutes approximately 0.4 more other commodity trains per day from the Reads Branch line than Alternative 1 (Proposed Project). Compared with the No-Action Alternative, Alternative 2, would reroute approximately 1.6 other commodity trains per day from the Reads Branch line to the Park Circle and Bexley Corridors. The impact Alternative 2 would have on the at-grade crossings along the Park Circle and Bexley corridors was not analyzed, because no ICTF trains would use these corridors.

Additionally, because the Northern Rail Connection would be relocated to the S-line, and turn east along Aragon Avenue to the existing NCTC rail line, an additional at-grade rail crossing would be created at O'Hear Avenue south of Bexley Street. The at-grade crossing of O'Hear Avenue would operate at LOS A in the opening year 2018 and LOS B in the design year 2038. The opening year 2018 and design year 2038 Alternative 2 at-grade rail crossing analysis results are shown in Table 4.8-22 and Table 4.8-23, respectively. The at-grade rail crossing daily LOS for the opening year 2018 and design year 2038 of Alternative 2 is shown in Figure 4.8-10.

The daily combined total rail occupancy time at the analyzed roadway crossings, which is defined by the number of occurrences multiplied by the average duration of each occurrence, would increase approximately 125 percent from the opening year 2018 No-Action Alternative to Alternative 2. In the design year 2038, the daily combined total rail occupancy time would increase nearly 200 percent.

Table 4.8-22
Opening Year 2018 At-Grade Rail Crossings Analysis Results for Alternative 2

ID[1]	Roadway Segment at Rail Crossing	Daily Volume (vehicles per day)	Number of Daily Train Crossings		Average Crossing Duration (min:sec)		Max ICTF Train Queue (feet)	ICTF Train Impact to Interstate Mainline	Roadway Network Delay per Vehicle (seconds per vehicle)	LOS	Impact	No-Action LOS
			Other	ICTF	Other	ICTF						
1	Rivers Avenue (US 78)	32,800	2.2	4.0	04:07	05:34	2,850	No	19.7	B	Minor	A
2	Attaway Street	4,500	3.3	4.0	03:47	05:38	800	No	14.0	B	Minor	A
3	North Rhett Avenue	16,200	3.3	4.0	07:16	05:38	>5,280	No	45.8	D	Negligible	D
4	Virginia Avenue	9,100	1.1	4.0	26:09	05:42	900	No	59.7	E	Moderate	D
5	Avenue B	9,000	1.1	4.0	34:34	05:40	2,500	No	89.1	F	Negligible	F
6	Dorchester Road (SC 642)	17,400	5.3	4.0	03:57	05:33	1,975	No	21.9	C	Minor	B

ID[1]	Roadway Segment at Rail Crossing	Daily Volume (vehicles per day)	Number of Daily Train Crossings		Average Crossing Duration (min:sec)		Max ICTF Train Queue (feet)	ICTF Train Impact to Interstate Mainline	Roadway Network Delay per Vehicle (seconds per vehicle)	LOS	Impact	No-Action LOS
			Other	ICTF	Other	ICTF						
7	Accabee Road	3,100	5.3	4.0	03:10	05:32	450	No	14.4	B	Minor	A
8	Misroon Street	500	5.3	4.0	03:10	05:32	75	No	13.5	B	Minor	A
9	Hackemann Avenue	1,500	3.1	4.0	04:06	05:32	3,700	No	55.4	E	Moderate	C
10	Discher Street	3,100	5.3	4.0	03:09	05:31	2,950	No	64.2	E	Major	B
11	Pittsburgh Avenue	2,000	0.0	4.0	00:00	05:32	400	No	9.0	A	Negligible	A
12	Meeting Street & Herbert Street	19,700 & 900	0.0	4.0	00:00	05:32	2,800	No	9.1	A	Negligible	--
13	O'Hear Avenue	1,600	0.0	4.0	00:00	05:32	225	No	7.3	A	Negligible	--

1. Analyzed at-grade crossing locations are shown in Figure 4.8-10.

Source: Appendix F.

Table 4.8-23
Design Year 2038 At-Grade Rail Crossings Analysis Results for Alternative 2

ID[1]	Roadway Segment at Rail Crossing	Daily Volume (vehicles per day)	Number of Daily Train Crossings		Average Crossing Duration (min:sec)		Max ICTF Train Queue (feet)	ICTF Train Impact to Interstate Mainline	Roadway Network Delay per Vehicle (seconds per vehicle)	LOS	Impact	No-Action LOS
			Other	ICTF	Other	ICTF						
1	Rivers Avenue (US 78)	37,000	2.2	4.0	05:13	10:52	>5,280	Yes	66.1	E	Major	B
2	Attaway Street	6,200	3.3	4.0	06:21	10:52	2,150	No	48.5	D	Moderate	B
3	North Rhett Avenue	24,200	3.3	4.0	09:44	10:52	>5,280	Yes	166.0	F	Negligible[2]	F
4	Virginia Avenue	10,400	1.1	4.0	27:22	10:51	2,075	No	82.3	F	Major	D
5	Avenue B	10,100	1.1	4.0	35:38	10:50	>5,280	No	122.0	F	Negligible[2]	F
6	Dorchester Road (SC 642)	18,400	5.3	4.0	05:05	11:34	5,000	Yes	84.5	F	Major	B
7	Accabee Road	3,100	5.3	4.0	05:05	11:34	875	No	33.3	C	Moderate	A
8	Misroon Street	500	5.3	4.0	04:13	11:31	125	No	42.7	D	Major	A
9	Hackemann Avenue	1,500	3.1	4.0	05:29	11:31	>5,280	No	367.5	F	Major	E
10	Discher Street	3,200	5.3	4.0	04:12	10:46	>5,280	No	334.7	F	Major	E

ID[1]	Roadway Segment at Rail Crossing	Daily Volume (vehicles per day)	Number of Daily Train Crossings		Average Crossing Duration (min:sec)		Max ICTF Train Queue (feet)	ICTF Train Impact to Interstate Mainline	Roadway Network Delay per Vehicle (seconds per vehicle)	LOS	Impact	No-Action LOS
			Other	ICTF	Other	ICTF						
11	Pittsburgh Avenue	2,100	0.0	4.0	00:00	10:46	875	No	44.1	D	Major	A
12	Meeting Street & Herbert Street	24,900 & 2,800	0.0	4.0	00:00	10:46	>5,280	No	36.6	D	Major	-
13	O'Hear Avenue	3,100	0.0	4.0	00:00	10:49	450	No	12.4	B	Minor	-

1. Analyzed at-grade crossing locations are shown in Figure 4.8-10.

2. Although the relative impact as compared to the No-Action is negligible the average delay per vehicle increased >20%.

Source: Appendix F.

4.8.5 Alternative 3: Proposed Project Site (South via Kingsworth / North via Hospital District)

The following sections describe the transportation impacts associated with Alternative 3, which is described in detail in Section 2.4.4. Potential impacts discussed in this section include both temporary construction impacts and permanent impacts resulting from operations of the facility. The permanent operations analysis was performed for the year in which the proposed ICTF would open, 2018, and the design year 2038. Alternative 3 impacts are summarized in Section 4.8.11.

Alternative 3 would be a variation of Alternative 1 (Proposed Project) where the southern rail connection would connect to an existing rail line near Kingsworth Avenue. The daily volumes for Alternative 3 would be the same as Alternative 1 (Proposed Project), which are shown in Appendix F.

Construction, Interstate 26, Interstate 526, U.S. Highway 17 and North Charleston Intersections

Alternative 3 would have the same impacts during construction in the opening year 2018 and design year 2038 to I-26, I-526, US 17 and North Charleston intersections as Alternative 1 (Proposed Project), which is described in Section 4.8.3.

At-Grade Rail Crossings

Alternative 3 would have the same impacts to the first nine at-grade rail crossings analyzed in Alternative 1 (Proposed Project). Compared with the No-Action Alternative, same as Alternative 1 (Proposed Project), Alternative 3 would reroute approximately 1.2 other commodity trains per day from the Reads Branch line to the Park Circle and Bexley Corridors. The impact Alternative 3 would have on the at-grade crossings along the Park Circle and Bexley corridors was not analyzed because no ICTF trains would use these corridors.

In Alternative 3 the southern alignment would only go down to around Kingsworth Avenue. Therefore, the existing at-grade crossings of Pittsburgh Avenue and Discher Street would not be impacted with ICTF train occurrences and the new at-grade crossing of Meeting Street at Herbert Street would not be created for Alternative 3. Alternative 3 would create two new at-grade crossings. One at-grade crossing would be at Meeting Street and the other at Spruill Avenue, near Kingsworth Avenue. Because these two at-grade crossings are located close together and their operations would influence each other, their impacts were identified as one location. The at-grade crossings of Meeting Street and Spruill Avenue would operate at LOS A in the opening year 2018 and at LOS D in the design year 2038. Alternative 3 would have a major adverse impact on these two new at-grade crossings in the design year 2038. When there is an ICTF train occurrence, only I-26 and King Street Extension would serve as a connection between North Charleston and Charleston. The opening year 2018 and design year 2038 Alternative 3 at-grade rail crossing analysis results are shown in Table 4.8-24 and Table 4.8-25, respectively. The at-grade rail crossing daily LOS for the opening year 2018 and design year 2038 of Alternative 3 is shown in Figure 4.8-11.

The daily combined total rail occupancy time at the analyzed roadway crossings, which is defined by the number of occurrences multiplied by the average duration of each occurrence, would increase nearly 100 percent from the opening year 2018 No-Action Alternative to Alternative 3. In the design year 2038, the daily combined total rail occupancy time would increase approximately 150 percent.

Table 4.8-24
Opening Year 2018 At-Grade Rail Crossings Analysis Results for Alternative 3

ID[1]	Roadway Segment at Rail Crossing	Daily Volume (vehicles per day)	Number of Daily Train Crossings		Average Crossing Duration (min:sec)		Max ICTF Train Queue (feet)	ICTF Train Impact to Interstate Mainline	Roadway Network Delay per Vehicle (seconds per vehicle)	LOS	Impact	No-Action LOS
			Other	ICTF	Other	ICTF						
1	Rivers Avenue (US 78)	32,800	2.2	4.0	04:07	05:34	2,850	No	19.7	B	Minor	A
2	Attaway Street	4,500	3.7	4.0	03:47	05:38	800	No	14.5	B	Minor	A
3	North Rhett Avenue	16,200	3.7	4.0	07:16	05:38	>5,280	No	47.3	D	Negligible	D
4	Virginia Avenue	9,100	1.1	4.0	26:09	05:42	900	No	59.7	E	Moderate	D
5	Avenue B	9,000	1.1	4.0	34:34	05:40	2,500	No	89.0	F	Negligible	F
6	Dorchester Road (SC 642)	17,400	5.3	4.0	03:57	05:33	1,975	No	21.9	C	Minor	B
7	Accabee Road	3,100	5.3	4.0	03:10	05:32	450	No	14.4	B	Minor	A
8	Misroon Street	500	5.3	4.0	03:10	05:32	75	No	13.5	B	Minor	A
9	Hackemann Avenue	1,500	3.1	4.0	04:06	05:32	3,700	No	55.4	E	Moderate	C
10	Discher Street	3,100	5.3	0.0	03:09	00:00	-	-	-	-	-	B
11	Pittsburgh Avenue	2,000	0.0	0.0	00:00	00:00	-	-	-	-	-	A
14	Meeting Street & Spruill Avenue	6,700 & 13,100	0.0	4.0	00:00	05:32	>5,280	No	9.4	A	Negligible	-

1. Analyzed at-grade crossing locations are shown in Figure 4.8-11.

Source: Appendix F.

Table 4.8-25
Design Year 2038 At-Grade Rail Crossings Analysis Results for Alternative 3

ID[1]	Roadway Segment at Rail Crossing	Daily Volume (vehicles per day)	Number of Daily Train Crossings		Average Crossing Duration (min:sec)		Max ICTF Train Queue (feet)	ICTF Train Impact to Interstate Mainline	Roadway Network Delay per Vehicle (seconds per vehicle)	LOS	Impact	No-Action LOS
			Other	ICTF	Other	ICTF						
1	Rivers Avenue (US 78)	37,000	2.1	4.0	05:13	10:52	>5,280	Yes	65.9	E	Major	B
2	Attaway Street	6,200	3.7	4.0	06:21	10:52	2,150	No	49.5	D	Moderate	B
3	North Rhett Avenue	24,200	3.7	4.0	09:44	10:52	>5,280	Yes	169.9	F	[2]Negligible	F
4	Virginia Avenue	10,400	1.1	4.0	27:22	10:51	2,075	No	81.0	F	Major	D
5	Avenue B	10,100	1.1	4.0	35:38	10:50	>5,280	No	119.6	F	[2]Negligible	F
6	Dorchester Road (SC 642)	18,400	5.2	4.0	05:05	11:34	5,000	Yes	84.3	F	Major	B
7	Accabee Road	3,100	5.2	4.0	05:05	11:34	875	No	33.4	C	Moderate	A
8	Misroon Street	500	5.2	4.0	04:13	11:31	125	No	42.6	D	Major	A
9	Hackemann Avenue	1,500	3.1	4.0	05:29	11:31	>5,280	No	367.2	F	Major	E
10	Discher Street	3,200	5.3	0.0	04:12	0:00	-	-	-	-	-	E
11	Pittsburgh Avenue	2,100	0.0	0.0	00:00	00:00	-	-	-	-	-	A
14	Meeting Street & Spruill Avenue	9,700 & 15,600	0.0	4.0	00:00	10:45	>5,280	No	38.4	D	Major	-

1. Analyzed at-grade crossing locations are shown in Figure 4.8-11.

2. Although the relative impact as compared to the No-Action is negligible the average delay per vehicle increased >20%.

Source: Appendix F.

4.8.6 Alternative 4: Proposed Project Site (South via Milford)

The following sections describe the transportation impacts associated with Alternative 4, which is described in detail in Section 2.4.5. Potential impacts discussed in this section include both temporary construction impacts and permanent impacts resulting from operations of the facility. The permanent operations analysis was performed for the year in which the proposed ICTF would open, 2018, and the design year 2038. Alternative 4 impacts are summarized in Section 4.8.11.

Alternative 4 would be a variation of Alternative 1 (Proposed Project), where all rail traffic would enter and exit the Navy Base ICTF from a dual southern rail connection near Milford Street. Proposed rail through the Hospital District would stop short of Noisette Creek. The daily volumes for Alternative 3 would be the same as Alternative 1 (Proposed Project), which are shown in Appendix F.

Construction, Interstate 26, Interstate 526, U.S. Highway 17 and North Charleston Intersections

Alternative 4 would have the same impacts during construction, opening year 2018 and design year 2038 to I-26, I-526, US 17 and North Charleston intersections as Alternative 1 (Proposed Project), which is described in Section 4.8.3.

At-Grade Rail Crossings

In Alternative 4 all rail traffic would use the southern rail alignment to Milford Street. Since no intermodal trains would use the Alternative 1 (Proposed Project) northern alignment, Alternative 4 would not impact the at-grade crossings of Rivers Avenue, Virginia Avenue and Avenue B. The at-grade rail crossings of Attaway Street and North Rhett Avenue would differ compared to the No-Action Alternative because Alternative 4 reroutes approximately 1.6 other commodity trains per day from the Reads Branch line to the Park Circle and Bexley Corridors. The impact Alternative 4 would have on the at-grade crossings along the Reads Branch, Park Circle and Bexley corridors was not analyzed because no ICTF trains would use these corridors.

Alternative 4 would have twice as many ICTF train occurrences than Alternative 1 (Proposed Project), eight per day, at the at-grade crossings along the southern alignment. The daily combined total rail occupancy time at the analyzed roadway crossings, which is defined by the number of occurrences multiplied by the average duration of each occurrence, would increase nearly 135 percent from the opening year 2018 No-Action Alternative for Alternative 4. In the design year 2038, the daily combined total rail occupancy time would increase approximately 215 percent.

Alternative 4 would have an impact on all seven of the analyzed at-grade rail crossings along the southern alignment. In the opening year 2018, two at-grade crossings would operate with a Poor LOS. These two locations are the at-grade crossings of Hackemann Avenue and Discher Street, both of which are located between Meeting Street and King Street. Alternative 4 would have a major adverse impact on both of these crossings, as Meeting Street and King Street would experience queueing and delay. None of the at-grade rail crossings would create a queue from an ICTF train occurrence that impacts an interstate mainline in the opening year 2018.

By the design year 2038, the average ICTF train crossing duration time would approximately double from the opening year 2018 value. The longer ICTF train crossing durations, as well as higher roadway volumes and longer other commodity train crossing durations, would lead to all seven of the at-grade crossing locations along the southern alignment operating with a Poor LOS. Alternative 4 would have a major adverse impact on all seven at-grade crossing locations. Additionally, the at-grade rail crossing of Dorchester Road west of Meeting Street would create a queue from an ICTF train occurrence that impacts an interstate mainline in the design year 2038.

The opening year 2018 and design year 2038 Alternative 4 at-grade rail crossing analysis results are shown in Table 4.8-26 and Table 4.8-27, respectively. The at-grade rail crossing daily LOS for the opening year 2018 and design year 2038 of Alternative 4 is shown in Figure 4.8-12.

Table 4.8-26
Opening Year 2018 At-Grade Rail Crossings Analysis Results for Alternative 4

ID[1]	Roadway Segment at Rail Crossing	Daily Volume (vehicles per day)	Number of Daily Train Crossings		Average Crossing Duration (min:sec)		Max ICTF Train Queue (feet)	ICTF Train Impact to Interstate Mainline	Roadway Network Delay per Vehicle (seconds per vehicle)	LOS	Impact	No-Action LOS
			Other	ICTF	Other	ICTF						
1	Rivers Avenue (US 78)	32,800	2.2	0.0	04:07	00:00	-	-	-	-	-	A
2	Attaway Street	4,500	3.3	0.0	03:47	00:00	-	-	-	-	-	A
3	North Rhett Avenue	16,200	3.3	0.0	07:16	00:00	-	-	-	-	-	D
4	Virginia Avenue	9,100	1.2	0.0	26:09	00:00	-	-	-	-	-	D
5	Avenue B	9,000	1.2	0.0	34:34	00:00	-	-	-	-	-	F
6	Dorchester Road (SC 642)	17,400	5.3	8.0	03:57	05:33	1,975	No	34.4	C	Minor	B
7	Accabee Road	3,100	5.3	8.0	03:10	05:32	450	No	20.9	C	Moderate	A
8	Misroon Street	500	5.3	8.0	03:10	05:32	75	No	21.8	C	Moderate	A
9	Hackemann Avenue	1,500	3.1	8.0	04:06	05:32	3,700	No	89.9	F	Major	C
10	Discher Street	3,100	5.3	8.0	03:09	05:31	2,950	No	108.1	F	Major	B
11	Pittsburgh Avenue	2,000	0.0	8.0	00:00	05:32	400	No	18.1	B	Minor	A
12	Meeting Street & Herbert Street	19,700 & 900	0.0	8.0	00:00	05:32	2,800	No	18.1	B	Minor	-

1. Analyzed at-grade crossing locations are shown in Figure 4.8-12.

Source: Appendix F.

Table 4.8-27
Design Year 2038 At-Grade Rail Crossings Analysis Results for Alternative 4

ID[1]	Roadway Segment at Rail Crossing	Daily Volume (vehicles per day)	Number of Daily Train Crossings		Average Crossing Duration (min:sec)		Max ICTF Train Queue (feet)	ICTF Train Impact to Interstate Mainline	Roadway Network Delay per Vehicle (seconds per vehicle)	LOS	Impact	No-Action LOS
			Other	ICTF	Other	ICTF						
1	Rivers Avenue (US 78)	37,000	2.2	0.0	05:13	00:00	-	-	-	-	-	B
2	Attaway Street	6,200	3.3	0.0	06:21	00:00	-	-	-	-	-	B
3	North Rhett Avenue	24,200	3.3	0.0	09:44	00:00	-	-	-	-	-	F
4	Virginia Avenue	10,400	1.2	0.0	27:22	00:00	-	-	-	-	-	D
5	Avenue B	10,100	1.2	0.0	35:38	00:00	-	-	-	-	-	F
6	Dorchester Road (SC 642)	18,400	5.3	8.0	05:05	11:34	5,000	Yes	149.1	F	Major	B
7	Accabee Road	3,100	5.3	8.0	05:05	11:34	875	No	58.8	E	Major	A
8	Misroon Street	500	5.3	8.0	04:13	11:31	125	No	75.9	E	Major	A
9	Hackemann Avenue	1,500	3.1	8.0	05:29	11:31	>5,280	No	679.2	F	Major	E
10	Discher Street	3,200	5.3	8.0	04:12	10:46	>5,280	No	591.8	F	Major	E
11	Pittsburgh Avenue	2,100	0.0	8.0	00:00	10:46	875	No	88.1	F	Major	A
12	Meeting Street & Herbert Street	24,900 & 2,800	0.0	8.0	00:00	10:46	>5,280	No	73.2	E	Major	-

1. Analyzed at-grade crossing locations are shown in Figure 4.8-12.

Source: Appendix F.

4.8.7 Alternative 5: River Center Project Site (South via Milford / North via Hospital District)

The following sections describe the transportation impacts associated with Alternative 5, which is described in detail in Section 2.4.6. Potential impacts discussed in this section include both temporary construction impacts and permanent impacts resulting from operations of the facility. The permanent operations analysis was performed for the year in which the proposed ICTF would open, 2018, and the design year 2038. The Alternative 5 impacts are summarized in Section 4.8.11.

Alternative 5 would be a variation of Alternative 1 (Proposed Project), with the Project site being moved to the River Center project site. Road and rail improvements would be adjusted accordingly to facilitate rail and road traffic at the new site. The primary roadway network change would be the elimination of the McMillan Avenue/ Cosgrove Avenue Realignment in Alternative 5.

As with as Alternative 1 (Proposed Project), Alternative 5 would also create a new at-grade rail crossing at the intersection of Meeting Street (US 52) and Herbert Street. This analyzed at-grade rail crossing network is identified by ID 12 in the tables.

Traffic patterns around the proposed ICTF at River Center site change compared to the No-Action Alternative due to the ICTF and modifications to the roadway network. The distribution of the River Center project site ICTF truck traffic between the container Port Terminals and other regional sites would be the same as the Project site, which is shown in Exhibit 4.8-1 in Section 4.8.3. Additionally, the total volume of truck, employee, and visitor traffic destined to and from the proposed ICTF at River Center would be the same as the Project site shown in Section 4.8.3. Roadway modifications, which are discussed in Section 2.4.6, lead to increased volumes compared to the No-Action Alternative primarily on Spruill Avenue north of McMillan Avenue, Noisette Boulevard, and the Local Access Road. The opening year 2018 and design year 2038 Alternative 5 daily volumes are shown in Appendix F.

Construction

During construction of the ICTF and associated roadway improvements, Alternative 5 would have a negligible impact on I-26, I-526 and US 17 and a minor adverse impact on the operations of the North Charleston intersections. The Corps anticipates that at the peak of construction, up to 200 trips per day would be generated. The construction traffic would primarily use major arterial roadways such as I-26, I-526, Cosgrove Avenue, McMillan Avenue, Rivers Avenue and Spruill Avenue. The 200 construction trips per day would only be a small fraction of the daily volumes on these roadways, especially the interstates. A maintenance of traffic (MOT) plan has not been developed but may include detours and temporary lane closures. MOTs are typically developed once final design is complete, prior to construction.

Interstate 26

Consistent with the opening year 2018 No-Action Alternative, the morning congestion on I-26 occurs in the eastbound direction, and the evening congestion occurs in the westbound direction for Alternative 5. Approximately 13 percent of the total analyzed segments (AM and PM peak hours for eastbound and westbound I-26) would operate at Poor LOS and 26 percent would operate at Fair LOS. By the design year 2038, approximately 24 percent of the total analyzed segments would operate at Poor LOS and 21 percent would operate at Fair LOS. A summary of the I-26 freeway segment LOS by direction and peak hour is shown in Table 4.8-28.

Table 4.8-28
I-26 Operations, Alternative 5

LOS	Eastbound				Westbound			
	AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
	2018	2038	2018	2038	2018	2038	2018	2038
Good	15 Segments (36%)	13 Segments (31%)	36 Segments (86%)	31 Segments (74%)	34 Segments (90%)	33 Segments (87%)	13 Segments (34%)	11 Segments (29%)
Fair	17 Segments (40%)	9 Segments (21%)	4 Segments (9%)	8 Segments (19%)	2 Segments (5%)	3 Segments (8%)	19 Segments (50%)	14 Segments (37%)
Poor	10 Segments (24%)	20 Segments (48%)	2 Segments (5%)	3 Segments (7%)	2 Segments (5%)	2 Segments (5%)	6 Segments (16%)	13 Segments (34%)

Note: Segments include basic freeway, weave, and ramp merge and diverge locations, which may vary in number between eastbound and westbound I-26.

Source: Appendix F.

In the opening year 2018 and design year 2038, Alternative 5 would have a negligible impact on the majority of the I-26 corridor in comparison with the No-Action Alternative. Alternative 5 would have a beneficial or adverse impact on a few segments due to a LOS change. The LOS change is a result of the segments having a density near a LOS threshold. All segments would only have a slight increase or decrease in density. A summary of the opening year 2018 and design year 2038 I-26 freeway impacts by direction and peak hour is shown in Table 4.8-29.

Table 4.8-29
Number of I-26 Freeway Segment Impacts, Alternative 5

Impact		Eastbound				Westbound			
		AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
		2018	2038	2018	2038	2018	2038	2018	2038
Beneficial	Major	0	0	0	0	0	0	0	0
	Moderate	0	0	0	0	0	0	1	0
	Minor	1	2	0	2	0	4	1	1
Negligible		39	39	41	40	36	34	34	35
Adverse	Minor	1	0	1	0	2	0	1	1
	Moderate	1	1	0	0	0	0	1	1
	Major	0	0	0	0	0	0	0	0

Note: Segments include basic freeway, weave, and ramp merge and diverge locations, which may vary in number between eastbound and westbound I-26.

Source: Appendix F.

Interstate 526

Similar to the opening year 2018 No-Action Alternative, the majority of the congestion along I-526 would occur between Paul Cantrell Boulevard and Long Point Road. Approximately 23 percent of the total analyzed segments (AM and PM peak hours for eastbound and westbound I-526) would operate at Poor LOS and 39 percent would operate at Fair LOS. By the design year 2038, approximately 35 percent of the total analyzed segments would operate at Poor LOS and 34 percent would operate at Fair LOS. A summary of the I-526 freeway segment LOS by direction and peak hour is shown in Table 4.8-30.

Table 4.8-30
I-526 Operations, Alternative 5

LOS	Eastbound				Westbound			
	AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
	2018	2038	2018	2038	2018	2038	2018	2038
Good	17 Segments (38%)	14 Segments (31%)	13 Segments (29%)	13 Segments (28%)	17 Segments (40%)	12 Segments (28%)	19 Segments (44%)	16 Segments (37%)
Fair	16 Segments (35%)	14 Segments (31%)	23 Segments (51%)	16 Segments (36%)	14 Segments (32%)	14 Segments (33%)	16 Segments (37%)	15 Segments (35%)
Poor	12 Segments (27%)	17 Segments (38%)	9 Segments (20%)	16 Segments (36%)	12 Segments (28%)	17 Segments (39%)	8 Segments (19%)	12 Segments (28%)

Note: Segments include basic freeway, weave, and ramp merge and diverge locations, which may vary in number between eastbound and westbound I-526.

Source: Appendix F.

In the opening year 2018 and design year 2038, Alternative 5 would have a negligible impact on the majority of the I-526 corridor in comparison with the No-Action Alternative. Alternative 5 would have a beneficial or adverse impact on a few segments due to a LOS change. The LOS change is a result of the segments having a density near a LOS threshold. All segments would only have a slight increase or decrease in density. A summary of the opening year 2018 and design year 2038 I-526 freeway impacts by direction and peak hour is shown in Table 4.8-31.

Table 4.8-31
Number of I-526 Freeway Segment Impacts, Alternative 5

Impact		Eastbound				Westbound			
		AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
		2018	2038	2018	2038	2018	2038	2018	2038
Beneficial	Major	1	1	0	2	2	0	0	0
	Moderate	0	0	1	0	0	0	0	0
	Minor	0	1	0	0	1	0	0	1
Negligible		43	41	44	39	40	38	43	36
Adverse	Minor	0	2	0	1	0	3	0	1
	Moderate	1	0	0	3	0	1	0	3
	Major	0	0	0	0	0	1	0	2

Note: Segments include basic freeway, weave, and ramp merge and diverge locations, which may vary in number between eastbound and westbound I-526.

Source: Appendix F.

U.S. Highway 17

Similar to the opening year 2018 No-Action Alternative, the majority of the US 17 corridor would operate at Good or Fair levels for Alternative 5. Only one freeway segment and no intersections would operate at Poor LOS in either the AM or PM peak hour. By the design year 2038, no additional freeway segments and three additional intersections would operate at Poor LOS in either the AM or PM peak hour. A summary of the US 17 freeway segment LOS by direction and peak hour is shown in Table 4.8-32. A summary of the US 17 signalized intersection operations is shown in Table 4.8-33.

Table 4.8-32
US 17 Freeway Operations, Alternative 5

LOS	Eastbound				Westbound			
	AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
	2018	2038	2018	2038	2018	2038	2018	2038
Good	10 Segments (100%)	9 Segments (90%)	8 Segments (80%)	5 Segments (50%)	11 Segments (100%)	8 Segments (73%)	11 Segments (100%)	10 Segments (91%)
Fair	0 Segments (10%)	1 Segment (10%)	1 Segment (10%)	4 Segments (40%)	0 Segments (0%)	3 Segments (27%)	0 Segments (0%)	1 Segment (9%)
Poor	0 Segments (0%)	0 Segments (0%)	1 Segment (10%)	1 Segment (10%)	0 Segments (0%)	0 Segments (0%)	0 Segments (0%)	0 Segments (0%)

Note: Segments include basic freeway, weave, and ramp merge and diverge locations, which may vary in number between northbound and southbound US 17.

Source: Appendix F.

Table 4.8-33
US 17 Intersection Operations, Alternative 5

LOS	AM Peak Hour		PM Peak Hour	
	2018	2038	2018	2038
Good	2 Intersections (40%)	2 Intersections (40%)	3 Intersections (60%)	2 Intersections (40%)
Fair	3 Intersections (60%)	2 Intersections (40%)	2 Intersections (40%)	1 Intersection (20%)
Poor	0 Intersections (0%)	1 Intersection (20%)	0 Intersections (0%)	2 Intersections (40%)

Source: Appendix F.

In the opening year 2018, Alternative 5 would have a negligible impact on the majority of the US 17 corridor in comparison with the No-Action Alternative. Alternative 5 would have a beneficial impact on four US 17 segments (10 percent of the total segments) and two US 17 intersections (20 percent of the total intersections) in either the AM or PM peak hour. All four of the freeway segments and one of the two intersections would have a minor beneficial impact, which equates to an improvement of one LOS grade. The intersection of US 17 at Shelmore Boulevard would have a moderate beneficial

impact in the AM peak hour. Alternatively, Alternative 5 would have an adverse impact on no US 17 segments and one US 17 intersection (10 percent of the total intersections) in either the AM or PM peak hour. The one intersection would have a minor adverse impact, which equates to a degradation of one LOS grade. In the design year 2038, Alternative 5 would have a negligible impact on all but one of the analyzed US 17 freeway segments and all of the US 17 intersections. Alternative 5 would have a moderate beneficial impact on the northbound US 17 diverge to Coleman Boulevard in the PM peak hour but would only experience a small decrease in density. A summary of the opening year 2018 and design year 2038 US 17 freeway impacts by direction and peak hour is shown in Table 4.8-34. A summary of the opening year 2018 and design year 2038 US 17 intersection impacts by peak hour is shown in Table 4.8-35.

Table 4.8-34
US 17 Freeway Segment Impacts for Alternative 5

Impact		Northbound				Southbound			
		AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
		2018	2038	2018	2038	2018	2038	2018	2038
Beneficial	Major	0	0	0	0	0	0	0	0
	Moderate	0	0	0	1	0	0	0	0
	Minor	2	0	0	0	2	0	0	0
Negligible		8	10	10	9	9	11	11	11
Adverse	Minor	0	0	0	0	0	0	0	0
	Moderate	0	0	0	0	0	0	0	0
	Major	0	0	0	0	0	0	0	0

Note: Segments include basic freeway, weave, and ramp merge and diverge locations, which may vary in number between northbound and southbound US 17.

Source: Appendix F.

Table 4.8-35
US 17 Intersection Impacts for Alternative 5

Impact		AM Peak Hour		PM Peak Hour	
		2018	2038	2018	2038
Beneficial	Major	0	0	0	0
	Moderate	1	0	0	0
	Minor	0	0	1	0
Negligible		3	5	4	5
Adverse	Minor	1	0	0	0
	Moderate	0	0	0	0
	Major	0	0	0	0

Source: Appendix F.

North Charleston Intersections

Alternative 5 included the analysis of 32 signalized intersections and 12 stop-controlled intersections within North Charleston. The ICTF truck driveway would replace the east leg of Cosgrove Avenue at the signalized intersection with Spruill Avenue. The ICTF employee and visitor driveway would create a new stop-controlled intersection at St. Johns Avenue where Turnbull Avenue currently exists. The segment of McMillan Avenue between St. Johns Avenue and Noisette Boulevard would be closed, which eliminates two of the stop-controlled intersections analyzed as part of the No-Action Alternative. Additionally, the removal of Viaduct Road eliminates two stop-controlled intersections, which are the ramps connecting Viaduct Road and Bainbridge Avenue. The existing stop-controlled Viaduct Road intersection at North Hobson Avenue and South Hobson Avenue is replaced with a stop-controlled intersection where the Local Access Road, North Hobson Avenue, and South Hobson Avenue meet. Finally, Bainbridge Avenue would be slightly realigned at "T" into the Local Access Road as a signalized intersection.

The worst of the AM and PM peak hour intersection LOS for the Alternative 5 opening year 2018 and design year 2038 are shown in Figure 4.8-13 and Figure 4.8-14 respectively. A summary of the North Charleston intersection operations is shown in Table 4.8-36.

Consistent with the opening year 2018 No-Action Alternative, within North Charleston, the majority of the analyzed intersections operate with little delay. The stop-controlled intersections of Virginia Avenue at Avenue B and the I-526 Eastbound Off-Ramp at Virginia Avenue are the only intersections that would operate with a Poor LOS.

Table 4.8-36
North Charleston Intersection Operations, Alternative 5

LOS	Signalized Intersections				Stop-Controlled Intersections			
	AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
	2018	2038	2018	2038	2018	2038	2018	2038
Good	32 (100%)	30 (94%)	30 (94%)	28 (88%)	10 (83%)	8 (67%)	11 (92%)	11 (92%)
Fair	0 (0%)	2 (6%)	2 (6%)	2 (6%)	0 (0%)	1 (8%)	1 (8%)	0 (0%)
Poor	0 (0%)	0 (0%)	0 (0%)	2 (6%)	2 (17%)	3 (25%)	0 (0%)	1 (8%)

Source: Appendix F.

By the design year 2038, a few additional intersections would operate with Poor LOS but the majority of the intersections would still operate with little delay. The signalized intersection of Cosgrove Avenue at Rivers Avenue and Cosgrove Avenue at Azalea Drive, the stop-controlled intersections of Turnbull Avenue at Noisette Boulevard, Avenue B at Virginia Avenue, Montague Avenue at Virginia Avenue, and the I-526 Eastbound Off-Ramp at Virginia Avenue are the only intersections that would operate with a Poor LOS.

A summary of the opening year 2018 and design year 2038 Alternative 5 North Charleston intersection impacts by peak hour is shown in Table 4.8-37. The stop-controlled intersection of the ICTF employee and visitor driveway at St. Johns Avenue did not exist in the No-Action Alternative so it was only analyzed in Alternative 5. An impact cannot be defined for this intersection, because it was not analyzed in the No-Action Alternative. However, the intersection would operate at Good LOS in the opening year 2018 and design year 2038 Alternative 5 for both the AM and PM peak hours.

In the opening year 2018, Alternative 5 would have a negligible impact on the majority of the analyzed intersections in North Charleston compared with the No-Action Alternative. Alternative 5 would have a beneficial impact on two intersections (2 percent of the total intersections) in either the AM or PM peak hour. Both of the intersections would have a minor beneficial impact, which equates to an improvement of one LOS grade. Alternatively, Alternative 5 would have an adverse impact on seven intersections (8 percent of the total intersections) in either the AM or PM peak hour. All seven of the intersections would have a minor adverse impact, which equates to a degradation of one LOS grade.

Table 4.8-37
North Charleston Intersection Impacts, Alternative 5

Impact		AM Peak Hour		PM Peak Hour	
		2018	2038	2018	2038
Beneficial	Major	0	0	0	0
	Moderate	0	1	0	0
	Minor	2	4	0	4
Negligible		38	33	39	35
Adverse	Minor	3	4	4	3
	Moderate	0	0	0	0
	Major	0	1	0	1

Source: Appendix F.

In the design year 2038, similar to the opening year 2018, Alternative 5 would have a negligible impact on the majority of the analyzed intersections in North Charleston compared with the No-Action Alternative. Alternative 5 would have a beneficial impact on nine intersections (10 percent of the total intersections) in either the AM or PM peak hour. Eight of the nine intersections would have a minor beneficial impact, which equates to an improvement of one LOS grade. A moderate beneficial impact would be experienced by the signalized intersection of Spruill Avenue at McMillan Avenue in the AM peak hour. The intersection LOS would improve, because the traffic volume on McMillan Avenue would go down in Alternative 5 as McMillan Avenue would be closed between St. Johns Avenue and Noisette Boulevard to accommodate the ICTF.

Alternatively, in the design year 2038, Alternative 5 would have an adverse impact on nine intersections (10 percent of the total intersections) in either the AM or PM peak hour. Seven of the nine intersections would have a minor adverse impact, which equates to a degradation of one LOS grade. The stop-controlled Montague Avenue at Virginia Avenue intersection would have an adverse major impact in both the AM and PM peak hours. Traffic volumes at this intersection would increase due to the closure of McMillan Avenue between St. Johns Avenue and Noisette Boulevard and due to the additional ICTF employee and visitor traffic.

The I-26 ramp terminal intersections at Cosgrove Avenue and I-26 Eastbound ramp terminal intersection at Montague Avenue are neither signalized nor stop-controlled. The ramp terminal intersections act as merge, diverge or weave elements along Cosgrove Avenue and Montague Avenue. All ten of the elements would operate at Good LOS during both the AM and PM peak hours in the opening year 2018 and design year 2038 Alternative 5.

In the opening year 2018, two freeway elements were analyzed on the Port Access Road. The HLT would not be open to traffic in the year 2018, so all eastbound Port Access Road traffic would be destined to the Local Access Road and all westbound Port Access Road traffic would come from the Local Access Road. The two analyzed elements were the eastbound Port Access Road merge from the eastbound and westbound I-26 ramps and the split of the westbound Port Access Road to eastbound and westbound I-26. Same as the No-Action Alternative, both of these elements would operate at Good LOS during both the AM and PM peak hours in the opening year.

In the design year 2038, the analysis also included the on- and off- ramps from the Port Access Road to the Local Access Road. The HLT would be open, and the Port Access Road would serve most of the traffic to and from the facility along with the traffic destined to the Local Access Road. Same as the No-Action Alternative, all four freeway elements on the Port Access Road would operate at Good LOS during both the AM and PM peak hours in the design year.

At-Grade Rail Crossings

For Alternative 5, the number of ICTF and other commodity train occurrences and the average duration of the occurrences would be the same as Alternative 1 (Proposed Project), while the roadway volumes would be different. The opening year 2018 and design year 2038 Alternative 5 at-grade rail crossing analysis results are shown in Table 4.8-38 and Table 4.8-39, respectively. The at-grade rail crossing daily LOS for the opening year 2018 and design year 2038 of Alternative 5 is shown in Figure 4.8-15.

Compared with the No-Action Alternative, Alternative 5 would reroute approximately 1.2 other commodity trains per day from the Reads Branch line to the Park Circle and Bexley corridors. The impact Alternative 5 would have on the at-grade crossings along the Park Circle and Bexley corridors was not analyzed, because no ICTF trains would use these corridors.

Alternative 5 would have an impact on several of the at-grade rail crossings in North Charleston due to changing train and vehicular volumes and routes. The daily combined total rail occupancy time at the analyzed roadway crossings, which is defined by the number of occurrences multiplied by the average duration of each occurrence, would increase nearly 120 percent from the opening year 2018 No-Action Alternative to Alternative 5. In the design year 2038, the daily combined total rail occupancy time would increase over 180 percent.

Table 4.8-38
Opening Year 2018 At-Grade Rail Crossings Analysis Results for Alternative 5

ID[1]	Roadway Segment at Rail Crossing	Daily Volume (vehicles per day)	Number of Daily Train Crossings		Average Crossing Duration (min:sec)		Max ICTF Train Queue (feet)	ICTF Train Impact to Interstate Mainline	Roadway Network Delay per Vehicle (seconds per vehicle)	LOS	Impact	No-Action LOS
			Other	ICTF	Other	ICTF						
1	Rivers Avenue (US 78)	32,600	2.2	4.0	04:07	05:34	2,925	No	18.2	B	Minor	A
2	Attaway Street	4,500	3.7	4.0	03:47	05:38	775	No	14.3	B	Minor	A
3	North Rhett Avenue	16,400	3.7	4.0	07:16	05:38	>5,280	Yes	50.3	D	Negligible	D
4	Virginia Avenue	9,200	1.1	4.0	26:09	05:42	900	No	57.6	E	Moderate	D
5	Avenue B	7,500	1.1	4.0	34:34	05:40	1,925	No	90.4	F	Negligible	F
6	Dorchester Road (SC 642)	17,000	5.3	4.0	03:57	05:33	2,125	No	25.3	C	Minor	B
7	Accabee Road	3,100	5.3	4.0	03:10	05:32	450	No	15.1	B	Minor	A
8	Misroon Street	500	5.3	4.0	03:10	05:32	75	No	13.5	B	Minor	A
9	Hackemann Avenue	1,500	3.1	4.0	04:06	05:32	3,675	No	48.9	D	Minor	C
10	Discher Street	3,100	5.3	4.0	03:09	05:31	3,450	No	58.7	E	Major	B
11	Pittsburgh Avenue	2,000	0.0	4.0	00:00	05:32	400	No	10.3	B	Minor	A
12	Meeting Street & Herbert Street	18,000 & 900	0.0	4.0	00:00	05:32	2,900	No	8.8	A	Negligible	--

1. Analyzed at-grade crossing locations are shown in Figure 4.8-15.

Source: Appendix F.

Table 4.8-39
Design Year 2038 At-Grade Rail Crossings Analysis Results for Alternative 5

ID[1]	Roadway Segment at Rail Crossing	Daily Volume (vehicles per day)	Number of Daily Train Crossings		Average Crossing Duration (min:sec)		Max ICTF Train Queue (feet)	ICTF Train Impact to Interstate Mainline	Roadway Network Delay per Vehicle (seconds per vehicle)	LOS	Impact	No-Action LOS
			Other	ICTF	Other	ICTF						
1	Rivers Avenue (US 78)	37,200	2.1	4.0	05:13	10:52	>5,280	Yes	64.3	E	Major	B
2	Attaway Street	6,300	3.7	4.0	06:21	10:52	2,200	No	50.4	D	Moderate	B
3	North Rhett Avenue	23,900	3.7	4.0	09:44	10:52	>5,280	Yes	185.1	F	[2]Negligible	F
4	Virginia Avenue	11,300	1.1	4.0	27:22	10:51	2,700	Yes	87.5	F	Major	D
5	Avenue B	9,600	1.1	4.0	35:38	10:50	>5,280	No	117.2	F	[2]Negligible	F
6	Dorchester Road (SC 642)	17,300	5.2	4.0	05:05	11:34	4,650	Yes	84.0	F	Major	B
7	Accabee Road	3,100	5.2	4.0	05:05	11:34	875	No	37.6	D	Major	A
8	Misroon Street	500	5.2	4.0	04:13	11:31	125	No	43.2	D	Major	A
9	Hackemann Avenue	1,500	3.1	4.0	05:29	11:31	>5,280	No	386.6	F	Major	E
10	Discher Street	3,200	5.2	4.0	04:12	10:46	>5,280	No	330.8	F	Major	E
11	Pittsburgh Avenue	2,100	0.0	4.0	00:00	10:46	825	No	45.5	D	Major	A
12	Meeting Street & Herbert Street	23,600 & 2,800	0.0	4.0	00:00	10:46	>5,280	No	36.6	D	Major	-

1. Analyzed at-grade crossing locations are shown in Figure 4.8-15.

2. Although the relative impact as compared to the No-Action is negligible the average delay per vehicle increased >20%.

Source: Appendix F.

In the opening year 2018, three at-grade crossings would operate with a Poor LOS. These three locations are the at-grade crossings of Virginia Avenue north of Empire Avenue, Avenue B east of Virginia Avenue, and Discher Street between Meeting Street and King Street. Only the at-grade rail crossing of Discher Street would have a major adverse impact. The at-grade rail crossing of Avenue B would have a negligible impact, because it would operate with a LOS F in both the No-Action Alternative and Alternative 5 and the average vehicle delay would only increase approximately ten percent. The at-grade rail crossing of Virginia Avenue would have a moderate adverse impact, as the LOS would degrade from a LOS D in the No-Action Alternative to a LOS E in Alternative 5. None of the at-grade rail crossings would create a queue from an ICTF train occurrence that impacts an interstate mainline in the opening year 2018. The at-grade rail crossings of North Rhett Avenue south of I-526 would create a queue from an ICTF train occurrence that impacts the I-526 mainline in the opening year 2018. However, this would also occur with another commodity train occurrence in the opening year 2018 No-Action Alternative.

By the design year 2038, the average ICTF train crossing duration time would approximately double from the opening year 2018 value. The longer ICTF train crossing durations, as well as higher roadway volumes and longer other commodity train crossing durations, would lead to seven of the 12 at-grade crossing locations operating with a Poor LOS and nine of the 12 analyzed at-grade rail crossings having a major adverse impact in the design year 2038. Additionally, the at-grade rail crossings of Rivers Avenue north of Taylor Street, North Rhett Avenue south of I-526, Virginia Avenue north of Empire Avenue, and Dorchester Road west of Meeting Street would create a queue from an ICTF train occurrence that impacts an interstate mainline in the design year 2038. However, in the No-Action Alternative, only the Dorchester Road at-grade crossing would not impact an interstate mainline.

4.8.8 Alternative 6: River Center Project Site (South via Kingsworth / North via Hospital District)

The following sections describe the transportation impacts associated with Alternative 6, which is described in detail in Section 2.4.7. Potential impacts discussed in this section include both temporary construction impacts and permanent impacts resulting from operations of the facility. The permanent operations analysis was performed for the year in which the proposed ICTF would open, 2018, and the design year 2038. The Alternative 6 impacts are summarized in Section 4.8.11.

Alternative 6 would be a variation of Alternative 1 (Proposed Project) with the Project site being moved to the River Center project site and the southern rail connection would connect to an existing rail line near Kingsworth Avenue. Road and rail improvements would be adjusted accordingly to facilitate rail and road traffic at the new site. The daily volumes for Alternative 6 would be the same as Alternative 5, which are shown in Appendix F.

Construction, Interstate 26, Interstate 526, U.S. Highway 17 and North Charleston Intersections

Alternative 6 would have the same impacts during construction in opening year 2018 and design year 2028 to I-26, I-526, US 17, and the North Charleston Intersections as Alternative 5, which is described in Section 4.8.7.

At-Grade Rail Crossings

Alternative 6 would have the same operations and impacts to the first nine at-grade rail crossings analyzed in Alternative 5. Compared with the No-Action Alternative, same as Alternative 5, Alternative 6 would reroute approximately 1.2 other commodity trains per day from the Reads Branch line to the Park Circle and Bexley corridors. The impact Alternative 6 would have on the at-grade crossings along the Park Circle and Bexley corridors was not analyzed because no ICTF trains would use these corridors.

In Alternative 6, the southern alignment would only go down to around Kingsworth Avenue. Therefore, the existing at-grade crossings of Pittsburgh Avenue and Discher Street would not be impacted with ICTF train occurrences and the new at-grade crossing of Meeting Street at Herbert Street would not be created for Alternative 6. Alternative 6 would create two new at-grade crossings. One at-grade crossings would be at Meeting Street and the other at Spruill Avenue, near Kingsworth Avenue. Because these two at-grade crossings are located close together and their operations would influence each other, their impacts were identified as one location. The at-grade crossings of Meeting Street and Spruill Avenue would operate at LOS A in the opening year 2018 and LOS C in the design year 2038. Alternative 6 would have a negligible impact on these two new at-grade crossings in the opening year 2018 and a moderate adverse impact in the design year 2038. When there is an ICTF train occurrence, only I-26 and King Street Extension would serve as a connection between North Charleston and Charleston. The opening year 2018 and design year 2038 Alternative 6 at-grade rail crossing analysis results are shown in Table 4.8-40 and Table 4.8-41, respectively. The at-grade rail crossing daily LOS for the opening year 2018 and design year 2038 of Alternative 6 is shown in Figure 4.8-16.

The daily combined total rail occupancy time at the analyzed roadway crossings, which is defined by the number of occurrences multiplied by the average duration of each occurrence, would increase nearly 100 percent from the opening year 2018 No-Action Alternative to Alternative 6. In the design year 2038, the daily combined total rail occupancy time would increase approximately 150 percent.

Table 4.8-40
Opening Year 2018 At-Grade Rail Crossings Analysis Results for Alternative 6

ID[1]	Roadway Segment at Rail Crossing	Daily Volume (vehicles per day)	Number of Daily Train Crossings		Average Crossing Duration (min:sec)		Max ICTF Train Queue (feet)	ICTF Train Impact to Interstate Mainline	Roadway Network Delay per Vehicle (seconds per vehicle)	LOS	Impact	No-Action LOS
			Other	ICTF	Other	ICTF						
1	Rivers Avenue (US 78)	32,600	2.2	4.0	04:07	05:34	2,925	No	18.2	B	Minor	A
2	Attaway Street	4,500	3.7	4.0	03:47	05:38	775	No	14.3	B	Minor	A
3	North Rhett Avenue	16,400	3.7	4.0	07:16	05:38	>5,280	Yes	50.3	D	Negligible	D
4	Virginia Avenue	9,200	1.1	4.0	26:09	05:42	900	No	57.5	E	Moderate	D
5	Avenue B	7,500	1.1	4.0	34:34	05:40	1,925	No	90.1	F	Negligible	F
6	Dorchester Road (SC 642)	17,000	5.3	4.0	03:57	05:33	2,125	No	25.3	C	Minor	B
7	Accabee Road	3,100	5.3	4.0	03:10	05:32	450	No	15.1	B	Minor	A
8	Misroon Street	500	5.3	4.0	03:10	05:32	75	No	13.5	B	Minor	A
9	Hackemann Avenue	1,500	3.1	4.0	04:06	05:32	3,675	No	48.9	D	Minor	C
10	Discher Street	3,100	5.3	0.0	03:09	00:00	-	-	-	-	-	B
11	Pittsburgh Avenue	2,000	0.0	0.0	00:00	00:00	-	-	-	-	-	A
14	Meeting Street & Spruill Avenue	6,800 & 11,400	0.0	4.0	00:00	05:32	4,775	No	7.5	A	Negligible	-

1. Analyzed at-grade crossing locations are shown in Figure 4.8-16.

Source: Appendix F.

Table 4.8-41
Design Year 2038 At-Grade Rail Crossings Analysis Results for Alternative 6

ID[1]	Roadway Segment at Rail Crossing	Daily Volume (vehicles per day)	Number of Daily Train Crossings		Average Crossing Duration (min:sec)		Max ICTF Train Queue (feet)	ICTF Train Impact to Interstate Mainline	Roadway Network Delay per Vehicle (seconds per vehicle)	LOS	Impact	No-Action LOS
			Other	ICTF	Other	ICTF						
1	Rivers Avenue (US 78)	37,200	2.1	4.0	05:13	10:52	>5,280	Yes	64.2	E	Major	B
2	Attaway Street	6,300	3.7	4.0	06:21	10:52	2,200	No	50.4	D	Moderate	B
3	North Rhett Avenue	23,900	3.7	4.0	09:44	10:52	>5,280	Yes	185.0	F	[2]Negligible	F
4	Virginia Avenue	11,300	1.1	4.0	27:22	10:51	2,700	Yes	87.1	F	Major	D
5	Avenue B	9,600	1.1	4.0	35:38	10:50	>5,280	No	116.6	F	[2]Negligible	F
6	Dorchester Road (SC 642)	17,300	5.2	4.0	05:05	11:34	4,650	Yes	84.0	F	Major	B
7	Accabee Road	3,100	5.2	4.0	05:05	11:34	875	No	37.6	D	Major	A
8	Misroon Street	500	5.2	4.0	04:13	11:31	125	No	43.2	D	Major	A
9	Hackemann Avenue	1,500	3.1	4.0	05:29	11:31	>5,280	No	386.6	F	Major	E
10	Discher Street	3,200	5.3	0.0	04:12	0:00	-	-	-	-	-	E
11	Pittsburgh Avenue	2,100	0.0	0.0	00:00	00:00	-	-	-	-	-	A
14	Meeting Street & Spruill Avenue	9,800 & 14,200	0.0	4.0	00:00	10:46	>5,280	No	34.7	C	Moderate	-

1. Analyzed at-grade crossing locations are shown in Figure 4.8-16.

2. Although the relative impact as compared to the No-Action is negligible the average delay per vehicle increased >20%.

Source: Appendix F.

4.8.9 Alternative 7: River Center Project Site (South via Milford)

The following sections describe the transportation impacts associated with Alternative 7, which is described in detail in Section 2.4.8. Potential impacts discussed in this section include both temporary construction impacts and permanent impacts resulting from operations of the facility. The permanent operations analysis was performed for the year in which the proposed ICTF would open, 2018, and the design year 2038. The Alternative 7 impacts are summarized in Section 4.8.11.

Alternative 7 would be a variation of Alternative 1 (Proposed Project) with the Project site being moved to the River Center project site and all rail traffic would enter and exit the Navy Base ICTF from a southern rail connection. Road and rail improvements would be adjusted accordingly to facilitate rail and road traffic at the new site. The daily volumes for Alternative 7 would be the same as Alternative 5, which are shown in Appendix F.

Construction, Interstate 26, Interstate 526, U.S. Highway 17 and North Charleston Intersections

Alternative 7 would have the same impacts during construction in opening year 2018 and design year 2038 to I-26, I-526, US 17 and the North Charleston Intersections as Alternative 5, which is described in Section 4.8.7.

At-Grade Rail Crossings

In Alternative 7 all rail traffic would use the southern rail alignment to Milford Street. Since no ICTF trains would use the Alternative 5 northern alignment, Alternative 7 would not impact the at-grade crossings of Rivers Avenue, Virginia Avenue and Avenue B. The at-grade rail crossings of Attaway Street and North Rhett Avenue would differ compared to the No-Action Alternative because Alternative 7 reroutes approximately 1.6 other commodity trains per day from the Reads Branch line to the Park Circle and Bexley corridors. The impact Alternative 7 would have on the at-grade crossings along the Reads Branch, Park Circle, and Bexley corridors was not analyzed because no ICTF trains would use these corridors.

Alternative 7 would have twice as many ICTF train occurrences than Alternative 5, eight per day, at the at-grade crossings along the southern alignment. The daily combined total rail occupancy time at the analyzed roadway crossings, which is defined by the number of occurrences multiplied by the average duration of each occurrence, would increase nearly 135 percent from the opening year 2018 No-Action Alternative to Alternative 4. In the design year 2038, the daily combined total rail occupancy time would increase approximately 215 percent.

Alternative 7 would have an impact on all seven of the analyzed at-grade rail crossings along the southern alignment. In the opening year 2018, two at-grade crossings would operate with a Poor LOS. These two locations are the at-grade crossings of Hackemann Avenue and Discher Street, both of which are located between Meeting Street and King Street. Alternative 7 would have a major adverse impact on both of these crossings, as Meeting Street and King Street would experience queueing and delay. None of the at-grade rail crossings would create a queue from an ICTF train occurrence that impacts an interstate mainline in the opening year 2018.

Table 4.8-42
Opening Year 2018 At-Grade Rail Crossings Analysis Results for Alternative 7

ID[1]	Roadway Segment at Rail Crossing	Daily Volume (vehicles per day)	Number of Daily Train Crossings		Average Crossing Duration (min:sec)		Max ICTF Train Queue (feet)	ICTF Train Impact to Interstate Mainline	Roadway Network Delay per Vehicle (seconds per vehicle)	LOS	Impact	No-Action LOS
			Other	ICTF	Other	ICTF						
1	Rivers Avenue (US 78)	32,600	2.2	0.0	04:07	00:00	-	-	-	-	-	A
2	Attaway Street	4,500	3.3	0.0	03:47	00:00	-	-	-	-	-	A
3	North Rhett Avenue	16,400	3.3	0.0	07:16	00:00	-	-	-	-	-	D
4	Virginia Avenue	9,200	1.2	0.0	26:09	00:00	-	-	-	-	-	D
5	Avenue B	7,500	1.2	0.0	34:34	00:00	-	-	-	-	-	F
6	Dorchester Road (SC 642)	17,000	5.3	8.0	03:57	05:33	2,125	No	39.5	D	Moderate	B
7	Accabee Road	3,100	5.3	8.0	03:10	05:32	450	No	22.1	C	Moderate	A
8	Misroon Street	500	5.3	8.0	03:10	05:32	75	No	21.8	C	Moderate	A
9	Hackemann Avenue	1,500	3.1	8.0	04:06	05:32	3,675	No	77.7	E	Moderate	C
10	Discher Street	3,100	5.3	8.0	03:09	05:31	3,450	No	99.7	F	Major	B
11	Pittsburgh Avenue	2,000	0.0	8.0	00:00	05:32	400	No	20.7	C	Moderate	A
12	Meeting Street & Herbert Street	18,000 & 900	0.0	8.0	00:00	05:32	2,900	No	17.7	B	Minor	-

1. Analyzed at-grade crossing locations are shown in Figure 4.8-17.

Source: Appendix F.

By the design year 2038, the average ICTF train crossing duration time would approximately double from the opening year 2018 value. The longer ICTF train crossing durations, as well as higher roadway volumes and longer other commodity train crossing durations, would lead to all seven of the at-grade crossing locations along the southern alignment operating with a Poor LOS. Alternative 7 would have a major adverse impact on all seven at-grade crossing locations. Additionally, the at-grade rail crossing of Dorchester Road west of Meeting Street would create a queue from an ICTF train occurrence that impacts an interstate mainline in the design year 2038.

Table 4.8-43
Design Year 2038 At-Grade Rail Crossings Analysis Results for Alternative 7

ID[1]	Roadway Segment at Rail Crossing	Daily Volume (vehicles per day)	Number of Daily Train Crossings		Average Crossing Duration (min:sec)		Max ICTF Train Queue (feet)	ICTF Train Impact to Interstate Mainline	Roadway Network Delay per Vehicle (seconds per vehicle)	LOS	Impact	No-Action LOS
			Other	ICTF	Other	ICTF						
1	Rivers Avenue (US 78)	37,200	2.2	0.0	05:13	00:00	-	-	-	-	-	B
2	Attaway Street	6,300	3.3	0.0	06:21	00:00	-	-	-	-	-	B
3	North Rhett Avenue	23,900	3.3	0.0	09:44	00:00	-	-	-	-	-	F
4	Virginia Avenue	11,300	1.2	0.0	27:22	00:00	-	-	-	-	-	D
5	Avenue B	9,600	1.2	0.0	35:38	00:00	-	-	-	-	-	F
6	Dorchester Road (SC 642)	17,300	5.3	8.0	05:05	11:34	4,650	Yes	148.8	F	Major	B
7	Accabee Road	3,100	5.3	8.0	05:05	11:34	875	No	63.0	E	Major	A
8	Misroon Street	500	5.3	8.0	04:13	11:31	125	No	76.8	E	Major	A
9	Hackemann Avenue	1,500	3.1	8.0	05:29	11:31	>5,280	No	721.0	F	Major	E
10	Discher Street	3,200	5.3	8.0	04:12	10:46	>5,280	No	584.1	F	Major	E
11	Pittsburgh Avenue	2,100	0.0	8.0	00:00	10:46	825	No	91.0	F	Major	A
12	Meeting Street & Herbert Street	23,600 & 2,800	0.0	8.0	00:00	10:46	>5,280	No	73.2	E	Major	-

1. Analyzed at-grade crossing locations are shown in Figure 4.8-17.

Source: Appendix F.

The opening year 2018 and design year 2038 Alternative 7 at-grade rail crossing analysis results are shown in Table 4.8-42 and Table 4.8-43, respectively. The at-grade rail crossing daily LOS for the opening year 2018 and design year 2038 of Alternative 7 is shown in Figure 4.8-17.

4.8.10 Related Activities

For traffic and transportation, the impacts associated with the related activity being built are incorporated into the impacts previously described for each of the alternatives in Section 4.8. The impacts to the transportation network are a result of the trains to and from the Navy Base ICTF not the physical tracks.

4.8.11 Summary of Impacts Table

Table 4.8-22 summarizes the environmental consequences to traffic and transportation from Alternative 1 (Proposed Project) and all the alternatives.

Table 4.8-44
Summary of Impacts, Traffic and Transportation

Alternative	I-26	I-526	US 17	North Charleston Intersections	At-Grade Rail Crossings
No-Action	None	None	None	None	None
1: *Proposed Project: South via Milford / North via Hospital District*	Negligible, short-term impact during construction. Negligible, permanent impact on majority of I-26 corridor in the opening year 2018 and design year 2038; beneficial or adverse permanent impact on a few segments due to an LOS change.	Negligible, short-term impact during construction. Negligible, permanent impact on majority of I-526 corridor in the opening year 2018 and design year 2038; beneficial or adverse permanent impact on a few segments due to an LOS change.	Negligible, short-term impact during construction. Negligible, permanent impact on the opening year 2018 and design year 2038 US 17 operations as Alternative 1 (Proposed Project) would have minimal influence on the US 17 traffic volumes.	Minor, short-term adverse impact during construction. Minor, permanent adverse impact on the opening year 2018 and design year 2038 North Charleston intersection operations. Traffic patterns would change but slightly more intersections would degrade than improve operations.	Negligible, short-term impact during construction. Moderate, permanent adverse impact on the opening year 2018 and major, permanent adverse impact design year 2038 at-grade crossing operations as Alternative 1 (Proposed Project) would increase the frequency and number of train occurrences in North Charleston. Additionally, one new at-grade crossing would be created.
2: *South via Milford / North via S-line*	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Similar to Alternative 1 (Proposed Project) but with a slightly different number of intersections degrading or improving operations.	Similar to Alternative 1 (Proposed Project) but with different at-grade rail crossing locations and operations. Additionally, two new at-grade crossings would be created.

Alternative	I-26	I-526	US 17	North Charleston Intersections	At-Grade Rail Crossings
3: *South via Kingsworth / North via Hospital*	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Similar to Alternative 1 (Proposed Project) but with a different number of new at-grade rail crossing locations (Meeting Street and Spruill Avenue at Kingsworth Avenue) and operations. Additionally, two new at-grade crossings would be created.
4: *South via Milford*	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Similar to Alternative 1 (Proposed Project) but with different at-grade rail crossing locations and operations as this Alternative would have double (8/day) the number of train occurrences on the southern rail connection as Alternative 1.

Alternative	I-26	I-526	US 17	North Charleston Intersections	At-Grade Rail Crossings
5: *River Center Project Site: South via Milford / North via Hospital District*	Negligible, short-term impact during construction. Negligible, permanent impact on majority of I-26 corridor in the opening year 2018 and design year 2038; beneficial or adverse, permanent impact on a few segments due to an LOS change.	Negligible, short-term impact during construction. Negligible, permanent impact on majority of I-526 corridor in the opening year 2018 and design year 2038; beneficial or adverse, permanent impact on a few segments due to an LOS change.	Negligible, short-term impact during construction. Negligible, permanent impact on the opening year 2018 and design year 2038 US 17 operations as Alternative 5 would have minimal influence on the US 17 traffic volumes.	Minor, short-term adverse impact during construction. Minor, permanent adverse impact on the opening year 2018 and design year 2038 North Charleston intersection operations. Traffic patterns would change but slightly more intersections would degrade than improve operations.	Negligible, short-term impact during construction. Moderate, permanent adverse impact on the opening year 2018 and major, permanent adverse impact on design year 2038 at-grade crossing operations as Alternative 5 would increase the frequency and number of train occurrences in North Charleston. Additionally, one new at-grade crossing would be created.
6: *River Center Project Site: South via Kingsworth / North via Hospital District*	Same as Alternative 5	Same as Alternative 5	Same as Alternative 5	Same as Alternative 5	Similar to Alternative 5 but with different at-grade rail crossing locations and operations. Additionally, two new at-grade crossings would be created.

Alternative	I-26	I-526	US 17	North Charleston Intersections	At-Grade Rail Crossings
7: *River Center Project Site: South via Milford*	Same as Alternative 5	Same as Alternative 5	Same as Alternative 5	Same as Alternative 5	Similar to Alternative 5 but with different at-grade rail crossing locations and operations as this alternative would have double (8/day) the number of train occurrences on the southern rail connection as Alternative 5.

Traffic and Transportation Impact Definitions

Negligible = No change in LOS. No perceivable impacts to the intersection delay, at-grade rail crossing delay or freeway density.

Minor = LOS changes one LOS grade. Impacts cause slightly perceptible change in intersection delay, at-grade rail crossing delay or freeway density.

Moderate = LOS changes two LOS grades or LOS degrades (adverse impact) to LOS E or improves (beneficial impact) from LOS E to LOS D. Impacts cause perceptible change in intersection delay, at-grade rail crossing delay or freeway density.

Major = LOS changes three or more LOS grades or LOS degrades (adverse impact) to LOS F or improves (beneficial impact) from LOS F to LOS E or LOS D. Additionally, for at-grade rail crossings, if off-ramp queue impacts interstate mainline. Impacts cause very noticeable change in intersection delay, at-grade rail crossing delay or freeway density.

4.8.12 Mitigation

4.8.12.1 Applicant's Proposed Avoidance and Minimization Measures

The Applicant has committed to several measures that avoid and/or minimize potential impacts of Alternative 1 (Proposed Project). These measures are taken from Palmetto Railways Mitigation Plan provided in Appendix N. Some of these measures are required under federal, state, and local permits; others are measures that Palmetto Railways has incorporated into the design and operations of Alternative 1 (Proposed Project). Each mitigation measure is also designated as one that either helps to avoid an impact or one that minimizes an impact.

- Perform a separate Surface Transportation Impact Study (in cooperation with the City of North Charleston, South Carolina Ports Authority, and SCDOT) to study and provide guidance regarding rail and highway traffic related to the facility; including the identification of optimal truck routes to and from the facility (see Appendix B for the proposal/scope of this study). * (Minimization)

- To minimize impacts to at-grade crossings outside of the facility footprint, automated switches will be used throughout the Project area to facilitate a continuous movement of trains while arriving or departing the facility. (Minimization)
- All at-grade crossings within the facility footprint will be eliminated to provide safe and unfettered movements through the facility. (Minimization)
- Provide access to St. Johns Avenue for residents and businesses located on the former Navy Base and west of Project North Lead railroad track. (Minimization)
- Automated gates and additional turn lanes will be constructed to reduce truck idling, wait times and congestion on North Hobson Avenue. When exiting the facility, a right-only turn onto North Hobson Avenue will direct truck traffic to the Port Access Road highway ramps. (Minimization)
- Cosgrove Avenue will be extended and an overpass over the facility's north rail lead will be constructed to facilitate public access to the CNC and adjoining neighborhoods. During construction, McMillan Avenue will be detoured. Once construction of the overpass is completed, McMillan Avenue will be closed east of Spruill Avenue and a cul-de-sac will be constructed. (Minimization)
- Improvements to Bainbridge Avenue and North Hobson Avenue intersection will be constructed to facilitate traffic flows in the southern portion of the CNC, including the Federal Law Enforcement Training Complex (FLETC), U.S. Coast Guard (USCG) complex and Veterans Terminal. (Minimization)
- A drayage road will be constructed to eliminate truck traffic on local roadways when transporting containers to the intermodal facility. (Minimization)
- Palmetto Railways will support the City of North Charleston to develop a truck route and restriction plan for the area. Additionally, Palmetto Railways will work to inform facility truck traffic of streets where truck traffic is not permitted when traveling to and from the intermodal facility. * (Minimization)
- Maintain Viaduct Road overpass until the local segment of the port access road is complete. (Minimization)
- Locate roadway improvements to minimize/avoid at-grade crossings and traffic delays associated with rail operations. * (Minimization)
- Additional intermodal capacity will encourage rail use and reduce truck traffic on local roads. * (Minimization)
- The Applicant worked with multiple parties to develop standards on studying public at-grade crossings (Crossing Analysis) impacted by the ICTF within the City of Charleston and drafted a Transportation Memorandum of Agreement (MOA) with the City of Charleston, the South Carolina Department of Commerce, and South Carolina Department of Transportation (SCDOT). The draft Transportation MOA commits these parties to conducting a joint Crossing Analysis and the Applicant proposes to fund up to $4.5 million for five transportation mitigation measures to be undertaken by the City of Charleston (or another government body). See Appendix B and N for additional details.* (Minimization)

These avoidance and minimization measures, except the items noted with an asterisk (*), have been considered in the preceding impact analysis. The complete list of Applicant-proposed avoidance and minimization measures related to traffic and transportation is also provided in Chapter 6.

4.8.12.2 Additional Potential Mitigation Measures

No additional mitigation measures have been identified for Traffic and Transportation by the Corps. Additional avoidance, minimization, and mitigation may be considered by the Corps in its decision-making process. Final mitigation measures may be adopted as conditions of the DA permit and documented in the Record of Decision (ROD).

Norfolk Southern Intermodal Terminal

CSX Intermodal Terminal

Hugh K. Leatherman, Sr. Terminal

Cooper River

Legend

- Existing Truck Restriction
- Container Port Terminals
- Port Access Road Project
- Railroads

Sources: SCDOT, ESRI, and SCDNR GIS Data Clearing House

0 0.5 1 Miles

N

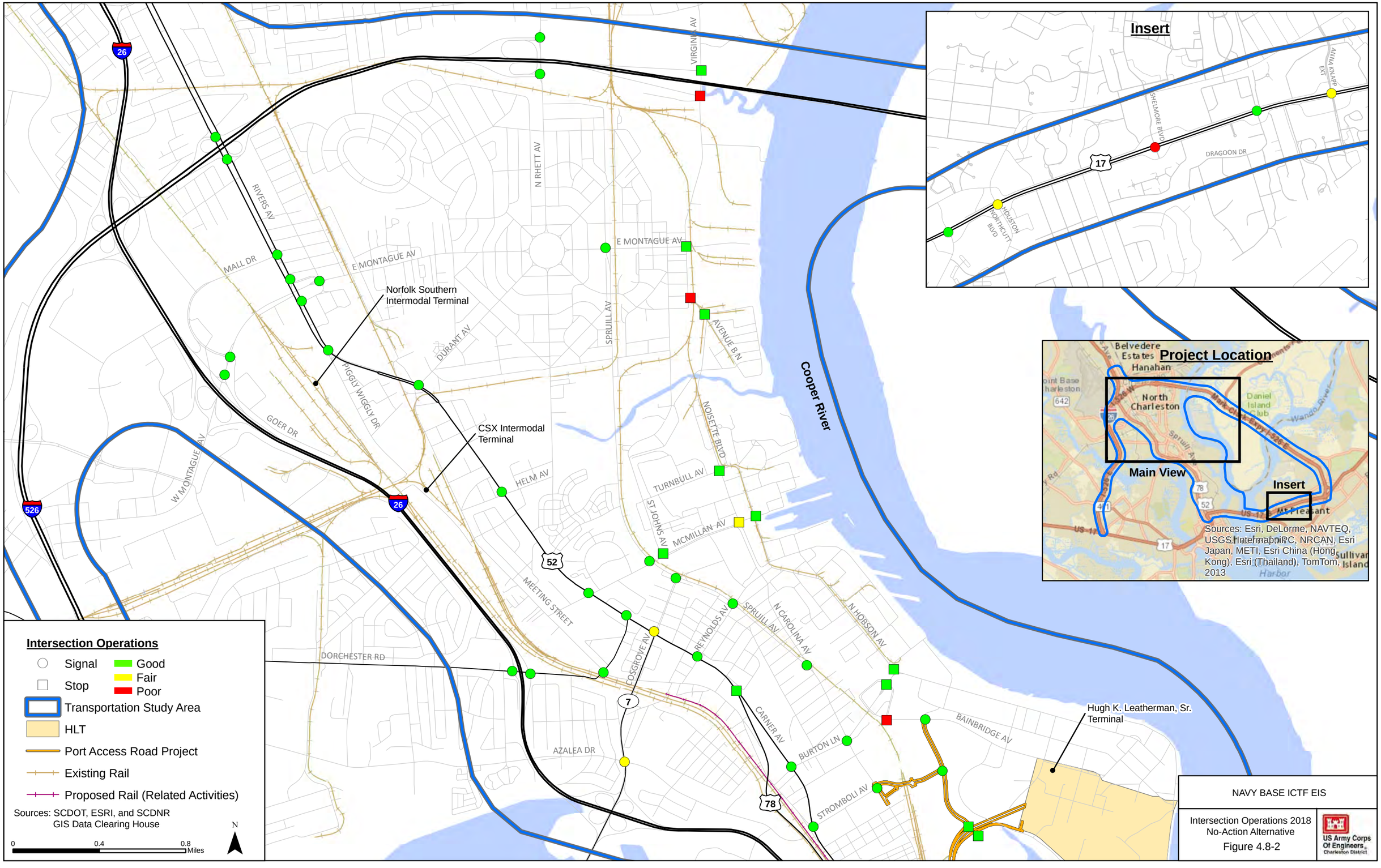
NAVY BASE ICTF EIS

North Charleston Truck Restrictions

Figure 4.8-1

US Army Corps Of Engineers Charleston District

POC_Traffic_EIS_TruckRestriction.mxd JNL 03.04.2016


Insert
SHELMORE BLVD
DRAGOON DR
ANNA KNAPP EXT
HOUSTON NORTHCUTT BLVD
17
Project Location
Belvedere Estates
Hanahan
North Charleston
Daniel Island Club
Main View
Insert
Mt Pleasant
Sullivan Island
Harbor
Sources: Esri, DeLorme, NAVTEQ, USGS, Intermap, IPC, NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom, 2013
Norfolk Southern Intermodal Terminal
CSX Intermodal Terminal
Hugh K. Leatherman, Sr. Terminal
Cooper River
RIVERS AV
MALL DR
E MONTAGUE AV
N RHETT AV
VIRGINIA AV
SPRUILL AV
DURANT AV
AVENUE B N
NOISETTE BLVD
PIGGLY WIGGLY DR
GOER DR
W MONTAGUE AV
HELM AV
TURNBULL AV
ST JOHNS AV
MCMILLAN AV
MEETING STREET
DORCHESTER RD
COSGROVE AV
REYNOLDS AV
N CAROLINA AV
N HOBSON AV
CARNER AV
BURTON LN
BAINBRIDGE AV
STROMBOLI AV
AZALEA DR
26
526
52
7
78
Intersection Operations
Signal
Stop
Transportation Study Area
HLT
Port Access Road Project
Existing Rail
Proposed Rail (Related Activities)
Good
Fair
Poor
Sources: SCDOT, ESRI, and SCDNR GIS Data Clearing House
0
0.4
0.8
Miles
N
NAVY BASE ICTF EIS
Intersection Operations 2018
No-Action Alternative
Figure 4.8-2
US Army Corps Of Engineers
Charleston District
POC_Traffic_PFEIS_IntersectionAlternatives.ai 11.21.2016 JNL

Insert

Project Location

Main View

Sources: Esri, DeLorme, NAVTEQ, USGS, Intermap, IPC, NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom, 2013

Norfolk Southern Intermodal Terminal

CSX Intermodal Terminal

Hugh K. Leatherman, Sr. Terminal

Cooper River

Intersection Operations

- Signal
- Stop
- Good
- Fair
- Poor
- Transportation Study Area
- HLT
- Port Access Road Project
- Existing Rail
- Existing Rail (Related Activities)

Sources: SCDOT, ESRI, and SCDNR GIS Data Clearing House

0 0.4 0.8 Miles

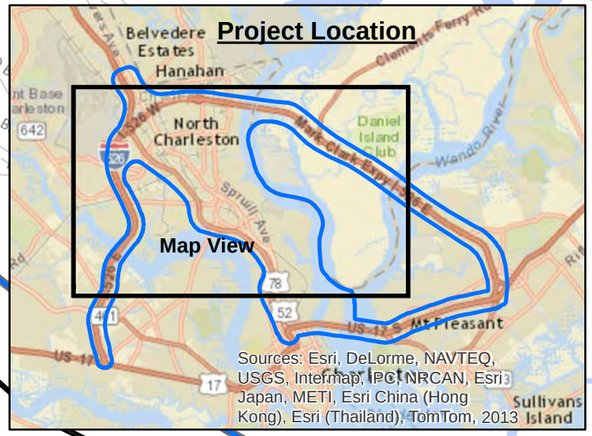
N

NAVY BASE ICTF EIS

Intersection Operations 2038
No-Action Alternative
Figure 4.8-3

US Army Corps Of Engineers Charleston District

POC_Traffic_PFEIS_IntersectionAlternatives.ai 11.21.2016 JNL



At-Grade Rail Crossing Network Descriptions

1. Rivers Avenue (US 78) north of Taylor Street
2. Attaway Street south of Greenbay Drive
3. North Rhett Avenue south of I-526
4. Virginia Avenue north of Empire Avenue
5. Avenue B east of Virginia Avenue
6. Dorchester Road (SC 642) west of Meeting Street
7. Accabee Road west of Meeting Street
8. Misroon Street west of Meeting Street
9. Hackemann Avenue west of Meeting Street
10. Discher Street west of Meeting Street
11. Pittsburgh Avenue east of Meeting Street

SUMNER AV
RIVERS AV
MALL DR
E MONTAGUE AV
W MONTAGUE AV
GOER DR
BRADDOCK AV
N RHETT AV
SPRUILL AV
O'HEAR AV
VIRGINIA AV
AVENUE B N
DURANT AV
BEXLEY ST
HELM AV
NOISETTE BLVD
TURNBULL AV
ST JOHN AV
MCMILLAN AV
Norfolk Southern Intermodal Terminal (7 - Mile)
CSX Intermodal Terminal (Ashley Junction)
Cooper River
CLEMENTS FERRY ROAD
REDFORD ROAD
MEETING STREET
DORCHESTER RD
AZALEA DR
COSGROVE AV
REYNOLDS AV
N CAROLINA AV
N HOBSON AV
CARNER AV
BURTON LN
BAINBRIDGE AV
STROMBOLI AV
HACKEMANN AV
PITTSBURGH AV
CHERRY HILL LN
MILFORD ST
CSX Intermodal Terminal (Cooper Yard)
Hugh K. Leatherman, Sr. Terminal
642
526
26
171
78
52

Legend

- Existing Rail
- (#) Analyzed At-Grade Rail Crossings
- Good Level of Service (LOS)
- Fair Level of Service (LOS)
- Poor Level of Service (LOS)
- 2018/2038 Year 2018 / Year 2038 (LOS)
- Transportation Study Area

Sources: SCDOT, ESRI, and SCDNR GIS Data Clearing House

0 0.57 1.14 Miles

N

NAVY BASE ICTF EIS

At-Grade Rail Crossings
No-Action Alternative
Figure 4.8-4

US Army Corps Of Engineers Charleston District

POC_Traffic_PFEIS_AlternativesRailwaysBasemap.ai JNL 11.21.2016

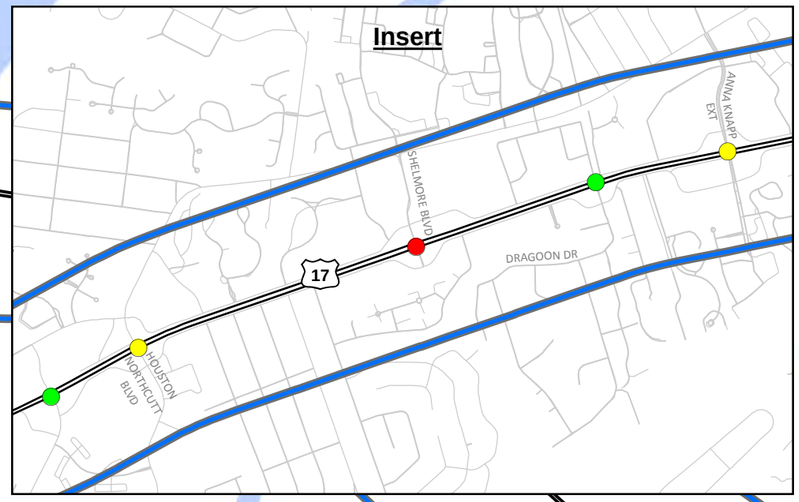
Norfolk Southern Intermodal Terminal

CSX Intermodal Terminal

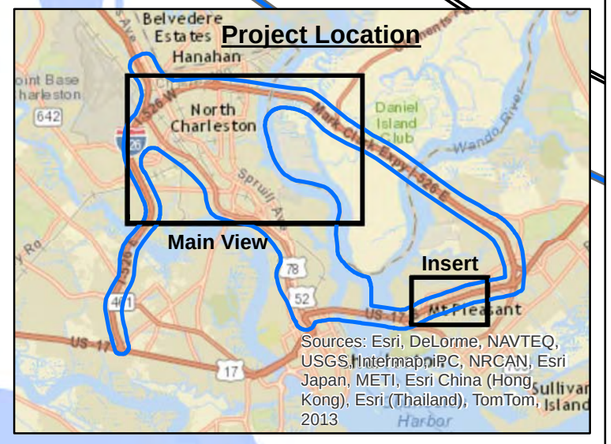
Hugh K. Leatherman, Sr. Terminal

Cooper River

Insert



Project Location



Intersection Operations

- Signal — Good
- Stop — Fair
- Poor
- Transportation Study Area
- Proposed Project
- HLT
- Port Access Road Project
- Proposed Roadway Improvements
- Existing Rail
- Existing Rail (Related Activities)

Sources: SCDOT, ESRI, and SCDNR GIS Data Clearing House

0 0.4 0.8 Miles

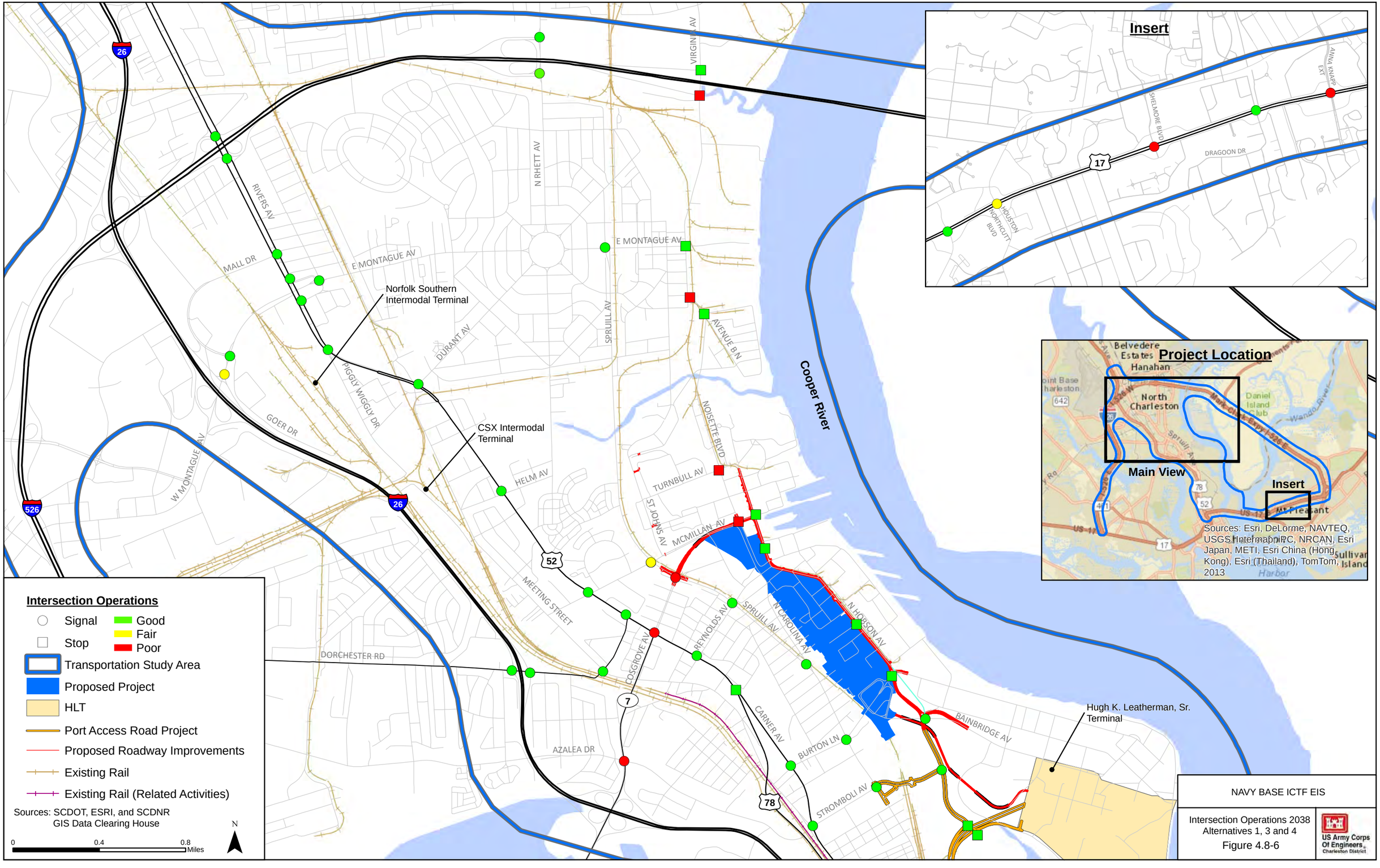
N

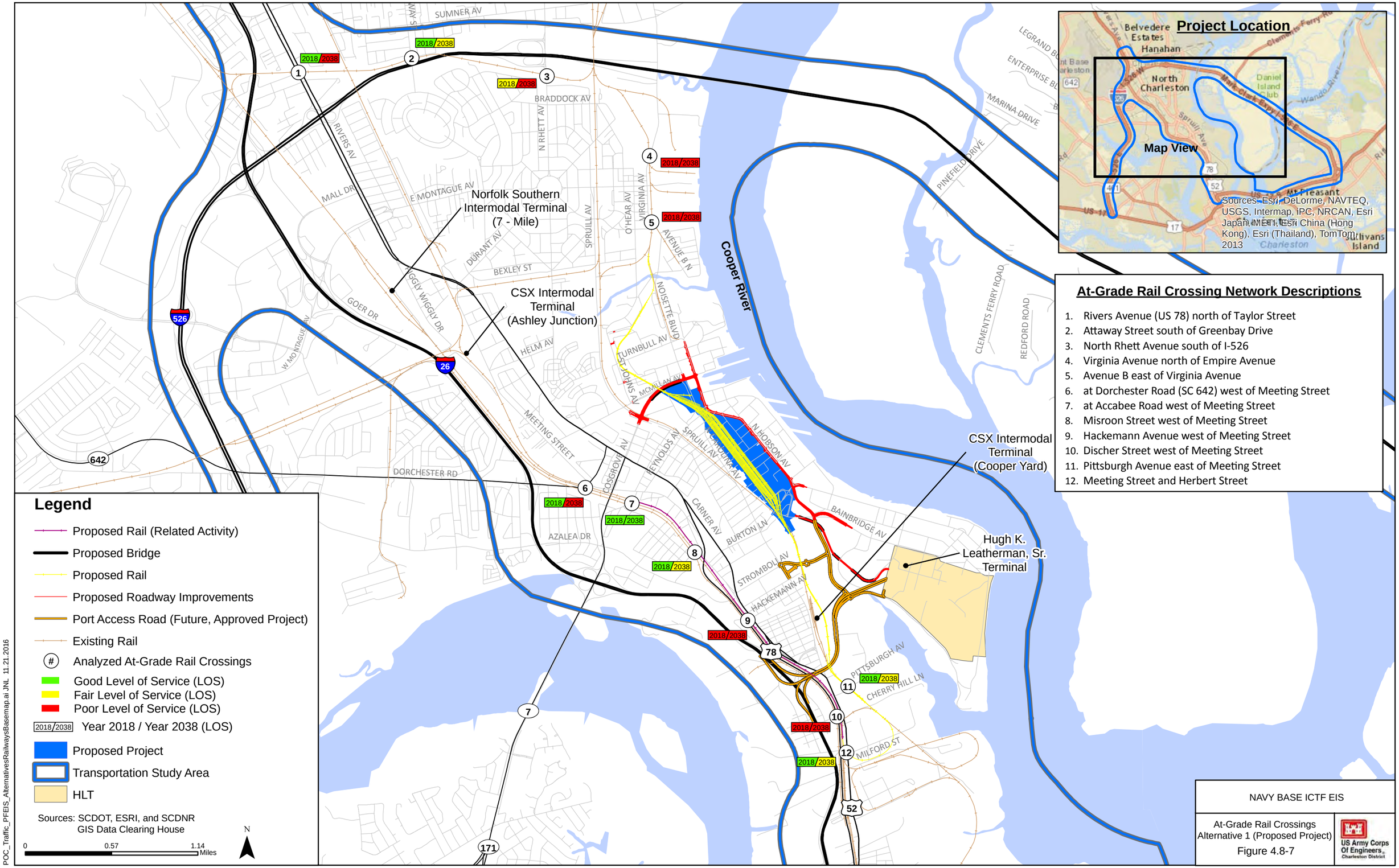
NAVY BASE ICTF EIS

Intersection Operations 2018
Alternatives 1,3 and 4
Figure 4.8-5

US Army Corps Of Engineers Charleston District

POC_Traffic_PFEIS_IntersectionAlternatives.ai 11.21.2016 JNL


Insert
SHELMORE BLVD
DRAGOON DR
ANNA KNAPP EXT
HOUSTON NORTHCUTT BLVD
17
Project Location
Belvedere
Estates
Hanahan
North
Charleston
Daniel
Island
Club
Main View
Insert
Mt Pleasant
Sullivan
Island
Harbor
Sources: Esri, DeLorme, NAVTEQ, USGS, Intermap, IPC, NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom, 2013
Norfolk Southern
Intermodal Terminal
CSX Intermodal
Terminal
Hugh K. Leatherman, Sr.
Terminal
Cooper River
RIVERS AV
MALL DR
E MONTAGUE AV
N RHETT AV
VIRGINIA AV
SPRUILL AV
DURANT AV
AVENUE B N
NOISETTE BLVD
GOER DR
W MONTAGUE AV
PIGGLY WIGGLY DR
HELM AV
TURNBULL AV
ST JOHNS AV
MCMILLAN AV
MEETING STREET
DORCHESTER RD
REYNOLDS AV
COSGROVE AV
N CAROLINA AV
N HOBSON AV
CARNER AV
BURTON LN
BAINBRIDGE AV
STROMBOLI AV
AZALEA DR
26
526
52
7
78
Intersection Operations
Signal
Stop
Good
Fair
Poor
Transportation Study Area
Proposed Project
HLT
Port Access Road Project
Proposed Roadway Improvements
Existing Rail
Existing Rail (Related Activities)
Sources: SCDOT, ESRI, and SCDNR GIS Data Clearing House
0
0.4
0.8
Miles
N
NAVY BASE ICTF EIS
Intersection Operations 2038
Alternatives 1, 3 and 4
Figure 4.8-6
US Army Corps Of Engineers
Charleston District
POC_Traffic_PFEIS_IntersectionAlternatives.ai 11.21.2016 JNL



At-Grade Rail Crossing Network Descriptions

1. Rivers Avenue (US 78) north of Taylor Street
2. Attaway Street south of Greenbay Drive
3. North Rhett Avenue south of I-526
4. Virginia Avenue north of Empire Avenue
5. Avenue B east of Virginia Avenue
6. at Dorchester Road (SC 642) west of Meeting Street
7. at Accabee Road west of Meeting Street
8. Misroon Street west of Meeting Street
9. Hackemann Avenue west of Meeting Street
10. Discher Street west of Meeting Street
11. Pittsburgh Avenue east of Meeting Street
12. Meeting Street and Herbert Street

Legend

- Proposed Rail (Related Activity)
- Proposed Bridge
- Proposed Rail
- Proposed Roadway Improvements
- Port Access Road (Future, Approved Project)
- Existing Rail
- (#) Analyzed At-Grade Rail Crossings
- Good Level of Service (LOS)
- Fair Level of Service (LOS)
- Poor Level of Service (LOS)
- 2018/2038 Year 2018 / Year 2038 (LOS)
- Proposed Project
- Transportation Study Area
- HLT

Sources: SCDOT, ESRI, and SCDNR GIS Data Clearing House

0 0.57 1.14 Miles

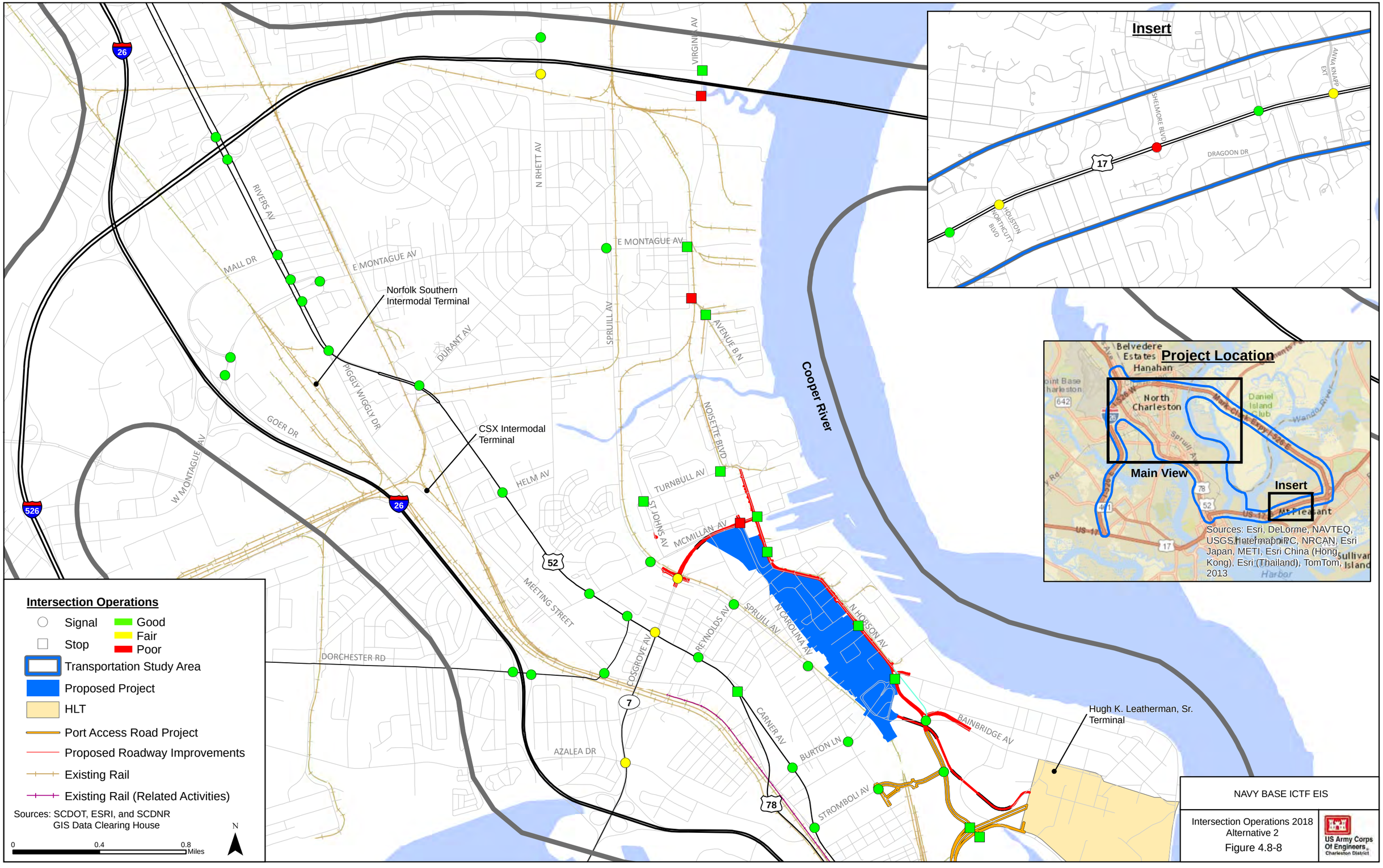
N

NAVY BASE ICTF EIS

At-Grade Rail Crossings
Alternative 1 (Proposed Project)
Figure 4.8-7

US Army Corps Of Engineers Charleston District

POC_Traffic_PFEIS_AlternativesRailwaysBasemap.ai JNL 11.21.2016


Insert
SHELMORE BLVD
DRAGOON DR
ANNA KNAPP EXT
HOUSTON NORTHCUTT BLVD
17
Project Location
Belvedere Estates
Hanahan
North Charleston
Daniel Island Club
Main View
Insert
Mt Pleasant
Sullivan Island
Harbor
Sources: Esri, DeLorme, NAVTEQ, USGS, Intermap, IPC, NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom, 2013
Norfolk Southern Intermodal Terminal
CSX Intermodal Terminal
Hugh K. Leatherman, Sr. Terminal
Cooper River
RIVERS AV
MALL DR
E MONTAGUE AV
N RHETT AV
VIRGINIA AV
SPRUILL AV
DURANT AV
AVENUE B N
NOISETTE BLVD
PIGGLY WIGGLY DR
GOER DR
W MONTAGUE AV
HELM AV
TURNBULL AV
ST JOHNS AV
MCMILLAN AV
MEETING STREET
DORCHESTER RD
COSGROVE AV
REYNOLDS AV
N CAROLINA AV
N HOBSON AV
CARNER AV
BURTON LN
BAINBRIDGE AV
STROMBOLI AV
AZALEA DR
26
526
52
7
78
Intersection Operations
Signal
Stop
Good
Fair
Poor
Transportation Study Area
Proposed Project
HLT
Port Access Road Project
Proposed Roadway Improvements
Existing Rail
Existing Rail (Related Activities)
Sources: SCDOT, ESRI, and SCDNR GIS Data Clearing House
0
0.4
0.8
Miles
N
NAVY BASE ICTF EIS
Intersection Operations 2018 Alternative 2
Figure 4.8-8
US Army Corps Of Engineers
Charleston District
POC_Traffic_PFEIS_IntersectionAlternatives.ai 11.21.2016 JNL

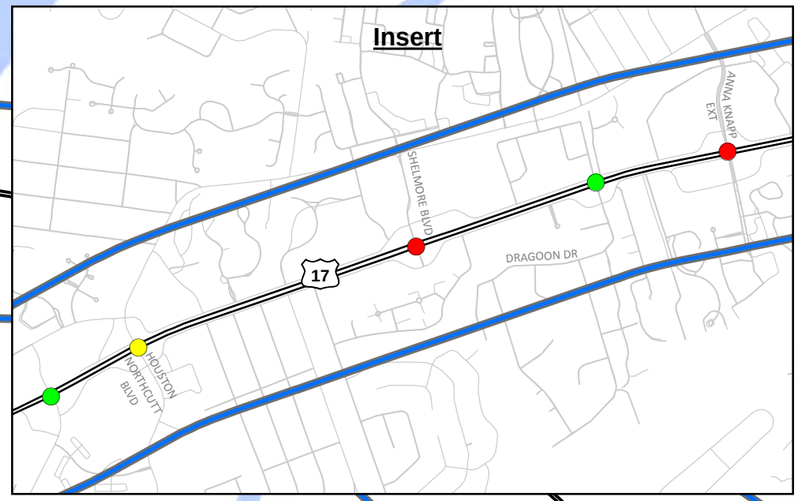
Norfolk Southern Intermodal Terminal

CSX Intermodal Terminal

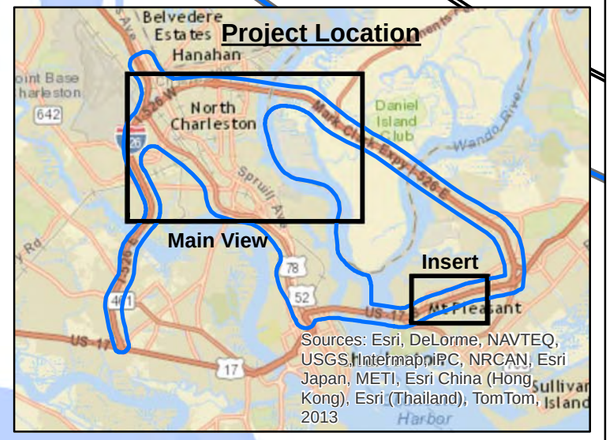
Hugh K. Leatherman, Sr. Terminal

Cooper River

Insert



Project Location



Intersection Operations

- Signal — Good / Fair / Poor
- Stop — Good / Fair / Poor
- Transportation Study Area
- Proposed Project
- HLT
- Port Access Road Project
- Proposed Roadway Improvements
- Existing Rail
- Existing Rail (Related Activities)

Sources: SCDOT, ESRI, and SCDNR GIS Data Clearing House

0 0.4 0.8 Miles

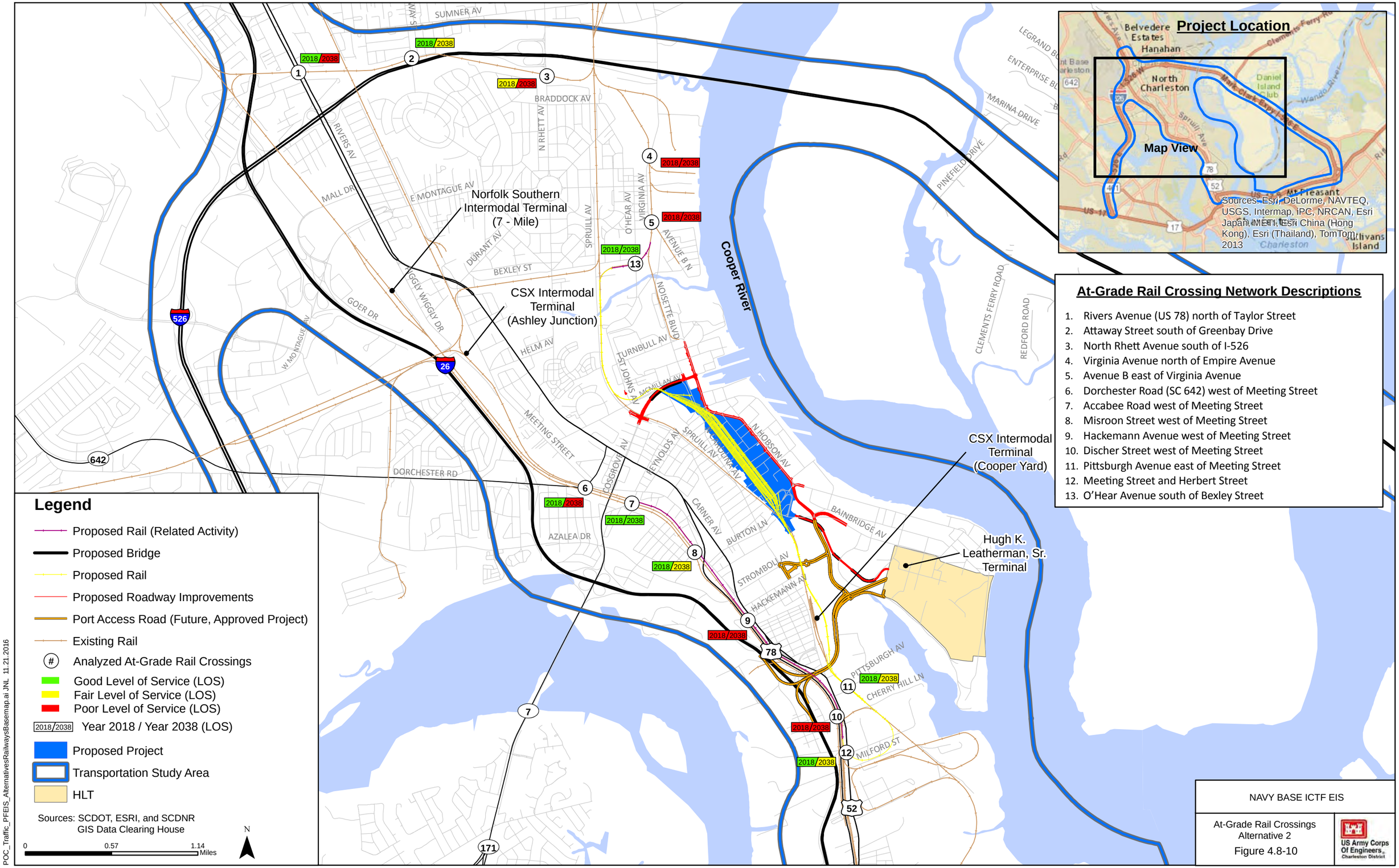
N

NAVY BASE ICTF EIS

Intersection Operations 2038
Alternative 2
Figure 4.8-9

US Army Corps Of Engineers Charleston District

POC_Traffic_PFEIS_IntersectionAlternatives.ai 11.21.2016 JNL



At-Grade Rail Crossing Network Descriptions

1. Rivers Avenue (US 78) north of Taylor Street
2. Attaway Street south of Greenbay Drive
3. North Rhett Avenue south of I-526
4. Virginia Avenue north of Empire Avenue
5. Avenue B east of Virginia Avenue
6. Dorchester Road (SC 642) west of Meeting Street
7. Accabee Road west of Meeting Street
8. Misroon Street west of Meeting Street
9. Hackemann Avenue west of Meeting Street
10. Discher Street west of Meeting Street
11. Pittsburgh Avenue east of Meeting Street
12. Meeting Street and Herbert Street
13. O'Hear Avenue south of Bexley Street

Legend

- Proposed Rail (Related Activity)
- Proposed Bridge
- Proposed Rail
- Proposed Roadway Improvements
- Port Access Road (Future, Approved Project)
- Existing Rail
- (#) Analyzed At-Grade Rail Crossings
- Good Level of Service (LOS)
- Fair Level of Service (LOS)
- Poor Level of Service (LOS)
- 2018/2038 Year 2018 / Year 2038 (LOS)
- Proposed Project
- Transportation Study Area
- HLT

Sources: SCDOT, ESRI, and SCDNR GIS Data Clearing House

0 0.57 1.14 Miles

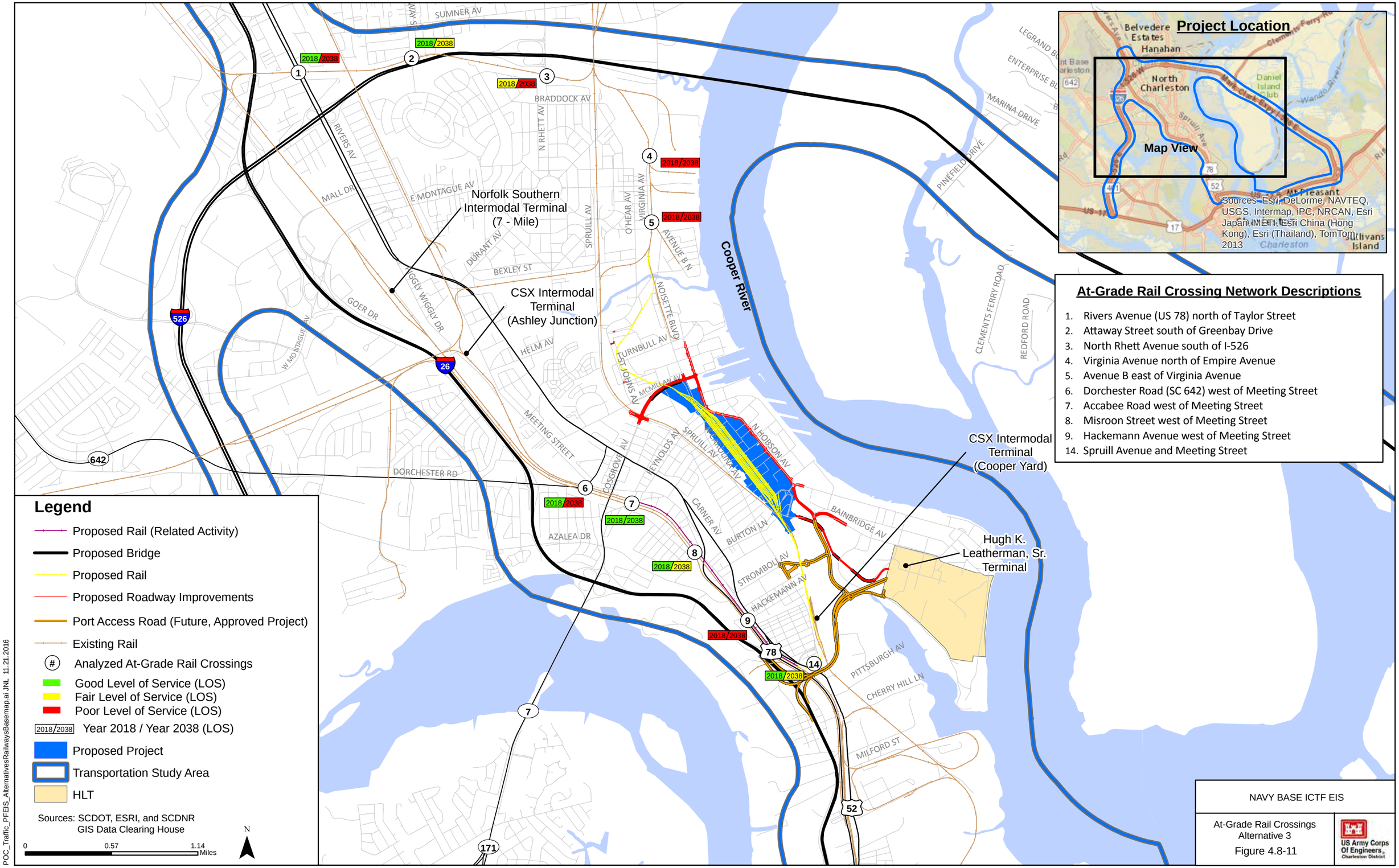
N

POC_Traffic_PFEIS_AlternativesRailwaysBasemap.ai JNL 11.21.2016

NAVY BASE ICTF EIS

At-Grade Rail Crossings
Alternative 2
Figure 4.8-10

US Army Corps Of Engineers Charleston District



At-Grade Rail Crossing Network Descriptions

1. Rivers Avenue (US 78) north of Taylor Street
2. Attaway Street south of Greenbay Drive
3. North Rhett Avenue south of I-526
4. Virginia Avenue north of Empire Avenue
5. Avenue B east of Virginia Avenue
6. Dorchester Road (SC 642) west of Meeting Street
7. Accabee Road west of Meeting Street
8. Misroon Street west of Meeting Street
9. Hackemann Avenue west of Meeting Street
14. Spruill Avenue and Meeting Street

Legend

- Proposed Rail (Related Activity)
- Proposed Bridge
- Proposed Rail
- Proposed Roadway Improvements
- Port Access Road (Future, Approved Project)
- Existing Rail
- (#) Analyzed At-Grade Rail Crossings
- Good Level of Service (LOS)
- Fair Level of Service (LOS)
- Poor Level of Service (LOS)
- 2018/2038 Year 2018 / Year 2038 (LOS)
- Proposed Project
- Transportation Study Area
- HLT

Sources: SCDOT, ESRI, and SCDNR GIS Data Clearing House

0 0.57 1.14 Miles

N

NAVY BASE ICTF EIS

At-Grade Rail Crossings
Alternative 3
Figure 4.8-11

US Army Corps Of Engineers Charleston District

POC_Traffic_PFEIS_AlternativesRailwaysBasemap.ai JNL 11.21.2016

Norfolk Southern Intermodal Terminal (7 - Mile)

CSX Intermodal Terminal (Ashley Junction)

CSX Intermodal Terminal (Cooper Yard)

Hugh K. Leatherman, Sr. Terminal

Cooper River

SUMNER AV
BRADDOCK AV
RIVERS AV
MALL DR
E MONTAGUE AV
N RHETT AV
SPRUILL AV
O'HEAR AV
VIRGINIA AV
AVENUE B N
DURANT AV
BEXLEY ST
GOER DR
W MONTAGUE AV
HELM AV
NOISETTE BLVD
TURNBULL AV
MCMILLAN AV
MEETING STREET
DORCHESTER RD
AZALEA DR
COSGROVE AV
REYNOLDS AV
CAROLINA AV
CARNER AV
BURTON LN
N HOBSON AV
BAINBRIDGE AV
STROMBOLI AV
HACKEMANN AV
PITTSBURGH AV
CHERRY HILL LN
MILFORD ST
MARINA DRIVE
PINEFIELD DRIVE
CLEMENTS FERRY ROAD
REDFORD ROAD
LEGRAND BLVD
ENTERPRISE BLVD

526 26 642 6 7 8 9 10 11 12 78 52 17 171

2018/2038

Project Location

Belvedere
Estates
Hanahan
North Charleston
Daniel Island Club
Mark Clark Expy
Wando River
Spruill Ave
Map View
Mt Pleasant
Sullivans Island
Charleston
US-17
US-52

Sources: Esri, DeLorme, NAVTEQ, USGS, Intermap, iPC, NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom, 2013

At-Grade Rail Crossing Network Descriptions

6. Dorchester Road (SC 642) west of Meeting Street
7. Accabee Road west of Meeting Street
8. Misroon Street west of Meeting Street
9. Hackemann Avenue west of Meeting Street
10. Discher Street west of Meeting Street
11. Pittsburgh Avenue east of Meeting Street
12. Meeting Street and Herbert Street

Legend

- Proposed Rail (Related Activity)
- Proposed Bridge
- Proposed Rail
- Proposed Roadway Improvements
- Port Access Road (Future, Approved Project)
- Existing Rail
- (#) Analyzed At-Grade Rail Crossings
- Good Level of Service (LOS)
- Fair Level of Service (LOS)
- Poor Level of Service (LOS)
- 2018/2038 Year 2018 / Year 2038 (LOS)
- Proposed Project
- Transportation Study Area
- HLT

Sources: SCDOT, ESRI, and SCDNR GIS Data Clearing House

0 0.57 1.14 Miles

N

POC_Traffic_PFEIS_AlternativesRailwaysBasemap.ai JNL 11.21.2016

NAVY BASE ICTF EIS

At-Grade Rail Crossings
Alternative 4
Figure 4.8-12

US Army Corps Of Engineers Charleston District

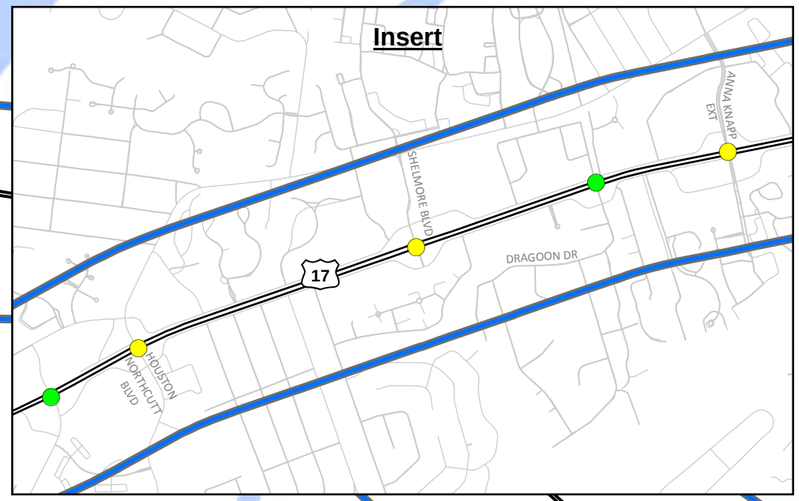
Norfolk Southern Intermodal Terminal

CSX Intermodal Terminal

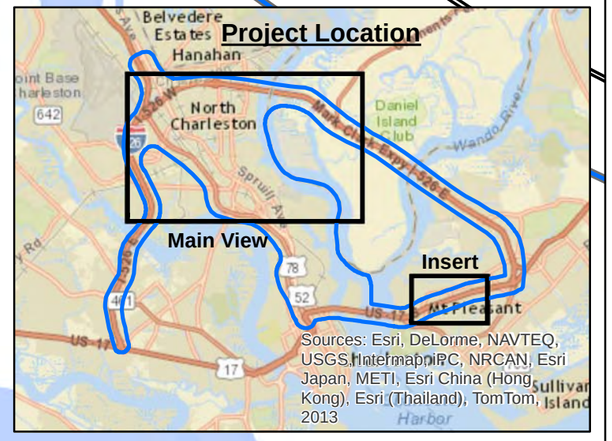
Hugh K. Leatherman, Sr. Terminal

Cooper River

Insert



Project Location



Intersection Operations

- Signal — Good
- Stop — Fair
- Poor
- Transportation Study Area
- River Center ICTF
- HLT
- Port Access Road Project
- Proposed Roadway Improvements
- Existing Rail
- Existing Rail (Related Activities)

Sources: SCDOT, ESRI, and SCDNR GIS Data Clearing House

0 0.4 0.8 Miles

N

NAVY BASE ICTF EIS

Intersection Operations 2018
Alternatives 5, 6 and 7

Figure 4.8-13

US Army Corps Of Engineers Charleston District

POC_Traffic_PFEIS_IntersectionAlternatives.ai 11.21.2016 JNL

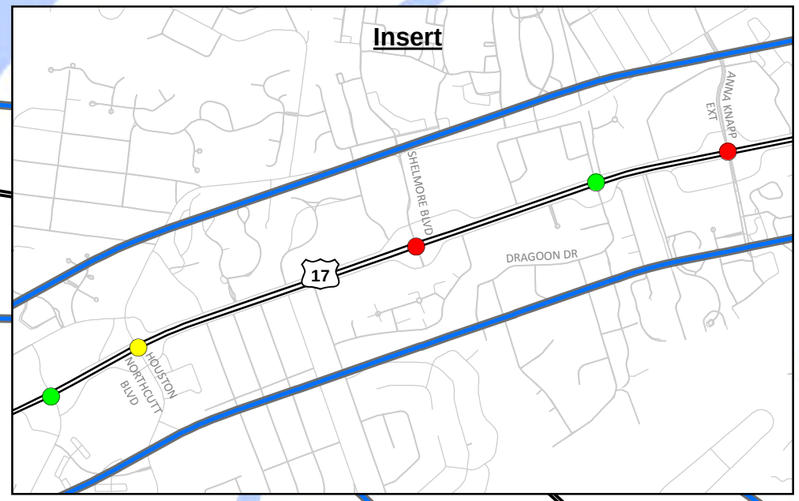
Norfolk Southern Intermodal Terminal

CSX Intermodal Terminal

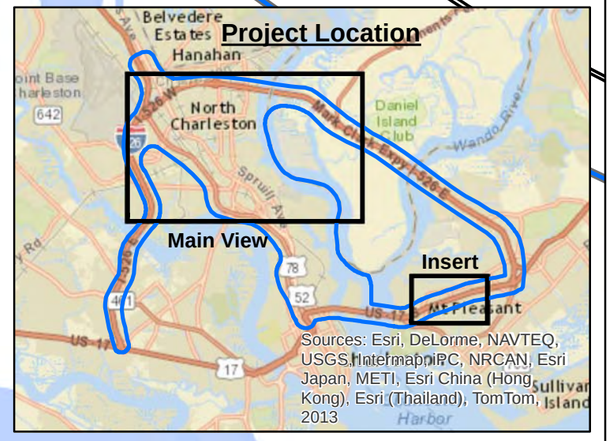
Hugh K. Leatherman, Sr. Terminal

Cooper River

Insert



Project Location



Sources: Esri, DeLorme, NAVTEQ, USGS, Intermap, IPC, NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom, 2013

Intersection Operations

- Signal
- Stop
- Good
- Fair
- Poor
- Transportation Study Area
- River Center ICTF
- HLT
- Port Access Road Project
- Proposed Roadway Improvements
- Existing Rail
- Existing Rail (Related Activities)

Sources: SCDOT, ESRI, and SCDNR GIS Data Clearing House

0 0.4 0.8 Miles

N

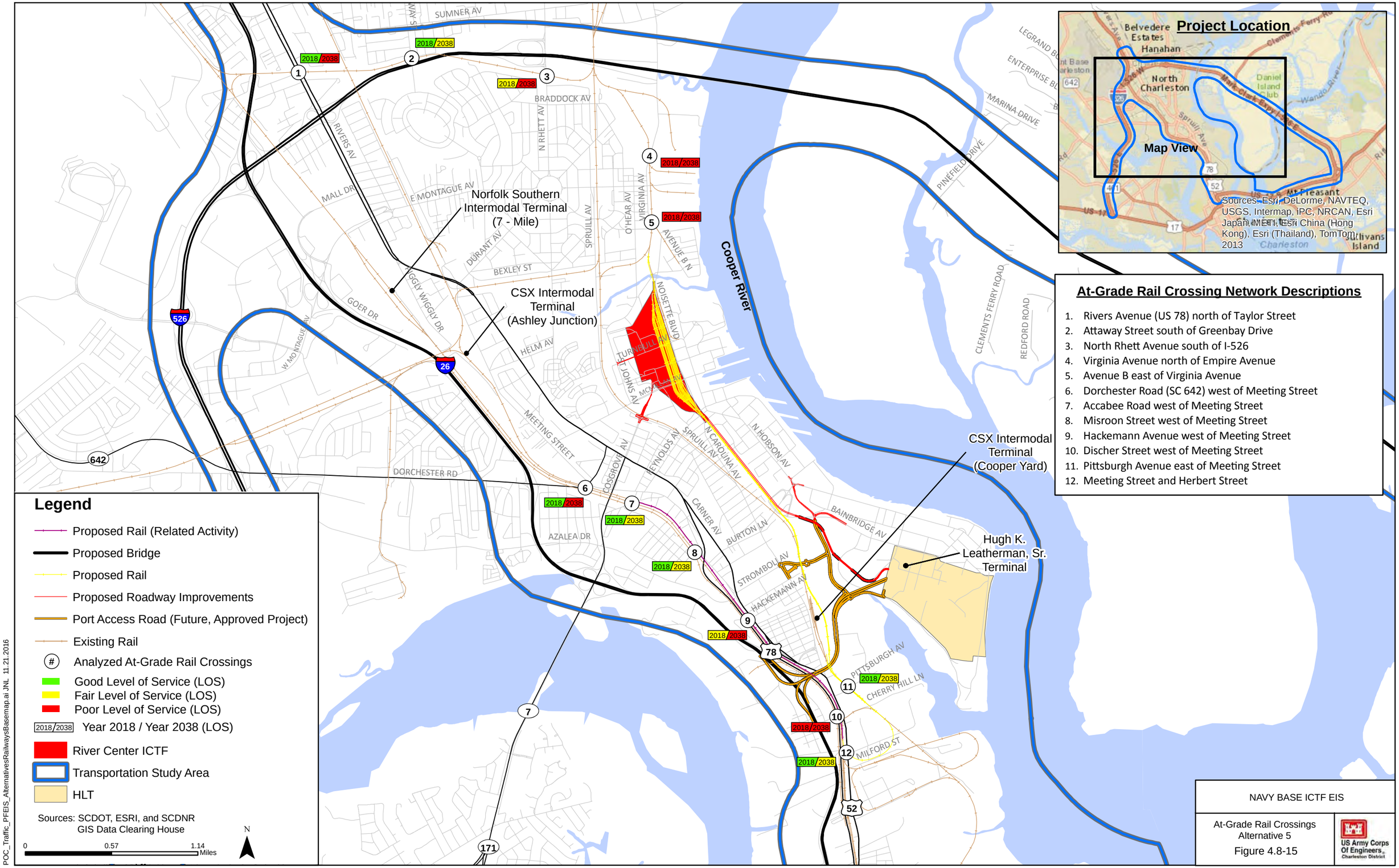
NAVY BASE ICTF EIS

Intersection Operations 2038
Alternatives 5, 6 and 7

Figure 4.8-14

US Army Corps Of Engineers Charleston District

POC_Traffic_PFEIS_IntersectionAlternatives.ai 11.21.2016 JNL


Norfolk Southern Intermodal Terminal (7 - Mile)
CSX Intermodal Terminal (Ashley Junction)
CSX Intermodal Terminal (Cooper Yard)
Hugh K. Leatherman, Sr. Terminal
Cooper River
SUMNER AV
BRADDOCK AV
RIVERS AV
MALL DR
E MONTAGUE AV
W MONTAGUE AV
GOER DR
WIGGLY WIGGLY DR
N RHETT AV
SPRUILL AV
O'HEAR AV
VIRGINIA AV
AVENUE B N
DURANT AV
BEXLEY ST
HELM AV
NOISETTE BLVD
TURNBULL AV
JOHN ST
MONTAGUE AV
MEETING STREET
DORCHESTER RD
COSGROVE AV
REYNOLDS AV
SPRUILL AV
N CAROLINA AV
N HOBSON AV
CARNER AV
BURTON LN
AZALEA DR
BAINBRIDGE AV
STROMBOLI AV
HACKEMANN AV
PITTSBURGH AV
CHERRY HILL LN
MILFORD ST
MARINA DRIVE
PINEFIELD DRIVE
CLEMENTS FERRY ROAD
REDFORD ROAD
LEGRAND BL
ENTERPRISE BL
2018/2038
1
2
3
4
5
6
7
8
9
10
11
12
526
26
642
78
52
171
17
Project Location
Belvedere
Estates
Hanahan
North Charleston
Daniel Island Club
Map View
Mt Pleasant
Charleston
Sullivans Island
Sources: Esri, DeLorme, NAVTEQ, USGS, Intermap, iPC, NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom, 2013
At-Grade Rail Crossing Network Descriptions
1. Rivers Avenue (US 78) north of Taylor Street
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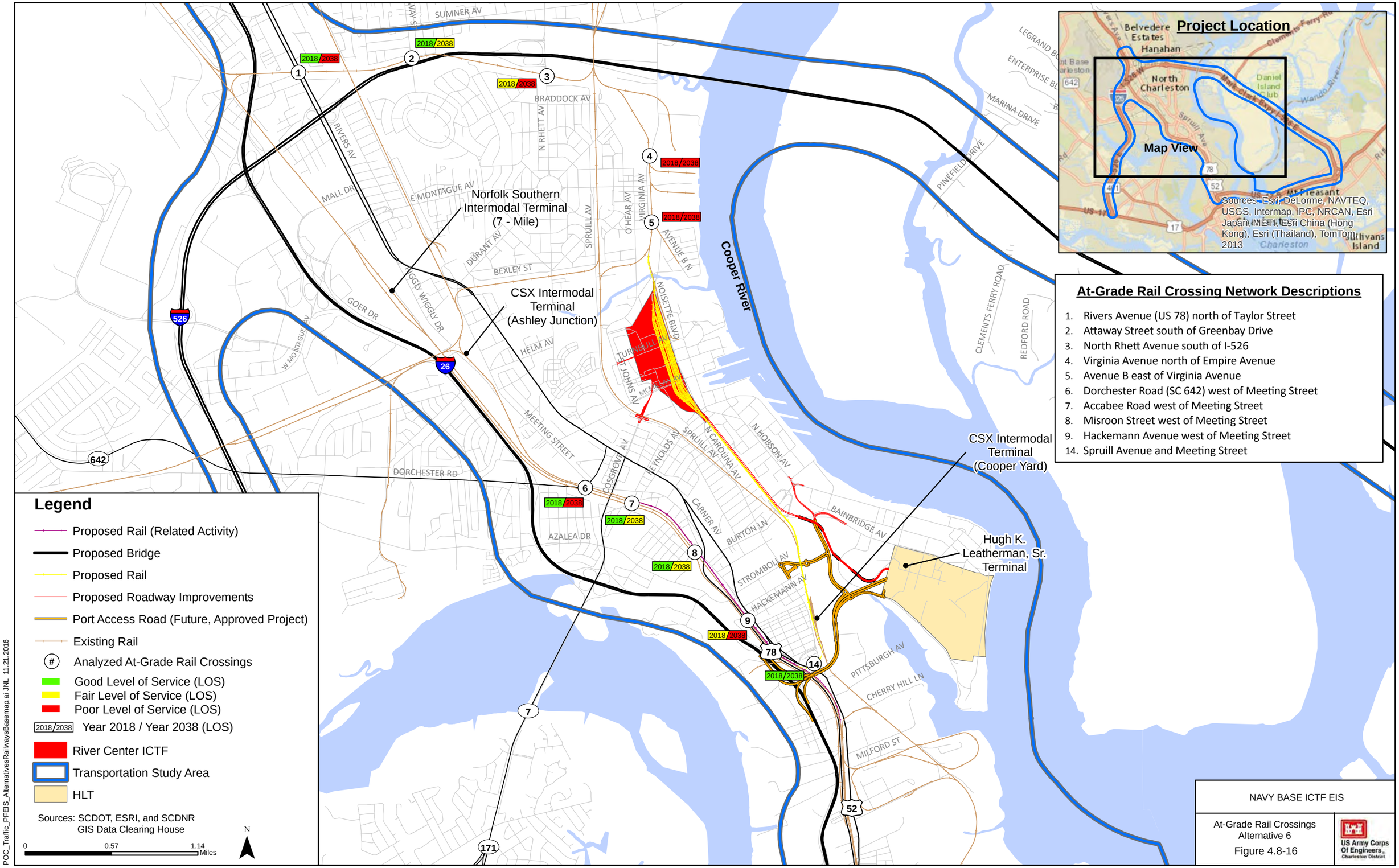
3. North Rhett Avenue south of I-526
4. Virginia Avenue north of Empire Avenue
5. Avenue B east of Virginia Avenue
6. Dorchester Road (SC 642) west of Meeting Street
7. Accabee Road west of Meeting Street
8. Misroon Street west of Meeting Street
9. Hackemann Avenue west of Meeting Street
10. Discher Street west of Meeting Street
11. Pittsburgh Avenue east of Meeting Street
12. Meeting Street and Herbert Street
Legend
Proposed Rail (Related Activity)
Proposed Bridge
Proposed Rail
Proposed Roadway Improvements
Port Access Road (Future, Approved Project)
Existing Rail
Analyzed At-Grade Rail Crossings
Good Level of Service (LOS)
Fair Level of Service (LOS)
Poor Level of Service (LOS)
2018/2038 Year 2018 / Year 2038 (LOS)
River Center ICTF
Transportation Study Area
HLT
Sources: SCDOT, ESRI, and SCDNR GIS Data Clearing House
0 0.57 1.14 Miles
N
NAVY BASE ICTF EIS
At-Grade Rail Crossings Alternative 5
Figure 4.8-15
US Army Corps Of Engineers Charleston District
POC_Traffic_PFEIS_AlternativesRailwaysBasemap.ai JNL 11.21.2016



Project Location

At-Grade Rail Crossing Network Descriptions

1. Rivers Avenue (US 78) north of Taylor Street
2. Attaway Street south of Greenbay Drive
3. North Rhett Avenue south of I-526
4. Virginia Avenue north of Empire Avenue
5. Avenue B east of Virginia Avenue
6. Dorchester Road (SC 642) west of Meeting Street
7. Accabee Road west of Meeting Street
8. Misroon Street west of Meeting Street
9. Hackemann Avenue west of Meeting Street
14. Spruill Avenue and Meeting Street

Legend

- Proposed Rail (Related Activity)
- Proposed Bridge
- Proposed Rail
- Proposed Roadway Improvements
- Port Access Road (Future, Approved Project)
- Existing Rail
- (#) Analyzed At-Grade Rail Crossings
- Good Level of Service (LOS)
- Fair Level of Service (LOS)
- Poor Level of Service (LOS)
- 2018/2038 Year 2018 / Year 2038 (LOS)
- River Center ICTF
- Transportation Study Area
- HLT

Sources: SCDOT, ESRI, and SCDNR GIS Data Clearing House

0 0.57 1.14 Miles

N

POC_Traffic_PFEIS_AlternativesRailwaysBasemap.ai JNL 11.21.2016

NAVY BASE ICTF EIS

At-Grade Rail Crossings
Alternative 6

Figure 4.8-16

US Army Corps Of Engineers Charleston District

Norfolk Southern Intermodal Terminal (7 - Mile)

CSX Intermodal Terminal (Ashley Junction)

CSX Intermodal Terminal (Cooper Yard)

Hugh K. Leatherman, Sr. Terminal

Cooper River

SUMNER AV
BRADDOCK AV
RIVERS AV
MALL DR
E MONTAGUE AV
N RHETT AV
SPRUILL AV
O'HEAR AV
VIRGINIA AV
AVENUE B N
DURANT AV
BEXLEY ST
GOER DR
W MONTAGUE AV
WIGGLY WIGGLY DR
HELM AV
NOISETTE BLVD
TURNBULL AV
JOHN ST
MONTAGUE AV
MEETING STREET
DORCHESTER RD
COSGROVE AV
REYNOLDS AV
SPRUILL AV
N CAROLINA AV
N HOBSON AV
CARNER AV
BURTON LN
AZALEA DR
BAINBRIDGE AV
STROMBOLI AV
HACKEMANN AV
PITTSBURGH AV
CHERRY HILL LN
MILFORD ST
LEGRAND BLVD
ENTERPRISE BLVD
MARINA DRIVE
PINEFIELD DRIVE
CLEMENTS FERRY ROAD
REDFORD ROAD

526
26
642
6
7
8
9
78
10
11
12
52
171

2018/2038

Project Location

Map View

Belvedere Estates
Hanahan
North Charleston
Daniel Island Club
Mark Clark Expressway
Wando River
Spruill Ave
Mt Pleasant
Charleston
Sullivans Island
Sources: Esri, DeLorme, NAVTEQ, USGS, Intermap, iPC, NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom, 2013

At-Grade Rail Crossing Network Descriptions

6. Dorchester Road (SC 642) west of Meeting Street
7. Accabee Road west of Meeting Street
8. Misroon Street west of Meeting Street
9. Hackemann Avenue west of Meeting Street
10. Discher Street west of Meeting Street
11. Pittsburgh Avenue east of Meeting Street
12. Meeting Street and Herbert Street

Legend

- Proposed Rail (Related Activity)
- Proposed Bridge
- Proposed Rail
- Proposed Roadway Improvements
- Port Access Road (Future, Approved Project)
- Existing Rail
- (#) Analyzed At-Grade Rail Crossings
- Good Level of Service (LOS)
- Fair Level of Service (LOS)
- Poor Level of Service (LOS)
- 2018/2038 Year 2018 / Year 2038 (LOS)
- River Center ICTF
- Transportation Study Area
- HLT

Sources: SCDOT, ESRI, and SCDNR GIS Data Clearing House

0 0.57 1.14 Miles

N

POC_Traffic_PFEIS_AlternativesRailwaysBasemap.ai JNL 11.21.2016

NAVY BASE ICTF EIS

At-Grade Rail Crossings
Alternative 7

Figure 4.8-17

US Army Corps Of Engineers Charleston District

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4.9 LAND USE AND INFRASTRUCTURE

4.9.1 Methods and Impact Definitions

Impacts to land use and infrastructure in the study area were evaluated using literature review, impact analysis from other potential resources (such as noise and visual resources), local comprehensive plan and land development ordinance requirements, design plans, technical repots and best professional judgment.

With respect to land use, the analysis focused on the potential for conflicts in and between land use districts as a result of construction and/or operation activities of Alternative 1 (Proposed Project). The Project site is within an urbanized area under the control of local governments with planning and zoning regulations in place. Conflicts could include incompatibility with existing zoning and the adopted Comprehensive Plan, restricted access, and incompatible visual and/or noise impacts. If potential conflicts were present between existing zoning and the comprehensive plan, measures could be employed to bring zoning and land use into compliance. The proposed action is not intended to stimulate growth and is planned to accommodate future demands for the movement of goods through the region and improve operational efficiency in the transport system. As a result, there is low potential for induced growth and the project would not result in indirect effects to land use. Any development that would occur in the area in relation to the ICTF facility would be regulated under existing land use and zoning controls.

With respect to infrastructure, the analysis focused on a review of the existing utility services, capacities within the study area, and the ability of these utilities to meet the new demand requirements resulting from the construction and operation of Alternative 1 (Proposed Project). A Preliminary Utility Report for the Navy Base Intermodal Facility was prepared in April 2016 (Appendix B - CDM Smith/TransSystems 2016). This report serves as a planning and feasibility guide for utilities needed to serve Alternative 1 (Proposed Project) and is based on previous Subsurface Utility Engineering investigations at the Project site, as well as input from utility owners. The report identifies utility owners within the limits of the Project site, recommends relocations, details potential conflicts, and proposes remediation.

Table 4.9-1 summarizes the impact definitions for land use and infrastructure impacts used in this analysis. Temporary impacts are considered to be those that would occur intermittently or less than 1 month; short-term impacts are considered to last between one to six months; long-term impacts last the duration of construction activities (anticipated to be two to three years); and permanent impacts are considered to continue indefinitely after construction and during the operation of the facility.

Table 4.9-1
Impact Definitions, Land Use and Infrastructure

Level of Impact	Definition
Negligible	Compatible land uses (no change in designation required); no demolition of non-Palmetto Railways owned structures; interruption(s) of service due to construction and/or operation of the Project for a duration of less than 12 hours.
Minor	Compatible land uses (no change in designation required); demolition of less than 10 non-Palmetto Railways owned structures, or no structures of special designation; interruption(s) of service due to construction and/or operation of the Project for a duration of more than 12 hours but less than 24 hours.
Major	Incompatible land uses (e.g., change in land use designation is required); demolition of more than 10 non-Palmetto Railways owned structures or of any structures of special designation required; construction and/or operation activities of the proposed ICTF exceed capacities of utilities to serve the Project, and/or routinely cause disruptions of service to residents and businesses within the study area for more than 24 hours.

4.9.2 No-Action Alternative

Under the No-Action Alternative, because these sites are primarily owned by Palmetto Railways, it is assumed that the Project site and the River Center Project site would eventually include mixed use and industrial land use, including rail-served warehousing and distribution. These uses would be consistent with the existing land uses (M-2, Heavy Industrial District, and Planned Development District), and would likely not require demolition of non-Palmetto Railways owned structures.

Future development activities would likely be of a smaller scale and intensity than Alternative 1 (Proposed Project), such that the existing design capacities of the serving utilities would be sufficient. There would not be a need to expand and/or improve the existing utilities infrastructure to the area.

For these reasons, the Corps anticipates that impacts to land use and infrastructure under the No-Action Alternative will be negligible.

4.9.3 Alternative 1: Applicant's Proposed Project (South via Milford / North via Hospital District)

4.9.3.1 Land Use and Zoning

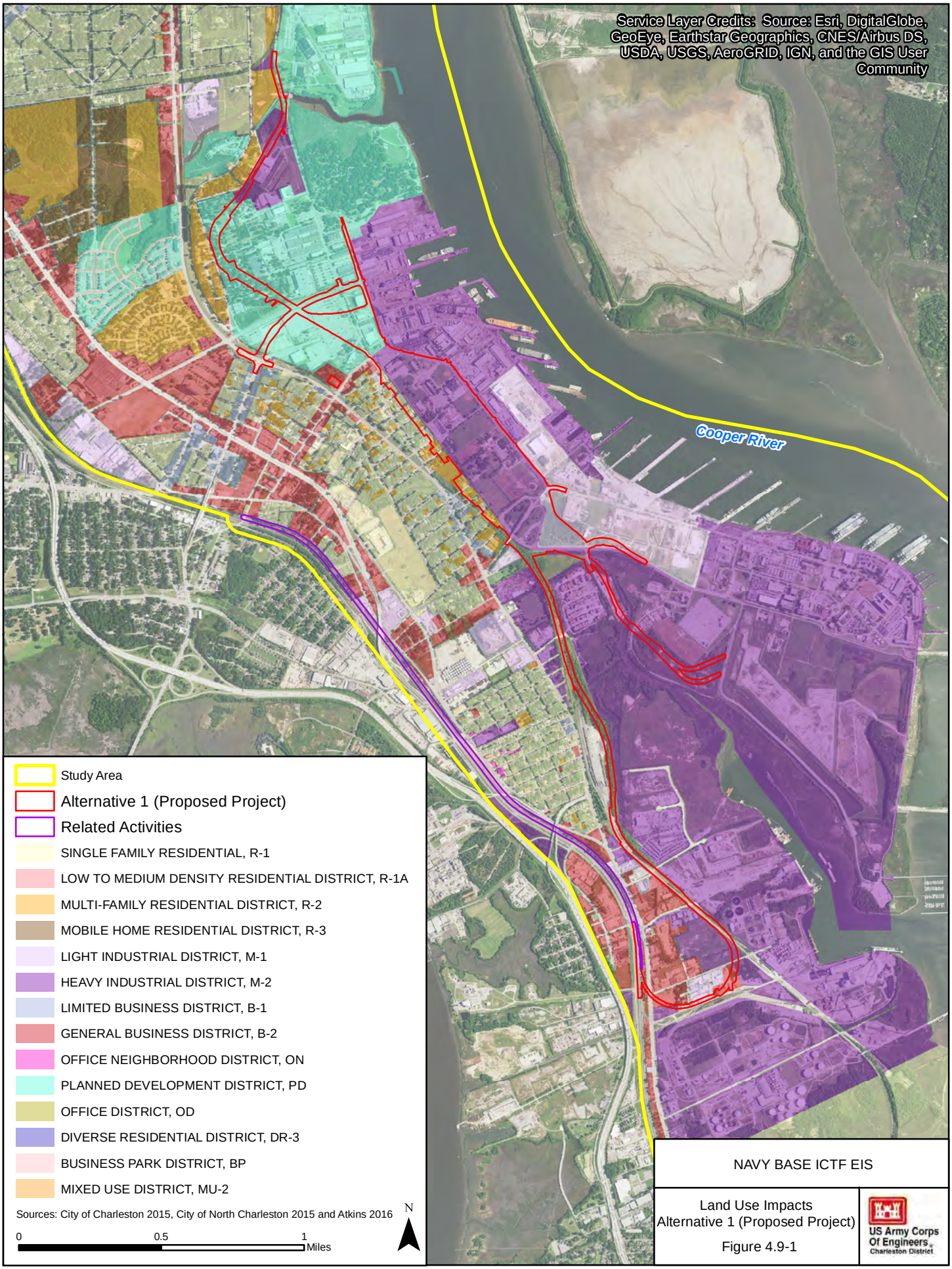
ICTF Site

During the former Charleston Naval Base operations, the Chicora-Cherokee community was exposed to the heavy marine industrial activities conducted by the U.S. Navy within the base and along the Cooper River. After the base closure, the zoning classifications of M-1 (Light Industrial District) and M-2 (Heavy Industrial District) adjacent to the community remained in place (Figure 4.9-1).

Consequently, the Chicora-Cherokee community has historically interfaced with the industrial activities on its eastern boundary.

The construction and operation of Alternative 1 (Proposed Project) would be consistent with the current zoning designation of M-2 for the ICTF site. Container storage facilities are generally addressed as a conditional use under the M-2 classification. However, the Future Land Use element of the adopted Comprehensive Plan for the City of North Charleston identifies portions of the Project site as an Institutional future land use. Deviation from this future land use would require a Comprehensive Plan Amendment which would be a major impact to land use. The northern portion of the Project site is zoned (PD) Planned Development District, which has the flexibility for the industrial uses associated with Alternative 1 (Proposed Project) (Figure 4.9-1).

A berm and sound walls would be constructed within a 100-foot buffer along the western boundary of the ICTF site as mitigation to minimize noise impacts to the adjacent residents. See Figure 4.12-15 for additional details and location of these mitigation measures. The western boundary of the ICTF site and the buffer/berm and walls would extend into the adjacent Chicora-Cherokee residential neighborhood, which is currently zoned R-1 (Single Family Residential District) and R-2 (Multi-Family Residential District). The Corps anticipates that this action would require a zoning change and Comprehensive Plan amendment due to the conversion of the current residential zoning classification to an industrial classification and to bring the adopted Comprehensive Plan and accompanying Future Land Use Map (FLUM) into compliance, which would be a major impact to land use. For any proposed construction that is not consistent with the existing zoning codes and adopted Comprehensive Plan, it would be incumbent upon Palmetto Railways to work with each municipality to go through the necessary processes to gain all administrative approvals related to land use to ensure compliance with all municipal land use regulations. In December 2012, the City of North Charleston and the South Carolina Division of Public Railways (now Palmetto Railways) entered into a Settlement Agreement and Release. Under the provisions of the Agreement, "City staff will support all reasonable rezoning, permitting and other administrative approvals necessary for implementation of the ICTF and associated railroad lines as well as any other activities required to facilitate the movement of cargo to and from the Port of Charleston" (Section II(C)(2), Case No. 2011-CP-10-491 through 494, 2011-CP-10-5550, and 2011-CP-10-3147). Because of this agreement, the Corps anticipates that this conditional use will be successfully negotiated and approved.


Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Cooper River
Study Area
Alternative 1 (Proposed Project)
Related Activities
SINGLE FAMILY RESIDENTIAL, R-1
LOW TO MEDIUM DENSITY RESIDENTIAL DISTRICT, R-1A
MULTI-FAMILY RESIDENTIAL DISTRICT, R-2
MOBILE HOME RESIDENTIAL DISTRICT, R-3
LIGHT INDUSTRIAL DISTRICT, M-1
HEAVY INDUSTRIAL DISTRICT, M-2
LIMITED BUSINESS DISTRICT, B-1
GENERAL BUSINESS DISTRICT, B-2
OFFICE NEIGHBORHOOD DISTRICT, ON
PLANNED DEVELOPMENT DISTRICT, PD
OFFICE DISTRICT, OD
DIVERSE RESIDENTIAL DISTRICT, DR-3
BUSINESS PARK DISTRICT, BP
MIXED USE DISTRICT, MU-2
Sources: City of Charleston 2015, City of North Charleston 2015 and Atkins 2016
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Miles
N
NAVY BASE ICTF EIS
Land Use Impacts
Alternative 1 (Proposed Project)
Figure 4.9-1
US Army Corps Of Engineers
Charleston District

Roadway/Rail Improvements

Proposed roadway and rail improvements within the City of North Charleston (Figure 4.9-1) would occur on lands currently classified as M-1 (Light Industrial District) and M-2 (Heavy Industrial District). These infrastructure improvements would be consistent with the respective zoning district use classifications. Near the vicinity of Pittsburgh Avenue, zoning jurisdiction changes to the City of Charleston and is thus subject to the zoning regulations of the City of Charleston. The new track connection in the vicinity of Milford Street would traverse land currently zoned as GB (General Business District), HI (Heavy Industrial District), LI (Light Industrial District) and BP (Business Park District) (Figure 4.9-1). Since the development of the Draft EIS, the City of Charleston has designated some portions of land within the southern part of the study area (along Meeting Street Rd.) as mixed-use to support redevelopment with a variety of urban uses. A new zoning District was developed called the UP (Upper Peninsula Zoning District) and was enacted in October 2015 to protect the existing neighborhoods, encourage responsible development, and allow for mixed use and increased density. The Corps anticipates that improvements associated with Alternative 1 (Proposed Project) will not require re-zoning within the City of Charleston. Palmetto Railways will work with the local municipalaties to go through the necessary processes to gain all approvals related to land use to ensure compliance with all municipal land use regulations.

Demolition of Structures

Construction of Alternative 1 (Proposed Project) would occur on land owned by Palmetto Railways, on land within an existing CSX ROW, and on parcels of private property. Within the ICTF site, this construction would cause the demolition of approximately 88 structures. Additional off-site roadway and rail improvements would cause the demolition of approximately 23 structures. The demolition of more than 10 non-Palmetto Railways owned structures would result in a major impact to land use. The community resources and structures of special designation that would be lost as a result of Alternative 1 (Proposed Project) are detailed in Section 4.16 (Socioeconomics and Environmental Justice) and Section 4.10 (Cultural Resources), respectively.

According to the Applicant, Alternative 1 (Proposed Project) would require ROW acquisitions that would result in the relocation of approximately 134 residential units from the Chicora-Cherokee neighborhood. The exact number of relocations will be determined at final design. Any person(s) whose property needs to be acquired as a result of Alternative 1 (Proposed Project) would be compensated in accordance with the U.S. Constitution and the Uniform Relocation Assistance and Real Properties Act of 1970[71] (The Uniform Act) (see Chapter 8 Relevant Laws, Regulations, and Executive Orders).

[71] 42 U.S.C.A. §§ 4601 et seq., as amended

4.9.3.2 Infrastructure and Utilities

Utility infrastructure and services are currently available in the vicinity of the Project site; however, utilities would have to be relocated and extended to serve Alternative 1 (Proposed Project). Existing utility systems, such as potable water, electricity, sanitary sewer, solid waste, and telecommunications, would provide services to the Project site. Demand for potable water and sanitary/solid waste collection would be generated by ICTF employees and occasional visitors during operation of the proposed ICTF. The operation of the facility would not require industrial water usage, nor would it generate sanitary or solid waste other than the amount relating to employees. Provision of services to the Project site would be subject to contract agreements with the respective utilities, and, in some cases (e.g., electrical), relocation and improvements to existing infrastructure. The Preliminary Utility Report for the Navy Base Intermodal Facility was prepared in April 2016 (Appendix B) and is based on analysis of 60 percent design plans (with the exception of the Drayage Road plans which are based on 30 percent). Efforts were made during the design phase to locate new facilities in ways to avoid and/or minimize impacts to significant utility facilities. Some utilities have been abandoned and removed to allow for demolition at the site. The report identifies abandonment and removal of existing utilities, makes recommendations for relocations, identifies prior rights, and address conflicts and potential remediation. In general, the majority of the utilities within the eastern portion of the Project site can remain in place, with some adjustments. Relocations will be required in the north, south, and western portions of the Project site. Utility relocations may change with evolving project design (including track and roadway modifications and construction) and needs of utility owners; however, changes to utility design are not expected to change the level of impacts to infrastructure and utilities. The Preliminary Utility Report (Appendix B) indicates that the Applicant will work with utility providers to minimize interruptions of service to local area residents and businesses.

4.9.3.2.1 Electricity

Estimated usage of electricity for Alternative 1 (Proposed Project) is 18 million kilowatt hours/year. Electricity to the Project site is to be provided by a partnership between the South Carolina Electric and Gas Company (SCE&G), a primary subsidiary of SCANA, and Santee-Cooper. Both electrical utilities have the capacity to serve the Project site. Peak service demands from the five electrical cranes on the Project site would require upgrades to the local infrastructure. SCE&G would serve the startup and future electrical demands for the ICTF from their onsite substation, which is located north of the truck gate on North Hobson Avenue. In addition, SCE&G built a 115 kilovolt (kV) transmission line in 2015 to meet the needs of the Clemson Wind Turbine Facility. Alternative 1 (Proposed Project) will benefit from this line by relocating their distribution lines to this pole. Santee-Cooper also has a 115-kV transmission line that enters the Project site from the west. Utility relocation plans call for the Santee-Cooper line to be relocated to the buffer/berm area along the western portion of the Project area. Additional electrical utilities within the Project site that cannot be used would be removed, altered, or relocated. Relocation of electrical infrastructure during

construction efforts could result in an interruption of service to local area residents and businesses for less than 12 hours.

4.9.3.2.2 Natural Gas

SCE&G also provides natural gas to retail customers through its extended transportation network in the Charleston area. Some gas lines at the site have been relocated, abandoned, and/or removed and the Preliminary Utility Report (Appendix B) makes additional recommendations for relocations. No natural gas service is anticipated to be required for Alternative 1 (Proposed Project).

4.9.3.2.3 Communications

SCANA Communications provides fiber optic telecommunications, Ethernet, and data center facilities to the Project site. Construction and operation of the ICTF would require relocation or removal of communication infrastructure from SCANA Communication as well as AT&T, EarthLink, Spirit and Comcast within the Project area. The provision of telecommunications and other services such as Internet would be accomplished with local connections to the SCANA communication network. The Preliminary Utility Report (Appendix B) makes recommendations on relocation requirements for communication providers and the Applicant is working with providers on developing individual relocation routes. The report also recommends the relocation of AT&T lines in the Kephart Services Corridor and reconnection to North Carolina Avenue facilities (if required). Relocation of communication infrastructure during construction efforts could result in an interruption of service to local area residents and businesses for less than 12 hours.

4.9.3.2.4 Potable Water

The estimated usage for water for Alternative 1 (Proposed Project) is 264,625 gallons/year, however there would be no impact on Charleston Water System (CWS) capacity or infrastructure to provide potable water and fire protection water flow for construction and operation of Alternative 1 (Proposed Project). The Project site is currently served by a 12-inch ductile iron potable water and fire serve pipeline that runs along the eastern ROW of North Hobson Avenue. This pipeline is adequate to provide the requirements of the Project at build-out and full employment (2038). External water use would be limited to landscape irrigation during dry months of the year. Fire protection is currently provided from hydrants spaced at 300 to 600 feet intervals along North Hobson Avenue. CWS maintains reserves for fire flow capacity and water pressure to serve the fire protection needs within their service area, which includes the location of Alternative 1 (Proposed Project).

There is currently a network of smaller potable water lines, ranging in size from 4 to 8 inches, within the Project site. These lines would be adapted to serve the respective project, abandoned in place, and/or relocated to continue service to the surrounding area. In addition, certain pipelines may be impacted by realignment of roads and the extension of rail lines within the study area, both north

and south of the Project site. The Preliminary Utility Report (Appendix B) makes recommendations on relocation requirements, and the Applicant is working with CWS on developing individual relocation routes and necessary improvements. Relocation of these water lines during construction efforts could result in an interruption of service to local area residents and businesses for less than 12 hours.

4.9.3.2.5 Wastewater

Wastewater collection and treatment services to the study area are provided by the North Charleston Sewer District. Treatment is performed at the Felix Davis Waste Water Treatment Plant (WWTP), which is designed to accommodate 27 million gallons per day (MGD) in capacity. The plant currently operates at an average of 15 MGD, leaving 12 MGD capacity for peak day loads and growth. As a result, the plant capacity is more than sufficient to accommodate the estimated 725 gallons per day (GPD) flow from Alternative 1 (Proposed Project), and there would be no impact to the North Charleston Sewer District from operation of Alternative 1 (Proposed Project).

Two wastewater pump stations are located on the Project site. Wastewater flow from these stations is accommodated by an existing 30-inch gravity and 20-inch force main. The North Charleston Sewer District is coordinating with Palmetto Railways to relocate the existing on-site pump station to accommodate Alternative 1 (Proposed Project). Sanitary sewer lines currently extend throughout the Project site. Lines of various sizes also extend along roads slated for removal and/or improvements, as well as under proposed railroad ROW. These lines may be rerouted and/or abandoned in place to accommodate the construction of Alternative 1 (Proposed Project). Realignment of these sanitary sewer lines during construction efforts could result in an interruption of service to local area residents and businesses for less than 12 hours.

4.9.3.2.6 Solid Waste

Daily/weekly solid waste collection is provided along an established route in the vicinity of the Project site by private waste management firms. Thus, there are sufficient private collection and disposal services available to serve the ICTF. Disposal of domestic solid waste in the region is accommodated at the Spring View landfill, which projects a 125-year remaining capacity based on current disposal rates. Spring View landfill currently follows all state and local standards for sanitary landfills. Commercial and industrial businesses must arrange for private collection and disposal of solid waste at the Spring View landfill, as well as hazardous and/or non-hazardous solid waste that would require special handling and disposal. Approximately 66,400 cubic yards of solid waste would be generated during the construction of the ICTF, all of which would be disposed of at the Spring View landfill. All state and local standards for solid waste disposal would be followed during construction and operation. As a result, there would be no impact from the collection and disposal of solid wastes from Alternative 1 (Proposed Project).

For the reasons discussed above, Alternative 1 (Proposed Project) would have major impacts to land use and demolition of structures, and negligible impacts to infrastructure.

4.9.4 Alternative 2: Proposed Project Site (South via Milford / North via S-line)

4.9.4.1 Land Use and Zoning

ICTF Site

Under Alternative 2, land use and zoning impacts related to the Project site (Figure 4.9-2) would be similar to those described for Alternative 1 (Proposed Project). This action would require zoning changes and a Comprehensive Plan amendment.

Roadway/Rail Improvements

Under Alternative 2, land use and zoning impacts related to roadway and rail improvements (Figure 4.9-2) would be similar to those described for the Alternative 1 (Proposed Project).

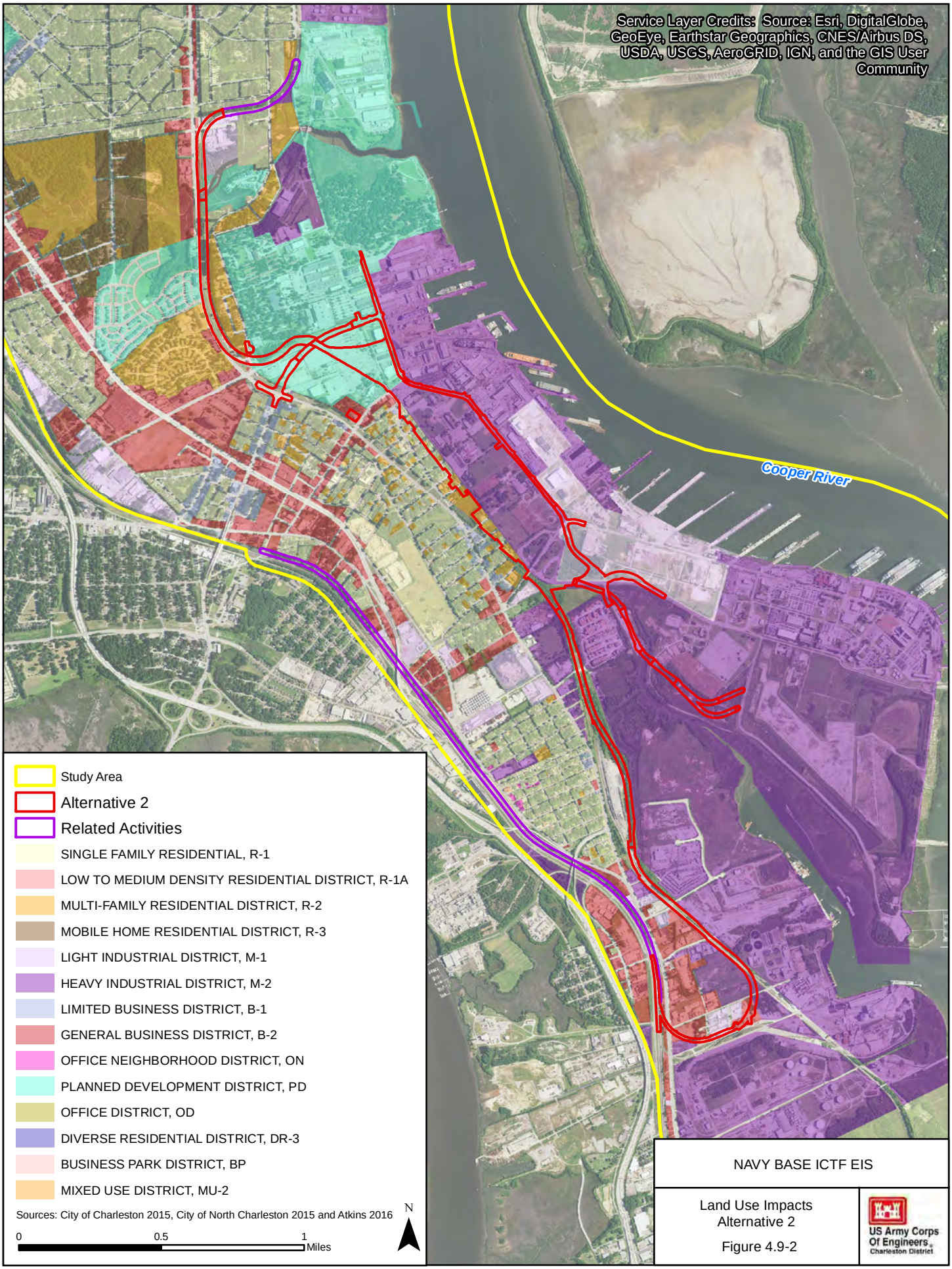
Demolition of Structures

Construction of Alternative 2 would occur on land owned by Palmetto Railways, on land within an existing CSX ROW, and on parcels of private property. Within the Project site, this construction would cause the demolition of approximately 88 structures. Additional off-site roadway and rail improvements would cause the demolition of approximately 26 structures.

4.9.4.2 Infrastructure and Utilities

Infrastructure and utility requirements and impacts under Alternative 2 would be similar to those described for Alternative 1 (Proposed Project). Any interruption of service to local area residents and businesses could be less than 12 hours.

For the reasons discussed above, Alternative 2 would have major impacts to land use and demolition of structures, and negligible impacts to infrastructure.


Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Cooper River
Study Area
Alternative 2
Related Activities
SINGLE FAMILY RESIDENTIAL, R-1
LOW TO MEDIUM DENSITY RESIDENTIAL DISTRICT, R-1A
MULTI-FAMILY RESIDENTIAL DISTRICT, R-2
MOBILE HOME RESIDENTIAL DISTRICT, R-3
LIGHT INDUSTRIAL DISTRICT, M-1
HEAVY INDUSTRIAL DISTRICT, M-2
LIMITED BUSINESS DISTRICT, B-1
GENERAL BUSINESS DISTRICT, B-2
OFFICE NEIGHBORHOOD DISTRICT, ON
PLANNED DEVELOPMENT DISTRICT, PD
OFFICE DISTRICT, OD
DIVERSE RESIDENTIAL DISTRICT, DR-3
BUSINESS PARK DISTRICT, BP
MIXED USE DISTRICT, MU-2
Sources: City of Charleston 2015, City of North Charleston 2015 and Atkins 2016
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Miles
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NAVY BASE ICTF EIS
Land Use Impacts
Alternative 2
Figure 4.9-2
US Army Corps Of Engineers
Charleston District

4.9.5 Alternative 3: Proposed Project Site (South via Kingsworth / North via Hospital)

4.9.5.1 Land Use and Zoning

ICTF Site

Under Alternative 3, land use and zoning impacts related to the Project site (Figure 4.9-3) would be similar to those described for the Alternative 1 (Proposed Project). This action would require zoning changes and a Comprehensive Plan amendment.

Roadway/Rail Improvements

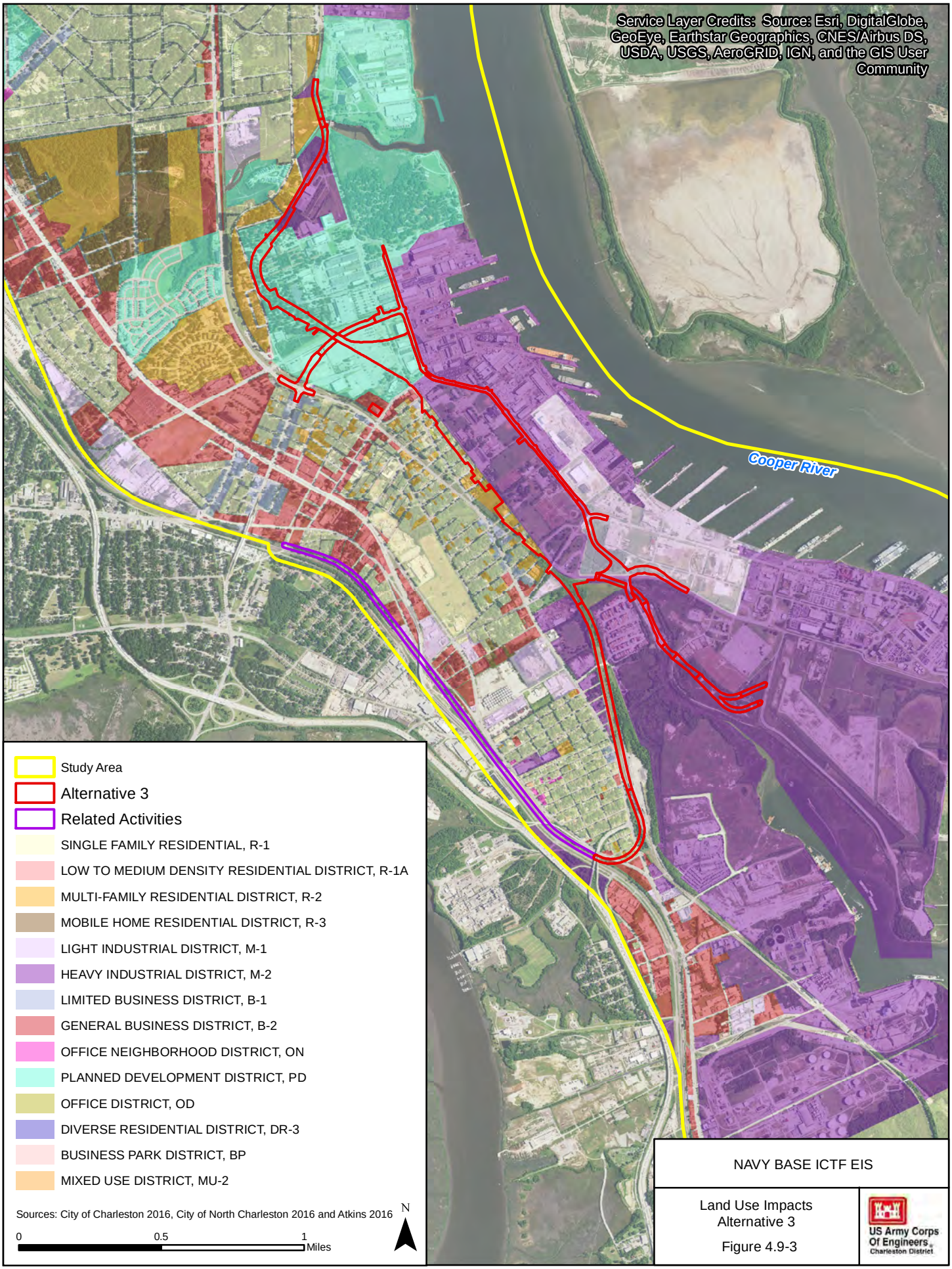
Under Alternative 3, land use and zoning impacts related to roadway and rail improvements (Figure 4.9-3) would be similar to those described for the Alternative 1 (Proposed Project).

Demolition of Structures

Construction of Alternative 3 would occur on land owned by Palmetto Railways, on land within an existing CSX ROW, and on parcels of private property. Within the ICTF site, this construction would cause the demolition of approximately 88 structures. Additional off-site roadway and rail improvements would cause the demolition of approximately 21 structures.

4.9.5.2 Infrastructure and Utilities

Infrastructure and utility requirements and impacts under Alternative 3 would be similar to those described for Alternative 1 (Proposed Project). Any interruption of service to local area residents and businesses could be less than 12 hours.


Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Cooper River
Study Area
Alternative 3
Related Activities
SINGLE FAMILY RESIDENTIAL, R-1
LOW TO MEDIUM DENSITY RESIDENTIAL DISTRICT, R-1A
MULTI-FAMILY RESIDENTIAL DISTRICT, R-2
MOBILE HOME RESIDENTIAL DISTRICT, R-3
LIGHT INDUSTRIAL DISTRICT, M-1
HEAVY INDUSTRIAL DISTRICT, M-2
LIMITED BUSINESS DISTRICT, B-1
GENERAL BUSINESS DISTRICT, B-2
OFFICE NEIGHBORHOOD DISTRICT, ON
PLANNED DEVELOPMENT DISTRICT, PD
OFFICE DISTRICT, OD
DIVERSE RESIDENTIAL DISTRICT, DR-3
BUSINESS PARK DISTRICT, BP
MIXED USE DISTRICT, MU-2
Sources: City of Charleston 2016, City of North Charleston 2016 and Atkins 2016
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NAVY BASE ICTF EIS
Land Use Impacts
Alternative 3
Figure 4.9-3
US Army Corps Of Engineers
Charleston District

For the reasons discussed above, Alternative 3 would have major impacts to land use and demolition of structures, and negligible impacts to infrastructure.

4.9.6 Alternative 4: Proposed Project Site (South via Milford)

4.9.6.1 Land Use and Zoning

ICTF Site

Under Alternative 4, land use and zoning impacts related to the Project site (Figure 4.9-4) would be similar to those described for the Alternative 1 (Proposed Project). This action would require zoning changes and a Comprehensive Plan amendment.

Roadway/Rail Improvements

Under Alternative 4, land use and zoning impacts related to roadway and rail improvements (Figure 4.9-4) would be similar to those described for the Proposed Project.

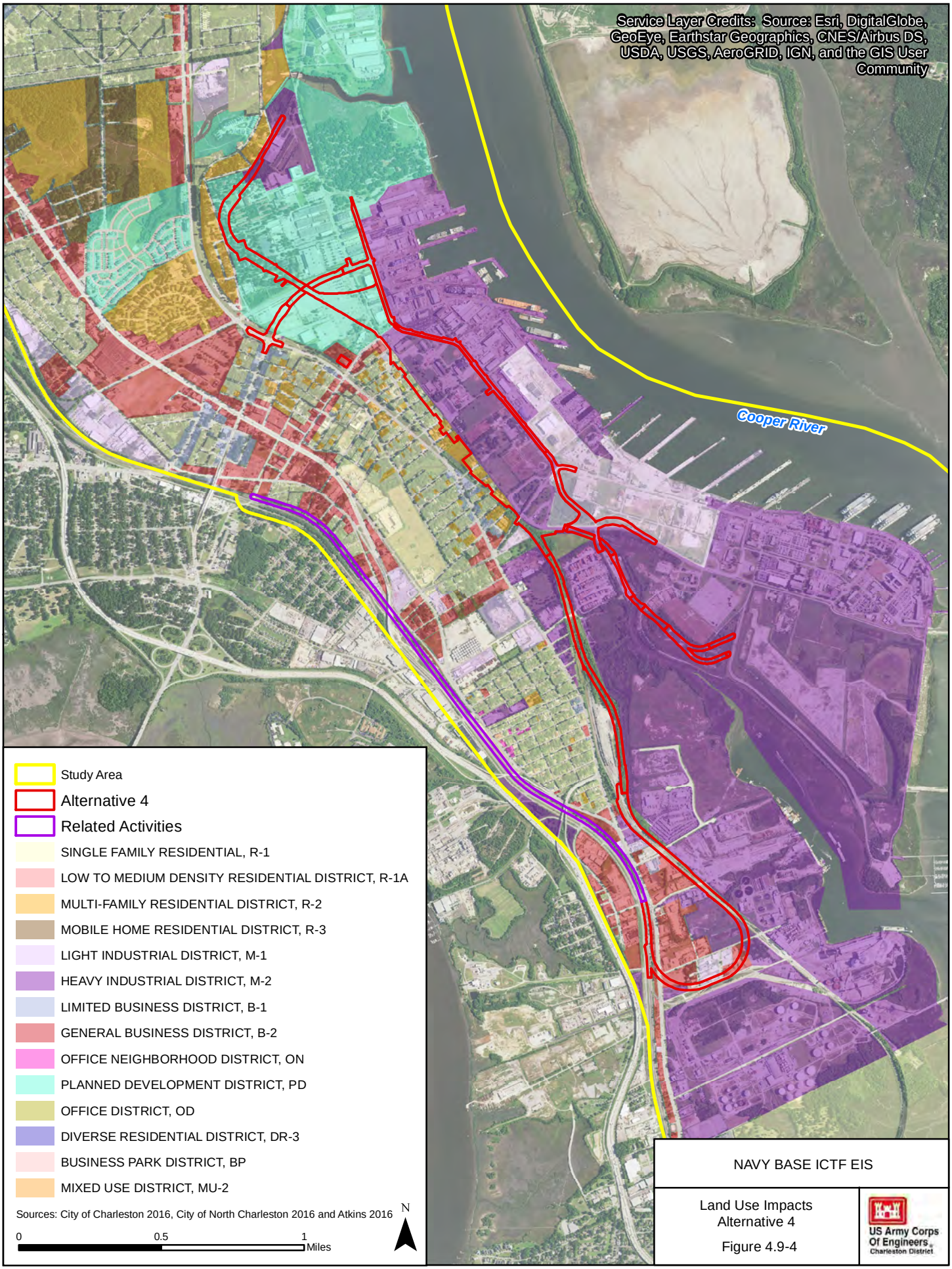
Demolition of Structures

Construction of Alternative 4 would occur on land owned by Palmetto Railways, on land within an existing CSX right of way, and on parcels of private property. Within the ICTF site, this construction would cause the demolition of approximately 88 structures. Additional off-site roadway and rail improvements would cause the demolition of approximately 19 structures.

4.9.6.2 Infrastructure and Utilities

Infrastructure and utility requirements and impacts under Alternative 4 would be similar to those described for Alternative 1 (Proposed Project). Any interruption of service to local area residents and businesses could be less than 12 hours.

For the reasons discussed above, Alternative 4 would have major impacts to land use and demolition of structures, and negligible impacts to infrastructure.


Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Cooper River
Study Area
Alternative 4
Related Activities
SINGLE FAMILY RESIDENTIAL, R-1
LOW TO MEDIUM DENSITY RESIDENTIAL DISTRICT, R-1A
MULTI-FAMILY RESIDENTIAL DISTRICT, R-2
MOBILE HOME RESIDENTIAL DISTRICT, R-3
LIGHT INDUSTRIAL DISTRICT, M-1
HEAVY INDUSTRIAL DISTRICT, M-2
LIMITED BUSINESS DISTRICT, B-1
GENERAL BUSINESS DISTRICT, B-2
OFFICE NEIGHBORHOOD DISTRICT, ON
PLANNED DEVELOPMENT DISTRICT, PD
OFFICE DISTRICT, OD
DIVERSE RESIDENTIAL DISTRICT, DR-3
BUSINESS PARK DISTRICT, BP
MIXED USE DISTRICT, MU-2
Sources: City of Charleston 2016, City of North Charleston 2016 and Atkins 2016
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NAVY BASE ICTF EIS
Land Use Impacts
Alternative 4
Figure 4.9-4
US Army Corps Of Engineers
Charleston District

4.9.7 Alternative 5: River Center Project Site (South via Milford / North via Hospital District)

4.9.7.1 Land Use and Zoning

River Center Project Site

Under Alternative 5, the construction and operation of the River Center project site (Figure 4.9-5) would be consistent with the current zoning classifications of PD (Planned Development District) and M-2 (Heavy Industrial District).

Roadway/Rail Improvements

Under Alternative 5, land use and zoning impacts related to roadway and rail improvements (Figure 4.9-5) would be similar to those described for the Alternative 1 (Proposed Project).

Demolition of Structures

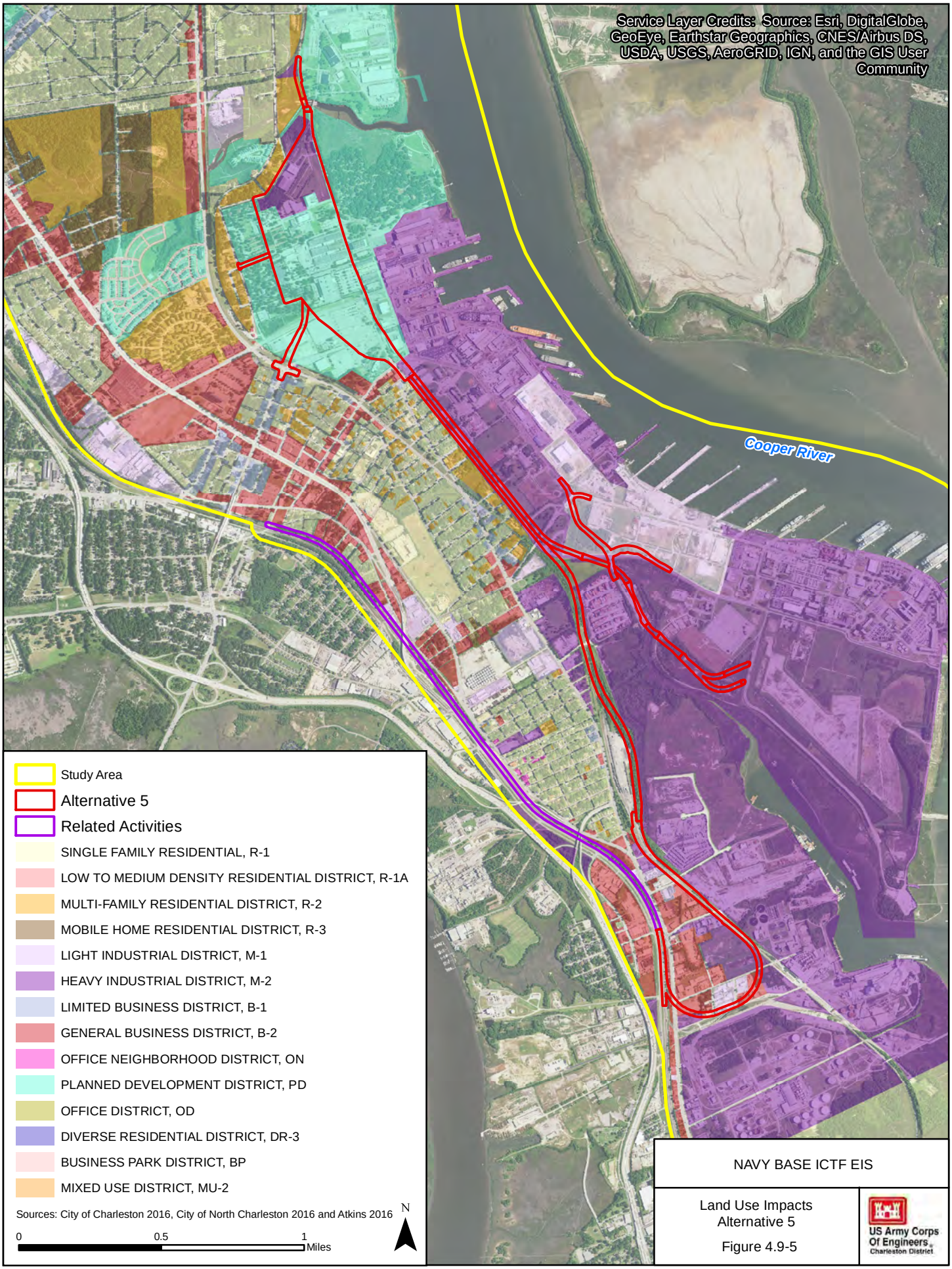
Construction of Alternative 5 would occur on land owned by Palmetto Railways, on land within an existing CSX ROW, and on parcels of private property. Within the River Center project site, this construction would cause the demolition of approximately 33 structures. Additional off-site roadway and rail improvements would cause the demolition of approximately 14 structures.

Alternative 5 would result in the relocation of 62 residences and 18 commercial properties, including 60 units from the West Yard Lofts low-income housing complex and the Lowcountry Innovation Center, which houses more than 15 companies. Any person(s) whose property needs to be acquired as a result of the project would be compensated in accordance with the U.S. Constitution and the Uniform Act of 1970, as amended (see Chapter 8, Relevant Laws, Regulations, and Executive Orders).

4.9.7.2 Infrastructure and Utilities

Infrastructure and utility requirements and impacts under Alternative 5 would be similar to those described for the Alternative 1 (Proposed Project), with the exception that potable water, sanitary sewer, and natural gas pipelines within the River Center project site may be relocated and or temporarily turned off during construction activities. Any interruption of service to local area residents and businesses could be less than 12 hours.

For the reasons discussed above, Alternative 5 would have negligible impacts to land use, major impacts to demolition of structures, and negligible impacts to infrastructure.


Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Cooper River
Study Area
Alternative 5
Related Activities
SINGLE FAMILY RESIDENTIAL, R-1
LOW TO MEDIUM DENSITY RESIDENTIAL DISTRICT, R-1A
MULTI-FAMILY RESIDENTIAL DISTRICT, R-2
MOBILE HOME RESIDENTIAL DISTRICT, R-3
LIGHT INDUSTRIAL DISTRICT, M-1
HEAVY INDUSTRIAL DISTRICT, M-2
LIMITED BUSINESS DISTRICT, B-1
GENERAL BUSINESS DISTRICT, B-2
OFFICE NEIGHBORHOOD DISTRICT, ON
PLANNED DEVELOPMENT DISTRICT, PD
OFFICE DISTRICT, OD
DIVERSE RESIDENTIAL DISTRICT, DR-3
BUSINESS PARK DISTRICT, BP
MIXED USE DISTRICT, MU-2
Sources: City of Charleston 2016, City of North Charleston 2016 and Atkins 2016
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NAVY BASE ICTF EIS
Land Use Impacts
Alternative 5
Figure 4.9-5
US Army Corps Of Engineers
Charleston District

4.9.8 Alternative 6: River Center Project Site (South via Kingsworth / North via Hospital)

4.9.8.1 Land Use and Zoning

River Center Project Site

Under Alternative 6, land use and zoning impacts related to the River Center project site (Figure 4.9-6) would be similar to those described for Alternative 5.

Roadway/Rail Improvements

Under Alternative 6, land use and zoning impacts related to roadway and rail improvements (Figure 4.9-6) would be similar to those described for Alternative 5

Demolition of Structures

Construction of Alternative 6 would occur on land owned by Palmetto Railways, on land within an existing CSX ROW, and on parcels of private property. Within the River Center project site, this construction would cause the demolition of approximately 33 structures. Additional off-site roadway and rail improvements would cause the displacement of approximately 16 structures.

Infrastructure and Utilities

Infrastructure and utility requirements and impacts under Alternative 6 would be similar to those described for Alternative 5. Any interruption of service to local area residents and businesses could be less than 12 hours.

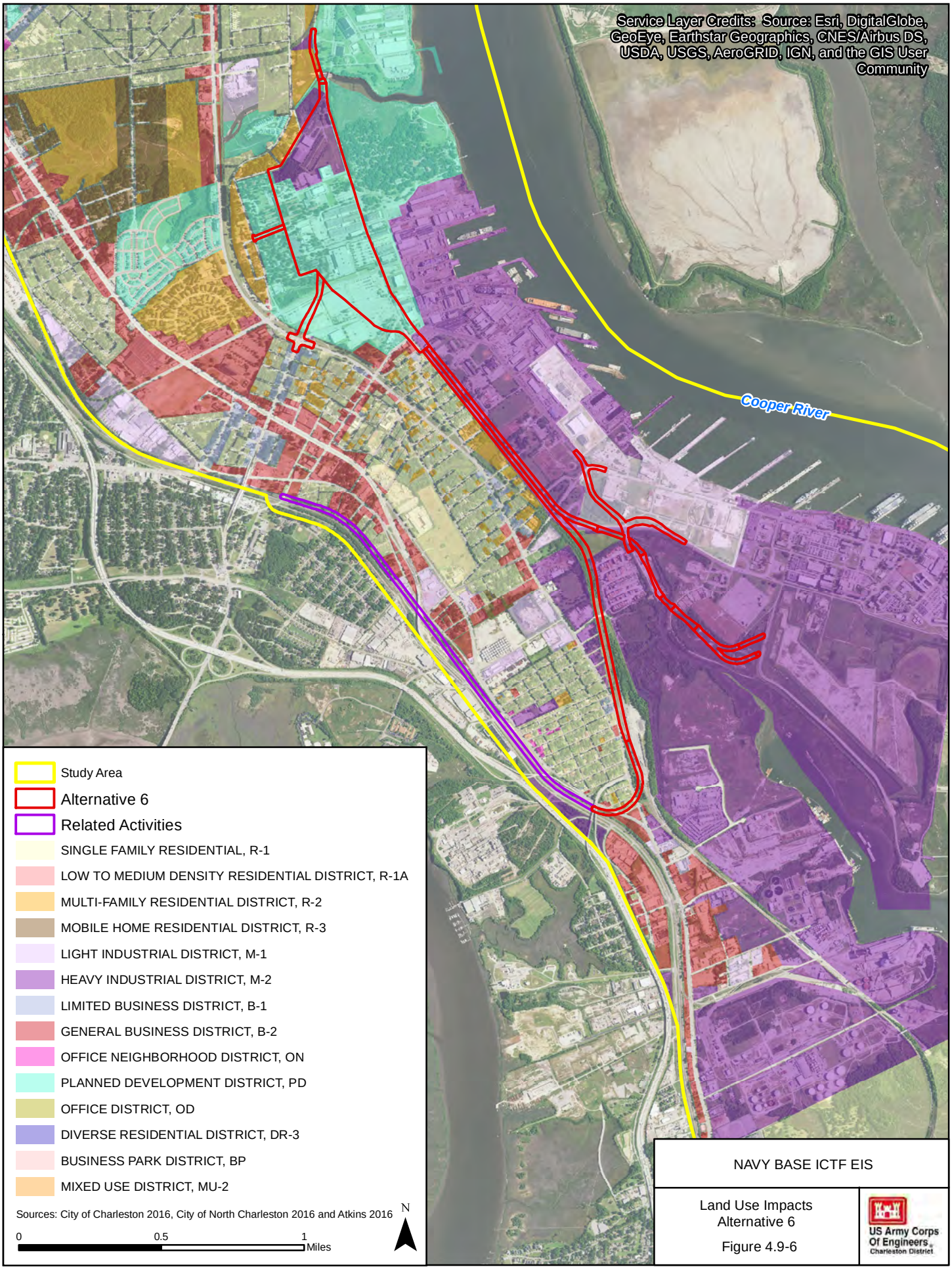
For the reasons discussed above, Alternative 6 would have negligible impacts to land use, major impacts to demolition of structures, and negligible impacts to infrastructure.

4.9.9 Alternative 7: River Center Project Site (South via Milford)

4.9.9.1 Land Use and Zoning

River Center Project Site

Under Alternative 7, land use and zoning impacts related to the River Center project site (Figure 4.9-7) would be similar to those described for Alternative 5.


Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Cooper River
Study Area
Alternative 6
Related Activities
SINGLE FAMILY RESIDENTIAL, R-1
LOW TO MEDIUM DENSITY RESIDENTIAL DISTRICT, R-1A
MULTI-FAMILY RESIDENTIAL DISTRICT, R-2
MOBILE HOME RESIDENTIAL DISTRICT, R-3
LIGHT INDUSTRIAL DISTRICT, M-1
HEAVY INDUSTRIAL DISTRICT, M-2
LIMITED BUSINESS DISTRICT, B-1
GENERAL BUSINESS DISTRICT, B-2
OFFICE NEIGHBORHOOD DISTRICT, ON
PLANNED DEVELOPMENT DISTRICT, PD
OFFICE DISTRICT, OD
DIVERSE RESIDENTIAL DISTRICT, DR-3
BUSINESS PARK DISTRICT, BP
MIXED USE DISTRICT, MU-2
Sources: City of Charleston 2016, City of North Charleston 2016 and Atkins 2016
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Land Use Impacts
Alternative 6
Figure 4.9-6
US Army Corps Of Engineers
Charleston District

Roadway/Rail Improvements

Under Alternative 7, land use and zoning impacts related to roadway and rail improvements (Figure 4.9-7) would be similar to those described for Alternative 5.

Demolition of Structures

Construction of Alternative 7 would occur on land owned by Palmetto Railways, on land within an existing CSX ROW, and on parcels of private property. Within the River Center project site, this construction would cause the demolition of approximately 33 structures. Additional off-site roadway and rail improvements would cause the demolition of approximately 14 structures.

Infrastructure and Utilities

Infrastructure and utility requirements and impacts under Alternative 7 would be similar to those described for Alternative 5. Any interruption of service to local area residents and businesses could be less than 12 hours.

For the reasons discussed above, Alternative 7 would have negligible impacts to land use and zoning, major impacts to demolition of structures, and negligible impacts to infrastructure.

4.9.10 Related Activities

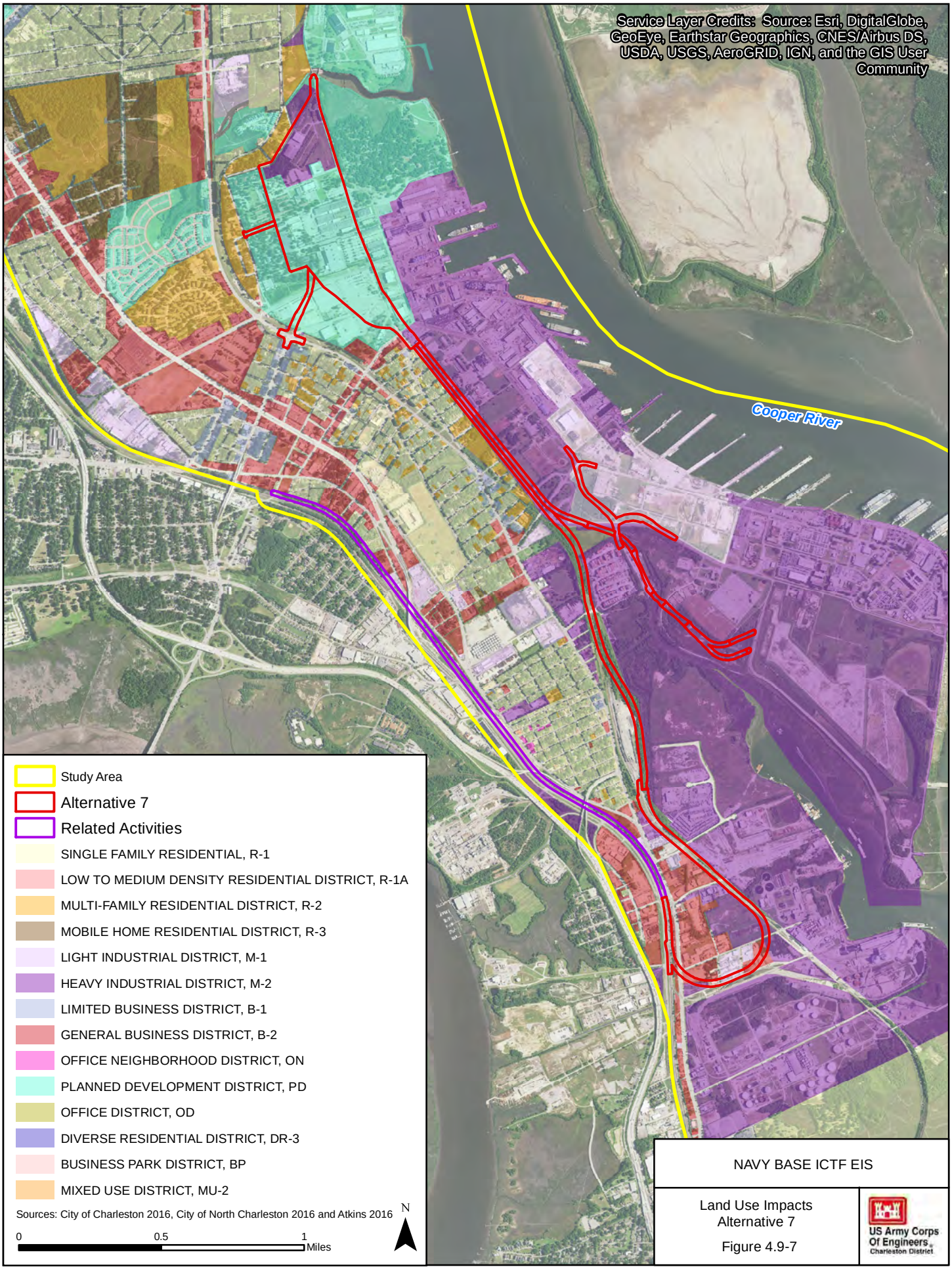
4.9.10.1 Land Use and Zoning

Land use and zoning requirements and impacts under the related activity would be negligible.

4.9.10.2 Infrastructure and Utilities

There would be no infrastructure or utility requirements or relocations as a result of the related activities.

For the reasons discussed above, the related activity would have negligible impacts to land use and zoning, demolition of structures, and infrastructure.


Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Cooper River
Study Area
Alternative 7
Related Activities
SINGLE FAMILY RESIDENTIAL, R-1
LOW TO MEDIUM DENSITY RESIDENTIAL DISTRICT, R-1A
MULTI-FAMILY RESIDENTIAL DISTRICT, R-2
MOBILE HOME RESIDENTIAL DISTRICT, R-3
LIGHT INDUSTRIAL DISTRICT, M-1
HEAVY INDUSTRIAL DISTRICT, M-2
LIMITED BUSINESS DISTRICT, B-1
GENERAL BUSINESS DISTRICT, B-2
OFFICE NEIGHBORHOOD DISTRICT, ON
PLANNED DEVELOPMENT DISTRICT, PD
OFFICE DISTRICT, OD
DIVERSE RESIDENTIAL DISTRICT, DR-3
BUSINESS PARK DISTRICT, BP
MIXED USE DISTRICT, MU-2
Sources: City of Charleston 2016, City of North Charleston 2016 and Atkins 2016
0
0.5
1
Miles
N
NAVY BASE ICTF EIS
Land Use Impacts
Alternative 7
Figure 4.9-7
US Army Corps Of Engineers
Charleston District

4.9.11 Summary of Impacts Table

Table 4.7-2 summarizes the environmental consequences to land use and infrastructure from Alternative 1 (Proposed Project) and all the alternatives.

Table 4.9-2
Summary of Impacts, Land Use and Infrastructure

Alternative	Land Use Change	Demolition of Structures	Infrastructure and Utilities
No-Action	Negligible. No change in land use designation required.	Negligible. No non-Palmetto Railways owned or specially designated structures would have to be displaced or demolished.	Negligible. No impacts as upgrades to service are not anticipated.
1: Applicant's *Proposed Project: Milford / North via Hospital District*	Major. Rezoning of the residential area along the western boundary of the ICTF and rezoning of portions of the Project site from Institutional future land use. Comprehensive Plan amendment required.	Major. Approximately 88 non-Palmetto Railways owned or specially designated structures would have to be displaced or demolished. Additional off-site roadway and rail improvements would cause the demolition of approximately 23 structures.	Negligible short-term impacts as any interruption of service to local area residents and businesses could be less than 12 hours.
2: Proposed Project Site: South via *Milford / North via S-line*	Similar to Alternative 1 (Proposed Project)	Similar to Alternative 1 (Proposed Project), except additional off-site roadway and rail improvements would cause the demolition of approximately 26 structures.	Similar to Alternative 1 (Proposed Project)
3: *Proposed Project Site: South via Kingsworth / North via Hospital District*	Similar to Alternative 1 (Proposed Project)	Similar to Alternative 1 (Proposed Project) except additional off-site roadway and rail improvements would cause the demolition of approximately 25 structures.	Similar to Alternative 1 (Proposed Project)
4: Proposed Project Site: *South via Milford*	Similar to Alternative 1 (Proposed Project)	Similar to Alternative 1 (Proposed Project)	Similar to Alternative 1 (Proposed Project)

Alternative	Land Use Change	Demolition of Structures	Infrastructure and Utilities
5: *River Center Project Site: South via Milford / North via Hospital District*	Negligible. No change in land use designation required	Major. Approximately 33 non-Palmetto Railways owned or specially designated structures would have to be displaced or demolished. Additional off-site roadway and rail improvements would cause the demolition of approximately 14 structures.	Negligible short-term impacts as any interruption of service to local area residents and businesses could be less than 12 hours.
6: *River Center Project Site: South via Kingsworth / North via Hospital District*	Similar to Alternative 5	Similar to Alternative 5 except additional off-site roadway and rail improvements would cause the demolition of approximately 16 structures.	Similar to Alternative 5
7: *River Center Project Site: South via Milford*	Similar to Alternative 5	Similar to Alternative 5	Similar to Alternative 5

4.9.12 Mitigation

4.9.12.1 Applicant's Proposed Avoidance and Minimization Measures

The Applicant has committed to several measures that avoid and/or minimize potential impacts of Alternative 1 (Proposed Project). These measures are taken from Palmetto Railways Mitigation Plan provided in Appendix N. Some of these measures are required under federal, state, and local permits; others are measures that Palmetto Railways has incorporated into the design and operations of Alternative 1 (Proposed Project). Each mitigation measure is also designated as one that either helps to avoid an impact or one that minimizes an impact.

- Ensure the Project and its operations are consistent with zoning codes and the Comprehensive Plan. (Avoidance)
- Support direction of the Historical Trust for land use and landscaping surrounding the Charleston Naval Hospital. (Minimization)
- Construction of a raised overpass with a pedestrian and multiuse path from Spruill Avenue to Riverfront Park to provide safe and uninterrupted access to existing and future development on the former CNC. (Minimization)
- Support the City of North Charleston and the Community Mitigation Group in the establishment of Quitman's marsh as a recreational area. (Minimization)

- Continue efforts to locate new utilities in ways to avoid/minimize impacts to significant utility facilities and minimize disruptions to service. (Avoidance and Minimization)
- Continue coordination efforts with utility providers and their design consultants to ensure capacity is available at the Project site, conflicts have been identified, and relocation plans are feasible. (Minimization)

These avoidance and minimization measures, except the items noted with an asterisk (*), have been considered in the preceding impact analysis. The complete list of Applicant-proposed avoidance and minimization measures related to land use and infrastructure is also provided in Chapter 6.

4.9.12.2 Additional Potential Mitigation Measures

No additional mitigation measures have been identified by the Corps for Land Use and Infrastructure. Additional avoidance, minimization, and mitigation may be considered by the Corps in its decision-making process. Final mitigation measures may be adopted as conditions of the DA permit and documented in the Record of Decision (ROD).

4.10 CULTURAL RESOURCES

4.10.1 Methods and Impact Definitions

Impacts to cultural resources were evaluated using literature review, GIS, best professional judgment, and proximity to construction and operation activities that could result in demolition, noise, vibration, and/or visual resource impacts. After all historic properties within the Cultural Resources study area (equivalent to the Area of Potential Effects) were identified through literature review and investigations conducted in support of this EIS, their locations were overlaid (using GIS) with the footprints of the alternatives to determine the proximity of the historic properties to the proposed facilities and the activities that would occur during their operation. For example, for impacts to historic districts, potential effects to the specific characteristics of the historic properties that create their historical significance (i.e., make them eligible for the NRHP) were reviewed to determine whether the alternatives would alter these characteristics in such a way that the NRHP eligibility of a specific historic property would be degraded or compromised. These characteristics were extracted from the information presented in the previous investigations that resulted in the determinations of eligibility from the NRHP nomination forms for the Charleston Navy Yard (CNY), Charleston Naval Hospital (CNH), and Charleston Navy Yard Officers' Quarters (CNYOQ) Historic Districts that were all prepared in 2006 (Appendix G).

The impact evaluation considers both construction and operation activities within the Cultural Resources study area. Impacts to historic properties were characterized as adverse, not adverse, or no effect as defined under Section 106 of NHPA[72] (Table 4.10-1). In addition, an evaluation was

[72] 36 C.F.R. 800

conducted to determine whether there were ways to avoid or minimize adverse effects. The Corps, in consultation with the South Carolina State Historic Preservation Office (SHPO), determines the nature of the effects and recommends appropriate mitigation where adverse effects cannot be avoided. Mitigative efforts generally are handled through the implementation of a Cultural Memorandum of Agreement (MOA) between the applicant, the lead federal agency, the SHPO, and any other major stakeholders, including, as appropriate, Cooperating Agencies. The Cultural Resources MOA identifies the responsibilities of each signator, the resources managed under the MOA, the procedures for developing and implementing mitigative actions (which may include specific criteria for particular actions), the procedures for resolving disputes among the signatories, and the procedures for terminating the MOA. Most MOAs are attached to the federal permits for an undertaking and may have specific timelines or milestones to ensure that managed resources are dealt with appropriately as the permitted action unfolds.

Consulting party status pursuant to Section 106 of the NHPA was requested by the Historic Charleston Foundation, the Preservation Society of Charleston, and the Naval Order of the United States in three separate letters received by the Corps during the 2015 public scoping period. The Corps granted these entities consulting party status on January 19, 2016. These consulting parties are not signatories to the Cultural Resources MOA; however, they are listed in the Cultural Resources MOA as concurring parties.

In accordance with Section 106 of the NHPA, the Corps and SCDHEC issued a joint Public Notice (PN) on October 19, 2016, officially stating that they had consulted with the SHPO, for the presence or absence of historic properties (as defined in 36 C.F.R. 800.16)(l)(1)), and determined that historic properties were present and that these historic properties may be affected by Alternative 1 (Proposed Project). The PN served to notify individuals or groups who would like to be consulting parties for the purposes of the NHPA and, to make such a request to the Corps in writing within 30 days of the PN. The PN also served as a request to the SHPO and other interested parties to provide any information they may have regarding historic properties, to ensure that other historic properties that the Corps was not aware of are not overlooked. The PN was distributed to local governments, tribes, state and federal agencies, elected officials, interest groups, general public, interested parties, and adjacent property owners by either mail or email. The PN was also posted through the project website.

The Muscogee (Creek) Nation requested additional information and requested to become a consulting party on March 1, 2017, because the Project area is located within the Muscogee (Creek) Nation's historic area of interest and is of importance to the tribe. However, according to correspondence with the Muscogee (Creek) Nation on January 20, 2017, they "agree that there is very little potential for intact archaeological deposits, and if there are any, they are likely beneath the (existing) fill" (Appendix G).

The Corps notified the Advisory Council on Historic Preservation (ACHP) on January 27, 2017, that Alternative 1 (Proposed Project) would have an adverse effect on historic properties and invited them to participate in the Section 106 Consultation. The ACHP requested to participate in the Section 106 consultation on March 7, 2017. A Section 106 consultation meeting was held on April 7, 2017, in Charleston, South Carolina. The meeting was attended by the Applicant, the Corps, project consultants, and representatives from Historic Charleston Foundation, the Preservation Society of Charleston, and the Naval Order of the United States. Additional representatives from SHPO, ACHP, The Muscogee (Creek) Nation, and the FRA called in to the meeting and participated via phone. By letter dated July 10, 2017, the FRA designated the Corps as the lead agency for the Section 106 process.

SHPO concurred with the inventory of the Project area and the findings of effects in July 2016. SHPO's final concurrence with effects determinations is the signed MOA. The Cultural Resources MOA among the Corps, FRA, SHPO, ACHP, the Muscogee (Creek) Nation and Palmetto Railways is included in Appendix G.

Table 4.10-1
Impact Definitions, Cultural Resources

No Effect	No Adverse Effect	Adverse Effect
No resources present or impacts would be at the lowest levels of detection: barely perceptible and not measurable, and thus do not alter any defining characteristic of a historic property. (No effect under Section 106.)	A direct or indirect alteration that would only slightly affect the character-defining features of a structure, resource, building, or district listed on or eligible for listing on the NRHP but does not compromise its eligibility. (No adverse effect under Section 106.)	A direct or indirect alteration of any characteristic of a historic property that qualifies it for inclusion in the NRHP; that diminishes the integrity of its location, design, setting, materials, workmanship, feeling, or association; or that diminishes the extent to which a resource retains its historic appearance. This can include the destruction of archaeological resources, alteration of historic viewsheds, and the modification or demolition of historic buildings (Adverse Effect under Section 106.)

4.10.2 No-Action Alternative

Under the No-Action Alternative, the Project site would continue to be used for mixed-use industrial activities. Activities would likely include the demolition of existing buildings and infrastructure, the alteration of the ground surface, and the installation of new buildings and structures necessary to support the light industries and warehousing/shipping entities that may occupy the future industrial space.

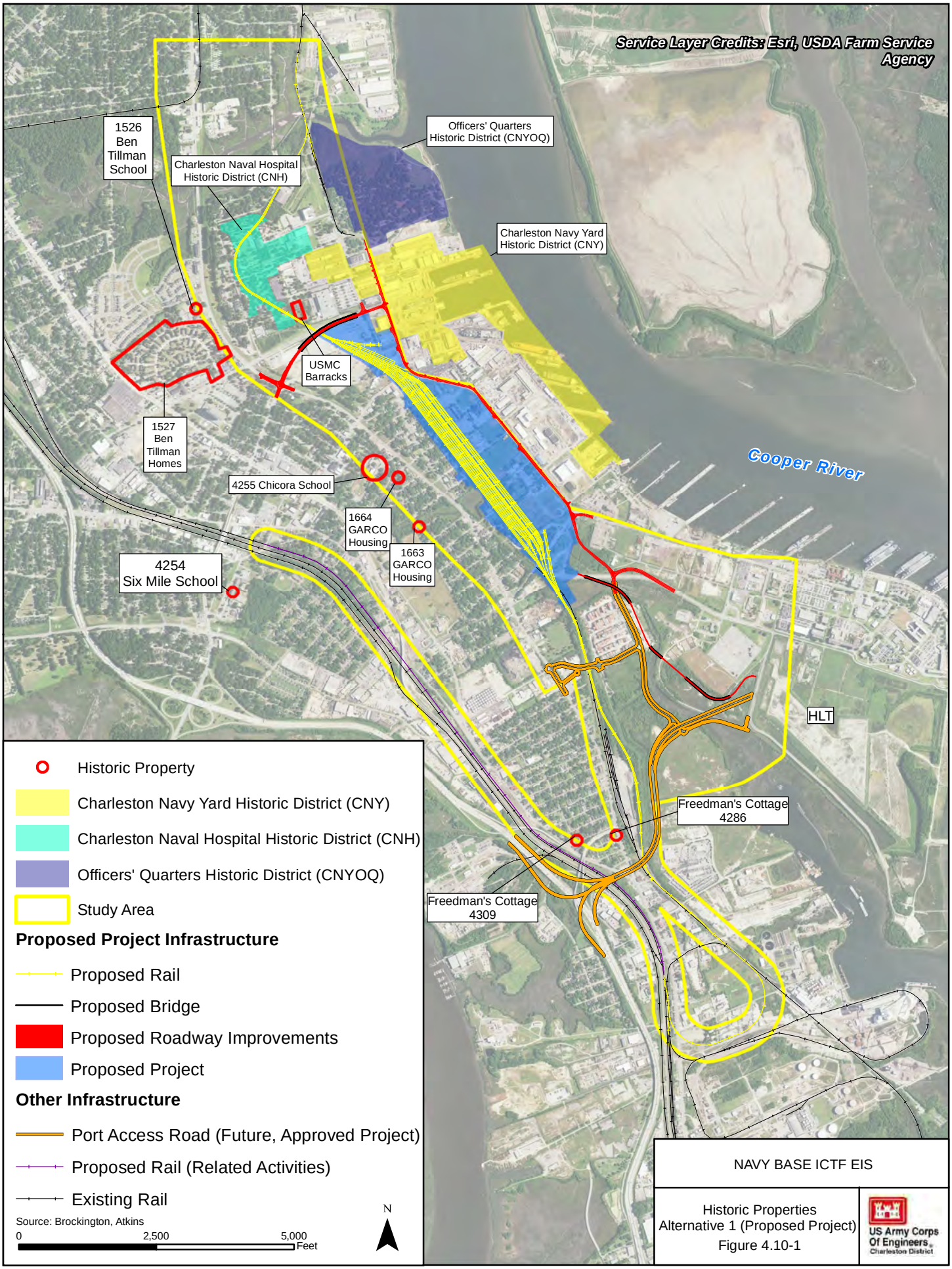
Construction activities and equipment would alter the current viewsheds and settings of historic properties near these lands and create vibrations and noise that may affect nearby historic properties. These alterations would be temporary, localized impacts, and would have no effect on cultural resources within the Cultural Resources study area. Noise and vibration impacts would also be temporary and localized, and would have no effect on historic properties within the Cultural Resources study area.

Impacts associated with the operation of a future industrial use within the Project site would likely involve an increase in road and rail traffic as compared to the existing condition, but significantly less than that predicted for the Navy Base ICTF. Increased traffic would create noise and vibrations that might affect nearby historic properties, and could result in the construction of roadway and rail improvements that could affect the current viewsheds of historic properties (primarily in the River Center project site). Impacts would be local and long term. The intensity of traffic, and its proximity to historic properties, is unknown; however, Palmetto Railways would be required to consult with the SHPO to ensure that any activities (and resulting alterations and noise and vibration impacts), would be mitigated in accordance with the contractual obligations and covenants from the PA. As a result, there would likely be no adverse effects to cultural resources from operations at the Project site.

4.10.3 Alternative 1: Applicant's Proposed Project (South via Milford / North via Hospital District)

Two historic properties, the CNH Historic District and USMC Barracks (CNC Building M-17), lie within the Project site. Ten additional historic properties lie near Alternative 1 (Proposed Project), including the CNY Historic District, the CNYOQ Historic District, the Chicora Elementary School, the Six Mile Elementary School, the Ben Tillman Graded School, Ben Tillman Homes, two Charleston freedman's cottages (Resources 4306 and 4309), and GARCO Employee Housing residences (Resources 1663 [which includes two buildings] and 1664). Figure 4.10-1 displays the location of the historic properties within and near Alternative 1 (Proposed Project).

The Northern Rail Connection passes through the southwest corner of the parade ground of the USMC Barracks and then passes through or very close to several buildings in the CNH Historic District (CNC Buildings M-5, M-6/M-7, M-8/M-9, AA/LL, BB/CC, DD/EE, FF/GG, HH/II, JJ/KK, 762, and 763). The rail link will separate CNC Buildings M-6/M-7, M-8/M-9, FF/GG, HH/II, JJ/KK, and 758-763 from the remaining elements of the CNH. All of these buildings are contributing elements of the CNH Historic District, and originally served as residences for hospital staff.


Service Layer Credits: Esri, USDA Farm Service Agency
1526 Ben Tillman School
Charleston Naval Hospital Historic District (CNH)
Officers' Quarters Historic District (CNYOQ)
Charleston Navy Yard Historic District (CNY)
USMC Barracks
1527 Ben Tillman Homes
4255 Chicora School
1664 GARCO Housing
1663 GARCO Housing
4254 Six Mile School
Cooper River
HLT
Freedman's Cottage 4286
Freedman's Cottage 4309
Historic Property
Charleston Navy Yard Historic District (CNY)
Charleston Naval Hospital Historic District (CNH)
Officers' Quarters Historic District (CNYOQ)
Study Area
Proposed Project Infrastructure
Proposed Rail
Proposed Bridge
Proposed Roadway Improvements
Proposed Project
Other Infrastructure
Port Access Road (Future, Approved Project)
Proposed Rail (Related Activities)
Existing Rail
Source: Brockington, Atkins
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NAVY BASE ICTF EIS
Historic Properties
Alternative 1 (Proposed Project)
Figure 4.10-1
US Army Corps Of Engineers
Charleston District

The CNY Historic District lies to the east of North Hobson Avenue, to the east of Alternative 1 (Proposed Project) and partially within the eastern portion of the Cultural Resources study area. CNC Building 32- Central Power Plant, a contributing element of the district, lies adjacent to the northeast corner of Alternative 1 (Proposed Project); a number of large industrial buildings not included in the district stand between most of Alternative 1 (Proposed Project) and the remainder of this historic property. The Northern Rail Connection parallels the northwest corner of the CNYOQ Historic District with contributing elements of the district standing 800+ feet to the east, with vegetated areas and existing rail lines between these buildings and the rail link. The Chicora Elementary School stands approximately 1,200 feet west of Alternative 1 (Proposed Project). Numerous residences and commercial buildings and Spruill Avenue stand between Alternative 1 (Proposed Project) and this historic property. The Six Mile Elementary School stands 500 feet west of the northern end of the CSX rail lines that will be upgraded as a related activity with other existing rail lines and vegetated areas in between. The Ben Tillman Graded School and Ben Tillman Homes stand on the west side of Spruill Avenue, approximately 1,000 feet west of the Northern Rail Connection; Spruill Avenue, existing rail lines, and residential buildings stand between these historic properties and the Northern Rail Connection. One of the freedman's cottages (Resource 4306) stands 500 feet west of the Southern Rail Connection, with existing rail lines and vegetated areas between the house and the rail line. The other freedman's cottage (Resource 3409) stands 150 feet east of the CSX rail lines to be upgraded as a related activity; Meeting Street and ramps for I-26 stand between this building and the rail line. The surviving GARCO housing residences stand approximately 1,100-1,400 feet west of Alternative 1 (Proposed Project). Numerous residential and commercial buildings stand between Alternative 1 (Proposed Project) and these historic properties.

4.10.3.1 Construction

Construction of Alternative 1 (Proposed Project) would result in the demolition of existing buildings, structures, and infrastructure (such as rail lines, roadways, power lines, sewer lines, etc.); the alteration of the ground surface; and the installation of new buildings and structures necessary to support the intermodal transfer of marine shipping containers between rail and road vehicles. The potential for archaeological sites to exist within the Project site is minimal (cf. Daugherty 2011; Shmookler 1995), and thus, ground disturbing activities are not likely to damage or destroy archaeological sites.

Under Alternative 1 (Proposed Project), the CNH Historic District and the USMC Barracks would be affected. The northern rail connection would extend through the CNH Historic District and through the southwest corner of the parade ground of the USMC Barracks, resulting in an adverse effect on these historic properties. The construction of the northern rail connection would require the demolition and removal of multiple buildings associated with the CNH Historic District, creating long-term, adverse impacts to this district. Elements of the CNH would be removed, destroying the associations that exist between the various elements. The rail line would also separate the remaining

buildings, further degrading the associations and spatial relationships of these remaining elements. The designed landscape of the CNH would be substantially altered by the installation of a rail line through the district. The Northern Rail Connection would also pass through the southwest corner of the USMC Barracks' parade ground, altering the setting of this building and reducing the open lawn that served as a parade ground when the building housed the USMC detachments assigned to Navy Base Charleston.

Construction activities and equipment also would alter the current viewsheds and settings of historic properties near Alternative 1 (Proposed Project); however, the alterations of the settings and viewshed by construction activities and equipment to the CNY and CNYOQ Historic Districts would be temporary, and would have no effect on the districts.

Vibrations related to construction activities under the Alternative 1 (Proposed Project) would be temporary and similar to those that occurred during the operation of Navy Base Charleston or industrial activities that occur today within the CNC. As a result, construction-related vibration would have no effect on historic properties.

4.10.3.2 Operation

Under Alternative 1 (Proposed Project), the Navy Base ICTF would operate within new buildings/ structures and transportation corridors; however, these new buildings/structures and infrastructure are industrial in nature and would not alter the character of the nearby historic properties within the CNC (the CNY and CNYOQ). The former Navy Base Charleston was an industrial facility that built and maintained ships. The historic properties within the CNC were the location of these industrial activities or supported the operation of the base and its assigned personnel. The Project's industrial activities support commercial maritime traffic rather than the military maritime traffic of the former navy base. The adaptive reuse of the CNC since the closure of Navy Base Charleston in 1996 has altered the character of the CNC from military to commercial over the last 20 years. Thus, changes in character of the historic properties within the CNC related to Alternative 1 (Proposed Project) would have no effect.

Under Alternative 1 (Proposed Project), operation of the Navy Base ICTF would also result in higher volumes of rail and road traffic on dedicated rail lines and thoroughfares, increasing noise and vibration. Navy Base Charleston was an industrial facility and generated a great deal of noise and vibration during its operation as a military installation throughout the twentieth century. The noises associated with the operation of the ICTF would create local, long-term, increased noise levels, but would not alter the industrial character and associations of the historic properties within the CNC. Similarly, historic properties in the nearby residential neighborhoods outside the CNC were built in support of the former Navy Base Charleston and witnessed the noises associated with the operation of the military facility. Since the closure of Navy Base Charleston in 1996, these noises have been reduced, but the CNC still contains industrial facilities similar to those that operated at the navy base.

Thus, increased noise levels related to the operation of the Navy Base ICTF would result in long-term, increased noise levels, but would not alter the character and associations of the nearby historic properties outside the CNC. As a result, noise impacts would have no effect on historic properties within and outside the CNC.

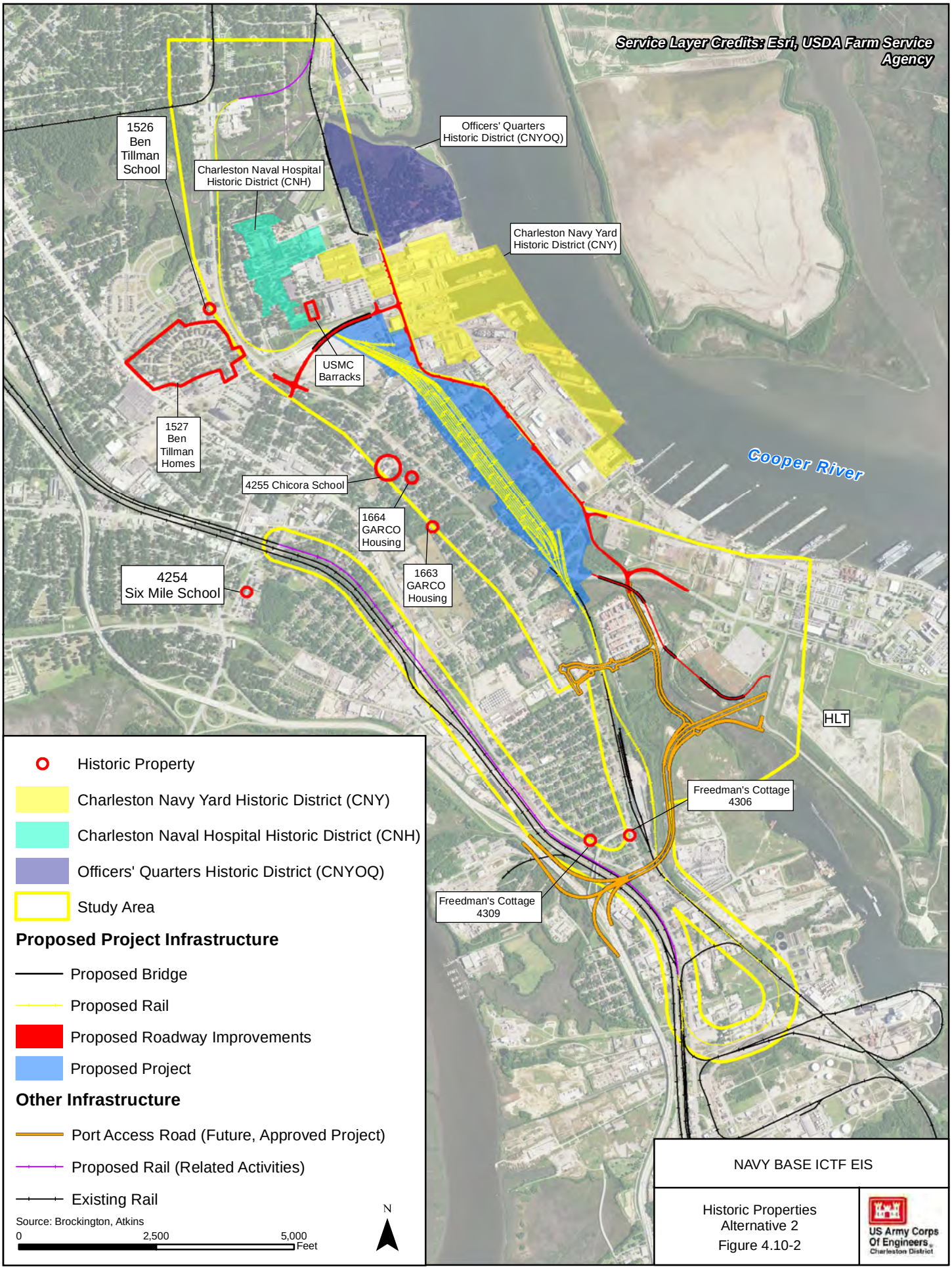
Under Alternative 1 (Proposed Project), vibrations related to the increased volume of rail traffic and operations within the proposed intermodal container facility could affect nearby properties within the CNC; however, the analysis discussed in Section 4.13 (Noise and Vibration) found that the ground-borne vibration generated by train activities would produce a negligible impact to the vibration-sensitive receptors along the railroad segments in the Cultural Resources study area in comparison with the No-Action Alternative. Rail vibration effects would be unlikely for the 76 receptors analyzed; therefore, vibration impacts would have no effect on historic properties within and outside the CNC. Periodic inspection and monitoring of masonry components of elements of the nearby CNY, CNH, and CNYOQ Historic Districts could identify whether these elements suffer adverse effects related to long-term exposure to increased vibrations resulting from the operation of the Navy Base ICTF.

4.10.4 Alternative 2: Proposed Project Site (South via Milford / North via S-Line)

The same historic properties noted for Alternative 1 (Proposed Project) also are present near the footprint of Alternative 2; however, the configuration of the northern rail connection is different in Alternate 2. It will loop 200-300 feet to the south and to the west of the CNH Historic District and USMC Barracks and parade ground in order to avoid direct impacts to these historic properties. The northern rail connection will be farther from the CNYOQ Historic District, approximately 1,000 feet west of the district boundary and 1,800–2,000 feet from any CNYOQ contributing elements. The Ben Tillman Graded School and Bill Tillman Homes historic properties lie closer to the rail link (600-800 feet west) but Spruill Avenue, existing rail lines, and narrow vegetated areas are present between these properties and the proposed rail line. Figure 4.10-2 displays the location of the historic properties within and near Alternative 2.

4.10.4.1 Construction

Construction of Alternative 2 would avoid direct impacts to historic properties. The CNH Historic District would not suffer the loss of contributing elements since the construction of the northern rail connection would be located west of the district. Thus, most of the effects (visual intrusions, noise, and vibration) related to construction within Alternative 2 are temporary and would have no effect on any historic properties. Again, the potential for archaeological sites to exist within Alternative 2 is minimal (cf. Daugherty 2011, Shmookler 1995).


Service Layer Credits: Esri, USDA Farm Service Agency
1526 Ben Tillman School
Charleston Naval Hospital Historic District (CNH)
Officers' Quarters Historic District (CNYOQ)
Charleston Navy Yard Historic District (CNY)
USMC Barracks
1527 Ben Tillman Homes
4255 Chicora School
1664 GARCO Housing
1663 GARCO Housing
4254 Six Mile School
Cooper River
HLT
Freedman's Cottage 4306
Freedman's Cottage 4309
Historic Property
Charleston Navy Yard Historic District (CNY)
Charleston Naval Hospital Historic District (CNH)
Officers' Quarters Historic District (CNYOQ)
Study Area
Proposed Project Infrastructure
Proposed Bridge
Proposed Rail
Proposed Roadway Improvements
Proposed Project
Other Infrastructure
Port Access Road (Future, Approved Project)
Proposed Rail (Related Activities)
Existing Rail
Source: Brockington, Atkins
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NAVY BASE ICTF EIS
Historic Properties
Alternative 2
Figure 4.10-2
US Army Corps Of Engineers
Charleston District

4.10.4.2 Operation

Operation of Alternative 2 would not disrupt historic properties. Similar to Alternative 1 (Proposed Project), vibration impacts would have no effect on historic properties within and outside the CNC.

4.10.5 Alternative 3: Proposed Project Site (South via Kingsworth / North via Hospital District)

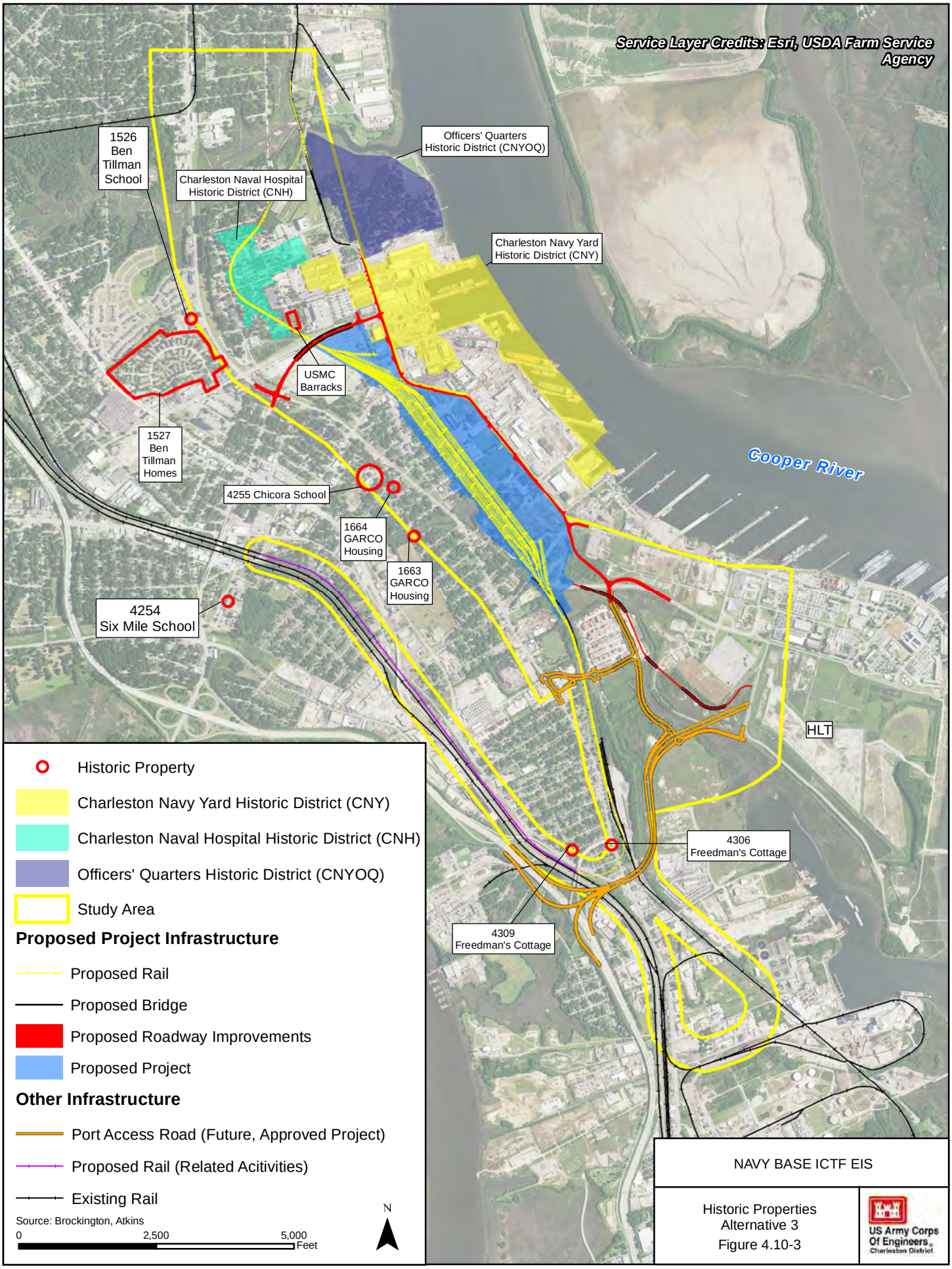
The same historic properties noted for Alternative 1 (Proposed Project) also are present near the footprint of Alternative 3. The relationships of all of the historic properties are the same as well, with the exception of one of the Charleston freedman's cottages near the southern rail connection. Resource 4306 stands 300 feet west and north of the proposed loop of the southern rail connection near Kingsworth Avenue, closer than for Alternative 1 (Proposed Project). Thus, the route of the northern rail connection would pass through the CNH Historic District and across the southwest corner of the parade ground of the USMC Barracks. Figure 4.10-3 displays the location of the historic properties within and near Alternative 3.

4.10.5.1 Construction

Construction of the Navy Base ICTF within Alternative 3 would result in the same adverse effects to the CNH Historic District and the USMC Barracks noted for Alternative 1 (Proposed Project). The potential effects related to visual intrusions, noise, and vibration associated with the construction of the Navy Base ICTF within Alternative 3 are temporary and would have no effect on any historic properties. Again, the potential for archaeological sites to exist within Alternative 3 is minimal (cf. Daugherty 2011, Shmookler 1995).

4.10.5.2 Operation

Operation of the Navy Base ICTF within Alternative 3 would also result in the same potential effects as noted for Alternative 1 (Proposed Project), and include the disruption of the CNH Historic District and the USMC Barracks. Similar to Alternative 1 (Proposed Project), vibration impacts would have no effect on historic properties within and outside the CNC.


Service Layer Credits: Esri, USDA Farm Service Agency
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Charleston Naval Hospital Historic District (CNH)
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Cooper River
HLT
4306 Freedman's Cottage
4309 Freedman's Cottage
Historic Property
Charleston Navy Yard Historic District (CNY)
Charleston Naval Hospital Historic District (CNH)
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Proposed Project
Other Infrastructure
Port Access Road (Future, Approved Project)
Proposed Rail (Related Acitivities)
Existing Rail
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NAVY BASE ICTF EIS
Historic Properties
Alternative 3
Figure 4.10-3
US Army Corps Of Engineers
Charleston District

4.10.6 Alternative 4: Proposed Project Site (South via Milford)

The same historic properties noted for Alternative 1 (Proposed Project) also are present near the footprint of Alternative 4. The relationships of all of the historic properties are the same as well, although all rail access would be through the southern rail connection. The route for the northern tail track would pass through the CNH Historic District and across the southwest corner of the parade ground of the USMC Barracks. Figure 4.10-4 displays the location of the historic properties within and near Alternative 4.

4.10.6.1 Construction

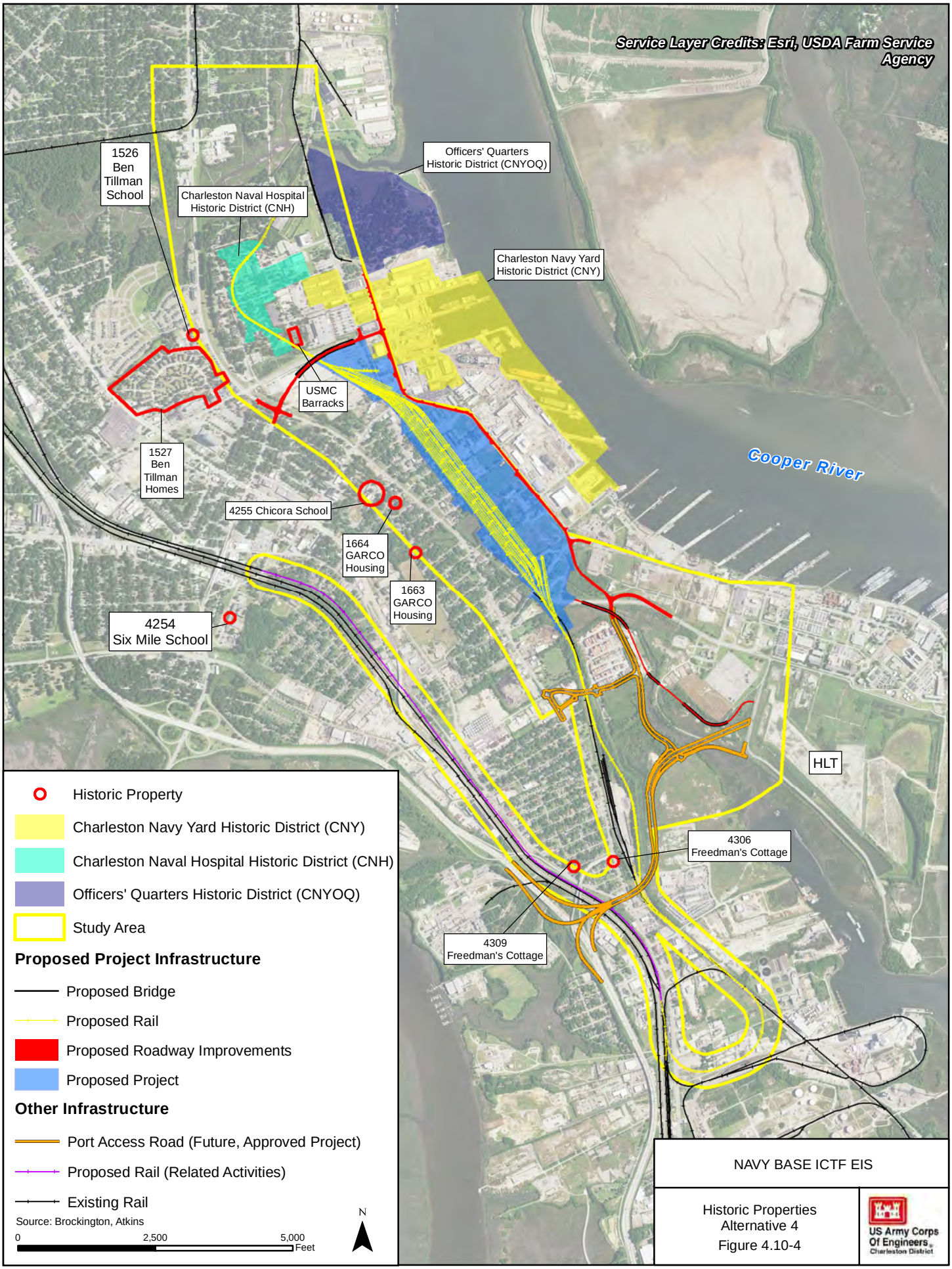
Construction of the Navy Base ICTF within Alternative 4 would result in the same adverse effects to the CNH Historic District and the USMC Barracks noted for Alternative 1 (Proposed Project). The potential effects related to visual intrusions, noise, and vibration associated with the construction of the Navy Base ICTF within Alternative 4 are temporary and would have no effect on any historic properties. Again, the potential for archaeological sites to exist within Alternative 4 is minimal (cf. Daugherty 2011, Shmookler 1995).

4.10.6.2 Operation

Operation of the Navy Base ICTF within Alternative 4 also would result in the same potential effects as noted for Alternative 1 (Proposed Project), and include the disruption of the CNH Historic District and the USMC Barracks. Like Alternative 1 (Proposed Project), vibration impacts would have no effect on historic properties within and outside the CNC.

4.10.7 Alternative 5: River Center Project Site (South via Milford / North via Hospital District)

Three historic properties (two historic districts and one individual building) lie within the footprint of Alternative 5, including the CNY Historic District, the CNH Historic District, and the USMC Barracks. Eight additional historic properties (one historic district, one planned community of houses and apartments, and seven individual building [one historic property contains two buildings]) lie near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Charleston Naval Hospital Historic District (CNH)
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Charleston Navy Yard Historic District (CNY)
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4255 Chicora School
1664 GARCO Housing
1663 GARCO Housing
4254 Six Mile School
HLT
4306 Freedman's Cottage
4309 Freedman's Cottage
Historic Property
Charleston Navy Yard Historic District (CNY)
Charleston Naval Hospital Historic District (CNH)
Officers' Quarters Historic District (CNYOQ)
Study Area
Proposed Project Infrastructure
Proposed Bridge
Proposed Rail
Proposed Roadway Improvements
Proposed Project
Other Infrastructure
Port Access Road (Future, Approved Project)
Proposed Rail (Related Activities)
Existing Rail
Source: Brockington, Atkins
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5,000
Feet
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NAVY BASE ICTF EIS
Historic Properties
Alternative 4
Figure 4.10-4
US Army Corps Of Engineers
Charleston District

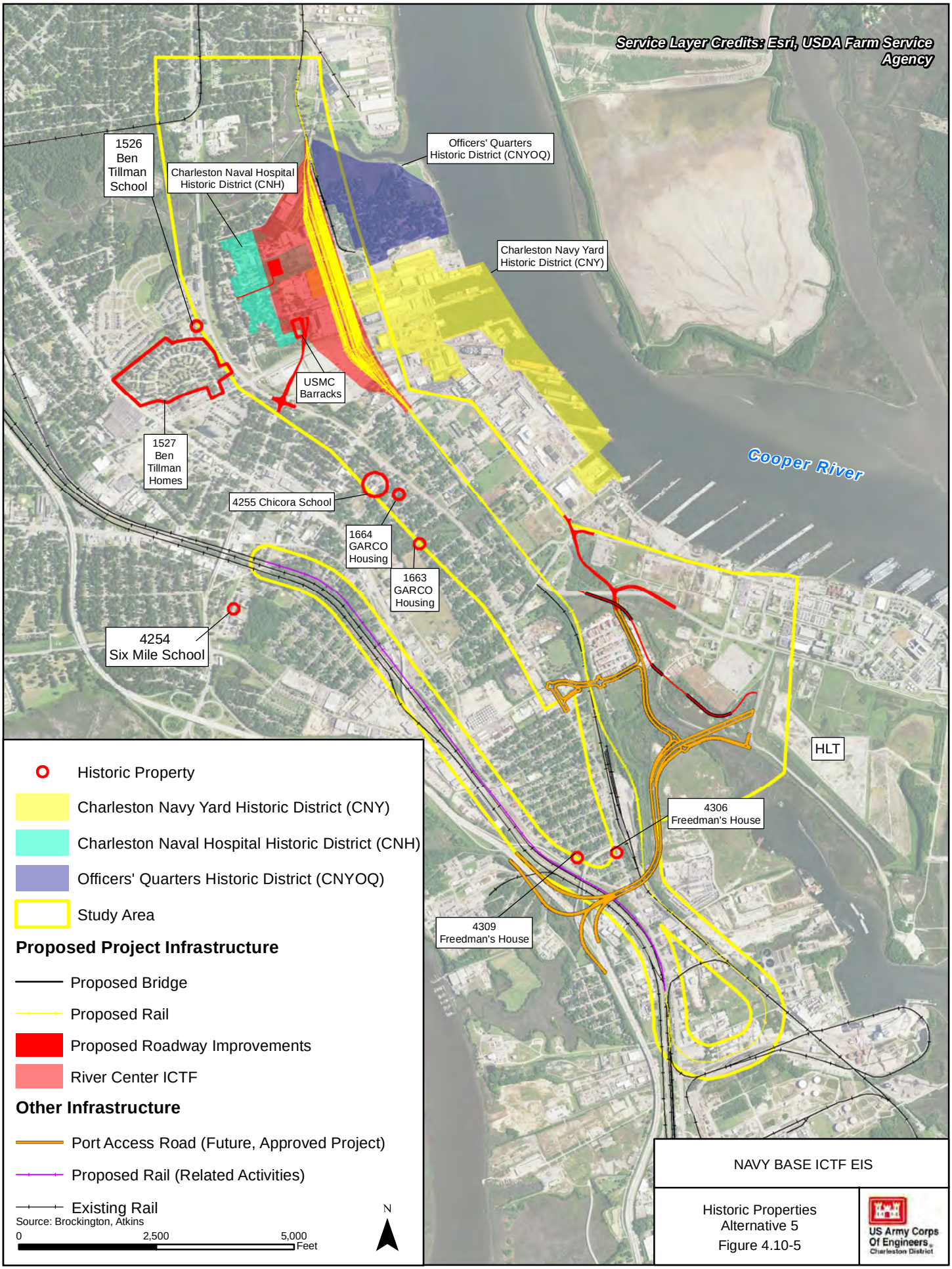
Alternative 5, including the CNYOQ Historic District, the Ben Tillman Homes, the Ben Tillman Graded School, the Chicora Elementary School, the Six Mile Elementary School, GARCO employee housing (Resources 1663 [which includes two buildings] and 1664), and two Charleston freedman's cottages (Resources 4306 and 4309). Figure 4.10-5 displays the location of the historic properties within and near Alternative 5.

Four elements of the CNY Historic District lie within Alternative 5. These elements are CNC Buildings 64, NSC 66, NSC 67 (all three are storehouses that contribute to the NRHP eligibility of the district), and CNC Building 1655 (a modern storage building that does not contribute to the district). The majority of the historic resources for this district lie to the east of Alternative 5 and outside of the Cultural Resources study area. Fourteen elements of the CNH Historic District lie completely within Alternative 5. These elements include CNC Buildings M-3A, M6/M7, NH-45, NH-46, NH-47, NH-49, NH-51, NH-53, NH-55, NH-61, NH-68, and 758 (treatment facilities, storehouses, residences, and a garage that contribute to the NRHP eligibility of the district); CNC Building NH-62 (a storehouse) does not contribute. The buildings and facilities of the CNH were originally separated from the naval industrial activities by a reasonable space, although storage buildings soon filled this space and began to encroach on the edge of the hospital campus. The CNYOQ Historic District lies to the northeast of Alternative 5 — outside but adjacent. As originally constructed, the elements of the CNYOQ stood as far removed from the naval industrial activities as possible, given the configuration of Navy Base Charleston. As the base expanded, some industrial facilities began to encroach on the edge of this residential neighborhood. Industrial buildings, some associated with the CNY Historic District, stand between Alternative 5 and this historic property.

The Ben Tillman Graded School and the Ben Tillman Homes stand on the west side of Spruill Avenue and the Cultural Resources study area, approximately 700 feet and 800 feet west of Alternative 5, respectively. Private residences, Spruill Avenue, and rail lines lie between Alternative 5 and these historic properties. Chicora Elementary School and the GARCO employee houses (Resources 1663 and 1663) stand 1,100-1,400 feet west of the southern rail connection of Alternative 5. The Six Mile Elementary School stands 500 feet west of the northern end of the CSX rail lines that will be upgraded as a related activity with existing rail lines and vegetated areas in between. One of the freedman's cottages (Resource 4306) stands 500 feet west of the southern rail connection, with existing rail lines and vegetated areas between the house and the rail link. The other freedman's cottage (Resource 4309) stands 150 east of the CSX rail lines to be upgraded as a related activity; Meeting Street and ramps for I-26 stand between this building and the rail line.

4.10.7.1 Construction

Construction of the River Center ICTF under Alternative 5 would result in the demolition of existing buildings, structures, and infrastructure, the alteration of the ground surface, and the installation of new buildings and structures necessary to support the intermodal transfer of marine shipping


Service Layer Credits: Esri, USDA Farm Service Agency
1526 Ben Tillman School
Charleston Naval Hospital Historic District (CNH)
Officers' Quarters Historic District (CNYOQ)
Charleston Navy Yard Historic District (CNY)
USMC Barracks
1527 Ben Tillman Homes
Cooper River
4255 Chicora School
1664 GARCO Housing
1663 GARCO Housing
4254 Six Mile School
HLT
4306 Freedman's House
4309 Freedman's House
Historic Property
Charleston Navy Yard Historic District (CNY)
Charleston Naval Hospital Historic District (CNH)
Officers' Quarters Historic District (CNYOQ)
Study Area
Proposed Project Infrastructure
Proposed Bridge
Proposed Rail
Proposed Roadway Improvements
River Center ICTF
Other Infrastructure
Port Access Road (Future, Approved Project)
Proposed Rail (Related Activities)
Existing Rail
Source: Brockington, Atkins
0
2,500
5,000
Feet
N
NAVY BASE ICTF EIS
Historic Properties
Alternative 5
Figure 4.10-5
US Army Corps Of Engineers
Charleston District

containers between rail and road vehicles. The potential for archaeological sites to exist within the Alternative 5 footprint is minimal (cf. Daugherty 2011, Shmookler 1995), and thus, ground disturbing activities are not likely to damage or destroy archaeological sites.

The demolition and removal of multiple buildings associated with the CNH and CNY Historic Districts would result in long-term, adverse effects. The NRHP-eligible USMC Barracks also stands within Alternative 5, and its demolition would result in an adverse effect to this historic building.

Construction activities and equipment would alter the current viewsheds and settings of four historic properties (the CNY, the CNYOQ, and the CNH Historic Districts, and the USMC Barracks) within or adjacent to Alternative 5 (see Figure 4.10-5). The alterations of settings and viewsheds of the CNYOQ Historic District by construction activities and equipment would be temporary, resulting in local, short-term impacts, and thus no effect.

Noise and vibration impacts related to construction activities under Alternative 5 would be similar to those discussed under Alternative 1 (Proposed Project). These impacts would be temporary and should not exceed those that occurred during the operation of Navy Base Charleston or industrial activities that occur today within the CNC. There would be no effect on historic properties from noise and vibration during construction activities.

4.10.7.2 Operation

The operation of the ICTF under Alternative 5 would have similar noise and vibration impacts to historic properties as described for the Navy Base ICTF under Alternative 1 (Proposed Project). The River Center ICTF would operate within new buildings/structures and transportation corridors that alter the setting of the CNC; however, the new buildings/structures and infrastructure are industrial in nature and would not alter the character of the CNC.

The CNH would have major changes to elements of the district, altering the setting of the district as a whole. Fourteen of the buildings associated with the district would be demolished. The associations of the remaining buildings would be severely compromised. The CNH was not an industrial facility but supported the industrial facility and the crews of the U.S. Navy ships that were stationed at Navy Base Charleston during its operation. While industrial facilities lie immediately adjacent to the district (on the opposite sides of roadways for the most part), the earliest buildings of the district were built within a designed layout. The loss of buildings and structures within this layout may severely degrade its cohesion and compromise its eligibility for the NRHP. This would create a long-term, adverse effect to the district.

The CNY would also be subjected to the loss of four former warehouses, which would create a long-term adverse effect.

The CNYOQ Historic District would experience a local, long-term visual impact to its setting. Similar to the CNH, the buildings and infrastructure within the CNYOQ were not industrial in nature, but supported the operation of the former Navy Base Charleston. Again, all of the industrial activities associated with the operation of Navy Base Charleston were separated from this district. Under Alternative 5, the River Center ICTF would be immediately adjacent to the CNYOQ. The industrial facilities associated with the River Center ICTF would be visible from portions of the CNYOQ, despite the presence of a noise abatement wall and other measures proposed by Palmetto Railways to minimize the visual impact of the facility. This alteration of setting would be an adverse effect. The closer proximity of industrial activities to the district also could result in higher noise and vibration levels than occurred during the military operation of Navy Base Charleston; however, vibration impacts would have no effect on historic properties within and outside the CNC.

4.10.8 Alternative 6: River Center Project Site (South via Kingsworth / North via Hospital District)

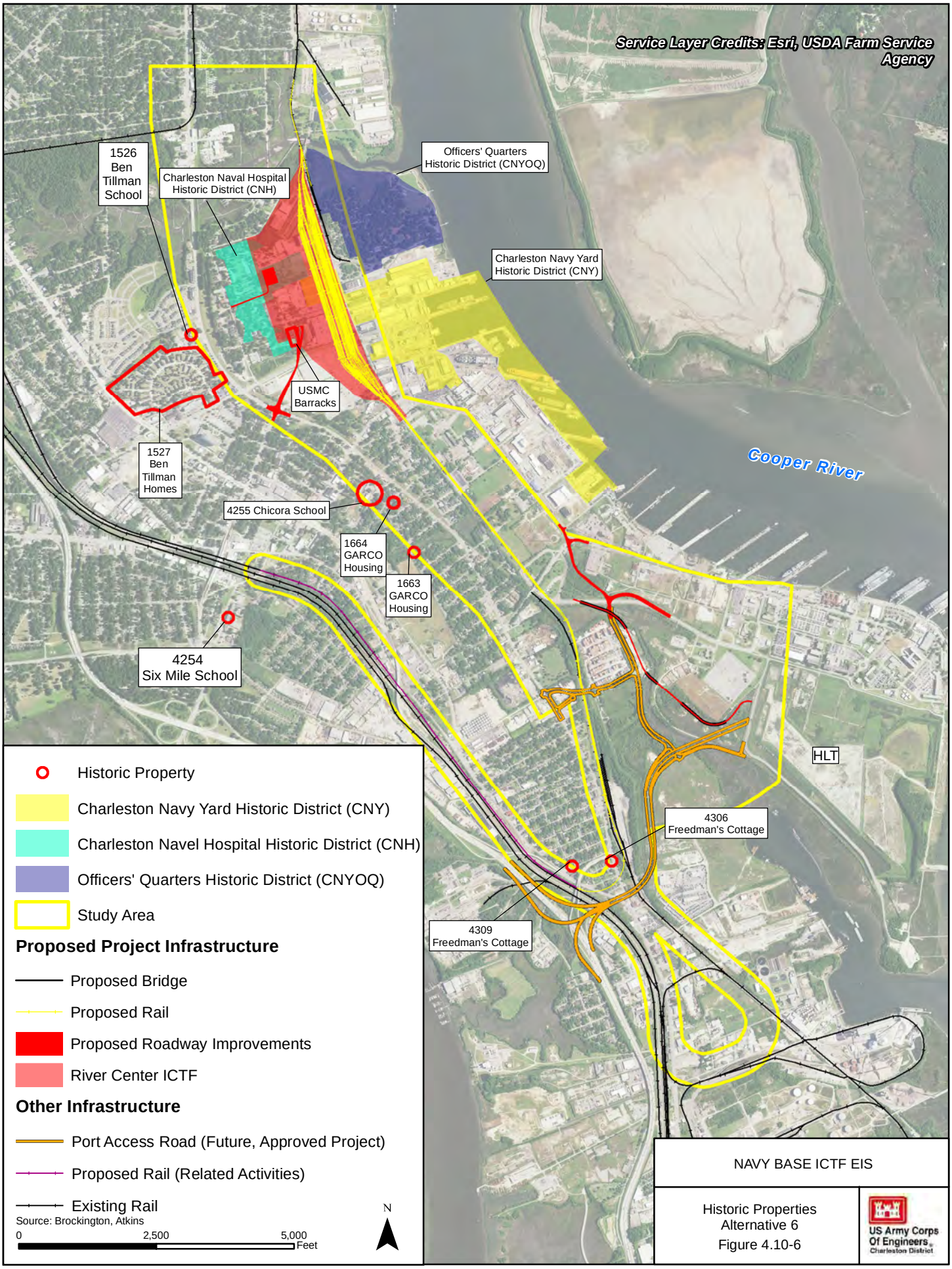
The same historic properties noted for Alternative 5 are also present in and near the footprint of Alternative 6. The relationships of all the historic properties are the same as well, with the exception of one of the Charleston freedman's cottages near the southern rail connection. Resource 4306 stands 300 feet west and north of the proposed loop of the southern rail connection near Kingsworth Avenue, closer than the rail under Alternative 5. Figure 4.10-6 displays the location of the historic properties within and near Alternative 6.

4.10.8.1 Construction

Construction of the River Center ICTF within Alternative 6 would result in the same adverse effects to the CNH, CNY, and CNYOQ Historic Districts and the USMC Barracks noted for Alternative 5. The potential effects related to visual intrusions, noise, and vibration associated with the construction of the River Center ICTF within Alternative 6 are temporary and would have no effect on any historic properties. Again, the potential for archaeological sites to exist within Alternative 6 is minimal (cf. Daugherty 2011, Shmookler 1995).

4.10.8.2 Operation

Operation of the River Center ICTF within Alternative 6 also would result in the same potential effects as noted for Alternative 5, to include the disruption of the CNH and CNY Historic Districts and the USMC Barracks. Similar to Alternative 5, vibration impacts would have no effect on historic properties within and outside the CNC.


Service Layer Credits: Esri, USDA Farm Service Agency
1526 Ben Tillman School
Charleston Naval Hospital Historic District (CNH)
Officers' Quarters Historic District (CNYOQ)
Charleston Navy Yard Historic District (CNY)
USMC Barracks
1527 Ben Tillman Homes
Cooper River
4255 Chicora School
1664 GARCO Housing
1663 GARCO Housing
4254 Six Mile School
HLT
4306 Freedman's Cottage
4309 Freedman's Cottage
Historic Property
Charleston Navy Yard Historic District (CNY)
Charleston Navel Hospital Historic District (CNH)
Officers' Quarters Historic District (CNYOQ)
Study Area
Proposed Project Infrastructure
Proposed Bridge
Proposed Rail
Proposed Roadway Improvements
River Center ICTF
Other Infrastructure
Port Access Road (Future, Approved Project)
Proposed Rail (Related Activities)
Existing Rail
Source: Brockington, Atkins
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5,000
Feet
N
NAVY BASE ICTF EIS
Historic Properties
Alternative 6
Figure 4.10-6
US Army Corps Of Engineers
Charleston District

4.10.9 Alternative 7: River Center Project Site (South via Milford)

The same historic properties noted for Alternative 5 are also present near the footprint of Alternative 7. The relationships of all of the historic properties are the same as well. Figure 4.10-7 displays the location of the historic properties within and near Alternative 7.

4.10.9.1 Construction

Construction of the River Center ICTF within Alternative 7 would result in the same adverse effects to the CNH, CNY, and CNYOQ Historic Districts and the USMC Barracks noted for Alternative 5. The potential effects related to visual intrusions, noise, and vibration associated with the construction of the River Center ICTF within Alternative 7 are temporary and would have no effect on any historic properties. Again, the potential for archaeological sites to exist within Alternate 7 is minimal (cf. Daugherty 2011, Shmookler 1995).

4.10.9.2 Operation

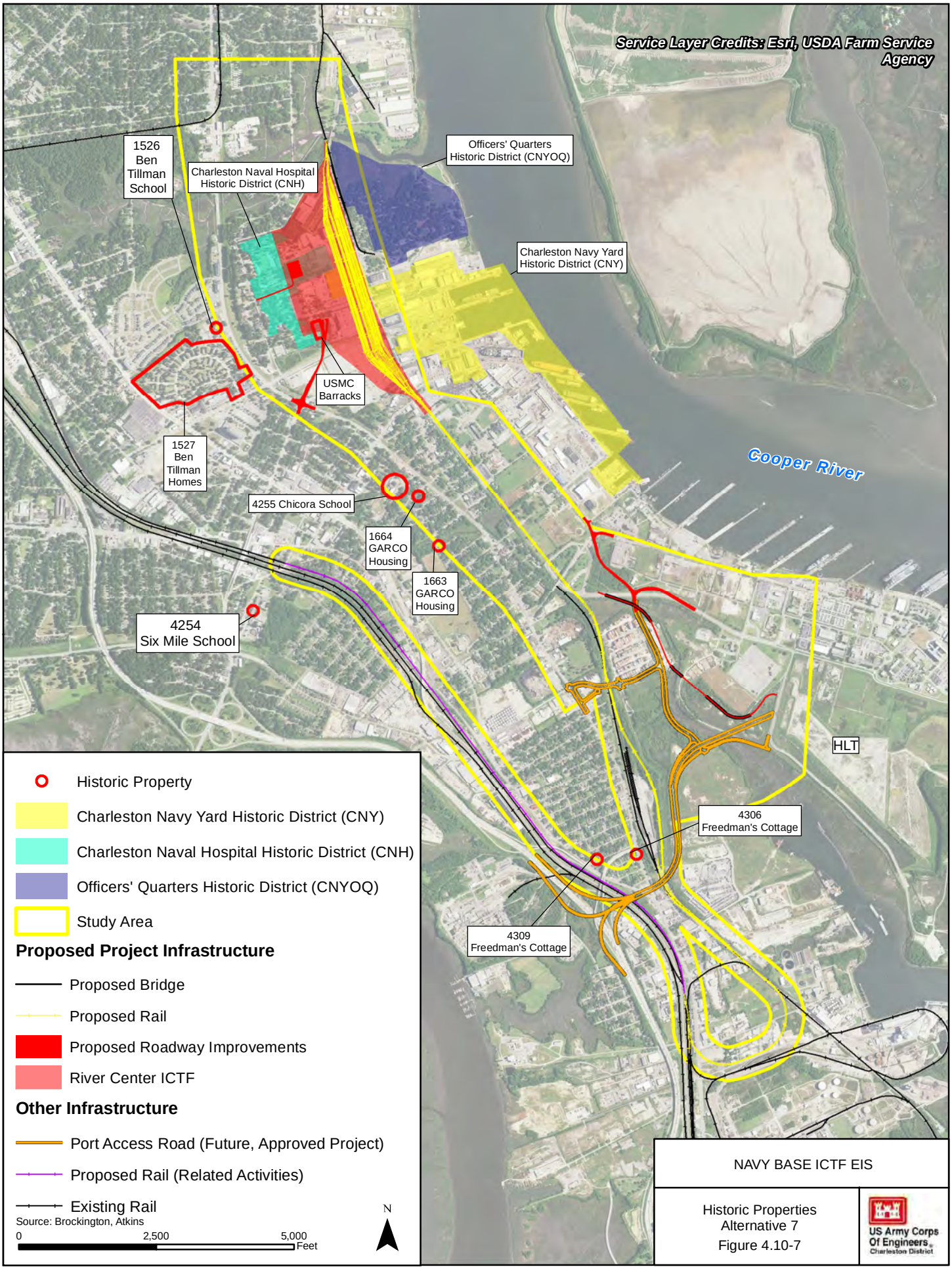
Operation of the River Center ICTF within Alternative 7 also would result in the same potential effects as noted for Alternative 5, to include the disruption of the CNH and CNY Historic Districts and the USMC Barracks. Similar to Alternative 5, vibration impacts would have no effect on historic properties within and outside the CNC.

4.10.10 Related Activities

Upgrading and reopening existing rail lines for the Class I rail carriers would occur in association with Alternatives 1-7. For Alternatives 1, 4, 5, and 7, this upgrading and reopening would occur from roughly Herbert Street north to Misroon Street to provide rail connection to the south. For Alternative 2, this upgrading and reopening would occur from roughly Herbert Street north to Misroon Street to provide rail connection to the south and from roughly Oakwood Avenue to Buist Avenue to provide rail connection to the north. For Alternatives 3 and 6, this upgrading and reopening would occur from the I-26 Spruill Avenue ramps north to Misroon Street to provide rail connection in the south. Historic properties near the Related Activities include the two Charleston freedman's cottages (Resources 4306 and 4309) in the south and the CNYOQ Historic District.

4.10.10.1 Construction

Construction associated with the Related Activities would create potential effects related to visual intrusions, noise, and vibration associated with the construction of the Navy Base ICTF. Like those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1526 Ben Tillman School
Charleston Naval Hospital Historic District (CNH)
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Proposed Rail (Related Activities)
Existing Rail
Source: Brockington, Atkins
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NAVY BASE ICTF EIS
Historic Properties
Alternative 7
Figure 4.10-7
US Army Corps Of Engineers
Charleston District

identified for construction activities within Alternatives 1-7, these effects are temporary and would have no effect on any historic properties. Again, the potential for archaeological sites to exist within the footprint of the Related Activities is minimal, since these areas are existing or former rail lines.

4.10.10.2 Operation

Operation of the Navy Base ICTF would increase the number of trains traveling over the rail lines of the Related Activities, creating the same potential effects for nearby resources noted for Alternatives 1-7, namely noise and vibration. The distance between the northern Related Activity and the CNYOQ Historic District limits the impact of these potential effects to this historic property. The Charleston freedman's cottages (Resources 4306 and 4309) were originally built near active rail lines. Operation of the Navy Base ICTF would not affect any historic properties due to the distances between the improved rail lines and the CNYOQ Historic District and the original associations of Resources 4306 and 4309.

4.10.11 Summary of Impacts Table

Table 4.10-2 summarizes the environmental consequences to historic properties from Alternative 1 (Proposed Project) and all the alternatives.

Table 4.10-2
Summary of Impacts, Cultural Resources

Alternative	Historic Properties				
	Charleston Naval Hospital (CNH) Historic District	***Charleston Navy Yard (CNY) Historic District***	***Charleston Navy Yard Officer's Quarters (CNYOQ) Historic District***	**U.S. Marine Corps (USMC) Barracks**	***Other historic properties outside the Charleston Naval Complex (CNC)***
No-Action	No effect	No effect	No effect	No effect	No effect
1: *Proposed Project: South via Milford / North via Hospital District*	Adverse effect from demolition of contributing elements of the Historic District, and altered setting of the District	No effect	No effect	Adverse effect from altered setting	No effect
2: *South via Milford / North via S-line*	No effect	No effect	No effect	No effect	No effect

Alternative	Historic Properties				
	Charleston Naval Hospital (CNH) Historic District	*Charleston Navy Yard (CNY) Historic District*	*Charleston Navy Yard Officer's Quarters (CNYOQ) Historic District*	U.S. Marine Corps (USMC) Barracks	*Other historic properties outside the Charleston Naval Complex (CNC)*
3: *South via Kingsworth / North via Hospital*	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)
4: *South via Milford*	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)
5: *River Center Project Site: South via Milford / North via North via Hospital District*	Adverse effect from demolition of contributing elements of the Historic District, and altered settings of the District	Adverse effect from demolition of contributing elements of the Historic District, and altered settings of the District	Adverse effect from altered settings of the District	Adverse effect from demolition of NRHP-listed building and altered settings of the District	No effect
6: *River Center Project Site: South via Kingsworth / North via Hospital*	Same as Alternative 5	Same as Alternative 5	Same as Alternative 5	Same as Alternative 5	Same as Alternative 5
7: *River Center Project Site: South via Milford*	Same as Alternative 5	Same as Alternative 5	Same as Alternative 5	Same as Alternative 5	Same as Alternative 5

Cultural Resource Impact Definitions

No Effect = No resources present or impacts would be at the lowest levels of detection: barely perceptible and not measurable, and thus do not alter any defining characteristic of a historic property. (No effect under Section 106.)

No Adverse Effect = A direct or indirect alteration that would only slightly affect the character-defining features of a structure, resource, building, or district listed on or eligible for listing on the NRHP but does not compromise its eligibility. (No adverse effect under Section 106.)

Adverse Effect = A direct or indirect alteration of any characteristic of a historic property that qualifies it for inclusion in the NRHP; that diminishes the integrity of its location, design, setting, materials, workmanship, feeling, or association; or that diminishes the extent to which a resource retains its historic appearance. This can include the destruction of archaeological resources, alteration of historic viewsheds, and the modification or demolition of historic buildings (Adverse Effect under Section 106.)

4.10.12 Mitigation

4.10.12.1 Applicant's Proposed Avoidance and Minimization Measures

The Applicant has committed to several measures that avoid and/or minimize potential impacts of Alternative 1 (Proposed Project), which are provided in Appendix N. Some of these measures are required under federal, state, and local permits; others are measures that Palmetto Railways has incorporated into the design and operations of Alternative 1 (Proposed Project) and are included in the Cultural Resources MOA. Each mitigation measure is also designated as one that either helps to avoid an impact or one that minimizes an impact.

- Minimize and avoid impacts to buildings and structures on the CNC. (Avoidance and Minimization)
- Minimize and avoid direct interaction with historic buildings and structures. (Avoidance and Minimization)
- Consulted with multiple agencies (state and federal) and historic organizations regarding potential impacts and mitigation for cultural resources. (Minimization)
- Execute a Cultural Memorandum of Agreement (MOA) regarding effects of the Project on historic properties between the Corps, the Federal Railroad Administration (FRA), Palmetto Railways, the Advisory Council on Historic Preservation (ACHP), the Muscogee (Creek) Nation, and the State Historic Preservation Office (SHPO). The Cultural Resources MOA commits the Applicant to the following requirements:
  - The Applicant shall monitor adversely affected historic properties for vibration damage during construction and for a period of 2 years during operation of the facility. If damage does occur during construction, the Applicant or its contractors shall be responsible for repairs of vibration damage to historic properties, in coordination with the Corps and SHPO and in accordance with the Secretary of the Interior Standards. (Minimization)
  - Construction activities shall occur in accordance with local noise regulations, policies, and guidance to minimize adverse noise effects. (Minimization)
  - The Applicant will develop and erect three state historical markers regarding the history of the USMC Barracks, CNH, and CNYOQ within 2 years of the execution of the Cultural Resources MOA and in coordination with SHPO. (Minimization)
  - The Applicant shall prepare a nomination of the USMC Barracks to the National Register of Historic Places (if deemed appropriate by SHPO) within 1 year of the execution of the Cultural Resources MOA. (Minimization)
  - The Applicant shall establish the Charleston Naval Base Historical Trust (CNB Historical Trust). The CNB Historical Trust governing board shall consist of at least one representative from the City of North Charleston, each concurring party, the Redevelopment Authority, Palmetto Railways, and SHPO. (Minimization)

- The Applicant shall provide funding in the amount of $2 million for the CNB Historical Trust for use in preserving and rehabilitating the Charleston Naval Hospital and USMC Barracks. (Minimization)
- The Applicant shall fund an additional historic resource survey of the study area under the oversight of SHPO, which is intended to update and catalogue changes to the properties listed in the Programmatic Agreement for use by the signatories on a going forward basis. (Minimization)
- The Applicant shall lease the CNH and/or USMC Barracks to the CNB Historical Trust for a nominal fee as long as they are actively implementing rehabilitation and preservation efforts. A transfer of title shall be provided upon satisfaction of certain conditions. (Minimization)
- The Applicant shall work with the CNB Historical Trust to place appropriate restrictive covenants on the CNH and/or USMC Barracks to reasonably protect the historic and cultural value of such structures for any rehabilitation or use to be held by the CNB Historical Trust if such properties are transferred or leased to any third party (or held by an appropriate third party), if title is retained by the CNB Historical Trust. Rehabilitation and reuse may include use for residential, commercial, office, mixed-use, and retail space and which may include an exhibit of historic or cultural interest. (Minimization).
- The Applicant will cause rehabilitation and reuse of the Power House (CNC Building 32 – Central Power Plant), which may include use for commercial, office, and retail space which may include an exhibit or other recognition of CNC objects of historical, scientific, artistic, or cultural interest, including but not limited to the transfer of title to any appropriate entity to accomplish these tasks upon reasonable request, subject to SHPO's prior consent approval. The Applicant has sold the Powerhouse to a private ownership entity with the stipulation that it be redeveloped within 4 years of purchase or returned to Palmetto Railways. (Minimization)
- The Applicant shall follow post-review discovery requirements and suspend construction operations if cultural resources are found and notify relevant parties for consultation including the Corps, SHPO, Muscogee (Creek) Nation, Catawba Indian Nation, and the FRA. (Minimization).
- The Applicant shall prepare an Annual Report documenting actions carried out in the MOA and distribute to the signatories and concurring parties. (Minimization)

These avoidance and minimization measures, except the items noted with an asterisk (*), have been considered in the preceding impact analysis. The complete list of Applicant-proposed avoidance and minimization measures related to land use and infrastructure is also provided in Chapter 6.

4.10.12.2 Additional Potential Mitigation Measures

No additional mitigation measures for Cultural Resources have been identified by the Corps. Additional avoidance, minimization, and mitigation may be considered by the Corps in its decision-making process. Final mitigation measures may be adopted as conditions of the DA permit and documented in the Record of Decision (ROD).

4.11 VISUAL RESOURCES AND AESTHETICS

4.11.1 Methods and Impact Definitions

Federal agencies that have not created their own regulations and guidance for visual resource management and analyses generally rely on methodologies promulgated by other federal agencies. The best known of these include the analytical frameworks developed by the U.S. Forest Service USFS); U.S. Department of the Interior (USDOI), Bureau of Land Management (BLM); and U.S. Department of Transportation (USDOT), Federal Highway Administration (FHWA), as described in the National Cooperative Highway Research Program Report 741, Evaluation of Methodologies for Visual Impact Assessment (Transportation Research Board 2013). The methodology used in this EIS reflects the concepts and principles of the Visual Resource Management methodologies in use by these federal agencies.

The impact evaluation considers both construction and operation activities within the Visual Resource study area (VRSA). Potential effects to visual resources were assessed based on a comparison between Visual Intensity and Viewer Sensitivity. Potential obstruction of scenic views, both panoramic (such as a broad expanse of water or mountain range held over a considerable distance) and focal views (close-in views of a visual or historic resource), possible changes in the visual character of the existing landscape, and potential viewer sensitivity and viewing distance, can each contribute to the evaluation.

4.11.1.1 Viewer Sensitivity

The determination of viewer sensitivity, ranging from none to high, considers the potential number of viewers, duration of the views, context of the viewing setting, viewing distances, and viewer expectations; for example, viewers would be more sensitive to landscape changes to foreground and middleground views. Viewer sensitivity is defined as follows:

High Sensitivity (H): The potential for public concern over change in scenic/visual quality is great. Effected views are rare, unique, or in other ways are special and highly valued in the region or locale. Even the smallest perceptible change in visual conditions (Impact Intensity Level 3 [see below]) would be considered to be a substantial (significant) lessening of visual quality.

Moderate Sensitivity (M): The potential for public concern over adverse change in scenic/visual quality is appreciable. Affected views are secondary in importance or similar to views commonly found in the region or locale. A moderately to highly intense visual impact (Impact Intensity Levels 1 or 2) would be perceived as a significant lessening of visual quality.

Low Sensitivity (L):	Generally, there may be some indication that a small minority of the public has a concern over scenic/visual resource impacts on the affected area. Only the greatest intensity of change in the condition of aesthetics/visual resources (Impact Intensity Level 1) would have the potential to register with the public as a substantial (significant) reduction in visual quality.
No Sensitivity (None):	The views are not public, or there are no indications of public concern over, or interest in, scenic/visual resource impacts on the affected area.

Based on the described methodology, viewer sensitivity is identified for each of the seven selected viewpoint locations (Table 4.11-1). It should be noted that sensitive viewers do not include commercial or industrial uses; for purposes of this analysis, sensitive viewers include residents, recreational users, motorists, bicyclists, and pedestrians.

Table 4.11-1
Viewpoint Sensitivity

Viewpoint	Sensitivity
1. Southern boundary of the Union Heights Neighborhood	Low
2. Intersection of Baxter Street and Spruill Avenue	Low
3. Chicora-Cherokee residential neighborhood east of Spruill Avenue	Moderate
4. Chicora-Cherokee residential neighborhood west of Spruill Avenue	Moderate
5. Intersection of McMillan Avenue and Spruill Avenue	Moderate
6. River Place and Horizon Village facing east across Spruill Avenue	Moderate
7. Riverfront Park and Noisette Creek east of Spruill Avenue	High

Source: Atkins 2016.

4.11.1.2 Impact Intensity

When a potential visual impact is identified, it is further defined and described in relation to the intensity of the impact. The intensity of a visual impact depends upon how noticeable the change may be. It is indicated by the degree to which existing visual conditions (the baseline for the analyses) would change as a result of features of project construction and operation. Viewer exposure is affected by the physical distance from and location of viewers relative to a resource, the number of viewers, and the duration of their view. For example, a passenger in a car will have a substantially different appreciation for a view than a driver. The same is true of a pedestrian who can linger to enjoy a view, rather than a motorist (either driver or passenger) who cannot stop to experience a view but passes it while moving.

The severity of an effect is partly dependent on the duration of the effect and whether the effect would last for an appreciable period of time, usually one year or longer (as opposed to being ephemeral or brief); however, visual effects enduring for less than one year may also be moderate or major, depending on the temporal context (assuming criteria for impact intensity and viewer sensitivity have been met). For the purposes of this evaluation, duration includes:

- Temporary Visual Effects—Those lasting for 1 year or less
- Short-Term Effects—Those lasting for more than 1 year, but less than 5 years
- Long-Term Effects—Those lasting for 5 years or more

Considering the above criteria (degree of change, viewer exposure, duration of effect), the intensity of an impact is defined as follows:

Level 1: A substantial change in visual character and quality or complete obstruction of view; introduction of elements that would be substantially inconsistent with the surrounding visual character in a historic district, specific plan area; or other area that is designated in a policy document or is otherwise identified as being important visually; and introduction of substantial new sources of light or glare that could disturb nighttime sleep or outdoor nighttime activities. The effect would be perceptible over a large geographic area by a substantial proportion of viewers for a longer duration (more than one year).

Level 2: The change would partially obstruct a scenic view and/or introduce elements that would be somewhat inconsistent with the surrounding visual character in a historic district, specific plan area; or other area that is designated in a policy document or is otherwise identified as being important visually. The effect would be perceptible to a large number of viewers and the effect would be of greater extent (i.e., not limited to a short distance from the Project site). Duration could be temporary but over an extended period of time (greater than one year).

Level 3: The change in visual character would be visible to a limited number of viewers and/or the activity would result in very limited obstruction of scenic views. There would be only minor introduction of inconsistent visual elements in a historic district, specific plan area; or other area that is designated in a policy document or is otherwise identified as being important visually. Nighttime views would not be substantially impaired. Any disruption of sleep or nighttime outdoor activities, as a result of light and glare, would be perceptible to few and would be localized to an extremely limited geographic area. The effect would typically be of limited duration and occur at long intervals.

Level 4: The change in visual character would be barely noticeable. There would be minimal disruption of sleep or nighttime outdoor activities as a result of light and glare. The effect would typically be of very limited duration and/or not occurring often.

4.11.1.3 Impact Determination

The intensity of the impact is compared to the sensitivity of the affected view to determine whether a substantial reduction in the visual setting would likely occur. Note that a perceptible reduction in visual setting is not treated in this methodology as significant unless it is estimated to persist for more than one year. Also, an adverse visual impact may be major if it is inconsistent with applicable ordinances; the impact, however, must be estimated to last more than one year.

Table 4.11-2 provides a matrix of the level of effect for each viewer sensitivity category and impact intensity level. *Impact level* is determined by comparing viewer sensitivity to intensity of effect.

Table 4.11-2
Impact Definitions, Visual Resources and Aesthetics

		Viewer Sensitivity			
		High	***Moderate***	***Low***	***None***
Impact Intensity	Level 1	Major adverse	Major adverse	Minor adverse	Negligible
	Level 2	Major adverse	Moderate adverse	Minor adverse	Negligible
	Level 3	Moderate adverse	Minor adverse	Negligible	Negligible
	Level 4	Minor adverse	Negligible	Negligible	Negligible

Source: Atkins 2016.

Note: Negligible impact level includes beneficial impact.

Potential impacts to visual resources and aesthetics discussed in this section include both temporary construction impacts and permanent impacts resulting from operation of the Navy Base ICTF. The analysis focuses on each alternatives' impact to viewer sensitivity, as it relates to scenic views, scenic resources, visual quality and character, and light and glare. In addition, the alternatives analysis includes a discussion of impacts to the selected viewpoints identified for the analysis.

4.11.2 No-Action Alternative

Under the No-Action Alternative, land uses on the Project site and River Center project site would be consistent with local zoning and ordinances as described in Section 8 (Regulatory Environment Overview). The Project site would continue to be used for mixed-use industrial activities. Activities would likely include the demolition of existing buildings and infrastructure, the alteration of the ground surface, and the installation of new buildings and structures necessary to support the light industries and warehousing/shipping entities that may occupy the future industrial space. Construction activities and equipment would alter the current viewsheds within the Project site and River Center project site. The two existing intermodal rail yards (Ashley Junction and the 7-Mile Yard) would continue to handle and process current and projected future intermodal container

traffic that would be transported by rail, and that CSX and NS would undertake operational and structural modifications to Ashley Junction and 7-Mile rail yards. The Corps assumes that the River Center project site uses would remain as under existing conditions.

Scenic Views

As there is abundant vegetation in the study area and the topography is flat, scenic views are limited, and include the scenic overlook at Riverfront Park, the banks of Noisette Creek, and views of the Cooper River facing east from near the water's edge (i.e., beyond the existing and adjacent Port facilities east of the site). Potential redevelopment of the Project site and/or construction within the River Center project site would not obstruct or alter these scenic views, and there would be no effect.

Scenic Resources

As defined in Section 3.11 (Visual Resources and Aesthetics), visual resources are those visible natural or manmade elements that are particularly valued by a community and are afforded protection from alteration or obstruction through an adopted policy or regulation. Several resources identified in Section 3.10 (Cultural Resources) are also considered scenic resources, such as the CNYOQ Historic District. Under the No-Action Alternative, there would be no effect to these cultural (scenic) resources. As identified in Section 3.4 (Vegetation and Wildlife), the City of North Charleston requires protection of mature trees, considered in this analysis to be a scenic resource. Any mature tree removal must comply with the City of North Charleston's policy. There would likely be significant removal of mature trees under the No-Action Alternative, and removal would have to comply with the City of North Charleston's policy. The impact on viewer sensitivity to scenic resources from the No-Action Alternative would be minor adverse because of the loss of mature trees, though new plantings and other landscaping efforts would minimize the adverse effect as trees and other vegetation matured.

Visual Quality and Character

The Project site is currently developed, and includes industrial buildings (e.g., high-tech, maritime, aerospace, and manufacturing facilities), vacant parking lots, a recreational facility (Sterett Hall) and associated baseball fields, warehouses, federal office buildings, and a few private businesses interspersed within a network of private roads. The Project site is also located in the CNH Historic District, which contains numerous contributing elements (e.g., structures).

Redevelopment by others would likely improve the visual quality and character over existing conditions, which includes expanses of vacant parking lots, grass fields (formally storage tanks and storage facilities), chain link fencing, and overhead power and telephone lines. The Corps assumes that any changes will conform to city zoning and building codes, contain landscaping, and be compatible with the existing industrial uses along the waterfront, and mixed uses, including residential to the west and north. Cranes from shipyard operations, ships, and shipyard buildings are

highly visible. There is some existing vegetation in the form of mature trees, but overall the vegetation is not of high quality or dense enough to screen views of or from the Project sites. Redevelopment efforts that did not introduce substantial new vertical elements (above 3-4 stories), or adversely impact the cultural resources within the Project site, would likely result in a minor beneficial impact to the visual quality and character of the VRSA.

Light and Glare

There is limited to no lighting currently on the Project site and River Center project site, and no nighttime port activities. Existing lighting is for security, street illumination (e.g., street lights), and what is required to operate low-level cranes. Future development could increase levels of light and glare in the VRSA above existing conditions; however, this level of light and glare would be consistent with adjacent land uses and likely result in no impact to viewers and/or to adjacent residents during nighttime.

Selected Viewpoints

Redevelopment efforts under the No-Action Alternative would have limited adverse impacts to the selected viewpoints. Table 4.11-3 identifies the impact determination for each selected viewpoint as well as the rationale for the determination. Selected viewpoints were identified as locations where the greatest amount of change would occur that could affect viewer sensitivity.

Table 4.11-3
Impact Determinations for Selected Viewpoints, No-Action Alternative

Viewpoint	Impact Intensity Discussion	Impact Determination
(#1) Southern boundary of the Union Heights Neighbor-hood	Redevelopment efforts would likely consist of new built features within the existing mixed use and industrial area of the Project sites that are currently dominated by built features and vacant land. A lack of new ROW acquisition and placement of new rail would limit visual changes at this selected viewpoint. Impact intensity would be Level 4 in conjunction with the Low Viewer Sensitivity.	Negligible
(#2) Intersection of Baxter Street and Spruill Avenue	Redevelopment efforts would likely consist of new built features within the existing mixed use and industrial area of the Project sites that are currently dominated by built features and vacant land. Two story or higher buildings may be seen on the Project site above existing vegetation and trees by drivers. Impact intensity would be Level 3 in conjunction with the Low Viewer Sensitivity.	Negligible

Viewpoint	Impact Intensity Discussion	Impact Determination
(#3) Chicora-Cherokee residential neighborhood east of Spruill Avenue	Redevelopment efforts would likely consist of new built features within the existing mixed use and industrial area of the Project sites that are currently dominated by built features and vacant land. Increased lighting on the Project site would increase illumination during nighttime hours. Two story or higher buildings may be seen on the Project site above existing vegetation and trees by residents and drivers. Impact intensity would be Level 3 in conjunction with the Moderate Viewer Sensitivity.	Minor Adverse
(#4) Chicora-Cherokee residential neighborhood west of Spruill Avenue	Redevelopment efforts would likely consist of new built features within the existing mixed use and industrial area of the Project sites that are currently dominated by built features and vacant land. Increased lighting on the Project site would increase illumination during nighttime hours. Two story or higher buildings may be seen on the Project site above existing vegetation and trees by residents and drivers. Impact intensity would be Level 3 in conjunction with the Moderate Viewer Sensitivity.	Minor Adverse
(#5) Intersection of McMillan Avenue and Spruill Avenue	Redevelopment efforts would likely consist of new built features within the existing mixed use and industrial area of the Project sites that are currently dominated by vacant land and some built features. Increased lighting on the Project site would increase illumination during nighttime hours. Two story or higher buildings may be seen on the Project site above existing vegetation and trees by residents and drivers. Impact intensity would be Level 3 in conjunction with the Moderate Viewer Sensitivity; however, replacement of vacant parking lots with built structures and associated landscaping would likely result in a beneficial change to the visual quality of the selected viewpoint.	Minor Beneficial
(#6) River Place and Horizon Village facing east across Spruill Avenue	Redevelopment efforts would likely consist of new built features within the existing mixed use and industrial area of the Project sites that are currently dominated by built features and vacant land. Three story or higher buildings could be seen in the distance on the Project sites above existing vegetation and trees by residents and drivers. Impact intensity would be Level 4 in conjunction with the Moderate Viewer Sensitivity.	Negligible
(#7) Riverfront Park and Noisette Creek east of Spruill Avenue	Redevelopment efforts would likely consist of new built features within the existing mixed use and industrial area of the Project sites that are currently dominated by built features and vacant land. Residents and drivers may likely see new three story or higher buildings in the distance across Noisette Creek on the River Center project site above existing vegetation and trees; recreationists would not likely be able to see such structures while on Noisette Creek. Impact intensity would be Level 4 in conjunction with the High Viewer Sensitivity.	Minor Adverse

4.11.3 Alternative 1: Applicant's Proposed Project (South via Milford / North via Hospital District)

Construction activities would change visual conditions within the Project site in the short-term, lasting for approximately two years. Activities would consist of short-term ground disturbance, construction staging and activities, and construction associated with implementation of mitigation measures. Construction equipment such as backhoes, tractors, cranes, and trucks would be in active use throughout the construction period. Soils and building materials would be stockpiled until removal or use. Construction fencing and nighttime security lighting would be visible from areas that have views of the Project site, primarily from McMillan Avenue and Reynolds Avenue, the streets in the Chicora-Cherokee residential neighborhood, and the residential uses along St. Johns Avenue. Upon completion of the construction of the Navy Base ICTF, new visual elements would be introduced into the VRSA that include arrival/departure rail tracks, a cut and retention wall creating an embankment and two 10-foot high sound walls along the northern rail connection, an at-grade railroad crossing, a renovated rail bridge over Noisette Creek, the Cosgrove-McMillan Overpass, an earthen berm (10 feet above the top of the rail elevation) and two sound walls along the western border of the Project site, electric wide-span gantry cranes (up to 103 feet tall initially, then up to 125 feet at full build-out), mast lighting poles (85 feet tall), a container stacking area, administrative buildings, a drayage road, and roadway realignment in the vicinity of Hobson Avenue and Bainbridge Avenue. Existing visual elements that would be removed include the Viaduct Road overpass, all existing built structures within the Project site, and homes, apartments, and security fencing along and within the western Project site boundary (e.g., Chicora-Cherokee neighborhood).

Scenic Views

As noted for the No-Action Alternative, flat topography and abundant vegetation limit the number of scenic views in the VRSA. Scenic views in the VRSA include the banks of Noisette Creek, the scenic overlook in Riverfront Park, and views of the Cooper River. The renovated rail bridge across Noisette Creek would increase in elevation by approximately 1 foot, but would largely resemble the similar, built structure in this largely natural setting. The impact intensity of this renovated rail bridge and subsequent train activity would be Level 4, as it would not affect a large number of viewers, would be intermittent in duration, and would occur in a very limited geographic area. Viewers of high sensitivity (e.g., recreationalists on the creek) would primarily be affected by this activity, thus resulting in a minor, permanent adverse impact to scenic views.

Scenic Resources

Scenic resources to the east of the Spruill Avenue CSX ROW include Noisette Creek, Riverfront Park, the CNH and CNYOQ Historic Districts, the USMC Barracks, and the Cooper River. In addition to the renovation of the existing rail bridge across Noisette Creek, new arrival/departure rail tracks would require the removal of CNH contributing structures to the historic district and would alter the setting

of the USMC Barracks. Additionally, construction of the new tracks, and clearing and grading of the Project site, would remove numerous mature trees, including those along the border of the Project site with the Chicora-Cherokee neighborhood.

The substantial number of mature trees along the border of the Chicora-Cherokee neighborhood, which are considered to be scenic resources, would be permanently removed for construction and replaced with a vegetated earthen berm. Because of the permanent removal of a substantial number of mature trees the removal of contributing elements of the CNH historic district, and the altered setting of the USMC Barracks, the intensity of this impact would be Level 1. With moderate viewer sensitivity, Alternative 1 (Proposed Project) would have a major, permanent adverse impact to scenic resources.

Visual Quality and Character

The majority of construction and operation activities of the Navy Base ICTF would not introduce visual elements that are inconsistent with the existing industrial/mixed uses and visual quality and character of the Project site because the dominant visual elements in the VRSA are professional and industrial buildings, vacant parking lots, and the Port with its appurtenant structures (e.g., cranes); however, several construction and operation activities associated with Alternative 1 (Proposed Project) would result in a change to the visual quality and character of the VRSA. The use of wide-span gantry cranes and high mast lighting on the Project site would introduce new vertical elements to the skyline of the VRSA that would be seen by a large number of viewers (residents, motorists, recreationists) during the day and night. While existing cranes can be seen adjacent to the Project site along the bank of the Cooper River, the wide-span gantry cranes would be located in a much closer proximity to residential neighborhoods and transportation networks, such as Spruill Avenue. The construction of the Cosgrove/McMillan overpass would also introduce a new vertical element to the study area as this bridge structure would be visible from multiple viewpoints in the VRSA. While the overpass would partially block views of gantry cranes and lighting masts on the Project site for viewers north of McMillan Avenue, the wide-span gantry cranes and new overpass would result in a Level 2 intensity impact, and with moderate viewer sensitivity for this area, result in a moderate, permanent adverse impact to visual quality and character of the VRSA.

The construction of new built structures on the Project site, such as the locomotive shop and administrative buildings, would incorporate architectural elements from historic naval buildings to maintain and enhance aesthetics with other structures surrounding the Project site on the CNC. Additionally, landscaping within and around the facility footprint would be installed. In light of these mitigation measures committed to by Palmetto Railways, the intensity impact from construction of Project structures would be Level 3, and with low viewer sensitivity for this area, result in a negligible impact to the visual quality and character of the VRSA.

The removal of mature trees throughout the Project site, and particularly along the border of the Chicora-Cherokee neighborhood, would alter the visual quality and character of the VRSA; however, with adherence to the City of North Charleston's regulations for mature tree removal, placement of new mitigation trees (if applicable, the Applicant will replace under the City's regulations), and maturation of newly landscaped vegetation/trees, the impact intensity would be Level 3. With moderate viewer sensitivity, the removal of mature trees would result in a minor adverse impact to visual quality and character of the VRSA.

The placement of new rail tracks to the North through the Hospital District would require the demolition of several contributing elements to the CNH Historic District, and would alter the visual setting of the USMC Barracks. This activity would result in a Level 1 intensity impact, and with moderate viewer sensitivity for this area, result in a major, permanent adverse impact to the visual quality and character of the VRSA. Construction of the renovated rail bridge across Noisette Creek, and subsequent operation of the Navy Base ICTF, would maintain a permanent, but similar, built structure in this largely natural setting. The increased rail activity associated with the operation of the Navy Base ICTF would increase the number and visibility of trains in the VRSA; however, there is already a notable amount of rail activity in the VRSA. The construction of the northern rail connection would require excavation, or a cut, through a natural embankment, which would result in a visual barrier from trains for some residents to the west along St. Johns Avenue. In addition, the construction of a noise abatement wall along portions of the northern rail connection will further act as a visual barrier for residences in the River Center site. The concrete used for the noise abatement wall will be aesthetically pleasing and, per the Applicant, may incorporate a community mural project or other design. The Applicant will work with the community to determine the appropriate design. This increase in train activity and construction of visual barriers would be a Level 3 intensity impact, and with moderate viewer sensitivity, result in a minor, permanent adverse impact to the visual quality and character of the VRSA.

Placement of arrival/departure tracks to the south of the ICTF would occur in a largely industrial area with existing rail tracks and train activity. The impact intensity of the construction and operation of new rail in the southern portion of the Project site would be Level 4 as it would not affect a large number of viewers, would be intermittent in duration, and would occur in a very limited geographic area. With the low viewer sensitivity in the area, there would be a negligible impact to the visual quality and character of the VRSA.

The roadway realignment of Hobson Avenue near Bainbridge Avenue would represent a Level 3 intensity impact as the area is industrial and the roadway network would stay primarily in place. With the low viewer sensitivity for the area, there would be a negligible impact. The removal of Viaduct Road would represent a Level 3 intensity impact, and with moderate viewer sensitivity for the area, result in a minor, permanent adverse impact to the visual quality and character of the VRSA.

Construction and operation of the drayage road would represent a Level 3 intensity impact, and with low viewer sensitivity, result in a negligible impact to visual quality and character of the VRSA.

The construction of the earthen berm (approximately 10 feet above the top of the rail elevation) on the western boundary of the Project site would block views of subsequent ICTF construction and ground-based operation activities of the Navy Base ICTF. While the removal of residential structures to accommodate the earthen berm would result in a change to the visual quality and character of the neighborhood, the presence of a landscaped berm and remaining residential structures, would result in a Level 3 impact intensity. With the moderate viewer sensitivity for the area, the construction of the earthen berm would result in a minor, permanent adverse impact. The following images show Orvid Street as it is today and a visualization of how the earthen berm of Alternative 1 (Proposed Project) would change the view.

Photo Visualization of the Project site facing
east on Orvid Street from North Carolina Avenue.

Facing east on Orvid Street from North Carolina Avenue with the Construction of the Earthen Berm.

Light and Glare

New vertical elements that would be sources for light and glare include the 85-foot-tall mast lighting that would be illuminated from dusk to dawn, as well as new train activity using the arrival and departure tracks. As per Palmetto Railways' proposed mitigation measures, the lighting on the ICTF would be directed downward and shielded to reduce spill light onto adjacent residential uses, and the photometric design would result in less than 0.5 foot-candles outside of the Project site. Analysis of lighting effects on residential structures adjacent to the Project site within the Chicora-Cherokee neighborhood indicate that illumination would result in the desired mitigation of light illumination of less than 0.5 foot-candles (Appendix N). As a result of these mitigation measures, the impact intensity from high mast lighting would be Level 3, and with moderate viewer sensitivity, would result in a minor, permanent adverse impact. Lighting of the ICTF during night time would not be of sufficient illumination as to disturb sleep and other nighttime activities off of the Project site.

49 C.F.R. Part 229, Subpart C, Section 229.125 prescribes the minimum levels of lighting required for locomotives and rear train cars. It requires that each headlight is to be aimed to illuminate a person at least 800 feet ahead and in front of the headlight, which can be composed of either one or two lamps. A peak intensity of at least 200,000 candela[73] is required to be aimed directly ahead, 3,000 candela at an angle of 7.5 degrees and at least 400 candela at an angle of 20 degrees from the centerline of the locomotive, when the light is aimed parallel to the tracks.

[73] Candela is defined as the amount of energy emitted by a light source. One foot-candle (ftcd) is equivalent to 0.981 candela.

Table 4.11-4 summarizes common outdoor light levels for comparison.

Table 4.11-4
Outside Light Levels

Condition	Illumination	
	(ftcd)	*(Candela)*
Sunlight	10,000	9,810
Full Daylight	1,000	981
Overcast Day	100	98.1
Very Dark Day	10	9.8
Twilight	1	0.98
Deep Twilight	.1	0.098
Full Moon	.01	0.0098
Quarter Moon	.001	0.00098
Starlight	.0001	0.000098
Overcast Night	.00001	0.0000098

Source: http://www.engineeringtoolbox.com/light-level-rooms-d_708.html

When trains operate at night, train headlights could shine into residential windows at points where the track turns, primarily affecting structures within the Hospital District (e.g., near McMillan Avenue and St. Johns Avenue). Even in daylight, train headlamps are required to be illuminated for safety.

Apparent brightness is different from candela, which is the measure of the energy output of the headlamp. Apparent brightness refers to how the energy output is perceived by the viewer, which is a function of both direction and distance. The farther away a viewer is from the light source, the less bright the lamp will appear. Similarly, when viewed from an oblique angle, apparent brightness also decreases with the increase in angle of view. As noted above, federal law requires that train headlamps emit 200,000 candela directly ahead to a distance of at least 800 feet. This intensity is approximately 20 times the intensity of sunlight. The intensity of the illumination decreases to 400 candela at an angle of 20 degrees from the horizontal. An intensity of 400 candela at an angle of 20 degrees from the horizontal would only be approximately four times greater than the apparent brightness on an overcast day. Therefore, the effect on residential uses would be substantial only where the train headlamps shine directly ahead into the residences, the residences are less than 800 feet from the tracks without visual obstruction, and where the tracks curve (otherwise the tracks are parallel to residential uses).

This effect would be similar to the flash of vehicle headlights, although substantially more intense. Residences and other structures within the Hospital District are most likely to be affected by train headlamps at night, with the likelihood of no more than 2 trains at night with full build-out (2038). Only those residences within 800 feet of the direct beam of the trains would be affected, though intervening vegetation, trees, the natural embankment, noise abatement wall, and other structures would help to block the light. Although the effect of train lighting on viewers in locations where the tracks curve could be intense, the effect would be momentary and occur seldom, and few viewers over a minimal geographic area would be impacted. The impact intensity would be Level 3, and with moderate viewer sensitivity, there would be a minor adverse impact from light and glare.

Light from increased truck traffic along the drayage road would not be anticipated to affect adjacent residential uses given the earthen berm wall that would be constructed at the western boundary of the Project site.

Selected Viewpoints

Redevelopment efforts under Alternative 1 (Proposed Project) would have adverse impacts to the selected viewpoints. Table 4.11-5 identifies the impact determination for each selected viewpoint as well as the rationale for the determination.

Table 4.11-5
Impact Determinations for Selected Viewpoints, Alternative 1 (Proposed Project)

Viewpoint	Impact Intensity Discussion	Impact Determination
(#1) Southern boundary of the Union Heights Neighborhood	Redevelopment efforts would consist of new arrival/departure trail tracks within an industrial area that contains existing rail tracks and activity. Impact intensity would be Level 4 in conjunction with the Low Viewer Sensitivity.	Negligible
(#2) Intersection of Baxter Street and Spruill Avenue	Wide-span gantry cranes would be visible (up to 103 feet tall initially, then up to 125 feet at full build-out), and other Project features, such as the earthen berm and noise abatement wall may be visible above existing vegetation and trees by drivers. Impact intensity would be Level 3 in conjunction with the Low Viewer Sensitivity.	Negligible
(#3) Chicora-Cherokee residential neighborhood east of Spruill Avenue	Increased lighting on the Project site and from train activity would increase illumination during nighttime hours. Wide-span gantry cranes, stacked containers, and other Project features, such as the earthen berm, would be visible by residents and drivers. Impact intensity would be Level 3 in conjunction with the Moderate Viewer Sensitivity.	Minor Adverse
(#4) Chicora-Cherokee residential neighborhood west of Spruill Avenue	Wide-span gantry cranes, stacked containers, and other Project features, such as the earthen berm, would be visible by residents and drivers. Increased lighting on the Project site and from train activity would increase illumination during nighttime hours. Impact intensity would be Level 3 in conjunction with the Moderate Viewer Sensitivity.	Minor Adverse
(#5) Intersection of McMillan Avenue and Spruill Avenue	Wide-span gantry cranes, stacked containers, the new Cosgrove-McMillan overpass, and other Project features, such as the earthen berm, would be visible by residents and drivers. Increased lighting on the Project site and from train activity would increase illumination during nighttime hours. Impact intensity would be Level 3 in conjunction with the Moderate Viewer Sensitivity	Minor Adverse
(#6) River Place and Horizon Village facing east across Spruill Avenue	Wide-span gantry cranes would be visible in the distance on the Project site above existing vegetation and trees by residents and drivers. Impact intensity would be Level 4 in conjunction with the Moderate Viewer Sensitivity.	Negligible
(#7) Riverfront Park and Noisette Creek east of Spruill Avenue	Residents and drivers would see renovated and slightly higher-elevated rail bridge, as well as train activity across Noisette Creek; recreationists would not likely be able to see wide-span gantry cranes while on Noisette Creek. Impact intensity would be Level 4 in conjunction with the High Viewer Sensitivity.	Minor Adverse

4.11.4 Alternative 2: Proposed Project Site (South via Milford / North via S-Line)

Construction and operation activities under Alternative 2 would be similar to those identified under Alternative 1 (Proposed Project), with the exception that the northern arrival/departure track would utilize the inactive CSX ROW (S-Line) along Spruill Avenue and tie into the NCTC rail line at the Bexley Street corridor before linking into the existing rail along Virginia Avenue.

Scenic Views: Under Alternative 2, impacts to scenic views would be similar to Alternative 1 (Proposed Project), which resulted in a minor, permanent adverse impact from construction of a new rail bridge across Noisette Creek, and new train activity.

Scenic Resources: Under Alternative 2, the northern rail connection would be relocated along Spruill Avenue within an existing CSX ROW. The scenic resources in the CNH Historic District and the USMC Barracks would be avoided. Mature tree removal would still occur across the Project site and along the Chicora-Cherokee neighborhood, and would be a Level 3 impact intensity. With the moderate viewer sensitivity, there would be a minor adverse impact to scenic resources.

Visual Quality and Character: Under Alternative 2, impacts to visual quality and character would be similar to those identified under Alternative 1 (Proposed Project), with the exception that there would be no major adverse impact to visual quality and character resulting from the loss of historic properties within the Hospital District. Instead, there would be a moderate, permanent adverse impact to visual quality and character from the placement of new vertical elements (e.g., wide-span gantry cranes and the Cosgrove-McMillan Overpass) into the VRSA.

Light and Glare: Under Alternative 2, light and glare impacts resulting from the high-mast lights on the ICTF would be similar to those under Alternative 1 (Proposed Project). Impacts from train head lamps at night would still occur at curvatures of the northern arrival/departure tracks; however, affected residences would include those near the St. Johns – McMillan Street intersection, those along St Johns Avenue and Spruill Avenue, and those located adjacent to Bexley Street and Aragon Avenue. Unlike Alternative 1 (Proposed Project), most residences within the Hospital District would not be subjected to nighttime train headlamps because of the intervening vegetation and structures.

Selected Viewpoints: Under Alternative 2, impacts associated with selected viewpoints would be the same for viewpoints #1–#5, and #7. For viewpoint #6, the presence of intermittent trains using the in-active CSX ROW along Spruill Avenue would result in an increased impact intensity of Level 3 because of the more numerous viewers along Spuill Avenue (e.g., motorists). With the moderate viewer sensitivity for the area, the increased train activity would result in a minor adverse impact.

4.11.5 Alternative 3: Proposed Project Site (South via Kingsworth / North via Hospital District)

Construction and operation activities under Alternative 3 would be similar to those identified under Alternative 1 (Proposed Project), with the exception that the southern arrival and departure track would pass through Kingsworth Avenue.

Scenic Views: Under Alternative 3, impacts to scenic views would be the same as Alternative 1 (Proposed Project), which resulted in a minor, permanent adverse impact from construction of a new rail bridge across Noisette Creek and new train activity.

Scenic Resources: Under Alternative 3, impacts to scenic resources would be the same as Alternative 1 (Proposed Project), which resulted in a major, permanent adverse impact from the demolition of contributing elements within the CNH Historic District and altered setting of the USMC Barracks.

Visual Quality and Character: Under Alternative 3, impacts to visual quality and character would be the same as Alternative 1 (Proposed Project), which resulted in a major, permanent adverse impact from the demolition of contributing elements within the CNH Historic District and altered setting of the USMC Barracks.

Light and Glare: Under Alternative 3, light and glare impacts resulting from the high-mast lights on the ICTF and nighttime train activity would be the same as Alternative 1 (Proposed Project), which resulted in a minor, permanent adverse impact.

Selected Viewpoints: Under Alternative 3, impacts associated with selected viewpoints would be the same as Alternative 1 (Proposed Project) for viewpoints #1–7.

4.11.6 Alternative 4: Proposed Project Site (South via Milford)

Construction and operation activities under Alternative 4 would be similar to those identified under Alternative 1 (Proposed Project), with the exception that the northern train arrival and departure track would be a tail track used for building trains and stop short of Noisette Creek. A second arrival and departure track located at the southern end of the ICTF would parallel the southern route to Milford Street.

Scenic Views: Under Alternative 4, there would be no impact to scenic views, as ICTF construction and operation activities would occur south of any identified scenic views in the VRSA.

Scenic Resources: Under Alternative 4, impacts would be similar to Alternative 1 (Proposed Project), as there would be major, permanent adverse impacts to scenic resources from the demolition of contributing elements of the CNH Historic District and mature trees, as well as the altered setting of the USMC Barracks.

Visual Quality and Character: Under Alternative 4, impacts to visual quality and character would be the same as Alternative 1 (Proposed Project), which resulted in a major, permanent adverse impact from the demolition of contributing elements within the CNH Historic District and altered setting of the USMC Barracks.

Light and Glare: Under Alternative 4, light and glare impacts resulting from the high-mast lights on the ICTF would be the same as Alternative 1 (Proposed Project), which resulted in a minor, permanent adverse impact. Nighttime train activity would result in a negligible impact, as there would be few curvatures on the southern route to Milford Street where residences would be affected.

Selected Viewpoints: Under Alternative 4, impacts associated with selected viewpoints would be the same for viewpoints #1–6. There would be no impact to viewpoint #7 as there would be no construction or ICTF train activity across Noisette Creek or in the immediate vicinity.

4.11.7 Alternative 5: River Center Project Site (South via Milford / North via Hospital District)

Construction and operation activities under Alternative 5 would be similar to those identified under Alternative 1 (Proposed Project), with the exception that the ICTF would be located at the River Center project site, and there would not be the need for a Cosgrove-McMillan Overpass.

Scenic Views: Under Alternative 5, there would be Level 1 impacts to scenic views around Noisette Creek, as the Navy Base ICTF construction and operations would be adjacent to the creek. With the high viewer sensitivity at this location, a major, permanent adverse impact to scenic views would occur.

Scenic Resources: Under Alternative 5, the overall impact to scenic resources would be similar to Alternative 1 (Proposed Project), resulting in a major, permanent adverse impact; however, in addition, two additional historic districts, the CNY and CNYOQ, would be adversely impacted and the USMC Barracks would be demolished. Contributing elements of the CNY would be demolished, and its visual setting altered, and the visual setting of the CNYOQ would also be altered.

Visual Quality and Character: Under Alternative 5, the overall impacts to visual quality and character would be similar to Alternative 1 (Proposed Project), including the major, permanent adverse impact to visual quality and character from the demolition of contributing elements of historic districts within the Hospital District (CNH and CNY), demolition of the USMC Barracks, and altered settings of the CNH, CNY, and CNYOQ.

Light and Glare: Under Alternative 5, light and glare impacts resulting from the high-mast lights on the ICTF would be the same as Alternative 1 (Proposed Project), which resulted in a minor, permanent adverse impact. Nighttime train activity would result in a negligible impact, as there

would be few curvatures on the southern route to Milford Street where residences would be affected, including the Chicora-Cherokee neighborhood.

Selected Viewpoints: Redevelopment efforts under Alternative 5 (Proposed Project) would have adverse impacts to the selected viewpoints. Table 4.11-6 identifies the impact determination for each selected viewpoint as well as the rationale for the determination.

Table 4.11-6
Impact Determinations for Selected Viewpoints, Alternative 5

Viewpoint	Impact Intensity Discussion	Impact Determination
(#1) Southern boundary of the Union Heights Neighbor-hood	Redevelopment efforts would consist of new arrival/departure trail tracks within an industrial area that contains existing rail tracks and train activity. Impact intensity would be Level 4 in conjunction with the Low Viewer Sensitivity.	Negligible
(#2) Intersection of Baxter Street and Spruill Avenue	Wide-span gantry cranes may be visible in the distance to the north above existing vegetation and trees by drivers. Impact intensity would be Level 4 in conjunction with the Low Viewer Sensitivity.	Negligible
(#3) Chicora-Cherokee residential neighborhood east of Spruill Avenue	Increased lighting from drayage road and train activities would increase illumination during nighttime hours, though it would be mostly blocked by existing trees and vegetation. Wide-span gantry cranes may be visible in the distance to the north above existing vegetation and trees by residents and drivers. Impact intensity would be Level 3 in conjunction with the Moderate Viewer Sensitivity.	Minor Adverse
(#4) Chicora-Cherokee residential neighborhood west of Spruill Avenue	Wide-span gantry cranes may be visible in the distance to the north above existing vegetation and trees by residents and drivers. Impact intensity would be Level 3 in conjunction with the Moderate Viewer Sensitivity.	Minor Adverse
(#5) Intersection of McMillan Avenue and Spruill Avenue	Wide-span gantry cranes, stacked containers, and other Project features would be visible by residents and drivers. Increased lighting on the Project site and from train activity would increase illumination during nighttime hours. Impact intensity would be Level 3 in conjunction with the Moderate Viewer Sensitivity	Minor Adverse
(#6) River Place and Horizon Village facing east across Spruill Avenue	Wide-span gantry cranes would be visible in the distance on the Project site above existing vegetation and trees by residents and drivers. Impact intensity would be Level 3 in conjunction with the Moderate Viewer Sensitivity.	Minor Adverse
(#7) Riverfront Park and Noisette Creek east of Spruill Avenue	Residents and drivers would see new rail bridge and train activity across Noisette Creek, as well as other elements of the ICTF such as container stacking and wide-span gantry cranes. Impact intensity would be Level 1 in conjunction with the High Viewer Sensitivity.	Major Adverse

4.11.8 Alternative 6: River Center Project Site (South via Kingsworth / North via Hospital District)

Construction and operation activities under Alternative 6 would be similar to those identified under Alternative 5, with the exception that the southern train arrival and departure would pass through Kingsworth Avenue.

Scenic Views: Under Alternative 6, impacts to scenic views would be the same as Alternative 5, which resulted in a major, permanent adverse impact from the placement of the ICTF alongside a portion of Noisette Creek.

Scenic Resources: Under Alternative 6, impacts to scenic resources would be the same as Alternative 5, which resulted in a major, permanent adverse impact from the demolition of contributing elements of historic districts within the Hospital District (CNH and CNY), demolition of the USMC Barracks, and altered settings of the CNH, CNY, and CNYOQ.

Visual Quality and Character: Under Alternative 6, the overall impact to visual quality and character would be similar to Alternative 5, which resulted in a major, permanent adverse impact to visual quality and character from the demolition of contributing elements of historic districts within the Hospital District (CNH and CNY), demolition of the USMC Barracks, and altered settings of the CNH, CNY, and CNYOQ.

Light and Glare: Under Alternative 6, light and glare impacts resulting from the high-mast lights on the ICTF would be the same as Alternative 5, which resulted in a minor, permanent adverse impact. Nighttime train activity would result in a negligible impact, as there would be few curvatures on the southern route to Kingsworth Avenue where residences would be affected, including the Chicora-Cherokee neighborhood.

Selected Viewpoints: Under Alternative 6, impacts associated with selected viewpoints would be the same for viewpoints #1–7 as those under Alternative 5.

4.11.9 Alternative 7: River Center Project Site (South via Milford)

Construction and operation activities under Alternative 7 would be similar to those identified under Alternative 5, with the exception that the northern train arrival and departure would be a tail track used for building trains and stop short of Noisette Creek. A second arrival and departure track would be located at the southern end of the ICTF and parallel the southern route to Milford Street.

Scenic Views: Under Alternative 7, impacts to scenic views would be the same as Alternative 5, which resulted in a major, permanent adverse impact from the placement of the ICTF alongside a portion of Noisette Creek.

Scenic Resources: Under Alternative 7, impacts to scenic resources would be the same as Alternative 5, which resulted in a major, permanent adverse impact from the demolition of contributing elements of historic districts within the Hospital District (CNH and CNY), demolition of the USMC Barracks, and altered settings of the CNH, CNY, and CNYOQ.

Visual Quality and Character: Under Alternative 7, the overall impact to visual quality and character would be similar to Alternative 5, which resulted in a major, permanent adverse impact to visual quality and character from the demolition of contributing elements of historic districts within the Hospital District (CNH and CNY), demolition of the USMC Barracks, and altered settings of the CNH, CNY, and CNYOQ.

Light and Glare: Under Alternative 7, light and glare impacts resulting from the high-mast lights on the ICTF would be the same as Alternative 5, which resulted in a minor adverse impact. Nighttime train activity would result in a negligible impact, as there would be few curvatures on the southern route to Kingsworth Avenue where residences would be affected, including the Chicora-Cherokee neighborhood.

Selected Viewpoints: Under Alternative 7, impacts associated with selected viewpoints would be the same for viewpoints #1–7 as those under Alternative 5.

4.11.10 Related Activities

If the project is constructed, a section of unimproved CSX ROW would have to be activated with rail lines that would accept intermodal trains at the proposed new at-grade crossing at Meeting Street in the vicinity of Herbert Street. This Related Activity would apply to Alternatives 1, 2, 4, 5, and 7. This new at-grade crossing would result in a Level 3 impact intensity, and with moderate viewer sensitivity for the area, result in a minor, permanent adverse impact on visual quality and character of the VRSA.

Under Alternatives 3 and 6, the Related Activity construction would begin at the proposed new at-grade crossing at Meeting Street in the vicinity of Kingsworth Avenue. This new at-grade crossing would result in a Level 3 impact intensity, and with moderate viewer sensitivity for the area, result in a minor, permanent adverse impact on visual quality and character of the VRSA.

Alternative 2 requires the reactivation of an out-of-service ROW and construction of a new railroad bridge to connect the northern arrival/departure tracks from the ICTF across a portion of marsh which drains to Noisette Creek to the existing NCTC track along Virginia Avenue. This new railroad bridge would be built parallel to an existing rail trestle bridge, and as such would be a Level 4 impact intensity. With high viewer sensitivity, it would result in a minor, permanent adverse impact to the Noisette Creek scenic view.

4.11.11 Summary of Impacts Table

Table 4.11-7 provides a summary of impacts on visual resources and aesthetics from Alternative 1 (Proposed Project) and all the alternatives.

Table 4.11-7
Summary of Impacts, Visual Resources and Aesthetics

Alternative	Scenic Views	Scenic Resources	Visual Quality and Character	Light and Glare
No-Action	No impact to scenic views.	Minor adverse impact to scenic resources through the removal of mature trees.	Potential minor beneficial impacts to visual quality and character from redevelopment efforts as vacant parking lots are other areas are replaced with newer built structures and associated landscaping.	No impact from light and glare.
Alternative 1: Applicant's Proposed Project (North via Milford / South via Hospital District)	Minor, permanent adverse impact to scenic views from renovation and slight elevation of existing rail bridge over Noisette Creek along Noisette Boulevard.	Major, permanent adverse impact to scenic resources from the removal of contributing elements of the CNH Historic District and mature trees, as well as the altered setting of the USMC Barracks.	Major, permanent adverse impact from demolition of contributing elements of the CNH historic district and altered setting of the USMC Barracks. Moderate, permanent adverse impact from new vertical elements in the VRSA (wide-span gantry cranes, high mast lighting, and the Cosgrove McMillan Overpass). Minor, permanent adverse impact from renovation and slight elevation of existing rail bridge over Noisette Creek. Negligible impact to visual quality and character from the arrival/departure tracks to the south of the ICTF. Negligible impact from the realignment of Hobson Ave/Bainbridge Ave and construction of the drayage road; minor, permanent adverse impact from the removal of the Viaduct Road Overpass. Minor, permanent adverse impact from the construction of the earthen berm adjacent to the Chicora-Cherokee neighborhood.	Minor, permanent adverse impact from light and glare associated with the new 85-foot-tall mast lighting that will be illuminated from dusk to dawn, and from nighttime train head lamps.

Alternative	Scenic Views	Scenic Resources	Visual Quality and Character	Light and Glare
Alternative 2: Proposed Project Site (North via Milford / South via S-Line)	Minor, permanent adverse impact to scenic views from construction of a new rail bridge over Noisette Creek along Spruill Avenue.	Minor adverse impact to scenic resources from the removal of mature trees.	Similar impacts to visual quality and character as described under Alternative 1 (Proposed Project), but no impact to CNH historic district and USMC Barracks.	Similar impacts from light and glare as those described under Alternative 1 (Proposed Project).
Alternative 3: Proposed Project Site (North via Kingsworth / South via Hospital District)	Same impact to scenic views as Alternative 1 (Proposed Project)	Same impacts to scenic resources as Alternative 1 (Proposed Project)	Same impacts to visual quality and character as Alternative 1 (Proposed Project).	Same impacts from light and glare as those described under Alternative 1 (Proposed Project).
Alternative 4: Proposed Project Site (South via Milford)	No impact to scenic views.	Same impacts to scenic resources as Alternative 1	Similar impacts to visual quality and character as described under Alternative 1 (Proposed Project), but without renovated rail bridge over Noisette Creek.	Similar impacts from light and glare as those described under Alternative 1 (Proposed Project), but negligible effect resulting from nighttime train head lamps due to lack of curvatures (and affected residences) on the southern arrival/departure tracks.
Alternative 5: River Center Project Site (North via Milford / South via Hospital District)	Major, permanent adverse impact on viewer sensitivity to scenic views from renovation and slight elevation of existing rail bridge near Noisette Boulevard over Noisette Creek and placement of the ICTF adjacent to Noisette Creek.	Major, permanent adverse impact to scenic resources from the removal of contributing elements to the CNH and CNY historic districts, the USMC Barracks, and mature trees, as well as the altered setting associated with the CNH, CNY, and CNYOQ.	The overall impacts to visual quality and character would be similar to Alternative 1 (Proposed Project), including the major, permanent adverse impact to visual quality and character from the demolition of contributing elements of to the CNH and CNY historic districts, demolition of the USMC Barracks, and altered settings of the CNH, CNY, and CNYOQ.	Minor, permanent adverse impact from light and glare associated with high mast lighting, but negligible effect resulting from nighttime train head lamps due to lack of curvatures (and affected residences) on the southern arrival/departure tracks.
Alternative 6: River Center Project Site (North via Kingsworth / South via Hospital District)	Same impact to scenic views as Alternative 5.	Same impacts to scenic resources as Alternative 5	The overall impacts to visual quality and character would be similar to Alternative 5	Similar impact from light and glare as those described under Alternative 5
Alternative 7: River Center Project Site (South via Milford)	Same impact to scenic views as Alternative 5	Same impacts to scenic resources as Alternative 5	The overall impacts to visual quality and character would be similar to Alternative 5	Similar impact from light and glare as those described under Alternative 5

Source: Atkins 2016.

Please see Section 4.11.1 for description of impacts determinations based on viewer sensitivity, viewpoints, impact intensity.

4.11.12 Mitigation

4.11.12.1 Applicant's Proposed Avoidance and Minimization Measures

The Applicant has committed to several measures that avoid and/or minimize potential impacts of Alternative 1 (Proposed Project). These measures are taken from Palmetto Railways Mitigation Plan provided in Appendix N. Some of these measures are required under federal, state, and local permits; others are measures that Palmetto Railways has incorporated into the design and operations of Alternative 1 (Proposed Project). Each mitigation measure is also designated as one that either helps to avoid an impact or one that minimizes an impact.

- Trains transiting from the north will travel through the base of a cut section (trench) that will serve to minimize the visual impacts associated with the site. (Minimization)
- Construct an earthen berm (approximately 10 feet above the rail elevation) and sound walls (10 feet in height) within a 100-foot buffer along the western boundary of the site to minimize visual impacts. (Minimization)
- The material used for the noise/visual barriers will be aesthetically pleasing and may incorporate a community mural project or other design. (Minimization)
- Landscaping will be installed within and around the facility footprint to reduce visual impacts from adjacent roadways for residences and businesses. The landscaping will meet City code requirements and architectural elements will match surrounding buildings. (Minimization)
- Completed a photometric design for facility high-mast lighting that would result in less than 0.5 foot-candles outside of property boundary. (Minimization)
- The construction of the earthen berm between the facility and adjacent neighborhoods may also help to minimize visual impacts of light sources at the site. (Minimization)
- LED lighting fixtures will be installed over bridges and other areas where practical. (Minimization)
- Buildings on the facility (locomotive shop and administration buildings) will be architecturally designed to match the historical characteristics of other buildings in the area. (Minimization)
- Implement four-container tall stacking limits to reduce visual impacts on surrounding neighborhoods.
- To minimize the impact of lights from the site on adjacent areas, all operating lights will be directed downward to shield light sources minimizing any light bleed off the facility footprint. (Minimization)

These avoidance and minimization measures, except the items noted with an asterisk (*), have been considered in the preceding impact analysis. The complete list of Applicant-proposed avoidance and minimization measures for the Navy Base ICTF is provided in Chapter 6, Table 6-1.

4.11.12.2 Additional Potential Mitigation Measures

No additional mitigation measures for Visual Resources and Aesthetics have been identified by the Corps. Additional avoidance, minimization, and mitigation may be considered by the Corps in its decision-making process. Final mitigation measures may be adopted as conditions of the DA permit and documented in the Record of Decision (ROD).

4.12 NOISE AND VIBRATIONS

4.12.1 Methods and Impact Definitions

The project alternatives are expected to generate additional automobile and truck traffic; alter automobile and truck traffic patterns; alter the existing railway network with additional future tracks and at-grade rail crossings; change the number of freight train operations along certain track segments; and introduce construction noise (temporary) and operational noise. These changes have the potential to cause traffic noise impacts, rail noise and vibration impacts, and construction (temporary) and operational noise impacts for land uses located adjacent to the components of the project. The following sections provide a summary of the methods used and impact definitions for the various noise and vibration sources.

4.12.1.1 Traffic Noise Methodology and Impact Thresholds

A noise screening procedure, which is detailed in Appendix H, was developed in order to determine road segments within the study area where the alternatives may cause a traffic noise impact. As a result, eight road segments were identified for detailed noise modeling and are shown in Figure 4.12-1[74]:

- North Rhett Avenue between I-526 ramp and Braddock Avenue;
- Montague Avenue between Spruill Avenue and Virginia Avenue;
- Virginia Avenue between Montague Avenue and Buist Avenue;
- Noisette Boulevard between Twiggs Street and McMillan Avenue;
- Cosgrove Avenue (SC-7) between Spruill Avenue and Rivers Avenue;
- Spruill Avenue between Noisette Creek and N. Carolina Avenue;
- St. Johns Avenue between O'Hear Avenue and McMillan Avenue;
- Port drayage road (future) between Port access road and NBIF.

[74] For modeling purposes, in Figure 4.12-1, St. Johns Avenue was split into two segments and Spruill Avenue was divided into seven segments. Some road segments also share boxes in the figure. This is why there are twelve boxes used to represent eight road segments in the figure.


Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community
1
2
3
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5
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7
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9
10
11
12
Prediction Location
Port Drayage Road (future) – Alternatives 5, 6, & 7
Study Area
Source: Wyle 2016
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0.25
0.5
Miles
N
NAVY BASE ICTF EIS
Noise Prediction Locations
Figure 4.12-1
US Army Corps Of Engineers
Charleston District

For the detailed analysis, 150 noise-sensitive receptor locations were identified for the Project alternatives, representing mostly residential land uses (single- and multi-family residences), as well as churches, schools, parks, and recreation areas. Several commercial areas and vacant lots exposed to traffic noise were also included for informational purposes. An additional eighteen receptors located adjacent to the proposed Port drayage road under Alternatives 5, 6, and 7 were also identified for noise modeling. The locations of these receptors are presented in Appendix H.

Noise predictions for each project alternative were computed using the FHWA's Traffic Noise Model (TNM), version 2.5 (2004). For more information on the TNM software and its inputs and outputs, see Appendix H. The primary output from TNM is the hourly average sound level (Leq(h)) for each receptor location. Prior to conducting noise modeling for the Project alternatives, the TNM predictions were validated for the study area. Further details regarding the noise model validation process can be found in Appendix H.

The evaluation of traffic noise generally follows the NEPA process as discussed in Highway Traffic Noise: Analysis and Abatement Guidance (FHWA 2011a). To determine whether a proposed build alternative would generate noise impacts, the proposed build alternative is compared with a baseline, in this case the future No-Action Alternative. An impact occurs if Alternative 1 (Proposed Project) or alternative changes the noise levels when compared to the No-Action Alternative for the same design year. For the purpose of this noise analysis, the levels of traffic noise impact associated with a build alternative in comparison with the No-Action Alternative (for the same year) are defined as follows:

Table 4.12-1
Impact Definitions, Traffic Noise

Negligible[75]	Minor	Moderate	Major
0–3 dB(A) increase in Leq(h)	3–5 dB(A) increase in Leq(h)	5–10 dB(A) increase in Leq(h)	Increase in Leq(h) greater than 10 dB(A)

4.12.1.2 Rail Noise Methodology and Impact Thresholds

A screening procedure to identify track segments for further analysis was developed utilizing information obtained from the transportation analysis (Section 4.8 and Appendix F) and Palmetto Railways. Noise levels were computed using the procedure for general noise assessment documented in Transit Noise and Vibration Impact Assessment (FTA 2006) and the CREATE railroad noise model (refer to Appendix H for more information on the screening procedure and the CREATE railroad noise model). The model output is the Day-Night Average Sound Level (DNL) value of rail noise at a specific distance from the track to the receptor. Segments identified as a result of the screening procedure

[75] Changes of 3 dB(A) or less are barely perceptible to the human ear (FHWA, 2011).

were further reviewed for the presence of noise-sensitive land uses within 300 feet[76] of the track centerline. If no noise-sensitive land uses were present within this screening distance, then no further noise assessment was necessary for these track segments.

As a result of the screening procedure, ten track segments were identified for further noise analysis and are shown on Figure 4.12-2.

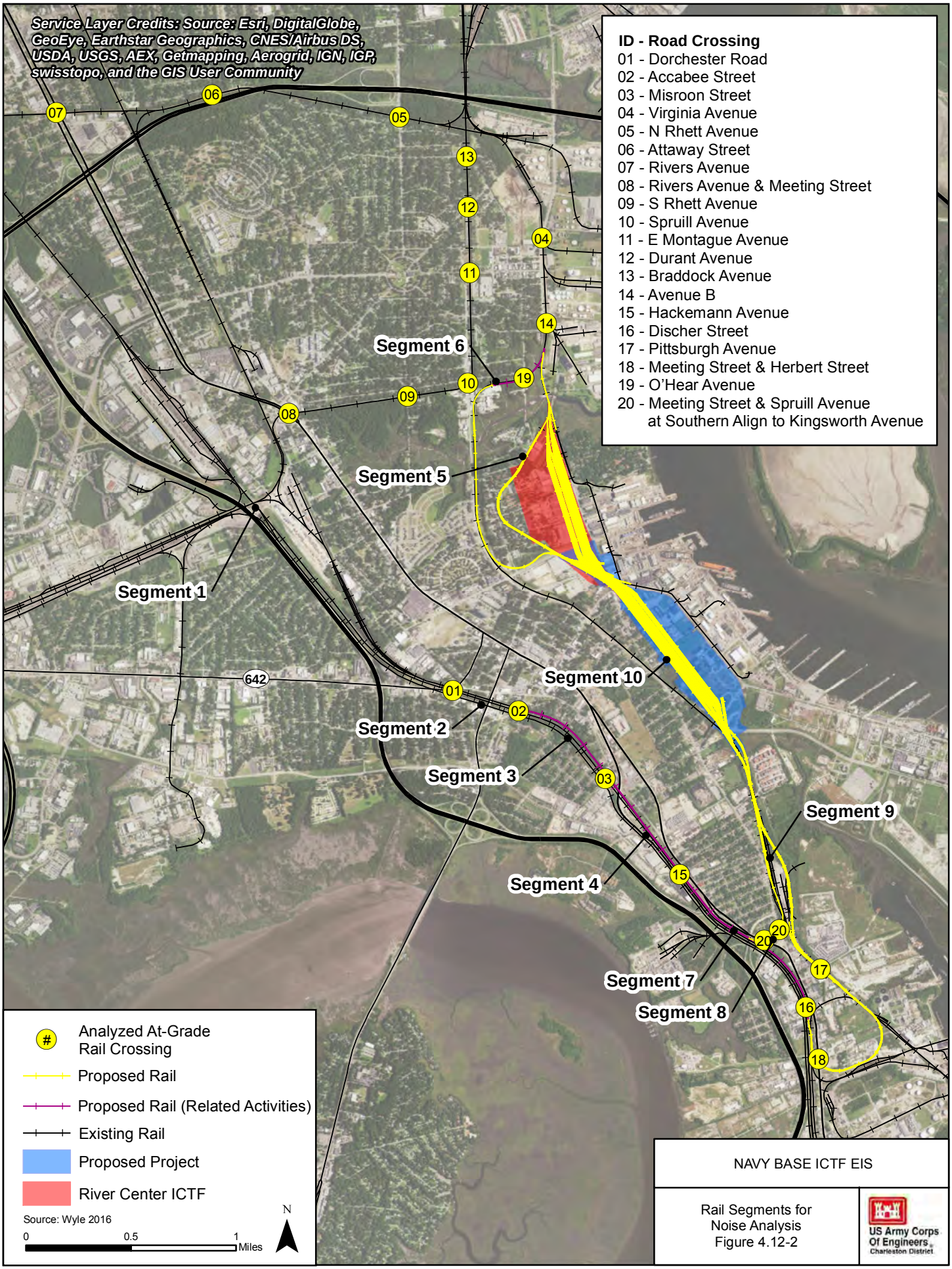
- Segment 1 – North of ID 01 Dorchester Road (existing)
- Segment 2 – Between ID 01 Dorchester Road and ID 02 Accabee Road (existing)
- Segment 3 – Between ID 02 Accabee Road and ID 03 Misroon Street (existing)
- Segment 4 – Between ID 03 Misroon Street and ID 15 Hackemann Avenue (existing)
- Segment 5 – Between ID 14 Avenue B North and ICTF (proposed) [Alternatives 1 and 3
- Segment 6 – Between ID 19 O'Hear Avenue and ICTF (proposed) [Alternative 2]
- Segment 7 – Between ID 15 Hackemann Avenue and ID 16 Discher Street (existing)
- Segment 8 – Between ID 20 Meeting Street and ID 20 Spruill Avenue (proposed) (Alternatives 3 and 6)
- Segment 9 – Between ID 20 Spruill Avenue and ICTF (proposed) (Alternatives 3 and 6)
- Segment 10 – Between ID 17 Pittsburgh Avenue and ICTF (proposed) (Alternatives 5 and 7)

Locomotive horn soundings are part of railroad operations and can contribute to rail noise impacts. Under the Train Horn Rule (49 C.F.R. Part 222), locomotive engineers must begin to sound train warning horns from 15 to 20 seconds in advance of all public grade crossings (for train speeds of 10 mph and below). The rule also provides an opportunity for localities nationwide to mitigate the effects of train horn noise by establishing quiet zones[77] (additional information on quiet zones and proposed quiet zones can be found in Appendix H).

As with the track segments, a screening procedure was developed for horn soundings (see Appendix H for more information on the screening procedure and criteria). Altogether, 20 existing and future rail crossings were modeled for horn soundings following the FTA's procedure (FTA 2006). If noise sensitive receivers are present within 300 feet of the rail crossing with the potential horn noise impact, further analysis was performed for the crossing. The rail crossings listed below met the screening criteria for further analysis (the crossing identification numbers correspond to the locations shown in Figure 4.12-2):

[76] A screening distance of 300 feet covers the first two rows of buildings nearest to the tracks. The second and subsequent rows of buildings are more remote and increasingly shielded from rail noise by intervening rows of buildings.

[77] In order to mitigate the effects of train horn noise, communities can establish "Quiet Zones" where horns are not needed due to safety improvements at the grade crossings. A guide to the quiet zone establishment process can be found at: www.fra.gov under Railroad Safety: "FRA Train Horn Rule and Quiet Zones."


Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community
ID - Road Crossing
01 - Dorchester Road
02 - Accabee Street
03 - Misroon Street
04 - Virginia Avenue
05 - N Rhett Avenue
06 - Attaway Street
07 - Rivers Avenue
08 - Rivers Avenue & Meeting Street
09 - S Rhett Avenue
10 - Spruill Avenue
11 - E Montague Avenue
12 - Durant Avenue
13 - Braddock Avenue
14 - Avenue B
15 - Hackemann Avenue
16 - Discher Street
17 - Pittsburgh Avenue
18 - Meeting Street & Herbert Street
19 - O'Hear Avenue
20 - Meeting Street & Spruill Avenue at Southern Align to Kingsworth Avenue
Segment 1
Segment 2
Segment 3
Segment 4
Segment 5
Segment 6
Segment 7
Segment 8
Segment 9
Segment 10
642
Analyzed At-Grade Rail Crossing
Proposed Rail
Proposed Rail (Related Activities)
Existing Rail
Proposed Project
River Center ICTF
Source: Wyle 2016
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Miles
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NAVY BASE ICTF EIS
Rail Segments for Noise Analysis
Figure 4.12-2
US Army Corps Of Engineers
Charleston District

- Dorchester Road
- Accabee Road
- Misroon Street
- Hackemann Avenue
- O'Hear Avenue
- Meeting Street and Spruill Avenue at Southern Alignment

4.12.1.3 Noise Prediction Model and Analysis

The DNL contours, along the selected track segments and at-grade crossings were predicted using a combination of the CREATE Railroad Noise Model (HMMH 2006) and the FTA Manual's equations for sound wall and trench noise attenuation and horn noise level prediction. Information on the assumptions and parameters used for the modeling can be found in Appendix H. It should be noted that Segment 5 under Alternatives 1 and 3 include plans for a ground cut section (trench) and two sound walls for several sections of the northern rail tracks (see Section 4.12.3 and 4.12.5).

The resultant output from the train noise and horn noise prediction models was the location of the DNL 70, 65, and 60 dB(A) noise contours in the vicinity of the modeled rail crossings for both the No-Action and build alternatives for design year 2038. The contours in the vicinity of a rail crossing are representative of the horn sounding in addition to the train pass bys, and also represent a 24-hour average of the noise levels that can be expected as a result of locomotive horn soundings. Refer back to Figure 3.12-4 for a representation of the noise level contours that would be expected as a result of an individual incident of a locomotive horn sounding.

The evaluation of potential rail noise impact follows the NEPA process for environmental analyses, as applied to the traffic noise impact assessment. Similarly, a proposed build alternative is compared with a baseline (the No-Action Alternative) to determine whether or not the proposed build alternative would generate noise impacts. Alternative 1 (Proposed Project) or the alternative would cause an impact if it changes the noise levels compared to the No-Action Alternative for the same design year.

Table 4.12-2
Impact Definitions, Rail Noise

Negligible	Minor	Moderate	Major
0–3 dB(A) increase in DNL	3–5 dB(A) increase in DNL	5–10 dB(A) increase in DNL	Increase in DNL greater than 10 dB(A)

4.12.1.4 Rail Vibration Methodology and Impact Thresholds

Ground-borne vibration (VdB) of high amplitude may cause buildings to shake and rumbling sounds to be heard. Vibration from sources such as trucks and buses is not usually perceptible, even in

locations close to major roads. However, it is not uncommon for freight trains to be the source of intrusive ground-borne vibration (refer back to Section 3.12 for more information on the characteristics of vibration). Vibration analysis for the selected receptors along the track segments was performed following procedures for rail transit systems; no measurements are required as part of this analysis. The FTA's Transit Noise and Vibration Impact Assessment manual provides the reference curve for vibration levels as a function of distance from the rail track (Figure 10-1 in the FTA manual) (FTA 2006). Adjustments (based on Table 10-1 of the manual) were applied to the curve to account for specific parameters such as train speed (-14 VdB for 10 mph), stiff primary suspension (+8 VdB), and coupling to house foundation (worst case for wood frame houses was used, -5 VdB). The total adjustment factor for shifting the reference curve was determined to be -11 VdB. The adjusted reference curve for a freight train at 10 mph is shown in Figure 4.12-3. It should be noted that the weight of the locomotives and rail cars does not play a significant role in vibration; however, train length and frequency of train events does impact the thresholds as more frequent events would lower the level considered an impact. For more information on the approach used in the vibration assessment, see Appendix H.

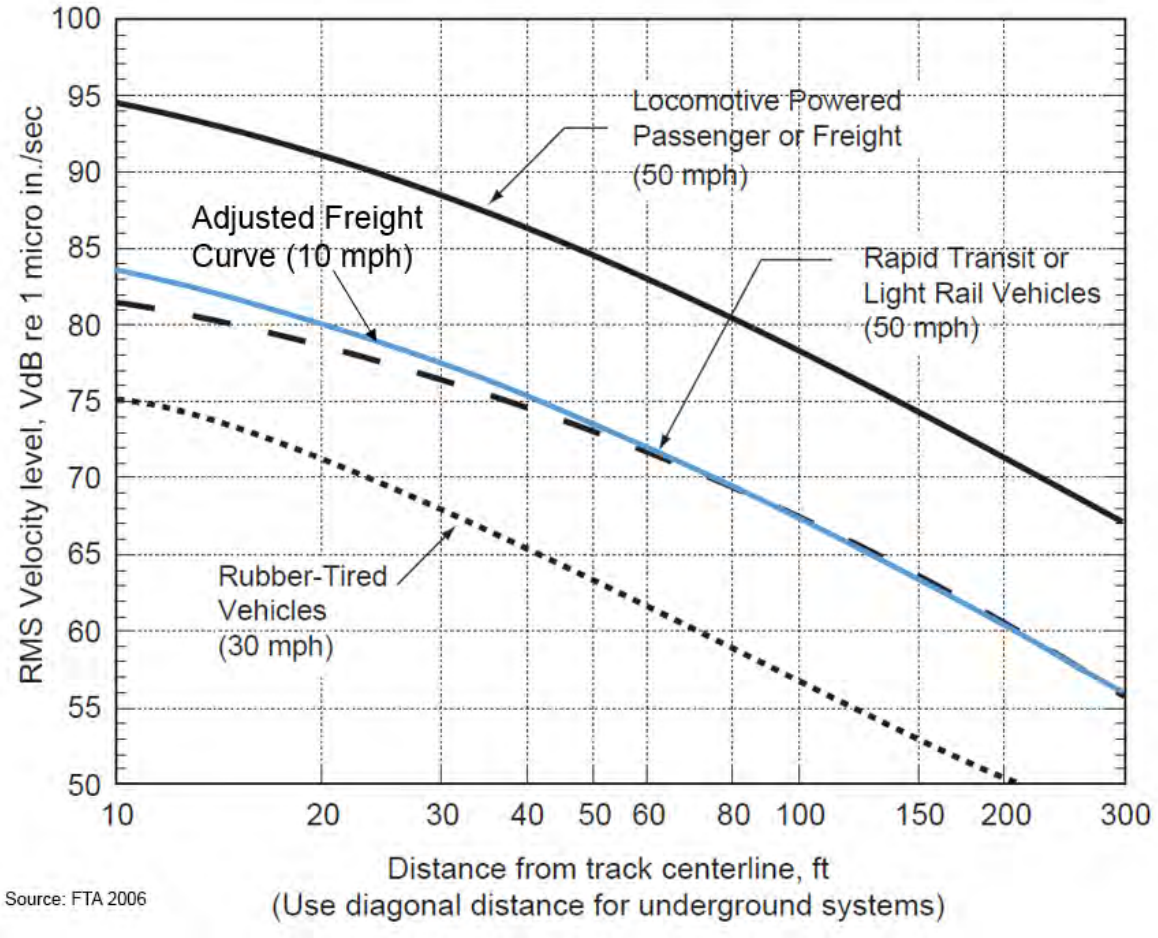


Figure 4.12-3. Adjusted Reference Curve for Vibration Levels of Locomotive-Powered Freight

Potential vibration impacts were analyzed in this study for freight railroads in the study area; however, no specific impact criteria exist for freight railroads. Vibration impact criterion for a single freight train pass by event is established following the FTA's manual (FTA 2006, Table 8-1). The impact criteria for ground-borne vibration are shown in Table 4.12-3.

Table 4.12-3
Impact Criteria for Ground-Borne Vibration of Freight Train Pass By

Land Use Category	Ground-Borne Vibration Impact Levels (VdB re 1 micro-inch/sec)		
	Frequent Events[1]	Occasional Events[2]	Infrequent Events[3]
Category I: Buildings where vibration would interfere with interior operations	65 VdB[4]	65 VdB[4]	65 VdB[4]
Category II: Residences and buildings where people normally sleep.	72 VdB	75 VdB	80 VdB
Category III: Institutional land uses with primarily daytime use.	75 VdB	78 VdB	83 VdB

Notes:

1. "Frequent Events" is defined as more than 70 vibration events of the same source per day. Most rapid transit projects fall into this category.

2. "Occasional Events" is defined as between 30 and 70 vibration events of the same source per day. Most commuter trunk lines have this many operations.

3. "Infrequent Events" is defined as fewer than 30 vibration events of the same kind per day. This category includes most commuter rail branch lines.

4. This criterion limit is based on levels that are acceptable for most moderately sensitive equipment, such as optical microscopes. Vibration sensitive manufacturing or research will require detailed evaluation to define the acceptable vibration levels. Ensuring lower vibration levels in a building often requires special design of the HVAC systems and stiffened floors.

Following the FTA recommendation, the ground-borne vibration level of 80 VdB from infrequent train pass by events typical for the Project alternatives is considered the impact criterion for vibration-sensitive land uses, such as residences and other buildings where people normally sleep (Category 2). Unlike the relative noise impact criteria that are based on a comparison of the future build alternatives with the No-Action Alternative, the vibration impact criterion is "absolute," in that the vibration impact is likely when a build alternative's predicted vibration level exceeds the vibration velocity threshold indicated above. Also in contrast to the aggregate Leq or DNL metrics used for the noise impact criteria, which combine multiple noise events within a certain time period, the vibration impact criterion applies to individual train pass by events.

It should be noted that the vibration analysis is based on the ground-borne vibration levels calculated for the straight-line track alignments and well-maintained systems. Curved track alignments are known to generate higher vibration levels. However, there is no existing methodology for modeling vibration from curved rail tracks.

Potential rail vibration impacts were evaluated for land uses identified along the selected railway segments and included 76 receptors. The locations of the 76 receptors analyzed are included in Table 4.12-4 along with their distances from the nearest rail centerline and the associated alternative(s). Based on the evaluation, it was determined that receptors located at a distance less than 20 feet from the track centerline would experience rail vibration impacts.

A special case of vibration-sensitive receptors in the study area are cultural resources, in particular historic properties reviewed in Section 3.10. The main concern for historic buildings is potential impacts to the masonry from ground-borne vibration generated by train operations. Generally, it is extremely rare for vibration from train operations to cause any sort of building damage, even minor cosmetic damage. However, there is sometimes concern about damage to historic buildings. Even in these cases, damage is unlikely except when the track would be very close to the structure. For this analysis, a vibration damage threshold of 94 VdB was applied to regular masonry buildings and 90 VdB was applied to buildings extremely susceptible to vibration damage (FTA 2006, Table 12-3).

Table 4.12-4
Location and Distance from Rail Centerline for 76 Receptors Analyzed for Vibration Impacts

Receptor Address	Approx. Distance from Nearest Rail Centerline (feet)	Alterna-tives	Receptor Address	Approx. Distance from Nearest Rail Centerline (feet)	Alterna-tives	Receptor Address	Approx. Distance from Nearest Rail Centerline (feet)	Alterna-tives
1651 Greenbay Dr	112	1 -7	1057 State Rd S-10-672	67	2	1301 Ave G	86	1, 3
1655 Greenbay Dr	100	1 -7	1065 State Rd S-10-672	100	2	1850 Truxtun Ave	71	1, 3
5465 Califf Rd	52	1 -7	1015 Aragon Ave	272	2	1800 Iris St	86	5, 6, 7
5406 Dutton Ave	161	1 -7	1071 State Rd S-10-672	120	2	1800 Calvert St	76	5, 6, 7
2001 Sylvia St	64	1 -7	1077 State Rd S-10-672	120	2	1805 Orvid St	152	5, 6, 7
2003 Sylvia St	78	1 -7	1079 State Rd S-10-672	78	2	1806 Orvid St	80	5, 6, 7
2005 Sylvia St	96	1 -7	1093 State Rd S-10-672	165	2	1807 Carlton St	80	5, 6, 7
2007 Sylvia St	66	1 -7	1046 Spartanburg Ave	34	2	1805 Carlton St	78	5, 6, 7
2009 Sylvia St	86	1 -7	3991 St Johns Ave	118	2	1804 Carlton St	69	5, 6, 7
2011 Sylvia St	89	1 -7	3975 St Johns Ave	225	2	1801 Success St	88	5, 6, 7
2013 Sylvia St	90	1 -7	4045 Gullah Ave	102	2	1800 Success St	75	5, 6, 7
5403 Gale Ave	193	1 -7	3955 St Johns Ave	185	2	1801 Leland St	61	5, 6, 7
5371 Rivers Ave	98	1 -7	3777-3799 Spruill Ave	111	2	1802 Leland St	76	5, 6, 7
2116 Taylor St	89	1 -7	3863 Reddin Rd	285	2	1803 Grayson St	58	5, 6, 7
2218 Taylor St	140	1 -7	3857 Reddin Rd	174	2	1801 Grayson St	51	5, 6, 7
2312 Taylor St	23	1 -7	3841 Reddin Rd	120	2	3250 Grayson St	59	5, 6, 7
1005 E Montague Ave	170	1 -7	3795 Spruill Ave	188	2	3244 N Carolina Ave	48	5, 6, 7
1004 Delsey St	180	1 -7	3721-3775 Spruill Ave	138	2	3250 N Carolina Ave	50	5, 6, 7
1005 Delsey St	193	1 -7	3803 Reddin Rd	121	2	3264 N Carolina Ave	64	5, 6, 7
1004 Crawford St	172	1 -7	3733 St Johns Ave	89	2	3286 N Carolina Ave	54	5, 6, 7
1005 Crawford St	178	1 -7	757 Commissary St	224	1, 3	1982 Kingsworth Ave	80	3, 6
1004 Bethany St	174	1 -7	1811 Commissary St	163	1, 3			
1005 Bethany St	171	1 -7	1014 Hunley Waters Cir	387	1, 3			
1004 Alamo St	172	1 -7	4133 St Johns Ave	96	1, 3			
1005 Alamo St	174	1 -7	4129 St Johns Ave	76	1, 3			
1004 Buist Ave	166	1 -7	4107 St Johns Ave	119	1, 3			
1005 Buist Ave	80	1 -7	1455 Ave H	132	1, 3			
1052 State Rd S-10-672	183	2	2415 Ave F	142	1, 3			

Source: Atkins 2017 (Appendix H).

4.12.1.5 Construction Noise Methodology and Impact Thresholds

Noise assessment for construction operations is conducted in accordance with the FHWA's Roadway Construction Noise Model (RCNM). Further information regarding noise from construction equipment can be found in Appendix H. No standardized criteria have been developed at a federal or state level for assessing construction noise impacts. Consequently, criteria are developed on a project-specific basis when local ordinances are not found to apply. Local noise ordinances (Charleston County 2011; North Charleston, SC Code of Ordinances) relate to nuisance and hours of allowed activities, but are not practical for assessing the impact of a major construction project. FTA guidelines for residential land uses is 80 dB(A) from daytime construction activities (FTA 2006, Page 12-8), which is an acceptable impact threshold value for construction noise of a temporary nature. Construction activities at such a level would be clearly audible over the existing ambient noise, but may be tolerable considering the temporary nature of the disturbance.

4.12.1.6 Operational Noise Methodology and Impact Thresholds

Operations of the ICTF either at the Project site or River Center project site would generate noise in the surrounding communities (refer back to Section 1.7.2 for a description of the operation activities) and would take place 24 hours a day, seven days a week. Because various noise sources would operate at different distances from the adjacent receptors, adjustments are made to the train, crane, and container impact noise data to account for the specific distance from the noise sources to the receptors and for the attenuation provided by an earthen berm between the ICTF and the nearest receptors. Detailed information regarding specific sources of operational noise, such as train and crane operations, can be found in Appendix H.

Operational noise impact from the proposed ICTF facility is based on exterior noise levels and is assessed in comparison with the exterior No-Action Alternative noise levels. Under the No-Action Alternative, construction and operation of the Navy Base ICTF would not occur and there would be no impact generated from the ICTF. There would be the potential for redevelopment of the Project site and the River Center project site to include rail-served warehousing and distribution. Detailed rail and traffic projections for the No-Action Alternative are described in Appendix F.

For the analysis of noise impacts generated by new roads and rail segments introduced with the Project alternatives in areas where roadways or railroads do not currently exist or are inactive, the No-Action Alternative is defined by the ambient noise levels anticipated in the adjacent community in the design year 2038. Noise impacts generated by operations at the Project site or River Center project site are also assessed using estimated No-Action ambient noise levels in the adjacent communities in 2038.

To characterize the existing noise environment in communities near the ICTF locations, noise measurements were conducted in July and August 2014 as detailed in Section 3.12.3. The ambient

noise levels measured at 18 locations throughout the Chicora-Cherokee Community varied in the range from approximately 49 to 59 dB(A), with an overall average of 51 dB(A) (see Table 3.12-1). Due to operations of the future rail-served warehousing and distribution center, the ambient noise level in the community is assumed to grow by 2 to 4 dB(A) in 24 years from 2014 to 2038. As a result, the No-Action ambient noise level of approximately 54 dB(A) [51 + 3 = 54] is estimated for the community in 2038.

Ambient noise is also assessed for the residential community of CNYOQ Historic District, east of the River Center Site. From the 2014 field noise measurements described in Section 3.12.4 for locations at Manley Avenue (Table 3.12-1, locations M17 and M18), the average existing ambient noise level of 56 dB(A) is estimated for the community. With a 3 dB(A) growth to 2038, the No-Action ambient noise level would be expected to be around 59 dB(A) for this community.

The estimated No-Action daytime and nighttime exterior ambient noise levels are shown in Table 4.12-5.

Table 4.12-5
2038 No-Action Alternative Exterior Ambient Noise Levels[78]

Community	Daytime	Nighttime[79]
Chicora-Cherokee Community	54 dB(A)	44 dB(A)
CNYOQ Historic District	59 dB(A)	49 dB(A)

Following the NEPA approach and consistent with the traffic noise impact criteria, the criteria for operational noise impact associated with build project alternatives are based upon comparison with the No-Action Alternative for the 2038 design year and are shown in Table 4.12-6.

Table 4.12-6
Impact Definitions, Operational Noise

Negligible	Minor	Moderate	Major
0–3 dB(A) increase in Leq(h)	3–5 dB(A) increase in Leq(h)	5 –10 dB(A) increase in Leq(h)	Increase in Leq(h) greater than 10 dB(A)

[78] Note the average noise levels presented are based on the logarithmic average of the measurements taken within the neighborhoods.

[79] An adjustment factor of 10 dBA is used for all exterior sound that occurs in the nighttime hours of 10:00 p.m. to 7:00 a.m. to reflect the greater sensitivity of most people to nighttime noise.

4.12.1.7 Additive Noise Impacts

The impacts assessed for each noise source described above generally relate to different groups of affected receptors, which are analyzed separately in this document and Appendix H. For example, receptors that would experience rail noise impact (located along certain track segments), would, for the most part, not be subject to noise impacts from vehicular traffic, ICTF construction, or ICTF operations. Exceptions to this include noise sensitive receptors located along several of the road segments in the study area. Receptors along the following roadways may experience noise impacts from both traffic and rail generated noise under certain alternatives where rail tracks are located near road segments:

- Virginia Avenue between Montague Avenue and Buist Avenue (Alternatives 1, 2, 3, 5 and 6);
- St. Johns Avenue between O'Hear Avenue and McMillan Avenue (Alternatives 1 and 3);
- Spruill Avenue between Noisette Creek and N. Carolina Avenue (Alternative 2); and
- Port Drayage Road between Port Access Road and ICTF (Alternatives 5, 6, and 7).

Because traffic noise analysis and rail noise analysis are based on different noise metrics (Leq(h) and DNL, respectively), for the assessment of additive noise impacts, the units must be converted. Following the FTA Manual (FTA 2006, Appendix D), the DNL can be approximately represented by the value of Leq(h) minus 2 dB(A). For the purpose of conservative estimation of additive noise impacts, the 2 dB(A) adjustment was disregarded and the DNL generated by traffic noise was assumed to be approximately equal to the modeled Leq(h) levels described in Section 2 of Appendix H. Refer to section 4.12.10 for a discussion of additive impacts.

4.12.2 No-Action Alternative

The No-Action Alternative is described in detail in Section 2.4. Evaluation of noise conditions related to the No-Action Alternative is necessary to satisfy NEPA requirements for environmental analyses and evaluate proposed build alternatives in comparison with the No-Action Alternative to determine whether the proposed build alternatives would generate noise and/or vibration impacts. Traffic and rail activities projected for the No-Action Alternative (see Appendix F) were used for the noise impact analyses. However, for the analysis of noise impacts generated by new roads and rail segments introduced with the Project alternatives in areas where roadways or railroads do not currently exist or are inactive, the No-Action Alternative is defined by the ambient noise (see Table 4.12-5) and vibration levels anticipated in the adjacent community. In a similar manner, noise impacts generated by operations at the Project site or River Center project site are also assessed using estimated No-Action ambient noise levels in the adjacent communities.

4.12.2.1 Traffic Noise

The future traffic volumes for the No-Action Alternative reflect the growth rate of traffic not related to the Project alternatives that will be generated by various developments in North Charleston, as well as other more remote developments. Table 4.12-7 shows the average TNM modeled traffic noise levels at the receptors identified for analysis in comparison to the existing conditions. Appendix H contains data of the modeled noise levels at each individual receptor.

Table 4.12-7
Average Traffic Noise Levels for 2013 Existing Conditions
and 2038 No-Action Alternative

Description	2013 Existing Loudest-Hour Leq(h), dB(A)	2038 No-Action Loudest-Hour Leq(h), dB(A)
Virginia Avenue	70	72
Spruill Avenue from North Carolina Avenue to Cosgrove Avenue	62	67
Cosgrove Avenue	63	67
Spruill Avenue from Cosgrove Avenue to Noisette Creek	61	65
St. Johns Avenue	54	57
Noisette Boulevard	54	55
North Rhett Avenue	63	67
Montague Avenue	55	56

Source: Atkins 2017 (Appendix H).

Consistent with growth of traffic volumes that is not project related, the traffic noise levels for the 2038 No-Action Alternative would exceed the existing 2013 noise levels. As seen in Table 4.12-7, the average loudest-hour noise levels for the No-Action Alternative would increase by 1 to 5 dB(A) versus the existing condition for most of the noise receptors; however, the No-Action noise level increase versus existing conditions does not constitute a project-related noise impact. More data on individual receptors can be found in Appendix H.

4.12.2.2 Rail Noise

The future rail operations provided in Appendix F for the No-Action Alternative reflect the growing number of train occurrences or increasing average length of trains not related to the Project alternatives that would be generated by various developments in North Charleston and elsewhere.

Table 4.12-8 shows the computed distance from the rail track centerline to the DNL noise contours along the existing rail segments under the 2038 No-Action Alternative.

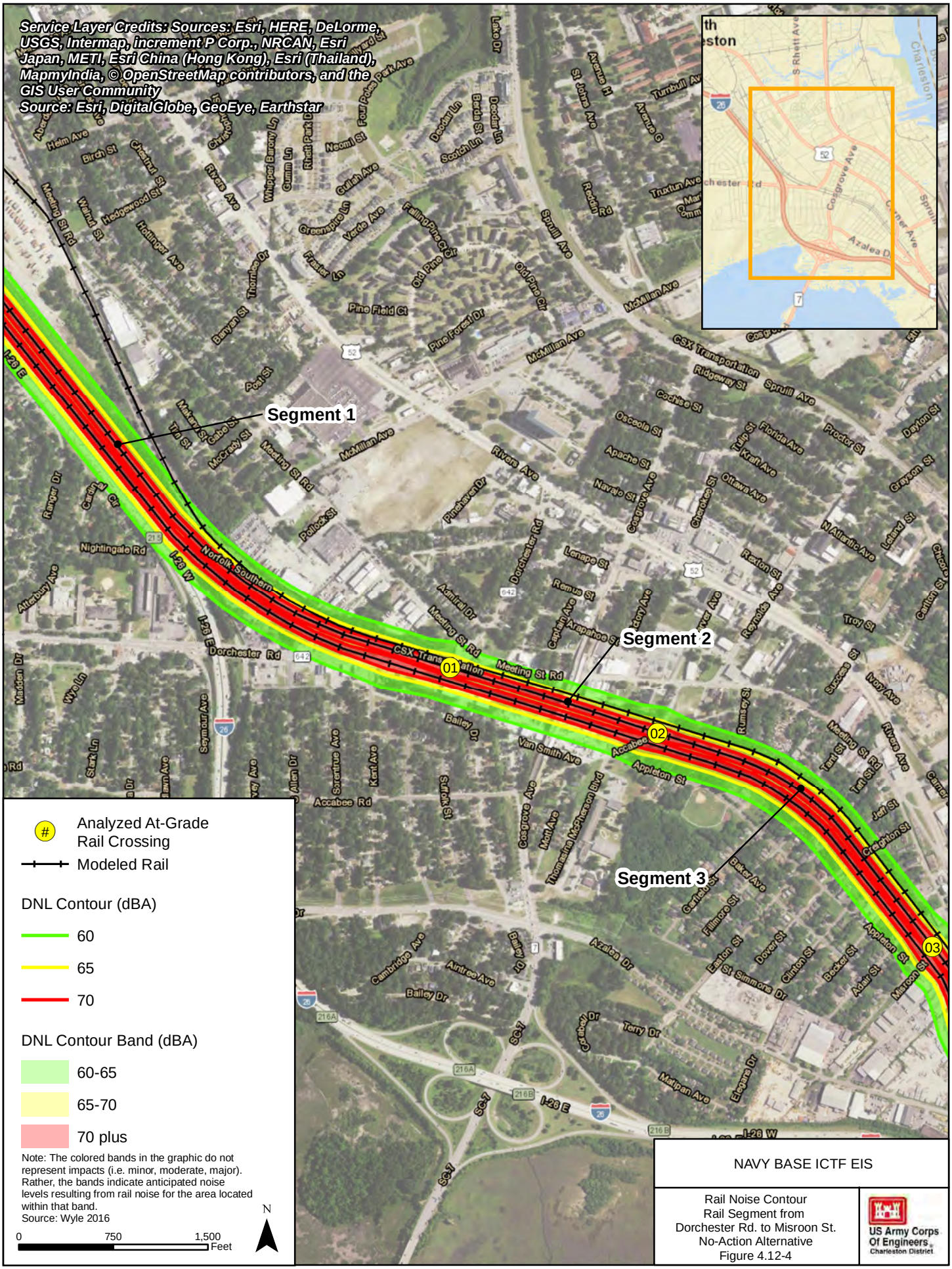
To provide a baseline for comparison with the future build alternatives, noise contours for the 2038 No-Action Alternative are reviewed for one existing rail segment, from north of Dorchester Road to Misroon Street (Segments 1, 2 and 3). Figure 4.12-4 illustrates the DNL noise contours for segments 1, 2, and 3. The noise contours also include horn noise effects. At rail crossings, the contour expands in size due to train horn soundings. Further details on the specific dimensions and distances of the noise contours at crossing locations can be found in Appendix H.

The No-Action noise level increase versus the existing condition for rail activity does not constitute a noise impact.

Table 4.12-8
DNL Contour Distance from Track Centerline for 2038, No-Action Alternative

Locations	Rail Segment	Distance (ft.) from Track Centerline to DNL Contour of		
		70 dB(A)	65 dB(A)	60 dB(A)
1–North	North of Dorchester Road (Segment 1)	37	79	170
1–2	Dorchester Road to Accabee Road (Segment 2)	37	79	170
2–3	Accabee Road to Misroon Street (Segment 3)	37	79	170
3–15	Misroon Street to Hackemann Avenue (Segment 4)	37	79	170
4–14	North of Virginia Avenue to Avenue B	24	52	112
5–East	East of North Rhett Avenue	95	205	442
5–6	Attaway Street to North Rhett Avenue	78	168	361
6–7	Rivers Avenue to Attaway Street	54	117	253
8–9	Rivers Avenue/Meeting Street to South Rhett Avenue	60	129	278
9–10	South Rhett Avenue to Spruill Avenue	63	135	290
10–11	Spruill Avenue to East Montague Avenue	65	141	303
11–12	East Montague Avenue to Durant Avenue	74	159	342
12–13	Durant Avenue to Braddock Avenue	79	169	365
13–North	North of Braddock Avenue	83	180	387
14–19	Avenue B to O'Hear Avenue	28	61	131
15–16	Hackemann Avenue to Discher Street (Segment 7)	29	55	107
16–18	Discher Street to Meeting Street	26	56	121

Source: Atkins 2017 (Appendix H).


Service Layer Credits: Sources: Esri, HERE, DeLorme, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), MapmyIndia, © OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar
Segment 1
Segment 2
Segment 3
01
02
03
Meeting St Rd
Dorchester Rd
Accabee Rd
Bailey Dr
Van Smith Ave
Appleton St
Azalea Dr
Cosgrove Ave
Norfolk Southern
CSX Transportation
I-26 E
I-26 W
Analyzed At-Grade Rail Crossing
Modeled Rail
DNL Contour (dBA)
60
65
70
DNL Contour Band (dBA)
60-65
65-70
70 plus
Note: The colored bands in the graphic do not represent impacts (i.e. minor, moderate, major). Rather, the bands indicate anticipated noise levels resulting from rail noise for the area located within that band.
Source: Wyle 2016
N
0
750
1,500
Feet
NAVY BASE ICTF EIS
Rail Noise Contour
Rail Segment from
Dorchester Rd. to Misroon St.
No-Action Alternative
Figure 4.12-4
US Army Corps Of Engineers
Charleston District

A number of the existing noise-sensitive land uses (defined as residences, schools, churches, hospitals, parks, etc.) would be located within the 2038 No-Action Alternative noise contours from the tracks, as the result of general non-project related developments.

The 2038 No-Action ambient noise levels in the vicinity of the future tracks are estimated to be below 60 dB(A) DNL. This estimate is based on the field-measured existing noise levels in the study area as described in Section 3.12 and adjusted for the design year 2038.

4.12.2.3 Rail Vibration

The ground-borne vibration levels generated by train activities at the vibration-sensitive receptors along the existing railroad segments would remain steady for the No-Action Alternative 2038 design year. Rail vibration effects are unlikely; however, one receptor, a single-family residence at 2312 Taylor Street, is currently located at a distance of 23 feet from the centerline of an existing track segment. This is very close to the vibration impact threshold distance of 20 feet. Due to this proximity, train activities on the track could potentially generate some vibration effects for the receptor exceeding the vibration impact criterion, even under the existing and No-Action conditions.

4.12.3 Alternative 1: Proposed Project (South via Milford / North via Hospital District)

4.12.3.1 Traffic Noise

Table 4.12-9 shows averages of the TNM modeled traffic noise levels for the receptors identified for analysis and compares those with the No-Action noise levels. Specific traffic noise levels at each receptor can be found in Appendix H. The Alternative 1 traffic volumes for Spruill Avenue are predicted to be lower than for the No-Action Alternative due to projected changes in the traffic patterns (for a description of the changes in traffic patterns under Alternative 1 refer back to Section 4.8.3). Therefore, there is a resulting decrease in noise levels at these locations. Alternative 1 would have a negligible impact on noise levels when compared to the No-Action Alternative.

Table 4.12-9
Average 2038 Traffic Noise Levels for Alternative 1 (Proposed Project) versus No-Action Alternative

Description	2038 Alternative 1 Loudest-Hour Leq(h), dB(A)	2038 No-Action Loudest-Hour Leq(h), dB(A)	Alternative 1 Minus No-Action
Virginia Avenue	74	72	2
Spruill Avenue from North Carolina Avenue to Cosgrove Avenue	66	67	-1
Cosgrove Avenue	68	67	1
Spruill Avenue from Cosgrove Avenue to Noisette Creek	65	65	0

Description	2038 Alternative 1 Loudest-Hour Leq(h), dB(A)	2038 No-Action Loudest-Hour Leq(h), dB(A)	Alternative 1 Minus No-Action
St. Johns Avenue	57	57	0
Noisette Boulevard	56	55	1
North Rhett Avenue	67	67	0
Montague Avenue	56	56	0

Source: Atkins 2017 (Appendix H).

4.12.3.2 Rail Noise

The future rail operations (Appendix F) indicate an increased number of train operations and average length of trains under Alternative 1. It should be noted that Segment 5 under Alternatives 1 and 3 includes plans for a ground cut section (trench) and two sound walls for several sections of the northern rail connection. The sound walls adjacent to St. Johns Avenue and Avenue F are designed to reduce the noise levels due to rail activities entering and exiting the ICTF facility through the northern rail connection. The sound walls would be approximately 10 feet in height. The trench is designed to level the ground under the tracks. If the trench is sufficiently deep, it also provides noise reduction effect (attenuation) for the receivers along the trench. Locations of the proposed noise mitigation measures including the trench and sound walls are shown in Figure 4.12-15. Descriptions of these mitigation measures are included in Section 4.12.12.

Table 4.12-10 shows the computed distance from the rail track centerline to the DNL noise contours along the existing and future rail segments under Alternative 1. For instance, under Alternative 1, a receptor adjacent to rail segment 1 located 68 feet or less from the rail centerline would have an expected noise level of 70 dB(A) or greater during train pass by events. A receptor located adjacent to rail segment 1 with a distance of greater than 68 feet but less than or equal to 147 feet away from the rail centerline would have an expected noise level between 65 and 70 dB(A). A receptor located adjacent to rail segment 1 with a distance greater than 147 feet but less than or equal to 316 feet away from the rail centerline would have an expected noise level between 60 and 65 dB(A). A receptor adjacent to rail segment 1 located more than 316 feet away from the rail centerline would have an expected noise level of less than 60 dB(A).

Table 4.12-10
DNL Contour Distance from Track Centerline for Alternative 1 (Proposed Project)

Locations	Rail Segment	Distance (ft.) from Track Centerline to DNL Contour of		
		70 dB(A)	65 dB(A)	60 dB(A)
1–North	North of Dorchester Road (Segment 1)	68	147	316
1–2	Dorchester Road to Accabee Road (Segment 2)	68	147	316
2–3	Accabee Road to Misroon Street (Segment 3)	68	147	316
3–15	Misroon Street to Hackemann Avenue (Segment 4)	68	147	316
4–14	North of Virginia Avenue to Avenue B	41	88	190
5–East	East of N. Rhett Avenue	90	194	419
5–6	Attaway Street to N. Rhett Avenue	79	171	369
6–7	Rivers Avenue to Attaway Street	70	151	326
8–9	Rivers Avenue/Meeting Street to S. Rhett Avenue	69	149	321
9–10	S. Rhett Avenue to Spruill Avenue	72	156	336
10–11	Spruill Avenue to E Montague Avenue	76	163	351
11–12	E. Montague Avenue to Durant Avenue	85	183	395
12–13	Durant Avenue to Braddock Avenue	92	198	426
13–North	North of Braddock Avenue	97	210	452
[1]14–ICTF	Avenue B to ICTF (Segment 5) – no trench or wall Avenue B to ICTF (Segment 5) – with trench Avenue B to ICTF (Segment 5) – with wall F Avenue B to ICTF (Segment 5) – with wall E	45 36–45 28 36–40	97 82–97 28 38–52	208 139–208 28 38–52
15–16	Hackemann Avenue to Discher Street (Segment 7)	56	113	233
16–18	Discher Street to Meeting Street	24	52	112
17–ICTF	Pittsburgh Avenue to ICTF	23	51	109
17–18	Meeting Street/Herbert Street to Pittsburgh Avenue	24	52	111

1. For rail Segment 5 from Avenue B to ICTF (location 14 – ICTF) the noise contour distances are provided for various conditions along the track, where neither trench nor sound wall are constructed and where the trench and sound walls are in place.

Source: Atkins 2017 (Appendix H).

The distances in Table 4.12-10 were compared to those calculated under the No-Action Alternative (refer back to Table 4.12-8), and segments where the noise contours would expand considerably were identified. The noise contours along the rail segments between Dorchester Road to Misroon Street (existing) (Segments 1, 2, and 3), Hackemann Avenue to Discher Street (existing) (Segment 7), and Avenue B and the ICTF facility (proposed) (Segment 5) would expand considerably under Alternative 1 as compared to the No-Action Alternative. Figures 4.12-5, 4.12-6, and 4.12-7 present

the calculated DNL noise zones under Alternative 1 for these rail segments, and Table 4.12-11 provides a summary of the estimated number of impacted receivers along these rail segments. Impact determinations are based on the amount of increase in the decibel level between the No-Action Alternative and Alternative 1 (Proposed Project). Minor to Moderate impacts [(3 to 10 dB(A)] would occur along several segments due to increased rail activity and new track builds.

Table 4.12-11
Estimated Number of Noise Impacted Receptors for Alternative 1 (Proposed Project)

Rail Segment	Estimated Number of Impacted Receptors		
	Minor Impact (3–5 dB(A) increase)	Moderate Impact (5–10 dB(A) increase)	Major Impact (>10 dB(A) increase)
North of Dorchester Road to Misroon Street (Segments 1, 2 and 3)	25	100	0
Hackemann Avenue to Discher Street (Segment 7)	0	19	0
Avenue B to ICTF (Segment 5)	0	17[80]	0

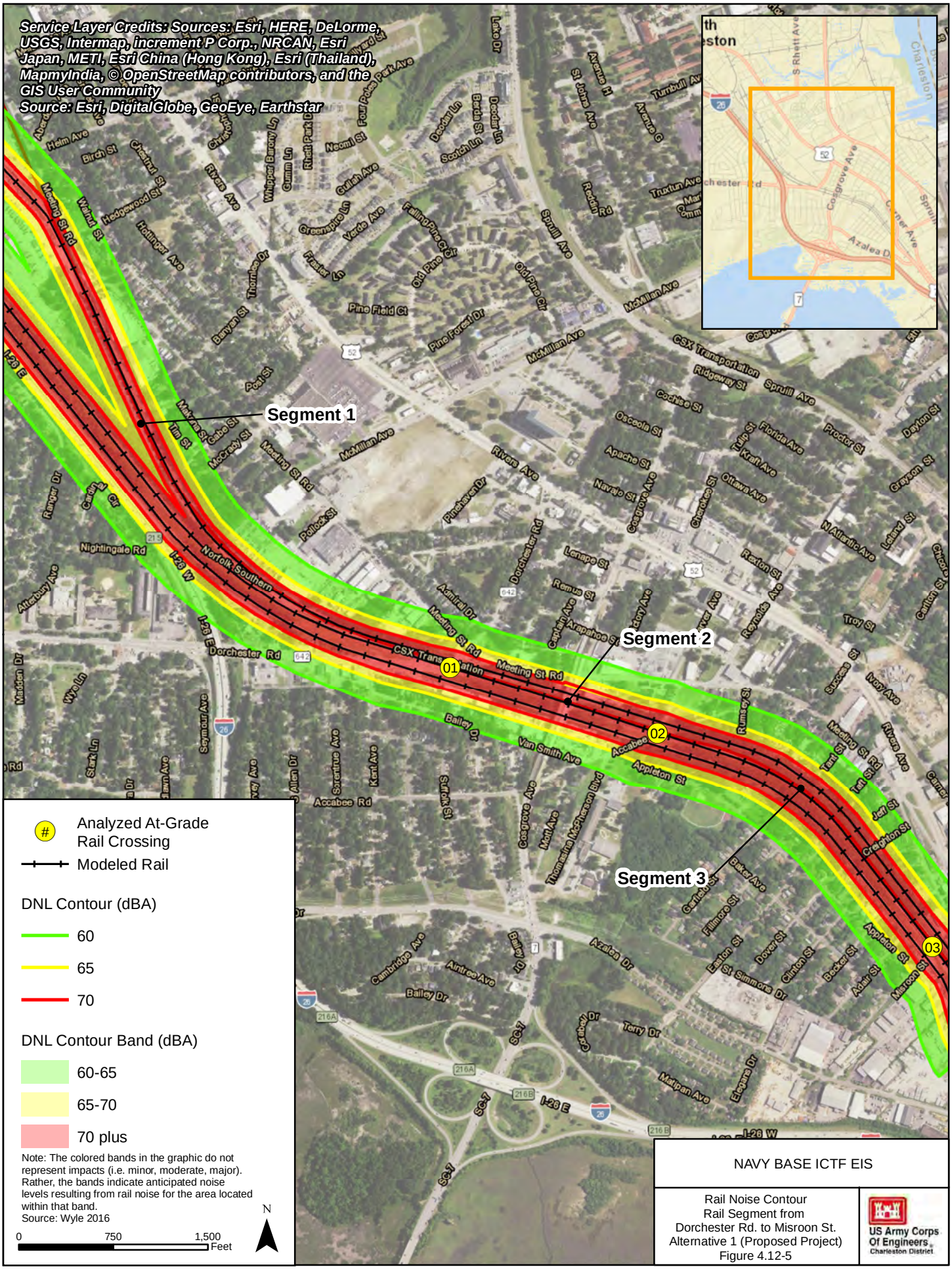
Source: Atkins 2017.

The noise contours in Figures 4.12-5, 4.12-6, and 4.12-7 include horn noise effects. For rail crossings, the contour expands in size due to train horn soundings. Further details on the specific dimensions and distances of the noise contours at crossing locations can be found in Appendix H.

4.12.3.3 Rail Vibration

As previously noted, potential rail vibration impacts were evaluated for land uses identified along the selected railway segments and included 76 receptors (see Table 4.12-4). Based on the adjusted reference curve (refer back to Figure 14.12-3), it was determined that only receptors located less than 20 feet from the track centerline would experience rail vibration impacts, which are defined as 80 VdB. Under Alternative 1 (Proposed Project), none of the receptors are located at a distance less than 20 feet from the track centerline. Therefore, because impacts are only anticipated for receptors located less than 20 feet from the rail centerline, rail vibration effects resulting from implementation of Alternative 1 (Proposed Project) would be unlikely for the 76 receptors analyzed. The ground-borne vibration generated by train activities would produce no or negligible impact for the vibration-sensitive receptors along the railroad segments in the study area in comparison with the 2038 No-Action Alternative.

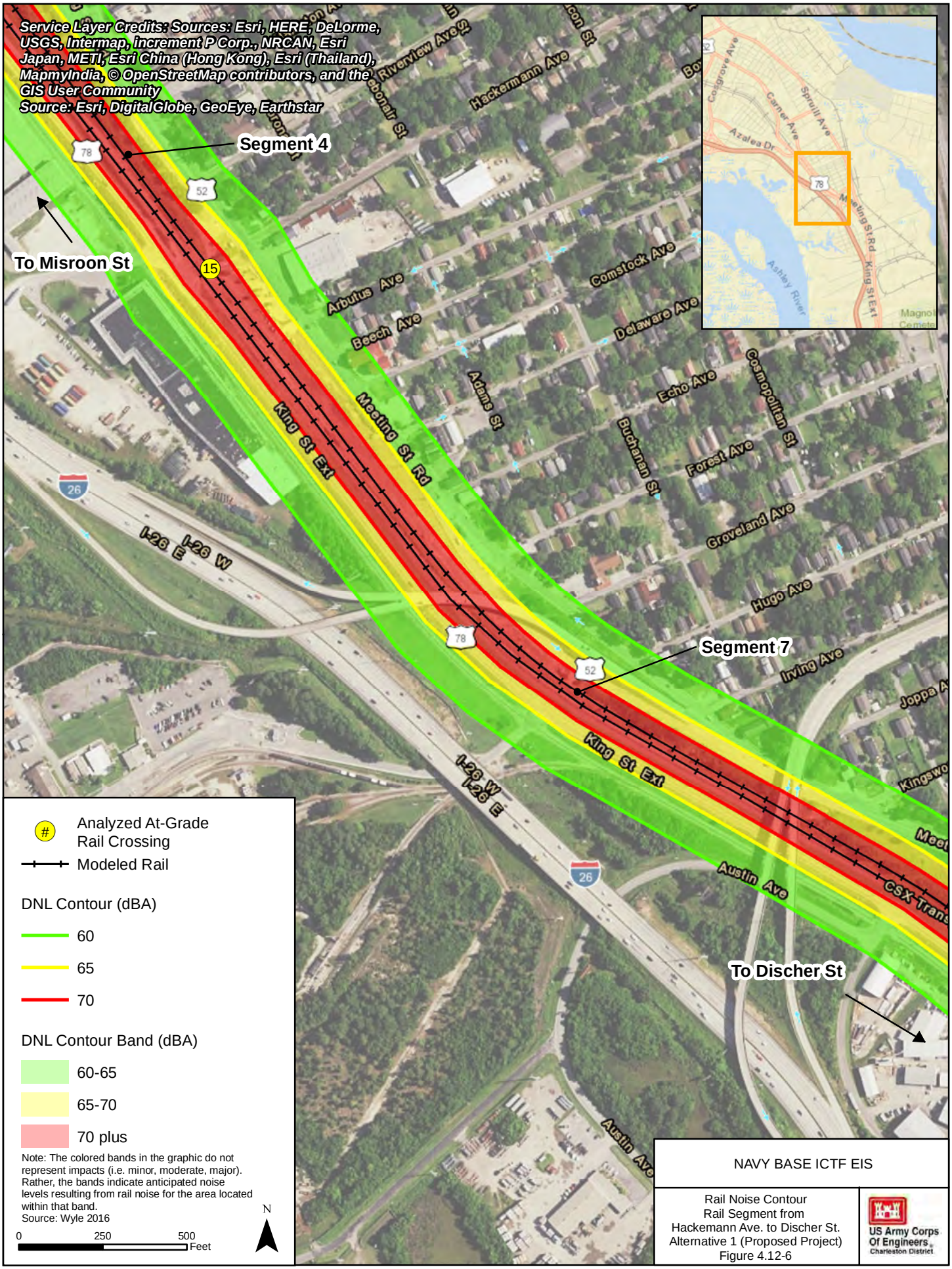
[80]It should be noted that a few of the impacted receptors are located within the limits of construction.

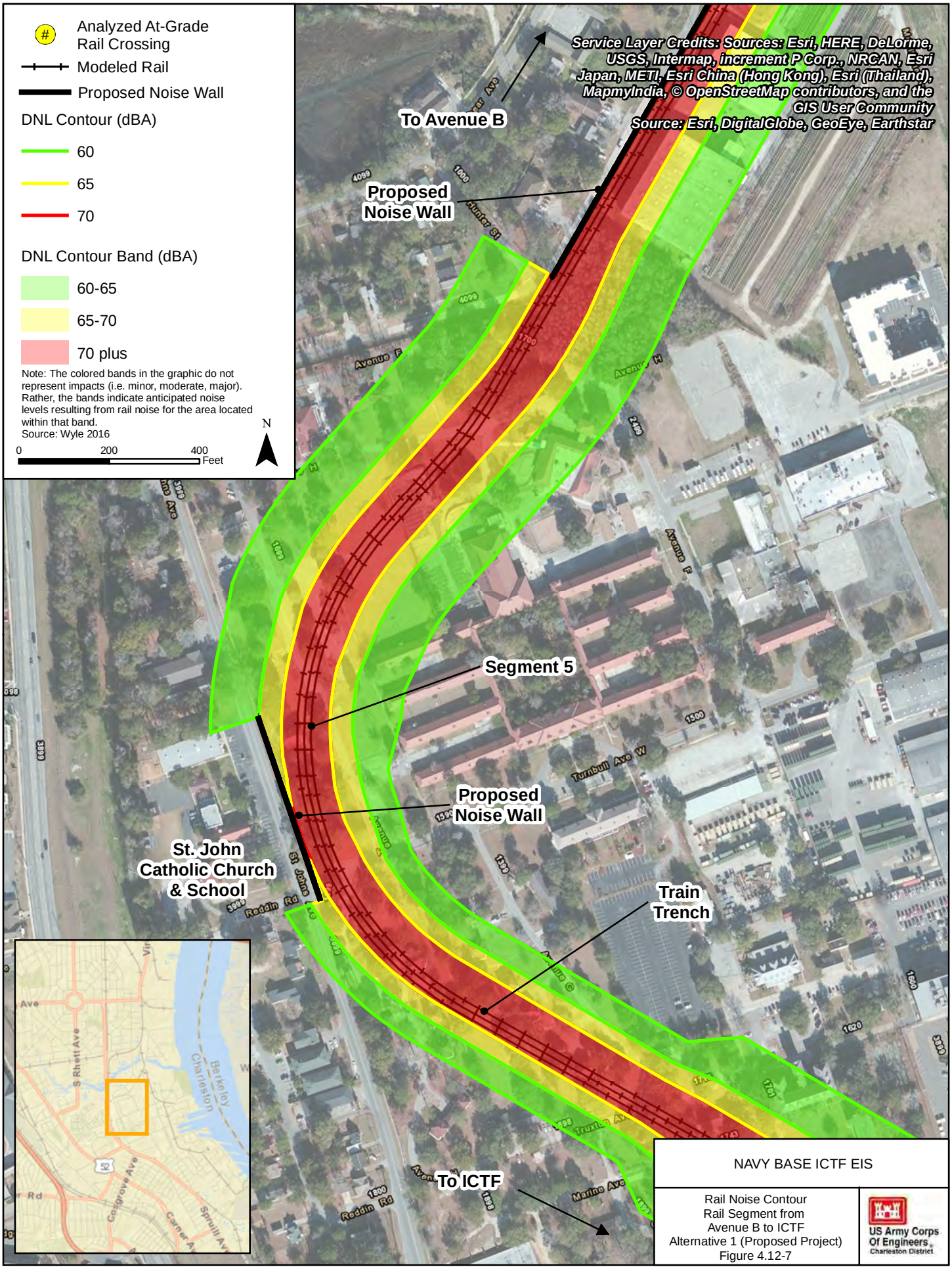


NAVY BASE ICTF EIS

Rail Noise Contour
Rail Segment from
Dorchester Rd. to Misroon St.
Alternative 1 (Proposed Project)
Figure 4.12-5

US Army Corps Of Engineers
Charleston District


Service Layer Credits: Sources: Esri, HERE, DeLorme, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), MapmyIndia, © OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar
Segment 4
Segment 7
To Misroon St
To Discher St
Hackemann Ave
Riverview Ave
Arbutus Ave
Beach Ave
Comstock Ave
Delaware Ave
Echo Ave
Forest Ave
Groveland Ave
Hugo Ave
Irving Ave
Austin Ave
Adams St
Buchanan St
Cosmopolitan St
Meeting St Rd
King St Ext
I-26 E
I-26 W
Analyzed At-Grade Rail Crossing
Modeled Rail
DNL Contour (dBA)
60
65
70
DNL Contour Band (dBA)
60-65
65-70
70 plus
Note: The colored bands in the graphic do not represent impacts (i.e. minor, moderate, major). Rather, the bands indicate anticipated noise levels resulting from rail noise for the area located within that band.
Source: Wyle 2016
0
250
500
Feet
N
NAVY BASE ICTF EIS
Rail Noise Contour
Rail Segment from Hackemann Ave. to Discher St.
Alternative 1 (Proposed Project)
Figure 4.12-6
US Army Corps Of Engineers
Charleston District


Analyzed At-Grade Rail Crossing
Modeled Rail
Proposed Noise Wall
DNL Contour (dBA)
60
65
70
DNL Contour Band (dBA)
60-65
65-70
70 plus
Note: The colored bands in the graphic do not represent impacts (i.e. minor, moderate, major). Rather, the bands indicate anticipated noise levels resulting from rail noise for the area located within that band.
Source: Wyle 2016
0
200
400
Feet
N
Service Layer Credits: Sources: Esri, HERE, DeLorme, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), MapmyIndia, © OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar
To Avenue B
Proposed Noise Wall
Segment 5
Proposed Noise Wall
St. John Catholic Church & School
Train Trench
To ICTF
Hunter St
Avenue F
Avenue H
Turnbull Ave W
Reddin Rd
St Johns Ave
Marine Ave
S Rhett Ave
Berkeley Charleston
Congrove Ave
Spruill Ave
NAVY BASE ICTF EIS
Rail Noise Contour
Rail Segment from
Avenue B to ICTF
Alternative 1 (Proposed Project)
Figure 4.12-7
US Army Corps Of Engineers
Charleston District

4.12.3.4 Construction Noise

Assessment of potential scenarios for the construction equipment distribution over the ICTF site during the construction phases noted in Appendix H was conducted using the RCNM model described in sub-section 4.12.1.4. Several scenarios including combinations of 7 to 15 individual pieces of equipment specified in Appendix H (such as excavators, front end loaders, dozers, pile drivers in operation, etc.) were modeled for each construction phase to determine associated additive impacts of the combined construction activities. The modeling was conducted for the nearest receptors, where the noise impacts would be the greatest. The representative results of the overall construction noise assessment for Alternative 1 are summarized in Table 4.12-12 for the residential receptors located 10 feet away from the berm's foot at the Project site. The predicted construction noise levels are compared with the acceptable impact threshold level of 80 dB(A) following the FTA guidelines (FTA, 2006; Page 12-8), as specified in sub-section 4.12.1.4.

Table 4.12-12
Predicted ICTF Construction Noise Levels

Construction Phase	L_{eq}, dB(A)	Acceptable Threshold	Noise Impact
Demolition and Surcharge	from 73 to 75	80 dB(A)	No
Earthen Berm Construction	from 85 to 89	80 dB(A)	Moderate
On-Site ICTF Yard – no pile driving	from 75 to 78	80 dB(A)	No
On-Site ICTF Yard – with pile driving	from 82 to 89	80 dB(A)	Minor to Moderate

Source: Atkins 2017 (Appendix H).

The average construction noise levels at the nearest residential land uses would meet the established criterion of 80 dB(A) during the general demolition/grading phase and the on-site ICTF yard construction phase. For short periods of time over the earthen berm construction (15 days) and pile diving activities (total of 90 days), the average noise levels are expected to exceed the acceptable criterion of 80 dB(A). Construction activities of the predicted noise levels would be clearly audible over the existing ambient noise in the surrounding communities, but may be tolerable due to the interim nature of the disturbance. The earthen berm construction and pile driving activities would be short-term, but still generate minor to moderate noise impacts with potential adverse community reaction.

RCNM was also utilized for modeling several potential scenarios of the equipment distribution over the northern rail connection construction area for a ground cut section (trench) and sound walls adjacent to St. Johns Avenue and Avenue F under Alternative 1 (Figure 4.12-15). For the nearest noise-sensitive receptors (residential, St. John Catholic Church and School) located at approximately 100 feet from the trench and/or sound wall, the estimated average construction noise levels would vary between 74 and 79 dB(A), thus below the established construction noise criterion of 80 dB(A). Again, construction activities of the predicted noise levels would be clearly audible over the existing ambient noise in the surrounding community, but may be tolerable due to the short-term nature of the disturbance. No noise impact due to construction activities is predicted for the ground cut section (trench) and sound walls adjacent to St. Johns Avenue and Avenue F.

Further information regarding specific construction operations and noise sources is available in Appendix H. Additionally, Appendix H contains ideal placements for specific pieces of equipment in terms of distance away from noise sensitive receivers to meet the construction noise threshold.

4.12.3.5 Operational Noise

The primary sources of the ICTF operational noise would be train movements at the classification and processing rail tracks, container loading/unloading operations performed by wide-span gantry cranes, and container stacking at the site. The noise levels generated by these sources are evaluated in Appendix H. The operational noise analysis for Alternative 1 is summarized in Table 4.12-13 for the residential receptors located 10 feet away from the berm's foot at the Project site. These receptors would be impacted the most by noise from the ICTF operations. The table presents the main individual operations generating noise at the site. Operations, such as truck movements or fork lifting would be concentrated in the area located much farther from the noise-sensitive receptors, beyond the train arrival/departure tracks, classification tracks, crane runways and container stacking area; noise levels at the residential receptors from these remote operations would be negligible in comparison with the primary noise sources.

Table 4.12-13
Operational Noise at Nearest Receivers, Alternative 1 (Proposed Project)[1]

Noise Source	Operation	Leq Type	Reference Noise Level dB(A)	Distance Attenuation dB(A)	Noise Berm Attenuation dB(A)	Noise Level at Receiver dB(A)	FRA Maximum Allowable Levels dB(A)[2]
Train (134 feet from receiver)	Arrival/ Departure	Max 1-sec Leq	81	11	10	60	90
	Car Coupling		97	11	10	76	92
	General Car Movement		64	11	10	43	88
Train (309 feet from receiver)	Arrival/ Departure	Max 1-sec Leq	81	18	10	53	90
	Car Coupling		97	18	10	69	92
	General Car Movement		64	18	10	36	88
Crane (309 feet from receiver)	Crane/Trolley Travelling	Maximum Level	70	12	10	48	n/a
	Crane Travelling	Average Level Per Hour	55	12	10	33	n/a
Container Impacts (309 feet from receiver)	Container Stacking	Max 1-sec Leq	70	12	10	48	n/a

[1] Other ICTF operational noises would be located farther from the residential receptors and would generate lower noise levels than train operations, their additive contribution to the combined noise level of the overall operations at ICTF would be minor in comparison to the train operations at the site.

[2] Appendix A to 40 C.F.R. Part 210, Summary of Noise Standards, 40 C.F.R. Part 201. Note that these allowable levels are based on a measured distance of 100 feet from the track. Also note that FRA does not regulate crane or container impact noise.

Source: Atkins 2017 (Appendix H).

The reference noise levels for train operations in Table 4.12-13 were obtained from measurements taken 38 feet from the track (see Appendix H). To verify compliance with the FRA's Railroad Noise Emission Compliance Regulations (49 C.F.R. Part 210), the reference noise levels were compared with the levels outlined in 49 C.F.R. Part 210. This guidance prescribes minimum compliance regulations for the total sound emitted by moving individual locomotives and rail cars under certain conditions. At a 100-foot measurement distance, the FRA's maximum allowable level for a moving locomotive is 90 dB(A). For comparison, the reference noise level for a train (locomotive) arrival/departure event of 81 dB(A), as measured at a distance of 38 feet, was converted[81] to a 100-foot distance, where it would be approximately 73 dB(A), which is lower than the FRA's compliance level. Also converted to a 100-foot distance, the rail car movement would have a noise level of 56 dB(A), which is lower than the compliance level of 88 dB(A) for rail cars moving with speeds less than 45 mph. At the same measurement distance, the car coupling operations would have a noise level of 89 dB(A), which is lower than the compliance level of 92 dB(A) for this operation. The above

[81] The conversion is conducted using a term 20 log10 (distance) that signifies the spherical spreading of acoustic energy with a sound level which decreases 6 dB per doubling of distance from the source.

comparisons show that the reference noise levels associated with the train operations at the Project site would be lower than the FRA's noise standards for railroad equipment, yards, and facilities.

In Table 4.12-13, the reference noise levels of the noise sources are further adjusted to account for the distance attenuation and noise attenuation due to the berm located between the sources at the Project site and the nearest noise-sensitive receptors. The appropriate distance attenuation and noise berm attenuation factors are specified in Appendix H.

The hourly average noise level of the train operations is estimated to be approximately 15 to 20 dB(A) below the maximum level measured for the car coupling (Appendix H). Applying this adjustment factor to the maximum car coupling noise level determined in Table 4.12-13, the hourly average noise level at the nearest receptors from the ICTF train operations is assessed in the range from 49 to 61 dB(A). Since other ICTF operational noise sources would be located farther from the residential receptors and would generate lower noise levels at these receivers than train operations, their additive contribution to the combined noise level of the overall operations at ICTF would be minor in comparison with the train operations at the site. Altogether, the average noise level of the total ICTF operations at the nearest residential receptors would be expected in the range from 58 to 61 dB(A).

Exterior noise impacts from Alternative 1 (Proposed Project) operations are determined in comparison with the 2038 No-Action Alternative exterior noise levels for the community adjacent to the site (see Table 4.12-5). The impacts for the nearest receptors (10 feet from the berm) are summarized in Table 4.12-14 for daytime and nighttime conditions. Daytime noise impact (7:00 a.m. to 10:00 p.m.) is most important to consider as this can affect people's activities outside their homes. The exterior noise levels from the ICTF operations would exceed the No-Action ambient noise level in the Chicora-Cherokee Communities during daytime hours by up to 7 dB(A). Such an increase constitutes a moderate noise impact for the residential land uses nearest to the Project site (as defined in Table 4.12-6). For the second row of homes along the earthen berm, assuming some shielding from the first row of homes, the daytime noise impact from the ICTF operations could be up to 4 dB(A), which is a minor impact. For the third row of homes, a negligible daytime noise impact below 3 dB(A) would likely be produced due to shielding from both the first and second rows of homes. The Corps anticipates that negligible daytime noise impacts below 3 dB(A) would be generated by the ICTF operations at distances beyond approximately 180 feet from the earthen berm.

Table 4.12-14
Operational Noise Impact at Nearest Receptors, Alternative 1 (Proposed Project)

Time of Day	Average Operational Noise Level at Receptors, dB(A)	2038 No-Action Ambient Noise Level, dB(A)	Operational Noise Impact	Approximate Number of First Row and Second Row Impacts[2]
Daytime	from 58 to 61	54	From 4 to 7 dB(A) (Minor to Moderate)	16 First Row 10 Second Row
Nighttime[1]	Exterior from 58 to 61 Interior from 38 to 41	44	Exterior from 14 to 17 dB(A) (Major)	

[1] An adjustment factor of 10 dB(A) is used for all exterior sound that occurs in the nighttime hours of 10:00 p.m. to 7:00 a.m. to reflect the greater sensitivity of most people to nighttime noise.

[2] At this time, the exact number of residential displacements that would occur due to construction of the berm is unknown (see Section 4.9.3.1). However, for the purposes of the impacts, it is assumed that only those structures that would be physically touched by the berm will be displaced. These structures are not included in total above. It should be noted that first row structures are defined as any structure that would not be shielded by other structures, and second row structures are those that would be provided with some shielding by intervening structures.

Source: Atkins 2017 (Appendix H).

With respect to operational noise, ambient noise associated with ICTF operations could expose the adjacent residential areas to exterior noise level increases over the No Action ambient of 4 to 7 dB(A) during daytime hours (defined as 7:00 a.m. to 10:00 p.m.) and 14 to 17 dB(A) during nighttime hours (defined as 10:00 p.m. to 7:00 a.m.). When compared to the No-Action ambient, this would equate to a minor to moderate impact during the daytime hours (defined as an increase of greater than 3 dB(A) to 10 dB(A) over the No Action) and a major impact during the nighttime hours (defined as an increase greater than 10 dB(A) over the No Action) to exterior noise levels. However, the nighttime hours are generally associated with sleep. The manner in which older homes were constructed generally provides a reduction of exterior-to-interior noise levels of about 20 to 25 dB(A) (Caltrans 1998) with closed windows. Taking into account a minimum 20 dB(A) reduction in noise levels from exterior to interior, interior noise levels would range from 38 to 41 dB(A) during the nighttime hours.

Numerous studies conducted over the last several decades indicate that transportation noise is a significant cause of sleep disturbance and a growing problem in cities. Studies conducted in the United States indicate that approximately 10-20 percent of sleep disturbance is related to transportation noise (Kim et al. 2012) and the World Health Organization (WHO) estimates that one in five individuals worldwide has disturbed sleep at night because of transportation-related noise (WHO 2011). Most studies focus on investigating possible secondary effects of sleep disturbance. Although no specific long-term health effects have been clearly linked to sleep disturbance, it is recognized as undesirable and thus considered an adverse noise impact. Sleep disturbance studies

have become the basis for predictive models of awakenings caused by transportation noise sources. Predictive awakenings percentages are described using SEL[82].

Table 4.12-15
Sleep Disturbance as a Function of Single Event Noise Exposure[83]

Indoor SEL	Average Percent Awakened
45 dB(A)	0.8%
50 dB(A)	1.0%
55 dB(A)	1.2%
60 dB(A)	1.5%
65 dB(A)	1.8%
70 dB(A)	2.2%
75 dB(A)	2.8%
80 dB(A)	3.4%
85 dB(A)	4.2%

Source: Finegold and Elias 2002.

As explained above, the Applicant has agreed to construct an earthen berm to mitigate noise impacts; specifically, nighttime noise impacts to residents located adjacent to the noise berm. For a period of time after the initiation of operations, qualified owners will have a right to relocate if they so choose (Chapter 6 and Appendix N).

4.12.4 Alternative 2: Proposed Project Site (South via Milford/ North via S-line)

Under Alternative 2, the project would be constructed as a variation of Alternative 1 (Proposed Project). Alternative 2 differs from Alternative 1 (Proposed Project) where the northern rail connection would be located, and road and rail improvements would be adjusted accordingly to facilitate rail and road traffic as a result of the northern rail connection. The Project site construction and operational activities would remain essentially the same as for Alternative 1.

[82] SEL, sound exposure level, is the constant noise level that would deliver the same acoustic energy to the ear of a listener during a one-second exposure as the actual time-varying noise would deliver over its entire time of occurrence. For a sound lasting longer than one second, its SEL will be higher than that of the largest of the shorter duration component sounds that make up the total. For example, the SEL of a ten-second-long sound made up of 10 one-second-long component sounds, each of 60 dBA amplitude, would be 70 dBA.

[83] Note that the tabulated awakening percentages (P_{ind}) apply only to a single noise event. The occurrence of multiple noise events during a night (or day) would result in a higher compound awakening percentage for those exposed than that expected for one event. This compound awakening percentage (P_{tot}) would increase as the individual SEL and the number of events (n) increase according to the following formula: $P_{tot} = 1 – (1- P_{ind})n$. For example, if the individual awakening probability for one event is 5 percent, with 10 such events per night the compound awakening probability would be 40 percent.

4.12.4.1 Traffic Noise

Table 4.12-16 shows the average TNM modeled traffic noise levels for Alternative 2 and compares those with the No-Action Alternative noise levels. Specific traffic noise levels for individual receptors are available in Appendix H. Table 4.12-16 shows that under Alternative 2, none of the roadway segments analyzed are expected to experience traffic noise increases exceeding 3 dB(A) in comparison with the 2038 No-Action Alternative. Therefore, Alternative 2 would have a negligible traffic noise impact.

Table 4.12-16
Average 2038 Traffic Noise Levels for Alternative 2
versus No-Action Alternative

Description	2038 Alternative 2 Loudest-Hour Leq(h), dB(A)	2038 No-Action Loudest-Hour Leq(h), dB(A)	Alt 2 minus No-Action
Virginia Avenue	74	72	2
Spruill Avenue from North Carolina Avenue to Cosgrove Avenue	66	67	-1
Cosgrove Avenue	68	67	1
Spruill Avenue from Cosgrove Avenue to Noisette Creek	65	65	0
St. Johns Avenue	55	57	-2
Noisette Boulevard	56	55	1
North Rhett Avenue	67	67	0
Montague Avenue	56	56	0

Source: Atkins 2017 (Appendix H).

4.12.4.2 Rail Noise

Under Alternative 2, the rail operations on the rail segments from north of Dorchester Road to Misroon Street (Segments 1, 2 and 3) and from Hackemann Avenue to Discher Street (Segment 7) would increase similar to Alternative 1. The data shown for Alternative 1 in Table 4.12-10 and Figures 4.12-5 and 4.12-6 are applicable (within several feet) to the DNL contours and noise zones for Alternative 2 for these rail segments.

Figures 4.12-8 and 4.12-9 show new build rail segments from O'Hear Avenue to the ICTF facility in the vicinity and south of crossing 19 (Segment 6). These stretches of track would only be built under Alternative 2, and noise from trains would impact eight residences along the first segment and 10 residences along the southern continuation of the rail line parallel to Spruill Avenue. Impacts along these rail segments would be moderate to major. It should be noted that land uses in closer proximity to the track path may need to be demolished in order to construct the track.

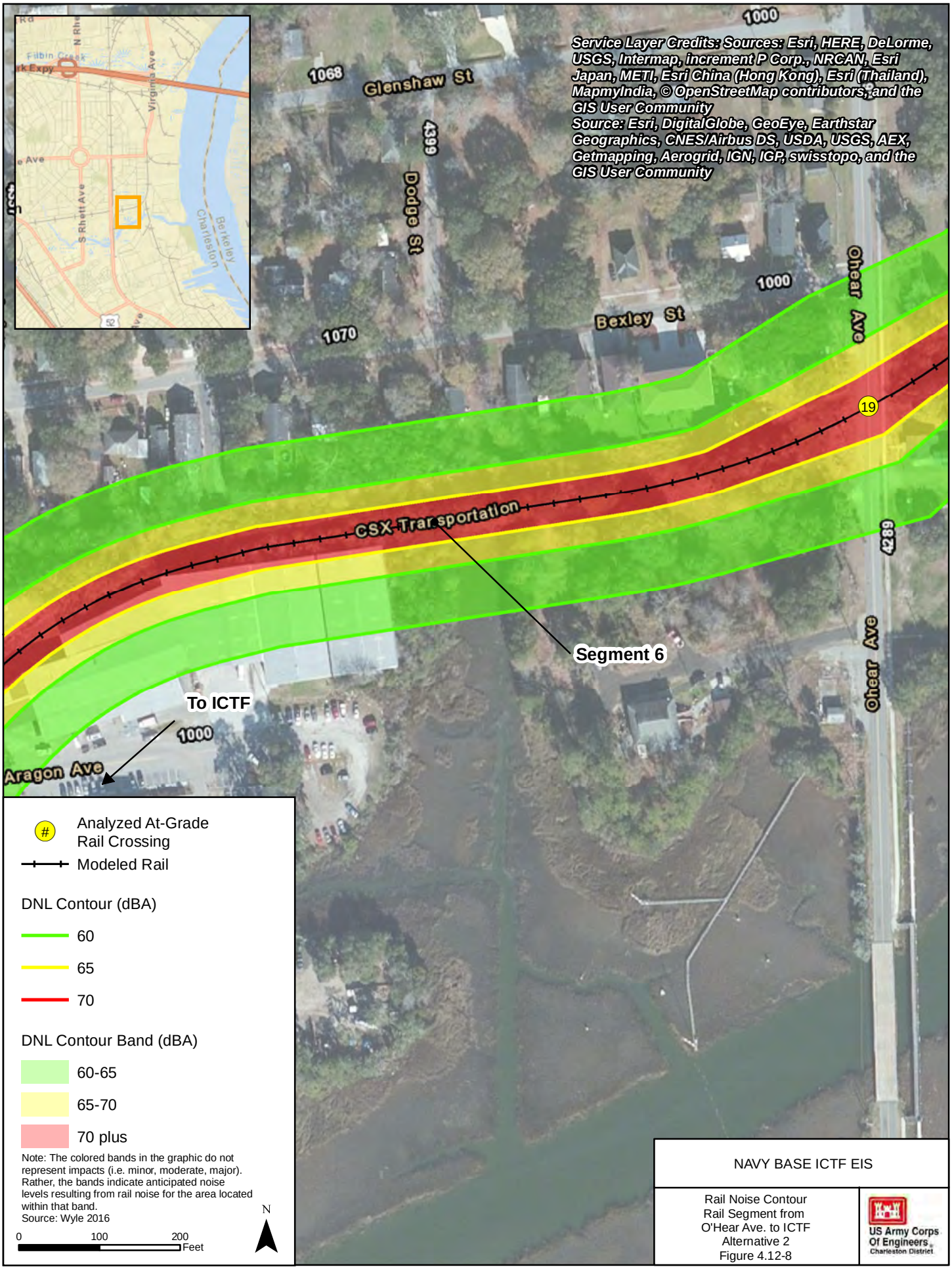
Table 4.12-17 provides a summary of the estimated number of impacted receivers along the rail segments discussed above.

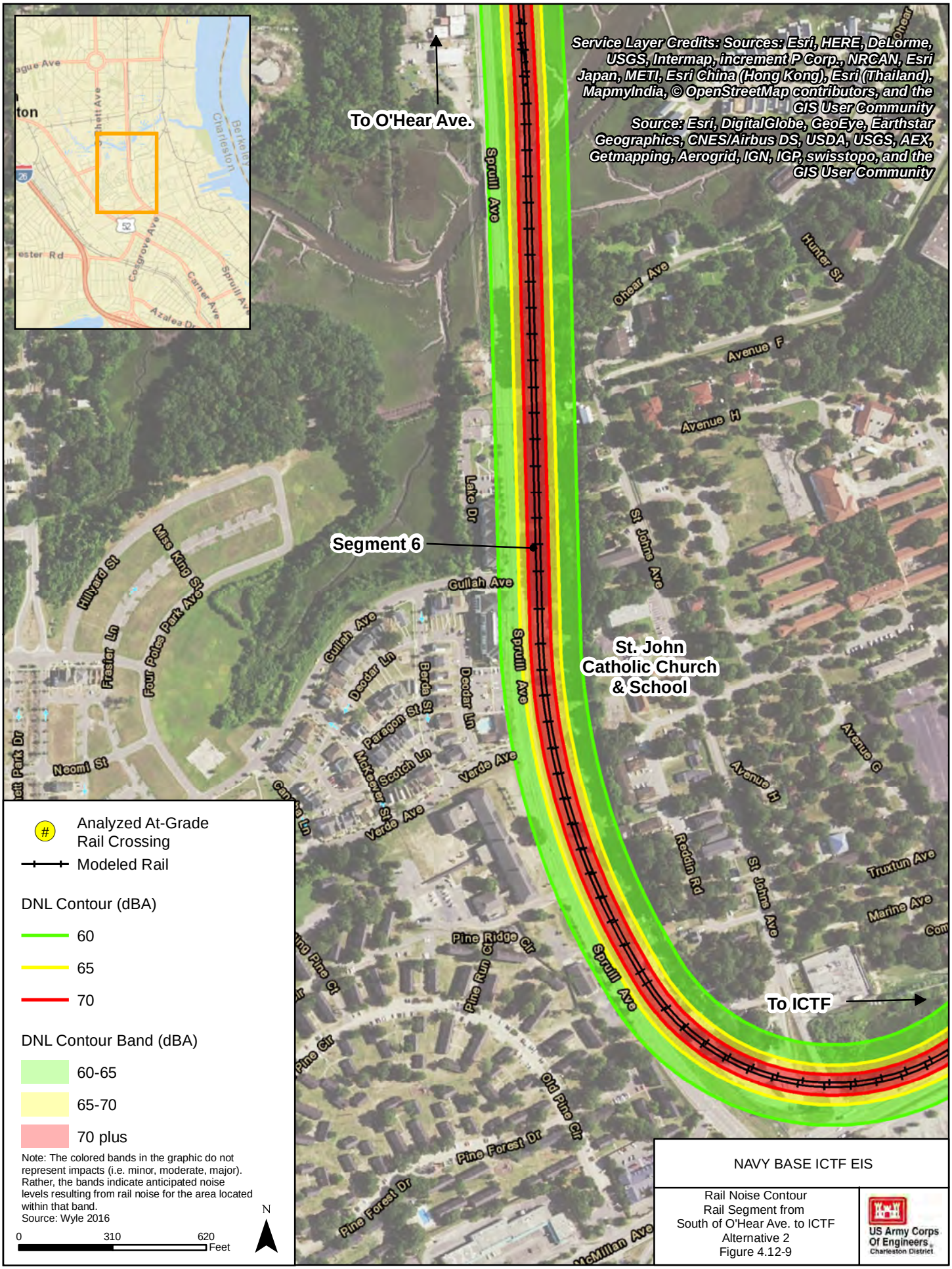
Table 4.12-17
Estimated Number of Noise Impacted Receptors for Alternative 2

Rail Segment	Estimated Number of Impacted Receptors		
	Minor Impact (3–5 dB(A) increase)	Moderate Impact (5–10 dB(A) increase)	Major Impact (>10 dB(A) increase)
North of Dorchester Road to Misroon Street (Segments 1, 2 and 3)	25	100	0
Hackemann Avenue to Discher Street (Segment 7)	0	19	0
O'Hear Avenue to ICTF (Segment 6)	0	14	4

Source: Atkins 2017.

The noise contours include horn noise effects. For rail crossings, the contour expands in size due to train horn soundings. Further details on the specific dimensions and distances of the noise contours at crossing locations can be found in Appendix H.


Service Layer Credits: Sources: Esri, HERE, DeLorme, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), MapmyIndia, © OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community
1000
1068
Glenshaw St
4299
Dodge St
1000
Ohear Ave
Bexley St
1070
19
CSX Transportation
4289
Ohear Ave
Segment 6
To ICTF
1000
Aragon Ave
Filbin Creek
Virginia Ave
S Rhett Ave
Berkeley
Charleston
52
Analyzed At-Grade Rail Crossing
Modeled Rail
DNL Contour (dBA)
60
65
70
DNL Contour Band (dBA)
60-65
65-70
70 plus
Note: The colored bands in the graphic do not represent impacts (i.e. minor, moderate, major). Rather, the bands indicate anticipated noise levels resulting from rail noise for the area located within that band.
Source: Wyle 2016
N
0
100
200
Feet
NAVY BASE ICTF EIS
Rail Noise Contour
Rail Segment from
O'Hear Ave. to ICTF
Alternative 2
Figure 4.12-8
US Army Corps Of Engineers
Charleston District


To O'Hear Ave.
Segment 6
To ICTF
St. John
Catholic Church
& School
Sprull Ave
Ohear Ave
Hunter St
Avenue F
Avenue H
Lake Dr
St Johns Ave
Gullah Ave
Hillyard St
Miss King St
Four Poles Park Ave
Frasier Ln
Cedar Ln
Barda St
Paragon St
McKelvey St
Scotch Ln
Verde Ave
Neomi St
Avenue G
Reddin Rd
Truxtun Ave
Marine Ave
Pine Ridge Cir
Pine Run Ct
Old Pine Cir
Pine Forest Dr
McMillan Ave
Service Layer Credits: Sources: Esri, HERE, DeLorme, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), MapmyIndia, © OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community
Analyzed At-Grade Rail Crossing
Modeled Rail
DNL Contour (dBA)
60
65
70
DNL Contour Band (dBA)
60-65
65-70
70 plus
Note: The colored bands in the graphic do not represent impacts (i.e. minor, moderate, major). Rather, the bands indicate anticipated noise levels resulting from rail noise for the area located within that band.
Source: Wyle 2016
N
0
310
620
Feet
NAVY BASE ICTF EIS
Rail Noise Contour
Rail Segment from
South of O'Hear Ave. to ICTF
Alternative 2
Figure 4.12-9
US Army Corps Of Engineers
Charleston District

4.12.4.3 Rail Vibration

Under Alternative 2, the ground-borne vibration generated by train activities would produce no or negligible impact for the majority of vibration-sensitive receptors along the railroad segments in the study area in comparison with the 2038 No-Action Alternative. Rail vibration effects would be unlikely for the 74 receptors analyzed. For the receptors located closer than 100 feet from the curved track along Spruill Avenue (State Rd S-10-672) and Aragon Avenue (Segment 6), vibration impacts might occur under Alternative 2 due to the rail curvature (the strength of the potential impact cannot be assessed, because no methodology exists to quantify vibration levels at receptors located near a segment of curved track).

A separate special case was considered for a bank building located at 1900 McMillan Avenue to address concerns related to potential false triggering of the bank security alarm by the train operations at the Spruill Avenue track segment. The closest wall of the building would be located at a distance of 250 feet from the rail track. Ground-borne vibration level at this one-story masonry building is estimated at 56 VdB. The vibration impact criterion for buildings with moderately sensitive equipment is 65 VdB (FTA 2006). The train vibration at the bank under normal conditions would be below this criterion, and false alarm triggering would not be expected.

4.12.4.4 Construction Noise

Noise conditions related to the ICTF construction activities under Alternative 2 are identical to the conditions estimated under Alternative 1 (Proposed Project).

4.12.4.5 Operational Noise

Noise impacts from the Project site operations under Alternative 2 are identical to the conditions estimated for Alternative 1 (Proposed Project).

4.12.5 Alternative 3: Proposed Project Site (South via Kingsworth / North via Hospital District)

Under Alternative 3, the Palmetto Railways Project would be constructed as a variation of the Alternative 1 (Proposed Project). Alternative 3 differs from Alternative 1 (Proposed Project) where the southern rail connection would be located, and road and rail improvements would be adjusted accordingly to facilitate rail and road traffic as a result of the southern rail connection. Alternative 3 includes a new at-grade crossing at Spruill Avenue and Meeting Street. The Project site construction and operational activities would remain essentially the same as for Alternative 1 (Proposed Project).

4.12.5.1 Traffic Noise

Under Alternative 3, the ICTF would be located and would operate the same as described under Alternative 1 (Proposed Project), and the road improvements and traffic volumes on the roads in the vicinity would also be identical. Therefore, the TNM modeling results for traffic noise levels shown in Table 4.12-9 apply to Alternative 3. Alternative 3 would have a negligible traffic noise impact on noise-sensitive land uses.

4.12.5.2 Rail Noise

Under Alternative 3, the rail operations would increase similar to Alternative 1. Also as with Alternative 1, Segment 5 includes plans for a ground cut section (trench) and two sound walls for the northern rail connection. Table 4.12-10 and Figure 4.12-5 provided for the rail segment from north of Dorchester Road to Misroon Street (Segments 1, 2 and 3) under Alternative 1 are applicable (within several feet) to the DNL contours and noise zones under Alternative 3. Slightly smaller noise zones were determined for the rail segment from Hackemann Avenue to Discher Street (Segment 7) under Alternative 3 when compared to Alternative 1.

Figure 4.12-10 shows a new build rail segment from Meeting Street to Spruill Avenue in the vicinity of crossing 20 (Segment 8). This stretch of track would only be built under Alternatives 3 and 6, and noise from trains would impact 10 noise sensitive receivers along the segment. The noise contours shown include horn noise effects. For rail crossings, the contour expands in size due to train horn soundings. Further details on the specific dimensions and distances of the noise contours at crossing locations can be found in Appendix H. The noise impact for these receivers would be minor to moderate. Land uses in closer proximity to the track path may be demolished in the construction of the rail track for this alternative.

Under Alternative 3, the proposed rail configuration between Avenue B and the ICTF facility (Segment 5) is identical to the Alternative 1 alignment with a trench and two sound walls for several sections. Slightly smaller noise zones were determined for this segment under Alternative 3 than for Alternative 1.

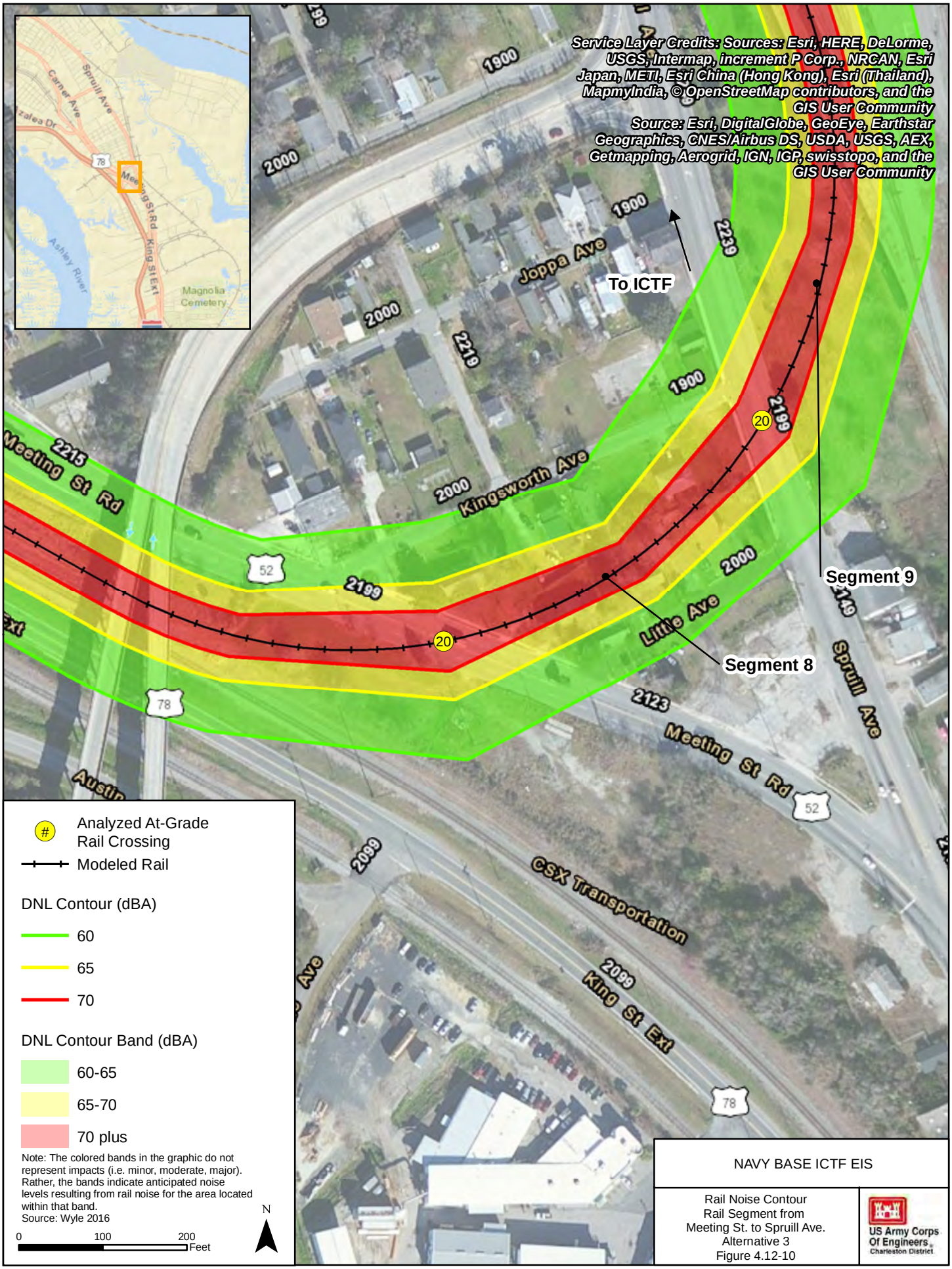

Service Layer Credits: Sources: Esri, HERE, DeLorme, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), MapmyIndia, © OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community
To ICTF
Segment 9
Segment 8
Joppa Ave
Kingsworth Ave
Little Ave
Spruill Ave
Meeting St Rd
CSX Transportation
King St Ext
Austin
Analyzed At-Grade Rail Crossing
Modeled Rail
DNL Contour (dBA)
60
65
70
DNL Contour Band (dBA)
60-65
65-70
70 plus
Note: The colored bands in the graphic do not represent impacts (i.e. minor, moderate, major). Rather, the bands indicate anticipated noise levels resulting from rail noise for the area located within that band.
Source: Wyle 2016
0
100
200
Feet
N
NAVY BASE ICTF EIS
Rail Noise Contour
Rail Segment from
Meeting St. to Spruill Ave.
Alternative 3
Figure 4.12-10
US Army Corps Of Engineers
Charleston District

Table 4.12-18 provides a summary of the estimated number of impacted receivers along the rail segments discussed above.

Table 4.12-18
Estimated Number of Noise Impacted Receptors for Alternative 3

Rail Segment	Estimated Number of Impacted Receptors		
	Minor Impact (3–5 dB(A) increase)	Moderate Impact (5–10 dB(A) increase)	Major Impact (>10 dB(A) increase)
North of Dorchester Road to Misroon Street (Segments 1, 2 and 3)	25	100	0
Hackemann Avenue to Discher Street (Segment 7)	0	16	0
Meeting Street to Spruill Avenue (Segment 8)	3	7	0
Avenue B to ICTF (Segment 5)	0	17[84]	0

Source: Atkins 2017.

4.12.5.3 Rail Vibration

Under Alternative 3, the ground-borne vibration generated by train activities would produce no or negligible impact for the majority of vibration-sensitive receptors along the railroad segments in the study area in comparison with the 2038 No-Action Alternative. Rail vibration effects would be unlikely for the 74 receptors analyzed. For the receptors located closer than 100 feet from the curved track near Kingsworth Avenue (Segment 8), vibration impacts might occur under Alternative 3 due to the rail curvature (the strength of the potential impact cannot be assessed, because no methodology exists to quantify vibration levels at receptors located near a segment of curved track).

4.12.5.4 Construction Noise

Noise conditions related to construction activities for the ICTF and northern rail connection ground cut section (trench) and sound walls under Alternative 3 are identical to the ones evaluated under Alternative 1.

4.12.5.5 Operational Noise

Noise impacts from site operations under Alternative 3 are identical to the ones estimated under Alternative 1.

[84]It should be noted that a few of the impacted receptors are located within the limits of construction.

4.12.6 Alternative 4: Proposed Project Site (South via Milford)

Alternative 4 would be constructed as a variation of Alternative 1 (Proposed Project) where trains enter and exit the Navy Base ICTF from a southern rail connection. A tail track would extend through the Hospital District and stop short of Noisette Creek. Road improvements would be the same as those identified in Alternative 1. The Project site construction and operational activities would also remain essentially the same as for Alternative 1.

4.12.6.1 Traffic Noise

Under Alternative 4, the ICTF would be located and would operate the same as described in Alternative 1, and the road improvements and traffic volumes would also be identical. Therefore, the traffic noise levels shown in Table 4.12-9 for Alternative 1 (Proposed Project) apply to Alternative 4. Alternative 4 would have a negligible traffic noise impact on noise-sensitive receptors.

4.12.6.2 Rail Noise

Under Alternative 4, the noise contours along the rail segment from north of Dorchester Road to Misroon Street (Segments 1, 2 and 3) shown in Figure 4.12-11 would be significantly expanded in comparison to the No-Action Alternative. The number of residences located within the 70, 65, and 60 dB(A) noise zones would increase.

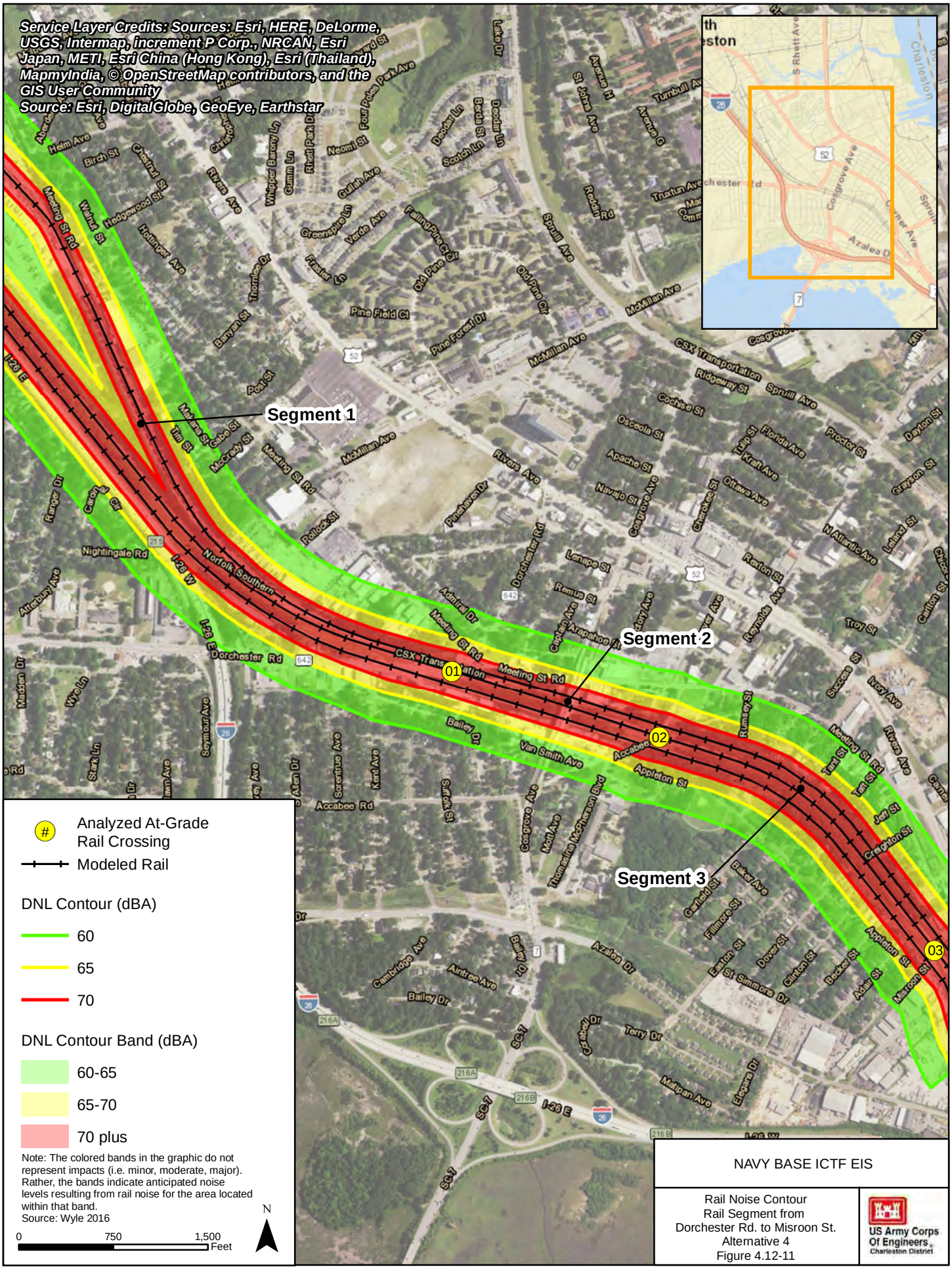
For the existing track from Hackemann Avenue to Discher Street (Segment 7), Figure 4.12-12 displays the DNL zones generated by the Alternative 4 rail operations between crossing locations 15 and 16. Under Alternative 4, the noise zones would expand considerably in comparison to the No-Action Alternative.

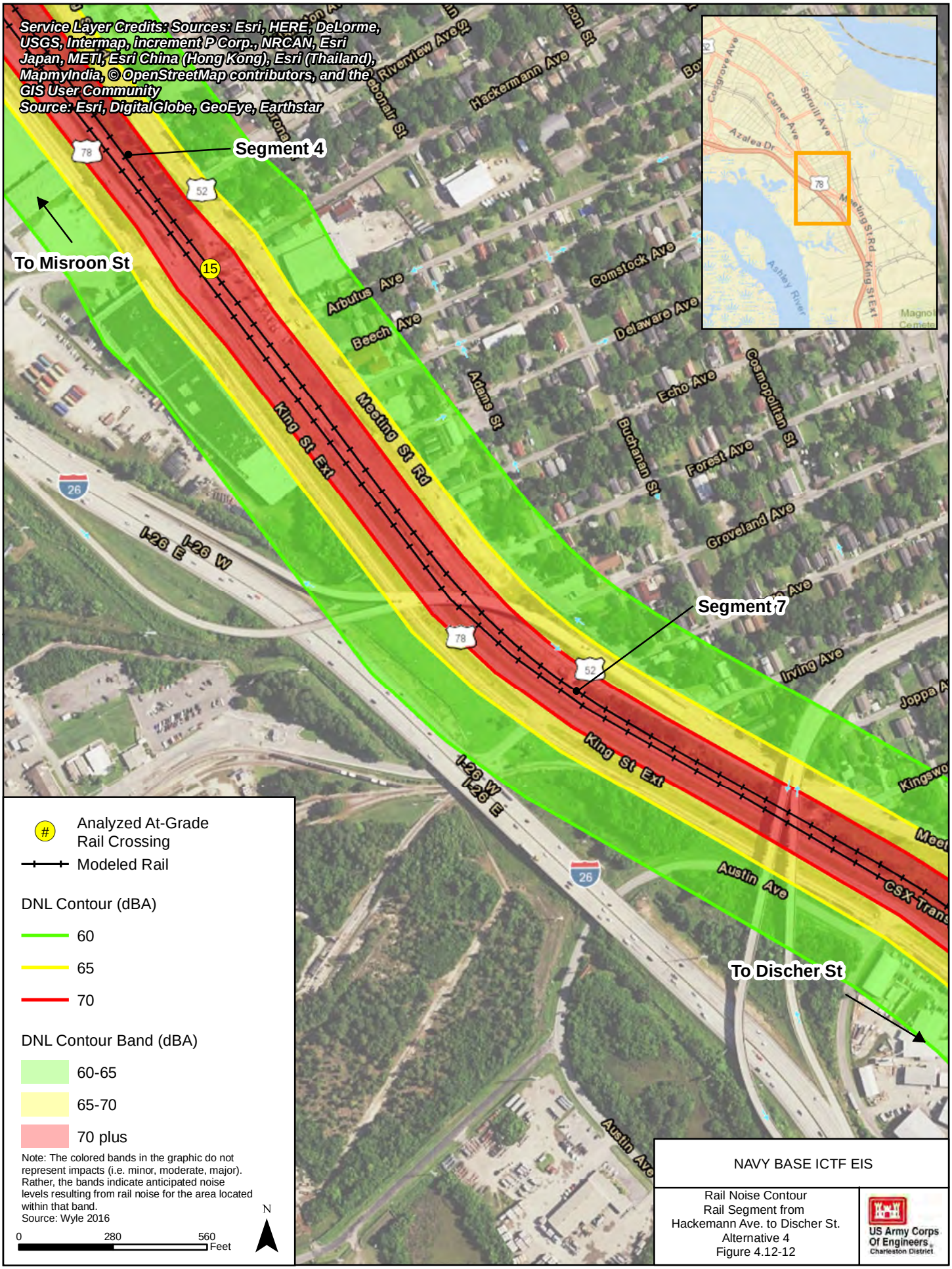
Table 4.12-19 provides a summary of the estimated number of impacted receivers along the rail segments discussed above.

Table 4.12-19
Estimated Number of Noise Impacted Receptors for Alternative 4

Rail Segment	Estimated Number of Impacted Receptors		
	Minor Impact (3–5 dB(A) increase)	Moderate Impact (5–10 dB(A) increase)	Major Impact (>10 dB(A) increase)
North of Dorchester Road to Misroon Street (Segments 1, 2, and 3)	60	170	0
Hackemann Avenue to Discher Street (Segment 7)	10	39	0

Source: Atkins 2017.


Service Layer Credits: Sources: Esri, HERE, DeLorme, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), MapmyIndia, © OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar
Segment 1
Segment 2
Segment 3
01
02
03
Analyzed At-Grade Rail Crossing
Modeled Rail
DNL Contour (dBA)
60
65
70
DNL Contour Band (dBA)
60-65
65-70
70 plus
Note: The colored bands in the graphic do not represent impacts (i.e. minor, moderate, major). Rather, the bands indicate anticipated noise levels resulting from rail noise for the area located within that band.
Source: Wyle 2016
N
0
750
1,500
Feet
NAVY BASE ICTF EIS
Rail Noise Contour
Rail Segment from
Dorchester Rd. to Misroon St.
Alternative 4
Figure 4.12-11
US Army Corps Of Engineers
Charleston District


Service Layer Credits: Sources: Esri, HERE, DeLorme, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), MapmyIndia, © OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar
Segment 4
To Misroon St
Segment 7
To Discher St
King St Ext
Meeting St Rd
I-26 E
I-26 W
Hackemann Ave
Riverview Ave
Arbutus Ave
Beech Ave
Comstock Ave
Delaware Ave
Echo Ave
Forest Ave
Groveland Ave
Irving Ave
Austin Ave
Adams St
Buchanan St
Cosmopolitan St
Cosgrove Ave
Carner Ave
Sproull Ave
Azalea Dr
Ashley River
Meeting St Rd
King St Ext
Magnolia Cemetery
Analyzed At-Grade Rail Crossing
Modeled Rail
DNL Contour (dBA)
60
65
70
DNL Contour Band (dBA)
60-65
65-70
70 plus
Note: The colored bands in the graphic do not represent impacts (i.e. minor, moderate, major). Rather, the bands indicate anticipated noise levels resulting from rail noise for the area located within that band.
Source: Wyle 2016
N
0
280
560
Feet
NAVY BASE ICTF EIS
Rail Noise Contour
Rail Segment from
Hackemann Ave. to Discher St.
Alternative 4
Figure 4.12-12
US Army Corps Of Engineers
Charleston District

The noise contours include horn noise effects. For rail crossings, the contour expands in size due to train horn soundings. Further details on the specific dimensions and distances of the noise contours at crossing locations can be found in Appendix H.

4.12.6.3 Rail Vibration

Under Alternative 4, the ground-borne vibration generated by train activities would produce no or negligible impact for the vibration-sensitive receptors along the railroad segments in the study area in comparison with the 2038 No-Action Alternative. Rail vibration effects would be unlikely for the 76 receptors analyzed.

4.12.6.4 Construction Noise

Noise conditions related to the ICTF construction activities under Alternative 4 are identical to the conditions evaluated under Alternative 1.

4.12.6.5 Operational Noise

Noise impacts from the Project site operations under Alternative 4 are identical to the conditions estimated under Alternative 1 (Proposed Project).

4.12.7 Alternative 5: River Center Site (South via Milford / North via Hospital District)

Alternative 5 is a variation of Alternative 1 (Proposed Project) with the Project site being moved to the River Center project site. Road and rail improvements would be adjusted accordingly to facilitate rail and road traffic at the new site. Roadway improvements for this alternative would incorporate a new segment of Port drayage road through the Proposed Project's site and other road modifications. Operation activities associated with the ICTF at the River Center project site would be similar to Alternative 1 (Proposed Project); however, different communities would potentially experience associated noise impact for adjacent sensitive land uses. A sound attenuation and security wall would be constructed adjacent to Noisette Boulevard along the length of the eastern boundary of the facility site.

4.12.7.1 Traffic Noise

Table 4.12-20 shows the average TNM modeled traffic noise levels for the receptors identified in Appendix H for Alternative 5 and compares those with the No-Action noise levels. Specific traffic noise levels for individual receptors can be found in Appendix H.

Table 4.12-20
Average 2038 Traffic Noise Levels for Alternative 5 versus No-Action Alternative

Description	2038 Alternatives 5 Loudest-Hour Leq(h), dB(A)	2038 No-Action Loudest-Hour Leq(h), dB(A)	Alternatives 5 minus No-Action
Virginia Avenue	74	72	2
Spruill Avenue from North Carolina Avenue to Cosgrove Avenue	67	67	0
Cosgrove Avenue	67	67	0
Spruill Avenue from Cosgrove Avenue to Noisette Creek	66	65	1
St. Johns Avenue	58	57	1
Noisette Boulevard	53	55	-2
North Rhett Avenue	67	67	0
Port drayage road	59	53	6
Montague Avenue	56	56	0

Source: Atkins 2017 (Appendix H).

As shown in Table 4.12-20, the change between the loudest-hour Leq(h) for Alternative 5 and the 2038 No-Action Alternative would not exceed 3 dB(A) for any receptor, with the exception of 18 receptors exposed to the proposed Port drayage road. For these 18, residential land uses in the Chicora-Cherokee community, the Alternative 5 noise levels would exceed the No-Action Alternative levels by 4 to 7 dB(A), which indicates a minor to moderate traffic noise impact. For all the other noise-sensitive land uses, negligible traffic noise impacts are anticipated under Alternative 5.

4.12.7.2 Rail Noise

Under Alternative 5, operations on the rail segment from north of Dorchester Road to Misroon Street (Segments 1, 2 and 3) would increase in comparison to the No-Action Alternative, similar to Alternative 1 (Proposed Project). The data presented for Alternative 1 (Proposed Project) for this rail segment are applicable (within several feet) to the DNL contours and noise zones under Alternative 5. The same conclusion applies to the rail segment from Hackemann Avenue to Discher Street (Segment 7).

Figure 4.12-13 shows a new build rail segment from Pittsburg Avenue to the ICTF facility (Segment 10), north of crossing 17. Under Alternative 5, the ICTF facility would be located at the River Center project site. Along this stretch of track, 23 noise sensitive receivers within the Chicora-Cherokee communities would be impacted by rail activity, as shown in Figure 4.12-13. Most of the affected residential land uses would be located within the DNL zone from 60 to 65 dB(A). They would be exposed to moderate noise impacts [from 5 to 10 dB(A)] in comparison with the 2038 No-Action Alternative.

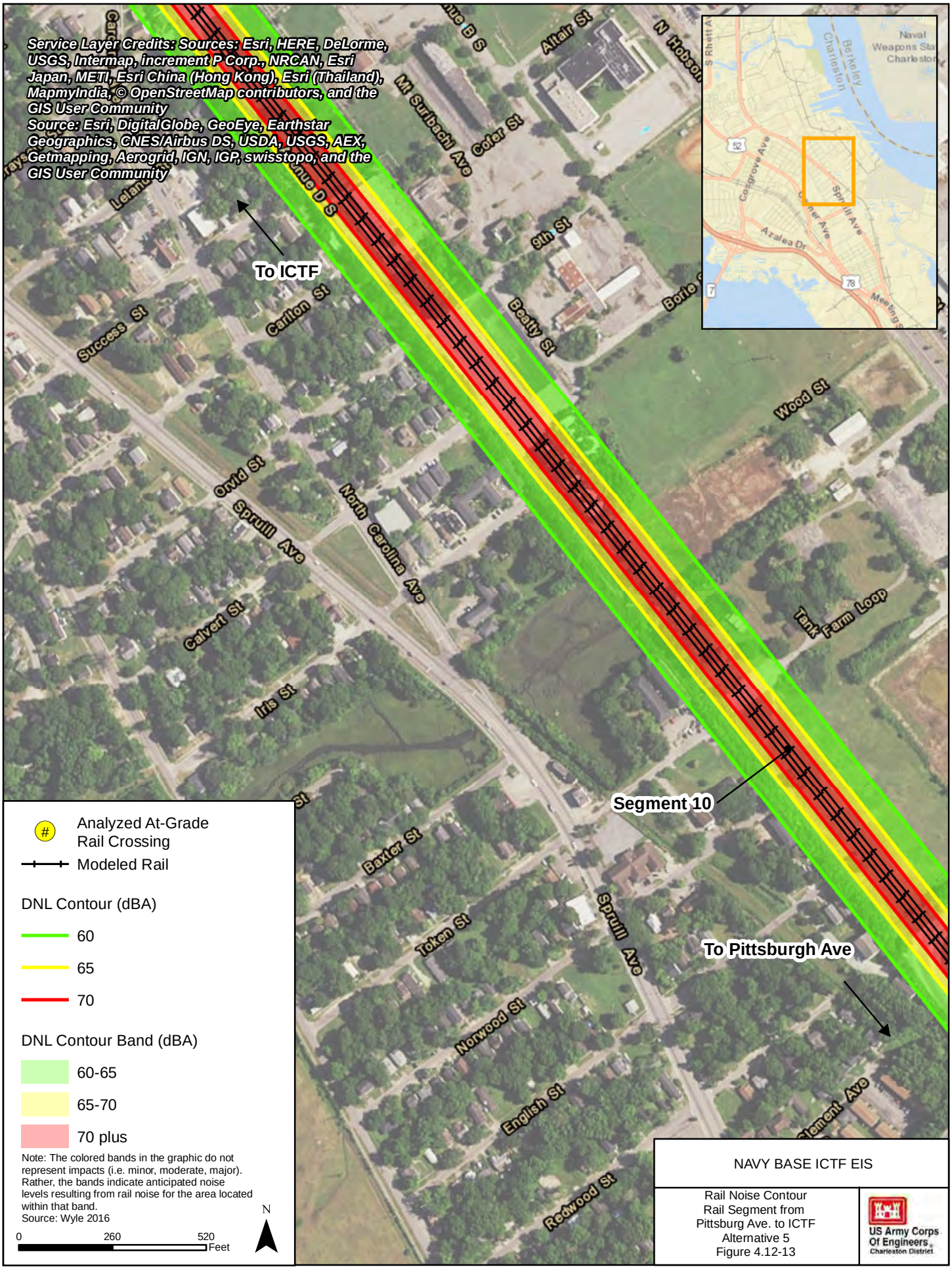

Service Layer Credits: Sources: Esri, HERE, DeLorme, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), MapmyIndia, © OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community
To ICTF
Segment 10
To Pittsburgh Ave
Altair St
Mt Suribachi Ave
Cofer St
9th St
Beaty St
Carlton St
Success St
Wood St
Orvid St
Spruill Ave
North Carolina Ave
Calvert St
Iris St
Tank Farm Loop
Baxter St
Token St
Norwood St
English St
Redwood St
Clement Ave
Azalea Dr
Naval Weapons Sta Charleston
Berkeley
Charleston
Analyzed At-Grade Rail Crossing
Modeled Rail
DNL Contour (dBA)
60
65
70
DNL Contour Band (dBA)
60-65
65-70
70 plus
Note: The colored bands in the graphic do not represent impacts (i.e. minor, moderate, major). Rather, the bands indicate anticipated noise levels resulting from rail noise for the area located within that band.
Source: Wyle 2016
N
0
260
520
Feet
NAVY BASE ICTF EIS
Rail Noise Contour
Rail Segment from Pittsburg Ave. to ICTF
Alternative 5
Figure 4.12-13
US Army Corps Of Engineers
Charleston District

Table 4.12-21 provides a summary of the estimated number of impacted receivers along the rail segments discussed above.

Table 4.12-21
Estimated Number of Noise Impacted Receptors for Alternative 5

Rail Segment	Estimated Number of Impacted Receptors		
	Minor Impact (3–5 dB(A) increase)	Moderate Impact (5–10 dB(A) increase)	Major Impact (>10 dB(A) increase)
North of Dorchester Road to Misroon Street (Segments 1, 2 and 3)	25	100	0
Hackemann Avenue to Discher Street (Segment 7)	0	19	0
Pittsburg Avenue to ICTF (Segment 10)	0	23	0

Source: Atkins 2017.

The noise contours include horn noise effects. For rail crossings, the contour expands in size due to train horn soundings. Further details on the specific dimensions and distances of the noise contours at crossing locations can be found in Appendix H.

4.12.7.3 Rail Vibration

Under Alternative 5, the ground-borne vibration generated by train activities would produce no or negligible impact for the vibration-sensitive receptors along the railroad segments in the study area in comparison with the 2038 No-Action Alternative. Rail vibration effects would be unlikely for the 76 receptors analyzed.

4.12.7.4 Construction Noise

The ICTF construction at the River Center project site would be accomplished similarly to construction at the Project site in Alternative 1 (Proposed Project). Similar construction phases, time schedules, and equipment would be utilized; however, due to differing site layout, different communities would be exposed to construction noise. The earthen berm would not be constructed; however, a sound attenuation and security wall would be constructed adjacent to Noisette Boulevard along the length of the eastern boundary of the River Center project site for abatement of noise from ICTF operations.

Analysis of the noise conditions related to construction activities under Alternative 1 (Proposed Project) is valid for the River Center project site under Alternative 5 (see Table 4.12-12). Construction of the sound attenuation wall would occur in proximity to the residential community of the CNYOQ Historic District. Impact pile drivers would be utilized in various locations at the site in construction of the sound wall, support pads for rail mounted gantry cranes, and for driving H-beam

piles for box culvert upgrades. The average construction noise levels at the nearest residential land uses would meet the established criterion of 80 dB(A) during the general demolition/grading phase and the on-site ICTF yard construction phase. For short periods of time during the sound wall construction and other pile diving activities, the average noise levels will exceed the accepted criterion. Construction activities would be clearly audible over the existing ambient noise in the community, but may be tolerable due to the interim nature of the disturbance. The pile driving activities would be short-term.

4.12.7.5 Operational Noise

Operational noise analysis for the River Center project site is similar to that prepared for Alternative 1 (Proposed Project). Operation activities would be identical, the primary sources of operational noise would be the same, and the site layout would also be similar but with the reversed north-south general orientation. No earthen berm would be constructed, but a sound attenuation and security wall would be built, as noted above. The nearest noise-sensitive receivers would be located in the CNYOQ Historic District along Manley Avenue (east of Noisette Boulevard), at a distance of 150 feet from the ICTF train operations. Table 4.12-22 summarizes the operational noise analysis for the River Center project site for these receptors that would be impacted the most by noise from the ICTF operations. The table presents the main individual operations generating noise at the site (train, crane, and containers). Operations such as truck movements or fork lifting would be concentrated in the area located much farther from the noise-sensitive receptors, beyond the train arrival/departure tracks, classification tracks, crane runways and container stacking area; noise levels at the residential receptors from these remote operations would be negligible in comparison with the primary noise sources.

Table 4.12-22
Operational Noise at Nearest Receptors, Alternative 5

Noise Source	Operation	Leq Type	Reference Noise Level dB(A)	Distance Attenuation dB(A)	Sound Wall Attenuation dB(A)	Noise Level at Receiver dB(A)
Train (150 feet from receiver)	Arrival/ Departure	Max 1-sec Leq	81	11	10	60
	Car Coupling		97	11	10	76
	General Car Movement		64	11	10	43
Train (382 feet from receiver)	Arrival/ Departure	Max 1-sec Leq	81	20	10	51
	Car Coupling		97	20	10	67
	General Car Movement		64	20	10	34
Crane (382 feet from receiver)	Crane/Trolley Travelling	Maximum Level	70	13	10	47
	Crane Travelling	Average Level Per Hour	55	13	10	32

Noise Source	Operation	Leq Type	Reference Noise Level dB(A)	Distance Attenuation dB(A)	Sound Wall Attenuation dB(A)	Noise Level at Receiver dB(A)
Container Impacts (309 feet from receiver)	Container Stacking	Max 1-sec Leq	70	12	10	48

Source: Atkins 2017 (Appendix H).

The projected noise levels for train operations in Table 4.12-22 are the same as for Alternative 1 (Proposed Project), as shown in Table 4.12-13, and would comply with the FRA noise regulation discussed in section 4.12.3.5. The reference noise levels associated with the train operations at the River Center project site would be lower than the FRA's noise standards for railroad equipment, yards, and facilities.

In Table 4.12-22, the reference noise levels of the noise sources are further adjusted to account for the distance attenuation and noise attenuation due to the sound wall located between the sources at the River Center project site and the nearest noise-sensitive receptors. These adjustment factors were determined to also be similar to the ones for the Proposed Project (refer back to Section 4.12.3.5). The resulting total average noise levels from the ICTF operations at the nearest receptors would be in the range from 58 to 61 dB(A), similar to the Proposed Project site.

Noise impacts from the River Center operations are based on exterior levels and determined in comparison with the 2038 No-Action Alternative noise levels for the community adjacent to the site (see Table 4.12-5). The impacts for the nearest receptors are summarized in Table 4.12-23 for daytime and nighttime conditions. Daytime noise impact (7:00 a.m. to 10:00 p.m.) is most important to consider, as this can affect people's activities outside their homes. The exterior noise levels from the ICTF operations would exceed the daytime No-Action ambient noise level at the edge of the CNYOQ Historic District during daytime hours by up to 2 dB(A), which is a negligible impact (as defined in Table 4.12-6). Loud operations like rail car coupling would be audible at the nearest residences but, in general, operational noise levels would remain comparable to the ambient noise. Homes east of Manley Avenue and beyond are also expected to experience negligible or no noise impact from daytime ICTF operations due to increased distance and shielding effect from other homes.

Table 4.12-23
Operational Noise Impact at Nearest Receivers, Alternative 5

Time of Day	Average Operational Noise Level at Receptors, dB(A)	2038 No-Action Ambient Noise Level, dB(A)	Operational Noise Impact
Daytime	from 58 to 61	59	From 0 to 2 dB(A) (Negligible)
Nighttime	Exterior from 58 to 61 Interior from 38 to 41	49	Exterior from 9 to 12 dB(A) (Moderate to major)

Source: Atkins 2017.

With respect to operational noise, ambient noise associated with ICTF operations could expose the adjacent residential areas to exterior noise level increases over the No-Action ambient of 0 to 2 dB(A) during daytime hours (defined as 7:00 a.m. to 10:00 p.m.) and 9 to 12 dB(A) during nighttime hours (defined as 10:00 p.m. to 7:00 a.m.). When compared to the No-Action ambient, this would equate to a negligible impact during the daytime hours and a moderate to major impact during the nighttime hours to exterior noise levels. However, the nighttime hours are generally associated with sleep. Refer back to Section 4.12.3.5 for the discussion on nighttime noise impacts and sleep disturbance.

In general, noise impacts generated by the River Center project site operations are lower in comparison with the impacts produced by the Proposed Project operations due to higher No-Action ambient noise levels anticipated in the vicinity of the River Center project site.

4.12.8 Alternative 6: River Center Site (South via Kingsworth / North via Hospital District)

Under Alternative 6, the ICTF would be located at the River Center project site. Road improvements for this alternative would be the same as described in Alternative 5. Rail improvements would be similar to those described for the northern and southern rail connection in Alternative 5, except that the southern rail connection would connect to an existing rail line near Kingsworth Avenue. This would result in a new at-grade crossing at Spruill Avenue and Meeting Street. The River Center project site construction and operational activities would remain essentially the same as for Alternative 5.

4.12.8.1 Traffic Noise

Under Alternative 6, the road improvements and traffic volumes would be identical to the ones under Alternative 5. Therefore, Alternative 6 would generate equal noise levels, and TNM modeling results for traffic noise levels shown in Table 4.12-20 apply to Alternative 6. Alternative 6 would have a minor to moderate traffic noise impact for the 18 residential land uses in the Chicora-Cherokee

community. For all the other noise-sensitive land uses, no or negligible traffic noise impacts are anticipated under Alternative 6.

4.12.8.2 Rail Noise

Under Alternative 6, operations on the rail segment from north of Dorchester Road to Misroon Street (Segments 1, 2, and 3) would increase similar to Alternative 5. Slightly smaller noise zones with lower counts of impacted residences are determined for the rail segment from Hackemann Avenue to Discher Street (Segment 7) under Alternative 6 as compared to Alternative 5.

Figure 4.12-10 shows a proposed rail segment from Meeting Street to Spruill Avenue in the vicinity of crossing 20 (Segment 8). This stretch of track would only be built under Alternatives 3 and 6, and noise from trains would impact 10 noise sensitive receivers along that segment. Land uses in closer proximity to the track path may be demolished for construction of the proposed rail track.

Under Alternative 6, the proposed new rail segment between Spruill Avenue and the ICTF facility (Segment 9) would impact 23 noise sensitive receivers in the Chicora-Cherokee communities as shown in Figure 4.12-13[85]. A moderate noise impact is estimated for these land uses in comparison with the 2038 No-Action Alternative.

Table 4.12-24 provides a summary of the estimated number of impacted receivers along the rail segments discussed above.

Table 4.12-24
Estimated Number of Noise Impacted Receptors for Alternative 6

Rail Segment	Estimated Number of Impacted Receptors		
	Minor Impact (3–5 dB dB(A) increase)	Moderate Impact (5–10 dB dB(A) increase)	Major Impact (>10 dB dB(A) increase)
North of Dorchester Road to Misroon Street (Segments 1, 2, and 3)	25	100	0
Hackemann Avenue to Discher Street (Segment 7)	0	16	0
Meeting Street to Spruill Avenue (Segment 8)	3	7	0
Pittsburg Avenue to ICTF (Segment 9)	0	23	0

Source: Atkins 2017.

The noise contours include horn noise effects. For rail crossings, the contour expands in size due to train horn soundings. Further details on the specific dimensions and distances of the noise contours at crossing locations can be found in Appendix H.

[85] Segments 9 and 10 are similar in the vicinity of the Chicora-Cherokee communities under Alternatives 5 and 6, hence the use of the same figure, and differ southeast of the displayed area.

4.12.8.3 Rail Vibration

Under Alternative 6, the ground-borne vibration generated by train activities would produce no or negligible impact for the majority of vibration-sensitive receptors along the railroad segments in the study area in comparison with the 2038 No-Action Alternative. Rail vibration effects would be unlikely for the 74 receptors analyzed. For the receptors located closer than 100 feet. from the curved track near Kingsworth Avenue (Segment 8), vibration impacts might occur under Alternative 6 due to the rail curvature (the strength of the potential impact cannot be assessed, because no methodology exists to quantify vibration levels at receptors located near a segment of curved track).

4.12.8.4 Construction Noise

Noise conditions related to the ICTF construction activities under Alternative 6 are identical to the ones evaluated under Alternative 5.

4.12.8.5 Operational Noise

Noise impact from the River Center project site operations under Alternative 6 is identical to those estimated for Alternative 5.

4.12.9 Alternative 7: River Center Site (South via Milford)

Under Alternative 7, the ICTF would be located at the River Center project site. Roadway improvements and traffic projections would be the same as described in Alternative 5. Rail improvements for Alternative 7 would be similar to those described under Alternative 5 with the exception that trains would enter and exit the ICTF from a southern rail connection only. The River Center project site construction and operational activities would remain essentially the same as for Alternative 5.

4.12.9.1 Traffic Noise

The TNM modeling results for traffic noise levels shown in Table 4.12-20 apply to Alternative 7, and the conclusions provided for Alternative 5 are valid for Alternative 7. Alternative 7 would have a minor to moderate traffic noise impact for the 18 residential land uses in the Chicora-Cherokee community. For all the other noise-sensitive land uses, no or negligible traffic noise impacts are anticipated under Alternative 7.

4.12.9.2 Rail Noise

Expansion of the noise contours under Alternative 7 is similar to Alternative 4 for the rail segment from north of Dorchester Road to Misroon Street (Segments 1, 2, and 3) (see Figure 4.12-11) when compared to the No-Action Alternative. A similar conclusion applies to the rail segment from

Hackemann Avenue to Discher Street (Segment 7), shown in Figure 4.12-12. Under Alternative 7, the DNL zones would also expand considerably versus the 2038 No-Action Alternative.

Figure 4.12-14 shows a new build rail segment from Pittsburg Avenue to the ICTF facility at the River Center project site (Segment 10). This stretch of track would only be built for the southern alignment under Alternatives 5, 6, and 7. Under Alternative 7, however, the DNL zones extend much farther from the track than for the other two alternatives. A moderate noise impact is estimated for most of these land uses in comparison with the 2038 No-Action Alternative.

Table 4.12-25 provides a summary of the estimated number of impacted receivers along the rail segments discussed above.

Table 4.12-25
Estimated Number of Noise Impacted Receptors for Alternative 7

Rail Segment	Estimated Number of Impacted Receptors		
	Minor Impact (3–5 dB dB(A) increase)	Moderate Impact (5–10 dB dB(A) increase)	Major Impact (>10 dB dB(A) increase)
North of Dorchester Road to Misroon Street (Segments 1, 2, and 3)	60	170	0
Hackemann Avenue to Discher Street (Segment 7)	10	39	0
Pittsburg Avenue to ICTF (Segment 10)	10	59	0

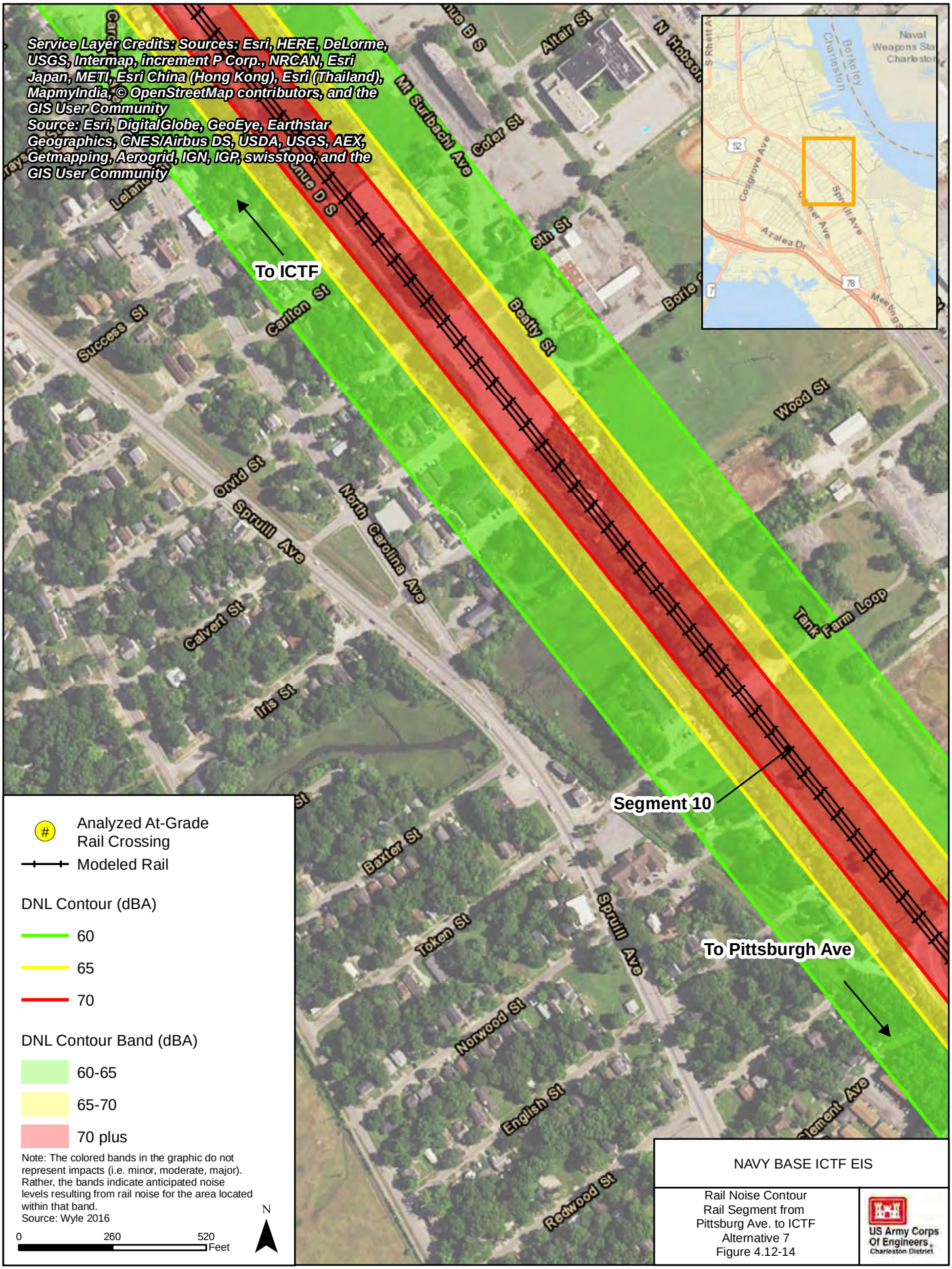
The noise contours include horn noise effects. For rail crossings, the contour expands in size due to train horn soundings. Further details on the specific dimensions and distances of the noise contours at crossing locations can be found in Appendix H.

4.12.9.3 Rail Vibration

Under Alternative 7, the ground-borne vibration generated by train activities would produce no or negligible impact for the vibration-sensitive receptors along the railroad segments in the study area in comparison with the 2038 No-Action Alternative. Rail vibration effects would be unlikely for the 76 receptors analyzed.

4.12.9.4 Construction Noise

Noise conditions related to the ICTF construction activities under Alternative 7 are identical to the ones evaluated for Alternative 5.


Service Layer Credits: Sources: Esri, HERE, DeLorme, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), MapmyIndia, © OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community
To ICTF
Segment 10
To Pittsburgh Ave
Altair St
Mt Suribachi Ave
Cofer St
9th St
Carlton St
Success St
Beaty St
Wood St
Orvid St
Spruill Ave
North Carolina Ave
Calvert St
Iris St
Tank Farm Loop
Baxter St
Token St
Norwood St
English St
Redwood St
Clement Ave
Analyzed At-Grade Rail Crossing
Modeled Rail
DNL Contour (dBA)
60
65
70
DNL Contour Band (dBA)
60-65
65-70
70 plus
Note: The colored bands in the graphic do not represent impacts (i.e. minor, moderate, major). Rather, the bands indicate anticipated noise levels resulting from rail noise for the area located within that band.
Source: Wyle 2016
N
0
260
520
Feet
NAVY BASE ICTF EIS
Rail Noise Contour
Rail Segment from Pittsburg Ave. to ICTF
Alternative 7
Figure 4.12-14
US Army Corps Of Engineers
Charleston District


Service Layer Credits: Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors Esri, USDA Farm Service Agency
Proposed Noise Wall F
Proposed Noise Wall E
Proposed Noise Wall A
Proposed Noise Wall B
Proposed Train Trench
Proposed Noise Berm
Proposed Noise Wall
Source: Wyle 2016
0
0.15
0.3
Miles
N
NAVY BASE ICTF EIS
Proposed Noise Mitigation Measures
Figure 4.12-15
US Army Corps Of Engineers
Charleston District

4.12.9.5 Operational Noise

Noise impacts from the River Center project site operations under Alternative 7 are identical to those estimated for Alternative 5.

4.12.10 Additive Noise Impacts

The impacts indicated for each noise source generally relate to different groups of affected receptors, which are analyzed separately in this document and Appendix H. For example, receptors that would experience rail noise impact (located along certain track segments), would, for the most part, not be subject to noise impacts from vehicular traffic, ICTF construction, or ICTF operations.

Exceptions to the general rule above include noise sensitive receptors located along several of the road segments in the study area. Table 4.12-26 summarizes the anticipated additive impacts associated with receptors located along certain roadways, where either rail noise or operational noise may contribute to increased noise levels when added to traffic noise. A description of each additive noise impact follows. Detailed descriptions of additive noise impacts can be found in Appendix H.

Table 4.12-26
Additive Noise Impacts

Description	Alternative(s)	2038 Traffic Noise Level (dB(A) DNL)[1]	2038 Rail Noise Contour Level (dB(A) DNL)	2038 Operations Noise (dB(A) DNL)	Additive Noise Level (dB(A) DNL)	Impact (versus the No-Action Alternative)
Virginia Avenue (between Montague Avenue and Buist Avenue)	1, 2, 3, 5 and 6	74	60–65	n/a	74	Negligible
St. Johns Avenue (between O'Hear Avenue and McMillan Avenue)	1 and 3	54-56	62	n/a	57–64	Minor to Moderate
Spruill Avenue (between Noisette Creek and N. Carolina Avenue)	2	65	60–65	n/a	65–67	Negligible
Port drayage road (between Port Access Road and ICTF)	5 and 6	59–60	62–63	n/a	65	Major
Port drayage road (between Port Access Road and ICTF)	7	59–60	65–70	n/a	71	Major

Description	Alternative(s)	2038 Traffic Noise Level (dB(A) DNL)[1]	2038 Rail Noise Contour Level (dB(A) DNL)	2038 Operations Noise (dB(A) DNL)	Additive Noise Level (dB(A) DNL)	Impact (versus the No-Action Alternative)
Noisette Boulevard (vicinity of the River Center site)	5, 6 and 7	54–56	n/a	49–61	55-67	Negligible (daytime) Moderate – Major (nighttime)

[1] As noted in Section 4.12.1, for the purposes of conservative estimation of additive noise impacts, DNL generated by traffic noise was assumed to be approximately equal to the modeled Leq(h) levels. Also note that the traffic noise levels presented were taken from the traffic noise tables in Appendix H. These noise levels are associated with the receptors within each roadway segment that could receive noise from multiple sources and are not the average noise levels presented in prior sections of this chapter.

Source: Atkins 2017 (Appendix H).

For Virginia Avenue (rail segment from North of Virginia Avenue to Avenue B, Alternatives 1, 2, 3, 5 and 6), because rail-generated DNL at these residences are much lower than DNL sound levels generated by traffic noise, rail noise does not provide a noticeable effect in addition to traffic noise.

For St. Johns Avenue (between O'Hear Avenue and McMillan Avenue, Alternatives 1 and 3), the proposed rail tracks would be located at a close distance in the vicinity of St. John Catholic Church and School. A proposed sound wall along St. Johns Avenue would shield the rail noise from some of the receptors. In this case, the rail-generated noise would dominate over the traffic-related noise, especially at receptors not protected by the sound wall to the same extent as others. As a result of additive impacts, an estimated increase of 4 to 7 dB(A) could occur, which is a minor to moderate noise impact.

For Spruill Avenue (from Noisette Creek to McMillian Avenue, Alternative 2), due to the distance from Spruill Avenue and the proposed track, the additive traffic noise and rail noise DNLs would not increase by more than 3 dB(A) in comparison with the No-Action Alternative, which is a negligible noise impact.

Under the River Center Site (Alternatives 5 through 7), a new rail track segment would run from Pittsburg Avenue to the ICTF along the new Port drayage road in the vicinity of the eastern neighborhood boundary of the Chicora-Cherokee community. The predicted traffic noise levels from Utility Tractor Rig (UTR) trucks on the drayage road would combine with the rail noise under Alternatives 5 and 6, and the additive level of up to 65 dB(A) DNL would exceed the No-Action level (53 dB(A) by up to 12 dB(A)), generating a major additive noise impact for those receptors.

Under Alternative 7, with higher train volumes at the track segment from Pittsburg Avenue to ICTF along the new Port drayage road in the vicinity of the eastern neighborhood boundary of the Chicora-Cherokee community, the additive traffic/rail DNL of up to 71 dB(A) would exceed the No-Action

levels by up to 18 dB(A), producing a major additive noise impact at the nearest residences. The second and third rows of residences along the property line are also expected to experience somewhat lesser major to moderate additive noise impacts.

Noise sensitive receptors along Noisette Boulevard in the vicinity of the River Center site would experience both traffic noise and ICTF operational noise under Alternatives 5, 6, and 7. The operational noise range would essentially remain unaffected when taking into account traffic noise. As the result, the River Center Site operational noise levels would, on average, exceed the noise levels generated by traffic on Noisette Boulevard, and the noise impact analysis of sub-section 4.12.7.5 remains valid.

4.12.11 Summary of Impacts Table

The noise impact analyses are summarized above for the No-Action Alternative and Alternatives 1 through 7, and in Appendix H. The traffic noise receptors analyzed are presented in Figures 4.12-1 and Appendix H. The rail segments analyzed are shown in Figure 4.12-2, with the related rail noise contours provided in Figures 4.12-4 through 4.12-14.

Table 4.12-26 summarizes the impacts due to traffic noise, rail noise, rail vibration, facility construction, and facility operation, and additive noise impacts for all potential build alternatives as compared to the No-Action Alternative. The numbers in parentheses for the traffic and rail noise impacts indicate the exterior impact values in comparison with the exterior noise levels for the No-Action Alternative. For the rail vibration impacts, the numbers in parenthesis indicate comparison with the impact criterion of 80 VdB. Construction noise impacts are shown in comparison with the impact threshold value of 80 dB(A) (see subsection 4.12.1.4). Operational noise impacts are shown in comparison with the exterior No-Action daytime and nighttime ambient noise levels for the related residential community indicated in Table 4.12-5.

Table 4.12-27
Summary of Impacts, Noise and Vibration

Alternative	Traffic Noise Impacts	Rail Noise Impacts	Rail Vibration Impacts	Construction Noise Impacts	Operational Noise Impacts	Additive Noise Impacts
***No-Action**	None	None	None	None	None	None
1: *Proposed Project: Milford / Hospital District*	Negligible impact [0 to 2 dB(A)]. Negligible beneficial effect for several street segments.	Minor to Moderate impact [(3 to 10 dB(A)] along several segments due to increased rail activity and new track builds.	Negligible impact (below 80 VdB)	Minor to Moderate impact [3 to 9 dB(A)] in the vicinity of noise berm due to frequent operations of construction equipment.	Minor to Moderate exterior daytime impact [4 to 7 dB(A)] and major exterior nighttime impact [14 to 17 dB(A)]**.	Negligible [Virginia Avenue (Traffic + Rail Noise)] Minor to Moderate [St. Johns Avenue (Traffic + Rail Noise)]

Alternative	Traffic Noise Impacts	Rail Noise Impacts	Rail Vibration Impacts	Construction Noise Impacts	Operational Noise Impacts	Additive Noise Impacts
2: *Milford / S-line*	Similar to Alternative 1 (Proposed Project).	Minor to Moderate impact [(3 to 10 dB(A)] along several segments due to increased rail activity and new track builds. Major impact [above 10 dB(A)] for up to 4 land uses along one future track segment.	Negligible impact (below 80 VdB) for the majority of receptors. Potential impact for two or three receptors near curved track of S-line.	Similar to Alternative 1 (Proposed Project).	Similar to Alternative 1 (Proposed Project).	Negligible [Virginia Avenue and Spruill Avenue (Traffic + Rail Noise)]
3: *Kingsworth/ Hospital District*	Similar to Alternative 1 (Proposed Project).	Similar to Alternative 1 (Proposed Project).	Negligible impact (below 80 VdB) for the majority of receptors. Potential impact for one or two receptors near curved track at Kingsworth Avenue.	Similar to Alternative 1 (Proposed Project).	Similar to Alternative 1 (Proposed Project).	Similar to Alternative 1 (Proposed Project).
4: *Milford*	Similar to Alternative 1 (Proposed Project).	Minor to Moderate impact [(3 to 10 dB(A)] along several segments due to increased rail activity in the southern alignment.	Similar to Alternative 1 (Proposed Project).	Similar to Alternative 1 (Proposed Project).	Similar to Alternative 1 (Proposed Project).	n/a
5: *River Center Project Site: Milford /Hospital District*	Negligible impact [0 to 2 dB(A)]. Minor to Moderate impact [4 to 7 dB(A)] along one future road.	Minor to Moderate impact [(3 to 10 dB(A)] along several segments due to increased rail activity and new track builds. Moderate impact [(5 to 10 dB(A)] along one new build future segment.	Negligible impact (below 80 VdB).	Minor to Moderate impact [3 to 10 dB(A)] in the vicinity of construction activities due to frequent operations of construction equipment.	Negligible exterior daytime impact [0 to 2 dB(A)] and Moderate to Major exterior nighttime impact [9 to 12 dB(A)]**.	Negligible (daytime) Moderate to Major (nighttime) [Noisette Boulevard (Traffic + Operations)] Negligible [Virginia Avenue (Traffic + Rail Noise)] Major [Port drayage road (Traffic + Rail)]

Alternative	Traffic Noise Impacts	Rail Noise Impacts	Rail Vibration Impacts	Construction Noise Impacts	Operational Noise Impacts	Additive Noise Impacts
6: *River Center Project Site: Kingsworth /Hospital District*	Similar to Alternative 5.	Minor to Moderate impact [(3 to 10 dB(A)] along several segments due to increased rail activity and new track builds. Moderate impact [(5 to 10 dB(A)] along one new build future segment.	Negligible impact (below 80 VdB) for the majority of receptors. Potential impact for one or two receptors near curved track at Kingsworth.	Similar to Alternative 5.	Similar to Alternative 5.	Similar to Alternative 5.
7: *River Center Project Site: Milford*	Similar to Alternative 5.	Minor to Moderate impact [(3 to 10 dB(A)] along several segments due to increased rail activity in the southern alignment. Moderate impact [(5 to 10 dB(A)] along one new build future segment.	Similar to Alternative 5.	Similar to Alternative 5.	Similar to Alternative 5.	Major [Port drayage road (Traffic + Rail)] Negligible (daytime) Moderate to Major (nighttime) [Noisette Boulevard (Traffic + Operations)]

Traffic Noise Impact Definitions

Negligible = 0–3 dB(A) increase in Leq(h); **Minor** = 3–5 dB(A) increase in Leq(h);
Moderate = 5–10 dB(A) increase in Leq(h)**; Major** = Increase in Leq(h) greater than 10 dB(A)

Rail Noise Impact Definitions

Negligible = 0–3 dB(A) increase in DNL; **Minor** = 3–5 dB(A) increase in DNL;
Moderate = 5–10 dB(A) increase in DNL; **Major** = increase in DNL greater than 10 dB(A)

Rail Vibration Impact Definitions

Negligible = less than 80 VdB based on FTA recommended impact criterion for ground-borne vibration.

Construction Noise Impact Definitions

No standard criteria have been developed at the federal or state level for assessing construction noise impacts. Noise assessment has been conducted in accordance with FHWA's Roadway Construction Noise Model (See Impact Definitions above for Traffic Noise). Construction noise would be tolerable due to temporary nature of the disturbance.

Operational Noise Impact Definitions

Negligible = 0–3 dB(A) increase in Leq(h); **Minor** = 3–5 dB(A) increase in Leq(h);
Moderate = 5–10 dB(A) increase in Leq(h); **Major** = Increase in Leq(h) greater than 10 dB(A).

*No-Action noise level increase versus existing conditions does not constitute a project-related noise impact.
**Refer to subsections 4.12.3.5 and 4.12.7.5 for information on exterior to interior noise reduction.

4.12.12 Mitigation

4.12.12.1 Applicant's Proposed Avoidance and Minimization Measures

The Applicant has committed to several measures that avoid and/or minimize potential impacts of Alternative 1 (Proposed Project). These measures are taken from Palmetto Railways Mitigation Plan provided in Appendix N. Some of these measures are required under federal, state, and local permits; others are measures that Palmetto Railways has incorporated into the design and operations of Alternative 1 (Proposed Project). Each mitigation measure is also designated as one that either helps to avoid an impact or one that minimizes an impact.

- To minimize noise impacts associated with operation of the site, the facility will use state-of-the-art equipment, such as electric wide-span gantry cranes, that will minimize sound emissions during operations. (Minimization)
- To further minimize noise impacts to the communities adjacent to the proposed facility, an earthen berm will be used to mitigate the noise/visual impacts. The earthen berm is planned for the western boundary of the site between the facility and adjacent neighborhoods. (Minimization)
- To minimize the impact of vibrations on the adjacent community, the Applicant will create a 100-foot buffer to the west of the current property line. This is expected to reduce the impacts of property damage, deterioration of residents' foundations, and structural damage to homes as it relates to vibrations associated with the construction and operations of the facility. (Minimization)
- One sound attenuation and security wall will be used, where appropriate, in place of the earthen berm adjacent to waters of the U.S. to avoid filling wetlands. One sound-attenuation wall will be located at the northern end of the earthen berm. Two sound attenuation walls will be used to minimize noise and visual impacts in two areas along the northern rail connection. (Minimization)
- The Applicant and the City of North Charleston are collaborating on the design of a mutually agreeable landscaping program for the ICTF. (Minimization)
- Support the Cities of Charleston and North Charleston, and Class I Rail Carriers, in the establishment of rail "Quiet Zones[86]. (Minimization)*
- The existing topography of the North Lead will require a substantial cut (trench) section to provide adequate grades to accommodate train movements. This cut section will mitigate visual and noise impacts that may result from the movement of trains in and out of the facility from the north. (Minimization)

[86] In order to mitigate the effects of train horn noise, communities can establish "Quiet Zones" where horns are not needed due to safety improvements at the grade crossings. A guide to the quiet zone establishment process can be found at: www.fra.gov under Railroad Safety: "FRA Train Horn Rule and Quiet Zones."

- Provide relocation services for a period of 3 years to owner-occupied residential property owners who reside in the Relocation Area from 100 feet of the Project up to North Carolina Avenue. (Minimization)

These avoidance and minimization measures, except the items noted with an asterisk (*), have been considered in the preceding impact analysis. The complete list of Applicant-proposed avoidance and minimization measures related to noise and vibrations is also provided in Chapter 6.

4.12.12.2 Additional Potential Mitigation Measures

No additional mitigation measures for Noise and Vibration have been recommended by the Corps. Additional avoidance, minimization, and mitigation may be considered by the Corps in its decision-making process. Final mitigation measures may be adopted as conditions of the DA permit and documented in the Record of Decision (ROD).

4.13 AIR QUALITY

4.13.1 Methods and Impact Definitions

Impacts on Air Quality by Alternative 1 (Proposed Project) and the alternatives were evaluated by estimating the criteria pollutant and Hazardous Air Pollutant (HAP) emissions associated with each alternative's construction and operation. As discussed in Chapter 3, criteria pollutants of concern for this Project include CO, NO_2, O_3, $PM_{2.5}$, PM_{10}, and SO_2. NO_2 impacts are commonly evaluated by analyzing NO_x, which is done in this analysis. O_3 is not directly emitted, but rather formed in the air through a photochemical reaction of NO_x and VOCs, referred to as O_3 precursors. O_3 impacts are evaluated by analyzing NO_x and VOC emissions. All sources of criteria pollutant and HAP emissions that were reasonably foreseeable were included in this analysis. Air emissions were evaluated for the full build-out year 2038 to best represent the air emissions at full operating capacity. Accordingly, 2038 criteria pollutant and HAP emissions inventories represent the criteria pollutant and HAP emissions for all operating years after 2038, and a conservative estimate for interim years between opening year 2018 and full build-out year 2038.

4.13.1.1 Construction NAAQS Emissions Inventory

Construction period criteria pollutant emissions inventories of CO, NO_x, $PM_{2.5}$, PM_{10}, SO_2, and VOCs included emissions from construction equipment exhaust, haul truck trips for importing and exporting material, and worker and vendor commute to and from the construction sites. Pollutant emissions would also be caused by off-gassing emissions from solvents in architectural paints and asphalt paving. Additionally, particulate matter would be emitted from surface disturbance activities, building demolition, the material movement of imports and exports, and on-road vehicle activity. Pollutant emissions from each of these activities were quantified using the EPA Motor Vehicle Emissions Simulator (MOVES) model, EPA guidance, activity information provided by Palmetto

Railways, and assumptions and other sources where necessary. All criteria pollutant emission calculations, assumptions, guidance references, data, and model runs are included in the Air Quality and Climate Change Technical Memorandum (Appendix I).

4.13.1.2 Operational NAAQS Criteria Pollutant Emissions Inventory

Operational criteria pollutant emissions of CO, NO_x, $PM_{2.5}$, PM_{10}, SO_2, and VOCs included emissions from locomotive activity, Over-the-Road (OTR) truck trips and idling, Utility Tractor Rig (UTR) truck trips and idling, and worker commute. Locomotive pollutant emissions were estimated for off-terminal line haul activity, on-terminal line haul activity, and switch locomotive activity. Line haul locomotives are used to move freight. Switch locomotives are used to put rail cars together to form trains within or around a railyard. They are also referred to as "switchers." Pollutant emissions from each of these activities were quantified using the EPA Motor Vehicle Emissions Simulator (MOVES) model, EPA guidance, activity information provided by Palmetto Railways, and assumptions and other sources where necessary. It is common for intermodal container transfer facilities to use off-road equipment such as forklifts and cranes during operations; however, Alternative 1 (Proposed Project) and the build alternatives would utilize electric equipment, including gantry cranes. Electric equipment does not directly emit air pollutants so pollutant emissions from these sources are not quantified. All criteria pollutant emission calculations, assumptions, and model runs are included in Appendix I.

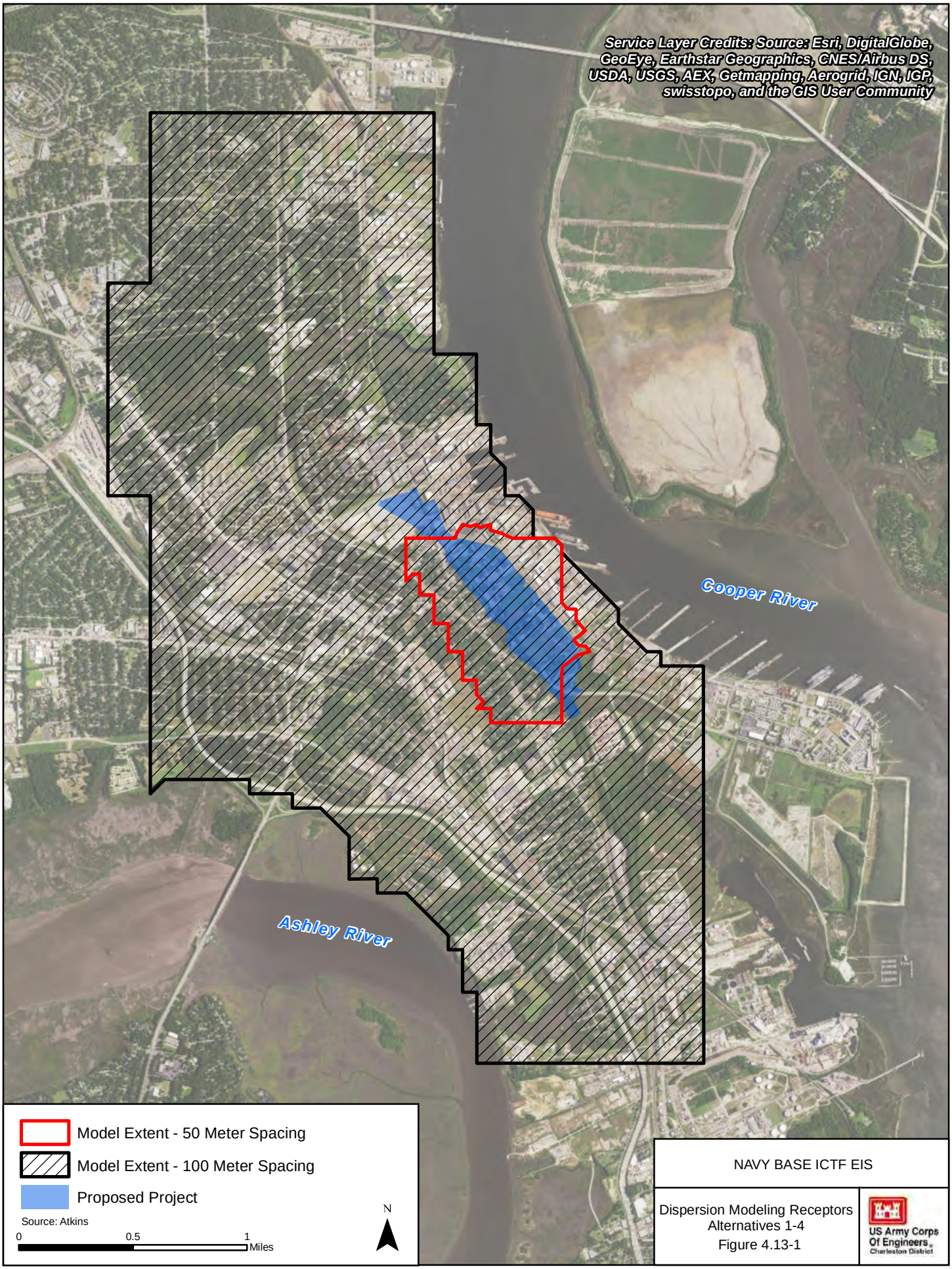
4.13.1.3 NAAQS Dispersion Modeling

In addition to criteria pollutant emissions inventories, which are reported in tons of each pollutant, dispersion modeling was included in this analysis to evaluate compliance with the of CO, NO_2, $PM_{2.5}$, PM_{10}, and SO_2 NAAQS. All dispersion modeling calculations, assumptions, data, and model runs are included in Appendix I. As discussed in Section 3.13, lead would not be emitted from the Proposed Project and alternatives, and is not included in this analysis. Ozone is not emitted directly from the combustion of fuels, but is formed through photochemical reactions. Ozone is generally modelled at the regional scale and is not included in the dispersion modeling of this analysis. While emissions inventories provide valuable information of how much of each pollutant the Proposed Project and alternatives would emit annually, the inventories do not show how much of each pollutant would be in the air at any given time or location. Therefore, an air emissions inventory alone does not provide a direct correlation to air pollutant concentrations. When a pollutant is emitted from a source, such as exhaust from a passenger car, it is dispersed in the air and becomes less potent or less concentrated as it is dispersed. Concentration of the criteria pollutants emitted from the operation of the Proposed Project and alternatives were estimated using the AERMOD Dispersion Model.

The AERMOD Dispersion Model was selected as the appropriate dispersion model for criteria pollutants because it is a preferred or recommended dispersion model as listed in Appendix W by the

EPA (EPA 2005). The American Meteorological Society/Environmental Protection Agency Regulatory Model Improvement Committee (AERMIC) was formed to introduce state-of-the-art modeling concepts into the EPA's air quality models. Through AERMIC, the modeling system, AERMOD, was introduced that incorporated air dispersion based on planetary boundary layer turbulence structure and scaling concepts, including treatment of both surface and elevated sources, and both simple and complex terrain. The AERMOD Dispersion Model is a stationary source dispersion model. Although many of the pollutant sources of the Proposed Project and alternatives would be considered mobile sources, such as the UTR and OTR trucks traveling on roadways, these can be modeled as line sources in AERMOD, as is supported in SCDHEC guidance (SCDHEC 2001). For these reasons, AERMOD was selected as the appropriate dispersion model for criteria pollutants.

AERMOD requires meteorological, terrain, receptor, and pollutant source data inputs. Meteorology and terrain data were taken from SCDHEC. The model receptor grid extents and spacing included in the dispersion modeling for the Proposed Project and alternatives are shown in Figure 4.13-1 and Figure 4.13-2. Receptors grids were placed in the study area at 50 meters spacing between the boundaries of the Project site and River Center project site and 300 meters from them. Receptors grids were then placed at 100 meters spacing from 300 meters from the sites to at least a quarter mile (1,320 feet) from the pollutant source. More information on the model receptor grid is provided in Appendix I. The sources included in the model were proposed off-terminal line haul rail, on-terminal line haul rail, switch locomotives, UTR trucks on the private drayage road, UTR truck on-site idling, OTR trucks on public roads, OTR truck on-site idling, and on-road passenger vehicles. The OTR truck activity and worker commute from the Proposed Project and alternatives on public roadways could not be isolated. Rather, all passenger car and truck traffic were included in the roadway sources, as is presented in the transportation analysis (Appendix F – Transportation Analysis Technical Memorandum). The analysis in Appendix F includes over 200 roadway links; however, this air quality analysis has a more narrowed scope and does not need all roadways links modeled to provide a reasonable estimate of air quality impacts. To reduce the number of roadway links included in the air dispersion model, a screening process was applied, which limited the public roadways.


Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community
Cooper River
Ashley River
Model Extent - 50 Meter Spacing
Model Extent - 100 Meter Spacing
Proposed Project
Source: Atkins
0
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1
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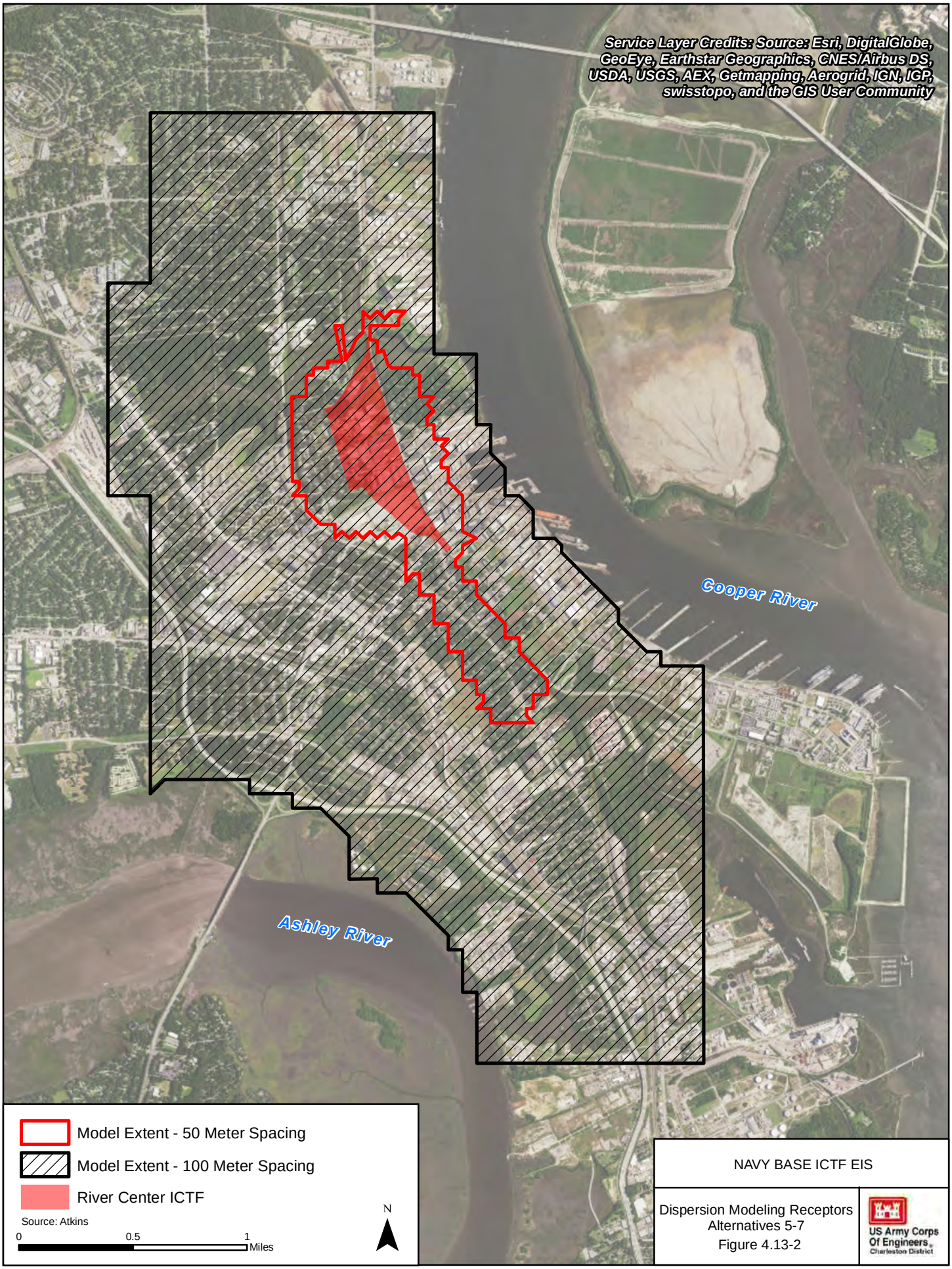
NAVY BASE ICTF EIS
Dispersion Modeling Receptors
Alternatives 1-4
Figure 4.13-1
US Army Corps Of Engineers
Charleston District


Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community
Cooper River
Ashley River
Model Extent - 50 Meter Spacing
Model Extent - 100 Meter Spacing
River Center ICTF
Source: Atkins
0
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1
Miles
N
NAVY BASE ICTF EIS
Dispersion Modeling Receptors
Alternatives 5-7
Figure 4.13-2
US Army Corps Of Engineers
Charleston District

Model source input emission rates were developed for each source from the same data used to develop the operational criteria pollutant emissions inventories, as well as additional data taken from the Appendix F and other sources as necessary. In addition to emission rates, the pollutant sources in the AERMOD model also included inputs for plume width, plume height, and flagpole receptor height. To analyze criteria pollutant air quality impacts, the model outputs were added to the SCDHEC background concentrations and pollutant levels anticipated from the HLT at the CNC, which had not yet been operating at the time of the most recent ambient air monitoring. SCDHEC background concentrations for modeling purposes were used to establish a baseline of the existing air quality. Every criteria pollutant is not monitored within the community. Therefore, the most representative monitoring station was used as a proxy for the lack of local monitoring data. The source of background concentrations and their representativeness are included in Appendix I. The sum of these three concentrations represents the total estimated pollutant concentrations at the full build-out of the Proposed Project and were compared to the NAAQS. All dispersion modeling calculations, assumptions, data, and model runs are included in Appendix I.

4.13.1.4 Hazardous Air Pollutants (HAP)

The CAA Amendments of 1990 listed 188 HAPs and addressed the need to control toxic emissions from transportation. In 2001, EPA issued its first Mobile Source Air Toxics Rule, which identified 21 mobile source air toxic (MSAT) compounds as being HAPs that required regulation. In addition, EPA identified seven compounds with significant contributions from mobile sources that are among the national and regional-scale cancer risk drivers from their 1999 National Air Toxics Assessment. These are acrolein, benzene, 1, 3-butidiene, diesel particulate matter (DPM) plus diesel exhaust organic gases, formaldehyde, naphthalene, and polycyclic organic matter. Therefore, this analysis focuses on the seven "priority" MSAT. Of the seven priority MSAT, DPM risk has been quantified and disclosed in the Health Risk Assessment section for Alternative 1 (Proposed Project) and alternatives. Further, DPM has become the dominant MSAT of concern. The remaining six MSAT (non-DPM HAPs) present a substantially lower health risk and, unlike the criteria pollutants, toxics do not have NAAQS, making evaluation of their impacts more subjective; however, generation of the non-DPM HAPs is provided herein for disclosure purposes. Acrolein is a prevalent pollutant in many communities; however, results of a short-term laboratory study conducted in 2010 raised significant questions about the consistency and reliability of acrolein monitoring results. It is one of the most difficult chemicals to measure in the air because it reacts easily with other chemicals to form other compounds thus complicating laboratory analysis. This means that although monitors detect acrolein in the air, precisely how much cannot be determined. In light of this uncertainty, EPA did not use acrolein monitoring data in evaluating the potential for health risks from exposure to air toxics in the School Air Toxics Monitoring Project. The EPA concluded that additional work is necessary to improve the accuracy of acrolein sample collection and analytical methods and is in the process of evaluating promising new technologies that may provide accurate data (EPA 2013). Although acrolein is a prevalent pollutant in many communities, quantifying it would include a higher level of

uncertainty compared to the other listed HAPs. Therefore, acrolein was not quantified in this analysis. Once emissions inventories were completed for each Project alternative, the amount of non-DPM HAPs emitted were calculated. Non-DPM HAPs are determined as a ratio of criteria pollutants (i.e., VOCs) discharged (Table 4.13-1). The ratios were obtained from EPA document Air Toxic Emissions from On-Road Vehicles in MOVES2014 and are detailed in the table below (EPA 2015a).

Table 4.13-1
HAP Ratios

Priority MSAT (non-DPM HAP)(1)	Proxy Pollutant	Ratio of MSAT to Proxy Pollutant
Benzene	VOC	0.01291
1,3-Butadiene	VOC	0.00080
Formaldehyde	VOC	0.21744
Naphthalene	VOC	0.01630
Polycyclic organic matter(2)	VOC	0.00130

(1) Acrolein is a non-DPM HAP, however it was not quantified due to its level of uncertainty.

(2) Polycyclic organic matter defines a broad class of compounds that includes polycyclic aromatic compounds. The EPA document, Air Toxic Emissions from On-Road Vehicles in MOVES2014, provides ratios for fifteen polycyclic aromatic compounds. A sum of the ratios for the fifteen compounds was used to represent the overall ratio for polycyclic organic matter.

Notes: All ratios were taken for 2007 and later diesel vehicles.

Source: EPA 2015a.

4.13.1.5 Health Risk Assessment

A human Health Risk Assessment (HRA) is the process to estimate the nature and probability of adverse health effects in humans who may be exposed to chemicals in contaminated environmental media, now or in the future. An evaluation of DPM was conducted using EPA protocols as listed in the Air Toxics Risk Assessment Reference Library Volume 1 (EPA 2004). The HRA includes four basic steps, presented below.

Planning, Scoping, and Problem Formulation is performed to identify the assessment questions, state the quantity and quality of data needed to answer those questions, establish the scope of this analysis, provide an in-depth discussion of how the analysis will be done, outline timing and resource considerations, identify product and documentation needs, and identify who will participate in the overall process from start to finish, along with their roles. During this process, an identification and evaluation of available data and ancillary information about the study area will be performed to help identify key chemicals, sources, and potential exposures, to determine what kind of analyses can be performed, and to establish the data gaps which need to be filled.

As described above, DPM is the HAP of concern for the Proposed Project and alternatives. The primary source of DPM associated with the Proposed Project and alternatives is diesel engines,

including the truck (UTR and OTR) and rail activity (line haul and switch locomotives). The concentration of DPM in the air would be necessary in evaluating its associated risk. DPM concentrations resulting from the Proposed Project and alternatives were modeled using the AERMOD dispersion model. The AERMOD Dispersion Model was selected as the appropriate dispersion model for DPM for the same reasons listed in section 4.13.1.3. The same data used in modeling criteria pollutants were also used for modeling DPM. All data, assumptions, and model information is provided in Appendix I.

Exposure Assessment is conducted to identify: (1) who is potentially exposed to air toxics; (2) what chemicals they may be exposed to; and (3) how they may be exposed to those chemicals, including the concentrations of chemicals in the air they breathe in.

Those who would be potentially exposed to air toxics from the Proposed Project and alternatives are people residing near the Project site and River Center project site. Residences within a quarter mile (1,320 feet) from the pollutant sources were included in the analysis. This population would be exposed to HAPs in the air; however, DPM is the pollutant of concern for this analysis because the other HAPs, which are listed in section 4.13.1.4, present a substantially lower health risk.

There are two exposure durations that are commonly used in exposure assessments: acute and chronic. Acute exposure refers to situations in which the exposure occurs over a short period of time (usually minutes, hours, or a day) and usually at relatively high concentrations. The averaging times commonly used to represent acute exposures concentrations are a 24-hour average, a 1-hour average, or a 15-minute average. Acute exposure may result in immediate respiratory and sensory irritation, chemical burns, narcosis, eye damage, and various other effects. Acute exposures also may result in longer-term health effects. Chronic exposure refers to situations in which the exposure occurs repeatedly over a long period of time (usually years to lifetime). Chronic exposures are relatively low in concentration and may result in health effects that do not show up immediately and that persist over the long term, such as cardiovascular disease, respiratory disease, liver and kidney disease, reproductive effects, neurological damage, and cancer (EPA 2004). Chronic exposure was included in this analysis due to the operational lifetime of the Proposed Project and alternatives, as well as the more severe health effects associated with chronic exposure.

Toxicity Assessment considers: (1) the types of adverse health effects associated with exposure to the chemicals in question; (2) the exposure circumstances associated with the effects (e.g., inhalation vs ingestion), and (3) the relationship between the amount of exposure and the resulting response (commonly referred to as the dose-response relationship).

DPM contains significant levels of fine particulates, which pose a significant health risk because they can pass through the nose and throat and lodge themselves in the lungs. These fine particles can cause lung damage and premature death. They can also aggravate conditions such as asthma and

bronchitis. In addition, in its health assessment for diesel engine exhaust, EPA concluded that chronic inhalation exposure is likely to pose a lung cancer hazard to humans (EPA 2006b).

Depending on the type of effect and the chemical, there are two types of dose-response values that traditionally may be derived: predictive cancer risk estimates, such as the inhalation unit risk (IUR) estimate, and predictive non-cancer estimates, such as the reference concentration (RfC). Both types of dose-response values may be developed for the same chemical, as appropriate. The IUR is the upper-bound excess lifetime cancer risk estimated to result from continuous exposure to an agent via inhalation per $\mu g/m^3$ over a lifetime. The EPA's s Office of Air Quality Planning and Standards has chronic toxicological values for risk assessments of HAPs, however there is none listed for the IUR of diesel engine emissions (EPA 2014e). The California Air Resources Board (ARB), which is part of the California EPA, published a report on diesel exhaust that reviewed human epidemiological studies of occupationally exposed populations, which are useful for quantitative risk assessment. The report demonstrated that the IUR based on human epidemiological data ranges from 1.3×10^{-4} to 2.4×10^{-3} $(\mu g/m^3)^{-1}$. After considering the results of the meta-analysis of human studies, as well as the detailed analysis of railroad workers, the report concludes that 3×10^{-4} $(\mu g/m^3)^{-1}$ is a reasonable estimate of unit risk expressed in terms of diesel particulate (ARB 1998). Thus, this IUR is used in this analysis.

The RfC is an estimate (with uncertainty spanning perhaps an order of magnitude) of a continuous inhalation exposure to the human population (including sensitive subpopulations) that is likely to be without an appreciable risk of deleterious effects during a lifetime. The RfC is generally used in noncancer health assessments. The RfC of DPM is 5 $\mu g/m^3$ (EPA 2014e).

Risk Characterization is the integration of information on hazard, exposure, and toxicity to provide an estimate of the likelihood that any of the identified adverse effects would occur in exposed people. Specifically, chemical-specific dose-response toxicity information is mathematically combined with modeled or monitored exposure estimates to give numbers that represent estimates of the potential for the exposure to cause an adverse health outcome. Risk characterization should be transparent, clear, consistent, and reasonable.

Quantification of risk and hazard is the step where exposure concentrations in air are combined with applicable inhalation dose-response values (the IUR and RfC). Predictive excess cancer risk estimates are presented separately from noncancer hazard quotients.

For inhalation exposures, chronic cancer risks for individual air toxics are typically estimated by multiplying the estimate of long-term exposure concentration (EC) by the corresponding IUR for each pollutant to estimate the potential incremental cancer risk for an individual (EPA 2004):

$$\text{Risk} = \text{EC} \times \text{IUR}$$

Where:

Risk = Cancer risk to an individual (expressed as an upper-bound risk of contracting cancer over a lifetime);
EC = Estimate of long-term inhalation exposure concentration for a specific air toxic; and
IUR = the corresponding inhalation unit risk estimate for that air toxic.

Performing the estimate in this way provides an estimate of the probability of developing cancer over a lifetime due to the exposure in question. Because of the way this equation is written, the underlying presumption is that a person is exposed continuously to the EC for their full lifetime (usually assumed to be 70 years). The EC used in this analysis is the maximum concentration output from the AERMOD dispersion model over a residence. The concentration represents an annual average that is averaged over five years. Model inputs, data, and assumptions are provided in Appendix I.

The potential risks calculated for specific inhalation exposures are excess or incremental risks; that is, they are potential risks that are in addition to those risks already faced by the population under study for reasons other than exposure to air toxics (e.g., hereditary, lifestyle risks such as smoking). Estimates of excess cancer risk are usually expressed as a statistical probability. For example, an additional risk of contracting cancer of one chance in 1,000,000 means that for every 1,000,000 people that are exposed, in the way that we have presumed, one of those people may develop cancer over their lifetime.

For inhalation exposures, noncancer hazards are estimated by dividing the estimate of the chronic inhalation EC by the RfC (EPA 2004):

$$\text{Noncancer Hazard} = EC / RfC$$

Where:

EC = estimate of chronic inhalation exposure to that air toxic; and
RfC = the corresponding reference concentration for that air toxic.

The EC used in this analysis is the maximum concentration output from the AERMOD dispersion model over a residence. The concentration represents an annual average that is averaged over five years. Model inputs, data, and assumptions are provided in Appendix I.

It is important to address variability and uncertainty in risk characterizations, as scientific uncertainty is inherent in the risk assessment process.

Variability refers to true heterogeneity or diversity. For example, among a local community that is exposed to an air toxic originating from the same source, and with all people breathing the same contaminant concentration in ambient air, the risks from inhalation of the contaminated air will still vary among the people in the population. This may be due to differences in exposure (i.e., different

people have different exposure frequencies and exposure durations), as well as differences in response (e.g., differences in metabolic processes of chemical uptake into target organs).

Uncertainty occurs because of a lack of knowledge. For example, we can be very certain that different people are exposed to contaminated air for different time periods, but we may be uncertain about how much variability there is in these exposure durations among the people in the population. Data may not be available concerning the amount of time specific people spend indoors at home, outdoors near home, or in other "microenvironments." Often, it is difficult to distinguish between uncertainty and variability in a risk assessment, particularly if available data are limited. For that reason, in many cases variability can be treated as a type of uncertainty in the risk assessment. Uncertainty is an inherent characteristic of each step of the risk assessment process.

Uncertainty, when applied to the process of risk assessment, is defined as "a lack of knowledge about specific factors, parameters, or models." Such uncertainties affect the confidence of any risk estimates that were developed for individuals exposed to the substances in question. It is important to keep in mind that many parameter values (e.g., emissions rates) may be *both* uncertain and variable. Also, the presence of uncertainty in risk assessment does not imply that the results of the risk assessment are wrong, but rather that the risks cannot be estimated beyond a certain degree of confidence (EPA 2004).

There is uncertainty inherent in the IUR and RfC. As described above, the ARB found a range of IUR values, and developed a reasonable value from the range. The RfC is also an estimate, with uncertainty spanning perhaps an order of magnitude. The EC taken from the AERMOD dispersion model also contains uncertainty, from both the AERMOD model inputs as well as the model itself. Even the perfect dispersion model is likely to have deviations from observed concentrations due to variations in unknown conditions (EPA 2005). The cancer risk equation presumes that a person is continuously exposed to the EC for 70 years. This means that the person would be standing outside their home continuously for 70 years. Further, the EC used in this analysis is the maximum concentration output from the AERMOD dispersion model over a residence. All nearby residents would not be exposed to this maximum concentration. In order to take into account the uncertainties in the science, the risk numbers used are plausible upper limits of the actual risk based on conservative assumptions. In actuality, the risk is probably somewhat lower than calculated, and in fact may be zero.

The full build-out year (2038) was selected for the Health Risk Assessment (HRA) rather than the opening year (2018) because the build-out would include full operation of the Project and worst-case traffic volumes on public roadways. The level of impact was determined based on the increment cancer risk and noncancer hazard. The No-Action Alternative served as the baseline condition and represents the projected 2038 traffic volumes, and rail operation in the study area without implementation of the Proposed Project. All HRA calculations and assumptions are included in Appendix I.

4.13.1.6 Impact Definitions

Impacts of criteria pollutants on air quality are analyzed by comparing Alternative 1 (Proposed Project) and alternatives criteria pollutant emissions inventories to the criteria pollutant emissions inventories of the study area (Tri-County area). Impacts are also analyzed by addressing if the criteria pollutant dispersion from the Proposed Project and alternatives would put the Tri-County area into non-attainment with the NAAQS. Impact definitions for criteria pollutants are in Table 4.13-2.

Table 4.13-2
Impact Definitions, Criteria Pollutants on Air Quality

Negligible	Minor	Major
Criteria pollutant emissions do not occur.	Criteria pollutant emissions would occur but not to the extent of putting the County in Non-Attainment.	Criteria pollutant emissions would occur to the extent of putting the County in Non-Attainment.

On July 28, 1987, Judge Robert Bork, writing for the D.C. Circuit Court of Appeals, remanded the vinyl chloride amendments to EPA, finding that the Agency had placed too great an emphasis on technical feasibility and cost rather than the provision of an "ample margin of safety" as required by the statue. The opinion also laid out a process for making decisions, consistent with the requirements of the law. The Bork opinion held that EPA must first determine a "safe" or acceptable" level considering only the potential health impacts of the pollutant. In September of 1989, EPA promulgated emission standards for several categories of benzene sources. EPA argued for the consideration of all relevant health information and established "presumptive benchmarks" for risks that would be deemed "acceptable." The goal, which came to be known as the "fuzzy bright line," is to protect the greatest number of persons possible to an individual lifetime risk no higher than one in one million and to limit to no higher than approximately 100 in one million the estimated maximum individual risk. The selection of even "fuzzy" risk targets placed greater emphasis on the development and communication of risk characterization results (EPA 2006b).

The level of total cancer risk that is of concern is a matter of personal, community, and regulatory judgment. In general, EPA considers excess cancer risks that are below about 1 per million to be so mall as to be negligible, and risks above 100 per million to be sufficiently large that some sort of remediation is desirable. Excess cancer risks that range between 1 per million and 100 per million are generally considered to be acceptable.

For noncancer hazard quotient, it is believed that a hazard quotient below 1 would have no appreciable risk that noncancer health effects would occur, although above 1 does not indicate an effect will definitely occur. The larger the hazard quotient value, the more likely it is that an adverse effect may occur (EPA 2015b). Impact definitions for HAPs are in Table 4.13-3.

Table 4.13-3
Impact Definitions, Hazardous Air Pollutants on Air Quality

Negligible	Acceptable	Unacceptable
HAPs emissions do not occur. Potential cancer risk would be below 1 per million. Potential noncancer hazard would be below 1.	HAPS emissions would occur. Potential cancer risk would be between 1 per million and 100 per million. Potential noncancer hazard would be above 1, but adverse effects are unlikely to occur.	HAPS emissions would occur. Potential cancer risk would be above 100 per million. Potential noncancer hazard quotient would be above 1 and adverse effects may occur.

4.13.2 No-Action Alternative

4.13.2.1 Construction Criteria Pollutant Emissions Inventory

Under the No-Action Alternative, application for the DA permit would be denied; the Proposed Project would not occur; CSX and NS would undertake operational and structural modifications to Ashley Junction and 7-Mile rail yards; and future use of the Proposed Project and River Center project sites would likely be mixed-use and industrial (e.g., rail-served warehousing distribution center). As such, the site would need to be built for these uses and construction activities would occur. Construction criteria pollutant emissions would be short term. Therefore, impacts resulting from the No-Action Alternative construction criteria pollutant emissions would be minor short-term adverse.

4.13.2.2 Operational Criteria Pollutant Emissions Inventory

Under the No-Action Alternative, existing rail yards would facilitate the transfer of the additional containers by rail. CSX and NS would do so by increasing the length of existing trains to accommodate more containers per train. Additional trains and locomotive engines would not be used under the No-Action Alternative. Therefore, for the No-Action Alternative there would be no increase in criteria pollutant emissions due to locomotive activity. The Corps assumes that the existing facility workers would be sufficient for the increase in container throughput; therefore, there is no increase in criteria pollutant emissions due to worker commute for the No-Action Alternative. Further, under the No-Action Alternative, the Proposed Project and River Center project sites would not be constructed and operated, including the private drayage road. Therefore, it is assumed that additional UTR trucks would not be operated under the No-Action Alternative, and OTR trucks would be used to transport all additional containers from existing terminals to the CSX and NS facilities. It is common for intermodal container transfer facilities to use off-road equipment, such as forklifts and cranes, in its operations; however, CSX and NS crane and forklift activity was unavailable. Although it is reasonable to assume that some activity would take place, criteria pollutant emissions from on-site off-road equipment was not quantified.

Therefore, criteria pollutant emissions due to operational activities of the No-Action Alternative would include running emissions from OTR truck trips and idling emissions from idling on-site at the Ashley Junction and 7-Mile rail yards. An idle time of 15 minutes was assumed per truckload. The operational criteria pollutant emissions inventory for the No-Action Alternative is in Table 4.13-4. Criteria pollutants emitted from the study area (Tri-County area) were taken from the 2011 EPA NEI and compared to the No-Action Alternative inventory in Table 4.13-5 (EPA 2015c).

Table 4.13-4
Annual Operational Criteria Pollutant Emissions Inventory, No-Action Alternative

Activity	Criteria Pollutant (tons)					
	CO	NO_x	PM_{10}	$PM_{2.5}$	SO_2	VOC
Off-Terminal Line Haul Locomotive	0	0	0	0	0	0
On-Terminal Line Haul Locomotive	0	0	0	0	0	0
Switch Locomotive	0	0	0	0	0	0
UTR Truck Running	0	0	0	0	0	0
UTR Truck Idling	0	0	0	0	0	0
OTR Truck Running	8.4	42.4	0.5	0.5	0.3	2.2
OTR Truck Idling	13.8	29.0	0.1	0.1	<0.1	4.2
Worker Commute	0	0	0	0	0	0
On-site Offroad Equipment	0	0	0	0	0	0
Total	**22.1**	**71.4**	**0.7**	**0.6**	**0.3**	**6.4**

Source: EPA 2014f.

Table 4.13-5
Comparison of Study Area Criteria Pollutant Emissions Inventory to No-Action Alternative Emissions

Criteria Pollutant	Tri-County Area Emissions Inventory (ton)	No-Action Emissions Compared to Total Inventory (percentage)
CO	230,292.8	0.010%
NO_x	36,526.0	0.195%
PM_{10}	26,159.7	0.003%
$PM_{2.5}$	11,299.7	0.005%
SO_2	26,442.8	0.001%
VOC	122,145.5	0.005%

Notes: Percentages developed using No-Action Alternative emissions shown in Table 4.13-7.

Source: EPA 2015c, 2015m.

Criteria pollutant emissions from the No-Action Alternative would equal less than 1 percent of the total criteria pollutants emitted in the study area. Impacts of Criteria Pollutants from the Operational Inventory of the No-Action Alternative would be minor permanent adverse.

4.13.2.3 Criteria Pollutant Dispersion Modeling

As discussed in section 4.13.1.3, OTR truck activity and worker commute on public roadways could not be isolated and so all passenger car and truck traffic were included in the dispersion modeling for the Proposed Project and alternatives. After applying the screening process to the roadway links in the No-Action Alternative, 34 roadway sources were included in the dispersion modeling. All other pollutant sources (locomotive, UTR, and OTR idling activities) were not included in the dispersion modeling for the No-Action Alternative. As such, the air dispersion model outputs for the No-Action Alternative represent the concentrations, ppm, and ppb of criteria pollutants from selected roadway sources in the study area for 2038. These outputs were added to the SCDHEC background concentrations and the HLT estimated pollutant levels, which were added because they are not reflected in the monitoring for the study area, as the HLT had not yet been operating. No-Action Alternative dispersion modeling outputs, background concentrations, estimated HLT emissions, and NAAQS compliance demonstration are included the Table 4.13-6.

As shown in Table 4.13-6, criteria pollutants emitted from the No-Action Alternative, along with the background concentrations and projected criteria pollutant levels, would not exceed the applicable NAAQS; therefore, the No-Action Alternative would not put the Tri-County area into non-attainment for any NAAQS. Impacts to air quality from the No-Action Alternative on criteria pollutants would be minor permanent adverse.

Table 4.13-6
Criteria Pollutant Dispersion Modeling, No-Action Alternative

Pollutant		Average Time	AERMOD Output	Background Concentrations(1)	HLT	Total Impact	NAAQS	NAAQS exceeded ?
Carbon Monoxide		8-hour	0.046 ppm	0.80 ppm	0.14 ppm	0.986 ppm	9 ppm	No
		1-hour	0.073 ppm	1.27 ppm	0.504 ppm	1.847 ppm	35 ppm	No
Nitrogen Dioxide		1-hour	9.324 ppb	38.35 ppb	Not Modeled	47.674 ppb	100 ppb	No
		Annual	1.352 ppb	6.60 ppb	1.59 ppb	9.542 ppb	53 ppb	No
Particle Pollution	***$PM_{2.5}$***	Annual	0.066 µg/m^3	7.6 µg/m^3	0.006 µg/m^3	7.672 µg/m^3	12 µg/m^3	No
		Annual	0.066 µg/m^3	7.6 µg/m^3	0.006 µg/m^3	7.672 µg/m^3	15 µg/m^3	No
		24-hour	0.129 µg/m^3	16 µg/m^3	0.37 µg/m^3	16.499 µg/m^3	35 µg/m^3	No
	PM_{10}	24-hour	0.197 µg/m^3	49 µg/m^3	6.00 µg/m^3	55.197 µg/m^3	150 µg/m^3	No
Sulfur Dioxide		1-hour	0.128 ppb	16.0 ppb	Not Modeled	16.128 ppb	75 ppb	No
		3-hour	<0.001 ppm	0.014 ppm	0.057 ppm	0.071 ppm	0.5 ppm	No

Notes and Acronyms:

µg/m^3 = micrograms per cubic meter

NAAQS = National Ambient Air Quality Standard

ppm =parts per million

ppb = parts per billion

The maximum AERMOD impact output over a receptor is shown.

AERMOD outputs are in µg/m^3. Criteria pollutants in ppm and ppb were converted from µg/m^3 to their appropriate unit. The NAAQS for PM2.5 has primary and secondary standards for the annual averaging time; 12 µg/m^3 is the primary standard and 15 µg/m^3 is the secondary standard.

HLT impacts are shown for the year 2025, which is its full build-out year. These impacts are added because they are not reflected in the 2013 ambient air monitoring for the study area, as the SCPA Marine Container Terminal had not yet been operating.

(1) Background concentration values used are the most recent design values from the most representative or conservative site as posted on the SCDHEC website that are developed specifically for dispersion modeling (http://www.scdhec.gov/Environment/AirQuality/ComplianceandReporting/AirDispersionModeling/ModelingData/). Background concentration values are in µg/m^3. Criteria pollutants in ppm and ppb were converted from µg/m^3 to their appropriate unit.

Sources: SCDHEC 2015d, Lakes 2015, EPA 2015o.

4.13.2.4 Hazardous Air Pollutants (HAPs)

HAPs emitted from the No-Action Alternative the study area (Tri-County area) were taken from the 2011 EPA NEI HAPS and are compared in Table 4.13-7.

Table 4.13-7
Comparison of Study Area HAP Emissions to No-Action Alternative HAP Emissions

Priority MSAT	No-Action Alternative HAP Emissions (ton)	Tri-County Area HAP Emissions (ton)	Compared Percentage of HAPS from No-Action
Benzene	0.083	566.7	0.015%
1,3-Butadiene	0.005	125.4	0.004%
Formaldehyde	1.394	2,192.6	0.064%
Naphthalene	0.104	1,991.0	0.005%
Polycyclic organic matter	0.008	158.8	0.005%

Notes and Acronyms:

Acrolein is a non-DPM HAP, however it was not quantified or included due to its level of uncertainty.

The EPA NEI 2011 did not include emissions of naphthalene and Polycyclic organic matter. These emissions were calculated from the VOC emissions reported in the EPA NEI 2011 and the MSAT ratios listed in Table 4.13-1.

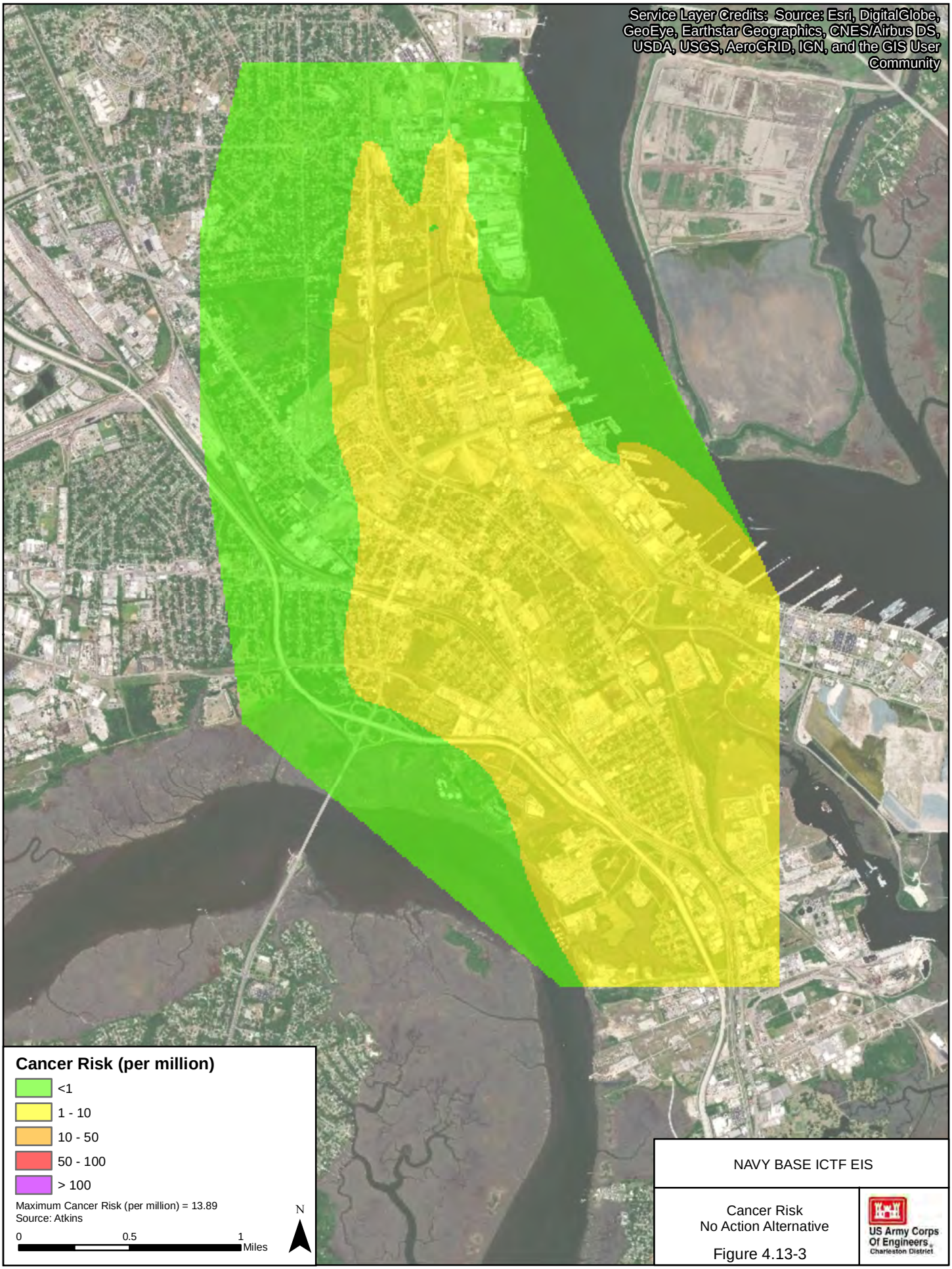
Source: EPA 2015a, 2015c, 2015m.

Non-DPM HAP emissions from the No-Action Alternative would each equal less than one-tenth of 1 percent of the total HAPs emitted in the study area. Impacts of non-DPM HAPs from the Operational Inventory of the No-Action Alternative would be acceptable.

4.13.2.5 Health Risk Assessment

The same model inputs and assumptions were used for the DPM dispersion modeling as for the criteria pollutant dispersion modeling, with the exception of gasoline passenger cars being excluded from the DPM modeling, represented as the Worker Commute Source Group. The No-Action Alternative therefore represents the projected 2038 traffic volumes, and rail operation in the study area for selected roadways. Under the No-Action Alternative, existing rail yards would facilitate the transfer of the additional containers by rail. As such, there would not be additional rail, UTR truck, OTR truck idling, or on-site offroad equipment activity at the Proposed Project and River Center project sites. There would be an increase in traffic volumes on public roadways, represented by the OTR Truck Running and Worker Commute Source Groups.

The AERMOD model output is in concentration of DPM ($\mu g/m^3$), which is then converted to cancer risk per million people and noncancer hazard. An emission density map of the cancer risk of the No-Action Alternative is in Figure 4.13-3. This figure is presented to demonstrate the dispersion of DPM


Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Cancer Risk (per million)
<1
1 - 10
10 - 50
50 - 100
> 100
Maximum Cancer Risk (per million) = 13.89
Source: Atkins
0
0.5
1
Miles
N
NAVY BASE ICTF EIS
Cancer Risk
No Action Alternative
Figure 4.13-3
US Army Corps Of Engineers
Charleston District

and corresponding health risk over the potentially exposed population. All dispersion modeling assumptions, data, and HRA calculations are included in Appendix I.

The maximum potential cancer risk is the highest estimated cancer risk at a residence for the No-Action Alternative and is analyzed to demonstrate the worst-case scenario. Contribution by source group is shown in Table 4.13-8. As shown in Table 4.13-8, OTR Truck Running is the only source group contributing to the No-Action Alternative cancer risk. The table also shows the maximum noncancer hazard.

Table 4.13-8
Cancer Risk and Noncancer Hazard by Source Group, No-Action Alternative

Source Group	DPM Concentration ($\mu g/m^3$)	Cancer Risk (per million)	Noncancer Hazard	Source Group Contribution
Line Haul Rail	0.00000	0.00	0.000	0.00%
Switch Rail	0.00000	0.00	0.000	0.00%
UTR Truck Running	0.00000	0.00	0.000	0.00%
UTR Truck Idling	0.00000	0.00	0.000	0.00%
OTR Truck Running	0.03185	9.55	0.006	100.00%
OTR Truck Idling	0.00000	0.00	0.000	0.00%
Worker Commute	0.00000	0.00	0.000	0.00%
On-site Offroad Equipment	0.00000	0.00	0.000	0.00%
Total	**0.03185**	**9.55**	**0.006**	**100.00%**

Notes and Acronyms:

DPM = Diesel Particulate Matter

UTR = Utility Tractor Rigs

OTR = Over the Road

The Line Haul Rail Source Group includes emissions from both Off-Terminal Line Haul and On-Terminal Line Haul Rail.

UTR Truck Running is from the drayage road.

OTR Truck Running includes all trucks on public roadways.

Worker Commute was not included in DPM dispersion modeling because gasoline passenger cars were the assumed vehicle, which are not DPM sources.

Source: Lakes 2015, EPA 2004, 2015d.

The maximum potential cancer risk from the No-Action Alternative would occur near the intersection of U.S. Highway 78 (King Street Ext) and Discher because of the proximity of the I-26, U.S. Highway 78, and Meeting Street, which were all included in the dispersion model. The maximum potential cancer risk from the No-Action Alternative falls between 1 per million and 100 per million, which is within the acceptable risk range (EPA 2006b). When discussing risks it is important to provide the size of risks in context.

The cancer risk is the likelihood, or chance, of getting cancer. The term "excess cancer risk" is used because people also have a "background risk" of about 4 in 10 chances of being diagnosed with cancer in their lifetimes (NCI 2015). In other words, in a million people, it is expected that 400,000 individuals would get cancer from a variety of causes. If there is a "one in a million" excess cancer risk from a given exposure to a contaminant, it means that if one million people are exposed to a carcinogen at a certain concentration over their lifetime, then one cancer above the background chance, or the 400,000th cancer, may appear in those million persons from that particular exposure. To further put risk in perspective, Figure 4.13-4 shows a variety of risks on a scale from 1 chance in 10 (100,000 per million), 1 chance in 10,000 (100 per million), to 1 chance per million (1 per million) (EPA 1991). A risk of 9.55 per million is close to the equivalent of 1 chance per 100,000 in Figure 4.13-4.

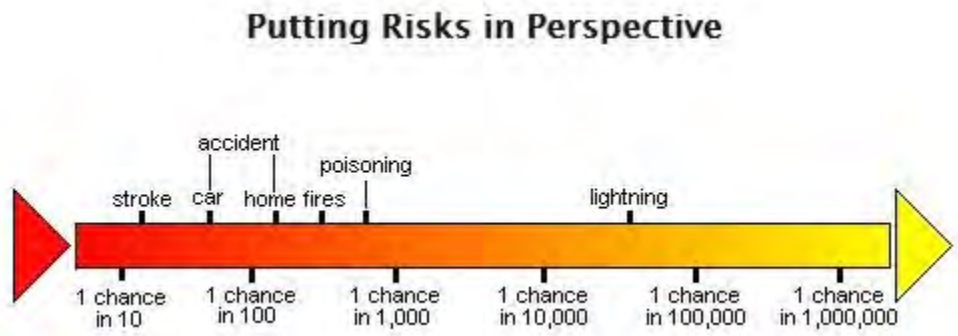


Figure 4.13-4: Putting Risks in Perspective (EPA 1991)

The maximum potential cancer risk from the No-Action Alternative falls between 1 per million and 100 per million, which is within the acceptable risk range (EPA 2006b). Impacts from the potential maximum cancer risk from the No-Action Alternative would be acceptable. The maximum noncancer hazard for the No-Action Alternative would be below 1. Impacts from the No-Action Alternative from noncancer hazard would be negligible.

4.13.3 Alternative 1: Proposed Project (South via Milford / North via Hospital District)

4.13.3.1 Construction Criteria Pollutant Emissions Inventory

Under Alternative 1 (Proposed Project), criteria pollutant emissions from construction activities including operation of construction equipment, haul truck trips for the import and export of material, and commutes by construction workers and vendors would occur. Total criteria pollutant emissions from construction are shown below in Table 4.13-9.

Table 4.13-9
Total Construction Criteria Pollutant Emissions Inventory, Alternative 1 (Proposed Project)

Activity	Criteria Pollutant (tons)					
	CO	NO_x	PM_{10}	$PM_{2.5}$	SO_2	VOC
Construction Equipment Exhaust	149.5	345.1	22.0	21.4	0.5	36.2
Haul Truck Exhaust	10,305.1	26,701.9	1,158.9	1,124.2	31.7	2,445.3
Worker and Vendor Commute	12.0	1.8	<0.1	<0.1	<0.1	0.3
Architectural Coating	**0**	0	0	0	0	0.1
Asphalt Paving	**0**	0	0	0	0	0.2
Demolition	**0**	0	27.3	4.1	0	0
Surface Disturbance	**0**	**0**	**2.5**	**3.1**	**0**	**0**
Material Movement	**0**	0	30.0	4.5	0	0
On-Road Fugitive Dust	**0**	0	0.4	0.1	0	0
Total	**10,466.6**	**27,048.8**	**1,241.1**	**1,157.4**	**32.2**	**2,482.1**

Note: Construction activity is scheduled to occur over 5 years.

Sources: EPA 2010, 2015d, FHWA 2011b, CAPCOA 2013.

Alternative 1 (Proposed Project) construction criteria pollutant emissions would be short term and spread out over five years. Alternative 1 (Proposed Project) construction criteria pollutant emissions would result in a minor short-term adverse effect.

4.13.3.2 Operational Criteria Pollutant Emissions Inventory

Under Alternative 1 (Proposed Project), criteria pollutant emissions from operational activities including operation of locomotives, UTR trucks, OTR trucks, and commutes by workers would occur. Total criteria pollutant emissions from operation are shown below in Table 4.13-10. Criteria pollutants emitted from the study area (Tri-County area) were taken from the 2011 EPA NEI are compared with Alternative 1 (Proposed Project) criteria pollutant emissions inventory in Table 4.13-11.

Table 4.13-10
Total Annual Operational Criteria Pollutant Emissions Inventory, Alternative 1 (Proposed Project)

Activity	Criteria Pollutant (tons)					
	CO	NO_x	PM_{10}	$PM_{2.5}$	SO_2	VOC
Off-Terminal Line Haul Locomotive	8.1	9.4	0.2	0.1	<0.1	0.4
On-Terminal Line Haul Locomotive	9.2	10.7	0.2	0.2	<0.1	0.4
Switch Locomotive	5.4	3.0	<0.1	<0.1	<0.1	0.2
UTR Truck Running	0.4	1.0	<0.1	<0.1	<0.1	0.4
UTR Truck Idling	0.3	0.8	<0.1	<0.1	<0.1	0.3
OTR Truck Running	3.1	15.5	0.2	0.2	0.1	0.8
OTR Truck Idling	4.8	10.2	<0.1	<0.1	<0.1	1.5
Worker Commute	2.6	0.1	<0.1	<0.1	<0.1	0.5
On-site Offroad Equipment	0	0	0	0	0	0
Total	**34.0**	**50.7**	**0.7**	**0.6**	**0.2**	**4.6**

Sources: EPA 2010, 2009a, 1998, 2009b, 2015d, SCPA 2013, CAPCOA 2013.

Table 4.13-11
Comparison of Study Area Criteria Pollutant Emissions Inventory
to Alternative 1 (Proposed Project) Emissions

Criteria Pollutant	Tri-County Area Emissions Inventory (ton)	Proposed Project Alternative compared to Total Inventory (percentage)
CO	230,292.8	0.015%
NO_x	36,526.0	0.139%
PM_{10}	26,159.7	0.003%
$PM_{2.5}$	11,299.7	0.005%
SO_2	26,442.8	0.001%
VOC	122,145.5	0.004%

Source: EPA 2015a, 2015c, 2015m.

Criteria pollutant emissions from Alternative 1 (Proposed Project) would each equal less than 1 percent of the total criteria pollutants emitted in the study area, and as such, criteria pollutants from the operation of Alternative 1 (Proposed Project) would result in a minor permanent adverse impact. It should be noted that, with the exception of CO, the No-Action Alternative would emit approximately the same or more criteria pollutants annually than Alternative 1 (Proposed Project). This condition is due to the efficient operations and transport of goods under Alternative 1 (Proposed Project), including the use of Tier 4 switch locomotive engines and Tier 4 UTR trucks at full build-out (2038). Alternative 1 (Proposed Project) would also include a semi-automated facility that would reduce UTR

and OTR truck idle times compared to the No-Action Alternative. All minimization measures applicable to Air Quality are listed in Section 4.13.12.

4.13.3.3 Criteria Pollutant Dispersion Modeling

Under Alternative 1 (Proposed Project), operations would be as described in Section 1.7.2. As such, criteria pollutant emissions from operational activities including operation of locomotives, UTR trucks, OTR trucks, and commutes by workers would occur. After applying the screening process to the roadway links in the alternative, 35 roadway sources were included in the dispersion modeling. All other pollutant sources (locomotive, UTR, and OTR idling activities) were also included in the dispersion modeling for the alternative. As such, the air dispersion model outputs for the alternative represent the concentrations, ppm, and ppb of criteria pollutants from selected roadway sources along with locomotive, UTR running and idling, and OTR idling activities associated with Alterative 1 (Proposed Project) in the study area for 2038. These outputs were added to the SCDHEC background concentrations and the HLT estimated pollutant levels, which were added because they are not reflected in the monitoring for the study area, as the HLT had not yet been operating. Project dispersion modeling outputs, background concentrations, the HLT estimated pollutant levels, and NAAQS compliance demonstration are included the Table 4.13-12. All dispersion modeling assumptions, calculations, and model output are included in Appendix I.

As shown in Table 4.13-12, criteria pollutants emitted from the operation of Alternative 1 (Proposed Project), along with the background concentrations and projected criteria pollutant levels, would not exceed the applicable NAAQS; therefore, Aternative 1 (Proposed Project) would not put the Tri-County area into non-attainment for any NAAQS. Impacts to air quality from the operation of Alternative 1 (Proposed Project) on criteria pollutants would be minor permanent adverse.

Table 4.13-12
Criteria Pollutant Dispersion Modeling, Alternative 1 (Proposed Project)

Pollutant		Average Time	AERMOD Output	Background Concentrations(1)	HLT	Total Impact	NAAQS	NAAQS exceeded?
Carbon Monoxide		8-hour	0.054 ppm	0.80 ppm	0.14 ppm	0.594 ppm	9 ppm	No
		1-hour	0.081 ppm	1.27 ppm	0.504 ppm	1.855 ppm	35 ppm	No
Nitrogen Dioxide		1-hour	56.552 ppb	38.35 ppb	Not Modeled	94.902 ppb	100 ppb	No
		Annual	5.805 ppb	6.60 ppb	1.59 ppb	13.995 ppb	53 ppb	No
Particle Pollution	***$PM_{2.5}$***	Annual	0.103 µg/m³	7.6 µg/m³	0.006 µg/m³	7.709 µg/m³	12 µg/m³	No
		Annual	0.103 µg/m³	7.6 µg/m³	0.006 µg/m³	7.709 µg/m³	15 µg/m³	No
		24-hour	0.252 µg/m³	16 µg/m³	0.37 µg/m³	16.622 µg/m³	35 µg/m³	No
	PM_{10}	24-hour	0.364 µg/m³	49 µg/m³	6.00 µg/m³	55.364 µg/m³	150 µg/m³	No
Sulfur Dioxide		1-hour	0.167 ppb	16.0 ppb	Not Modeled	16.167 ppb	75 ppb	No
		3-hour	<0.001 ppm	0.014 ppm	0.057 ppm	0.071 ppm	0.5 ppm	No

Notes and Acronyms:
See Table 4.13-6.
Sources: SCDHEC 2015c, Lakes 2015, EPA 2015o.

4.13.3.4 Hazardous Air Pollutants (HAPs)

Under Alternative 1 (Proposed Project), the Palmetto Railways Project would be operated as proposed. Operational non-DPM HAP emissions are shown in Table 4.13-13 and are compared with non-DPM HAPs emitted from the study area.

Table 4.13-13
Comparison of Study Area HAP Emissions to Alternative 1 (Proposed Project) HAP Emissions

Priority MSAT	Proposed Project Annual Operational HAP Emissions (ton)	Tri-County Area HAP Emissions (ton)	Compared Percentage of HAPS from Alternative 5
Benzene	0.059	566.7	0.010%
1,3-Butadiene	0.004	125.4	0.003%
Formaldehyde	0.990	2,192.6	0.045%
Naphthalene	0.074	1,991.0	0.004%
Polycyclic organic matter	0.006	158.8	0.004%

Source: EPA 2015a, 2015c, 2015m.

Non-DPM HAP emissions from Alternative 1 (Proposed Project) would each contribute to less than one-tenth of 1 percent of the total non-DPM HAPs emitted in the study area. Impacts of non-DPM HAPs from the Operational Inventory of Alternative 1 (Proposed Project) would be acceptable.

4.13.3.5 Health Risk Assessment

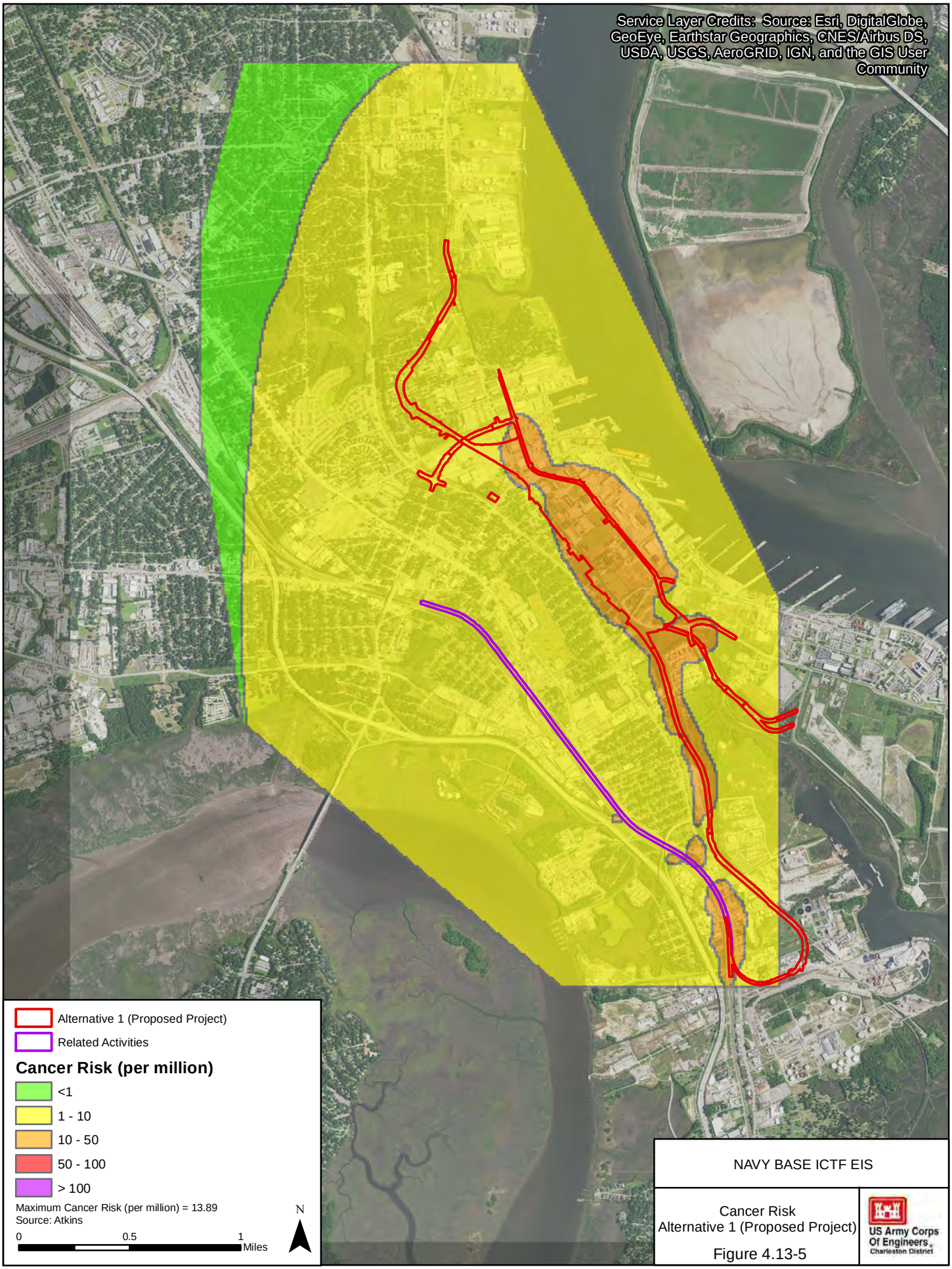
Alternative 1 (Proposed Project) includes emissions from line haul and switch rail, UTR trucks running on the private drayage road, UTR and OTR trucks idling on-site, OTR truck running on public roadways. An emission density map of the cancer risk of Alternative 1 (Proposed Project) is in Figure 4.13-5. This figure demonstrates the dispersion of DPM and corresponding health risk over the potentially exposed population. All dispersion modeling assumptions, data, and HRA calculations are included in Appendix I.

The maximum potential cancer risk is the highest estimated cancer risk at a residence for Alternative 1 (Proposed Project) and is analyzed to demonstrate the worst-case scenario. Contribution by source group is shown in Table 4.13-14. As shown in Table 4.13-14, line haul rail is the single largest source, contributing 37.73 percent of the highest estimated cancer risk. Emissions from OTR truck idling are the second largest contributor, at 30.78 percent. The table also shows the maximum noncancer hazard.

Table 4.13-14
Cancer Risk and Noncancer Hazard by Source Group, Alternative 1 (Proposed Project)

Source Group	DPM Concentration ($\mu g/m^3$)	Cancer Risk (per million)	Noncancer Hazard	Source Group Contribution
Line Haul Rail	0.01747	5.24	0.003	37.73%
Switch Rail	0.00107	0.33	0.0002	2.31%
UTR Truck Running	0.00041	0.12	0.00008	0.89%
UTR Truck Idling	0.00536	1.61	0.001	11.58%
OTR Truck Running	0.00774	2.32	0.002	16.72%
OTR Truck Idling	0.01425	4.28	0.003	30.78%
Worker Commute	0.00000	0.00	0.000	0.00%
On-site Offroad Equipment	0.00000	0.00	0.000	0.00%
Total	**0.04630**	**13.89**	**0.009**	**100.00%**

Notes and Acronyms:
See Table 4.13-8.
Source: Lakes 2015, EPA 2015o 2004.


Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Alternative 1 (Proposed Project)
Related Activities
Cancer Risk (per million)
<1
1 - 10
10 - 50
50 - 100
> 100
Maximum Cancer Risk (per million) = 13.89
Source: Atkins
0
0.5
1
Miles
N
NAVY BASE ICTF EIS
Cancer Risk
Alternative 1 (Proposed Project)
Figure 4.13-5
US Army Corps Of Engineers
Charleston District

The maximum potential cancer risk from Alternative 1 (Proposed Project), would occur directly adjacent to the Proposed Project site due to on-site rail and truck activity. The cancer risk falls between the 1 per million and 100 per million, which is within the acceptable risk range (EPA 2006b). When discussing risk it is important to provide the size of risks in context.

The cancer risk is the likelihood, or chance, of getting cancer. The term "excess cancer risk" is used because people also have a "background risk" of about 4 in 10 chances of being diagnosed with cancer in their lifetimes (NCI 2015). In other words, in a million people, it is expected that 400,000 individuals would get cancer from a variety of causes. If there is a "one in a million" excess cancer risk from a given exposure to a contaminant, it means that if one million people are exposed to a carcinogen at a certain concentration over their lifetime, then one cancer above the background chance, or the 400,000th cancer, may appear in those million persons from that particular exposure. To further put risk in perspective, Figure 4.13-4 shows a variety of risks on a scale from 1 chance in 10 (100,000 per million), 1 chance in 10,000 (100 per million), to 1 chance per million (1 per million) (EPA 1991). A risk of 13.89 per million is near the equivalent of 1 chance per 100,000 in Figure 4.13-4.

The maximum potential cancer risk from Alternative 1 (Proposed Project) falls between 1 per million and 100 per million, which is within the acceptable risk range (EPA 2006b). Impacts from the potential maximum cancer risk from Alternative 1 (Proposed Project) would be acceptable. The maximum noncancer hazard for Alternative 1 (Proposed Project) would be below 1 and impacts from Alternative 1 (Proposed Project) from noncancer hazard would be negligible.

4.13.4 Alternative 2: Proposed Project Site (South via Milford / North via S-line)

4.13.4.1 Construction Criteria Pollutant Emissions Inventory

Under Alternative 2, the Palmetto Railways Project would be constructed as a variation of Alternative 1 (Proposed Project). Alternative 2 differs from Alternative 1 (Proposed Project) where the northern rail connection for NS would be located, and road and rail improvements would be adjusted accordingly to facilitate rail and road traffic as a result of the NS northern rail connection alignment. As such, construction of the rail alignments differs slightly from Alternative 1 (Proposed Project), and so construction equipment exhaust criteria pollutant emissions are different to reflect the change in length of the NS northern rail connection. Haul truck activities, worker and vendor commute, architectural coating, asphalt paving, material movement, and demolition were assumed to be the same as Alternative 1 (Proposed Project). Total criteria pollutant emissions from construction of Alternative 2 are shown below in Table 4.13-15.

Table 4.13-15
Total Construction Criteria Pollutant Emissions Inventory, Alternative 2

Activity	Criteria Pollutant (tons)					
	CO	NO_x	PM_{10}	$PM_{2.5}$	SO_2	VOC
Construc-tion Equipment Exhaust	151.7	345.1	22.4	21.7	0.6	36.7
Haul Truck Exhaust	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)
Worker and Vendor Commute	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)
Architec-tural Coating	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)
Asphalt Paving	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)
Demolition	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)
Surface Disturbance	**0**	**0**	**2.5**	**3.1**	**0**	**0**
Material Movement	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)
On-Road Fugitive Dust	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)
Total	**10,468.8**	**27,048.8**	**1,241.5**	**1,157.7**	**32.3**	**2,482.6**

Note: Construction activity is scheduled to occur over 5 years.

Sources: EPA 2010, 2015d, FHWA 2011b, CAPCOA 2013.

Impacts to Air Quality by Alternative 2 construction criteria pollutant emissions would be similar to Alternative 1 (Proposed Project).

4.13.4.2 Operational Criteria Pollutant Emissions Inventory

Under Alternative 2, the Palmetto Railways Project would be operated as proposed. As such, criteria pollutant emissions from operational activities would be the same as Alternative 1 (Proposed Project) and impacts would be the same as Alternative 1 (Proposed Project).

4.13.4.3 Criteria Pollutant Dispersion Modeling

Under Alternative 2, the Palmetto Railways Project would be operated as proposed. As such, criteria pollutant emissions from the operational activities would be the same as Alternative 1 (Proposed Project), with the exception of where the pollutants would be emitted due to the different rail track segments. Alternative 2 dispersion modeling outputs, SCDHEC background concentrations, HLT estimated pollutant levels, and NAAQS compliance demonstration are included the Table 4.13-21. All dispersion modeling assumptions, calculations, and model output are included in Appendix I.

As shown in Table 4.13-16, criteria pollutants emitted from the operation of Alternative 2, along with the background concentrations and projected criteria pollutants, would not exceed the applicable NAAQS; therefore, Alternative 2 would not put the Tri-County area into non-attainment for any criteria pollutants. Impacts to air quality from the operation of Alternative 2 on criteria pollutants would be minor permanent adverse.

4.13.4.4 Hazardous Air Pollutants (HAPs)

Under Alternative 2, the Palmetto Railways Project would be operated as proposed. As such, HAPs emissions from operational activities would be the same as Alternative 1 (Proposed Project) and impacts would be the same as Alternative 1 (Proposed Project).

Table 4.13-16
Criteria Pollutant Dispersion Modeling, Alternative 2

Pollutant		Average Time	AERMOD Output	Background Concentrations(1)	HLT	Total Impact	NAAQS	NAAQS Exceeded?
Carbon Monoxide		8-hour	0.054 ppm	0.80 ppm	0.14 ppm	0.994 ppm	9 ppm	No
		1-hour	0.081 ppm	1.27 ppm	0.504 ppm	1.855 ppm	35 ppm	No
Nitrogen Dioxide		1-hour	56.543 ppb	38.35 ppb	Not Modeled	94.893 ppb	100 ppb	No
		Annual	5.807 ppb	6.60 ppb	1.59 ppb	13.997 ppb	53 ppb	No
Particle Pollution	***$PM_{2.5}$***	Annual	0.103 µg/m³	7.6 µg/m³	0.006 µg/m³	7.709 µg/m³	12 µg/m³	No
		Annual	0.103 µg/m³	7.6 µg/m³	0.006 µg/m³	7.709 µg/m³	15 µg/m³	No
		24-hour	0.252 µg/m³	16 µg/m³	0.37 µg/m³	16.622 µg/m³	35 µg/m³	No
	PM_{10}	24-hour	0.362 µg/m³	49 µg/m³	6.00 µg/m³	55.362 µg/m³	150 µg/m³	No
Sulfur Dioxide		1-hour	0.167 ppb	16.0 ppb	Not Modeled	16.167 ppb	75 ppb	No
		3-hour	<0.001 ppm	0.014 ppm	0.057 ppm	0.071 ppm	0.5 ppm	No

Notes and Acronyms:
See Table 4.13-6.
Sources: SCDHEC 2015c, Lakes 2015, EPA 2015o.

4.13.4.5 Health Risk Assessment

An emission density map of the excess cancer risk of Alternative 2 is in Figure 4.13-6. This figure demonstrates the dispersion of DPM and corresponding health risk over the potentially exposed population. All dispersion modeling assumptions, inputs and outputs, and HRA calculations are included in Appendix I.

The maximum potential cancer risk is the highest estimated cancer risk at a residence for Alternative 2 and is analyzed to demonstrate the worst-case scenario. Contribution by source group is shown in Table 4.13-17. As shown in Table 4.13-17, line haul rail is the single largest source, contributing 37.48 percent of the highest estimated cancer risk. Emissions from OTR truck idling are the second largest contributor, at 30.76 percent. The table also shows the maximum noncancer hazard.

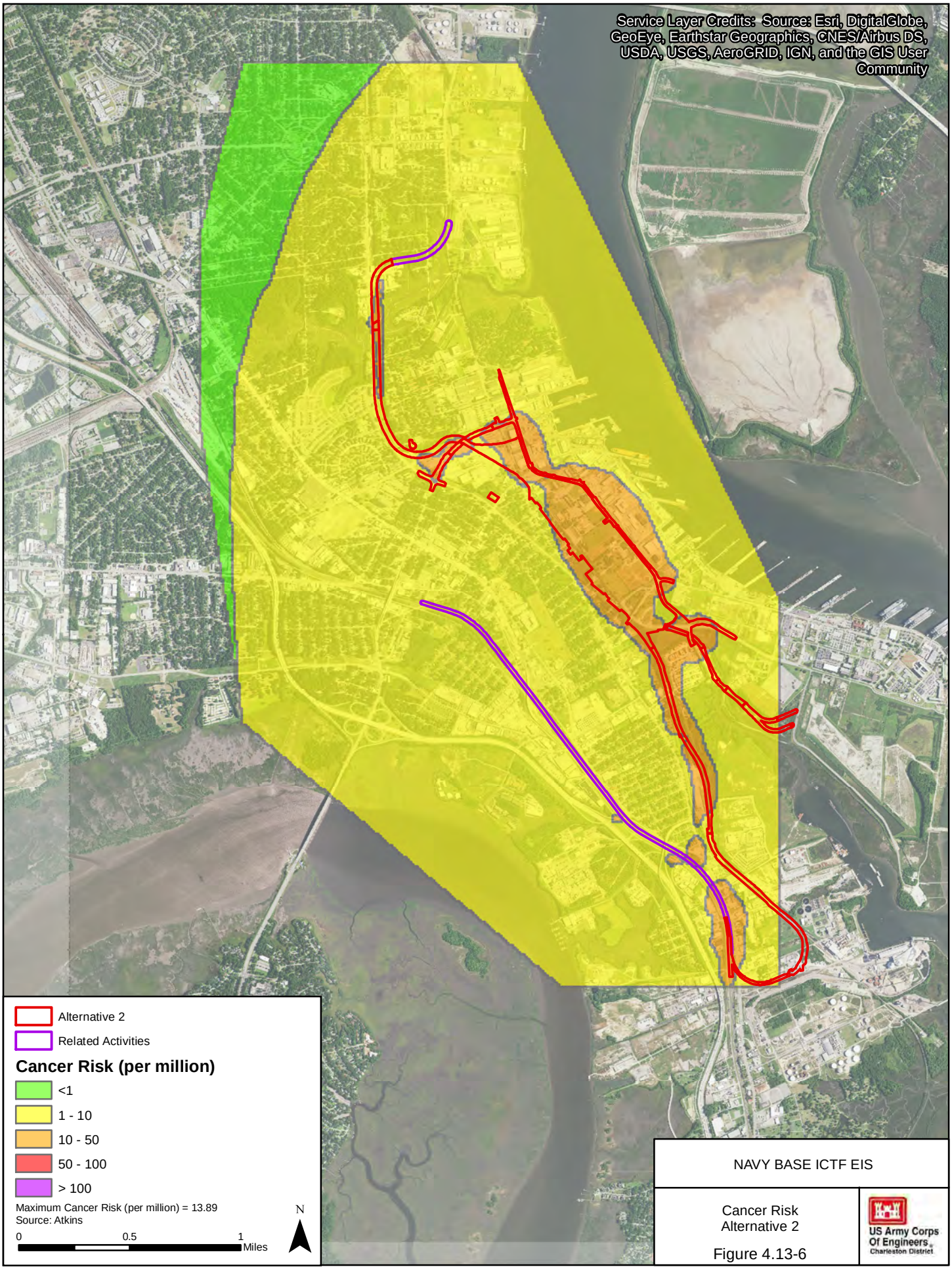

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Alternative 2
Related Activities
Cancer Risk (per million)
<1
1 - 10
10 - 50
50 - 100
> 100
Maximum Cancer Risk (per million) = 13.89
Source: Atkins
0
0.5
1
Miles
N
NAVY BASE ICTF EIS
Cancer Risk
Alternative 2
Figure 4.13-6
US Army Corps Of Engineers
Charleston District

Table 4.13-17
Cancer Risk and Noncancer Hazard by Source Group, Alternative 2

Source Group	DPM Concentration (µg/m³)	Cancer Risk (per million)	Noncancer Hazard	Source Group Contribution
Line Haul Rail	0.01736	5.21	0.003	37.48%
Switch Rail	0.00107	0.32	0.0002	2.31%
UTR Truck Running	0.00041	0.12	0.00008	0.89%
UTR Truck Idling	0.00536	1.61	0.001	11.57%
OTR Truck Running	0.00787	2.36	0.002	16.99%
OTR Truck Idling	0.01425	4.28	0.003	30.76%
Worker Commute	0.00000	0.00	0.000	0.00%
On-site Offroad Equipment	0.00000	0.00	0.000	0.00%
Total	**0.04632**	**13.90**	**0.009**	**100.00%**

Notes and Acronyms:
See Table 4.13-8.
Source: Lakes 2015; EPA 2004, 2015o.

The maximum potential cancer risk from Alternative 2 falls between 1 per million and 100 per million, which is within the acceptable risk range (EPA 2006b). Impacts from the potential maximum cancer risk from Alternative 2 would be acceptable. The maximum noncancer hazard for the Alternative 2 would be below 1. Impacts from Alternative 2 from noncancer hazard would be negligible.

4.13.5 Alternative 3: Proposed Project Site (South via Kingsworth / North via Hospital)

4.13.5.1 Construction Criteria Pollutant Emissions Inventory

Under Alternative 3, the Palmetto Railways Project would be constructed as a variation of Alternative 1 (Proposed Project). Alternative 3 differs from Alternative 1 (Proposed Project) where the southern rail connection would be located, and road and rail improvements would be adjusted accordingly to facilitate rail and road traffic as a result of the southern rail connection alignments. As such, construction of the rail alignments differs slightly from Alternative 1 (Proposed Project), and so construction equipment exhaust criteria pollutant emissions are different to reflect the change in length of the southern rail connection. Haul truck activities, worker and vendor commute, architectural coating, asphalt paving, material movement, and demolition were assumed to be the same as Alternative 1 (Proposed Project). Total criteria pollutant emissions from construction of Alternative 3 are shown below in Table 4.13-18.

Table 4.13-18
Total Construction Criteria Pollutant Emissions Inventory, Alternative 3

Activity	Criteria Pollutant (tons)					
	CO	NO_x	PM_{10}	$PM_{2.5}$	SO_2	VOC
Construction Equipment Exhaust	143.3	330.7	21.1	20.5	0.5	34.7
Haul Truck Exhaust	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)
Worker and Vendor Commute	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)
Architectural Coating	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)
Asphalt Paving	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)
Demolition	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)
Surface Disturbance	**0**	**0**	**2.5**	**3.1**	**0**	**0**
Material Movement	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)
On-Road Fugitive Dust	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)
Total	**10,460.4**	**27,034.4**	**1,240.2**	**1,156.5**	**32.2**	**2,480.6**

Note: Construction activity is scheduled to occur over 5 years.

Sources: EPA 2010, 2015d; FHWA 2011b; CAPCOA 2013.

Impacts to Air Quality by Alternative 3 construction criteria pollutant emissions would be similar to Alternative 1 (Proposed Project).

4.13.5.2 Operational Criteria Pollutant Emissions Inventory

Under Alternative 3, the Palmetto Railways Project would be operated as proposed. As such, criteria pollutant emissions from operational activities would be the same as Alternative 1 (Proposed Project) and impacts would be the same as Alternative 1 (Proposed Project).

4.13.5.3 Criteria Pollutant Dispersion Modeling

Under Alternative 3, the Palmetto Railways Project would be operated as proposed. As such, criteria pollutant emissions from the operational activities would be the same as Alternative 1 (Proposed Project), with the exception of where the pollutants would be emitted due to the different rail track segments. Alternative 3 dispersion modeling outputs, SCDHEC background concentrations, HLT estimated pollutant levels, and NAAQS compliance demonstration are included the Table 4.13-19. All dispersion modeling assumptions, calculations, and model output are included in Appendix I.

Table 4.13-19
Criteria Pollutant Dispersion Modeling, Alternative 3

Pollutant		Average Time	AERMOD Output	Background Concentrations[(1)]	HLT	Total Impact	NAAQS	NAAQS exceeded?
Carbon Monoxide		8-hour	0.054 ppm	0.80 ppm	0.14 ppm	0.594 ppm	9 ppm	No
		1-hour	0.081 ppm	1.27 ppm	0.504 ppm	1.855 ppm	35 ppm	No
Nitrogen Dioxide		1-hour	56.840 ppb	38.35 ppb	Not Modeled	95.190 ppb	100 ppb	No
		Annual	5.807 ppb	6.60 ppb	1.59 ppb	13.997 ppb	53 ppb	No
Particle Pollution	***$PM_{2.5}$***	Annual	0.103 µg/m³	7.6 µg/m³	0.006 µg/m³	7.709 µg/m³	12 µg/m³	No
		Annual	0.103 µg/m³	7.6 µg/m³	0.006 µg/m³	7.709 µg/m³	15 µg/m³	No
		24-hour	0.252 µg/m³	16 µg/m³	0.37 µg/m³	16.622 µg/m³	35 µg/m³	No
	PM_{10}	24-hour	0.362 µg/m³	49 µg/m³	6.00 µg/m³	55.362 µg/m³	150 µg/m³	No
Sulfur Dioxide		1-hour	0.167 ppb	16.0 ppb	Not Modeled	16.167 ppb	75 ppb	No
		3-hour	<0.001 ppm	0.014 ppm	0.057 ppm	0.071 ppm	0.5 ppm	No

Notes and Acronyms:
See Table 4.13-6.
Sources: SCDHEC 2015c, Lakes 2015, EPA 2015o.

As shown in Table 4.13-19, criteria pollutants emitted from the operation of Alternative 3, along with the background concentrations and projected criteria pollutants, would not exceed the applicable NAAQS; therefore, Alternative 3 would not put the Tri-County area into non-attainment for any criteria pollutants. Impacts to air quality from the operation of Alternative 3 on criteria pollutants would be minor permanent adverse.

4.13.5.4 Hazardous Air Pollutants (HAPs)

Under Alternative 3, the Palmetto Railways Project would be operated as proposed. As such, HAPs emissions from operational activities would be the same as Alternative 1 (Proposed Project) and impacts would be the same as Alternative 1 (Proposed Project).

4.13.5.5 Health Risk Assessment

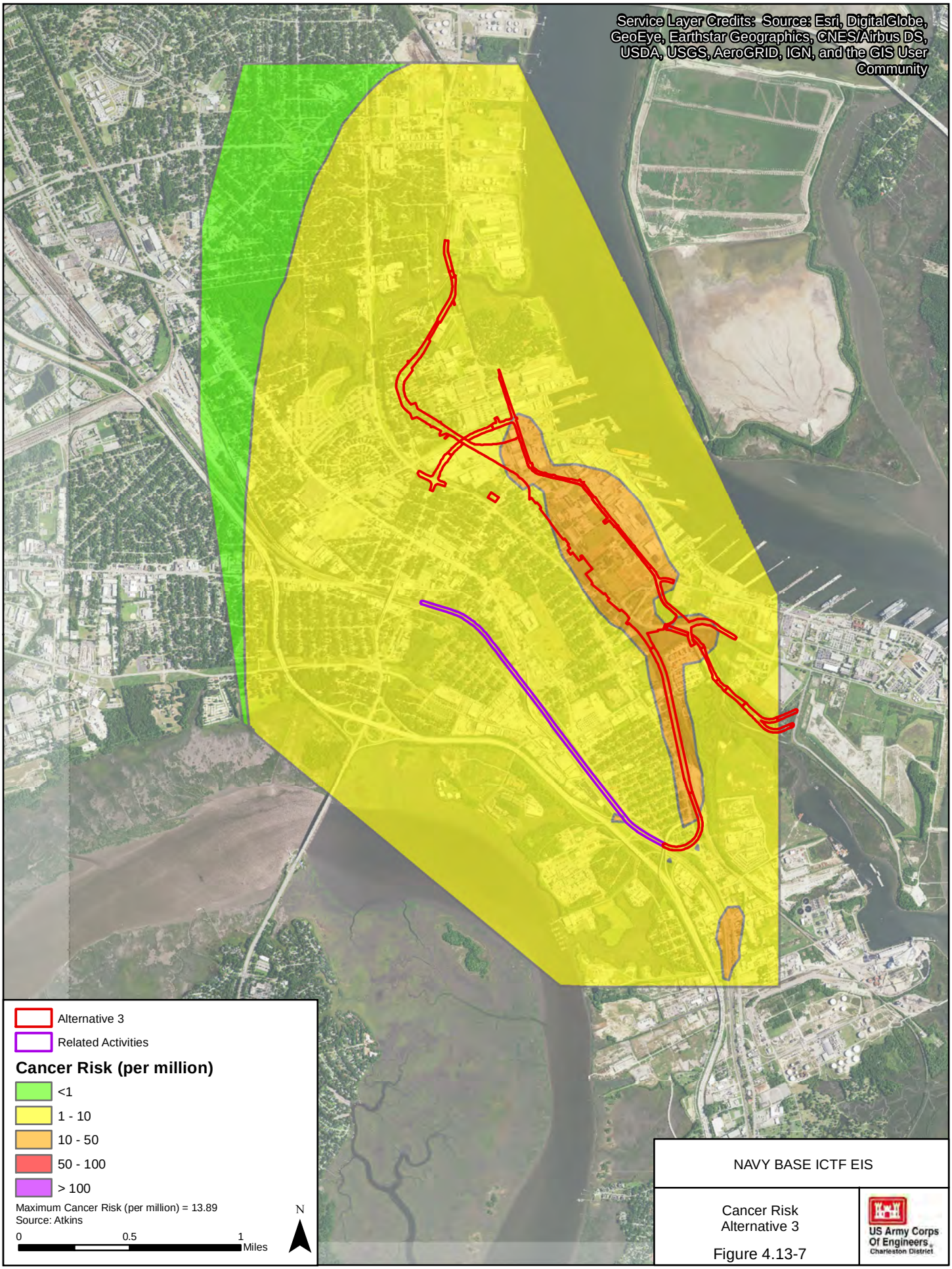
An emission density map of the cancer risk of Alternative 3 is in Figure 4.13-7. This figure demonstrates the dispersion of DPM and corresponding health risk over the potentially exposed population. All dispersion modeling assumptions, inputs and outputs, and HRA calculations are included in Appendix I.

The maximum potential cancer risk is the highest estimated cancer risk at a residence for Alternative 3 and is analyzed to demonstrate the worst-case scenario. Contribution by source group is shown in Table 4.13-20. As shown in Table 4.13-20, line haul rail is the single largest source, contributing 37.71 percent of the highest estimated cancer risk. Emissions from OTR truck idling are the second largest contributor, at 30.79 percent. The table also shows the maximum noncancer hazard.

Table 4.13-20
Cancer Risk and Noncancer Hazard by Source Group, Alternative 3

Source Group	DPM Concentration ($\mu g/m^3$)	Cancer Risk (per million)	Noncancer Hazard	Source Group Contribution
Line Haul Rail	0.01745	5.24	0.003	37.71%
Switch Rail	0.00107	0.32	0.0002	2.31%
UTR Truck Running	0.00041	0.12	0.00008	0.89%
UTR Truck Idling	0.00536	1.61	0.001	11.58%
OTR Truck Running	0.00774	2.32	0.002	16.72%
OTR Truck Idling	0.01425	4.28	0.003	30.79%
Worker Commute	0.00000	0.00	0.000	0.00%
On-site Offroad Equipment	0.00000	0.00	0.000	0.00%
Total	**0.04628**	**13.88**	**0.009**	**100.00%**

Notes and Acronyms:
See Table 4.13-8.
Source: Lakes 2015; EPA 2004, 2015o.


Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Alternative 3
Related Activities
Cancer Risk (per million)
<1
1 - 10
10 - 50
50 - 100
> 100
Maximum Cancer Risk (per million) = 13.89
Source: Atkins
0
0.5
1
Miles
N
NAVY BASE ICTF EIS
Cancer Risk
Alternative 3
Figure 4.13-7
US Army Corps Of Engineers
Charleston District

The maximum potential cancer risk from Alternative 3 falls between 1 per million and 100 per million, which is within the acceptable risk range (EPA 2006b). Impacts from the potential maximum cancer risk from Alternative 3 would be acceptable. The maximum noncancer hazard for the Alternative 3 would be below 1. Impacts from Alternative 3 from noncancer hazard would be negligible.

4.13.6 Alternative 4: Proposed Project Site (South via Milford)

4.13.6.1 Construction Criteria Pollutant Emissions Inventory

Under Alternative 4, the Palmetto Railways Project would be constructed as a variation of Alternative 1 (Proposed Project). Alternative 4 differs from Alternative 1 (Proposed Project) where trains would also enter and exit the Navy Base ICTF from a southern rail connection, and with proposed rail through the Hospital District that would stop short of Noisette Creek. As such, construction of the rail alignments differs from Alternative 1 (Proposed Project), and so construction equipment exhaust GHG emissions are different to reflect the change in length of the southern rail connection. Haul truck activities, worker and vendor commute, architectural coating, asphalt paving, material movement, and demolition were assumed to be the same as Alternative 1 (Proposed Project). Total criteria pollutant emissions from construction of Alternative 4 are shown below in Table 4.13-21.

Table 4.13-21
Total Construction Criteria Pollutant Emissions Inventory, Alternative 4

Activity	Criteria Pollutant (tons)					
	CO	NO_x	PM_{10}	$PM_{2.5}$	SO_2	VOC
Construction Equipment Exhaust	141.9	327.4	20.9	20.3	0.5	34.4
Haul Truck Exhaust	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)
Worker and Vendor Commute	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)
Architectural Coating	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)
Asphalt Paving	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1

Activity	Criteria Pollutant (tons)					
	CO	NO_x	PM_{10}	$PM_{2.5}$	SO_2	VOC
	(Proposed Project)	(Proposed Project)	(Proposed Project)	(Proposed Project)	(Proposed Project)	(Proposed Project)
Demolition	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)
Surface Disturbance	**0**	**0**	**2.5**	**3.0**	**0**	**0**
Material Movement	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)
On-Road Fugitive Dust	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)
Total	**10,459.0**	**27,031.1**	**1,240.0**	**1,156.2**	**32.2**	**2,480.3**

Note: Construction activity is scheduled to occur over 5 years.

Sources: EPA 2010, 2015d, FHWA 2011b, CAPCOA 2013.

Impacts to Air Quality by Alternative 4 construction criteria pollutant emissions would be similar to Alternative 1 (Proposed Project).

4.13.6.2 Operational Criteria Pollutant Emissions Inventory

Under Alternative 4, the Palmetto Railways Project would be operated as proposed. As such, criteria pollutant emissions from operational activities would be the same as Alternative 1 (Proposed Project) and impacts would be the same as Alternative 1 (Proposed Project).

4.13.6.3 Criteria Pollutant Dispersion Modeling

Under Alternative 4, the Palmetto Railways Project would be operated as proposed. As such, criteria pollutant emissions from the operational activities would be the same as Alternative 1 (Proposed Project), with the exception of where the pollutants would be emitted due to the different rail track segments. Alternative 4 dispersion modeling outputs, SCDHEC background concentrations, HLT estimated pollutant levels, and NAAQS compliance demonstration are included the Table 4.13-22. All dispersion modeling assumptions, calculations, and model output are included in Appendix I.

Table 4.13-22
Criteria Pollutant Dispersion Modeling, Alternative 4

Pollutant		Average Time	AERMOD Output	Background Concentrations[1]	HLT	Total Impact	NAAQS	NAAQS Exceeded?
Carbon Monoxide		8-hour	0.056 ppm	0.80 ppm	0.14 ppm	0.996 ppm	9 ppm	No
		1-hour	0.078 ppm	1.27 ppm	0.504 ppm	1.852 ppm	35 ppm	No
Nitrogen Dioxide		1-hour	60.134 ppb	38.35 ppb	Not Modeled	98.484 ppb	100 ppb	No
		Annual	5.822 ppb	6.60 ppb	1.59 ppb	14.012 ppb	53 ppb	No
Particle Pollution	***$PM_{2.5}$***	Annual	0.103 µg/m^3	7.6 µg/m^3	0.006 µg/m^3	7.709 µg/m^3	12 µg/m^3	No
		Annual	0.103 µg/m^3	7.6 µg/m^3	0.006 µg/m^3	7.709 µg/m^3	15 µg/m^3	No
		24-hour	0.252 µg/m^3	16 µg/m^3	0.37 µg/m^3	16.622 µg/m^3	35 µg/m^3	No
	PM_{10}	24-hour	0.363 µg/m^3	49 µg/m^3	6.00 µg/m^3	55.363 µg/m^3	150 µg/m^3	No
Sulfur Dioxide		1-hour	0.170 ppb	16.0 ppb	Not Modeled	16.170 ppb	75 ppb	No
		3-hour	<0.001 ppm	0.014 ppm	0.057 ppm	0.071 ppm	0.5 ppm	No

Notes and Acronyms:

See Table 4.13-6.

Sources: SCDHEC 2015c, Lakes 2015, EPA 2015o.

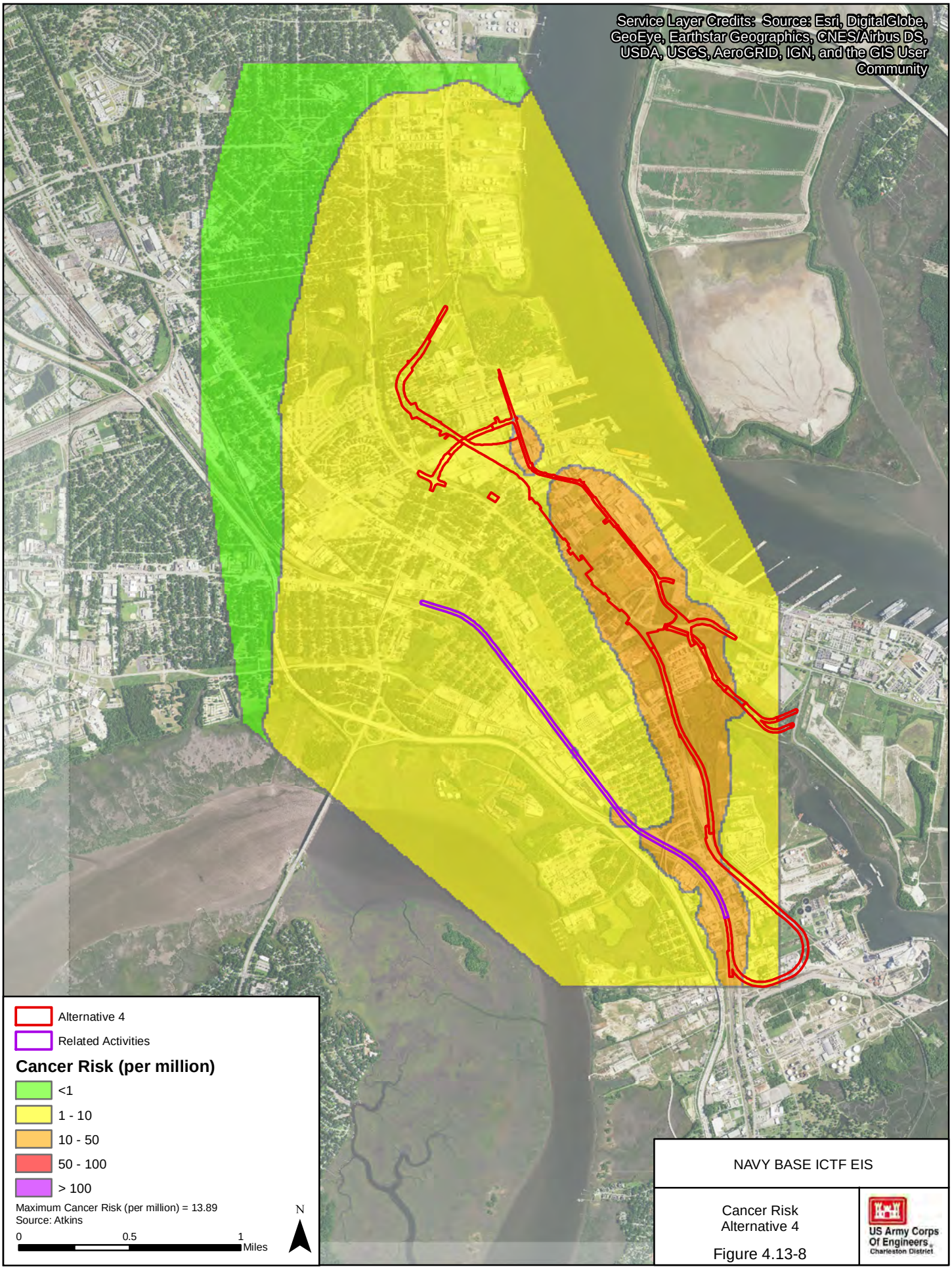
As shown in Table 4.13-22, criteria pollutants emitted from the operation of Alternative 4, along with the background concentrations and projected criteria pollutants, would not exceed the applicable NAAQS; therefore, Alternative 4 would not put the Tri-County area into non-attainment for any criteria pollutants. Impacts to air quality from the operation of Alternative 4 on criteria pollutants would be minor.

4.13.6.4 Hazardous Air Pollutants (HAPs)

Under Alternative 4, the Palmetto Railways Project would be operated as proposed. As such, HAPs emissions from operational activities would be the same as Alternative 1 (Proposed Project) and impacts would be the same as Alternative 1 (Proposed Project).

4.13.6.5 Health Risk Assessment

An emission density map of the cancer risk of Alternative 4 is in Figure 4.13-8. This figure demonstrates the dispersion of DPM and corresponding health risk over the potentially exposed population. All dispersion modeling assumptions, inputs and outputs, and HRA calculations are included in Appendix I.


Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Alternative 4
Related Activities
Cancer Risk (per million)
<1
1 - 10
10 - 50
50 - 100
> 100
Maximum Cancer Risk (per million) = 13.89
Source: Atkins
0
0.5
1
Miles
N
NAVY BASE ICTF EIS
Cancer Risk
Alternative 4
Figure 4.13-8
US Army Corps Of Engineers
Charleston District

The maximum potential cancer risk is the highest estimated cancer risk at a residence for Alternative 4 and is analyzed to demonstrate the worst-case scenario. Contribution by source group is shown in Table 4.13-23. As shown in Table 4.13-23, line haul rail is the single largest source, contributing 67.39 percent of the highest estimated cancer risk. Emissions from OTR truck running are the second largest contributor, at 13.71 percent. The table also shows the maximum noncancer hazard.

Table 4.13-23
Cancer Risk and Noncancer Hazard by Source Group, Alternative 4

Source Group	DPM Concentration ($\mu g/m^3$)	Cancer Risk (per million)	Noncancer Hazard	Source Group Contribution
Line Haul Rail	0.03983	11.95	0.008	67.39%
Switch Rail	0.00194	0.58	0.0004	3.28%
UTR Truck Running	0.00103	0.31	0.0002	1.74%
UTR Truck Idling	0.00224	0.67	0.0005	3.79%
OTR Truck Running	0.00810	2.43	0.002	13.71%
OTR Truck Idling	0.00596	1.79	0.001	10.08%
Worker Commute	0.00000	0.00	0.000	0.00%
On-site Offroad Equipment	0.00000	0.00	0.000	0.00%
Total	**0.05610**	**17.73**	**0.01**	**100.00%**

Notes and Acronyms:
See Table 4.13-8.
Source: Lakes 2015, EPA 2004, 2015o.

The maximum potential cancer risk from Alternative 4 falls between 1 per million and 100 per million, which is within the acceptable risk range (EPA 2006b). Impacts from the potential maximum cancer risk from Alternative 4 would be acceptable. The maximum noncancer hazard for the Alternative 4 would be below 1. Impacts from Alternative 4 from noncancer hazard would be negligible.

4.13.7 Alternative 5: River Center Project Site (South via Milford / North via Hospital District)

4.13.7.1 Construction Criteria Pollutant Emissions Inventory

Alternative 5 is a variation of Alternative 1 (Proposed Project) with the ICTF being moved to the River Center project site. Road and rail improvements would be adjusted accordingly to facilitate rail and road traffic at the new site. As such, construction of the rail and road alignments differs from Alternative 1 (Proposed Project), and so construction equipment exhaust criteria pollutant emissions are different to reflect the change in length of the rail connections and road segments. Haul truck

activities, worker and vendor commute, architectural coating, asphalt paving, and material movement were assumed to be the same as Alternative 1 (Proposed Project). Demolition of buildings at the River Center project site would be different than that for Alternative 1 (Proposed Project), because of the difference in building square footage that would need to be demolished. Total criteria pollutant emissions from construction of Alternative 5 are shown below in Table 4.13-24.

Table 4.13-24
Total Construction Criteria Pollutant Emissions Inventory, Alternative 5

Activity	Criteria Pollutant (tons)					
	CO	NO_x	PM_{10}	$PM_{2.5}$	SO_2	VOC
Construction Equipment Exhaust	163.7	378.2	24.1	23.4	0.6	39.7
Haul Truck Exhaust	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)
Worker and Vendor Commute	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)
Architectural Coating	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)
Asphalt Paving	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)
Demolition	0	0	42.6	6.5	0	0
Surface Disturbance	0	0	2.9	3.6	0	0
Material Movement	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)
On-Road Fugitive Dust	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)
Total	**10,480.8**	**27,081.9**	**1,258.9**	**1,162.3**	**32.3**	**2,485.6**

Note: Construction activity is scheduled to occur over 5 years.

Sources: EPA 2010, 2015d, FHWA 2011b, CAPCOA 2013.

Impacts to Air Quality by Alternative 5 construction criteria pollutant emissions would be similar to Alternative 1 (Proposed Project).

4.13.7.2 Operational Criteria Pollutant Emissions Inventory

Under Alternative 5, the Palmetto Railways Project would be operated as proposed, with the exception of UTR truck activity on the private drayage road. As such, criteria pollutant emissions from operational activities besides UTR truck running emissions would be the same as Alternative 1 (Proposed Project). The private drayage road in Alternative 5 is 2 miles long, which is twice the distance of the private drayage road in Alternative 1 (Proposed Project). To maintain the daily container throughput, twice as many UTR trucks at the same rate of daily truckloads are required for operating Alternative 5 compared to Alternative 1 (Proposed Project). Therefore, Alternative 5 has twice as many criteria pollutant emissions from UTR truck running as Alternative 1 (Proposed Project). Total criteria pollutant emissions from operation are shown below in Table 4.13-25. Criteria pollutants emitted from the study area (Tri-County area) were taken from the 2011 EPA NEI are compared with Alternative 1 (Proposed Project) criteria pollutant emissions inventory in Table 4.13-26.

Table 4.13-25
Annual Operational Criteria Pollutant Emissions Inventory, Alternative 5

Activity	Criteria Pollutant (tons)					
	CO	NO_x	PM_{10}	$PM_{2.5}$	SO_2	VOC
Off-Terminal Line Haul Locomotive	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)
On-Terminal Line Haul Locomotive	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)
Switch Locomotive	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)
UTR Truck Running	0.8	1.9	0.1	0.1	0.0	0.8
UTR Truck Idling	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)
OTR Truck Running	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)

Activity	Criteria Pollutant (tons)					
	CO	NO_x	PM_{10}	$PM_{2.5}$	SO_2	VOC
OTR Truck Idling	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)
Worker Commute	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)
On-site Offroad Equipment	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)
Total	**34.4**	**51.6**	**0.7**	**0.7**	**0.2**	**4.9**

Sources: EPA 2010, 2009a, 1998, 2009b, 2015d, SCPA 2013, CAPCOA 2013.

Table 4.13-26
Comparison of Study Area Criteria Pollutant Emissions Inventory to Alternative 5 Emissions

Criteria Pollutant	Tri-County Area Emissions Inventory (ton)	Proposed Project Alternative Emissions Compared to Total Inventory (percentage)
CO	230,292.8	0.015%
NO_x	36,526.0	0.141%
PM_{10}	26,159.7	0.003%
$PM_{2.5}$	11,299.7	0.005%
SO_2	26,442.8	0.001%
VOC	122,145.5	0.004%

Source: EPA 2015a, 2015c, 2015m.

Criteria pollutant emissions from Alternative 5 would each equal less than 1 percent of the total criteria pollutants emitted in the study area. Impacts of criteria pollutants from the operational inventory of Alternative 5 would be minor permanent adverse.

4.13.7.3 Criteria Pollutant Dispersion Modeling

Under Alternative 5, the Palmetto Railways Project would be operated as proposed, with the exception of UTR truck activity on the private drayage road and the location of where the pollutants would be emitted due to the different rail track segments and site. Alternative 5 dispersion modeling

outputs, SCDHEC background concentrations, HLT estimated pollutant levels, and NAAQS compliance demonstration are included the Table 4.13-27. All dispersion modeling assumptions, calculations, and model outputs are included in Appendix I.

Table 4.13-27
Criteria Pollutant Dispersion Modeling, Alternative 5

Pollutant		Average Time	AERMOD Output	Background Concentrations(1)	HLT	Total Impact	NAAQS	NAAQS Exceeded?
Carbon Monoxide		8-hour	0.058 ppm	0.80 ppm	0.14 ppm	0.998 ppm	9 ppm	No
		1-hour	0.087 ppm	1.27 ppm	0.504 ppm	1.861 ppm	35 ppm	No
Nitrogen Dioxide		1-hour	69.368 ppb	38.35 ppb	Not Modeled	107.718 ppb	100 ppb	**May Exceed**
		Annual	5.613 ppb	6.60 ppb	1.59 ppb	13.803 ppb	53 ppb	No
Particle Pollution	***$PM_{2.5}$***	Annual	0.109 µg/m^3	7.6 µg/m^3	0.006 µg/m^3	7.715 µg/m^3	12 µg/m^3	No
		Annual	0.109 µg/m^3	7.6 µg/m^3	0.006 µg/m^3	7.715 µg/m^3	15 µg/m^3	No
		24-hour	0.405 µg/m^3	16 µg/m^3	0.37 µg/m^3	16.775 µg/m^3	35 µg/m^3	No
	PM_{10}	24-hour	0.484 µg/m^3	49 µg/m^3	6.00 µg/m^3	55.484 µg/m^3	150 µg/m^3	No
Sulfur Dioxide		1-hour	0.140 ppb	16.0 ppb	Not Modeled	16.140 ppb	75 ppb	No
		3-hour	<0.001 ppm	0.014 ppm	0.057 ppm	0.071 ppm	0.5 ppm	No

Notes and Acronyms:
See Table 4.13-6.
Sources: SCDHEC 2015c, Lakes 2015, EPA 2015o.

As shown in Table 4.13-27, criteria pollutants emitted from the operation of Alternative 5, along with the background concentrations and projected criteria pollutants, may exceed the NAAQS for 1-hour NO_2. The EPA recommends a three-tiered screening approach to estimate ambient concentrations of NO_2 with Tier 1 being the most conservative approach resulting in higher NO_2 concentrations and Tier 3 being the most detailed approach resulting in lower NO_2 concentrations. The Tier 1 modeling approach was used in this analysis. Further refinement of the modeling to a Tier 2 or Tier 3 approach would likely produce results that would predict compliance and continued attainment with the NAAQS. Under full operation of Alternative 5, the Tri-County area may not remain in compliance with the NAAQS. Impacts to air quality from the operation of Alternative 5 on criteria pollutants would be minor adverse.

4.13.7.4 Hazardous Air Pollutants (HAPs)

Under Alternative 5, the Palmetto Railways Project would be operated as proposed, with the exception of UTR truck activity on the drayage road. The UTR truck activity in Alternative 5 would be double the activity in Alternative 1 (Proposed Project) to account for the double length of the private drayage road. Operational non-DPM HAP emissions from Alternative 5 are shown in Table 4.13-28 and are compared with non-DPM HAPs emitted from the study area.

Table 4.13-28
Comparison of Study Area HAP Emissions to Alternative 5 HAP Emissions

Priority MSAT	Annual Operational HAP Emissions (tons)	Tri-County Area HAP Emissions (tons)	Compared Percentage of HAPS from Alternative 5
Benzene	0.059	566.7	0.010%
1,3-Butadiene	0.004	125.4	0.003%
Formaldehyde	1.075	2,192.6	0.049%
Naphthalene	0.081	1,991.0	0.004%
Polycyclic organic matter	0.006	158.8	0.004%

Source: EPA 2015a, 2015c, 2015m.

Non-DPM HAP emissions from Alternative 5 would each contribute to less than one-tenth of 1 percent of the total non-DPM HAPs emitted in the study area. Impacts of non-DPM HAPs from the operational inventory of Alternative 5 would be acceptable.

4.13.7.5 Health Risk Assessment

An emission density map of the cancer risk of Alternative 5 is in Figure 4.13-9. This figure demonstrates the dispersion of DPM and corresponding health risk over the potentially exposed population. All dispersion modeling assumptions, inputs and outputs, and HRA calculations are included in Appendix I.

The maximum potential cancer risk is the highest estimated cancer risk at a residence for Alternative 5 and is analyzed to demonstrate the worst-case scenario. Contribution by source group is shown in Table 4.13-29. As shown in Table 4.13-35, OTR Truck idling is the largest source, contributing 39.37 percent of the highest estimated cancer risk. Emissions from OTR truck running are the second largest contributor, at 29.61 percent. OTR truck running and idling contributions are higher in this alternative than in Alternatives 1-4 because the OTR truck driveway and on-site truck idling would occur on the western side of the River Center project site, which is closer to the potentially exposed population. The table also shows the maximum noncancer hazard.

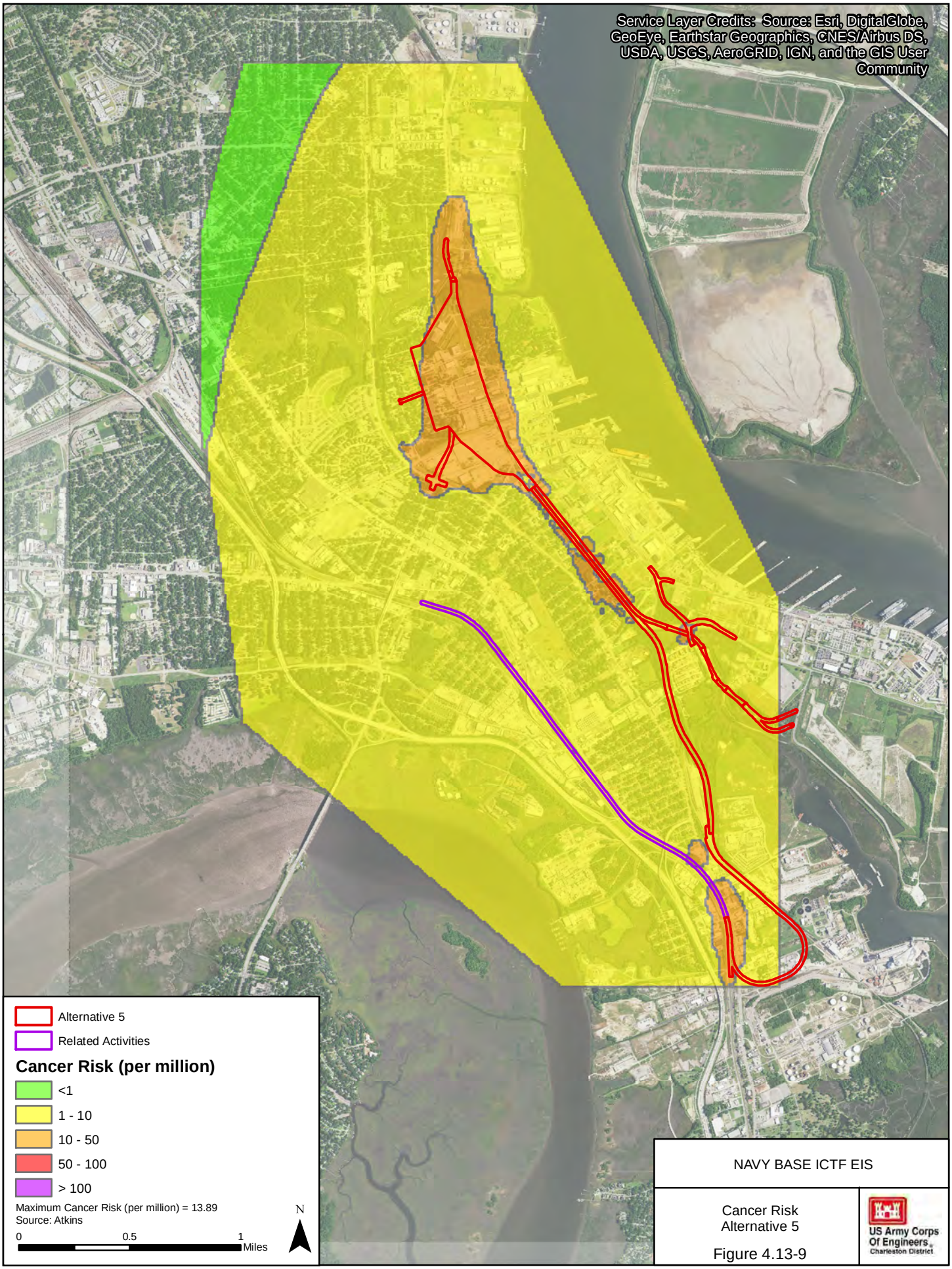

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Alternative 5
Related Activities
Cancer Risk (per million)
<1
1 - 10
10 - 50
50 - 100
> 100
Maximum Cancer Risk (per million) = 13.89
Source: Atkins
0
0.5
1
Miles
N
NAVY BASE ICTF EIS
Cancer Risk
Alternative 5
Figure 4.13-9
US Army Corps Of Engineers
Charleston District

Table 4.13-29
Cancer Risk and Noncancer Hazard by Source Group, Alternative 5

Source Group	DPM Concentration ($\mu g/m^3$)	Cancer Risk (per million)	Noncancer Hazard	Source Group Contribution
Line Haul Rail	0.01099	3.30	0.002	13.29%
Switch Rail	0.00116	0.35	0.0002	1.40%
UTR Truck Running	0.00125	0.38	0.0003	1.51%
UTR Truck Idling	0.01224	3.67	0.002	14.81%
OTR Truck Running	0.02448	7.34	0.005	29.61%
OTR Truck Idling	0.03255	9.77	0.007	39.37%
Worker Commute	0.00000	0.00	0.000	0.00%
On-site Offroad Equipment	0.00000	0.00	0.000	0.00%
Total	**0.08267**	**24.80**	**0.02**	**100.00%**

Notes and Acronyms:

See Table 4.13-8.

Source: Lakes 2015, EPA 2004 and 2015o.

The maximum potential cancer risk from Alternative 5 falls between 1 per million and 100 per million, which is within the acceptable risk range (EPA 2006b). Impacts from the potential maximum cancer risk from Alternative 5 would be acceptable. The maximum noncancer hazard for the Alternative 5 would be below 1. Impacts from Alternative 5 from noncancer hazard would be negligible.

4.13.8 Alternative 6: River Center Project Site (South via Kingsworth / North via Hospital)

4.13.8.1 Construction Criteria Pollutant Emissions Inventory

Alternative 6 is a variation of Alternative 1 (Proposed Project), with the ICTF being moved to the River Center project site and the southern rail connection connecting to an existing rail line. Road and rail improvements would be adjusted accordingly to facilitate rail and road traffic at the new site. As such, construction of the rail and road alignments differs from Alternative 1 (Proposed Project), and so construction equipment exhaust criteria pollutant emissions are different to reflect the change in length of the rail connections and road segments. Haul truck activities, worker and vendor commute, architectural coating, asphalt paving, and material movement were assumed to be the same as Alternative 1 (Proposed Project). Demolition of buildings at the River Center project site would be the same for Alternative 6 as for Alternative 5. Total criteria pollutant emissions from construction of Alternative 6 are shown below in Table 4.13-30.

Table 4.13-30
Total Construction Criteria Pollutant Emissions Inventory, Alternative 6

Activity	Criteria Pollutant (tons)					
	CO	NO_x	PM_{10}	$PM_{2.5}$	SO_2	VOC
Construction Equipment Exhaust	155.9	360.0	23.0	22.3	0.6	37.9
Haul Truck Exhaust	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)
Worker and Vendor Commute	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)
Architectural Coating	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)
Asphalt Paving	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)
Demolition	0	0	42.6	6.5	0	0
Surface Disturbance	0	0	2.9	3.6	0	0
Material Movement	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)
On-Road Fugitive Dust	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)
Total	**10,473.0**	**27,063.7**	**1,257.8**	**1,161.2**	**32.3**	**2,483.8**

Note: Construction activity is scheduled to occur over 5 years.

Sources: EPA 2010, 2015d, FHWA 2011b, CAPCOA 2013.

Impacts to Air Quality by Alternative 6 construction criteria pollutant emissions would be similar to Alternative 1 (Proposed Project).

4.13.8.2 Operational Criteria Pollutant Emissions Inventory

Under Alternative 6, the Palmetto Railways Project would be operated as proposed, with the exception of UTR truck activity on the drayage road. The UTR truck activity in Alternative 6 would be

the same as the activity in Alterative 5. As such, criteria pollutant emissions from operational activities would be the same as Alternative 5 and impacts would be the same as Alternative 5.

4.13.8.3 Criteria Pollutant Dispersion Modeling

Under Alternative 6, the Palmetto Railways Project would be operated as proposed, with the exception of UTR truck activity on the private drayage road and the location of where the pollutants would be emitted due to the different rail track segments and site. Alternative 6 dispersion modeling outputs, SCDHEC background concentrations, HLT estimated pollutant levels, and NAAQS compliance demonstration are included the Table 4.13-31. All dispersion modeling assumptions, calculations, and model outputs are included in Appendix I.

Table 4.13-31
Criteria Pollutant Dispersion Modeling, Alternative 6

Pollutant		Average Time	AERMOD Output	Background Concentrations[1]	HLT	Total Impact	NAAQS	NAAQS Exceeded?
Carbon Monoxide		8-hour	0.058 ppm	0.80 ppm	0.14 ppm	0.998 ppm	9 ppm	No
		1-hour	0.087 ppm	1.27 ppm	0.504 ppm	1.861 ppm	35 ppm	No
Nitrogen Dioxide		1-hour	69.369 ppb	38.35 ppb	Not Modeled	107.719 ppb	100 ppb	**May Exceed**
		Annual	5.613 ppb	6.60 ppb	1.59 ppb	13.803 ppb	53 ppb	No
Particle Pollution	***$PM_{2.5}$***	Annual	0.109 µg/m³	7.6 µg/m³	0.006 µg/m³	7.715 µg/m³	12 µg/m³	No
		Annual	0.109 µg/m³	7.6 µg/m³	0.006 µg/m³	7.715 µg/m³	15 µg/m³	No
		24-hour	0.405 µg/m³	16 µg/m³	0.37 µg/m³	16.775 µg/m³	35 µg/m³	No
	PM_{10}	24-hour	0.484 µg/m³	49 µg/m³	6.00 µg/m³	55.484 µg/m³	150 µg/m³	No
Sulfur Dioxide		1-hour	0.140 ppb	16.0 ppb	Not Modeled	16.140 ppb	75 ppb	No
		3-hour	<0.001 ppm	0.014 ppm	0.057 ppm	0.071 ppm	0.5 ppm	No

Notes and Acronyms:
See Table 4.13-6.
Sources: SCDHEC 2015c, Lakes 2015, EPA 2015o.

As shown in Table 4.13-37, criteria pollutants emitted from the operation of Alternative 6, along with the background concentrations and projected criteria pollutants, may exceed the NAAQS for 1-hour NO_2. The EPA recommends a three-tiered screening approach to estimate ambient concentrations of NO_2 with Tier 1 being the most conservative approach resulting in higher NO_2 concentrations and Tier 3 being the most detailed approach resulting in lower NO_2 concentrations. The Tier 1 modeling approach was used in this analysis. Further refinement of the modeling to a Tier 2 or Tier 3 approach would likely produce results that would predict compliance and continued attainment with the NAAQS. Under full operation of Alternative 6, the Tri-County area may not remain in compliance with the NAAQS. Impacts to air quality from the operation of Alternative 6 on criteria pollutants would be minor adverse.

4.13.8.4 Hazardous Air Pollutants (HAPs)

Under Alternative 6, the Palmetto Railways Project would be operated as proposed, with the exception of UTR truck activity on the drayage road. The UTR truck activity in Alternative 6 would be the same as the activity in Alterative 5. As such, HAPs emissions from operational activities would be the same as Alterative 5 and impacts would be the same as Alternative 5.

4.13.8.5 Health Risk Assessment

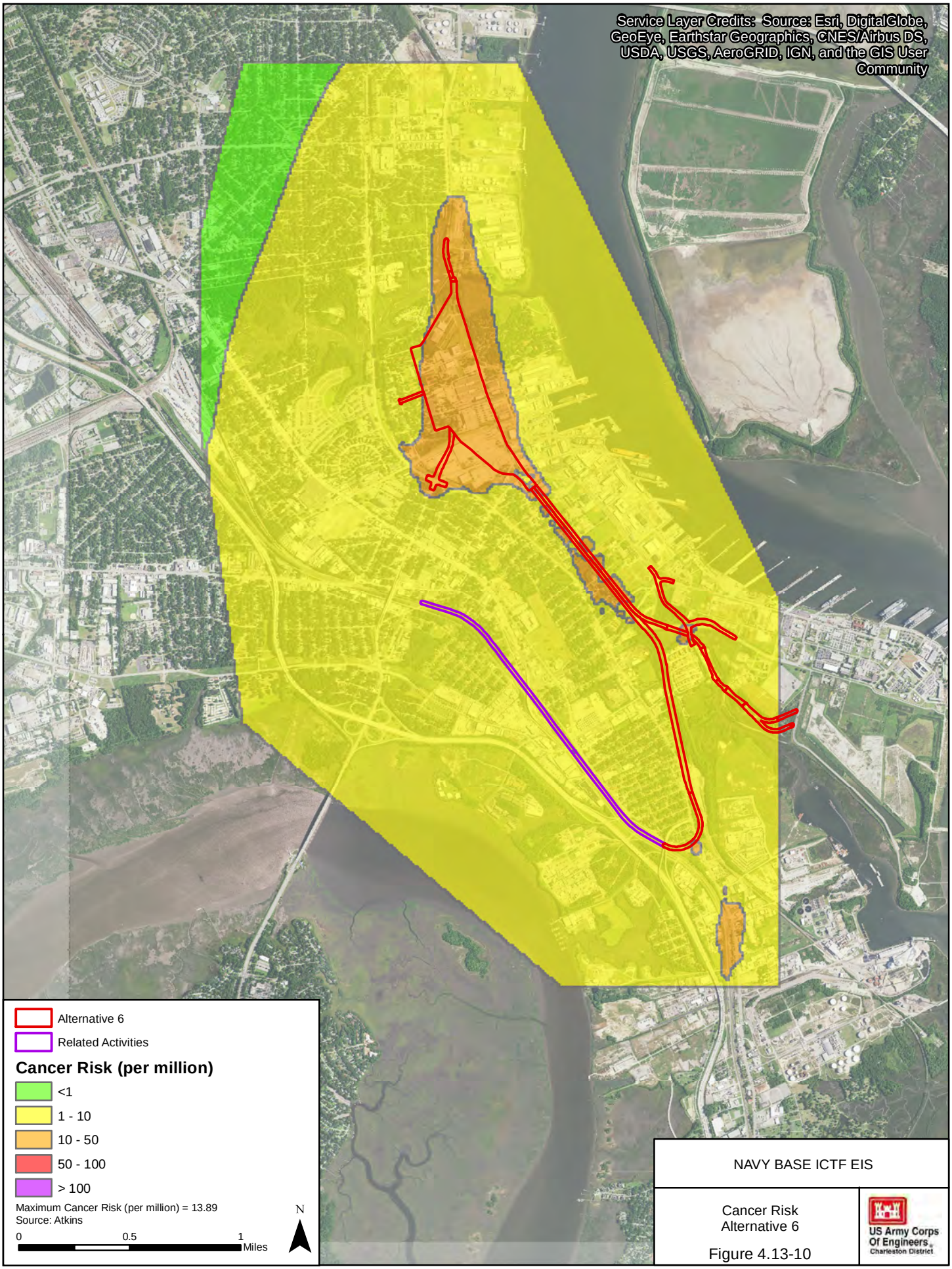
An emission density map of the cancer risk of Alternative 6 is in Figure 4.13-10. This figure demonstrates the dispersion of DPM and the corresponding health risk over all of the potentially exposed population. All dispersion modeling assumptions, inputs and outputs, and HRA calculations are included in Appendix I.

The maximum potential cancer risk is the highest estimated cancer risk at a residence for Alternative 6 and is analyzed to demonstrate the worst-case scenario. Contribution by source group is shown in Table 4.13-32. As shown in Table 4.13-32, OTR Truck idling is the largest source, contributing 39.38 percent of the highest estimated cancer risk. Emissions from OTR truck running are the second largest contributor, at 29.62 percent. The table also shows the maximum noncancer hazard.

Table 4.13-32
Cancer Risk and Noncancer Hazard by Source Group, Alternative 6

Source Group	DPM Concentration ($\mu g/m^3$)	Cancer Risk (per million)	Noncancer Hazard	Source Group Contribution
Line Haul Rail	0.01098	3.29	0.002	13.28%
Switch Rail	0.00116	0.35	0.0002	1.40%
UTR Truck Running	0.00125	0.38	0.0003	1.51%
UTR Truck Idling	0.01224	3.67	0.002	14.81%
OTR Truck Running	0.02448	7.34	0.005	29.62%
OTR Truck Idling	0.03255	9.77	0.007	39.38%
Worker Commute	0.00000	0.00	0.000	0.00%
On-site Offroad Equipment	0.00000	0.00	0.000	0.00%
Total	**0.08267**	**24.80**	**0.02**	**100.00%**

Notes and Acronyms:
See Table 4.13-8.
Source: Lakes 2015, EPA 2004, 2015o.


Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Alternative 6
Related Activities
Cancer Risk (per million)
<1
1 - 10
10 - 50
50 - 100
> 100
Maximum Cancer Risk (per million) = 13.89
Source: Atkins
0
0.5
1
Miles
N
NAVY BASE ICTF EIS
Cancer Risk
Alternative 6
Figure 4.13-10
US Army Corps Of Engineers
Charleston District

The maximum potential cancer risk from Alternative 6 falls between 1 per million and 100 per million, which is within the acceptable risk range (EPA 2006b). Impacts from the potential maximum cancer risk from Alternative 6 would be acceptable. The maximum noncancer hazard for the Alternative 6 would be below 1. Impacts from Alternative 6 from noncancer hazard would be negligible.

4.13.9 Alternative 7: River Center Project Site (South via Milford)

4.13.9.1 Construction Criteria Pollutant Emissions Inventory

Under Alternative 7, a variation of Alternative 1 (Proposed Project) with the ICTF being moved to the River Center project site and trains would also enter and exit the Navy Base ICTF from a southern rail connection. Road and rail improvements would be adjusted accordingly to facilitate rail and road traffic at the new site. As such, construction of the rail and road alignments differs from Alternative 1 (Proposed Project), and so construction equipment exhaust GHG emissions are different to reflect the change in length of the rail connections and road segments. Haul truck activities, worker and vendor commute, architectural coating, asphalt paving, and material movement were assumed to be the same as Alternative 1 (Proposed Project). Demolition of buildings at the River Center project site would be the same for Alternative 7 as for Alternative 5. Total criteria pollutant emissions from construction of Alternative 7 are shown below in Table 4.13-33.

4.13.9.2 Operational Criteria Pollutant Emissions Inventory

Under Alternative 7, the Palmetto Railways Project would be operated as proposed, with the exception of UTR truck activity on the drayage road. The UTR truck activity in Alternative 7 would be the same as the activity in Alterative 5. As such, criteria pollutant emissions from operational activities would be the same as Alternative 5 and impacts would be the same as Alternative 5.

4.13.9.3 Criteria Pollutant Dispersion Modeling

Under Alternative 7, the Palmetto Railways Project would be operated as proposed, with the exception of UTR truck activity on the private drayage road and the location of where the pollutants would be emitted due to the different rail track segments and site. Alternative 7 dispersion modeling outputs, SCDHEC background concentrations, HLT estimated pollutant levels, and NAAQS compliance demonstration are included the Table 4.13-34. All dispersion modeling assumptions, calculations, and model outputs are included in Appendix I.

Impacts to Air Quality by Alternative 7 construction criteria pollutant emissions would be similar to Alternative 1 (Proposed Project).

Table 4.13-33
Total Construction Criteria Pollutant Emissions Inventory, Alternative 7

Activity	Criteria Pollutant (tons)					
	CO	NO_x	PM_{10}	$PM_{2.5}$	SO_2	VOC
Construction Equipment Exhaust	159.6	368.6	23.5	22.8	0.6	38.8
Haul Truck Exhaust	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)
Worker and Vendor Commute	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)
Architectural Coating	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)
Asphalt Paving	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)
Demolition	0	0	42.6	6.5	0	0
Surface Disturbance	0	0	2.9	3.6	0	0
Material Movement	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)
On-Road Fugitive Dust	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)
Total	**10,476.7**	**27,072.3**	**1,258.3**	**1,161.7**	**32.3**	**2,484.7**

Note: Construction activity is scheduled to occur over 5 years.

Sources: EPA 2010, 2015d, FHWA 2011b, CAPCOA 2013.

Table 4.13-34
Criteria Pollutant Dispersion Modeling, Alternative 7

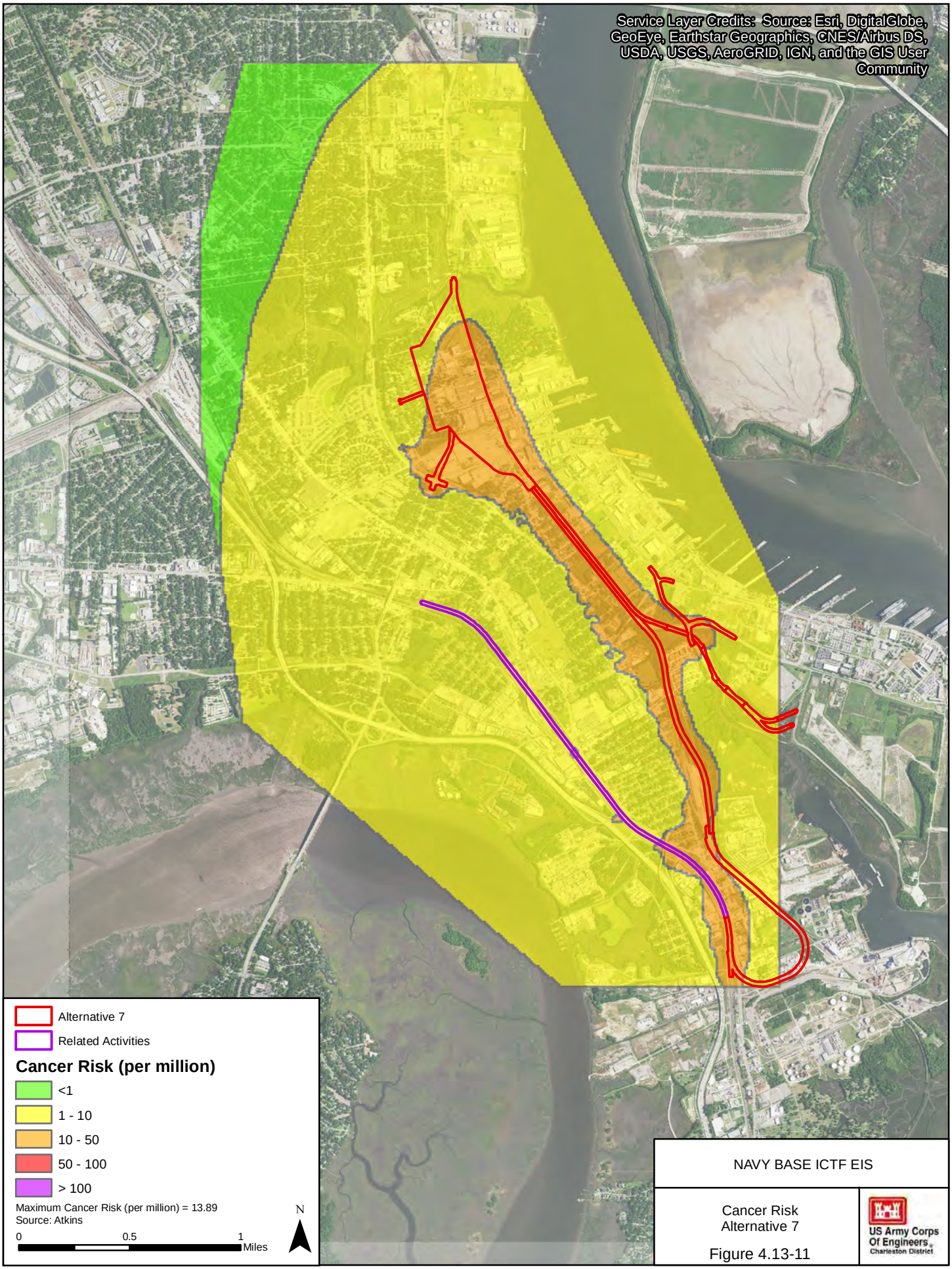
Pollutant		Average Time	AERMOD Output	Background Concentrations[1]	HLT	Total Impact	NAAQS	NAAQS Exceeded?
Carbon Monoxide		8-hour	0.055 ppm	0.80 ppm	0.14 ppm	0.995 ppm	9 ppm	No
		1-hour	0.082 ppm	1.27 ppm	0.504 ppm	1.856 ppm	35 ppm	No
Nitrogen Dioxide		1-hour	66.321 ppb	38.35 ppb	Not Modeled	104.671 ppb	100 ppb	**May Exceed**
		Annual	5.591 ppb	6.60 ppb	1.59 ppb	13.781 ppb	53 ppb	No
Particle Pollution	***$PM_{2.5}$***	Annual	0.108 µg/m^3	7.6 µg/m^3	0.006 µg/m^3	7.714 µg/m^3	12 µg/m^3	No
		Annual	0.108 µg/m^3	7.6 µg/m^3	0.006 µg/m^3	7.714 µg/m^3	15 µg/m^3	No
		24-hour	0.399 µg/m^3	16 µg/m^3	0.37 µg/m^3	16.769 µg/m^3	35 µg/m^3	No
	PM_{10}	24-hour	0.477 µg/m^3	49 µg/m^3	6.00 µg/m^3	55.447 µg/m^3	150 µg/m^3	No
Sulfur Dioxide		1-hour	0.140 ppb	16.0 ppb	Not Modeled	16.140 ppb	75 ppb	No
		3-hour	<0.001 ppm	0.014 ppm	0.057 ppm	0.071 ppm	0.5 ppm	No

Notes and Acronyms:
See Table 4.13-6.
Sources: SCDHEC 2015c, Lakes 2015, EPA 2015o.

As shown in Table 4.13-34, criteria pollutants emitted from the operation of Alternative 7, along with the background concentrations and projected criteria pollutants, may exceed the NAAQS for 1-hour NO_2. The EPA recommends a three-tiered screening approach to estimate ambient concentrations of NO_2 with Tier 1 being the most conservative approach resulting in higher NO_2 concentrations and Tier 3 being the most detailed approach resulting in lower NO_2 concentrations. The Tier 1 modeling approach was used in this analysis. Further refinement of the modeling to a Tier 2 or Tier 3 approach would likely produce results that would predict compliance and continued attainment with the NAAQS. Under full operation of Alternative 7, the Tri-County area may not remain in compliance with the NAAQS. Impacts to air quality from the operation of Alternative 7 on criteria pollutants would be minor adverse.

4.13.9.4 Hazardous Air Pollutants (HAPs)

Under Alternative 7, the Palmetto Railways Project would be operated as proposed, with the exception of UTR truck activity on the drayage road. The UTR truck activity in Alternative 7 would be the same as the activity in Alterative 5. As such, HAPs emissions from operational activities would be the same as Alternative 5 and impacts would be the same as Alternative 5.


Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Alternative 7
Related Activities
Cancer Risk (per million)
<1
1 - 10
10 - 50
50 - 100
> 100
Maximum Cancer Risk (per million) = 13.89
Source: Atkins
0
0.5
1
Miles
N
NAVY BASE ICTF EIS
Cancer Risk
Alternative 7
Figure 4.13-11
US Army Corps Of Engineers
Charleston District

4.13.9.5 Health Risk Assessment

An emission density map of the cancer risk of Alternative 7 is in Figure 4.13-11. This figure demonstrates the dispersion of DPM and corresponding health risk over the potentially exposed population. All dispersion modeling assumptions, inputs and outputs, and HRA calculations are included in Appendix I.

The maximum potential cancer risk is the highest estimated cancer risk at a residence for Alternative 7 and is analyzed to demonstrate the worst-case scenario. Contribution by source group is shown in Table 4.13-35. As shown in Table 4.13-35, OTR Truck idling is the largest source, contributing 39.38 percent of the highest estimated cancer risk. Emissions from OTR truck running are the second largest contributor, at 29.62 percent. The table also shows the maximum noncancer hazard.

Table 4.13-35
Cancer Risk and Noncancer Hazard by Source Group, Alternative 7

Source Group	DPM Concentration (µg/m³)	Cancer Risk (per million)	Noncancer Hazard	Source Group Contribution
Line Haul Rail	0.01002	3.01	0.002	12.26%
Switch Rail	0.00116	0.35	0.0002	1.42%
UTR Truck Running	0.00125	0.38	0.0003	1.53%
UTR Truck Idling	0.01224	3.67	0.002	14.98%
OTR Truck Running	0.02448	7.34	0.005	29.96%
OTR Truck Idling	0.03255	9.77	0.007	39.84%
Worker Commute	0.00000	0.00	0.000	0.00%
On-site Offroad Equipment	0.00000	0.00	0.000	0.00%
Total	**0.08170**	**24.51**	**0.02**	**100.00%**

Notes and Acronyms:
See Table 4.13-8.
Source: Lakes 2015; EPA 2004, 2015o.

The maximum potential cancer risk from Alternative 7 falls between 1 per million and 100 per million, which is within the acceptable risk range (EPA 2006b). Impacts from the potential maximum cancer risk from Alternative 7 would be acceptable. The maximum noncancer hazard for the Alternative 7 would be below 1. Impacts from Alternative 7 from noncancer hazard would be negligible.

4.13.10 Related Activities

If the Palmetto Railways Project was constructed, new track would be constructed on a section of out-of-service CSX ROW to accept intermodal trains at the proposed new at-grade crossing at Meeting

Street. Construction would extend from the vicinity of Discher to Misroon Street. Existing track would be reactivated from Misroon Street into Ashley Junction, as needed. This Related Activity would apply to Alternatives 1, 2, 4, 5, and 7. Under Alternatives 3 and 6, the Related Activity construction would be the same as Alternatives 1, 2, 4, 5, and 7; however, construction of new track would begin at the proposed new at-grade crossing at Meeting Street in the vicinity of Kingsworth Avenue. Under Alternative 2 an additional Related Activity, reactivating an out-of-service ROW and constructing a new railroad bridge, would be required to connect the NS arrival/departure tracks lead track from the ICTF across a portion of marsh which drains to Noisette Creek to the existing NCTC track along Virginia Avenue.

The criteria pollutant emissions from the construction and operation of the related activity were included in the construction and operational criteria pollutant emissions inventories for Alternatives 1–7, as well as the non-DPM HAPs emission inventories. The related activity was also included in the dispersion modeling of the NAAQS and DPM. Therefore, impacts from the construction and operation of the related activity are analyzed in this analysis.

4.13.11 Summary of Impacts Table

Table 4.13-36 provides a summary of impacts on air quality from Alternative 1 (Proposed Project) and all other alternatives.

Table 4.13-36
Summary of Impacts, Air Quality

Alternative	Impacts of the Criteria Pollutants on Air Quality			Impacts of HAPs on Air Quality	
	Construction Emissions	Operational Emissions	NAAQS Dispersion Modeling	Non-DPM HAPs	DPM
No-Action	The No-Action Alternative would result in short-term construction period criteria pollutant emissions. Potential impacts would be minor short-term adverse.	The No-Action Alternative operational criteria pollutant emissions would be less than 1 percent of study area's criteria pollutant emissions. Potential impacts would be minor permanent adverse.	Criteria pollutants emitted from the No-Action Alternative, along with the existing and projected criteria pollutants, would not put the Tri-County area into non-attainment for any criteria pollutants and the NAAQS would remain in compliance. Potential impacts would be minor permanent adverse.	Non-DPM HAP emissions from the No-Action Alternative would each equal less than one-tenth of 1 percent of the total HAPs emitted in the study area. Potential impacts would be acceptable.	Potential excess cancer risk would be within the acceptable range. Impacts from cancer risk would be acceptable. The maximum noncancer hazard would be below 1. Potential impacts from noncancer hazard would be negligible.

Alternative	Impacts of the Criteria Pollutants on Air Quality			Impacts of HAPs on Air Quality	
	Construction Emissions	Operational Emissions	NAAQS Dispersion Modeling	Non-DPM HAPs	DPM
1: Proposed Project: South via Milford / North via Hospital District	Alternative 1 (Proposed Project) construction criteria pollutant emissions would be short term and spread out over five years. Potential impacts to air quality would be minor short-term adverse.	Alternative 1 (Proposed Project) operational criteria pollutant emissions would be less than 1 percent of study area's criteria pollutant emissions. Potential impacts would be minor permanent adverse.	Criteria pollutants emitted from Alternative 1 (Proposed Project), along with the existing and projected criteria pollutants, would not put the Tri-County area into non-attainment for any criteria pollutants and the NAAQS would remain in compliance. Potential impacts would be minor permanent adverse.	Non-DPM HAP emissions from Alternative 1 (Proposed Project) would each equal less than one-tenth of 1 percent of the total HAPs emitted in the study area. Potential impacts would be acceptable.	Potential excess cancer risk would fall within the acceptable range. Impacts from cancer risk would be acceptable. The maximum noncancer hazard would be below 1. Potential impacts from noncancer hazard would be negligible.
2: South via Milford / North via S-line	Potential impacts would be similar to Alternative 1 (Proposed Project).	Potential impacts would be the same as Alternative 1 (Proposed Project).	Potential impacts would be the similar to Alternative 1 (Proposed Project).	Potential impacts would be the same as Alternative 1 (Proposed Project)	Potential impacts would be the similar to Alternative 1 (Proposed Project)
3: South via Kingsworth / North via Hospital District	Potential impacts would be the similar to Alternative 1 (Proposed Project)	Potential impacts would be the same as Alternative 1 (Proposed Project)	Potential impacts would be similar to Alternative 1 (Proposed Project).	Potential impacts would be the same as Alternative 1 (Proposed Project).	Potential impacts would be the similar to Alternative 1 (Proposed Project).
4: South via Milford	Potential impacts would be the similar to Alternative 1 (Proposed Project)	Potential impacts would be the same as Alternative 1 (Proposed Project).	Potential impacts would be similar to Alternative 1 (Proposed Project).	Potential impacts would be the same as Alternative 1 (Proposed Project).	Potential impacts would be the similar to Alternative 1 (Proposed Project).
5: River Center Project Site: South via Milford / North via Hospital District	Alternative 5 construction criteria pollutant emissions would be short term and spread out over five years. Potential impacts to air quality would be minor short-term adverse.	Alternative 5 operational criteria pollutant emissions would be less than 1 percent of Study Area's criteria pollutant emissions. Potential impacts would be minor permanent adverse.	Criteria pollutants emitted from Alternative 5, along with the existing and projected criteria pollutants, may put the Tri-County area into non-attainment for the NO_2 1 hour NAAQS. Potential impacts would be minor adverse.	Non-DPM HAP emissions from Alternative 5 would each equal less than one-tenth of 1 percent of the total HAPs emitted in the Study Area. Potential impacts would be acceptable.	Potential excess cancer risk would fall within the acceptable range. Impacts from cancer risk would be acceptable. The maximum noncancer hazard would be below 1. Potential impacts from noncancer hazard would be negligible.
6: River Center Project Site: South via Kingsworth / North via Hospital District	Potential impacts would be similar to Alternative 5	Potential impacts would be the same as Alternative 5	Potential impacts would be similar to Alternative 5	Potential impacts would be the same as Alternative 5	Potential impacts would be similar to Alternative 5

Alternative	Impacts of the Criteria Pollutants on Air Quality			Impacts of HAPs on Air Quality	
	Construction Emissions	Operational Emissions	NAAQS Dispersion Modeling	Non-DPM HAPs	DPM
7: River Center Project Site: South via Milford	Potential impacts would be similar to Alternative 5	Potential impacts would be the same as Alternative 5	Potential impacts would be similar to Alternative 5	Potential impacts would be the same as Alternative 5	Potential impacts would be similar to Alternative 5

Criteria Pollutants Impact Definitions

Negligible = Criteria pollutant emissions do not occur.

Moderate = Criteria pollutant emissions would occur but not to the extent of putting the County in Non-Attainment.

Major = Criteria pollutant emissions would occur to the extent of putting the County in Non-Attainment.

Hazardous Air Pollutants Impact Definitions

Negligible = HAPs emissions do not occur. Potential cancer risk would be below 1 per million. Potential noncancer hazard would be below 1.

Acceptable =HAPS emissions would occur. Potential cancer risk would be between 1 per million and 100 per million. Potential noncancer hazard would be above 1, but adverse effects are unlikely to occur.

Unacceptable = HAPS emissions would occur. Potential cancer risk would be above 100 per million. Potential noncancer hazard quotient would be above 1 and adverse effects may occur.

4.13.12 Mitigation

4.13.12.1 Applicant's Proposed Avoidance and Minimization Measures

The Applicant has committed to several measures that avoid and/or minimize potential impacts of Alternative 1 (Proposed Project). These measures are taken from Palmetto Railways Mitigation Plan provided in Appendix N. Some of these measures are required under federal, state, and local permits; others are measures that Palmetto Railways has incorporated into the design and operations of Alternative 1 (Proposed Project). Each mitigation measure is also designated as one that either helps to avoid an impact or one that minimizes an impact.

- The Applicant is committed to implement options to minimize air emissions for the community and the environment of the region and executed an Air Quality Memorandum of Agreement (MOA) with South Carolina Department of Health and Environmental Control (SCDHEC). The facility will comply with all applicable requirements, conditions, and reporting and would maintain air pollution control equipment in accordance with such requirements and commitments found in the Air Quality MOA. The Air Quality MOA will expire by its term on December 31, 2019, unless otherwise terminated. Commitments outlined in the Air Quality MOA include:
  - SCDHEC Bureau of Air Quality commits to promptly and thoroughly review any regulatory determinations and respond to requested consultations by the Applicant. (Minimization)
  - SCDHEC commits to designate a point of contact who will make staff reasonably available to participate in discussions related to the design of the ICTF and review of operational and equipment options at future and existing Palmetto Railway facilities. (Minimization)

- SCDHEC commits to work cooperatively with Palmetto Railways in evaluating reasonable and proven practices and technologies to assist Palmetto Railways in meeting applicable environmental standards at the proposed and existing Palmetto Railways facilities while fairly accounting for environmental, economic, and competitiveness considerations. (Minimization)
- During the term of the MOA and for two years after operations begin at the ICTF, SCDHEC shall conduct an annual community meeting in the vicinity of the ICTF to update the community on relevant and pertinent environmental and health issues. Palmetto Railways shall use its best efforts to cooperate and assist SCDHEC with such community meeting as may be reasonably requested by SCDHEC. (Minimization)
- The Applicant commits to work cooperatively with SCDHEC staff to evaluate potential design, operation, and equipment options that are environmentally beneficial and fiscally feasible with demonstrated technologies and practices of intermodal facilities on the east coast in areas designated as attainment for implementation at the ICTF. Palmetto Railways will consider innovative technologies on a case-by-case basis. (Minimization)
- The Applicant commits that when major equipment reaches the end of its useful life and is retired, they will identify and replace such equipment with environmentally beneficial and fiscally feasible equipment and demonstrated technology of intermodal facilities on the east coast in areas designated as attainment then currently available. Enterprise (MBE) firms will be provided opportunities on the project. An example of this commitment, replacement equipment for retired equipment will include engines that meet the federal Tier 3 or higher emission standard. (Minimization)
- The Applicant will designate one (1) individual as the point of contact with SCDHEC related to the implementation of the Air Quality MOA. (Minimization)
- The Applicant will contribute fifty thousand dollars ($50,000.00) towards ambient air quality initiatives in conjunction and coordination with SCDHEC and the Medical University of South Carolina on air quality initiatives in the Charleston region, for which SCDHEC will serve as the lead and point of contact. (Minimization)
- The Applicant will include in its contractor bid documents and in the construction contract for the ICTF the terms, conditions, and provisions set forth in the Air Quality MOA to ensure the implementation of best management practices (BMPs) and minimize air emissions during the construction of the ICTF. (Minimization)

- Once operational, the ICTF will reduce truck traffic on local roads by providing additional intermodal capacity and encouraging the use of rail to transport containers, thereby improving fuel efficiency and reducing emissions. (Minimization)
- The ICTF will be a semi-automated facility that minimizes air quality emissions during operations as a result of increased efficiencies during the handling and processing of containers. (Minimization)
- The project will use electric wide-span gantry cranes that emit zero air emissions versus diesel-powered lift equipment. (Minimization)

- An automated gate system will be utilized for the over-the-road (OTR) trucks entering/ exiting the facility from the Wando Welch and North Charleston Container Terminals and an optical character recognition (OCR) portal at the connection from the facility (drayage road) to the HLT to reduce on-site idle times of trucks. (Minimization)
- Use of automated gates at at-grade crossings to reduce emissions due to reduced truck idling. (Minimization)
- The Applicant will provide access to air quality and health assessment data as requested to evaluate health impacts. (Minimization)
- The Applicant will support the South Carolina Ports Authority (SCPA) efforts to implement a container barge service to transfer containers between Wando Welch Terminal and a yet-to-be- determined wharf location at the former CNC in North Charleston for transport via intermodal rail at the proposed ICTF. Transferring containers between terminals via barge transportation will help to alleviate truck congestion on the interstate system, specifically I-526 between the Wando Welch Marine Container Terminal on Long Point Road and I-26, and minimizing impacts of air emissions. This service would work in conjunction with the Hugh K. Leatherman, Sr. Terminal (HLT) and the ICTF drayage road efforts in alleviating truck congestion on the area local roads and interstate system. *(Minimization)
- Implement dust control measures (such as watering unpaved work areas, temporary and permanent seeding and mulching, covering stockpiled materials, and using covered haul trucks). (Minimization)
- Construct an earthen berm between the processing and classification tracks and adjacent neighborhoods. (Minimization)
- Comply with Air Quality State Construction and Operating permit requirements, conditions, and reporting. (Minimization)
- Operate and maintain air pollution control equipment in accordance with permit requirements. (Minimization)
- Use Tier 4 Utility Tractor Rigs (UTR) at full build out (2038) on the private drayage road to transfer containers to the ICTF versus transferring the same containers using over the road trucks on public roadways to minimize emissions. (Minimization)
- Limit switching activity within the ICTF to Tier 4 locomotive engines by full build-out (2038). (Minimization)

4.13.12.2 Additional Potential Mitigation Measures

No additional mitigation measures for Air Quality have been recommended by the Corps. Additional avoidance, minimization, and mitigation may be considered by the Corps in its decision-making process. Final mitigation measures may be adopted as conditions of the DA permit and documented in the Record of Decision (ROD).

4.14 CLIMATE CHANGE

4.14.1 Methods and Impact Definitions

Impacts on Climate Change by Alternative 1 (Proposed Project) and the alternatives were evaluated by estimating the Greenhouse Gas (GHG) emissions associated with the construction and operation of the Proposed Project and alternatives. GHG emissions were evaluated for the full buildout year, 2038 to best represent the GHG emissions at full operating capacity. Accordingly, a 2038 GHG emissions inventory represents the GHG emissions for all operating years after 2038, and a conservative estimate for interim years between opening year, 2018, and full buildout.

Construction period GHG emissions inventories included emissions from construction equipment exhaust, haul truck trips for importing and exporting material, and worker and vendor commute to and from the construction sites. GHG emissions from each of these activities were quantified using the EPA Motor Vehicle Emissions Simulator (MOVES) model, EPA guidance, activity information provided by Palmetto Railways, and assumptions and other sources where necessary. All GHG emission calculations, assumptions, and model runs are included in the Air Quality and Climate Change Technical Memorandum (Appendix I).

Operational GHG emissions inventories included emissions from locomotive activity, Over-the-Road (OTR) truck trips and idling, Utility Tractor Rig (UTR) truck trips and idling, worker commute, and GHG emissions associated with electricity consumption, water use, wastewater, and solid waste generation. Locomotive GHG emissions were estimated for off-terminal line haul activity, on-terminal line haul activity, and switch locomotive activity. It is common for intermodal container transfer facilities to use off-road equipment such as forklifts and cranes in its operations. Alternative 1 (Proposed Project) and the build alternatives would, however, utilize electric equipment, including gantry cranes. Electric equipment does not directly emit GHGs, although GHG emissions are indirectly emitted at the source of electrical generation and are inherent in the use of electricity. This analysis of operational GHG emissions includes these indirect sources of GHG emissions in the GHG calculations for electricity consumption. The analysis incorporated emission reduction strategies built into the Project. Emission reductions from these Project features were calculated where feasible as minimization. GHG emissions from each of the operational activities were quantified using the EPA MOVES model, EPA guidance, activity information provided by Palmetto Railways, and assumptions and other sources where necessary. All GHG emission calculations, assumptions, and model runs are included in Appendix I.

Individual GHGs have varying heat-trapping properties and atmospheric lifetimes. Table 4.14-1 identifies the CO_2 equivalent (CO_2e) of basic GHGs. Each GHG is compared to CO_2 with respect to its ability to trap infrared radiation, its atmospheric lifetime, and its chemical structure. The CO_2e is a consistent methodology for comparing GHG emissions since it normalizes various GHG emissions to a consistent measure. For example, CH_4 is a GHG that is 25 times more potent than CO_2; therefore,

one metric ton of CH_4 is equal to 25 metric tons CO_2e. When direct calculation to metric tons of CO_2e was not available, GWPs were used to convert calculated CH_4 and N_2O emissions into CO_2e.

Table 4.14-1
Global Warming Potential (GWP) of GHGs

GHG	GWP
CO_2	1
CH_4	25
N_2O	298

Source: IPCC 2007.

Impact criteria for GHGs have not been established by the EPA; however, the Council on Environmental Quality (CEQ) has provided a reference point of 25,000 metric tons (MT) of CO_2e emitted annually below which a GHG emission quantitative analysis is not warranted (CEQ 2014).

Climate Change impacts on the Proposed Project and alternatives were evaluated by analyzing the effects of sea level rise and the increased frequency and intensity of storm events resulting from Climate Change at and on the Project site (Alternatives 1–4) and the River Center project site (Alternatives 5-7). The U.S. Army Corps of Engineers Engineering Circular 1100-2-8162 (2013) recommends that sea level change (SLC) be calculated for projects influenced by tidal waters and reported as a "low," "intermediate," and "high" SLC for consideration of project impacts, as defined in Appendix I, for both "with" and "without" project conditions. The calculations of SLC for the Proposed Project and alternatives are based on the methods recommended in Engineering Circular 1100-2-8162 (2013) (Corps 2013). Storm events, which includes hurricanes, tropical storms, and associated events such as storm surges, can impact infrastructure and equipment through water damage and threaten human safety. The increase in storm events and their intensity increases the risk of infrastructure damage and threat to human safety through inundation. The Sea, Lake, and Overland Surges from Hurricanes (SLOSH) model obtained from NOAA was used to determine storm surge inundation for different hurricane wind categories at high tide (NOAA 2016c). The SLOSH model uses Maximum of Maximums (MOMs), an ensemble product of maximum storm surge heights. MOMs represent the worst case scenario for a given category of storm and initial water level under ideal storm conditions (NOAA 2016c). Climate Change resiliency measures were recommended to minimize and mitigate impacts where possible. Sea level rise and storm event calculations, assumptions, and methods are included in Appendix I.

The CEQ recommends the following be considered when addressing climate change in NEPA documents:

1. The potential effects of a proposed action on climate change as indicated by its GHG emissions; and
2. The implication of climate change for the environmental effects of a proposed action (CEQ 2014).

Climate Change impacts are by nature, cumulative and long term. An individual project cannot generate enough GHG emissions to influence Global Climate Change. The project contributes to this potential impact by its incremental contribution combined with the cumulative increase of all other sources of GHGs, which when taken together create changes in the climate. In addition, once emitted GHG emissions persist in the atmosphere for decades or longer impacting the climate over the long term. Furthermore, according to the CEQ guidance, the ultimate determination of significance remains subject to agency practice for the consideration of context and intensity. As such, impacts by the Proposed Project and alternatives on Global Climate Change will be evaluated comparatively against each alternative with the consideration of context and intensity (Table 4.14-2).

Table 4.14-2
Impact Definitions, Climate Change

Negligible	Minor	Major
Short-term and long-term GHG emissions do not occur or are at negligible levels.	Short-term or long-term GHG emissions may occur. Short-term GHG emissions help make long-term emissions more efficient. Long-term emissions are minimized or mitigated through improved efficiency.	Short or long-term GHG emissions may occur. Long-term GHG emissions are considerable due to inefficient use of fuel and/or resources.

Table 4.14-3
Impact Definitions, Climate Change Impacts on the Proposed Projects and Alternatives

Negligible	Minor	Major
Undetectable changes to on-site structural integrity. No predictable impacts to human health and safety.	Environmental conditions that require reduced on-site operations. Minimal damage to on-site structures that do not alter any structural integrity. No predictable impacts to human health and safety with standard safety precautions applied.	Environmental conditions that require temporary closure of on-site operations. Damage to on-site structures that alter or comprise structural integrity. Predictable unavoidable impacts to human health and safety.

4.14.2 No-Action Alternative

Under the No-Action Alternative, the application for DA permit would be denied; the Proposed Project would not occur; CSX and NS would undertake operational and structural modifications to Ashley Junction and 7-Mile rail yards; and future use of the Project site and River Center project site would likely be mixed-use and industrial (e.g., rail-served warehousing distribution center). As such, the site would need to be built for these uses and construction activities would occur. Other existing rail yards would facilitate the transfer of the additional containers by rail. CSX and NS would do so by increasing the length of existing trains to accommodate more containers per train. Additional trains and locomotive engines would not be used under the No-Action Alternative.

4.14.2.1 Impacts on Climate Change by the No-Action Alternative: Construction GHG Emissions Inventory

The No-Action Alternative would result in construction period GHG emissions. Construction period GHG emissions would be short term. Therefore, impacts to Global Climate Change resulting from the No-Action Alternative construction GHG emissions would be minor adverse.

4.14.2.2 Impacts on Climate Change by the No-Action Alternative: Operational GHG Emissions Inventory

There would be no increase in GHG emissions due to locomotive activity for the No-Action Alternative. The Corps assumes that the existing facility workers would be sufficient for the increase in container throughput; therefore, there are no increase in GHG emissions due to worker commute for the No-Action Alternative. Further, under the No-Action Alternative, the Proposed Project site and River Center project site would not be constructed and operated, including the private drayage road. Therefore, the Corps assumes that additional UTR trucks would not be operated under the No-Action Alternative, and OTR trucks would be used to transport all additional containers from existing terminals to the CSX and NS facilities. Although CSX and NS would undertake operational and structural modifications to Ashley Junction and 7-Mile rail yards, it is assumed CSX and NS would not

increase their facility's energy use, water use, wastewater and solid waste generation. Therefore, there would be no increase in GHG emissions due to energy use, water use, wastewater and solid waste generation for the No-Action Alternative. It is common for intermodal container transfer facilities to use off-road equipment such as forklifts and cranes in its operations. However, CSX and NS crane and forklift activity was unavailable. Although it is reasonable to assume that some activity would take place, GHG emissions from on-site off-road equipment was not quantified.

Therefore, GHG emissions due to operational activities of the No-Action Alternative would include running emissions from OTR truck trips and idling emissions from idling on-site at the Ashley Junction and 7-Mile rail yards. An idle time of 15 minutes was assumed per truckload, while trucks idle in queu to enter the facility, enter the facility, unload containers, and exit the facility. The operational GHG emissions inventory for the No-Action Alternative is in Table 4.14-3.

Table 4.14-4
Alternative Annual Operational GHG
Emissions Inventory, No-Action Alternative

Activity	CO_2e (MT)
Off-Terminal Line Haul Locomotive	0
On-Terminal Line Haul Locomotive	0
Switch Locomotive	0
UTR Truck Running	0
UTR Truck Idling	0
OTR Truck Running	34,773
OTR Truck Idling	1,287
Worker Commute	0
Electricity	0
Water	0
Wastewater	0
Solid Waste	0
On-site Offroad Equipment	0
Total	**36,060**
Exceed 25,000 MT CO_2e?	**YES**

Source: IPCC 2007, EPA 2014f.

Operation of the No-Action Alternative would generate annual GHG emissions above the CEQ reference point of 25,000 MT CO_2e / year. When considering context and intensity, this analysis looks at both short-term and long-term effects and benefits associated with phases of a single proposed action. Table 4.14-3 summarizes operational phase emissions, which provides a review of long-term effects. The long-term effect of the operational phase of the No-Action Alternative is an inefficient

movement of goods between the Port and the destination of the goods. This is due to the extensive use of OTR trucks to facilitate the movement of goods, compared to the increased use of rail and UTR trucks on the private drayage road under Alternatives 1-7. This is also due to the longer truck idling time (15 minutes) assumed for the No-Action Alternative in comparison to the shorter idle time (7.5 minutes) that would be expected under Alternative 1 (Proposed Project) and alternatives which would include an automated gate system for OTR trucks entering and exiting the facility. As demonstrated in the following sections, the No-Action Alternative has a higher annual operational GHG emissions inventory than under Alternatives 1-7. This comparison is important when considering the context and intensity of the impacts. Due to the higher annual operational GHG emissions inventory from the inefficient use of resources, the No-Action Alternative's long-term effects on Global Climate Change would be more severe than those in Alternatives 1-7. Because of this, impacts of the long-term effects on Global Climate Change from the No-Action Alternative are major adverse. Short-term and long-term effects of Alternative 1 (Proposed Project) and alternatives are analyzed in comparison to the No-Action Alternative and summarized in section 4.14.11.

4.14.2.3 Impacts on the No-Action Alternative by Climate Change: Sea Level Rise

Assuming a project life of 50 years from opening year, 2018, SLC was calculated through the year 2068 using the local "low" SLC rate obtained by NOAA data and the SLC calculator for the "intermediate" and "high" SLC rates, as detailed in Appendix I. Table 4.14-5 provides the summary of all estimated SLC rates for the estimated 50-year lifespan.

Table 4.14-5
Summary of SLC Estimates between the Years 2018 and 2068

Method	Estimate	SLC Rise Estimate	
		(meters)	(feet)
Historic Tide Gauge Trend	Low	0.16	0.52
NRC Curve I	Intermediate	0.30	0.97
NRC Curve III	High	0.73	2.41

Method outlined in Appendix I.

Source: NOAA 2016a, Corps 2013, Corps 2016.

Under the No-Action Alternative, future use of the Proposed Project and River Center project sites would likely be mixed-use and industrial (e.g., rail-served warehousing distribution center), so impacts of sea level rise at both of these locations were evaluated. The current elevation of both the Project site and the River Center project site is 13 feet above mean sea level (amsl) (FEMA 2004a, 2004b). Applying the "high" SLC estimate of 2.41 feet, which is the highest (and, therefore, most conservative estimate), the mean sea level is not expected to rise high enough to inundate either site by 2068. Applying the most conservative estimate, sea level rise is not expected to cause the mean sea level to inundate the Project site or River Center project site in 2068.

As stated by the Corps in Engineering Circular 1100-2-8162 (2013), the SLC rates are meant to provide guidance in determining how sensitive projects are to these rates of future local mean SLC, how the sensitivity affects calculated risk, and what design or operations and maintenance measures should be implemented to adapt to SLC to minimize adverse consequences while maximizing local benefits (Corps 2013). The performance should be evaluated in terms of human health and safety, economic costs and benefits, environmental impacts, and other social effects. To best evaluate how sea level rise would impact the Proposed Project and River Center project sites, high tides and extreme water levels were also included in the analysis. Sea level rise would also affect the increased frequency and intensity of storms; however, this is further addressed in Section 4.14.2.4.

"King Tides" is a non-scientific term used to describe the highest seasonal tides that occur each year. For example, in Charleston, the average high tide range is about 5.5 feet, whereas during a King Tide event the high tide range may reach 7 feet or higher (SCDHEC 2015). NOAA calculates annual exceedance probability curves to indicate the highest and lowest water levels as a function of return period in years (NOAA 2016b). NOAA measures the exceedances in meters above Mean Higher High Water (MHHW), the average of the higher high water height of each tidal day, also known as high tide. The results of these curves for the NOAA tide gauge station 8665530 (Charleston station) are shown in Table 4.14-6 (NOAA 2016b).

Table 4.14-6
NOAA Annual Exceedance Probability Curve, 8665530 Charleston, SC

Return Period (years / 100 years)	Meters above MHHW	Feet above MHHW
1	1.3	4.3
10	0.8	2.6
50	0.6	2.0
99	0.4	1.3

Source: NOAA 2016b.

As shown in Table 4.14-6, at least once per year (return period of 99 years / 100 years), Charleston could have sea level approximately 1.3 feet higher than the average high tide. Once in 100 years (return period of 1 year / 100 years), sea level approximately 4.3 feet higher than the average high tide could be experienced in the Charleston area. This represents an extreme event that is possible to occur over the life of the No-Action Alternative and is used to analyze the effect of sea level rise at the Proposed Project and River Center project sites. Table 4.14-7 shows the combination of how SLC, high tide, and an extreme water level event (return period of 1 year / 100 years) would have when combined at the Proposed Project and River Center project sites.

Table 4.14-7
Estimated Extreme Water Level in Year 2068

SLC Rise Estimate		High Tide (feet)	Feet above MHHW (Return Period of 1 year/100 years)	Total Increase in Water Level during Return Period of 1 year/100 years	Current BFE (feet)	Does Estimated Extreme Water Level Exceed Current BFE?
Estimate	(feet)					
Low	0.52	5.5	4.3	10.32	13	**No**
Intermediate	0.97	5.5	4.3	10.77	13	**No**
High	2.41	5.5	4.3	12.21	13	**No**

Sources: NOAA 2016a, Corps 2013, Corps 2016, SCDHEC 2015, NOAA 2016b, FEMA 2004a, 2004b

As shown in Table 4.14-7, the effects of SLC, high tides, and extreme water level events would not raise sea levels above the current BFE. This assumes the uses on the Proposed Project and River Center project sites would not occur below its BFE. The sea level rise would not cause detectable changes to on-site structural integrity, nor would it cause predictable impacts to human health and safety. Therefore, impacts due to sea level rise at the Proposed Project and River Center project sites would be negligible.

4.14.2.4 Impacts on the No-Action Alternative by Climate Change: Increased Frequency and Intensity of Storm Events

Most tropical systems to make landfall in South Carolina are tropical storms and Category 1 hurricanes. Since 1851, only seven hurricanes to make landfall in the South Carolina and Georgia were considered major (Category 3-5), occurring once approximately every 25 years (NWS 2016). However, a predicted result of Climate Change is the increase in storm event frequency and intensity (NOAA 2017).

Inundation from storm surges can damage infrastructure, such as buildings, roads, and bridges, through erosion. The structural integrity of the infrastructure could be compromised from intense storm events, or many lesser intense events over a longer period of time. Inundation can threaten human safety by blocking roadways and making roadway travel dangerous. The evacuation route for North Charleston is along I-26 (SCDOT 2015). The SLOSH model obtained from NOAA was used to determine storm surge inundation for different hurricane wind categories at high tide (NOAA 2016c). The maximum inundation shown on each site is listed in Table 4.14-8.

Table 4.14-8
SLOSH Storm Surge Inundation MOM Estimates

Hurricane Category	MOM Inundation Depth	
	Proposed Project Site	River Center Project Site
1	Up to 3 feet above ground	No Inundation
2	Greater than 3 feet above ground	Greater than 3 feet above ground
3	Greater than 9 feet above ground	Greater than 6 feet above ground
4	Greater than 9 feet above ground	Greater than 9 feet above ground
5	Greater than 9 feet above ground	Greater than 9 feet above ground

Source: NOAA 2016c.

Although major hurricanes make landfall in South Carolina and Georgia approximately once every 25 years, it is likely the Proposed Project and River Center project sites would experience at least one over the life of the Project, between 2018 and 2068. According to the SLOSH model estimates shown in Table 4.14-8, the Proposed Project site would likely experience a storm surge of greater than 9 feet above ground, and the River Center project site would likely experience a storm surge of greater than 6 feet above ground (NOAA 2016c). This level of inundation could damage on-site structures to the point of altering their structural integrity, move and damage heavy equipment, and pose a threat to human health and safety of people on-site. Because of this, impacts from increased frequency and intensity of storms on the Proposed Project and River Center project sites would be major. Mitigation measures are listed in section 4.14.12.

4.14.3 Alternative 1: Proposed Project (South via Milford / North via Hospital District)

Under Alternative 1, the Proposed Project would be constructed. As such, GHG emissions from construction activities, including operation of construction equipment, haul truck trips for the import and export of material, and commutes by construction workers and vendors, would occur. GHG emissions from operational activities including operation of locomotives, UTR trucks, OTR trucks, and commutes by workers would also occur, as well as GHG emissions associated with electricity use, water use, wastewater, and solid waste.

4.14.3.1 Impacts on Climate Change by the Proposed Project: Construction GHG Emissions Inventory

Total GHG emissions from construction of Alternative 1 (Proposed Project) are shown below in Table 4.14-9.

Table 4.14-9
Total Construction GHG Emissions Inventory, Alternative 1

Activity	Total CO_2e (MT)
Construction Equipment Exhaust	90,624
Haul Truck Exhaust	2,631
Worker and Vendor Commute	1,361
Total	**94,616**
Annual Average	**18,923**
Exceed 25,000 MT CO_2e?	**No**

Note: Construction activity is scheduled to occur over 5 years.

Sources: IPCC 2007; EPA 2010, 2014f, 2014b; FHWA 2011b; CAPCOA 2013.

Construction of Alternative 1 (Proposed Project) would generate annual GHG emissions below the CEQ reference point of 25,000 MT CO_2e / year. When considering context and intensity, this analysis looks at both short-term and long-term effects and benefits associated with phases of a single proposed action. Table 4.14-9 summarizes construction phase emissions, which provides a review of short-term effects. The long-term benefit of the construction phase is that the rail and roadway infrastructure would be built to facilitate an efficient goods movement between the Port facilities and the destination of the goods. The construction phase provides much of the infrastructure improvements needed to facilitate an efficient goods movement. Because the GHG emissions from the construction phase are short-term in nature and provide the needed infrastructure for the increased efficiency in the transport of goods, the impacts from the construction GHG emissions on Global Climate Change would be minor adverse. The long-term effects of the Proposed Project on Global Climate Change are analyzed in section 4.14.3.2. Short-term and long-term effects of the Proposed Project and alternatives are analyzed in comparison to the No-Action Alternative and summarized in section 4.14.11.

4.14.3.2 Impacts on Climate Change by the Proposed Project: Operational GHG Emissions Inventory

Total GHG emissions from operation of Alternative 1 (Proposed Project) are shown below in Table 4.14-10.

Table 4.14-10
Annual Operational GHG Emissions Inventory,
Alternative 1 (Proposed Alternative)

Activity	CO_2e (MT)
On-Terminal Line Haul Locomotive	6,127
Off-Terminal Line Haul Locomotive	5,361
Switch Locomotive	2,612
UTR Truck Running	1,261
UTR Truck Idling	1,051
OTR Truck Running	12,751
OTR Truck Idling	450
Worker Commute	727
Electricity(1)	4
Water	<1
Wastewater	<1
Solid Waste	4
Total	**30,347**
Exceed 25,000 MT CO_2e?	**Yes**

Notes: It is common for intermodal facilities to operate on-site offroad equipment such as gantry cranes. The Navy Base ICTF would operate electric gantry cranes. As such, GHG emissions associated with on-site offroad equipment are included in the GHG emissions associated with electricity consumption.

Source: IPCC 2007, EPA 2014f, 2014b, 2014c.

Operation of the Proposed Project would generate annual GHG emissions above the CEQ reference point of 25,000 MT CO_2e / year. When considering context and intensity, this analysis looks at both short-term and long-term effects and benefits associated with phases of a single proposed action. Table 4.14-10 summarizes operational phase emissions, which provides a review of long-term effects. The long-term benefit of the operational phase of the Proposed Project would be the facilitation and efficient goods movement between the Port and the destination of the goods. The Proposed Project operations provide the improvements needed to facilitate an efficient goods movement through its additional use of rail and UTR trucks. The use of the UTR trucks on the private drayage road takes many OTR trucks off of public roadways compared to the No-Action Alternative. The use of the private drayage road also shortens the length of the trips taken by the UTR trucks, reducing the running emissions of diesel trucks during operation. The Proposed Project also includes minimization measures, outlined in section 4.14.12.1, that the No-Action Alternative does not. These include limiting OTR idle time to 7.5 minutes per truckload and UTR idling time to 5 minutes per truckload through the utilization of an automated gate system for the OTR and UTR trucks. The automated gate system effectively reduces GHG emissions from OTR and UTR truck idling by half of

what they would be without these minimization measures. These minimization measures also include using Tier 4 UTR trucks and Tier 4 Switch locomotive engines. These minimization measures, along with the design of the Proposed Project increase the efficiency of its operations. Although the Proposed Project's annual operational GHG emissions inventory exceeds the CEQ reference point, it is lower than the No-Action Alternative operations inventory and Alternatives 5-7 operational inventories, as shown in sections 4.14.7 through 4.14.9. This comparison is important when considering the context and intensity of the impacts. Due to the lower annual operational GHG emissions inventory, the Proposed Project's long-term effects on Global Climate Change would be less severe than those under the No-Action Alternative and Alternatives 5-7. As a result, impacts of the long-term effects on Global Climate Change from Alternative 1 (Proposed Project) are minor adverse. Short-term and long-term effects of Alternative 1 (Proposed Project) and alternatives are analyzed in comparison to the No-Action Alternative and summarized in section 4.14.11.

4.14.3.3 Impacts on the Proposed Project by Climate Change: Sea Level Rise

As shown in Table 4.14-7, the effects of SLC, high tides, and extreme water level events would not raise sea levels above the current BFE on the Proposed Project site. This assumes the uses on the Proposed Project site would not occur below its BFE. The sea level rise would not cause detectable changes to on-site structural integrity, nor would it cause predictable impacts to human health and safety. Therefore, impacts due to sea level rise at the Proposed Project site would be negligible.

4.14.3.4 Impacts on the Proposed Project by Climate Change: Increased Frequency and Intensity of Storm Events

Although major hurricanes make landfall in the South Carolina and Georgia approximately once every 25 years, it is likely the Proposed Project site would experience at least one over the life of the Project, between 2018 and 2068. According to the SLOSH model estimates shown in Table 4.14-8, the Proposed Project site would likely experience a storm surge of greater than 9 feet above ground (NOAA 2016c). This level of inundation could damage on-site structures to the point of altering their structural integrity, move and damage heavy equipment, and pose a threat to human health and safety of people on-site.

Approximately 5 percent of containers at the ICTF are estimated to hold hazardous materials, as described in Section 4.15. It is possible that an intense storm could lead to a hazardous material spill on-site if the containers of those materials are compromised during handling or derailment. Hazardous materials stored on-site and in containers should be tracked and stored with caution. Hazardous materials would also need to be checked after storm events to confirm no spill occurred. If the storage of hazardous materials is compromised due to the severity of a storm event, human health and safety of on-site employees would be comprised. To prevent such spillage, Palmetto Railways would create and implement an SPCC plan. Implementation of such a plan would make the Proposed Project site more resilient to Climate Change effects. While an SPCC Plan would work to

prevent hazardous material from spilling, there would remain a threat to human health and safety from inundation expected from major hurricanes. Therefore, impacts on Alternative 1 (Proposed Project) by increased frequency and severity of storm events would be major.

4.14.4 Alternative 2: Proposed Project Site (South via Milford / North via S-line)

Alternative 2 would be constructed as a variation of Alternative 1 (Proposed Project). Alternative 2 differs from Alternative 1 (Proposed Project) where the northern rail connection for NS would be located, and road and rail improvements would be adjusted accordingly to facilitate rail and road traffic as a result of the NS northern rail connection alignment. As such, construction of the rail alignments differs slightly from Alternative 1 (Proposed Project). GHG emissions from construction equipment exhaust are different to reflect the change in length of the NS northern rail connection. Haul truck activities and worker and vendor commute were assumed to be the same as Alternative 1 (Proposed Project). Alternative 2 would also be operated as proposed.

4.14.4.1 Impacts on Climate Change by Alternative 2: Construction GHG Emissions Inventory

Total GHG emissions from construction of Alternative 2 are shown below in Table 4.14-11. Impacts to Global Climate Change by Alternative 2 construction GHG emissions would be similar to Alternative 1 (Proposed Project).

Table 4.14-11
Total Construction GHG Emissions Inventory, Alternative 2

Activity	Total CO_2e (MT)	Comparison to Proposed Project
Construction Equipment Exhaust	91,935	Greater than Proposed Project
Haul Truck Exhaust	2,631	Same as Proposed Project
Worker and Vendor Commute	1,361	Same as Proposed Project
Total	**95,927**	Greater than Proposed Project
Annual Average	**19,185**	Greater than Proposed Project
Exceed 25,000 MT CO_2e?	**No**	

Note: Construction activity is scheduled to occur over 5 years.

Sources: IPCC 2007, EPA 2014f, 2014b, 2010, FHWA 2011b, CAPCOA 2013.

4.14.4.2 Impacts on Climate Change by Alternative 2: Operational GHG Emissions Inventory

GHG emissions from operational activities would be the same as Alternative 1 (Proposed Project). Thus, impacts would be the same as Alternative 1 (Proposed Project).

4.14.4.3 Impacts on Alternative 2 by Climate Change: Sea Level Rise

Impacts would be the same as Alternative 1 (Proposed Project).

4.14.4.4 Impacts on Alternative 2 by Climate Change: Increased Frequency and Intensity of Storm Events

Impacts would be the same as Alternative 1 (Proposed Project).

4.14.5 Alternative 3: Proposed Project Site (South via Kingsworth / North via Hospital)

Alternative 3 would be constructed as a variation of the Alternative 1 (Proposed Project). Alternative 3 differs where the southern rail connection would be located, and road and rail improvements would be adjusted accordingly to facilitate rail and road traffic as a result of the southern rail connection alignments. As such, construction of the rail alignments differs slightly from Alternative 1 (Proposed Project). GHG emissions from construction equipment exhaust are different to reflect the change in length of the southern rail connection. Haul truck activities and worker and vendor commute were assumed to be the same as Alternative 1 (Proposed Project). Alternative 3 would also be operated as proposed.

4.14.5.1 Impacts on Climate Change by Alternative 3: Construction GHG Emissions Inventory

Total GHG emissions from construction of Alternative 3 are shown below in Table 4.14-12. Impacts to Global Climate Change by Alternative 3 construction GHG emissions would be similar to Alternative 1 (Proposed Project).

Table 4.14-12
Total Construction GHG Emissions Inventory, Alternative 3

Activity	Total CO_2e (MT)	Comparison to Proposed Project
Construction Equipment Exhaust	86,808	Less than Proposed Project
Haul Truck Exhaust	2,631	Same as Proposed Project
Worker and Vendor Commute	1,361	Same as Proposed Project
Total	**90,800**	Less than Proposed Project
Annual Average	**18,160**	Less than Proposed Project
Exceed 25,000 MT CO_2e?	**No**	

Note: Construction activity is scheduled to occur over 5 years.
Sources: IPCC 2007, EPA 2014f, 2014b, 2010, FHWA 2011b, CAPCOA 2013.

4.14.5.2 Impacts on Climate Change by Alternative 3: Operational GHG Emissions Inventory

GHG emissions from operational activities would be the same as Alternative 1 (Proposed Project). Thus, impacts would be the same as Alternative 1 (Proposed Project).

4.14.5.3 Impacts on Alternative 3 by Climate Change: Sea Level Rise

Impacts would be the same as Alternative 1 (Proposed Project).

4.14.5.4 Impacts on Alternative 3 by Climate Change: Increased Frequency and Intensity of Storm Events

Impacts would be the same as Alternative 1 (Proposed Project).

4.14.6 Alternative 4: Proposed Project Site (South via Milford)

Alternative 4 would be constructed as a variation of Alternative 1 (Proposed Project). Alternative 4 differs from Alternative 1 (Proposed Project) in that trains would both enter and exit the Navy Base ICTF from a southern rail connection. As such, construction of the rail alignments differs from Alternative 1 (Proposed Project). GHG emissions from construction equipment exhaust are different to reflect the change in length of the southern rail connection. Haul truck activities and worker and vendor commute were assumed to be the same as Alternative 1 (Proposed Project). Alternative 4 would be also operated as proposed.

4.14.6.1 Impacts on Climate Change by Alternative 4: Construction GHG Emissions Inventory

Total GHG emissions from construction of Alternative 4 are shown below in Table 4.14-13. Impacts to Global Climate Change by Alternative 4 construction GHG emissions would be similar to Alternative 1 (Proposed Project).

Table 4.14-13
Total Construction GHG Emissions Inventory, Alternative 4

Activity	Total CO_2e (MT)	Comparison to Proposed Project
Construction Equipment Exhaust	85,943	Less than Proposed Project
Haul Truck Exhaust	2,631	Same as Proposed Project
Worker and Vendor Commute	1,361	Same as Proposed Project
Total	**89,935**	Less than Proposed Project
Annual Average	**17,987**	Less than Proposed Project
Exceed 25,000 MT CO_2e?	**No**	

Note: Construction activity is scheduled to occur over 5 years.

Sources: IPCC 2007, EPA 2014a, 2010, FHWA 2011, CAPCOA 2013.

4.14.6.2 Impacts on Climate Change by Alternative 4: Operational GHG Emissions Inventory

GHG emissions from operational activities would be the same as the Proposed Project. Thus, impacts would be the same as Alternative 1 (Proposed Project).

4.14.6.3 Impacts on Alternative 4 by Climate Change: Sea Level Rise

Impacts would be the same as Alternative 1 (Proposed Project).

4.14.6.4 Impacts on Alternative 4 by Climate Change: Increased Frequency and Intensity of Storm Events

Impacts would be the same as Alternative 1 (Proposed Project).

4.14.7 Alternative 5: River Center Project Site (South via Milford / North via Hospital District)

Alternative 5 would be variation of Alternative 1 (Proposed Project) with the ICTF being moved to the River Center project site. Road and rail improvements would be adjusted accordingly to facilitate rail and road traffic at the alternative site. As such, construction of the rail and road alignments differs from Alternative 1 (Proposed Project). GHG emissions from construction equipment exhaust are

different to reflect the change in length of the rail connections and road segments. Haul truck activities and worker and vendor commute were assumed to be the same as Alternative 1 (Proposed Project). Alternative 5 would be operated as proposed, with the exception of UTR truck activity on the drayage road. The private drayage road under Alternative 5 is 2 miles long, which is twice the distance of the private drayage road under Alternative 1 (Proposed Project). To maintain the daily container throughput, twice as many UTR trucks at the same rate of daily truckloads would be required for operating Alternative 5 compared to Alternative 1 (Proposed Project).

4.14.7.1 Impacts on Climate Change by Alternative 5: Construction GHG Emissions Inventory

Total GHG emissions from construction of Alternative 5 are shown below in Table 4.14-14.

Table 4.14-14
Total Construction GHG Emissions Inventory, Alternative 5

Activity	Total CO_2e (MT)	Comparison to Proposed Project
Construction Equipment Exhaust	99,512	Greater than Proposed Project
Haul Truck Exhaust	2,631	Same as Proposed Project
Worker and Vendor Commute	1,361	Same as Proposed Project
Total	**103,504**	Greater than Proposed Project
Annual Average	**20,701**	Greater than Proposed Project
Exceed 25,000 MT CO_2e?	**No**	

Note: Construction activity is scheduled to occur over 5 years.
Sources: IPCC 2007, EPA 2014f, 2014b, 2010, FHWA 2011b, CAPCOA 2013.

Construction of Alternative 5 would generate annual GHG emissions greater than Alternative 1 (Proposed Project), but below the CEQ reference point of 25,000 MT CO_2e / year. When considering context and intensity, this analysis looks at both short-term and long-term effects and benefits associated with phases of a single proposed action. Table 4.14-14 summarizes construction phase emissions, which provides a review of short-term effects. The long-term benefit of the construction phase is that the rail and roadway infrastructure would be built to facilitate an efficient goods movement between the Port facilities and the destination of the goods. The construction phase provides much of the infrastructure improvements needed to facilitate an efficient goods movement. Because the GHG emissions from the construction phase are short-term in nature and provide the needed infrastructure for the increased efficiency in the transport of goods, the impacts from construction GHG emissions on Global Climate Change would be minor adverse. The long-term effects of Alternative 5 on Global Climate Change are analyzed in section 4.14.7.2. Short-term and long-term effects of the Alternative 1 (Proposed Project) and alternatives are analyzed in comparison to the No-Action Alternative and summarized in section 4.14.11.

4.14.7.2 Impacts on Climate Change by Alternative 5: Operational GHG Emissions Inventory

GHG emissions from operational activities besides UTR truck running emissions would be the same as the Proposed Project. Alternative 5 would have twice as many GHG emissions from UTR truck running than Alternative 1 (Proposed Project). Total GHG emissions from operation are shown below in Table 4.14-15.

Table 4.14-15
Annual Operational GHG Emissions Inventory, Alternative 5

Activity	CO_2e (MT)	Comparison to Proposed Project
On-Terminal Line Haul Locomotive	6,127	Same as Proposed Project
Off-Terminal Line Haul Locomotive	5,361	Same as Proposed Project
Switch Locomotive	2,612	Same as Proposed Project
UTR Truck Running	2,522	Greater then Proposed Project
UTR Truck Idling	1,051	Same as Proposed Project
OTR Truck Running	12,751	Same as Proposed Project
OTR Truck Idling	450	Same as Proposed Project
Worker Commute	727	Same as Proposed Project
Electricity(1)	4	Same as Proposed Project
Water	<1	Same as Proposed Project
Wastewater	<1	Same as Proposed Project
Solid Waste	4	Same as Proposed Project
Total	**31,608**	Greater then Proposed Project
Exceed 25,000 MT CO_2e?	**Yes**	-

Notes: It is common for intermodal facilities to operate on-site offroad equipment such as gantry cranes. The Navy Base ICTF would operate electric gantry cranes. As such, GHG emissions associated with on-site offroad equipment are included in the GHG emissions associated with electricity consumption.

Source: IPCC 2007, EPA 2014f, 2014b, 2014g, 2009a, 2009b, 2008, SCPA 2013, USDOE 2011, AirProducts 2016, ICBE 2000.

Operation of Alternative 5 would generate annual GHG emissions above the CEQ reference point of 25,000 MT CO_2e / year. When considering context and intensity, this analysis looks at both short-term and long-term effects and benefits associated with phases of a single proposed action. Table 4.14-15 summarizes operational phase emissions, which provides a review of long-term effects. The long-term benefit of the operational phase of Alternative 5 would be similar to Alternatives 1-4. Both Alternative 5 and Alternatives 1–4 operations provide the improvements needed to facilitate an efficient goods movement through additional use of rail and UTR trucks, along with the minimization measures listed in section 4.14.12. The variation for Alternative 5 is the use of the UTR trucks on the

longer private drayage road. It takes more OTR trucks off of public roadways compared to the No-Action Alternative; however, the doubled length of the drayage road compared to Alternatives 1-4 makes Alternative 5 slightly less efficient.

Although the annual operational GHG emissions inventory for Alternative 5 exceeds the CEQ reference point, it is lower than the operational inventory for the No-Action Alternative and slightly higher than the operational inventories for Alternatives 1-4, as shown in section 4.14.3. This comparison is important when considering the context and intensity of the impacts. Due to the lower annual operational GHG emissions inventory than the No-Action Alternative, the long-term effects of Alternative 5 on Global Climate Change would be less severe than those under the No-Action Alternative. Although annual operational GHG emissions inventory of Alternative 5 is slightly higher than Alternatives 1–4 inventories, its long-term effects would likely be very similar. Because of this, impacts of the long-term effects on Global Climate Change from Alternative 5 are minor adverse. Short-term and long-term effects of Alternative 1 (Proposed Project) and alternatives are analyzed in comparison to the No-Action Alternative and summarized in section 4.14.11.

4.14.7.3 Impacts on Alternative 5 by Climate Change: Sea Level Rise

As shown in Table 4.14-7, the effects of SLC, high tides, and extreme water level events would not raise sea levels above the current BFE on the River Center site. This assumes the uses on the River Center site would not occur below its BFE. The sea level rise would not cause detectable changes to on-site structural integrity, nor would it cause predictable impacts to human health and safety. Therefore, impacts due to sea level rise at the River Center site would be negligible.

4.14.7.4 Impacts on Alternative 5 by Climate Change: Increased Frequency and Intensity of Storm Events

Although major hurricanes make landfall in South Carolina and Georgia approximately once every 25 years, it is likely the River Center site would experience at least one over the life of the Project, between 2018 and 2068. According to the SLOSH model estimates shown in Table 4.14-8, the River Center project site would likely experience a storm surge of greater than 6 feet above ground (NOAA 2016c). This level of inundation could damage on-site structures to the point of altering their structural integrity, move and damage heavy equipment, and pose a threat to human health and safety of people on-site.

Approximately 5 percent of containers at the ICTF are estimated to hold hazardous materials, as described in Chapter 4.15. It is possible that an intense storm could lead to a hazardous material spill on-site if the containers of those materials are compromised during handling or derailment. Hazardous materials stored on-site and in containers should be tracked and stored with caution. Hazardous materials would also need to be checked after storm events to confirm no spill occurred. If the storage of hazardous materials is compromised due to the severity of a storm event, human

health and safety of on-site employees would be comprised. To prevent such spillage, Palmetto Railways would create and implement an SPCC plan. Implementation of such a plan would make the River Center site more resilient to Climate Change effects. While a SPCC Plan would work to prevent hazardous material from spilling, there would remain a threat to human health and safety from inundation expected from major hurricanes. Therefore, impacts on the River Center site by increased frequency and severity of storm events would be major.

4.14.8 Alternative 6: River Center Project Site (South via Kingsworth / North via Hospital)

Alternative 6 would be a variation of Alternative 1 (Proposed Project) with the ICTF being moved to the River Center project site and the southern rail connection would connect to an existing rail line in the vicinity of Kingsworth Avenue. Road and rail improvements would be adjusted accordingly to facilitate rail and road traffic at the alternative site. As such, construction of the rail and road alignments differs from the Proposed Project. GHG emissions from construction equipment exhaust are different to reflect the change in length of the rail connections and road segments. Haul truck activities and worker and vendor commutes were assumed to be the same as Alternative 1 (Proposed Project). Alternative 6 would be operated as proposed, with the exception of UTR truck activity on the drayage road. The UTR truck activity in Alternative 6 would be the same as the activity in Alternative 5.

4.14.8.1 Impacts on Climate Change by Alternative 6: Construction GHG Emissions Inventory

Total GHG emissions from construction of Alternative 6 are shown below in Table 4.14-16. Impacts to Global Climate Change by Alternative 6 construction GHG emissions would be the same as Alternative 5.

Table 4.14-16
Total Construction GHG Emissions Inventory, Alternative 6

Activity	Total CO_2e (MT)	Comparison to Proposed Project
Construction Equipment Exhaust	94,710	Greater than Proposed Project
Haul Truck Exhaust	2,631	Same as Proposed Project
Worker and Vendor Commute	1,361	Same as Proposed Project
Total	**98,702**	Greater than Proposed Project
Annual Average	**19,740**	Greater than Proposed Project
Exceed 25,000 MT CO_2e?	**No**	

Note: Construction activity is scheduled to occur over 5 years.

Sources: IPCC 2007, EPA 2014a, 2014b, 2010, FHWA 2011b, CAPCOA 2013.

4.14.8.2 Impacts on Climate Change by Alternative 6: Operational GHG Emissions Inventory

GHG emissions from operational activities would be similar to Alternative 5. Thus, impacts would be the similar to Alternative 5.

4.14.8.3 Impacts on Alternative 6 by Climate Change: Sea Level Rise

Impacts would be the same as Alternative 5.

4.14.8.4 Impacts on Alternative 6 by Climate Change: Increased Frequency and Intensity of Storm Events

Impacts would be the same as Alternative 5.

4.14.9 Alternative 7: River Center Project Site (South via Milford)

Alternative 7 would be a variation of the Proposed Project with the ICTF being moved to the River Center project site and trains would enter and exit the Navy Base ICTF from a southern rail connection. Road and rail improvements would be adjusted accordingly to facilitate rail and road traffic at the alternative site. As such, construction of the rail and road alignments differs from the Proposed Project. Alternative 7 would be operated as proposed, with the exception of UTR truck activity on the drayage road. GHG emissions from construction equipment exhaust are different to reflect the change in length of the rail connections and road segments. Haul truck activities and worker and vendor commute were assumed to be the same as the Proposed Project. The UTR truck activity in Alternative 7 would be the same as the activity in Alternative 5.

4.14.9.1 Impacts on Climate Change by Alternative 7: Construction GHG Emissions Inventory

Total GHG emissions from construction of Alternative 7 are shown below in Table 4.14-17. Impacts to Global Climate Change by Alternative 7 construction GHG emissions would be similar to Alternative 5.

4.14.9.2 Impacts on Climate Change by Alternative 7: Operational GHG Emissions Inventory

GHG emissions from operational activities would be the same as Alternative 5. Thus, impacts would be the same as Alternative 5.

Table 4.14-17
Total Construction GHG Emissions Inventory, Alternative 7

Activity	Total CO_2e (MT)	Comparison to Proposed Project
Construction Equipment Exhaust	96,977	Greater than Proposed Project
Haul Truck Exhaust	2,631	Same as Proposed Project
Worker and Vendor Commute	1,361	Same as Proposed Project
Total	**100,969**	Greater than Proposed Project
Annual Average	**20,194**	Greater than Proposed Project
Exceed 25,000 MT CO_2e?	**No**	

Note: Construction activity is scheduled to occur over 5 years.
Sources: IPCC 2007, EPA 2014a, 2014b, 2010, FHWA 2011b, CAPCOA 2013.

4.14.9.3 Impacts on Alternative 7 by Climate Change: Sea Level Rise

Impacts would be the same as Alternative 5.

4.14.9.4 Impacts on Alternative 7 by Climate Change: Increased Frequency and Intensity of Storm Events

Impacts would be the same as Alternative 5.

4.14.10 Related Activities

If the Proposed Project is constructed, new track would be constructed on a section of out-of-service CSX ROW to accept intermodal trains at the proposed new at-grade crossing at Meeting Street. Construction would extend from the vicinity of Discher Street to Misroon Street. Existing track would be reactivated from Misroon Street into Ashley Junction as needed. This Related Activity would apply to Alternatives 1, 2, 4, 5, and 7. Under Alternatives 3 and 6, the Related Activity construction would be the same as Alternatives 1, 2, 4, 5, and 7; however, construction of new track would begin at the proposed new at-grade crossing at Meeting Street in the vicinity of Kingsworth Avenue. Under Alternative 2 an additional Related Activity, reactivating an out-of-service ROW and constructing a new railroad bridge, would be required to connect the NS arrival/departure tracks from the ICTF across a portion of marsh which drains to Noisette Creek to the existing NCTC track along Virginia Avenue.

The GHG emissions from the construction and operation of the related activity were included in the construction and operational GHG emissions inventories for Alternatives 1-7. Therefore, impacts from the construction and operation of the related activity are analyzed in section 4.14.3-9.

4.14.11 Summary of Impacts Table

Table 4.14-18 provides a summary of impacts on climate change from Alternative 1 (Proposed Project) and all the alternatives.

Table 4.14-18
Summary of Impacts, Climate Change

Alternative	Impacts of the Alternatives on Climate Change		Impacts of Climate Change on the Alternatives	
	Construction Emissions	Operational Emissions	Sea Level Rise	Increased Frequency and Intensity of Storm Events
No-Action	The No-Action Alternative results in short term construction related greenhouse gas (GHG) emissions and potential short-term impacts would be minor adverse.	Annual Operational GHG Emissions Inventory would be 36,060 MT CO_2e. The No-Action Alternative would be the least efficient. Long-term effects would be major adverse.	The predicted sea level rise would not cause detectable changes to on-site structural integrity at the Proposed Project and River Center project sites, nor would it cause predictable impacts to human health and safety. Impacts due to sea level rise at the Proposed Project and River Center project sites would be negligible.	The Proposed Project site and River Center site are predicted to get a level of storm surge inundation that could damage on-site structures to the point of altering their structural integrity, move and damage heavy equipment, and pose a threat to human health and safety of people on-site. Impacts on the Proposed Project and River Center project sites would be major.
1: Proposed Project: South via Milford / North via Hospital District	Because the GHG emissions from the construction phase provide the needed infrastructure for the increased efficiency in the transport of goods, the short-term impacts would be minor adverse.	Annual Operational GHG Emissions Inventory would be 30,948 MT CO_2e. The Proposed Project would be the most efficient. Long-term effects would be minor adverse.	The predicted sea level rise would not cause detectable changes to on-site structural integrity at the Proposed Project site, nor would it cause predictable impacts to human health and safety. Impacts would be negligible.	The Proposed Project site is predicted to get a level of storm surge inundation that could damage on-site structures to the point of altering their structural integrity, move and damage heavy equipment, and pose a threat to human health and safety of people on-site. Impacts would be major.
2: South via Milford / North via S-line	Similar to Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)
3: South via Kingsworth / North via Hospital District	Similar to Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)
4: South via Milford	Similar to Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)

Alternative	Impacts of the Alternatives on Climate Change		Impacts of Climate Change on the Alternatives	
	Construction Emissions	Operational Emissions	Sea Level Rise	Increased Frequency and Intensity of Storm Events
5: River Center Project Site: South via Milford / North via Hospital District	Because the GHG emissions from the construction phase provide the needed infrastructure for the increased efficiency in the transport of goods, the short-term impacts would be minor adverse.	Annual Operational GHG Emissions Inventory would be 32,208 MT CO_2e. Alternative 5 would be more efficient than the No-Action Alternative and nearly as efficient as the Proposed Project. Long-term effects would be minor adverse.	The predicted sea level rise would not cause detectable changes to on-site structural integrity at the River Center site, nor would it cause predictable impacts to human health and safety. Impacts would be negligible.	The River Center site is predicted to get a level of storm surge inundation that could damage on-site structures to the point of altering their structural integrity, move and damage heavy equipment, and pose a threat to human health and safety of people on-site. Impacts would be major.
6: River Center Project Site: South via Kingsworth / North via Hospital District	Similar to Alternative 5	Same as Alternative 5	Same as Alternative 5	Same as Alternative 5
7: River Center Project Site: South via Milford	Similar to Alternative 5	Same as Alternative 5	Same as Alternative 5	Same as Alternative 5

Climate Change Impact Definitions

Negligible = Short-term and Long-term GHG emissions do not occur or are at negligible levels.

Minor = Short-term or Long-term GHG emissions may occur. Short-term GHG emissions help make long-term emissions more efficient. Long-term emissions are minimized or mitigated through improved efficiency.

Major = Short or Long-term GHG emissions may occur. Long-term GHG emissions are considerable due to inefficient use of fuel and/or resources.

Climate Change Impacts on the Proposed Project and Alternatives Impact Definitions

Negligible = Undetectable changes to on-site structural integrity. No predictable impacts to human health and safety.

Minor = Environmental conditions that require reduced on-site operations. Minimal damage to on-site structures that do not alter any structural integrity. No predictable impacts to human health and safety with standard safety precautions applied.

Major = Environmental conditions that require temporary closure of on-site operations. Damage to on-site structures that alter or comprise structural integrity. Predictable unavoidable impacts to human health and safety.

4.14.12 Mitigation

4.14.12.1 Applicant's Proposed Avoidance and Minimization Measures

The Applicant's measures to avoid and minimize potential impacts of Alternative 1 (Proposed Project) are summarized below based on information submitted by Palmetto Railways provided in Appendix B. Some of these measures are required under federal, state, and local permits; others are measures that Palmetto Railways has incorporated into the design and operations of Alternative 1

(Proposed Project). Each mitigation measure is also designated as one that either helps to avoid an impact, or one that minimizes an impact.

For Climate Change mitigation, see Air Quality mitigation measures in Section 4.13. The complete list of Applicant-proposed avoidance and minimization measures is also provided in Chapter 6.

4.14.12.2 Additional Potential Mitigation Measures

No additional mitigation measures for Climate Change have been recommended by the Corps. Additional avoidance, minimization, and mitigation may be considered by the Corps in its decision-making process. Final mitigation measures may be adopted as conditions of the DA permit and documented in the Record of Decision (ROD).

4.15 HAZARDOUS, TOXIC, AND RADIOACTIVE WASTE

4.15.1 Methods and Impact Definitions

The analysis and evaluation of potential HTRW impacts has been conducted using both qualitative and quantitative methods. These methods include literature reviews, presence/absence determinations of known contaminated areas within the study area (through the preparation of Phase 1 and/or Phase 2 ESAs and similar site evaluations), GIS, and professional judgment. The analysis also evaluates and determines the potential for the generation of new HTRW impacts associated with the construction and/or operation of the Navy Base ICTF, including but not limited to the potential processing and handling of HTRW materials in cargo containers and potential use of new ASTs and/or USTs for petroleum and other substances of concern.

The impact definitions are provided in Table 4.15-1.

Table 4.15-1
Impact Definitions, Hazardous, Toxic, and Radioactive Waste

Negligible	Minor	Major
Negligible (or no) involvement with contaminated soil, contaminated groundwater, or disturbance of existing hazardous materials/wastes. No existing structures would be demolished or require major renovations, so no involvement with asbestos or metals-based paints would occur. No potential for accidental spills and/or operational activities that contain HTRW materials.	Ground disturbance in areas designated as active SWMUs/AOCs, or in LUCs that require permitting with the U.S. Navy. Surficial impact to a Superfund (NPL-listed) site Existing groundwater monitoring wells may require removal and replacement. Demolition of structures that contain asbestos or metals-based paints. Accidental spills may occur on occasion, and clean-up programs prevent creation of a new HTRW site.	Accidental spills and/or construction/operation activities that result in soil or groundwater contamination that requires designation of a new area as an HTRW site, that contaminates surface waters at a reportable level requiring cleanup, and/or that requires future monitoring activities. Construction activities involving major disturbances to a Superfund (NPL-listed) site.

4.15.2 No-Action Alternative

Under the No-Action Alternative, the Navy Base ICTF and River Center ICTF sites would be developed with land uses consistent with their zoning designations (M-1/M-2 and PDD, respectively). The No-Action Alternative considers the combined footprints of the other alternatives, and it assumes there will be development of all or most of those parcels. As a result, there would likely be impacts to each contaminated site identified for each alternative.

Significant portions of the former CNC are subject to a RCRA Hazardous Waste Permit (SC0 170 022 560), issued to the Navy by the SCDHEC. As part of any potential future development activities, there would be the potential for actions occurring within active SWMUs/AOCs and LUCs, which would be subject to the Navy's permitting process consistent with the Navy's document "Process to Conduct Construction Activities in areas under Land Use Controls at the Charleston Naval Complex, Revision 3" dated April 2007 (Process Document), as well as compliance with the existing SCDHEC VCC related to Parcels 10C, 11, 12, 13A, 13B, 14, 15, 17, 18, FLETC Area, Hospital Parcel, and the foreclosed properties addressed in the Haynsworth Tract B and C Phase I ESAs (Department of the Navy, 2007). The Process Document requires submittal and approval of a "Charleston Naval Complex LUC Area Construction Permit." The permits are intended to ensure: 1) proper protection of workers and the public, 2) reporting of discovery of any unknown contamination, 3) management of excess soil and groundwater, and 4) posting and use of on-site safety information. As part of the VCC, Palmetto Railways is required to comply with the Navy's permitting requirements for areas to be developed as part of the Proposed Project.

Special precautions are required to be used when excavating or dewatering during construction activities in areas that have LUCs and are part of the VCC. Excavation within these areas would need to be monitored, and water effluent managed as appropriate, to ensure that no new contamination may impact groundwater and/or surface waters, and to ensure that workers were properly protected from the presence of HTRW contaminants. There is the potential for both minor adverse and major adverse impacts; however, compliance with permitting requirements, and use of BMPs and spill prevention programs would minimize the potential for adverse impacts.

Development activities may require the removal of existing groundwater monitoring wells, and any affected wells would need to be relocated in order for the Navy to continue its monitoring program and reporting obligations. Future development activities may also require the demolition of structures that have been identified to contain, or would need to be tested for, asbestos and metals-based paints. Prior to demolition activities, projects would need to comply with all asbestos and metals-based paint testing, abatement, and worker protection standards such as the EPA's Asbestos National Emissions Standards for Hazardous Air Pollutants (NESHAP).

Lastly, businesses may store fuel on-site and store/use minor quantities of hazardous materials, such as lead batteries and cleaning solvents, and as a result, there is the potential for accidental spills of hazardous materials under the No-Action Alternative. Any potential ASTs and USTs would be provided with secondary containment in compliance with SCHDEC regulations, and the hazardous materials would be stored properly in compliance with RCRA, to minimize the potential for minor and/or major adverse impacts. Increased vehicular and rail traffic would likely contribute PAHs (e.g., grease from train and truck wheel bearings) and metals (e.g., from wearing of brake pads) to the nearby soil, and ultimately to the groundwater.

4.15.3 Alternative 1: Proposed Project (South via Milford / North via Hospital District)

The Project site contains large areas that are subject to LUCs and the VCC entered into between Palmetto Railways and SCDHEC. Construction of Alternative 1 (Proposed Project) must comply with the LUCs and with the VCC. The parcels of land making up the Project site, along with the adjacent parcels needed for railroad/road improvements (not including the Southern Alternatives area), include approximately eight contaminated sites that are undergoing active monitoring by the Navy. One site was also identified with contamination concerns that warranted further investigations. In addition, the proposed development of rail infrastructure for the southern rail connection (e.g., the Southern Alternatives Area) may impact an additional 14 sites that have a high risk of contamination involvement. Due to the proposed railway construction in the Hospital District, there would be an impact to the active groundwater monitoring site near Noisette Creek (AOC 721), which may include wells that would need to be relocated. Accordingly, there would be a concern about properly monitoring and addressing contaminated soil and dewatering effluent disposal.

The number of buildings with the potential to contain asbestos or metals-based paints within the ICTF site is approximately 88. In addition to the site itself, approximately 23 structures may need to be removed to accommodate the railway improvements for the northern and southern connection. This analysis assumes all buildings within the ICTF site and outside of the ICTF site have the potential to contain asbestos and/or metals-based paints.

The Corps anticipates that relatively low number of containers coming into the Navy Base ICTF would contain hazardous materials. As discussed in the FEIS for the Proposed Marine Container Terminal at the CNC (Corps 2006), and as documented by the South Carolina Ports Authority, the number of containers with hazardous materials coming into the Port terminals typically did not exceed 5 percent. Accordingly, it is estimated that approximately 5 percent of containers handled by the Navy Base ICTF would contain hazardous materials. The types of hazardous materials that could transit through the ICTF would be required to comply with all applicable regulations governing the identification, handling, and transport of hazardous materials.

4.15.3.1 Construction

Alternative 1 (Proposed Project) would require soil excavation to construct or rebuild roadways and railways and to construct facilities (such as buildings, work yards, and railyards, etc.) within the Project site. These excavation activities may involve contaminated soils. The study areas have been subject to numerous and extensive environmental studies and assessments; thus, the potential for the Project to encounter large quantities of previously-unknown buried or stored hazardous materials or hazardous wastes is considered unlikely. The Navy permitting process requires stoppage of work if discovery of unknown contamination occurs. As with other construction projects involving contaminated soils, the soils impacted by Alternative 1 (Proposed Project) would require testing and proper disposal at an approved facility if they exceed given regulatory thresholds.

For areas of deeper excavations, such as installation of stormwater infrastructure (the 4 dry detention ponds), foundation footers, roadway and rail pilings, and other deeper excavations, contaminated groundwater may be encountered, which would require proper disposal of the dewatering effluent. Provisions for addressing groundwater use restrictions and proper disposal of dewatering effluent are included in the "Charleston Naval Complex LUC Area Construction Permit" process described under the No-Action Alternative. The potential for Alternative 1 (Proposed Project) to have involvement with contaminated groundwater is probable; however, avoidance and minimization measures (such as avoiding excavation activities in known active sites and adherence to the Navy permitting process) would help to keep potential impacts to a minimum adverse impact. The Navy is currently conducting periodic groundwater monitoring at AOCs 569, 570, 578, 607, 728, and SWMUs 9 and 196, which would be impacted by the railroad infrastructure planned immediately northwest and south of the Project site. Thus, affected groundwater monitoring wells may need to be relocated.

For those buildings and other structures that would require demolition or significant renovations, NESHAP requires that asbestos and lead paint surveys be conducted. Any structures confirmed to contain asbestos and/or lead-based paint would need to be addressed according to the NESHAP prior to their renovation/demolition. Palmetto Railways may minimize the number of structures to be demolished in its design of the Navy Base ICTF; however, the aerial extent of the facility and the number of structures that would require demolition would not eliminate the need for demolition, nor avoid the potential interaction with structures that could contain asbestos and/or metals-based paints. As a result, impacts can be minimized, but some impacts are unavoidable. Demolition of structures and remediation activities would be considered a minor short-term adverse impact.

Similar to the No-Action Alternative, there is the potential for accidental spills during construction activities; however, use of BMPs and Spill Prevention Programs can minimize the adverse impact from these occurrences. The Applicant has committed to implement a Solid and Hazardous Waste Management Plan, SPCC plan, and comply with Resource Conservation and Recovery Act (RCRA) and SCDHEC requirements for storage and handling of hazardous and toxic wastes as a mitigation measure.

The Project site should have minimal involvement with the Macalloy Corporation Superfund Site. Other infrastructure, such as the future, approved Port Access Road, is planned for the Macalloy Corporation Superfund Site, but that work is not considered part of the Proposed Project.

4.15.3.2 Operation

Under Alternative 1 (Proposed Project), there would be limited potential for operational activities that could impact HTRW above and beyond those discussed under construction activities. The Corps assumes that Palmetto Railways may use ASTs to store diesel fuel for the yard trucks, and as a result, there is the potential for localized, minor spills of petroleum; however, implementation of a spill prevention program and placement of appropriate clean-up materials nearby would minimize any adverse spill. Increased vehicular and rail traffic would likely contribute PAHs (e.g., grease from train and truck wheel bearings) and metals (e.g., from wearing of brake pads) to the nearby soil, and ultimately to the groundwater. The levels of contaminants would be expected to be greater than those resulting from operations under the No-Action Alternative.

The presence of containers with hazardous materials may also result in accidental spills from handling or derailment; thus, the potential exists for minor and major (depending on spill location) adverse impacts from such an occurrence. To ensure the safest handling of hazardous materials there are mandated requirements for rail, roadway, and intermodal facilities. The transportation of hazardous materials is regulated by the U.S. Department of Transportation (USDOT), the U.S. Department of Homeland Security, the U.S. Transportation Security Administration, and the Federal

Railroad Administration (FRA), among others[87]. Railroads must register with the USDOT as a transporter of hazardous materials and follow the Hazardous Materials Transportation and Security Reauthorization Act of 2005[88], the federal law governing hazardous material shipments. All hazardous materials shipments must be loaded and described in compliance with the Association of American Railroads' (AAR) Intermodal Loading Guide[89], AAR's Instructions for Handling Hazardous Materials[90], and the USDOT Hazardous Materials Regulations (49 C.F.R. §§ 100–185). Class I railroads have adopted special operating practices for hazardous materials transport that often exceed regulatory requirements to help ensure these materials are shipped safely and securely. Hazardous materials containers will be handled according to industry standard. Use of BMPs, implementation of a Spill Prevention Program, involvement of emergency response (Hazmat) personnel, and compliance with all federal, state, and local spill control and response regulations in such circumstances will help mitigate the adverse impact. The Applicant has committed to implement a Solid and Hazardous Waste Management Plan, Spill Prevention, Controls, and Countermeasures (SPCC) Plan, and comply with Resource Conservation and Recovery Act (RCRA) and SCDHEC requirements for storage and handling of hazardous and toxic wastes as a mitigation measure (see Chapter 6, Mitigation). In addition, the Clean Water Act (33 U.S.C. § 1251 et seq.) and the Comprehensive Environmental Response, Compensation, and Liability Act (P.L. 96-510; 42 U.S.C. 9601 et seq.) require the notification and remediation for oil and hazardous material spills. These regulations require that all oil/hazardous material spills that produce a sheen on a body of water, is a threat to navigable waterways, or violate applicable water quality standards must be reported to the state and federal authorities (South Carolina Office of Environmental Quality Control and the National Response Center). Spills greater than 25 gallons on land must also be reported and remediated (EPA 2017).

4.15.4 Alternative 2: Proposed Project Site (South via Milford / North via S-line)

The footprint of the areas impacted by Alternative 2 is comparable to the footprint of those areas for Alternative 1 (Proposed Project), with the significant exception that the northern rail connection would connect to an existing railroad corridor along Spruill Avenue to the west of the Hospital District. Impacts to the Hospital District, as they relate to HTRW, would essentially be avoided, as discussed below.

[87] https://www.csx.com/index.cfm/about-us/safety/hazardous-materials1/

[88] 49 U.S. Code Chapter 51. https://www.csx.com/index.cfm/library/files/customers/safety-and-security/hazardous-materials/the-hazardousmaterials- transportation-and-security-reauthorization-act-of-2005/

[89] Intermodal Loading Guide for Products in Closed Trailers and Containers. Issued 07/01/2011. http://www.nsdirect.com/sites/default/files/kcfinder/files/AAR-intermodal-PDF.pdf

[90] Instructions for Handling Hazardous Materials – Intermodal Gate Operations. November 20, 2011

4.15.4.1 Construction

The environmental consequences of construction of the Navy Base ICTF under Alternative 2 would be similar to Alternative 1 (Proposed Project) with the following exceptions due to the alternative location of the northern rail connection:

- Involvement with the groundwater monitoring site located near Noisette Creek (AOC 721) would be avoided.
- The removal of approximately 26 structures to accommodate the northern rail connection, resulting in slightly more potential need for testing and/or abatement of asbestos and metals-based paints associated with these structures than Alternative 1 (Proposed Project).

4.15.4.2 Operation

The environmental consequences of operation of the Navy Base ICTF under Alternative 2 would be similar to those discussed under Alternative 1 (Proposed Project).

4.15.5 Alternative 3: Proposed Project Site (South via Kingsworth / North via Hospital District)

The footprint of the areas impacted by Alternative 3 is comparable to the footprint of those areas for Alternative 1 (Proposed Project), with the significant exception that the southern rail connection would connect with an existing railroad corridor in the area along Spruill Avenue, but north of Kingsworth Avenue. Impacts to the commercial and industrial areas south of Kingsworth Avenue, to as far south as Milford Street (i.e., the bulk of the Southern Alternatives Area), would essentially be avoided, as discussed below.

4.15.5.1 Construction

The environmental consequences of construction of the Navy Base ICTF under Alternative 3 would be similar to Alternative 1 (Proposed Project), with the following exceptions due to the alternative location for the southern rail connection:

- This alternative would affect only two of the 14 sites in the Southern Alternatives Area that pose a high risk of contamination involvement.
- Removal of approximately 25 structures to accommodate the northern and southern rail connection, resulting in slightly more potential need for testing and/or abatement of asbestos and metals-based paints associated with these structures than Alternative 1 (Proposed Project).

4.15.5.2 Operation

The environmental consequences of operation of the Navy Base ICTF under Alternative 3 would be similar to those discussed under Alternative 1 (Proposed Project).

4.15.6 Alternative 4: Proposed Project Site (South via Milford)

From the perspective of involvement with contaminated or potentially contaminated properties, the footprint of the areas impacted by Alternative 4 is essentially the same as the footprint of those areas for Alternative 1 (Proposed Project). Therefore, the differences between Alternative 4 and Alternative 1 (Proposed Project) are negligible with respect to HTRW resources.

4.15.6.1 Construction

The environmental consequences of construction of the Navy Base ICTF under Alternative 4 would be similar to Alternative 1 (Proposed Project).

4.15.6.2 Operation

The environmental consequences of operation of the Navy Base ICTF under Alternative 4 would be similar to those discussed under Alternative 1 (Proposed Project).

4.15.7 Alternative 5: River Center Project Site (South via Milford / North via Hospital District)

The parcels of land making up the River Center project site and its associated infrastructure include approximately eight contaminated sites that are undergoing active monitoring. Two sites were also identified with contamination concerns that warranted further investigations. Review of the Phase I ESA for the 90.211-acre parcel identified only one REC within that tract (an indoor shooting range) and three nearby off-site RECs that are being assessed by the Navy. One of the three RECs would not be impacted by the River Center ICTF. The Phase I ESAs for the CMCI property and the Former Naval Hospital Property identified one on-site former underground tank facility with ongoing monitoring. Multiple SWMUs, AOCs, and fuel storage tank issues were present on the River Center project site, but all had received letters from SCDHEC of No Further Action. The rail lines south of the River Center project site and the proposed drayage road pass through or are in the nearby vicinity of AOCs 578, 607, 637, 654, 706, 728, 744, 747, and 753 and SWMUs 8, 9, 20, 24, 121, and 196. Of these, AOC 607 and SWMUs 9 and 196 are undergoing active groundwater monitoring. As with Alternative 1 (Proposed Project), Alternative 5 includes proposed development of railroad infrastructure in the southern area along Spruill Avenue, at Meeting Street Road, and as far south as Milford Street (the Southern Alternatives Area). Improvements to this southern area may be impacted by an additional 14 sites that have a high risk of contamination involvement.

The number of buildings with the potential to contain asbestos or metals-based paints within the River Center project site is approximately 33. Portions of the River Center project site are also subject to the LUCs, AULs, and Navy permitting process described above for the Project site. An additional approximately 14 buildings may need to be removed to accommodate the railway improvements to the south of the main site. The interaction with the Macalloy Superfund site under Alternative 5 would be limited in a similar fashion to Alternative 1 (Proposed Project), as only surface roads are planned in that area.

4.15.7.1 Construction

The potential for the River Center project site to have involvement with contaminated soils or contaminated groundwater is probable and similar to the Alternative 1 (Proposed Project) site. The potential for Alternative 5 to have involvement with asbestos and metals-based paints is less involved than Alternative 1 (Proposed Project) due to the River Center project site having fewer buildings with the potential of containing asbestos or metals-based paints.

The environmental consequences of construction of Alternative 5 would be similar to those discussed in Alternative 1 (Proposed Project), except that approximately 47 buildings would require demolition, with the associated concerns about asbestos and metals-based paints in the buildings.

4.15.7.2 Operation

The environmental consequences of operation of the Navy Base ICTF at the River Center project site would be similar to those discussed under Alternative 1 (Proposed Project).

4.15.8 Alternative 6: River Center Project Site (South via Kingsworth/North via Hospital District)

The footprint of the areas impacted by Alternative 6 is comparable to the footprint of those areas for Alternative 5, with the exception that the southern rail connection would connect with an existing railroad corridor in the area along Spruill Avenue, but north of Kingsworth Avenue. Impacts to the commercial and industrial areas south of Kingsworth Avenue, to as far south as Milford Street (i.e., the bulk of the Southern Alternatives Area), would essentially be avoided, as discussed below.

4.15.8.1 Construction

The environmental consequences of construction of the Navy Base ICTF under Alternative 6 would be similar to those associated with Alternative 5, with the following exceptions due to the alternative location for the southern rail connection:

- This alternative would affect only two of the 14 sites in the Southern Alternatives Area that pose a high risk of contamination involvement.

- The need to remove approximately 16 structures to accommodate the southern rail connection, resulting in more potential need for testing and/or abatement of asbestos and metals-based paints associated with these structures than would be required with Alternative 5.

4.15.8.2 Operation

The environmental consequences of operation of the Navy Base ICTF under Alternative 6 would be similar to those discussed under Alternative 5 (and essentially the same as Alternative 1 [Proposed Project]).

4.15.9 Alternative 7: River Center Project Site (South via Milford)

From the perspective of involvement with contaminated or potentially contaminated properties, the footprint of the areas impacted by Alternative 7 is essentially the same as the footprint of those areas for Alternative 5. Therefore, the differences between Alternative 7 and Alternative 5 are negligible regarding HTRW resources.

4.15.9.1 Construction

The environmental consequences of construction of the Navy Base ICTF under Alternative 7 would be similar to Alternative 5.

4.15.9.2 Operation

The environmental consequences of operation of the Navy Base ICTF under Alternative 7 would be similar to those discussed for Alternative 5 and essentially the same as Alternative 1 (Proposed Project).

4.15.10 Related Activities

Related Activities with the potential to affect HTRW resources include the re-use and rebuilding of railroad infrastructure within existing CSX railroad ROWs, such as along Meeting Street Road, to the south and southeast of the main Project construction areas for all of the alternatives. The primary contamination impacts associated with the proposed re-use of railroad lines in the Related Activity areas of the Project would be the potential for involvement with soils having arsenic and BEQs contamination.

4.15.11 Summary of Impacts Table

Table 4.15-2 summarizes HTRW-related environmental consequences from Alternative 1 (Proposed Project) and all the alternatives, including the No-Action Alternative.

Table 4.15-2
Summary of Impacts, Hazardous, Toxic, and Radioactive Waste

Alternative	Number of contaminated sites	Number of buildings requiring demolition/ renovation	Contaminated Soil Impacts	Contaminated Groundwater Impacts	Superfund Sites Impacts	Asbestos-Containing Materials and Metals-Based Paints Impacts	Accidental Spills
No-Action	Eight active monitoring, two requiring investigation for a total of 10.	Unknown	Potential minor adverse impacts to soil (contami-nation) from excavation activities (after compliance with the Navy's permitting process, RCRA Permit #SC0 170 022 560 and all applicable laws for testing and disposal of contaminated soils). Ten known, active contamination sites have been identified in the areas associated with the No Action Alternative.	Potential minor adverse impacts to groundwater (contamination) from dewatering in excavation areas after compliance with the Navy's permitting process, RCRA Permit SC0 170 022 560, and all applicable laws for treatment and disposal of dewatering effluent.	Unknown	Potential minor adverse impact from demolition of structures with asbestos and/or metals-based paints (after survey and applicable abatement measures).	Potential for minor and/or major adverse impacts from accidental spills.

Alternative	Number of contaminated sites	Number of buildings requiring demolition/ renovation	Contaminated Soil Impacts	Contaminated Groundwater Impacts	Superfund Sites Impacts	Asbestos-Containing Materials and Metals-Based Paints Impacts	Accidental Spills
1: Proposed Project: South via Milford/ North via Hospital District	Eight active monitoring, 15 requiring investigation for a total of 23.	Approximately 107	Similar to the No-Action Alternative, but 14 more potentially contaminated sites would be impacted for a total of 24.	Similar to the No-Action Alternative; multiple areas with groundwater monitoring that would be impacted, and more potentially contaminated sites would be impacted than the No-Action Alternative	No anticipated involvement with the Macalloy Superfund Site	Similar to the No-Action Alternative; approximately 107 buildings affected	Potential for minor and/or major adverse impacts from accidental spills resulting from use of above-ground storage tanks (ASTs) (diesel fuel), storage of other minor amounts of solvents on the premises, and from containers containing hazardous materials.
2: South via Milford/ North via S-line	Eight active monitoring, 14 requiring investigation for a total of 22.	Approximately 114	Similar to Alternative 1 (Proposed Project)	Similar to Alternative 1 (Proposed Project)	Similar to Alternative 1 (Proposed Project)	Similar to Alternative 1 (Proposed Project) but with approximately 114 buildings to be impacted	Similar to Alternative 1 (Proposed Project)

Alternative	Number of contaminated sites	Number of buildings requiring demolition/ renovation	Contaminated Soil Impacts	Contaminated Groundwater Impacts	Superfund Sites Impacts	Asbestos-Containing Materials and Metals-Based Paints Impacts	Accidental Spills
3: South via Kingsworth/ North via Hospital District	Eight active monitoring, three requiring investigation for a total of 11.	Approximately 113	Similar to Alternative 1 (Proposed Project) but 13 fewer potentially contaminated sites would be impacted	Similar to the No-Action Alternative	Similar to Alternative 1 (Proposed Project)	Similar to Alternative 1 (Proposed Project) but with approximately 113 buildings to be impacted	Similar to Alternative 1 (Proposed Project)
4: South via Milford	Similar to Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Similar to Alternative 1 (Proposed Project)	Similar to Alternative 1 (Proposed Project)	Similar to Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)	Similar to Alternative 1 (Proposed Project)
5: River Center Project Site: South via Milford/ North via Hospital District	Eight active monitoring, 16 requiring investigation for a total of 24.	Approximately 47	Similar to Alternative 1 (Proposed Project) but fewer areas with existing groundwater contamination and monitoring wells	Similar to Alternative 1 (Proposed Project)	Similar to Alternative 1 (Proposed Project)	Similar to Alternative 1 (Proposed Project) with approximately 47 buildings to be impacted	Similar to Alternative 1 (Proposed Project)
6: River Center Project Site: South via Kingsworth/ North via Hospital District	Eight active monitoring, four requiring investigation for a total of 12.	Approximately 49	Similar to Alternative 5, but with 12 fewer potentially contaminated sites impacted	Similar to Alternative 5, but with 12 fewer potentially contaminated sites impacted	Similar to Alternative 5	Similar to Alternative 5, but with approximately 49 buildings to be impacted	Similar to Alternative 5

Alternative	Number of contaminated sites	Number of buildings requiring demolition/ renovation	Contaminated Soil Impacts	Contaminated Groundwater Impacts	Superfund Sites Impacts	Asbestos-Containing Materials and Metals-Based Paints Impacts	Accidental Spills
7: River Center Project Site: South via Milford	Similar to Alternative 5	Same as Alternative 5	Similar to Alternative 5	Similar to Alternative 5	Similar to Alternative 5	Same as Alternative 5	Similar to Alternative 5

4.15.12 Mitigation

4.15.12.1 Applicant's Proposed Avoidance and Minimization Measures

The Applicant has committed to several measures that avoid and/or minimize potential impacts of Alternative 1 (Proposed Project). These measures are taken from Palmetto Railways Mitigation Plan provided in Appendix N. Some of these measures are required under federal, state, and local permits; others are measures that Palmetto Railways has incorporated into the design and operations of Alternative 1 (Proposed Project). Each mitigation measure is also designated as one that either helps to avoid an impact or one that minimizes an impact.

- Implement a Solid and Hazardous Waste Management Plan, SPCC plan and comply with RCRA and SCDHEC requirements for storage and handling of hazardous and toxic wastes. (Minimization)
- The Applicant is working with the U.S. Navy for long-term monitoring and removal of hazardous wastes. The following hazardous materials have already been removed from the intermodal site: 10,860 linear feet of fuel lines, 2,110 linear feet of natural gas lines, 4,570 linear feet of underground asbestos lines, 530 linear feet of asbestos stream lines, 980 square feet of transite panel, 96,150 gallons of product, and 206 cubic yards of asbestos containing materials. * (Minimization)
- Employ the use of oil-water separator at the locomotive shop and proper spill protection (e.g., spill kit, collector pans) for light duty repairs in the vicinity of the "repair in place" tracks to ensure treatment of any oily waste from on-terminal equipment maintenance activities. (Minimization)
- Inclusion of forebays in stormwater management system to provide pretreatment of stormwater runoff before it discharges to Pond A. (Minimization)
- Installation of additional water monitoring wells, in cooperation with SCDHEC and the Navy, will support ongoing reclamation of the site from U.S. Navy Operations. (Minimization)
- Perform all land and groundwater disturbance activities in compliance with the U.S. Navy Construction Process Document (Navy "Dig" Permit), included as part of its SCDHEC RCRA Hazardous Waste Permit, which identifies the permit process and requirements for conducting construction or other land disturbing activities in Land Use Control (LUC) areas at the former Navy Base (CNC. (Minimization)

These avoidance and minimization measures, except the items noted with an asterisk (*), have been considered in the preceding impact analysis. The complete list of Applicant-proposed avoidance and minimization measures related to HTRW is also provided in Chapter 6.

4.15.12.2 Additional Potential Mitigation Measures

No additional mitigation measures for Hazardous, Toxic, and Radioactive Waste are proposed by the Corps. Additional avoidance, minimization, and mitigation may be considered by the Corps in its

decision-making process. Final mitigation measures may be adopted as conditions of the DA permit and documented in the Record of Decision (ROD).

4.16 SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE

4.16.1 Methods and Impact Definitions

Socioeconomic and Environmental Justice impacts were evaluated based on a comparison of existing community conditions in the study area to projected conditions during and after construction of Alternative 1 (Proposed Project) and the alternatives. Sources of information reviewed for this analysis include U.S. Census data, regional socioeconomic projections, and data from local mapping, plans, policies, and regulations. The analysis also considers observations from field visits as well as information received from scoping, interviews with local planners, community leaders, and citizens in an effort to document community resources along with community vision, values, and goals.

Adverse impacts to the community may occur if they disrupt community cohesion or stability, have detrimental effects on the economy of the area, result in a loss of community facilities, reduce mobility, increase emergency response times, or cause recurring impacts to neighborhoods impacted by previous projects. Impacts to Environmental Justice populations are considered significant if they are disproportionately high and adverse compared to the adverse effect that would be suffered by the non-minority and/or non-low-income population. A disproportionately high and adverse effect on minority and low-income populations means an adverse effect that:

1) Is predominately borne by a minority population and/or a low-income population; or
2) Will be suffered by the minority population and/or low-income population and is appreciably more severe or greater in magnitude than the adverse effect that will be suffered by the non-minority population and/or non-low-income population.

A project may also have beneficial impacts to socioeconomic resources by providing employment opportunities for the local community and the region.

Table 4.16-1
Impact Definitions, Socioeconomics and Environmental Justice

Negligible	Minor	Major
• No impacts to economic and business resources. • No loss of mobility or access. • No increase in emergency response times over the existing condition. • No impacts to neighborhoods or community resources. • No barriers to the elderly or handicapped persons. • No impacts to Environmental Justice communities.	• Loss of 10 or fewer businesses. • Short-term adverse construction related impacts that result in changes in access, but no loss of mobility. • Short-term adverse construction related impacts and long-term adverse operational impacts to emergency response times that are longer than response times under the No-Action Alternative. Alternate routes for emergency response are available. • Loss of 10 or fewer residential units from area neighborhoods and/or community resources but no loss of function. • Temporary barriers to the elderly or handicapped persons during construction. • An impact to Environmental Justice communities, but not a disproportionate impact.	• Loss of more than 10 businesses and/or insufficient relocation sites available in neighborhood. • Long-term changes in access or loss of access and/or mobility. • Increase in emergency response times under the action alternatives compared to the No-Action Alternative. No emergency response alternate routes are available. • Loss of more than 10 residential units in a neighborhood and/or loss of connections between neighborhoods. • Continued adverse impacts to previously impacted neighborhoods. • Loss of community resources with no replacement sites available. • Long-term and/or permanent barriers to the elderly or handicapped persons. • Disproportionately high and adverse impact on Environmental Justice communities.

The following sections describe the socioeconomic and Environmental Justice impacts associated with the No-Action Alternative, Alternative 1 (Proposed Project), and Alternatives 2–7. Figure 4.16-1 is a key map of notable features in the study area. Figures 4.16-2 through 4.16-8 show the alternatives in relation to socioeconomic resources. Potential impacts discussed in this section

include both temporary construction impacts and permanent impacts resulting from operation of the proposed Navy Base ICTF. The types of impacts addressed include:

- Community resources, cohesion, and stability impacts (Socioeconomics)
  - Economic and business resource impacts
  - Mobility and access impacts
  - Community safety and emergency response impacts
  - Community and neighborhood impacts
  - Barriers to the elderly and handicapped persons
- Environmental Justice considerations

4.16.2 No-Action Alternative

Under the No-Action Alternative, the Project site and River Center project site would continue to be used for mixed-use industrial activities. Activities would likely include the demolition of existing buildings and infrastructure and the installation of new buildings and structures necessary to support the light industries and warehousing/shipping entities.

Economic and Business Resource Impacts. The light industrial and mixed-use development that is anticipated under the No-Action Alternative would likely create indirect, long-term economic benefits to the regional and local community, as employment opportunities are directly and indirectly created as a result of future redevelopment within the Project site and River Center project site. Therefore, the No-Action Alternative would result in minor beneficial impacts to economic and business resources.

Mobility and Access Impacts. Temporary detours during construction of light industrial and mixed-use development anticipated under the No-Action Alternative may increase travel times, change or remove access to properties, and/or limit mobility in the study area. These indirect adverse impacts would be short-term and localized to the study area. Implementation of a traffic control plan and the provision of safe and efficient detour routes and advance notice of road closures would minimize impacts; therefore, the intensity of construction-related mobility and access impacts from private developers is anticipated to be minor.

Long-term mobility and access impacts associated with the No-Action Alternative would be dependent upon the location and intensity of light industrial and mixed-use development; however, road and/or rail improvements would likely result in minor adverse impacts to mobility and access so long as multiple access routes to/from the CNC are maintained, and new at-grade rail crossings have similar daily average time delays for commuters as those under existing conditions.

Community Safety and Emergency Response Impacts. The No-Action Alternative would have negligible impacts to safety and emergency response if redevelopment occurred to include rail-served warehousing and distribution facilities. Daily average time delays for commuters would be similar to those experienced under existing conditions.

Community and Neighborhood Impacts. Construction and operation of light industrial and mixed-use development would result in the loss of Sterett Hall (a community recreation center closed and demolished in 2016) and surrounding arts facilities. As described in Section 3.16 (Socioeconomics and Environmental Justice), Sterett Hall was an important community resource that offered recreational opportunities, an auditorium, and meeting space not available elsewhere in the community. Until recently, the City of North Charleston's Cultural Arts Department used two buildings adjacent to Sterett Hall for classrooms, artist studios, rehearsal space, and summer camps. The City of North Charleston is currently leasing Sterett Hall from Palmetto Railways. Removal of these resources would have long-term, indirect impacts to the neighborhoods surrounding the Project site due to the loss of a community gathering space and individual and organized recreational and arts opportunities.

Opportunities for replacement of the programs and services provided at Sterett Hall may exist in the Chicora Life Center at the corner of McMillan Avenue and Spruill Avenue, which is planned to include a recreational facility. Per the 2012 Settlement Agreement between South Carolina Public Railways (Palmetto Railways) and the City of North Charleston, which includes the transfer of the Project site (including Sterett Hall) from the City of North Charleston to Palmetto Railways, Palmetto Railways would pay a total of $8 million to the City of North Charleston by 2016 as mitigation for rail access impacts and Palmetto Railways would assume $6.5 million in outstanding Tax Increment Financing (TIF) obligations from the City of North Charleston. With mitigation, overall intensity of impacts is anticipated to be minor adverse while the replacement facility is under construction. However, if no replacement is provided for services and programs currently located at Sterett Hall, the adverse impact to the community would be major adverse. Under the No-Action Alternative, there would be no adverse direct or indirect impact to the unnamed community park, the Chicora-Cherokee Neighborhood Park, or Riverfront Park.

Barriers to the Elderly and Handicapped. The Americans with Disabilities Act (ADA) of 1990 (PL 110-325) provides for equal opportunity for individuals with disabilities to access public and private facilities. Construction of rail served warehousing and mixed-use development would be built in compliance with ADA requirements. Therefore, the No-Action Alternative would not result in physical impacts in terms of new barriers to the elderly and handicapped.

Environmental Justice Considerations. Environmental Justice principles would not apply to the No-Action Alternative since no federal action would be involved and the future development would be undertaken in accordance with local zoning regulations.

4.16.3 Alternative 1: Proposed Project (South via Milford / North via Hospital District)

Economic and Business Resource Impacts. Alternative 1 (Proposed Project) would result in the relocation of six businesses with a total of approximately 50 displaced employees. These businesses are located along the proposed northern and southern rail connections. An estimated $150 million dollars will be used to develop and construct Alternative 1 (Proposed Project). This expenditure would result in a major short-term benefit to the local and regional economy. As noted in a study completed in 2015 by Frank Hefner with the College of Charleston, 3,032 temporary construction jobs within the region would be created from construction, and a total of 55 direct jobs at the site after its completion (Hefner, 2016). In addition, Alternative 1 (Proposed Project) would provide indirect, long-term economic benefits to the regional and local community as employment opportunities are directly and indirectly created as a result of the Proposed Project. Palmetto Railways estimates that the Navy Base ICTF would employ approximately 96 people by 2038. According to a study completed in 2015 by the University of South Carolina, for every 10 jobs that are directly supported by SCPA operations, an additional 14 jobs are indirectly created elsewhere with companies that do business through the SCPA (Von Nessen, 2015). The purpose of the Navy base ICTF is to improve efficiency within the intermodal container transportation network to and from the port. This increased efficiency in local intermodal transport is expected to attract economic activity and provide a competitive advantage for the ports. The study also indicates that the total economic impact of the SCPA corresponds to $53 billion in annual economic output, creating 187,206 jobs and over $10.2 billion in labor income in the state that would not exist otherwise (Von Nessen, 2015).

The main gate for trucks and employees to access the ICTF would be located on Hobson Avenue, to the north of Supply Street. If trucks are queuing along Hobson Avenue and blocking access to Supply Street, this activity would have an indirect adverse impact on businesses along the water that are accessed via Supply Street, including Pierside Boatworks, the H.L. Hunley Confederate Submarine (museum and tourist site), and the Clemson University Restoration Institute. This was a concern noted by business owners in the area during public meetings. Palmetto Railways has configured the facility and proposed road improvements (e.g., turning lanes) to minimize the potential for trucks obstructing access to Supply Street (and other streets near the Navy Base ICTF).

Alternative 1 (Proposed Project) has the potential for long-term indirect adverse impacts to businesses near the Project site if noise or aesthetic impacts cause a loss of customers. For example, the owner of a special events facility on the east side of North Carolina Avenue in the Chicora-Cherokee neighborhood expressed concerns during the scoping process that people will not want to rent his facility if there are noise impacts from trains and visual impacts from cranes and containers. Similarly, the owner of a software company on North Carolina Avenue at Success Street expressed reservations during scoping about investing in additional improvements to his property because the

Navy Base ICTF would operate only a few hundred feet away. All scoping comments can be found in Appendix C. Proposed mitigation to minimize noise and aesthetic impacts include features such as the vegetated earthen noise berm, sound walls, and electric wide-span gantry cranes. These mitigation measures by Palmetto Railways would help mitigate the minor indirect adverse impacts to these businesses. Additional noise and visual resources mitigation measures are identified in Sections 4.12 and 4.11, respectively.

The northern arrival/departure track through the Hospital District has the potential to directly impact the Lowcountry Orphan Relief (see Figure 4.16-2) due to noise. However, the Applicant and the Lowcountry Orphan Relief have reached an agreement to minimize and compensate for impacts to the property. The southern arrival/departure tracks would require ROW acquisition for a southern rail connection through existing industrial properties just north of Milford Street. The majority of the properties are vacant or storage lots. Businesses that could be displaced include Fraziers Ironworks, Willie Transport, Inc., eLifespaces, Glassburn, The Loft Pilates Center, and Applied Building Sciences Inc. These business relocations will comply with The Uniform Act.

Overall, impacts to economic and business resources as a result of Alternative 1 (Proposed Project) would be minor adverse in light of mitigation measures. Specific mitigation measures regarding employment, job training, and educational opportunities are listed in 4.16.12 and Chapter 6.

Mobility and Access Impacts. Temporary detours during construction would likely increase travel times, change or remove access to properties, and limit mobility in the Project site. These indirect adverse impacts would be short-term and localized to the study area. Implementation of a traffic control plan, the provision of safe and efficient detour routes, and advance notice of road closures would minimize impacts; therefore, the intensity of construction-related mobility and access impacts is anticipated to be minor short-term adverse. Specific mitigation measures regarding community and social infrastructure mitigation are listed in 4.16.12 and Chapter 6.

At the northern end of the Project site, Alternative 1 (Proposed Project) would realign and grade-separate Cosgrove Avenue, over new rail tracks, from Spruill Avenue connecting to McMillan Avenue near Noisette Boulevard. This action would allow for the undisturbed flow of both vehicular and rail traffic. Cosgrove Avenue would serve as one of the main vehicular access points to the Proposed Project and would provide direct access to I-26. McMillan Avenue from Kephart Street to St. Johns Avenue would be eliminated. The remainder of McMillan Avenue would become an extension of St. Johns Avenue connecting to Spruill Avenue. Turnbull Avenue would be closed. Alternative 1 (Proposed Project) would affect access and mobility through the Hospital District due to the location of the northern arrival/departure track. Rental homes on the former Navy Base and Lowcountry Orphan Relief are currently accessed from Noisette Boulevard via Turnbull Avenue. These properties are located on the west side of the proposed northern arrival/departure track on the Hospital District. Access will be maintained through improved connections from St. Johns Avenue to Truxtun Avenue and from St. Johns Avenue to Avenue H. Access to rental homes, offices, and a non-profit

organization (Family Corps) on the CNC east of the proposed northern arrival/departure track could be maintained from Noisette Boulevard, assuming no additional construction is proposed on the remainder of the Hospital District. At the southern end of the Project site, the Viaduct Road Overpass would be closed and removed. Bainbridge Avenue and North Hobson Avenue would be realigned, including improvements to their intersection. With the removal of Viaduct Road, vehicular access to the southern end of the CNC would use the new local port access road. Stromboli Avenue would be elevated from its existing at-grade configuration. The construction of the local access segment of the Port Access Road, including the elevation of Stromboli Avenue, would be an independent project undertaken by the SCDOT, and would be completed before the closure and removal of Viaduct Road. New rail tracks would create one new major at-grade rail crossing on Meeting Street.

Alternative 1 (Proposed Project) would change the way residents of the Chicora-Cherokee neighborhood access destinations on the east side of the Project site, such as the Free Harvest Medical Clinic and employment opportunities at Detyens Shipyard. These residents would no longer be able to use Reynolds Avenue or Viaduct Road to travel east to Hobson Avenue; they would have to travel farther north on Spruill Avenue to use the new Cosgrove Avenue extension (approximately a 0.5-mile detour), or travel farther south to use the new Stromboli Avenue extension (approximately a 0.7-mile detour). The Applicant has committed to include a pedestrian and multiuse path as part of the raised overpass connecting Spruill Avenue to North Hobson Avenue which will provide safe and uninterrupted access to existing and future development on the former CNC. The City of North Charleston could connect the multiuse path to Riverfront Park in the future.

Employees of Detyens Shipyard currently use the parking lot on the south side of McMillan Avenue, west of Noisette Boulevard, and then walk east along McMillan Avenue to access the shipyard. Alternative 1 (Proposed Project) would eliminate this parking lot and would also remove this section of McMillan Avenue, both of which would adversely impact parking access to the shipyard for employees; however, Palmetto Railways has held discussions with affected stakeholders about constructing a parking structure at the surface lot on the west side of Noisette Boulevard. If a parking structure is built, then there would be no adverse impact to Detyens Shipyard employee parking. According to the Applicant, they have come to an agreement with Detyens Shipyard for an alternative location for parking. The long-term goal for all local property owners is to construct a parking structure but there is currently no timeline nor funding mechanism in place.

Increased rail traffic from the Project would have a long-term, indirect effect on mobility in neighborhoods to the north and south of the Project site (Park Circle area) in the form of longer and/or more frequent delays at at-grade rail crossings. In addition to increased delays and reduced mobility at existing at-grade crossings, Alternative 1 (Proposed Project) would also introduce one new at-grade crossing at Meeting Street. Additional delays at rail crossings was a major concern voiced by residents at public meetings who felt they currently experience lengthy delays. The

intensity of this adverse impact is minor, and a discussion about the impact can be found in the traffic analysis located in Section 4.8 (Transportation).

According to the traffic analysis, in 2018 the new crossing at Meeting Street would have a daily average of 4 crossings at approximately 6 minutes each. In 2038, this would increase to a daily average of 4 crossings at approximately 11 minutes each. This additional crossing would have a minor impact on mobility in the Project site.

Alternative 1 (Proposed Project) may impact the mobility of bus routes in the area. Specifically, CARTA Route 104 currently travels along McMillan Avenue to Noisette Boulevard and service could be interrupted during construction of the Cosgrove/McMillan Overpass. CARTA Routes 10 and 11 would be delayed by lengthy closures of Meeting Street at the new at-grade crossing. These interruptions to bus routes would result in a minor adverse temporary impact, because CARTA will coordinate with Palmetto Railways on timing of construction activities and prepare alternate routes (personal communication, Geoffrey Burns, BCDCOG, October 21, 2016). Access to areas that would be serviced by Routes 104, 10, and 11 would likely be maintained.

Community Safety and Emergency Response Impacts. Community safety and emergency response impacts associated with Alternative 1 (Proposed Project) are related to the construction of an additional at-grade crossing and an increase in truck volumes on local streets. Construction of the rail and ROW improvements at Meeting Street for the southern rail connection would result in one new major at-grade rail crossing. This new at-grade rail crossing would have a minor indirect adverse impact to community safety by introducing a new conflict point between trains and automobiles, bicycles, and pedestrians. There are existing bike lanes and sidewalks along Meeting Street at the location of this proposed new at-grade crossing.

This new at-grade crossing may also have a minor adverse impact on emergency response times for certain locations, because there is the potential for Meeting Street to be blocked for approximately 11 minutes[91], four times a day in design year 2038, when trains are entering and leaving the Navy Base ICTF. Detour routes are available, such as the elevated Stromboli Avenue and Cosgrove-McMillan Overpass, but the detour could increase response times, depending on the location of the emergency. The community of Union Heights would also experience a minor adverse impact to emergency response if an ICTF train was blocking access on both east and west access points as it navigated the U-turn.

In the northern portion of the Navy Base ICTF, the grade separation of Cosgrove Avenue with multi-use path over proposed rail tracks on the Project site would preserve east-west mobility for

[91] Based on an 8,000-foot train traveling at 10 miles per hour through the crossing.

automobiles, bicycles, and pedestrians, and would preserve access to the eastern portion of the northern study area for emergency responders.

While there are short-term adverse construction related impacts and long-term adverse operational impacts to emergency response times under Alternative 1 (Proposed Project), the overall impact is minor. Response times would be longer than those under the No-Action Alternative; however, alternate routes for emergency response are available.

Community and Neighborhood Impacts. Communities and neighborhoods surrounding the Project site could experience noise, air quality, and visual impacts. These impacts and proposed mitigation for them are discussed in detail in Section 4.12 (Noise), Section 4.13 (Air Quality), and Section 4.11 (Visual Resources and Aesthetics). Information from these sections is included in this section as applicable when discussing the overall range and intensity of impacts that communities and neighborhoods may experience as a result of the Project alternatives. The socioeconomic impacts discussed above combined with the physical impacts discussed in other sections of this EIS have an overall impact on the communities and neighborhoods surrounding the Project site. The Chicora-Cherokee Neighborhood directly borders the western boundary of the Project site and would be subjected to noise, air quality, aesthetic, mobility, access, and community cohesion impacts as a result of Alternative 1 (Proposed Project). According to the Applicant, Alternative 1 (Proposed Project) would result in ROW acquisitions that would result in the relocation of approximately 134 residential units from the Chicora-Cherokee Neighborhood. Any person(s) whose property needs to be acquired as a result of Alternative 1 (Proposed Project) would be compensated in accordance with the U.S. Constitution and the Uniform Act of 1970, as amended (see Chapter 8 Relevant Laws, Regulations, and Executive Orders). The loss of this housing represents approximately 8 percent of the housing units in the neighborhood. Approximately 126 of the 134 residential units are renter occupied. Available housing is not available in the Chicora-Cherokee Neighborhood for all the relocatees to stay within the neighborhood, especially if they were all relocated at the same time. However, the Applicant plans to conduct phased relocations to address this impact.

The loss of this housing and associated population is a major adverse direct impact to the community. The indirect effect of this housing loss would exacerbate the current trend of population loss in the neighborhood as previously identified in Section 3.16.2.1. However, the Applicant has included measures in the Community Mitigation Plan (included in Appendix N) for the affected communities that includes the establishment of a revolving fund for affordable housing to be stewarded by the Metanoia Community Development Corporation. This fund will assist with offsetting the trend of population loss in the neighborhood by providing affordable housing opportunities in the neighborhood. There is an additional mitigation measure in the Community Mitigation Plan which states that for a period of 3 years after the official opening of the ICTF, the Applicant shall provide relocation services, consistent with the Uniform Act, to qualified (Appendix N) owner-occupied

residences. Residents choosing to exercise this mitigation option would indirectly contribute to population losses previously identified in Section 3.16.2.1.

Noise impacts in the Chicora-Cherokee Neighborhood are detailed in Section 4.12. There would be a minor to moderate adverse daytime exterior noise impact to the residential structures closest to the vegetated earthen berm. Exterior nighttime noise impacts for residential structures during operation of the ICTF would be major. Refer to subsection 4.12.3.5 for information on exterior to interior noise reduction. Interior noise levels are not anticipated to disrupt sleep. Air quality impacts are detailed in Section 4.13.

Aesthetic impacts to the neighborhood include views of a landscaped earthen berm, a 103- to 125-foot crane, and 85-foot mast lights, which would operate every night from dusk until dawn. To mitigate these impacts, the Applicant has committed to build an aesthetically pleasing noise/visual barrier which may incorporate a community mural project or other design. In addition, the vegetated earthen berm and sound walls between the ICTF and the adjacent Chicora-Cherokee Neighborhood will be appropriately landscaped with native, non-invasive vegetation and permanently maintained by the Applicant (Chapter 6).

Mobility and access impacts, as discussed above, include changes in the way residents of the neighborhood access destinations on the east side of the Project site (e.g., the Harvest Free Medical Clinic and Riverfront Park), employment opportunities at the shipyard, and potential changes and delays to bus routes.

Sterett Hall and two buildings used by the North Charleston Arts Department (recently closed) would be displaced under the No-Action Alternative and, as such, there would be a negligible impact to this community resource under Alternative 1 (Proposed Project). Numerous comments on the DEIS expressed concerns regarding the loss of Sterett Hall and the need to replace the programs and services that it provided to the community. As a result, the Applicant agreed in the Community Mitigation Plan (Appendix N) to commit $3 million for the construction of a community recreation center on property to be provided by the City of North Charleston (in the area of the Chicora Tank Farm). Plans for the new center propose 10,000 square feet of gymnasium space and approximately 5,000 square feet of fitness space, office space and bathroom facilities. In addition, the Applicant agreed to support the City of North Charleston in the rehabilitation and repair of the Chicora Elementary School for the benefit of the community. The Corps anticipates that these repairs, in combination with the funds committed by the Applicant, will serve to replace the Sterett Hall facilities that were once provided to the community.

Alternative 1 (Proposed Project) would not directly impact the unnamed community park, Riverfront Park, or the Chicora-Cherokee Community Park. Users of the parks may be indirectly impacted due to increased noise and visually through the presence of wide-span gantry cranes that might be seen above existing vegetated buffers. To increase recreational opportunities in the community, the

Applicant will support the City of North Charleston and the Community Mitigation Working Group in the establishment of Quitman's Marsh as a recreational area (Chapter 6).

The Olde North Charleston Neighborhood generally includes the portion of the study area north of Noisette Creek, but also includes subdivisions south of Noisette Creek such as Hunley Waters and residences along St. Johns Avenue. The southern portion of this neighborhood has the potential for minor adverse noise, mobility, and safety impacts as a result of the proposed northern rail line, as well as the daily addition of, on average, 1-2 commodity trains travelling through the neighborhood to and/or from CSX's Ashley Junction. As discussed in Section 4.8, the additional commodity trains are a result of the operation of the Navy Base ICTF; however, approximately 11 trains currently travel along the same route, and with equal average delays at existing at-grade rail crossings (approximately 7 to 8 minutes). However, to address the noise impact, the Applicant has committed to adding sound walls adjacent to St. Johns Avenue and Avenue F under Alternative 1 (Figure 4.12-15).

The Park Circle and Oak Park neighborhoods in the northern portion of the study area would be indirectly impacted by increased rail traffic on existing tracks and at-grade crossings on the eastern edge of the Park Circle Neighborhood along Virginia Avenue, along the northern edge of the Park Circle and Oak Park neighborhoods (parallel to I-526), and within Park Circle as 1–2 additional commodity trains would traverse on existing rail across Spruill Avenue to CSX's Ashley Junction. This impact includes additional rail traffic at the at-grade crossing of North Rhett Avenue, where several people at the public meetings commented that they already experience long wait times. Based on the traffic analysis, increased rail traffic at this crossing with Alternative 1 (Proposed Project) would result in only a minor impact (approximately 4 additional trains per day in 2018 and four additional trains per day in 2038).

The Howard Heights and Union Heights neighborhoods to the south of the Navy Base ICTF would also experience an increase in rail activity on their eastern and western boundaries. Up to 4 new trains would enter and exit the Navy Base ICTF. Noise and air quality impacts would be a minor to moderate and minor adverse effect, respectively, as discussed in Sections 4.12 and 4.13. While there is already existing train traffic to the west of Union Heights along the CSX and NS rail lines, the approximate three trains per day in 2018 under existing condition would increase to seven trains per day (including the additional ICTF trains) under Alternative 1 (Proposed Project). The Navy Base ICTF trains would result in an 11-minute average delay at the Meeting Street at-grade crossing. As a result, residents of Union Heights and Howard Heights would experience a minor adverse impact to mobility and access.

The Navy Base ICTF is not consistent with the City of North Charleston's previous vision (i.e., the Noisette Master Plan) for a mixed-use new urban community on the northern portion of the CNC. Moreover, the concept of an industrial intermodal rail facility is not what the community has been expecting based on the previous local plan. As a result, the Navy Base ICTF may indirectly impact the stability of many new businesses and residential developments that were developed in the area

under the impression that they would be part of a mixed-use new urban community. At public meetings and neighborhood meetings, the community has voiced concerns that the Project may reverse the positive investments and changes that have been made in the area in recent years.

In summary, impacts to community and neighborhoods include: negligible impact from displacement of Sterett Hall and surrounding arts facilities as they would be displaced with or without Alternative 1 (Proposed Project); major adverse impacts to Chicora-Cherokee Neighborhood from approximately 134 residential displacements; minor to moderate impact to Chicora-Cherokee Neighborhood from visual and noise impacts; minor adverse noise impacts to Olde North Charleston; and minor to moderate noise impacts to Howard Heights/Union Heights/Windsor neighborhoods. The Applicant has collaborated with the cities of Charleston and North Charleston and multiple neighborhood organizations to develop various mitigation measures, which are included in the Applicant's Community Mitigation Plan, that help improve the quality of life in the surrounding community. Neighborhood organizations included the Chicora-Cherokee Neighborhood Association, the Union Heights Community Council, the LAMC, and the Metanoia Community Development Corporation. LAMC represents seven neighborhoods (Accabee, Chicora/Cherokee, Union Heights, Howard Heights, Windsor Place, Five Mile, and Liberty Hill). The Applicant and the groups entered into a Memorandum of Agreement (MOA) on October 18, 2016 (see the Community Mitigation Plan and Community MOA in Appendix N for additional details). As part of this agreement, the Applicant has committed $1 million to mitigate effects to neighborhoods and communities (in addition to the funds for the community recreation center).

Barriers to the Elderly and Handicapped. The Project site is located on flat, level terrain that would not create barriers to access for the elderly or handicapped. Facility buildings would be built in compliance with ADA requirements. Designated ADA compliant parking spaces would be provided to assure the availability of parking and decrease the distance for elderly and disabled visitors to facility buildings. Mobility and access impacts from Alternative 1 (Proposed Project) would be short-term and localized to the Project study area. ADA compliant sidewalks would be included with the Cosgrove Avenue flyover. The general population would experience delays by trains at at-grade rail crossings. A delay would not constitute a physical barrier. As a result, Alternative 1 (Proposed Project) would not result in new barriers to the elderly and handicapped and impacts would be negligible. Interruptions to bus routes would result in a minor adverse temporary impact because alternate routes would be employed by CARTA and access to areas that would be serviced by Routes 104, 10, and 11 would likely be maintained.

Environmental Justice Considerations. The adverse impacts associated with Alternative 1 (Proposed Project) would be predominantly borne by the minority and low-income population of the Chicora-Cherokee Neighborhood, and are appreciably more severe than the adverse effects that would be suffered by the non-minority and non-low-income population of the City of North Charleston and Charleston County. With regard to benefits and burdens, the benefits of Alternative 1

(Proposed Project) would extend to the greater Charleston region, while the burdens would largely be borne by the Environmental Justice community adjacent to the Project site. Therefore, the benefits and burdens of Alternative 1 (Proposed Project) are not equitably distributed. However, the Applicant and community groups entered into a Memorandum of Agreement on October 18, 2016 (see the Community Mitigation Plan and Community MOA in Appendix N for additional details). Measures outlined in this agreement would mitigate the adverse burdens borne by the Environmental Justice community.

4.16.4 Alternative 2: Proposed Project Site (South via Milford / North via S-line)

Economic and Business Resource Impacts. Economic and business resource impacts under Alternative 2 would be similar to those under Alternative 1 (Proposed Project), with the exception that the proposed northern rail connection in the vicinity of the Spruill Avenue/Aragon Avenue/Bexley Street intersection would directly impact commercial properties (Reddy Ice, Z-Bar, and some vacant properties) in the southwest quadrant of the Spruill Avenue/Aragon Avenue/ Bexley Street intersection.

Mobility and Access Impacts. Mobility and access impacts under Alternative 2 would be similar to those under Alternative 1 (Proposed Project), with the exception that a cul-de-sac would be constructed at the intersection of St. Johns Avenue and McMillan Avenue. This closure of St. Johns Avenue would have adverse indirect impacts to properties accessed from St. Johns Avenue, including small businesses, a church, a school, and many residences; however, the connection of Turnbull Avenue to St. Johns Avenue would be opened and, as a result, would mitigate the loss of access to a minor adverse impact by providing an alternate route that connects to Noisette Boulevard.

Community Safety and Emergency Response Impacts. Impacts to community safety and emergency response under Alternative 2 would be similar to those under Alternative 1 (Proposed Project); however, there are several differences. In Alternative 2, the northern rail connection for NS would be relocated along Spruill Avenue within existing CSX ROW to the S-line, and turn east along Aragon Avenue to the existing NCTC rail line. As a result of the rail alignment, a cul-de-sac would be constructed at the southern end of St. Johns Avenue. The former Charleston Naval Complex gate at Turnbull Avenue will be open to provide future access between St. Johns Avenue and Noisette Boulevard. Same as Alternative 1 (Proposed Project), Alternative 2 creates a new at-grade rail crossing at the intersection of Meeting Street and Herbert Street and at O'Hear Avenue south of Bexley Street.

Alternative 2 results in a minor adverse impact to human health from delay to emergency response times for the same reasons as Alternative 1 (Proposed Project).

Community and Neighborhood Impacts. Community and neighborhood impacts associated with Alternative 2 would be similar to the impacts associated with Alternative 1 (Proposed Project); however, there are the following differences. The northern rail connection in Alternative 2 is located in an Environmental Justice community. An Environmental Justice analysis has been conducted (see Section 3.16) to access whether the population meets the criteria for the presence of minority and/or low-income population. This area of potential impact is located within block groups CT 37 BG 3 and CT 55 BG 1 (see Figure 4.18-1). CT 37 BG 3 and CT 55 BG 1 both have Black or African American minority Environmental Justice populations (see Table 3.16-19). In addition, CT 55 BG 1 also has a low-income Environmental Justice population (see Table 3.16-20). As a result, impacts within this section of the study area would result in additional impacts to the Environmental Justice community impacted by the project. Specifically, Alternative 2 would have 33 additional residential relocations over Alternative 1 (Proposed Project) for a total of 167 residential relocations.

Also, residential homes along Bexley Street would be directly impacted by long-term noise impacts and train headlamps at nighttime as a result of trains operating along a new rail track just south of Bexley Street. Similarly, properties between Spruill Avenue and St. Johns Avenue, including residential homes and St. John Catholic Church and School, would be directly impacted by long-term noise impacts from trains operating along a new rail track on the east side of Spruill Avenue (see Figure 4.16-3).

Barriers to the Elderly and Handicapped. Barriers to the elderly and handicapped persons under Alternative 2 would be the same as those under Alternative 1 (Proposed Project).

Environmental Justice Considerations. Environmental Justice impacts under Alternative 2 would be similar to Alternative 1 (Proposed Project), with an additional 33 residential relocations within an Environmental Justice community.

4.16.5 Alternative 3: Proposed Project Site (South via Kingsworth / North via Hospital District)

Economic and Business Resource Impacts. Economic and business resource impacts under Alternative 3 would be similar to those under Alternative 1 (Proposed Project), except the businesses north of Milford Street for the southern rail connection would be unaffected.

Mobility and Access Impacts. Mobility and access impacts under Alternative 3 would be similar to those under Alternative 1 (Proposed Project), with the exception that construction of the rail and ROW improvements under Alternative 3 would result in an at-grade crossing of Spruill Avenue and Meeting Street, west of Cooper Yard.

Community Safety and Emergency Response Impacts. Impacts to community safety and emergency response under Alternative 3 would be similar to those under Alternative 1 (Proposed

Project); however, there are several differences. The southern rail connection would connect to an existing rail line near Kingsworth Avenue (and adjacent to existing rail ROW); therefore, the existing at-grade crossings of Pittsburgh Avenue and Discher Street would not be impacted with ICTF train occurrences and the new at-grade crossing of Meeting Street at Herbert Street would not be created. However, Alternative 3 would create at-grade crossings, of both Meeting Street and Spruill Avenue near Kingsworth Avenue.

The new at-grade rail crossings would have a minor indirect adverse impact to community safety by introducing new conflict points between trains and automobiles, bicycles, and pedestrians. There are existing bike lanes and sidewalks along Meeting Street and Spruill Avenue at the location of these proposed new at-grade crossings.

These new at-grade crossings may also have a moderate adverse impact on emergency response times for certain locations because there is the potential for Meeting Street and Spruill Avenue to be blocked for approximately 11 minutes[92], four times a day, when the CSX trains are entering and leaving the Navy Base ICTF. Detour routes are available such as the elevated Stromboli Avenue and Cosgrove-McMillan Overpass, but the detours could increase response times, depending on the location of the emergency. The communities of Union Heights, Windsor, and Howard Heights might also experience a moderate adverse impact to emergency response time if a train related to Alternative 3 was blocking access on both east and west access points as it navigated the U-turn.

Community and Neighborhood Impacts. Community and neighborhood impacts associated with Alternative 3 would be similar to the impacts associated with those under Alternative 1 (Proposed Project). In addition, the new ROW acquisition for rail track and the at-grade rail crossing would directly impact the Union Heights Neighborhood and would result in the need for relocation of eight residential units. The loss of these eight residential units represents 1 percent of the housing units in the neighborhood and would be considered a minor impact to community cohesion since the units are currently separated from the rest of the neighborhood by the existing access ramps from Spruill Avenue to I-26. Overall, a total of approximately 142 residential relocations would occur under Alternative 3. The southern portion of the Union Heights neighborhood would also be directly impacted by long-term noise impacts from train operations along the new rail track (see Figure 4.16-4).

Barriers to the Elderly and Handicapped. Barriers to the elderly and handicapped persons under Alternative 3 would be similar to those under Alternative 1 (Proposed Project).

[92] Based on an 8,000-foot train traveling at 5 miles per hour through the crossing.

Environmental Justice Considerations. Environmental Justice impacts under Alternative 3 would be the similar to Alternative 1 (Proposed Project); however, there would be the additional relocation of eight residential units in the Union Heights Neighborhood.

4.16.6 Alternative 4: Proposed Project Site (South via Milford)

To the north of the intermodal facility, a rail spur or tail track, is proposed to extend from the facility through the River Center Neighborhood, as is identified for Alternative 1 (Proposed Project), but would stop short of Noisette Creek (see Figure 4.16-5).

Economic and Business Resource Impacts. Economic and business resource impacts under Alternative 4 would be similar to those under Alternative 1 (Proposed Project), with the exception that there would be no residential and/or business impacts within the Hospital District.

Mobility and Access Impacts. Mobility and access impacts under Alternative 4 would be similar to those under Alternative 1 (Proposed Project), with the exception that there would be no road and rail improvements, and associated mobility and access impediments and/or impacts, to the north of the ICTF facility.

Community Safety and Emergency Response Impacts. Impacts to community safety and emergency response under Alternative 4 would be the similar to those under Alternative 1 (Proposed Project); however, there are several differences. Alternative 4 is a variation of Alternative 1 (Proposed Project), where NS and CSX would also enter and exit the Navy Base ICTF from a southern rail connection. Proposed rail through the Hospital District would stop short of Noisette Creek.

Under Alternative 4, trains would use the southern rail alignment to Milford Street and there would be no impact to the at-grade crossings of Rivers Avenue, Virginia Avenue, and Avenue B. Alternative 4 would have twice as many ICTF train occurrences as Alternative 1 (Proposed Project), eight per day, at the at-grade crossings along the southern alignment. The community of Union Heights might also have a localized moderate adverse impact to emergency response if a train was blocking access on both east and west access points as it navigated the U-turn.

Community and Neighborhood Impacts. Community cohesion and stability impacts associated with Alternative 4 would be similar to those under Alternative 1 (Proposed Project).

Barriers to the Elderly and Handicapped. Barriers to the elderly and handicapped persons under Alternative 4 would be similar to those under Alternative 1 (Proposed Project).

Environmental Justice Considerations. Environmental Justice impacts associated with Alternative 4 would be the same as those under Alternative 1 (Proposed Project).

4.16.7 Alternative 5: River Center Project Site (South via Milford / North via Hospital District)

Economic and Business Resource Impacts. Similar to Alternative 1 (Proposed Project), the construction and operation of the River Center ICTF would result in major short-term and indirect long-term economic benefits to the local area and region. Switching the location of the ICTF facility to the River Center project site under Alternative 5 would also eliminate the need to relocate the approximately 134 residential units associated with the Chicora-Cherokee Neighborhood. Alternative 5 would result in new noise and visual impacts to offices and businesses located on the east side of Noisette Boulevard adjacent to the ICTF, including the Berkeley-Charleston-Dorchester Council of Governments and 10 Storehouse Row; however, the noise abatement wall proposed along the eastern boundary of the River Center ICTF would help minimize these adverse impacts. Alternative 5 would result in the relocation of 62 residences and 18 commercial properties, including 60 units from the West Yard Lofts low-income housing complex and the Lowcountry Innovation Center (see Figure 4.16-6), which houses more than 15 companies. The relocation of these businesses and low-income residents would have major short-term, localized direct adverse impacts. The owner of West Yard Lofts is under contract to provide low-income housing and is concerned about violating their contract if they are forced to relocate; however, in compliance with the Uniform Act of 1970, these impacts would be minimized by providing relocation assistance and working with business owners and residents to find replacement facilities.

Alternative 5 would also lead to the termination of existing leases with businesses on the west side of Noisette Boulevard on the River Center project site, including Department of Defense offices, a furniture store, and a large marine container manufacturer. This alternative may also require the termination of leases for local non-profit organizations and residential properties located on the western portion of the River Center project site, depending upon the final design.

Lowcountry Orphan Relief is located in the vicinity of the River Center project site, but would not be directly impacted as currently designed. Lowcountry Orphan Relief includes a donation center and is heavily reliant on volunteers. It also hosts several large outdoor events each year. This facility would be indirectly impacted if the volunteers lose easy access for donors and volunteers, or if outdoor events are affected by the presence of the River Center ICTF. Palmetto Scholars Academy relocated[93] to another location several miles from the River Center project site; therefore, no impacts would occur.

For Alternative 5, the main gate for trucks coming from I-26 would be located on an extension of Cosgrove Avenue. Based on the traffic analysis, the annual average daily volume of trucks on Cosgrove Avenue east of Spruill Avenue would be approximately 2,200 in 2018 under Alternative 2 compared to 85 under the No-Action Alternative. This volume of trucks would have a long-term,

[93] As of December 2016, this relocation has occurred.

indirect adverse impact on businesses located along Cosgrove Avenue, including small shops and offices, a hair salon, a bank, and the Charleston County Department of Social Services. Customers may have a difficult time accessing these businesses, and may be deterred from patronizing these businesses, if there is an increase in the volume of trucks along the road.

Mobility and Access Impacts. As with Alternative 1 (Proposed Project), temporary detours during construction of Alternative 5 would likely increase travel times, change or remove access to properties, and limit mobility to River Center project site. These indirect, minor adverse impacts would be short-term and localized to the study area. Implementation of a traffic control plan and the provision of safe and efficient detour routes and advance notice of road closures would minimize adverse impacts.

Alternative 5 would result in a minor long-term adverse impact to east-west mobility as it would make it more difficult for residents of neighborhoods west and south of the River Center ICTF to access destinations to the east of it, including Riverfront Park. Similar to Alternative 1 (Proposed Project), this alternative would adversely impact parking access for Detyens Shipyard employees using the parking lot along McMillan Avenue; however, as with Alternative 1 (Proposed Project), Palmetto Railways has come to an agreement with Deytens Shipyard for an alternative location for parking. The long-term goal for all local property owners is to construct a parking structure but there is currently no timeline nor funding mechanism in place. Alternative 5 would result in a minor adverse impact to CARTA Route 104, which currently runs along Spruill Avenue, Noisette Boulevard, and McMillan Avenue in the study area. Alternative 5 would eliminate access between Spruill Avenue and Noisette Boulevard in the vicinity of McMillan Avenue, and no alternate route is provided. Therefore, CARTA Route 104 would have to be re-routed. In addition, access to the CARTA Superstop at the corner of Cosgrove Avenue and Rivers Avenue would likely be impacted by a high volume of trucks travelling on Cosgrove Avenue to access the ICTF. This traffic may make it difficult for buses and riders to access the facility, and may also pose a potential safety issue due to high pedestrian activity near the Superstop, resulting in the potential for a minor adverse impact.

Alternative 5 would introduce additional traffic onto St. Johns Avenue due to the location of the employee entrance on St. Johns Avenue at Turnbull Avenue. This traffic may result in adverse access impacts for St. John Catholic Church and School, which is located adjacent to the proposed employee entrance; however, Alternative 5 has an increase of only approximately 600 vehicles per day on St. Johns Avenue over the No-Action Alternative. This is a relatively small increase over a 24-hour period. Additionally, St. Johns Avenue and the ICTF employee driveway would operate at acceptable levels of service in both 2018 and 2038. Therefore, any access impacts to St. John Catholic Church and School would be negligible.

Community Safety and Emergency Response Impacts. Community safety and emergency response impacts associated with Alternative 5 are generally related to the construction of the additional at-grade crossing and an increase in truck volumes on local streets.

Alternative 5 would result in a potential major adverse impact to emergency response times due to delays at at-grade crossings compared to the No-Action Alternative, because it would eliminate several east-west routes in the study area. McMillan Avenue and Reynolds Avenue would no longer provide a connection from Spruill Avenue to Noisette Boulevard. Cosgrove Avenue east of Spruill Avenue would only provide access to the River Center project site. The closest EMS station is located on Dorchester Road west of the DCIA. Emergency responders coming from the west side of the DCIA would have to go north of Noisette Creek then east to connect to Noisette Boulevard to access properties along the Cooper River. Emergency responders dispatching from Fire Station 2 on the corner of Carner Avenue and Clement Avenue would have to travel south to the future Stromboli Avenue Bridge over rail tracks then north on the improved Bainbridge Avenue to access properties on the Cooper River.

Similar to Alternative 1 (Proposed Project), construction of the rail and ROW improvements at Meeting Street for the southern rail connection would result in one new major at-grade rail crossing. This new at-grade rail crossing would have a potential minor, direct adverse impact to community safety by introducing a new conflict point between trains and automobiles, bicycles, and pedestrians. There are existing bike lanes and sidewalks along Meeting Street at the location of this proposed new at-grade crossing.

Similar to Alternative 1, there would be the potential for Meeting Street to be blocked by a train for approximately 11 minutes[94], four times a day, when the trains are entering and leaving the River Center ICTF. The CARTA Superstop is located at the corner of Cosgrove Avenue and Rivers Avenue. Alternative 5 would result in a high volume of trucks (2,161 trucks per day in 2018) traveling on Cosgrove Avenue to access the ICTF. These trucks could pose a safety concern to pedestrians walking to and from the buses.

Community and Neighborhood Impacts. Communities and neighborhoods surrounding Alternative 5 would experience similar noise, air quality, and visual impacts as those under Alternative 1 (Proposed Project). Neighborhoods within the study area (shown on Figure 3.16-2) include Olde North Charleston, Chicora-Cherokee (made up on Chicora Place and Cherokee Place), Windsor, Howard Heights, and Union Heights. Alternative 5 would directly impact the Chicora-Cherokee, Olde North Charleston, and Union Heights neighborhoods and the West Yard Lofts low-income community, and would indirectly impact the Park Circle and Oak Park neighborhoods.

Alternative 5 includes the extension of arrival/departure tracks, to the south, and a drayage road adjacent to the Chicora-Cherokee neighborhood between Reynolds Avenue and Viaduct Road. The drayage road would expose the neighborhood to noise impacts from trains on the arrival/departure tracks as well as noise and air quality impacts from diesel trucks on the drayage road. These direct, long-term impacts would occur 24 hours per day. It should be noted that due to a longer drayage

[94] Based on an 8,000-foot train traveling at 5 miles per hour through the crossing.

road between the ICTF and the port, Alternative 5 would require twice as many trucks traveling on the drayage road to transport the same volume of containers as Alternative 1. The combined noise from trains and trucks would result in a major localized noise impact (see Section 4.12.10) to the Chicora-Cherokee Neighborhood.

The Corps assumes that the Project site would still be developed with industrial or warehousing uses as indicated under the No-Action Alternative. Therefore, Sterett Hall and the arts building would still be lost, and community resources, cohesion, and stability impacts associated with the No-Action Alternative would also apply to Alternative 5 without a replacement facility.

Alternative 5 would not directly impact the unnamed community park, Riverfront Park, or the Chicora-Cherokee Community Park; however, it would create indirect impacts as a result of increased noise from rail and truck traffic and visual impacts as a result of the wide-span gantry cranes.

Similar to Alternative 1 (Proposed Project), the eastern portion of the Olde North Charleston Neighborhood has the potential for minor, indirect noise, mobility, and safety adverse impacts as a result of the proposed rail lines and existing at-grade crossings along Virginia Avenue as part of Alternative 5. The River Center Neighborhood would experience a negligible exterior daytime impact and moderate to major exterior nighttime impact from operational noise. Additionally, there would be a moderate adverse rail noise impact to the Union Heights Neighborhood. Alternative 5 would also cause a major adverse impact to the River Center Neighborhood from displacement of approximately 62 residential units, which includes West Yard Lofts (60-unit, low-income housing development that opened in 2011). The Park Circle and Oak Park neighborhoods would experience similar impacts associated with a River Center ICTF as those under Alternative 1 (Proposed Project).

Barriers to the Elderly and Handicapped. Barriers to the elderly and handicapped persons under Alternative 5 would be the similar to those under Alternative 1 (Proposed Project).

Environmental Justice Considerations. Alternative 5 has the potential for disproportionately high and adverse impacts to Environmental Justice populations, primarily the residents associated with West Yard Lofts. The adverse impacts associated with Alternative 5 would be predominantly borne by the minority and low-income populations and are appreciably more severe than the adverse effects that would be suffered by the nonminority and non-low-income population of the City of North Charleston and Charleston County. With regard to benefits and burdens, the benefits of Alternative 5 would extend to the greater Charleston region, while the burdens would be borne by the Environmental Justice community adjacent to the Project. Therefore, the benefits and burdens of Alternative 5 are not equitably distributed. However, measures outlined in any agreements made under Alternative 5 could mitigate the adverse burdens borne by the Environmental Justice community.

4.16.8 Alternative 6: River Center Project Site (South via Kingsworth / North via Hospital District)

Alternative 6 is similar to Alternative 5 with the exception that the southern rail connection would connect to an existing rail line near Kingsworth Avenue (and adjacent to existing rail and ROW). Construction of the rail and ROW improvements under Alternative 6 would result in a new at-grade crossing at Spruill Avenue and Meeting Street. This new track and at-grade rail crossing would directly impact the Union Heights Neighborhood from ROW acquisition and residential relocations. The southern portion of the neighborhood would also be directly impacted by long-term noise impacts from operating along the new rail track (see Figure 4.16-7).

Economic and Business Resource Impacts. Economic and business resource impacts under Alternative 6 would be similar to those under Alternative 5, with the exception that the businesses north of Milford Street for the southern rail connection would be unaffected.

Mobility and Access Impacts. Mobility and access impacts under Alternative 6 would be similar to those under Alternative 5.

Community Safety and Emergency Response Impacts. Impacts to community safety and emergency response under Alternative 6 would be similar to those under Alternative 5; however, there are differences. The southern rail connection would connect to an existing rail line near Kingsworth Avenue (and adjacent to existing rail and ROW), therefore the existing at-grade crossings of Pittsburgh Avenue and Discher Street would not be impacted with ICTF train occurrences and the new at-grade crossing of Meeting Street at Herbert Street would not be created for Alternative 6. Alternative 6 would create at-grade crossings of both Meeting Street and Spruill Avenue near Kingsworth Avenue.

The new at-grade rail crossings would have a minor indirect adverse impact to community safety by introducing new conflict points between trains and automobiles, bicycles, and pedestrians. There are existing bike lanes and sidewalks along Meeting Street and Spruill Avenue at the location of these proposed new at-grade crossings.

These new at-grade crossings may also have a major adverse impact on emergency response times for certain locations because there is the potential for Meeting Street and Spruill Avenue to be blocked for approximately 11 minutes[95], four times a day, when the trains are entering and leaving the Navy Base ICTF. Detour routes are available along the southern rail connection such as the elevated Stromboli Avenue. There would be no detour route available in the northern portion of the River Center project site and no Cosgrove-McMillan Overpass, increasing response times depending on the location of the emergency. The community of Union Heights, Windsor, and Howard Heights

[95] Based on an 8,000-foot train traveling at 5 miles per hour through the crossing.

might also have a moderate adverse impact to emergency response if a train related to Alternative 6 was blocking access on both east and west access points as it navigated the U-turn.

The City of Charleston's planned public service operation center would not be impacted by Alternative 6.

Community and Neighborhood Impacts. Community and neighborhood impacts associated with Alternative 6 would be similar to those under Alternative 5, with the exception that eight residential units would be displaced in the Union Heights Neighborhood for new rail tracks. This loss of these eight residential units represents 1 percent of the housing units in the neighborhood and would be considered a minor adverse impact to community cohesion since the units are currently separated from the neighborhood by the existing access ramps from Spruill Avenue to I-26. A total of approximately 70 residential relocations would be required as part of Alternative 6.

Barriers to the Elderly and Handicapped. Barriers to the elderly and handicapped persons under Alternative 6 would be similar to those under Alternative 1 (Proposed Project).

Environmental Justice Considerations. Environmental Justice impacts associated with Alternative 6 would be similar to Alternative 5; with the addition of eight residential units requiring relocation in the Union Heights neighborhood. These additional relocations are not considered to be a disproportionate adverse impact to this Environmental Justice community.

4.16.9 Alternative 7: River Center Project Site (South via Milford)

Economic and Business Resource Impacts. Economic and business resource impacts under Alternative 7 would be similar to those under Alternative 5.

Mobility and Access Impacts. Mobility and access impacts under Alternative 7 would be similar to those under Alternative 5.

Community Safety and Emergency Response Impacts. Impacts to community safety and emergency response under Alternative 7 would be similar to those under Alternative 5; however, there are several differences. Alternative 7 is a variation of Alternative 5 where trains would also enter and exit the Navy Base ICTF from a southern rail connection. Proposed rail through the Hospital District would stop short of Noisette Creek (Figure 4.16-8).

Under Alternative 7, both trains would use the southern rail alignment to Milford Street. Alternative 7 would have twice as many ICTF train occurrences than Alternative 5, eight per day, at the at-grade crossings along the southern alignment. The community of Union Heights would also have a major adverse impact to emergency response if a train related to Alternative 7 was blocking access on both east and west access points as it navigated the U-turn. In addition, the construction of the drayage

road from the River Center project site for Alternative 7 limits east-west mobility throughout the study area.

Community and Neighborhood Impacts. Community cohesion and stability impacts associated with Alternative 7 would be similar to those under Alternative 5.

Barriers to the Elderly and Handicapped. Barriers to the elderly and handicapped persons under Alternative 7 would be similar to those under Alternative 1 (Proposed Project).

Environmental Justice Considerations. Environmental Justice impacts associated with Alternative 7 would be the same as those under Alternative 5.

4.16.10 Related Activities

If the project is constructed, a section of unimproved CSX ROW would have to be activated with rail lines that would accept intermodal trains at the proposed new at-grade crossing at Meeting Street in the vicinity of Discher Street. This Related Activity would apply to Alternatives 1, 2, 4, 5, and 7. Under Alternatives 3 and 6, the Related Activity construction would begin at the proposed new at-grade crossing at Meeting Street in the vicinity of Kingsworth Avenue. Alternative 2 requires the reactivation of an out-of-service ROW and construction of a new railroad bridge to connect the NS arrival/departure track to the north from the ICTF across a portion of marsh that drains to Noisette Creek to the existing NCTC track along Virginia Avenue.

Economic and Business Resource Impacts. Direct or indirect impacts to economic and business resources are not anticipated from the Related Activities. There would be no relocations associated with the Related Activities.

Mobility and Access Impacts. Direct impacts to mobility and access would result from the reactivation of rail tracks and train lengths. The increased train activity is likely to increase delay to pedestrians and vehicle traffic at all associated at-grade rail crossings.

Community Safety and Emergency Response Impacts. Adverse indirect impacts to community safety and emergency response are anticipated from project Related Activities. Increased train activity could result in a delay for emergency responders at all associated at-grade rail crossings.

Community and Neighborhood Impacts. Direct impacts to community cohesion and stability are not anticipated from the Project Related Activities.

Barriers to the Elderly and Handicapped. Related Activities would not result in barriers to the elderly and handicapped.

Environmental Justice Considerations. Adverse indirect impacts from noise are anticipated from increased train activity with project Related Activities.

4.16.11 Summary of Impacts Table

Table 4.16-2 summarizes the environmental consequences to socioeconomics and Environmental Justice from Alternative 1 (Proposed Project) and all the alternatives.

Table 4.16-2
Summary of Impacts, Socioeconomics and Environmental Justice

Alternative	Community Resources, Cohesion, and Stability					Environmental Justice Considerations
	Economic and Business Resource Impacts	Mobility and Access Impacts	Community Safety and Emergency Response Impacts	Community and Neighborhood Impacts	Barriers to the Elderly and Handicapped	
No-Action	Negligible as there are no impacts to economic and business resources	Minor adverse impact from private developer construction.	Negligible impact as any delay would be similar to existing conditions.	Major impact from displacement of Sterett Hall and surrounding arts facilities.	Negligible as there is no physical impact in terms of new barriers to the elderly and handicapped.	Not applicable (no federal action).
1: *Proposed Project: South via Milford / North via Hospital District*	Major short-term and indirect long-term benefit to local and regional economy; minor indirect adverse impact to local businesses adjacent to project (access, relocations, and aesthetics)	Minor short-term adverse impacts from construction; minor adverse access impacts for Chicora-Cherokee residents; minor adverse mobility impacts from new at-grade rail crossings and increased delay at intersections and at-grade crossings.	Potential minor adverse emergency response time impacts due to delay at at-grade crossings compared to No-Action; however alternate routes available. Potential minor safety impacts due to an additional conflict point at Meeting Street at-grade crossing.	Negligible impact from displacement of Sterett Hall and surrounding arts facilities as they would be displaced with or without Alternative 1 (Proposed Project). Major adverse impacts to Chicora-Cherokee Neighborhood from approximately 134 residential displacements; minor to moderate impact from visual and noise impacts. Minor indirect impact from exacerbation of housing and population loss.	Negligible impact in terms of new barriers to the elderly and handi-capped.	Major adverse impact from displacement of approximately 134 residential units would result in a dispro-portionately high and adverse impact to Chicora Cherokee Neighborhood.

Alternative	Community Resources, Cohesion, and Stability					Environmental Justice Considerations
	Economic and Business Resource Impacts	Mobility and Access Impacts	Community Safety and Emergency Response Impacts	Community and Neighborhood Impacts	Barriers to the Elderly and Handicapped	
				Minor adverse impacts to Olde North Charleston and minor to moderate adverse impacts to Howard Heights/Union Heights/Windsor neighborhoods from noise.		
2: *South via Milford / North via S-line*	Similar to Alternative 1 (Proposed Project).	Similar to Alternative 1 (Proposed project), with an additional minor adverse impact from creation of cul-de-sac at St. Johns Avenue and McMillian Avenue.	Similar to Alternative 1 (Proposed Project), but indirect minor adverse impacts (noise, light, and glare) to residents and businesses along Spruill Avenue and Bexley Street corridor.	Similar to Alternative 1 (Proposed Project).	Similar to Alternative 1 (Proposed Project).	Similar to Alternative 1 (Proposed Project). Same disproportionatel y high and adverse impact on Chicora-Cherokee neighborhood as Alternative 1 (Proposed Project). Additional 33 residential relocations within Olde North Charleston neighborhood.
3: *South via Kingsworth / North via Hospital*	Similar to Alternative 1 (Proposed Project); however, businesses north of Milford Street would be avoided.	Similar to Alternative 1 (Proposed Project). Location of 2 new at-grade crossings are located at Meeting Street and Spruill Avenue at Kingsworth Avenue.	Similar to Alternative 1 (Proposed Project) with localized moderate impacts to emergency response.	Similar to Alternative 1 (Proposed Project), but with approximately eight additional residential displacements from Union Heights neighborhood.	Similar to Alternative 1 (Proposed Project).	Similar to Alternative 1 (Proposed Project). Same dispropor-tionately high and adverse impact on Chicora-Cherokee neighborhood as Alternative 1 (Proposed Project). Additional eight residential relocations from Union Heights neighborhood.

Alternative	Community Resources, Cohesion, and Stability					Environmental Justice Considerations
	Economic and Business Resource Impacts	Mobility and Access Impacts	Community Safety and Emergency Response Impacts	Community and Neighborhood Impacts	Barriers to the Elderly and Handicapped	
4:*South via Milford*	Similar to Alternative 1 (Proposed Project).	Similar to Alternative 1 (Proposed Project).	Similar to Alternative 1 (Proposed Project) with localized moderate impacts to emergency response.	Similar to Alternative 1 (Proposed Project).	Similar to Alternative 1 (Proposed Project).	Same dispro-portionately high and adverse impact on Chicora-Cherokee neighborhood as Alternative 1 (Proposed Project).
5: *River Center Project Site: South via Milford / North via Hospital District*	Major short-term and indirect long-term benefit to local and regional economy; direct adverse impacts to businesses on River Center project site; major direct adverse impacts to businesses relocations along Noisette Boulevard and the Lowcountry Innovation Center; minor adverse impact to properties adjacent to project (truck traffic, noise, aesthetics).	Minor, long-term adverse impact to east-west mobility for residents and businesses within the study area; Closure of McMillan Avenue would result in a minor adverse impact from the disruption of CARTA Route 104).	Potential for major adverse emergency response time impacts, due to delay at at-grade crossings compared to the No-Action Alternative and as a result of limited east-west access through the study area. Potential for minor safety adverse impacts due to an additional conflict point at the Meeting Street at-grade crossing.	Negligible impact from displacement of Sterett Hall and surrounding arts facilities as they would be displaced with or without Alternative 5. For the Chicora-Cherokee neighborhood, overall noise impacts would be minor to moderate adverse from rail and a localized major adverse noise impact from rail and drayage road. Chicora-Cherokee Neighborhood would have negligible visual impacts. Major adverse impact to River Center Neighborhood from displacement of approximately 62 residential units (includes 60-unit West Yard Lofts). Negligible exterior daytime impact and moderate to major exterior	Similar to Alternative 1 (Proposed Project).	Major adverse impact from displacement of the approximately 60-unit West Yard Lofts low-income housing development would result in a dispropor-tionately high and adverse impact

Alternative	Community Resources, Cohesion, and Stability					Environmental Justice Considerations
	Economic and Business Resource Impacts	Mobility and Access Impacts	Community Safety and Emergency Response Impacts	Community and Neighborhood Impacts	Barriers to the Elderly and Handicapped	
				nighttime impact to the River Center Neighborhood from operational noise. Moderate adverse rail noise impacts to Union Heights Neighborhood.		
6: *River Center Project Site: South via Kingsworth / North via Hospital*	Similar to Alternative 5; however, businesses north of Milford Street would be avoided.	Similar to Alternative 5.	Similar to Alternative 5.	Similar to Alternative 5, with approximately eight additional residential displacements from the Union Heights Neighborhood.	Similar to Alternative 5.	Similar to Alternative 5.
7: *River Center Project Site: South via Milford*	Similar to Alternative 5.	Similar to Alternative 5.	Similar to Alternative 5.	Similar to Alternative 5.	Similar to Alternative 5.	Same as Alternative 5.

Socioeconomic Impacts and Environmental Justice Impact Definitions

Negligible = No impacts to economic and business resources No loss of mobility or access. No increase in emergency response times over the existing condition. No impacts to neighborhoods or community resources. No barriers to the elderly or handicapped persons. No impacts to Environmental Justice communities.

Minor = Loss of 10 or fewer businesses. Short-term adverse construction related impacts that result in changes in access, but no loss of mobility. Short-term adverse construction related impacts and long-term adverse operational impacts to emergency response times that are longer than response times under the No-Action Alternative. Alternate routes for emergency response are available. Loss of 10 or fewer residential units from area neighborhoods and/or community resources but no loss of function. Temporary barriers to the elderly or handicapped persons during construction. An impact to Environmental Justice communities, but not a disproportionate impact.

Major = Loss of more than 10 businesses and/or insufficient relocation sites available in neighborhood. Long-term changes in access or loss of access and/or mobility. Increase in emergency response times under the action alternatives compared to the No-Action Alternative. No emergency response alternate routes are available. Loss of more than 10 residential units in a neighborhood and/or loss of connections between neighborhoods. Continued adverse impacts to previously impacted neighborhoods. Loss of community resources with no replacement sites available. Long-term and/or permanent barriers to the elderly or handicapped persons. Disproportionately high and adverse impact on Environmental Justice communities.

4.16.12 Mitigation

4.16.12.1 Applicant's Proposed Avoidance and Minimization Measures

The Applicant has committed to several measures that avoid and/or minimize potential impacts of Alternative 1 (Proposed Project). These measures are taken from Palmetto Railways Mitigation Plan provided in Appendix N. Some of these measures are required under federal, state, and local permits; others are measures that Palmetto Railways has incorporated into the design and operations of Alternative 1 (Proposed Project). Each mitigation measure is also designated as one that either helps to avoid an impact or one that minimizes an impact.

These avoidance and minimization measures, except the items noted with an asterisk (*), have been considered in the preceding impact analysis. The complete list of Applicant-proposed avoidance and minimization measures related to socioeconomics and Environmental Justice is also provided in Chapter 6.

- Contributed $8 million to the City of North Charleston as part of the 2012 settlement agreement to mitigate the impacts to the community[96]. (Minimization)
- Residential properties that are forced to relocate will receive full compensation in accordance with the Uniform Relocation Assistance and Real Properties Act of 1970 (The Uniform Act). Affected property owners and displaced persons will receive assistance in accordance with The Uniform Act including (but not limited to) the following: relocation services to displaced tenants and owner occupants, minimum 90 days written notice to vacate, reimbursement for moving expenses, and payments for the added cost of renting or purchasing comparable replacement housing. (Minimization)
- The Applicant will provide relocation services for a period of three (3) years (after the official opening of the facility) to owner-occupied residential property owners who, as of the Effective Date of the Community MOA, reside in the Relocation Area from 100 feet of the Project up to North Carolina Avenue. (Minimization)
- Nonresidential properties (businesses, nonprofit organizations) will receive full compensation in accordance with The Uniform Act. The business located on the four parcels along Milford Street that are required to relocate will receive relocation assistance consisting of the following: inspecting and gathering information regarding each displacee and a search area for available replacement sites, conducting an inventory of personal property to be moved and securing a cost to relocate those items within a 50-mile radius, offering relocation assistance to displaces after establishing their eligibility and assist in getting them relocated from the site, providing the appropriate written notices to the displacees, coordinating securing the approximate payment, ensuring that displaces understand their options, and providing relocation services as necessary to advance the project. (Minimization)
- Developed the Community Mitigation Working Group, comprised of the Chicora- Cherokee Neighborhood Association, Union Heights Community Council, Lowcountry Alliance for

[96] This mitigation measure is based on lawsuit settled in December 2012 (Section 1.5.1).

Model Communities (LAMC), and Metanoia Community Development Corporation. (Minimization).

- The Applicant and the Community Mitigation Working Group entered into a Memorandum of Agreement (MOA) related to the use of mitigation funds in connection with the impacts of the facility (details on the agreement can be found in Appendix N). The Community MOA specifically addresses the following activities:
  - The Applicant shall fund $3 million for the construction of a community recreation center on property to be provided by the City of North Charleston, located in the area of the Chicora Tank Farm. The recreation center is proposed to include approximately 10,000 square feet of gymnasium space, 5,000 square feet of fitness facility space, office space, and bathrooms facilities. LAMC commits to provide $200,000 for fitness equipment and $50,000 for exterior fitness stations. The Applicant also supports the inclusion of an outdoor area that could be used as a community farmer's market in the planning for the center. (Minimization)
  - The Applicant shall provide an additional $1 million in mitigation funds for the impacts of the ICTF. The funding amount may be increased should the construction funds for the recreation center not be fully expended or utilized. The community mitigation funds shall be distributed as follows: 47% for affordable housing, 13% for job training, 13% for education, 13% for environmental research, 8% for a youth endowment, and 6% for an endowment for community organizations. (Minimization)
  - Development of an agreement with SCDHEC to address environmental impacts including support for operational efficiencies and Best Management Practices (BMPs) for intermodal facilities. (see Air Quality mitigation). (Minimization)
  - The Applicant will construct a 100-foot buffer with a landscaped earthen berm and noise wall between the ICTF and Chicora-Cherokee Neighborhood. The buffer will be appropriately landscaped with native, noninvasive vegetation. When appropriate, the Applicant will seek exceptions to the City of North Charleston's Tree Preservation Ordinance for vegetation options that can support appropriate mitigation. The buffer will be permanently maintained by the Applicant. (Minimization)
  - For a period of 3 years after the official opening of the ICTF, the Applicant shall provide relocation services to owner-occupied residential property owners who, as of the Effective Date of the Community MOA, reside in the Relocation Area from the project area to North Carolina Avenue. The relocation services provided by will be consistent with the Uniform Act. (Minimization)
  - The Applicant will maintain its 5 percent (5%) set aside goal for Disadvantaged Business Enterprises (DBEs) in its construction contracts. They further commit to making the Community Mitigation Working Group aware of all job opportunities, through providing job announcements to the community, minority media, and local organizations. The Applicant will also support job fairs in the local community, internship and training programs, with regard to the facility in both its construction and operation stages. In addition, the Applicant will further investigate the possibility of summer internships for

youth in partnership with the Community Mitigation Working Group. See Appendix N for specific details (Minimization)

- The Applicant will support the City of North Charleston and Class I Rail Carriers and the Community Mitigation Working Group to establish quiet zones for rail traffic within the affected communities. [97] (Minimization)
- The Applicant will support the City of North Charleston to develop a truck route and restriction plan for the area and will work to inform truck drivers as to the approved routes to and from the facility. (Minimization)
- The Applicant will support the City of North Charleston in the rehabilitation and repair of the former Chicora Elementary School in the Chicora-Cherokee area for the benefit of the community. The City of North Charleston's rehabilitation of the auditorium, which, when combined with the recreation center partially funded by the Applicant, will serve to replace the facilities that were once provided to the affected communities at Sterett Hall. Palmetto Railways assumes no responsibility or obligation, financial or otherwise, for the rehabilitation of the auditorium, which is not a part of the agreement. (Minimization)
- The Applicant will support the City of North Charleston and the Community Mitigation Working Group in the establishment of Quitman's Marsh as a recreational area. (Minimization)

- The Applicant and the Low County Orphan Relief have reached an agreement to minimize and compensate for impacts to the property. (Minimization)
- The Applicant has developed an ongoing community engagement and awareness plan to keep stakeholders and the public engaged and informed, including the following activities:
  - Provide newsletters to the affected community on a biannual basis targeting the needs and opportunities for the affected community during the duration of construction. (Minimization)
  - Provide community presentations to organizations and the affected community throughout the project's duration. (Minimization)
  - Presenting the Community Mitigation Plan to the community during the draft and final stages. (Minimization)
  - Hold community leadership meetings in the affected community every six months after the Record of Decision (ROD) is posted to address community concerns. (Minimization)
  - Hold construction meetings with the affected community twice a year during construction to keep the public informed and gather comments and feedback from the public. (Minimization)
  - A Community Advisory Panel will be established with the affected community, interested stakeholders and businesses twice a year after construction is completed to gather

[97] In order to mitigate the effects of train horn noise, communities can establish "Quiet Zones" where horns are not needed due to safety improvements at the grade crossings. A guide to the quiet zone establishment process can be found at: www.fra.gov under Railroad Safety: "FRA Train Horn Rule and Quiet Zones."

feedback and keep the public informed about the facility. The Community Advisory Panel will continue through operations. (Minimization)

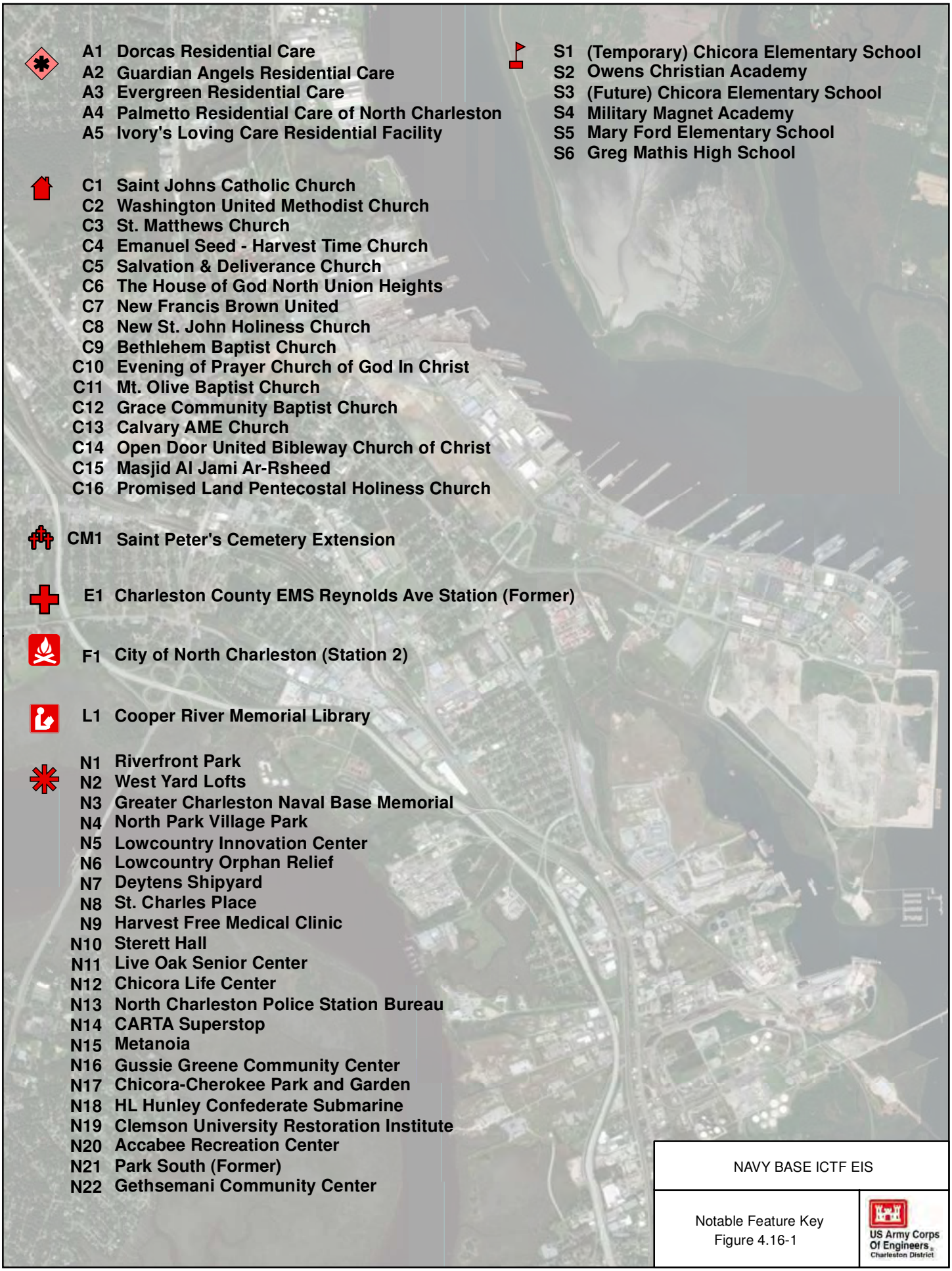
- The Applicant agrees to provide a quarterly report to the Community Mitigation Working Group regarding the construction of the recreation center, until construction is completed. (Minimization)
- The Palmetto Railways website (www.palmettorailways.com) will be used for community information about the facility and tours of the facility can be scheduled at any time during construction and operation. (Minimization)

- Implement the Air Quality Memorandum of Agreement (MOA) with the SCDHEC to address certain concerns related to the environmental impacts of the Project. The Air Quality MOA provides for air quality initiatives including the contribution of $50,000 from the Applicant to go towards ambient air quality initiatives in conjunction and coordination with SCDHEC and the Medical University of South Carolina on air quality initiatives in the Charleston region. (Minimization)
- Incorporate design elements into the facility including a landscaped earthen berm, sounds walls, 100-foot buffer, cut (trench) section, use directional lighting, container stacking limits, and implement other identified mitigation measures that minimize noise, vibrations, visual, and air quality impacts. (Minimization)
- Continue to cooperate with the appropriate emergency services personnel within the Cities of North Charleston and Charleston to address emergency response coordination and other specific issues as they arise. (Minimization)
- Examine emergency service benefits and gather input from local emergency service providers as part of the Surface Transportation Impact Study. See Appendix B for details on the study* (Minimization)
- Study the need for grade separated crossings as part of the Crossing Analysis. See Appendix N for details. * (Minimization)

These avoidance and minimization measures, except the items noted with an asterisk (*), have been considered in the preceding impact analysis. The complete list of Applicant-proposed avoidance and minimization measures for the Navy Base ICTF is provided in Chapter 6, Table 6.1.

4.16.12.2 Additional Potential Mitigation Measures

No additional mitigation measures Socioeconomics and Environmental Justice have been recommended by the Corps. Additional avoidance, minimization, and mitigation may be considered by the Corps in its decision-making process. Final mitigation measures may be adopted as conditions of the DA permit and documented in the Record of Decision (ROD).



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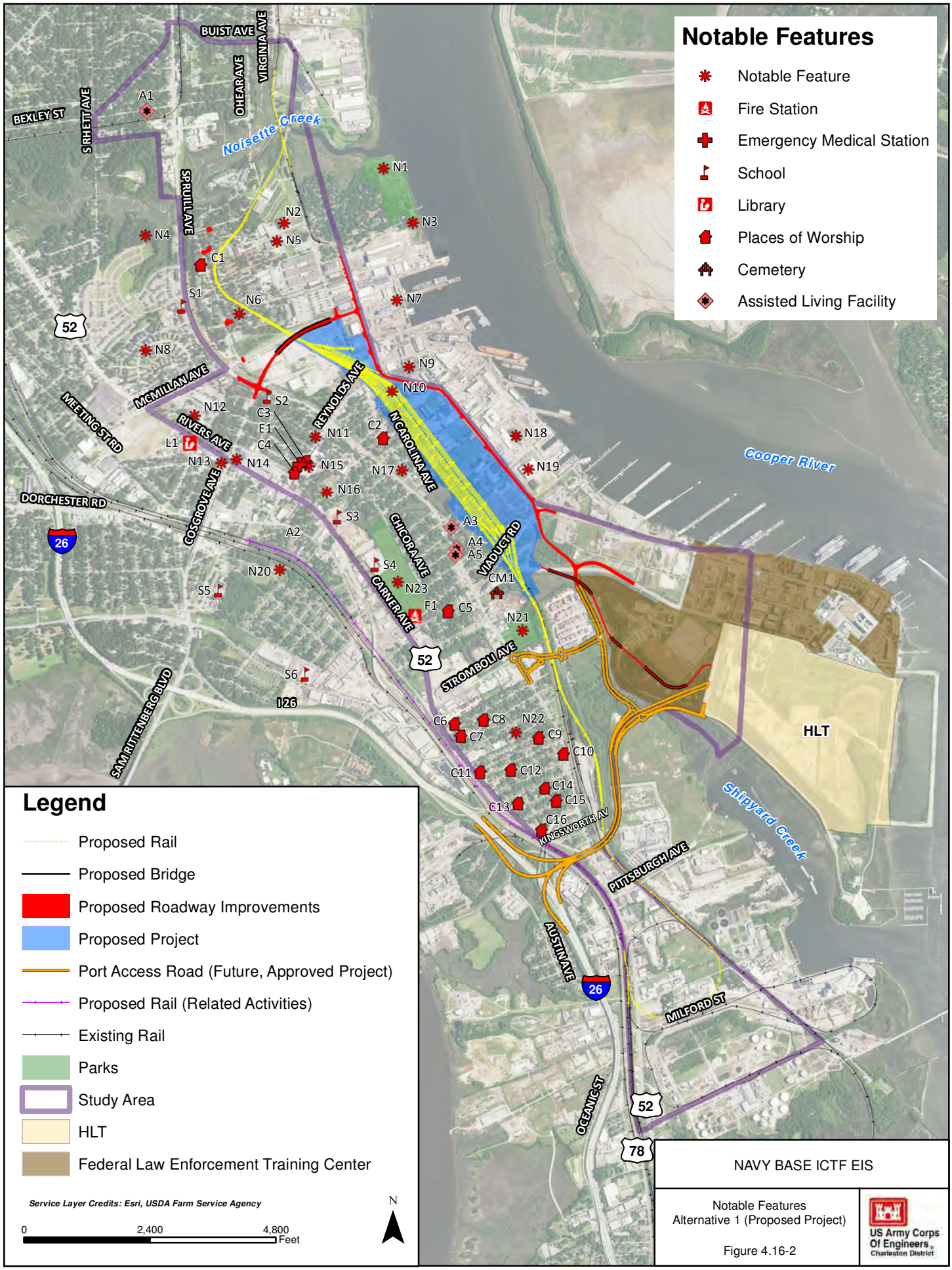
Notable Features
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Proposed Roadway Improvements
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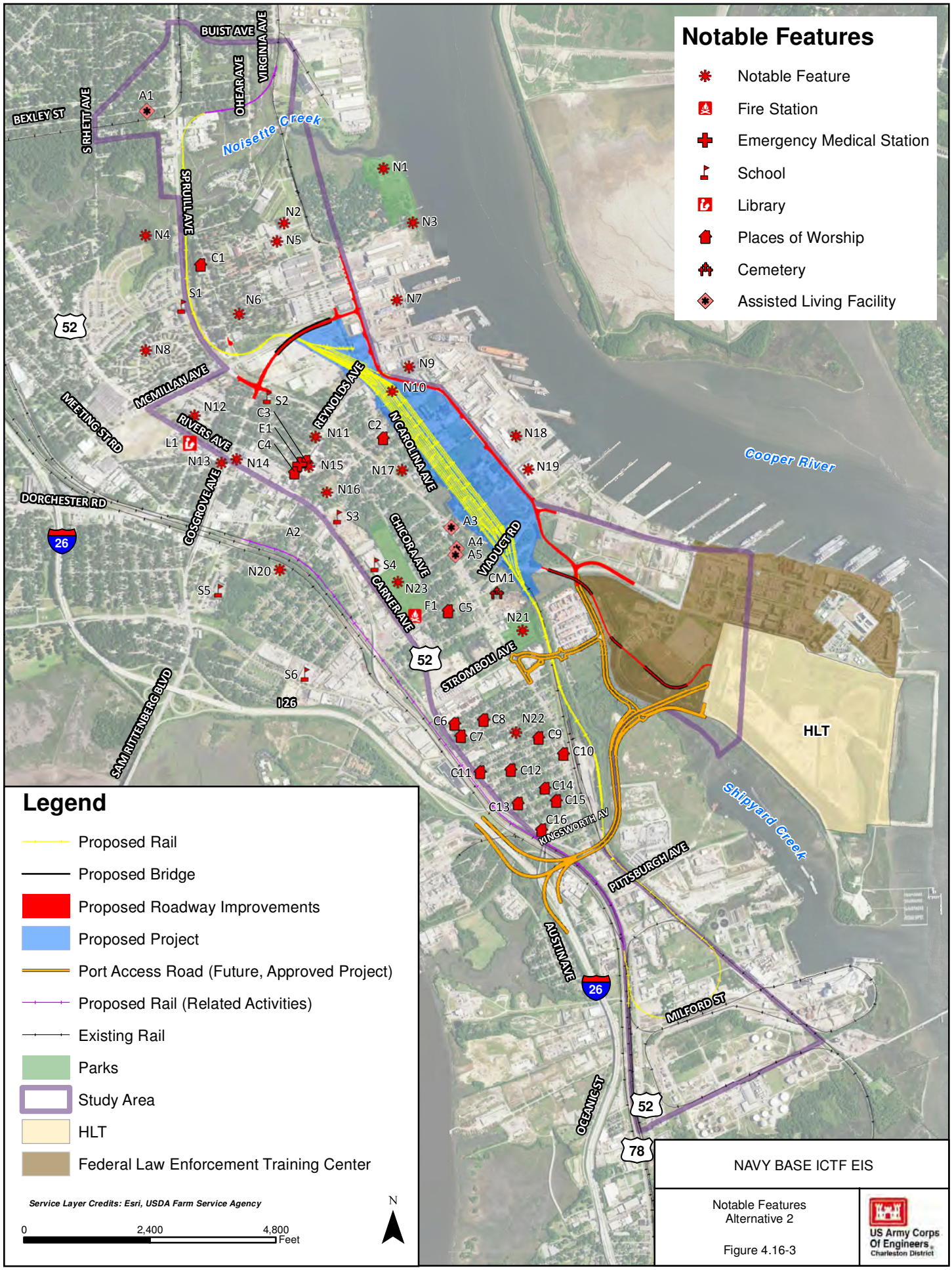
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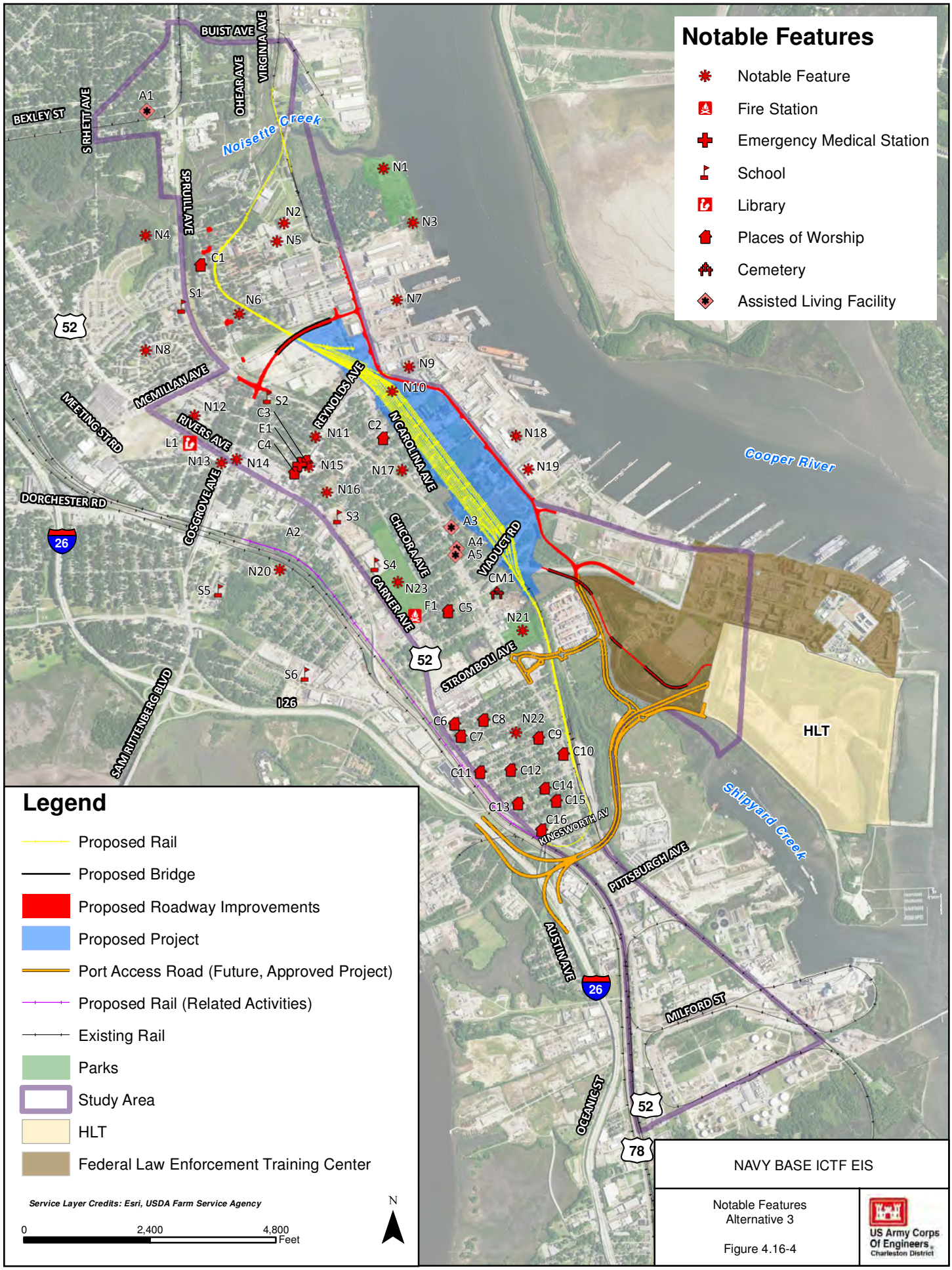
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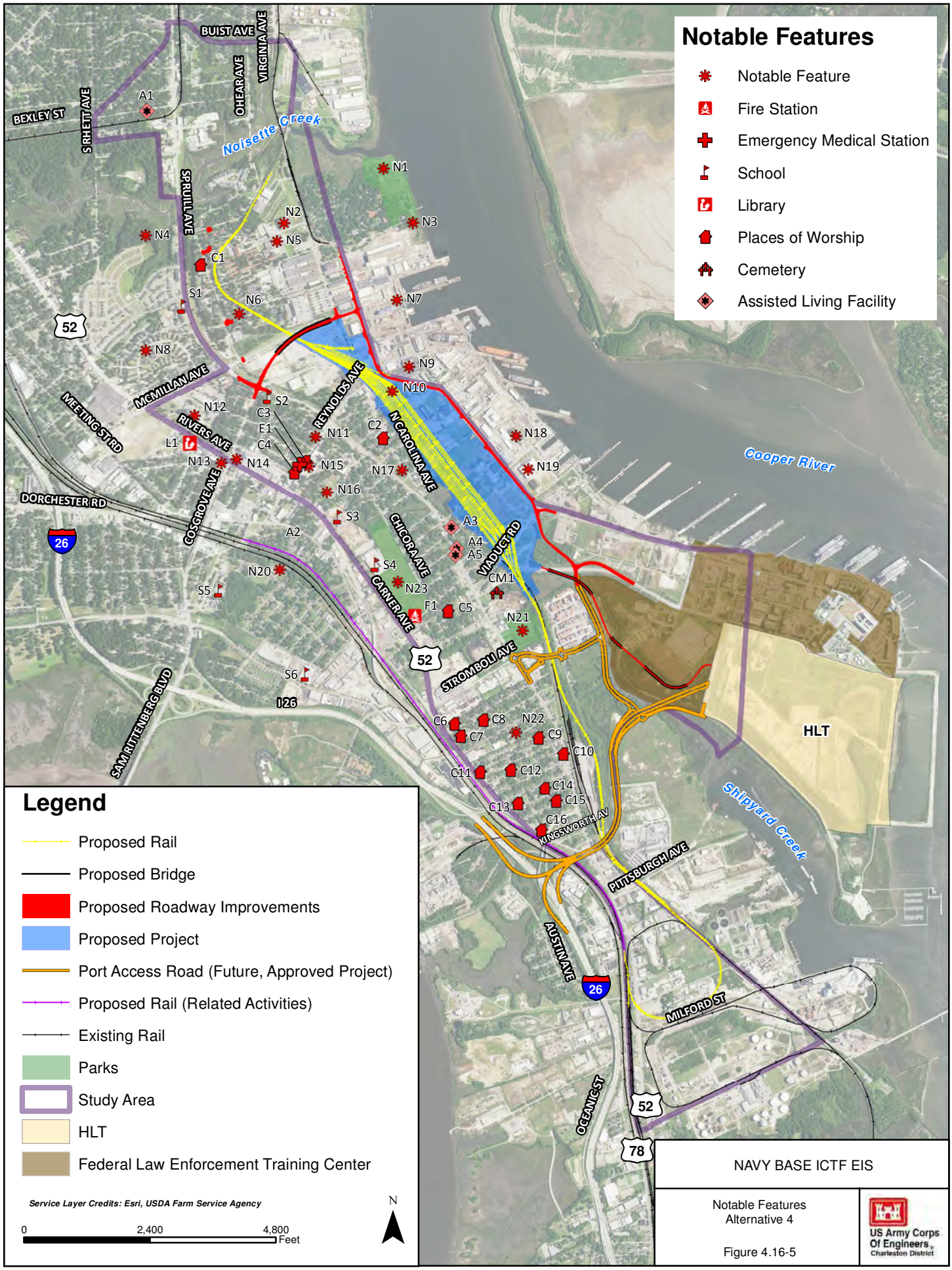

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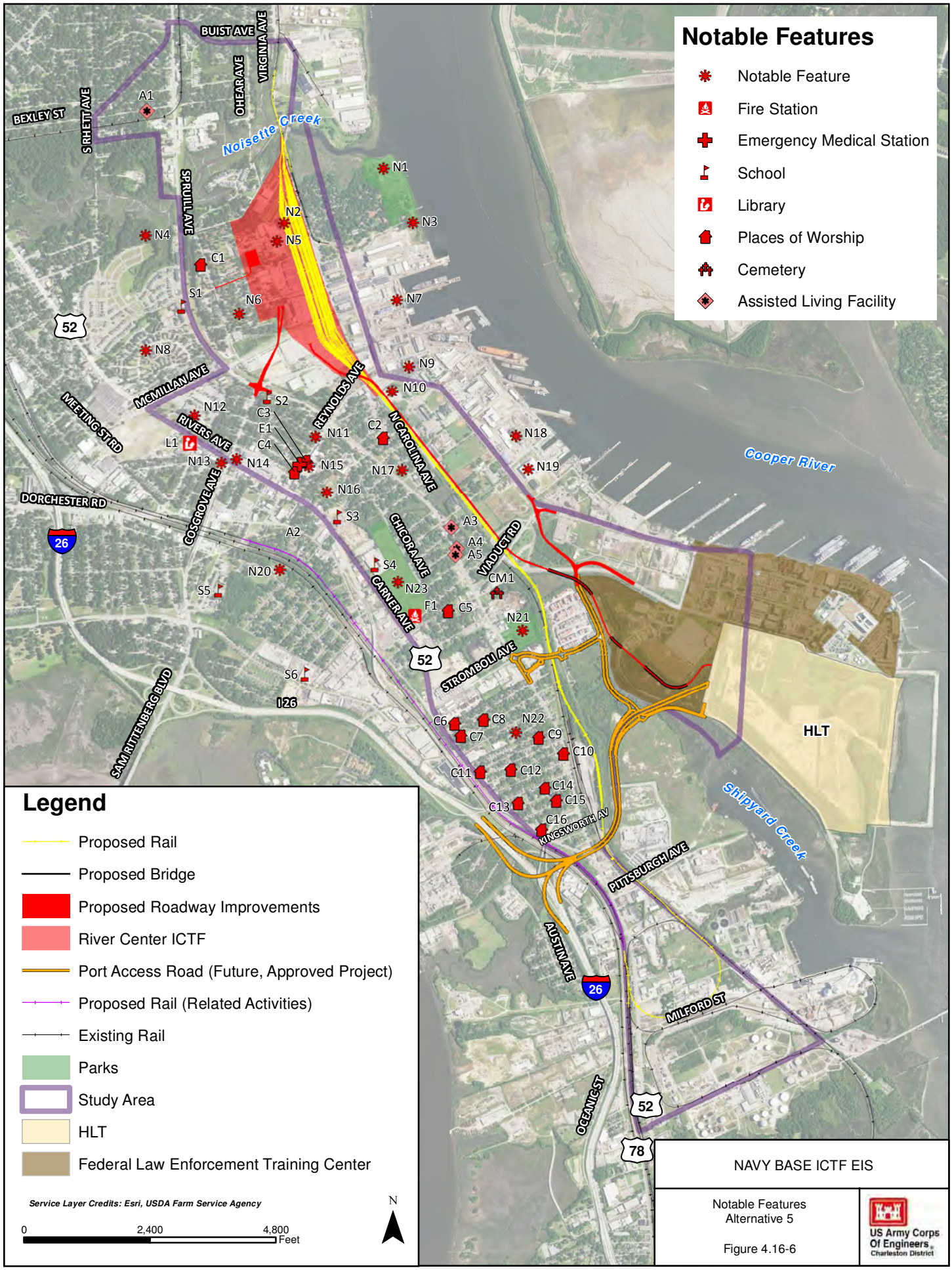
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Figure 4.16-6
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Charleston District
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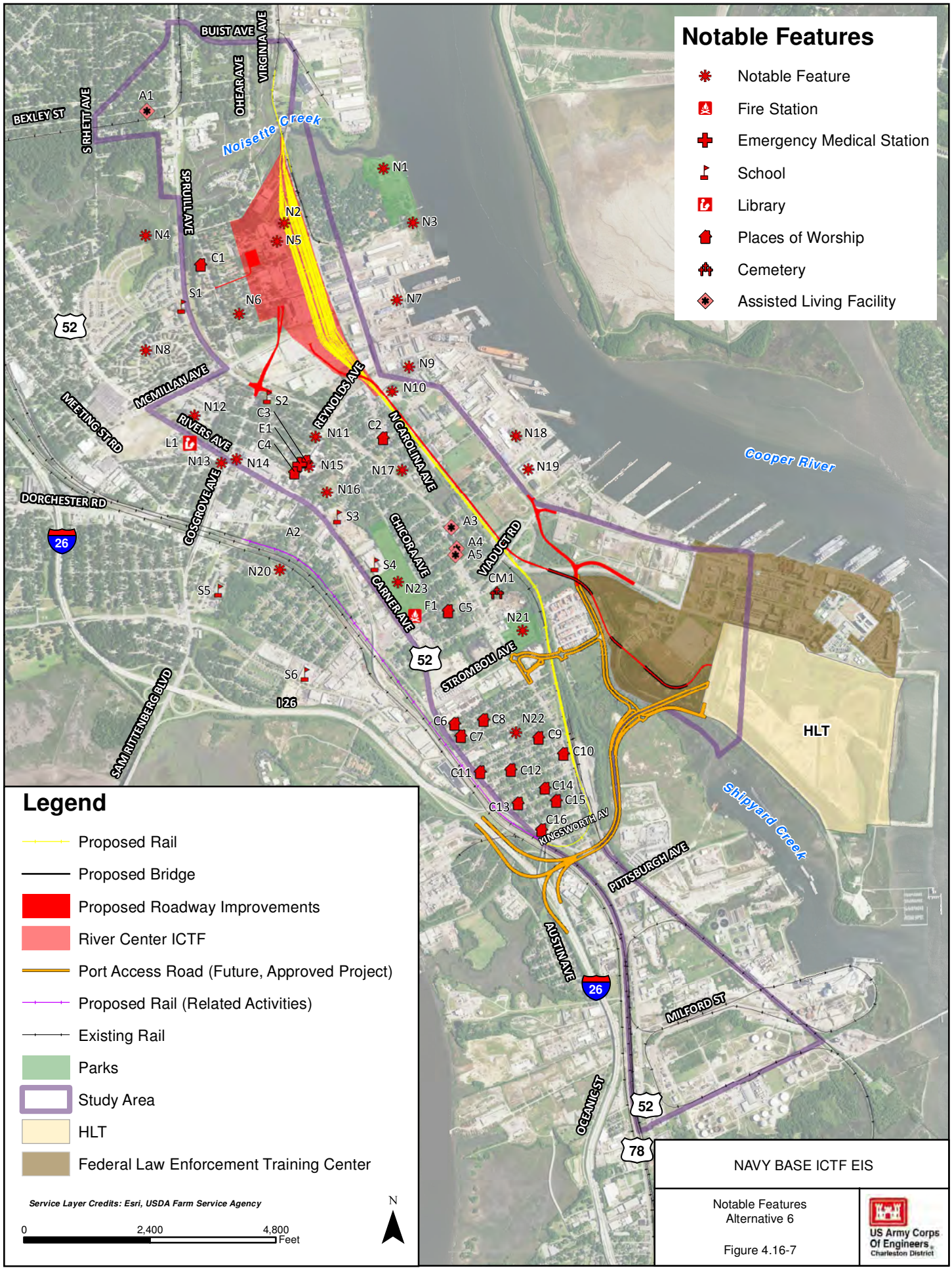

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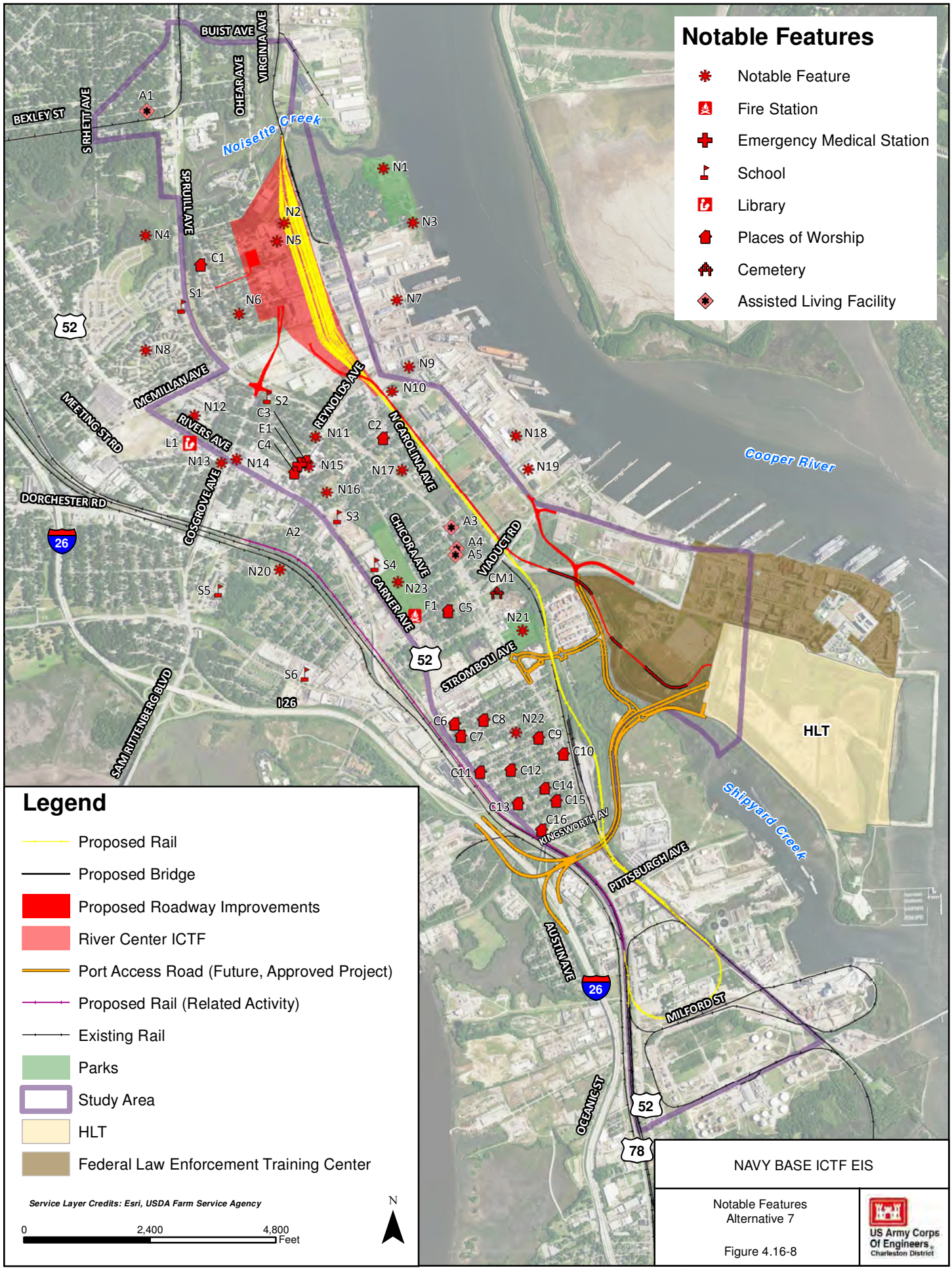

NAVY BASE ICTF EIS

Notable Features
Alternative 7

Figure 4.16-8

US Army Corps Of Engineers, Charleston District

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4.17 HUMAN HEALTH AND SAFETY

4.17.1 Methods and Impact Definitions

Alternative 1 (Proposed Project) has the potential to impact the human health and safety of the community surrounding it. Each of the other resource sections in this document was reviewed to determine if there would be potential associated impacts to human health and safety. Affected Environment and Environmental Consequences sections for Water Quality (Section 3.3/4.3), Visual Resources and Aesthetics (Section 3.11/4.11), Noise and Vibrations (Section 3.12/4.12), Air Quality (Section 3.13/4.13), Hazardous, Toxic, and Radioactive Waste (Section 3.15/4.15), and Socio-economics and Environmental Justice (3.16/4.16) describe existing conditions and provide inventories of known and potential risks due to Alternative 1 (Proposed Project) and the Project alternatives to human health and safety.

The purpose of this environmental consequences section is to compile and document potential impacts to the human health and safety of construction workers during construction, operations staff during the operation, and residents in the community surrounding the facility.

Adverse impacts to human health and safety may occur if the project activities create new health hazards that are not currently present, worsen existing health conditions, or increase emergency response times.

4.17.2 No-Action Alternative

The No-Action Alternative would involve the construction of rail-served warehousing and mixed-use development on the Project site and River Center project site. Potential risks to human health and safety under the No-Action Alternative are identified by impact type.

4.17.2.1 Worker Safety

Under the No-Action Alternative, the potential for direct worker health impacts from heavy equipment is similar to the existing condition risk potential. Any ongoing monitoring of known hazardous material sites would continue in accordance with previous permit requirements and BMPs. Existing worker health conditions would generally be expected to continue. Therefore, there would be a negligible impact to worker health and safety with the No-Action Alternative.

4.17.2.2 Drinking Water Quality

As noted in Section 4.3, water supply sources for all of North Charleston are located outside of the study area (Bushy Park Reservoir and Edisto River) and would not be impacted by others from construction activities or disturbance of known contaminated groundwater sources. Therefore, there

would be a negligible impact to human health and safety from drinking water quality impacts with the No-Action Alternative.

4.17.2.3 Noise and Vibration

Noise is defined as unwanted sound. According to the EPA, human health concerns related to noise include "stress-related illnesses, high blood pressure, speech interference, hearing loss, sleep disruption, and lost productivity" (EPA 2014d). Potential noise from the proposed facility has been identified as a major concern of local residents. The noise and vibration analysis includes four types of potential noise impacts that could affect human health. These impact types are traffic noise, rail noise (includes horns), rail vibration, and operational noise from the Project site.

For the Chicora-Cherokee residential community west of the Project site, ambient noise conditions were estimated using the field-measured existing noise levels in the community. From the measurement data for these locations provided in Section 3.12, the average existing ambient noise level of 51 dB(A) is estimated for the Chicora-Cherokee community adjoining the Project site. Due to operations of the future rail-served warehousing and distribution center as described for the No-Action Alternative, the ambient noise level in the community is assumed to grow by 2 to 4 dB(A) in 24 years from 2014 to 2038. As a result, the No-Action ambient noise level of approximately 54 dB(A) [51 + 3 = 54] is estimated for the community in 2038.

Ambient noise is also assessed for the residential community of CNYOQ Historic District, east of the River Center project site. From the 2014 field noise measurements described in Section 3.12.4 for locations at Manley Avenue (Table 3.12.1, locations M17 and M18), the average existing ambient noise level of 56 dB(A) is estimated for the community. With a 3 dB(A) growth to 2038, the No-Action ambient noise level would be expected to be around 59 dB(A) for this community. This No-Action ambient noise level is used for assessing the operational noise impact of the River Center project site.

Traffic Noise

As noted in Section 4.12 Noise and Vibration, the No-Action Alternative represents the future without Alternative 1 (Proposed Project) and is used as a baseline from which to compare the action alternatives. For noise resulting from traffic, the averaged loudest-hour noise levels for the No-Action Alternative would increase by 1 to 5 dB(A) versus the existing 2013 condition for most of the noise receptors. This increase would be caused by growth of traffic volumes, including an increase in the number of heavy trucks during the loudest hour projected for the No-Action Alternative.

Rail Noise

The future rail operations for the No-Action Alternative reflect the growing number of train occurrences or increasing average length of trains not related to the Project alternatives that will be generated by various developments in North Charleston and elsewhere. A number of the existing

noise-sensitive land uses (defined as residences, schools, churches, hospitals, parks, etc.) would be located within the 2038 No-Action Alternative noise contours from the tracks as the result of the general non-Project related developments. The 2038 No-Action ambient noise levels in the vicinity of the future tracks are estimated below 60 dB(A) DNL. This estimate is based on the field-measured existing noise levels in the study area as described in Section 3.12 and adjusted for design year 2038. The No-Action noise level increase versus the existing condition for rail activity does not constitute a noise impact.

Rail Vibration

The ground-borne vibration levels generated by train activities at vibration-sensitive receptors along the existing railroad segments would remain steady for the No-Action Alternative for the 2038 design year. Rail vibration effects are unlikely; however, a single-family residence at 2312 Taylor Street is currently located at a distance of 23 feet from the centerline of the existing Reads Branch track segment at Rivers Avenue, which is very close to the vibration impact threshold distance of 20 feet. Due to this proximity, train activities on the track would potentially generate some vibration effects for the receptor exceeding the vibration impact criterion even under the existing and No-Action conditions.

Noise and Vibration Human Health Impact Summary

As a result, there would be no impacts to human health and safety from noise and vibration associated with the No-Action Alternative.

4.17.2.4 Air Quality

The quality of ambient air plays an important role in the health of the public. Exposure to pollutants is associated with numerous effects on human health, including increased respiratory symptoms, hospitalization for heart or lung disease, and even premature death. The EPA sets NAAQS limits to protect human health. Section 3.13.2 describes each of the criteria air pollutants for which a NAAQS has been established and their known health effects. As stated in Section 3.13 (Air Quality), the Charleston region currently meets all NAAQS, but ozone levels in North Charleston are relatively high due to industrial and mobile sources in the area.

Construction criteria pollutant emissions would be short term. Therefore, impacts resulting from the No-Action Alternative construction criteria pollutant emissions would be minor, short-term adverse. Criteria pollutant emissions from the No-Action Alternative would equal less than 1 percent of the total criteria pollutants emitted in the study area. Impacts of criteria pollutants from the Operational Inventory of the No-Action Alternative would be minor, permanent adverse. Criteria pollutants emitted from the No-Action Alternative, along with the existing and projected criteria pollutants, would not exceed the applicable NAAQS; therefore, the No-Action Alternative would not put the Tri-County area into non-attainment for any NAAQS. Impacts to air quality from the No-Action

Alternative on criteria pollutants would be minor, permanent adverse. Non-DPM HAP emissions from the No-Action Alternative would each equal less than one-tenth of 1 percent of the total HAPs emitted in the study area. Potential impacts would be acceptable. Potential excess cancer risk would be within the acceptable range. Impacts from cancer risk would be acceptable. The maximum noncancer hazard would be below 1. Potential impacts from noncancer hazard would be negligible.

Air Quality Human Health Impact Summary

The No-Action Alternative would result in a minor impact to human health and safety from air quality impacts.

4.17.2.5 Hazardous Materials

As documented in Section 4.15 (HTRW), the No-Action Alternative results in a minor impact from the potential to encounter 10 known contaminated sites. Minor impacts result from excavation activities, exposure to contaminated groundwater from dewatering in excavation areas, demolition of (unknown number of) structures with asbestos and/or metals-based paints, and minor and/or major (depending on location) impacts from potential accidental spills; however, with implementation of BMPs during construction and operation (Section 4.15.3.2), there is a negligible impact to human health from hazardous waste and materials.

4.17.2.6 Community Safety and Emergency Response Times

The No-Action Alternative would have negligible impacts to safety and emergency response if redevelopment occurred to include rail-served warehousing and distribution facilities and if daily average time delays for commuters are similar to those experienced under existing conditions.

In addition, Charleston County EMS has adopted the following response time goals for urban/suburban areas:

- Acceptable – Response time less than 8 minutes 80 percent of the time
- Marginal – Response time between 8 and 15 minutes
- Unacceptable – Response time greater than 15 minutes

4.17.2.7 Light and Glare

Light and glare can have a variety of adverse health effects. There is limited to no lighting currently on the Project site and River Center project site, and no nighttime port activities. Existing lighting is for security, street illumination (e.g., street lights), and what is required to operate low-level cranes. Future development could increase levels of light and glare above existing conditions; however, this level of light and glare would be consistent with adjacent land uses and likely result in no impact to

viewers and/or adjacent residents during nighttime. Therefore, there would be no impact to human health and safety from light and glare with the No-Action Alternative.

4.17.3 Alternative 1: Proposed Project (South via Milford / North via Hospital District)

Section 1.7 details the design elements of Alternative 1 (Proposed Project) and operations of the proposed facility. Potential risks to human health and safety during construction and operation of Alternative 1 (Proposed Project) are identified by impact type.

4.17.3.1 Worker Safety

Construction and operation of the ICTF involves features and activities that can expose workers to potential injuries, illnesses, or fatalities; however, the potential risk of injury from Project facilities is considered low, because of the design features included with Alternative 1 (Proposed Project), safety precautions and training measures that would be implemented by the Applicant during construction and operation of the facility, and compliance with safety guidelines (Section 4.17.12.1). Therefore, there would be a negligible impact to worker health and safety with Alternative 1 (Proposed Project).

4.17.3.2 Drinking Water Quality

As identified for the No-Action Alternative, drinking water supply sources for all of North Charleston are located outside of the study area (Bushy Park Reservoir and Edisto River) and would not be impacted by Alternative 1 (Proposed Project) from construction activities or from disturbance of known contaminated groundwater sources. Therefore, there would be a negligible impact to human health and safety from drinking water quality impacts with Alternative 1 (Proposed Project).

4.17.3.3 Noise and Vibration

Impacts from traffic, rail (includes horns), construction, and operational noise from the Project site under Alternative 1 (Proposed Project) were identified by comparing the increase in noise over the No-Action Alternative (existing condition). Impact levels are defined as:

- 0 to 3 dB(A) increase in $L_{eq(h)}$ is a no or negligible impact
- 3 to 5 dB(A) increase in $L_{eq(h)}$ is a minor impact
- 5 to 10 dB(A) increase in $L_{eq(h)}$ is a moderate impact
- Increase in $L_{eq(h)}$ greater than 10 dB(A) is a major impact

Following the FTA recommendation, the ground-borne vibration level of 80 VdB from infrequent train pass by events typical for the Project alternatives is considered the impact criterion for vibration-sensitive land uses, such as residences and other buildings where people normally sleep (Category 2). Unlike the relative noise impact criteria that are based on a comparison of the future

build alternatives with the No-Action Alternative, the vibration impact criterion is "absolute" in that the vibration impact is likely when a build alternative's predicted vibration level exceeds the vibration velocity threshold indicated above. Also in contrast to the aggregate Leq or DNL metrics used for the noise impact criteria, which combine multiple noise events within a certain time period, the vibration impact criterion applies to individual train pass by events.

Traffic Noise

Alternative 1 (Proposed Project) results in a negligible impact from traffic noise when compared to the No-Action alternative.

Rail Noise

The noise contours along the rail segments between Dorchester Road to Misroon Street (existing) (Segments 1, 2, and 3), Hackemann Avenue to Discher Street (existing) (Segment 7), and Avenue B and the ICTF facility (proposed) (Segment 5) would expand considerably under Alternative 1 as compared to the No-Action Alternative. Regarding train and train horn noise, under Alternative 1 (Proposed Project), the number of residences that will have a major impact is 0, moderate impact is 145, and minor impact is 25. Alternative 1 (Proposed Project) would result in minor to moderate impacts [(3 to 10 dB(A)] along several segments due to increased rail activity and new track builds.

Rail Vibration

Potential rail vibration impacts were evaluated for land uses identified along the selected railway segments and included 76 receptors. These locations can be found in Appendix H. Based on the evaluation, it was determined that receptors located at a distance less than 20 feet from the track centerline would experience rail vibration impacts (defined as 80 VdB). Under Alternative 1, none of the receptors are located at a distance less than 20 feet from the track centerline; therefore, rail vibration effects would be unlikely for the 76 receptors analyzed. The ground-borne vibration generated by train activities would produce no or negligible impact for the vibration-sensitive receptors along the railroad segments in the study area in comparison with the 2038 No-Action Alternative. As a result, there would be negligible rail vibration impacts for Alternative 1 (Proposed Project) in comparison with the 2038 No-Action Alternative.

Construction Noise

The average construction noise levels at the nearest residential land uses (residential receptors located 10 feet away from the foot of the berm) would meet the established criterion of 80 dB(A) during the general demolition/grading phase and the on-site ICTF yard construction phase. For short periods of time over the earthen berm construction (15 days) and pile diving activities (total of 90 days), the average noise levels are expected to exceed the acceptable criterion of 80 dB(A). Several potential scenarios of the equipment distribution over the northern rail connection construction area

for a ground cut section (trench) and sound walls adjacent to St. Johns Avenue and Avenue F under Alternative 1 were modeled. For the nearest noise-sensitive receptors (residential and St. John Catholic Church and School) located at approximately 100 feet from the trench and/or sound wall, the estimated average construction noise levels would vary between 74 and 79 dB(A), thus below the established construction noise criterion of 80 dB(A). Construction activities of the predicted noise levels would be clearly audible over the existing ambient noise in the surrounding communities, but may be tolerable due to the interim nature of the disturbance. The earthen berm construction and pile driving activities would be short-term, but still generate minor to moderate noise impacts with potential adverse community reaction.

Operational Noise

Exterior noise impacts from Alternative 1 (Proposed Project) operations are determined in comparison with the 2038 No-Action Alternative exterior noise levels for the community adjacent to the site (see Table 4.12-5). The impacts for the nearest receptors (10 feet from the berm) are summarized in Table 4.12-14 for daytime and nighttime conditions. Daytime noise impact (7:00 a.m. to 10:00 p.m.) is most important to consider as this can affect people's activities outside their homes. The exterior noise levels from the ICTF operations would exceed the No-Action ambient noise level in the Chicora-Cherokee communities during daytime hours by up to 7 dB(A). Such an increase constitutes a moderate noise impact for the residential land uses nearest to the Project site (as defined in Table 4.12-6). For the second row of homes along the earthen berm, assuming some shielding from the first row of homes, the daytime noise impact from the ICTF operations could be up to 4 dB(A), which is a minor impact. For the third row of homes, a negligible daytime noise impact below 3 dB(A) would likely be produced due to shielding from both the first and second rows of homes. It is anticipated that negligible daytime noise impacts below 3 dB(A) would be generated by the ICTF operations at distances beyond approximately 180 feet from the earthen berm.

Ambient noise associated with ICTF operations could expose the adjacent residential areas to exterior noise level increases over the No-Action ambient of 4 to 7 dB(A) during daytime hours (defined as 7:00 a.m. to 10:00 p.m.) and 14 to 17 dB(A) during nighttime hours (defined as 10:00 p.m. to 7:00 a.m.). When compared to the No-Action ambient, this would equate to a major impact during the nighttime hours to exterior noise levels. However, the nighttime hours are generally associated with sleep. Refer to subsection 4.12.3.5 for information on exterior to interior noise reduction, sleep disturbance, and sleep disturbance health effects. Interior noise levels are not anticipated to disrupt sleep. In general, minor to moderate exterior daytime impacts and major exterior nighttime impacts would result from operational noise associated with Alternative 1 (Proposed Project).

Additive Noise Impacts

The impacts indicated for each noise source generally relate to different groups of affected receptors, which are analyzed separately in this document and Appendix H. For example, receptors that would

experience rail noise impacts (located along certain track segments), would, for the most part, not be subject to noise impacts from vehicular traffic, ICTF construction, or ICTF operations. Exceptions to the general rule above include noise sensitive receptors located along several of the road segments in the study area. For Alternative 1 (Proposed Project), additive noise impacts would be negligible in the vicinity of Virginia Avenue for traffic and rail noise and minor to moderate in the vicinity of St. Johns Avenue for traffic and rail noise (see Section 4.12.10).

Noise and Vibration Human Health Impact Summary

Within the study area, the composite impacts of noise and vibration would be negligible. However, in localized areas (within close proximity to the ICTF and/or several segments of new track [see Section 4.12]) impacts of exterior noise would be minor to moderate (daytime) and major (nighttime). Refer to subsection 4.12.3.5 for information on exterior to interior noise reduction. Interior noise levels are not anticipated to disrupt sleep. Included as a mitigation measure, the construction of an earthen berm along the western boundary of the Project site boundary reduces the number of noise sensitive receivers affected by operational noise from the facility. Additional noise mitigation measures for Alternative 1 (Proposed Project) include a cut-section (trench), four sound walls (See Figure 4.12-15), and the option for qualified owners to have the right to relocate if they so choose (Chapter 6 and Appendix N). As a result of proposed mitigation, the overall impact to human health and safety from noise and vibration with Alternative 1 (Proposed Project) would be minor.

4.17.3.4 Air Quality

Proposed Project construction criteria pollutant emissions would be short term and spread out over 5 years. Potential impacts to air quality would be minor short-term adverse. Operational criteria pollutant emissions would be less than 1 percent of the study area's criteria pollutant emissions. Potential impacts would be minor permanent adverse. Criteria pollutants emitted from Alternative 1 (Proposed Project), along with the existing and projected criteria pollutants, would not put the Tri-County area into non-attainment for any criteria pollutants and the NAAQS would remain in compliance. Potential impacts would be minor permanent adverse. Non-DPM HAP emissions from Alternative 1 (Proposed Project)would each equal less than one-tenth of 1 percent of the total HAPs emitted in the study area. Potential impacts would be acceptable. Potential excess cancer risk would fall within the acceptable range. Impacts from cancer risk would be acceptable. The maximum noncancer hazard would be below 1. Potential impacts from noncancer hazard would be negligible.

Air Quality Human Health Impact Summary

The overall impact to human health and safety from air quality impacts by Alternative 1 (Proposed Project) would be minor permanent adverse. Due to air quality concerns in the community; a Air Quality Memorandum of Agreement (MOA) between the Applicant and SCDHEC was executed on

October 26, 2016, and commits to several air quality initiatives (see the Community Mitigation Plan in Appendix N for additional details and a copy of the Air Quality MOA).

4.17.3.5 Hazardous Materials

Impacts to human health and safety from hazardous materials by Alternative 1 (Proposed Project) are similar to the No-Action Alternative. A minor impact results from the potential to encounter 23 known contaminated sites. Minor impacts result from excavation activities, exposure to contaminated groundwater from dewatering in excavation areas, and the demolition of approximately 150 structures with asbestos and/or metals-based paints. There is no anticipated involvement with the Macalloy Superfund site. There is potential for minor and/or major impacts from accidental spills on the Project site from the use of ASTs (diesel fuels), storage of other minor amounts of solvents on the premises, and from containers containing hazardous materials. However, with implementation of BMPs during construction and operation (Section 4.15.11), there is a negligible impact to human health from hazardous waste and materials.

4.17.3.6 Community Safety and Emergency Response Times

Community safety and emergency response impacts associated with Alternative 1 (Proposed Project) are related to the construction of an additional at-grade crossing and an increase in truck volumes on local streets. Construction of the rail and ROW improvements at Meeting Street for the southern rail connection would result in one new major at-grade rail crossing. This new at-grade rail crossing would have a minor indirect adverse impact to community safety by introducing a new conflict point between trains and automobiles, bicycles, and pedestrians. There are existing bike lanes and sidewalks along Meeting Street at the location of this proposed new at-grade crossing.

This new at-grade crossing may also have a minor adverse impact on emergency response times for certain locations, because there is the potential for Meeting Street to be blocked for approximately 11 minutes[98], four times a day in design year 2038, when the trains are entering and leaving the ICTF. Detour routes are available, such as the elevated Stromboli Avenue and Cosgrove-McMillan Overpass, but the detour could increase response times, depending on the location of the emergency. The community of Union Heights would also experience a minor adverse impact to emergency response, if a train related to Alternative 1 (Proposed Project) was blocking access on both east and west access points as it navigated the U-turn.

In the northern portion of the Navy Base ICTF, the grade separation of Cosgrove Avenue with multi-use path over proposed rail tracks on the Project site would preserve east-west mobility for automobiles, bicycles, and pedestrians, and would preserve access to the eastern portion of the northern study area for emergency responders.

[98] Based on an 8,000-foot train traveling at 10 miles per hour through the crossing.

During Project scoping, the City of Charleston identified its acquirement of approximately 16 acres of land north of Herbert Street for the construction of a new public service operations center for Police, Fire and Public Service. The City of Charleston identified a concern that the southern rail connection would extend through a portion of the proposed operations center facility affecting the size of the facility and access to/from the property. The City of Charleston also noted that the emergency access and daily access to the site are critical to their planned operations center to enable the City of Charleston to provide essential police, fire, and public safety services to residents. Mitigation for impacts is included in Appendix N.

Community Safety and Emergency Response Time Human Health Impact Summary

While there are short-term adverse construction related impacts and long-term adverse operational impacts to emergency response times under Alternative 1 (Proposed Project), the overall impact is minor, because response times would be longer than those under the No-Action Alternative; however, alternate routes for emergency responders are available. In addition, transportation studies will be conducted to further examine potential impacts to surrounding the ICTF. The Surface Transportation Study and Crossing Analysis will examine impacts and make recommendations on potential transportation improvements that could potentially improve the surrounding transportation network and routes for emergency response. See Section 4.8.1 for additional information on these studies. The overall impact to human health and safety from community safety and emergency response impacts associated with Alternative 1 (Proposed Project) would be minor.

4.17.3.7 Light and Glare

New sources for light and glare associated with Alternative 1 (Proposed Project) include the 85-foot-tall mast lighting that would be illuminated from dusk to dawn, as well as new train activity using the arrival and departure tracks. As per Palmetto Railways' proposed mitigation measures, the lighting on the ICTF would be directed downward and shielded to reduce spill light onto adjacent residential uses, and the photometric design would result in less than 0.5 foot-candles outside of the Project site. Analysis of lighting effects on residential structures adjacent to the Project site within the Chicora-Cherokee Neighborhood indicate that illumination would result in the desired mitigation of light illumination of less than 0.5 foot-candles (Appendix B). As a result of these mitigation measures, the impact intensity from high mast lighting would result in a negligible, permanent adverse impact. Lighting of the ICTF during night time would not be of sufficient illumination as to disturb sleep and other nighttime activities off of the Project site.

When trains operate at night, train headlights could shine into residential windows at points where the track turns, primarily affecting structures within the Hospital District (e.g., near McMillan Avenue and St. Johns Avenue). This effect would be similar to the flash of vehicle headlights, although substantially more intense. Residences and other structures within the Hospital District are most

likely to be affected by train headlamps at night, with the likelihood of no more than 2 trains at night with full build-out. Only those residences within 800 feet of the direct beam of the trains would be affected, though intervening vegetation, trees, and other structures would help to block the light. Although the effect of train lighting on viewers in locations where the tracks curve could be intense, the effect would be momentary and occur seldom, and few viewers over a minimal geographic area would be impacted. There would be a minor adverse impact from light and glare as a result of new train activity.

Light from increased truck traffic along the drayage road would not be anticipated to affect adjacent residential uses given the earthen berm and walls that would be constructed at the western boundary of the Project site.

Light and Glare Human Health Impact Summary

There would be minor adverse impacts to human health and safety from light and glare for Alternative 1 (Proposed Project).

4.17.4 Alternative 2: Proposed Project Site (South via Milford / North via S-line)

Section 2.4 summarizes the design elements of Alternative 2 and operations of the proposed facility. Potential risks to human health and safety during construction and operation of Alternative 2 include:

4.17.4.1 Worker Safety

Potential risks to worker safety under Alternative 2 would be similar to Alternative 1 (Proposed Project). The impact to worker health and safety is negligible for the same reasons identified for Alternative 1 (Proposed Project).

4.17.4.2 Drinking Water Quality

The impact to human health and safety from drinking water quality impacts under Alternative 2 would be similar (negligible) to Alternative 1 (Proposed Project).

4.17.4.3 Noise and Vibration

Impacts from traffic, rail (includes horns), construction, and operational noise from the Project site under Alternative 2 were identified by comparing the increase in noise over the No-Action Alternative (existing condition).

Traffic Noise

Alternative 2 would result in a negligible impact, similar to Alternative 1 (Proposed Project), from traffic noise when compared to the No-Action alternative.

Rail Noise

Under Alternative 2, new build rail segments would be built from O'Hear Avenue to the ICTF facility in the vicinity and south of crossing 19 (Segment 6). Noise from trains along these stretches of track would impact eight residences along the first segment and 10 residences along the southern continuation of the rail line parallel to Spruill Avenue. Impacts along these rail segments would be moderate to major. It should be noted that land uses in closer proximity to the track path may need to be demolished to construct the track. Regarding train and train horn noise, under Alternative 2, the number of residences that will have a major impact is four, moderate impact is 133, and minor impact is 25. Alternative 2 would result in impacts similar to Alternative 1 (Proposed Project), from rail noise (minor to moderate) when compared to the No-Action Alternative.

Rail Vibration

Under Alternative 2, impacts from ground-borne vibration generated by train activities would be negligible and similar to Alternative 1 (Proposed Project).

Construction Noise

Noise conditions related to the ICTF construction activities under Alternative 2 are the same as those estimated under Alternative 1 (minor to moderate and short term).

Operational Noise

Noise impacts from the Project site operations under Alternative 2 are the same as the ones estimated for Alternative 1 (minor to moderate for daytime noise and major for exterior nighttime noise).

Additive Noise Impacts

For Alternative 2, additive noise impacts would be negligible in the vicinity of Virginia Avenue and Spruill Avenue for traffic and rail noise (see Section 4.12.10).

Noise and Vibration Health Impact Summary

The overall impact to human health and safety from noise and vibration impacts by Alternative 2 would be similar to impacts with Alternative 1 (Proposed Project).

4.17.4.4 Air Quality

Impacts to Air Quality by Alternative 2 construction criteria pollutant emissions would be similar to Alternative 1 (Proposed Project). Criteria pollutant emissions and impacts from operational activities would be the same as Alternative 1 (Proposed Project). Criteria pollutants emitted from the operation of Alternative 2, along with the existing and projected criteria pollutants, would not exceed the applicable NAAQS; therefore, Alternative 2 would not put the Tri-County area into non-attainment for any criteria pollutants. Impacts to air quality from the operation of Alternative 2 on criteria pollutants would be minor. Non-DPM HAPs emissions from operational activities and impacts would be the same as Alternative 1 (Proposed Project). Potential excess cancer risk would fall within the acceptable range. Impacts from cancer risk would be acceptable. The maximum noncancer hazard would be below 1. Potential impacts from noncancer hazard would be negligible.

Air Quality Human Health Impact Summary

The overall impact to human health and safety from air quality impacts by Alternative 2 would be similar (minor, permanent adverse) to Alternative 1 (Proposed Project).

4.17.4.5 Hazardous Materials

Impacts to Human Health and Safety from hazardous materials by Alternative 2 would be similar to Alternative 1 (Proposed Project), except there are 30 fewer buildings that would be demolished reducing the potential to encounter asbestos and/or metals-based paints and 22 known contaminated sites. However, with implementation of BMPs during construction and operation (Section 4.15.11) there would be a negligible impact to human health from hazardous waste and materials.

4.17.4.6 Community Safety and Emergency Response Times

Impacts to community safety and emergency response under Alternative 2 would be similar to those under Alternative 1 (Proposed Project), however there are several differences. Under Alternative 2, the northern rail connection would be relocated along Spruill Avenue within existing ROW to the S-line, and turn east along Aragon Avenue to the existing NCTC rail line. As a result of the rail alignment, a cul-de-sac would be constructed at the southern end of St. Johns Avenue. The former Charleston Naval Complex gate at Turnbull Avenue will be open to provide future access between St. Johns Avenue and Noisette Boulevard. Same as Alternative 1 (Proposed Project), Alternative 2 creates a new at-grade rail crossing at the intersection of Meeting Street and Herbert Street and at O'Hear Avenue south of Bexley Street.

Alternative 2 results in a minor adverse impact to human health from delay to emergency response times for the same reasons as Alternative 1 (Proposed Project).

4.17.4.7 Light and Glare

The overall impact to human health and safety from light and glare by Alternative 2 would be similar (minor) to Alternative 1 (Proposed Project).

4.17.5 Alternative 3: Proposed Project Site (South via Kingsworth / North via Hospital)

Section 2.4 summarizes the design elements of Alternative 3 and operations of the proposed facility. Potential risks to human health and safety during construction and operation of Alternative 3 include:

4.17.5.1 Worker Safety

Potential risks to worker safety under Alternative 3 would be similar to Alternative 1 (Proposed Project). The impact to worker health and safety would be negligible for the same reasons identified for Alternative 1 (Proposed Project).

4.17.5.2 Drinking Water Quality

The impact to human health and safety from drinking water quality impacts under Alternative 3 would be similar (negligible) to Alternative 1 (Proposed Project).

4.17.5.3 Noise and Vibration

Impacts from traffic, rail (includes horns), construction, and operational noise from the Project site under Alternative 3 were identified by comparing the increase in noise over the No-Action Alternative (existing condition).

Traffic Noise

Under Alternative 3, impacts from traffic noise when compared to the No-Action alternative would be the same (negligible) as Alternative 1 (Proposed Project).

Rail Noise

A new build rail segment from Meeting Street to Spruill Avenue in the vicinity of crossing 20 (Segment 8) would be built under Alternative 3, and noise from trains would impact 10 noise sensitive receivers along the segment. The noise impact for these receivers would be minor to moderate. Land uses in closer proximity to the track path may be demolished in the construction of the rail track for this alternative. Under Alternative 3, the proposed rail configuration between Avenue B and the ICTF facility (Segment 5) is identical to the Alternative 1 alignment and would impact the same receivers. A moderate noise impact is estimated for these land uses. Regarding train and train horn noise, under

Alternative 3, the number of residences that will have a major impact is 0, moderate impact is 140, and minor impact is 28.

Rail Vibration

Under Alternative 3, impacts from ground-borne vibration generated by train activities would be similar (negligible) to Alternative 1 (Proposed Project).

Construction Noise

Noise conditions related to the ICTF construction activities under Alternative 3 are the same as those estimated under Alternative 1 (minor to moderate and short-term).

Operational Noise

Noise impacts from the Project site operations under Alternative 3 are the same as those estimated for Alternative 1 (minor to moderate for daytime noise and major for exterior nighttime noise).

Additive Noise Impacts

For Alternative 3, additive noise impacts would be negligible in the vicinity of Virginia Avenue for traffic and rail noise and minor to moderate in the vicinity of St. Johns Avenue for traffic and rail noise (see Section 4.12.10).

Noise and Vibration Health Impact Summary

The overall impact to human health and safety from noise and vibration impacts by Alternative 3 would be similar to impacts under Alternative 1 (Proposed Project).

4.17.5.4 Air Quality

Impacts to Air Quality by Alternative 3 construction criteria pollutant emissions would be similar to Alternative 1 (Proposed Project). Criteria pollutant emissions and impacts from operational activities would be the same as Alternative 1 (Proposed Project). Criteria pollutants emitted from the operation of Alternative 3, along with the existing and projected criteria pollutants, would not exceed the applicable NAAQS; therefore, Alternative 3 would not put the Tri-County area into non-attainment for any criteria pollutants. Impacts to air quality from the operation of Alternative 3 on criteria pollutants would be minor. Non-DPM HAPs emissions from operational activities and impacts would be the same as Alternative 1 (Proposed Project). Potential excess cancer risk would fall within the acceptable range. Impacts from cancer risk would be acceptable. The maximum noncancer hazard would be below 1. Potential impacts from noncancer hazard would be negligible.

Air Quality Human Health Impact Summary

The overall impact to human health and safety from air quality impacts by Alternative 3 (minor, permanent adverse) would be similar to Alternative 1 (Proposed Project).

4.17.5.5 Hazardous Materials

Impacts to Human Health and Safety from hazardous materials by Alternative 3 would be similar to Alternative 1 (Proposed Project), except there are 10 fewer buildings that would be demolished reducing the potential to encounter asbestos and/or metals-based paints and only 11 known contaminated sites. However, with implementation of BMPs during construction and operation (Section 4.15.11), there is a negligible impact to human health from hazardous waste and materials.

4.17.5.6 Community Safety and Emergency Response Times

Impacts to community safety and emergency response under Alternative 3 would be similar to those under Alternative 1 (Proposed Project), however there are several differences. The southern rail connection would connect to an existing rail line near Kingsworth Avenue (and adjacent to existing rail and ROW); therefore, the existing at-grade crossings of Pittsburgh Avenue and Discher Street would not be impacted with ICTF train occurrences and the new at-grade crossing of Meeting Street at Herbert Street would not be created for Alternative 3. Alternative 3 would create at-grade crossings, of both Meeting Street and Spruill Avenue near Kingsworth Avenue.

The new at-grade rail crossings would have a minor indirect adverse impact to community safety by introducing new conflict points between trains and automobiles, bicycles, and pedestrians. There are existing bike lanes and sidewalks along Meeting Street and Spruill Avenue at the location of these proposed new at-grade crossings.

These new at-grade crossings may also have a moderate adverse impact on emergency response times for certain locations, because there is the potential for Meeting Street and Spruill Avenue to be blocked for approximately 11 minutes[99], four times a day in design year 2038, when the trains are entering and leaving the ICTF. Detour routes are available such as the elevated Stromboli Avenue and Cosgrove-McMillan Overpass, but the detour could increase response times, depending on the location of the emergency. The community of Union Heights, Windsor, and Howard Heights might also have a moderate adverse impact to emergency response if a train related to the Alternative 3 was blocking access on both east and west access points as it navigated the U-turn.

[99] Based on an 8,000-foot train traveling at 10 miles per hour through the crossing.

Community Safety and Emergency Response Human Health Impact Summary

Alternative 3 would result in minor adverse impacts to emergency response times, similar to Alternative 1 (Proposed Project), with localized moderate impacts to emergency response that would not occur under Alternative 1 (Proposed Project).

4.17.5.7 Light and Glare

The overall impact to human health and safety from light and glare by Alternative 3 would be similar to Alternative 1 (Proposed Project).

4.17.6 Alternative 4: Proposed Project Site (South via Milford)

Section 2.4 summarizes the design elements of Alternative 4 and operations of the proposed facility. Potential risks to human health and safety during construction and operation of Alternative 4 include:

4.17.6.1 Worker Safety

Potential risks to worker safety under Alternative 4 would be similar to Alternative 1 (Proposed Project). The impact to worker health and safety is negligible for the same reasons identified for Alternative 1 (Proposed Project).

4.17.6.2 Drinking Water Quality

The impact to human health and safety from drinking water quality impacts under Alternative 4 would be similar (negligible) to Alternative 1 (Proposed Project).

4.17.6.3 Noise and Vibration

Impacts from traffic, rail (includes horns), construction, and operational noise from the Project site under Alternative 4 were identified by comparing the increase in noise over the No-Action Alternative (existing condition).

Traffic Noise

Under Alternative 4, impacts from traffic noise when compared to the No-Action alternative would be the same (negligible) as Alternative 1 (Proposed Project).

Rail Noise

Under Alternative 4, the noise contours along the rail segment from north of Dorchester Road to Misroon Street (Segments 1, 2 and 3) and from Hackemann Avenue to Discher Street (Segment 7) would be significantly expanded in comparison to the No-Action Alternative. Regarding train and

train horn noise, under Alternative 3, the number of residences that will have a major impact is 0, moderate impact is 209, and minor impact is 70.

Rail Vibration

Under Alternative 4, impacts from ground-borne vibration generated by train activities would be similar (negligible) to Alternative 1 (Proposed Project).

Construction Noise

Noise conditions related to the ICTF construction activities under Alternative 4 would be the same (minor to moderate and short-term) as the ones estimated under Alternative 1.

Operational Noise

Noise impacts from the Project site operations under Alternative 4 would be the same (minor to moderate for daytime noise and major for exterior nighttime noise) to the ones estimated for Alternative 1.

Additive Noise Impacts

For Alternative 4, no additive noise impacts are anticipated.

Noise and Vibration Health Impact Summary

The overall impact to human health and safety from noise and vibration impacts by Alternative 4 would be similar to impacts under Alternative 1 (Proposed Project).

4.17.6.4 Air Quality

Impacts to Air Quality by Alternative 4 construction criteria pollutant emissions would be similar to Alternative 1 (Proposed Project). Criteria pollutant emissions and impacts from operational activities would be the same as Alternative 1 (Proposed Project). Criteria pollutants emitted from the operation of Alternative 4, along with the existing and projected criteria pollutants, would not exceed the applicable NAAQS; therefore, Alternative 4 would not put the Tri-County area into non-attainment for any criteria pollutants. Impacts to air quality from the operation of Alternative 4 on criteria pollutants would be minor. Non-DPM HAPs emissions from operational activities and impacts would be the same as Alternative 1 (Proposed Project). Potential excess cancer risk would fall within the acceptable range. Impacts from cancer risk would be acceptable. The maximum noncancer hazard would be below 1. Potential impacts from noncancer hazard would be negligible.

Air Quality Human Health Impact Summary

The overall impact to human health and safety from air quality impacts by Alternative 4 (minor permanent adverse) would be similar to Alternative 1 (Proposed Project).

4.17.6.5 Hazardous Materials

Impacts to Human Health and Safety from hazardous materials by Alternative 4 would be similar to Alternative 1 (Proposed Project). However, with implementation of BMPs during construction and operation (Section 4.15.11) there would be a negligible impact to human health from hazardous waste and materials.

4.17.6.6 Community Safety and Emergency Response Times

Impacts to community safety and emergency response under Alternative 4 would be similar to those under Alternative 1 (Proposed Project), however there are several differences. Alternative 4 is a variation of Alternative 1 (Proposed Project) where all trains would enter and exit the ICTF from a southern rail connection. Proposed rail through the Hospital District would stop short of Noisette Creek.

Under Alternative 4, trains would use the southern rail alignment to Milford Street. Since there would be no northern rail connection, Alternative 4 would not impact the at-grade crossings of Rivers Avenue, Virginia Avenue, and Avenue B. Alternative 4 would have twice as many ICTF train occurrences than Alternative 1 (Proposed Project), eight per day, at the at-grade crossings along the southern alignment. The community of Union Heights might also have a moderate adverse impact to emergency response, if a train related to the Alternative 4 was blocking access on both east and west access points as it navigated the U-turn.

Community Safety and Emergency Response Human Health Impact Summary

Alternative 4 would result in minor adverse impacts to emergency response times, similar to Alternative 1 (Proposed Project).

4.17.6.7 Light and Glare

The overall impact to human health and safety from light and glare by Alternative 4 is similar (minor) to Alternative 1 (Proposed Project).

4.17.7 Alternative 5: River Center Site (South via Milford / North via Hospital District)

Section 2.4 summarizes the design elements of Alternative 5 and operations of the proposed facility on the River Center project site. Potential risks to human health and safety during construction and operation of Alternative 5 include:

4.17.7.1 Worker Safety

Construction and operation of Alternative 5 involves features and activities that can expose workers to potential injuries, illnesses, or fatalities; however, the potential risk of injury from Project facilities is considered low because of the design features included with Alternative 5, safety precautions and training measures that would be implemented by the Applicant during construction and operation of the facility, and compliance with safety guidelines (Section 4.17.12.1). Therefore, there would be a negligible impact to worker health and safety with Alternative 5.

4.17.7.2 Drinking Water Quality

As identified for the No-Action Alternative, drinking water supply sources for all of North Charleston are located outside of the study area (Bushy Park Reservoir and Edisto River) and would not be impacted by Alternative 5 construction activities or from disturbance of known contaminated groundwater sources. Therefore, there would be a negligible impact to human health and safety from drinking water quality impacts with Alternative 5.

4.17.7.3 Noise and Vibration

Impacts from traffic, rail (includes horns), construction, and operational noise from the Project site under Alternative 5 were identified by comparing the increase in noise over the No-Action Alternative (existing condition).

Traffic Noise

Alternative 5 would result in a minor to moderate impact to 18 receptors in the Chicora-Cherokee community exposed to traffic noise from the proposed drayage road from the River Center project site through the Proposed Project site.

Rail Noise

Under Alternative 5, operations on the rail segment from north of Dorchester Road to Misroon Street (Segments 1, 2 and 3), Hackemann Avenue to Discher Street (Segment 7), and Pittsburg Avenue to the ICTF facility (Segment 10), north of crossing 17 would increase in comparison to the No-Action Alternative, similar to Alternative 1 (Proposed Project). Regarding train and train horn noise, under

Alternative 5, the number of residences that will have a major impact is 0, moderate impact is 142, and minor impact is 25.

Rail Vibration

Under Alternative 5, the ground-borne vibration generated by train activities would produce no or negligible impact for the vibration-sensitive receptors along the railroad segments in the study area in comparison with the 2038 No-Action Alternative. Rail vibration effects would be unlikely for the 76 receptors analyzed.

Construction Noise

For Alternative 5, the average construction noise levels at the nearest residential land uses would meet the established criterion of 80 dB(A) during the general demolition/grading phase and the on-site ICTF yard construction phase. For short periods of time over the sound wall construction and other pile diving activities, the average noise levels are expected to exceed the accepted criterion and produce a minor to moderate short-term adverse impact. Construction activities would be clearly audible over the existing ambient noise in the community, but may be tolerable due to the interim nature of the disturbance. The pile driving activities would be short-term.

Operational Noise

Noise impacts from the River Center operations are based on exterior levels and were determined in comparison with the 2038 No-Action Alternative noise levels for the community adjacent to the site (see Table 4.12-5). The impacts for the nearest receptors are summarized in Table 4.12-21 for daytime and nighttime conditions. Daytime noise impact (7:00 a.m. to 10:00 p.m.) is most important to consider, as this can affect people's activities outside their homes. The exterior noise levels from the ICTF operations would exceed the daytime No-Action ambient noise level at the edge of the CNYOQ Historic District during daytime hours by up to 2 dB(A), which is a negligible impact (as defined in Table 4.12-6). Loud operations like rail car coupling would be audible at the nearest residences but, in general, operational noise levels would remain comparable to the ambient noise. Homes east of Manley Avenue and beyond are also expected to experience negligible or no noise impact from daytime ICTF operations due to increased distance and shielding effect from other homes.

Ambient noise associated with ICTF operations could expose the adjacent residential areas to exterior noise level increases over the No-Action ambient of 0 to 2 dB(A) during daytime hours (defined as 7:00 a.m. to 10:00 p.m.) and 9 to 12 dB(A) during nighttime hours (defined as 10:00 p.m. to 7:00 a.m.). When compared to the No Action ambient, this would equate to a moderate to major impact during the nighttime hours to exterior noise levels. However, the nighttime hours are generally associated with sleep. Refer to subsection 4.12.7.5 for information on exterior to interior noise reduction and sleep disturbance. Interior noise levels are not anticipated to disrupt sleep.

Additive Noise Impacts

For Alternative 5, additive noise impacts would be negligible in the vicinity of Virginia Avenue for traffic and rail noise because rail-generated DNL at these residences are much lower than DNL sound levels generated by traffic noise and rail noise does not provide a noticeable effect in addition to traffic noise (Table 4.12-26). Under the River Center Alternatives (5, 6, and 7), a new rail track segment would run from Pittsburg Avenue to the ICTF along the new Port drayage road in the vicinity of the eastern neighborhood boundary of the Chicora-Cherokee community. The predicted traffic noise levels from UTR trucks on the drayage road would combine with the rail noise under Alternatives 5 and 6, and the additive level of up to 65 dB(A) DNL would exceed the No-Action level (53 dB(A) by up to 12 dB(A)), generating a major additive noise impact for those receptors (Table 4.12-26). Noise sensitive receptors along Noisette Boulevard in the vicinity of the River Center site would experience both traffic noise and ICTF operational noise under River Center Alternatives (5, 6, and 7). The operational noise range would essentially remain unaffected when taking into account traffic noise. As the result, the River Center project site operational noise levels would, on average, exceed the noise levels generated by traffic on Noisette Boulevard, and the noise impact analysis of sub-section 4.12.7.5 remains valid.

Noise and Vibration Health Impact Summary

Within the study area the composite impacts of noise and vibration would be negligible. However, in localized areas (within close proximity to the River Center project site and/or several segments of track (see Section 4.12), impacts of noise would be minor to moderate (daytime) and major (nighttime). Refer to subsection 4.12.7.5 for information on exterior to interior noise reduction and sleep disturbance. Interior noise levels are not anticipated to disrupt sleep. Included as a mitigation measure, the construction of a sound wall along the eastern boundary of the River Center project site boundary reduces the number of noise sensitive receivers affected by operational noise from the facility.

4.17.7.4 Air Quality

Under Alternative 5, construction criteria pollutant emissions would be short term and spread out over five years. Potential impacts to air quality would be minor short-term adverse. Operational criteria pollutant emissions would be less than 1 percent of study area's criteria pollutant emissions. Potential impacts would be minor permanent adverse. Criteria pollutants emitted from Alternative 5, along with the existing and projected criteria pollutants, may put the Tri-County area into non-attainment for the NO_2 1-hour NAAQS. Potential impacts would be minor adverse. Non-DPM HAP emissions from the River Center Alternatives would each equal less than one-tenth of 1 percent of the total HAPs emitted in the study area. Potential impacts would be acceptable. Potential excess cancer risk would fall within the acceptable range. Impacts from cancer risk would be acceptable.

The maximum noncancer hazard would be below 1. Potential impacts from noncancer hazard would be negligible.

Air Quality Human Health Impact Summary

Under Alternative 5, the Tri-County area may be in non-attainment for NO_2. This and other air quality impacts could result in a minor, permanent adverse impact to human health and safety.

4.17.7.5 Hazardous Materials

Impacts to Human Health and Safety from hazardous materials by Alternative 5 would be similar to Alternative 1 (Proposed Project), except 82 fewer buildings would be demolished. As a result, there is the potential to encounter asbestos and/or metals-based paints at 24 known contaminated soil sites. However, with implementation of BMPs during construction and operation (Section 4.15.11) there would be a negligible impact to human health from hazardous waste and materials.

4.17.7.6 Community Safety and Emergency Response Times

Community safety and emergency response impacts associated with Alternative 5 are generally related to the construction of the additional at-grade crossing and an increase in truck volumes on local streets.

Alternative 5 would result in a potential major adverse impact to emergency response times due to delays at at-grade crossings compared to the No-Action Alternative, because it would eliminate several east-west routes in the study area. McMillan Avenue and Reynolds Avenue would no longer provide a connection from Spruill Avenue to Noisette Boulevard. Cosgrove Avenue east of Spruill Avenue would only provide access to the River Center project site. The closest EMS station is located on Dorchester Road west of the study area. Emergency responders coming from the west side of the study area would have to go north of Noisette Creek then east to connect to Noisette Boulevard to access properties along the Cooper River. Emergency responders dispatching from Fire Station 2 on the corner of Carner Avenue and Clement Avenue would have to travel south to the future Stromboli Avenue Bridge over rail tracks then north on the improved Bainbridge Avenue to access properties on the Cooper River.

Similar to Alternative 1 (Proposed Project), construction of the rail and ROW improvements at Meeting Street for the southern rail connection would result in one new major at-grade rail crossing. This new at-grade rail crossing would have a potential minor, direct adverse impact to community safety by introducing a new conflict point between trains and automobiles, bicycles, and pedestrians. There are existing bike lanes and sidewalks along Meeting Street at the location of this proposed new at-grade crossing.

Similar to Alternative 1, there would be the potential for Meeting Street to be blocked by a train for approximately 11 minutes[100], four times a day in design year 2038, when the trains are entering and leaving the River Center ICTF. The CARTA Superstop is located at the corner of Cosgrove Avenue and Rivers Avenue. Alternative 5 would result in a high volume of trucks (2,161 trucks per day in 2018) traveling on Cosgrove Avenue to access the ICTF. These trucks could pose a safety concern to pedestrians walking to and from the buses.

Community Safety and Emergency Response Human Health Impact Summary

Alternative 5 would result in major adverse impacts to emergency response times due to delays at at-grade crossings and limited east-west access. In addition, Alternative 5 would also result in a minor impact to community safety due to an additional conflict point at the Meeting Street at-grade crossing. As a result, major impacts to human health and safety would result from Alternative 5.

4.17.7.7 Light and Glare

Under Alternative 5, light and glare impacts resulting from the high-mast lights on the ICTF would be similar to Alternative 1 (Proposed Project), which would result in a negligible, permanent adverse impact. Nighttime train activity would result in a negligible impact, as there would be few curvatures on the southern route to Milford Street where residences would be affected, including the Chicora-Cherokee Neighborhood.

4.17.8 Alternative 6: River Center Site (South via Kingsworth / North via Hospital)

Section 2.4 summarizes the design elements of Alternative 6 and operations of the proposed facility on the River Center project site. Potential risks to human health and safety during construction and operation of Alternative 6 include:

4.17.8.1 Worker Safety

Potential risks to worker safety under Alternative 6 would be similar to Alternative 5. The impact to worker health and safety is negligible for the same reasons identified for Alternative 5.

4.17.8.2 Drinking Water Quality

The impact to human health and safety from drinking water quality impacts under Alternative 6 is the same (negligible) as Alternative 5.

[100] Based on an 8,000-foot train traveling at 5 miles per hour through the crossing.

4.17.8.3 Noise and Vibration

Impacts from traffic, rail (includes horns), construction, and operational noise from the Project site under Alternative 6 were identified by comparing the increase in noise over the No-Action Alternative (existing condition).

Traffic Noise

Under Alternative 6, impacts from traffic noise when compared to the No-Action alternative would be the same (negligible except for minor to moderate traffic noise impact for the 18 residential land uses in the Chicora-Cherokee community) as Alternative 5.

Rail Noise

Under Alternative 6, the noise contours along the rail segment from north of Dorchester Road to Misroon Street (Segments 1, 2 and 3) and from Hackemann Avenue to Discher Street (Segment 7), would be significantly expanded in comparison to the No-Action Alternative. A proposed rail segment from Meeting Street to Spruill Avenue in the vicinity of crossing 20 (Segment 8) would be built under Alternative 6, and noise from trains would impact 10 noise sensitive receivers along the segment. Land uses in closer proximity to the track path may be demolished for construction of the proposed rail track. The proposed new rail segment between Spruill Avenue and the ICTF facility (Segment 9) would impact 23 noise sensitive receivers in the Chicora-Cherokee communities. Regarding train and train horn noise, under Alternative 6, the number of residences that will have a major impact is 0, moderate impact is 146, and minor impact is 28.

Rail Vibration

Under Alternative 6, impacts from ground-borne vibration generated by train activities would be similar (negligible) to Alternative 5. For the receptors located closer than 100 feet from the curved track near Kingsworth Avenue (Segment 8), vibration impact might occur under Alternative 6 due to the rail curvature (the strength of the potential impact cannot be assessed, because no methodology exists to quantify vibration levels at receptors located near a segment of curved track).

Construction Noise

Noise conditions related to the ICTF construction activities under Alternative 6 would be the same as those estimated under Alternative 5 (minor to moderate and short-term).

Operational Noise

Noise impacts from the Project site operations under Alternative 6 would be the same as those estimated for Alternative 5 (negligible exterior daytime and moderate to major exterior nighttime).

Additive Noise Impacts

For Alternative 6, additive noise impacts would be similar to Alternative 5.

Noise and Vibration Health Impact Summary

Alternative 6 would have similar impacts to human health and safety from noise and vibration impacts as Alternative 5.

4.17.8.4 Air Quality

Impacts to Air Quality by Alternative 6 construction criteria pollutant emissions would be similar to Alternative 5. Criteria pollutant emissions and impacts from operational activities would be the same as Alternative 5. Criteria pollutants emitted from Alternative 6, along with the existing and projected criteria pollutants, may put the Tri-County area into non-attainment for the NO_2 1 hour NAAQS. Potential impacts would be minor adverse. Non-DPM HAPs emissions from operational activities and impacts would be the same as Alternative 5. Potential excess cancer risk would fall within the acceptable range. Impacts from cancer risk would be acceptable. The maximum noncancer hazard would be below 1. Potential impacts from noncancer hazard would be negligible.

Air Quality Human Health Impact Summary

The overall impact to human health and safety from air quality impacts by Alternative 6 would be similar to Alternative 5 (minor permanent adverse).

4.17.8.5 Hazardous Materials

Impacts to Human Health and Safety from hazardous materials by Alternative 6 would be similar to Alternative 5, except there are 10 fewer buildings that would be demolished reducing the potential to encounter asbestos and/or metals-based paints and with 12 fewer known contaminated sites. However, with implementation of BMPs during construction and operation (Section 4.15.11) there is a negligible impact to human health from hazardous waste and materials.

4.17.8.6 Community Safety and Emergency Response Times

Impacts to community safety and emergency response under Alternative 6 would be similar to those under Alternative 5, however there are differences. The southern rail connection would connect to an existing rail line near Kingsworth Avenue (and adjacent to existing rail and ROW); therefore the existing at-grade crossings of Pittsburgh Avenue and Discher Street would not be impacted with ICTF train occurrences, and the new at-grade crossing of Meeting Street at Herbert Street would not be created for Alternative 6. Alternative 6 would create at-grade crossings of both Meeting Street and Spruill Avenue near Kingsworth Avenue.

The new at-grade rail crossings would have a minor indirect adverse impact to community safety by introducing new conflict points between trains and automobiles, bicycles, and pedestrians. There are existing bike lanes and sidewalks along Meeting Street and Spruill Avenue at the location of these proposed new at-grade crossings.

These new at-grade crossings may also have a major adverse impact on emergency response times for certain locations because there is the potential for Meeting Street and Spruill Avenue to be blocked for approximately 11 minutes[101] in design year 2038, four times a day, when the trains are entering and leaving the Navy Base ICTF. Detour routes are available along the southern rail connection such as the elevated Stromboli Avenue. There would be no detour route available in the northern portion of the River Center project site and no Cosgrove-McMillan Overpass, increasing response times depending on the location of the emergency. The community of Union Heights, Windsor, and Howard Heights might also have a moderate adverse impact to emergency response if a train related to the Alternative 6 was blocking access on both east and west access points as it navigated the U-turn.

The City of Charleston's planned public service operation center would not be impacted by Alternative 6.

Community Safety and Emergency Response Human Health Impact Summary

Alternative 6 would result in major adverse impacts to emergency response times (similar to Alternative 5) with localized moderate impacts to emergency response. As a result, major impacts to human health and safety would result from Alternative 6.

4.17.8.7 Light and Glare

The overall impact to human health and safety from light and glare by Alternative 6 would be similar to Alternative 5.

4.17.9 Alternative 7: River Center Site (South via Milford)

Section 2.4 summarizes the design elements of Alternative 7 and operations of the proposed facility on the River Center Site. Potential risks to human health and safety during construction and operation of Alternative 7 include:

4.17.9.1 Worker Safety

Potential risks to worker safety under Alternative 7 would be similar to Alternative 5. The impact to worker health and safety is negligible for the same reasons identified for Alternative 5.

[101] Based on an 8,000-foot train traveling at 10 miles per hour through the crossing.

4.17.9.2 Drinking Water Quality

The impact to human health and safety from drinking water quality impacts under Alternative 7 would be similar (negligible) to Alternative 5.

4.17.9.3 Noise and Vibration

Impacts from traffic, rail (includes horns), construction, and operational noise from the River Center site under Alternative 7 were identified by comparing the increase in noise over the No-Action Alternative (existing condition).

Traffic Noise

Under Alternative 7, impacts from traffic noise when compared to the No-Action alternative would be the same (negligible except for minor to moderate traffic noise impact for the 18 residential land uses in the Chicora-Cherokee community) as Alternative 5.

Rail Noise

Under Alternative 7, the noise contours along the rail segment from north of Dorchester Road to Misroon Street (Segments 1, 2 and 3) and from Hackemann Avenue to Discher Street (Segment 7); would be significantly expanded in comparison to the No-Action Alternative. A new build rail segment from Pittsburg Avenue to the ICTF facility at the River Center project site (Segment 10) would only be built for the southern alignment under Alternative 7. Regarding train and train horn noise, under Alternative 7, the number of residences that will have a major impact is 0, moderate impact is 268, and minor impact is 80.

Rail Vibration

Under Alternative 7, impacts from ground-borne vibration generated by train activities would be similar (negligible) to Alternative 5.

Construction Noise

Noise conditions related to the ICTF construction activities under Alternative 7 would be the same as those estimated under Alternative 5 (minor to moderate and short-term).

Operational Noise

Noise impacts from the Proposed Project site operations under Alternative 7 are the same as those estimated for Alternative 5 (negligible exterior daytime and moderate to major exterior nighttime).

Additive Noise Impacts

For Alternative 7, with higher train volumes at the track segment from Pittsburg Avenue to ICTF along the new Port drayage road in the vicinity of the eastern neighborhood boundary of the Chicora-Cherokee community, the additive traffic/rail DNL of up to 71 dB(A) would exceed the No-Action levels by up to 18 dB(A), producing a major additive noise impact at the nearest residences. The second and third rows of residences along the property line are also expected to experience somewhat lesser major to moderate additive noise impacts. Noise sensitive receptors along Noisette Boulevard in the vicinity of the River Center project site would experience both traffic noise and ICTF operational noise under River Center project site Alternatives (5, 6, and 7). The operational noise range would essentially remain unaffected when taking into account traffic noise. As the result, the River Center Site operational noise levels would, on average, exceed the noise levels generated by traffic on Noisette Boulevard, and the noise impact analysis of sub-section 4.12.7.5 remains valid.

Noise and Vibration Health Impact Summary

Alternative 7 would have similar impacts to human health and safety from noise and vibration impacts as Alternative 5.

4.17.9.4 Air Quality

Impacts to Air Quality by Alternative 7 construction criteria pollutant emissions would be similar to Alternative 5. Criteria pollutant emissions and impacts from operational activities would be the same as Alternative 5. Criteria pollutants emitted from Alternative 7, along with the existing and projected criteria pollutants, may put the Tri-County area into non-attainment for the NO_2 1-hour NAAQS. Potential impacts would be minor adverse. Non-DPM HAPs emissions from operational activities and impacts would be the same as Alternative 5. Potential excess cancer risk would fall within the acceptable range. Impacts from cancer risk would be acceptable. The maximum noncancer hazard would be below 1. Potential impacts from noncancer hazard would be negligible.

Air Quality Human Health Impact Summary

The overall impact to human health and safety from air quality impacts by Alternative 7 would be minor permanent adverse.

4.17.9.5 Hazardous Materials

Impacts to Human Health and Safety from hazardous materials by Alternative 7 would be similar to Alternative 5. With implementation of BMPs during construction and operation (Section 4.15.11) there would be a negligible impact to human health from hazardous waste and materials.

4.17.9.6 Community Safety and Emergency Response Times

Impacts to community safety and emergency response under Alternative 7 would be the similar to those under Alternative 5, however there are several differences. Alternative 7 is a variation of Alternative 5 where trains would also enter and exit the Navy Base ICTF from a southern rail connection. Proposed rail through the Hospital District would stop short of Noisette Creek.

Under Alternative 7, trains would use the southern rail alignment to Milford Street. Alternative 7 would have twice as many ICTF train occurrences than Alternative 5, eight per day, at the at-grade crossings along the southern alignment. The community of Union Heights might also have a moderate adverse impact to emergency response if a train related to Alternative 7 was blocking access on both east and west access points as it navigated the U-turn. In addition, the construction of the drayage road from the River Center project site under Alternative 7 limits east-west mobility throughout the study area.

Community Safety and Emergency Response Human Health Impact Summary

Alternative 7 would result in a major adverse impact to human health from delay to emergency response times for the same reasons as Alternative 5.

4.17.9.7 Light and Glare

The overall impact to human health and safety from light and glare by Alternative 7 would be similar to Alternative 5 (negligible).

4.17.10 Related Activities

Section 2.4 summarizes the Related Activities associated with the action alternatives. Potential risks to human health and safety during construction and operation of Related Activities include:

4.17.10.1 Worker Safety

Potential risks to worker safety from Related Activity are similar to all of the action alternatives. The impact to worker health and safety would be negligible for the same reasons identified for Alternative 1 (Proposed Project).

4.17.10.2 Drinking Water Quality

The impact to human health and safety from drinking water quality impacts under the Related Activities would be negligible.

4.17.10.3 Noise and Vibration

There would be a negligible impact to Human Health and Safety by Related Activities from rail noise. The increase in rail noise would be barely perceptible when compared to existing condition.

4.17.10.4 Air Quality

There is a minor impact to Human Health and Safety from air quality impacts by Related Activities from operational emissions.

4.17.10.5 Hazardous Materials

There is a minor to major impact to Human Health and Safety from Related Activities from potential accidental spills on the rail tracks. However, with implementation of BMPs during construction and operation (Section 4.15.11 and 4.15.3.2), there is a negligible impact to human health from hazardous waste and materials.

4.17.10.6 Community Safety and Emergency Response Times

There would be a minor impact from delay at at-grade crossings from increased rail traffic.

4.17.10.7 Light and Glare

The overall impact to human health and safety from light and glare would be negligible.

4.17.11 Summary of Impacts Table

Table 4.17-2 summarizes the environmental consequences to human health and safety from Alternative 1 (Proposed Project) and all the alternatives.

Table 4.17-2
Summary of Impacts, Human Health and Safety

	Direct Health Impacts from Individual Sources Summary						
Alternative	**Worker Safety**	**Drinking Water Quality**	**Noise and Vibration**	**Air Quality**	**Hazardous Materials**	**Community Safety and Emergency Response Times**	**Light and Glare**
No-Action	Negligible impact.	Negligible impact to drinking water supply as drinking sources are located outside of the study area.	No impact	Minor impact from air quality	Negligible impact from hazardous materials due to implementation of BMPs during construction and operation.	Negligible impact as delay would be similar to existing conditions	No impact from light and glare.

	Direct Health Impacts from Individual Sources Summary						
Alternative	**Worker Safety**	**Drinking Water Quality**	**Noise and Vibration**	**Air Quality**	**Hazardous Materials**	**Community Safety and Emergency Response Times**	**Light and Glare**
1: *Proposed Project: South via Milford / North via Hospital District*	Negligible impact resulting from design features of the Proposed Project, safety precautions and training measures, and compliance with safety guidelines.	Negligible impact to water supply as drinking sources are located outside of the study area.	Negligible impact from traffic noise and vibration; minor to moderate impact (several areas) from rail noise, construction noise (short-term), and operational noise (daytime). Major nighttime operation noise impacts. Additive noise impacts: negligible [Virginia Avenue (Traffic + Rail Noise)] minor to moderate [St. Johns Avenue (Traffic + Rail Noise)]. Overall impact to human health is minor with mitigation measures.	Minor permanent adverse impact from air quality as the Tri-County area is in attainment for criteria pollutants and the NAAQS would remain in compliance. Potential impacts from non-DPM HAP emissions would be acceptable. Potential excess cancer risk and cancer risk would be acceptable. Potential impacts from noncancer hazard would be negligible.	Negligible impact from hazardous materials due to implementation of BMPs during construction and operation.	Potential minor adverse impact on emergency response times and minor indirect adverse impact to community safety.	Negligible effect from high mast lighting, minor, permanent adverse impact from light and glare associated with nighttime train head lamps to residential structures along curvatures of the track.
2: *South via Milford / North via S-line*	Similar to Alternative 1 (Proposed Project).	Similar to Alternative 1 (Proposed Project).	Similar to Alternative 1 (Proposed Project).	Similar to Alternative 1 (Proposed Project).	Similar to Alternative 1 (Proposed Project).	Similar to Alternative 1 (Proposed Project).	Similar to Alternative 1 (Proposed Project).

	Direct Health Impacts from Individual Sources Summary						
Alternative	**Worker Safety**	**Drinking Water Quality**	**Noise and Vibration**	**Air Quality**	**Hazardous Materials**	**Community Safety and Emergency Response Times**	**Light and Glare**
3: *South via Kingsworth / North via Hospital District*	Similar to Alternative 1 (Proposed Project).	Similar to Alternative 1 (Proposed Project).	Similar to Alternative 1 (Proposed Project).	Similar to Alternative 1 (Proposed Project).	Similar to Alternative 1 (Proposed Project).	Similar to Alternative 1 (Proposed Project) with localized moderate impacts to emergency response.	Similar to Alternative 1 (Proposed Project).
4: *South via Milford*	Similar to Alternative 1 (Proposed Project).	Similar to Alternative 1 (Proposed Project).	Similar to Alternative 1 (Proposed Project), but no additive noise impacts.	Similar to Alternative 1 (Proposed Project).	Similar to Alternative 1 (Proposed Project).	Similar to Alternative 1 (Proposed Project) with localized moderate impacts to emergency response.	Similar to Alternative 1 (Proposed Project).

	Direct Health Impacts from Individual Sources Summary						
Alternative	**Worker Safety**	**Drinking Water Quality**	**Noise and Vibration**	**Air Quality**	**Hazardous Materials**	**Community Safety and Emergency Response Times**	**Light and Glare**
5: *River Center Site: South via Milford / North via Hospital District*	Negligible impact resulting from design features of the Proposed Project, safety precautions and training measures, and compliance with safety guidelines.	Negligible impact to water supply as drinking sources are located outside of the study area.	Negligible impact from operational noise (daytime) and vibration; minor to moderate impact (several areas) from traffic noise, rail noise, and construction noise (short-term). Moderate to Major exterior nighttime impact. Additive noise impacts: negligible (daytime) moderate to major (nighttime) [Noisette Boulevard (Traffic + Operations)], negligible [Virginia Avenue (Traffic + Rail Noise)], and major [Port drayage road (Traffic + Rail)]	Minor impact to air quality as the Tri-County area may be in non-attainment for NO_2. Potential impacts from non-DPM HAP emissions would be acceptable. Potential excess cancer risk and cancer risk would be acceptable. Potential impacts from noncancer hazard would be negligible.	Negligible impact from hazardous materials due to implementation of BMPs during construction and operation.	Major impact to emergency response times and minor impact to community safety.	Negligible effect from high mast lighting and negligible effect from nighttime train head lamps due to lack of curvatures (and affected residences) on the southern arrival/departure tracks.
6: *River Center Site: South via Kingsworth / North via Hospital District*	Similar to Alternative 5.	Similar to Alternative 5.	Similar to Alternative 5.	Similar to Alternative 5.	Similar to Alternative 5.	Similar to Alternative 5 with additional localized moderate impacts to emergency response.	Similar to Alternative 5.

	Direct Health Impacts from Individual Sources Summary						
Alternative	**Worker Safety**	**Drinking Water Quality**	**Noise and Vibration**	**Air Quality**	**Hazardous Materials**	**Community Safety and Emergency Response Times**	**Light and Glare**
7: *River Center Site: South via Milford*	Similar to Alternative 5.	Similar to Alternative 5.	Similar to Alternative 5, but additive noise impacts: major [Port drayage road (Traffic + Rail)], negligible (daytime), moderate to major (nighttime) [Noisette Boulevard (Traffic + Operations)].	Similar to Alternative 5.	Similar to Alternative 5.	Similar to Alternative 5 with additional localized moderate impacts to emergency response.	Similar to Alternative 5.

Note: The purpose of this analysis is to compile and document potential impacts to the human health and safety of construction workers during construction of the Proposed Project, operations staff during the operation of the Proposed Project, and residents in the community surrounding the Proposed Project. Adverse impacts to human health and safety may occur if the Proposed Project activities create new health hazards that are not currently present, worsen existing health conditions, or increase emergency response times. Each of the other resource sections in this document was reviewed to determine if there would be potential associated impacts to human health and safety. Affected Environment and Environmental Consequences sections for Water Quality (Section 3.3/4.3), Visual Resources and Aesthetics (Section 3.11/4.11), Noise and Vibrations (Section 3.12/4.12), Air Quality (Section 3.13/4.13), Hazardous, Toxic, and Radioactive Waste (Section 3.15/4.15), and Socioeconomics and Environmental Justice (3.16/4.16) describe existing conditions and provide inventories of known and potential risks due to the Proposed Project and alternatives to human health and safety.

4.17.12 Mitigation

4.17.12.1 Applicant's Proposed Avoidance and Minimization Measures

The Applicant has committed to several measures that avoid and/or minimize potential impacts of Alternative 1 (Proposed Project). These measures are taken from Palmetto Railways Mitigation Plan provided in Appendix N. Some of these measures are required under federal, state, and local permits; others are measures that Palmetto Railways has incorporated into the design and operations of Alternative 1 (Proposed Project). Each mitigation measure is also designated as one that either helps to avoid an impact or one that minimizes an impact.

- Provide around-the-clock security through a combination of security fencing, video cameras, and other security measures. (Minimization)
- Conduct construction and operations in accordance with appropriate regulations, permits, best practices, and codes. (Minimization)
- Employ the use of automated switches to eliminate the need for train crews to get out of trains to manually throw switches and thus enhancing the safety of railroad workers and additionally reducing grade crossing closures. (Minimization)
- Use of inter-box connector (IBC) carts to provide enhanced safety for railroad workers by avoiding slip, trip, and fall incidents while accessing railcars to (un)lock IBCs on containers. (Minimization)
- Employ the use of an automated gate system to eliminate the need for railroad workers to complete inbound, container and chassis damage inspections by walking in a congested gate area thus enhancing safety of railroad workers and potentially reducing grade crossing closures. (Minimization)
- Safety precautions and training measures would be implemented by the Applicant during construction and operation of the facility, and safety guidelines would be complied with. (Minimization)
- Use of state of the art equipment to minimize sound emissions during operations. (Minimization)
- Design and construct a cut section (trench), sound walls, a landscaped berm within a 100-foot buffer for noise reduction to adjacent neighborhoods. (Minimization)
- See Section 4.12.12 for a complete list of mitigation for potential noise and vibration impacts.
- Design and construct a semi-automated facility that minimizes emissions during operations. (Minimization)
- Contribute $50,000 towards ambient air quality initiatives in conjunction and coordination with SCDHEC and the Medical University of South Carolina on air quality initiatives in the Charleston region. (Minimization)
- See Section 4.13.12 for a complete list of mitigation for potential air quality impacts.

- Continue planned removal of hazardous materials at the site. (Minimization)
- Install additional water monitoring wells at the site. (Minimization)
- Implementation of BMPs and SPCC at the site. (Minimization)
- See Section 4.15.12 for a complete list of mitigation for potential impacts from Hazardous materials.
- To minimize the impact of lights from the site on adjacent areas, all operating lights will be directed downward to shield light sources minimizing any light bleed off the facility footprint. (Minimization)
- Design the facility to minimize visual impacts including a cut section (trench) and an earthen berm within a 100-foot buffer between the facility and adjacent neighborhoods. LED lighting fixtures will be installed over bridges and other areas where practical. (Minimization)
- Completed a photometric design for intermodal facility high-mast lighting that would result in less than 0.5-foot-candles outside of the property boundary. (Minimization)
- See Section 4.11.12 for a complete list of mitigation for potential impacts from light and glare.
- Continue to cooperate with the appropriate emergency services personnel within the Cities of North Charleston and Charleston to address emergency response coordination and other specific issues as they arise. (Minimization)
- Examine emergency service benefits and gather input from local emergency service providers as part of the Surface Transportation Impact Study. (Minimization)
- Study the need for grade separated crossings as part of the Crossing Analysis. (See Transportation MOA in Appendix N). * (Minimization)
- Provide detour routes (elevated Stromboli Avenue and Cosgrove-McMillan Overpass). (Minimization)

These avoidance and minimization measures, except the items noted with an asterisk (*), have been considered in the preceding impact analysis. The complete list of Applicant-proposed avoidance and minimization measures related to Human Health and Safety is also provided in Chapter 6.

4.17.12.2 Additional Potential Mitigation Measures

No additional mitigation measures for Human Health and Safety have been recommended by the Corps. Additional avoidance, minimization, and mitigation may be considered by the Corps in its decision-making process. Final mitigation measures may be adopted as conditions of the DA permit and documented in the Record of Decision (ROD).

4.18 SECTION 4(F) AND 6(F) RESOURCES

4.18.1 Methods and Impact Definitions

This section relies on, and incorporates the information and analysis in Section 3.10/4.10 (Cultural Resources) and 3.16/4.16 (Socioeconomics and Environmental Justice). For this analysis, impacts to Section 4(f) properties are classified as either "No Use" or "Use" and Section 6(f) properties are classified as either "No Conversion" or "Conversion" (Table 4.18-1).

Table 4.18-1
Impact Definitions for Section 4(f) Resources and Section 6(f) Resources

No Use of a Section 4(f) Resource	Use of a Section 4(f) Resource
There would not be an actual, temporary, or constructive use of the Section 4(f).	There would be an actual, temporary or constructive use of the Section 4(f) property.
No Conversion of a Section 6(f) Resource	**Conversion of a Section 6(f) Resource**
There would not be a conversion of the Section 6(f) property.	There would be a conversion of the Section 6(f) property.

4.18.2 Alternatives

As described in Chapter 2 (Development and Description of Alternatives), the Corps considered numerous alternatives to the Proposed Project, and after a step-wise screening process, identified a reasonable range of alternatives for further evaluation in the EIS. This allowed the Corps to evaluate each alternative and would support the Corps determination of which alternative, including the Proposed Project, is the Least Environmentally Damaging Practicable Alternative (LEDPA). The Corps may only issue a DA permit for the LEDPA, and this decision would be documented in the Corps' Record of Decision.

With respect to FRA's approval, as described above, FRA cannot approve an alternative that uses a 4(f) property unless it can be demonstrated there is no feasible and prudent avoidance alternative, and the project includes all measures to minimize a use. This section identifies and evaluates the potential uses of Section 4(f) properties that could result from the Proposed Project and the Project alternatives carried forward for detailed evaluation in the Draft EIS.

4.18.3 No-Action Alternative

Under the No-Action Alternative, there would be no Proposed Project and therefore no project-related Section 4(f) uses. However, under the No-Action Alternative, the proposed site would continue to be used for mixed-use industrial activities. Activities would likely include the demolition of existing buildings and infrastructure, the alteration of the ground surface, and the installation of new buildings and structures necessary to support the light industries and warehousing/shipping entities that may occupy the future industrial space. There would be no conversion of a 6(f) resource under the No-Action Alternative.

4.18.4 Alternative 1: Applicant's Proposed Project (South via Milford / North via Hospital District)

Construction and operation activities associated with Alternative 1 would not result in the use of the two Section 4(f) parks, Chicora-Cherokee Community Park and unnamed community park (also a Section 6(f) park) within the Study Area because these parks are located outside the Project site where construction and operation activities would occur. Construction activities and equipment could create vibration and noise that may affect the parks; however, potential impacts would be temporary and localized, based on the analyses presented in Section 4.12 (Noise and Vibration). Under Alternative 1 (Proposed Project), it is unlikely that construction and operation activities at the Project site would alter the visual setting of Section 4(f) or 6(f) properties. With respect to indirect impacts during construction and operations, the Chicora-Cherokee Community Park and the unnamed community park have intervening vegetation and mature trees that would eliminate most views of construction equipment or any new vertical elements that would be placed on the Project site (less than 3–4 stories in height). As such, there would not be a constructive use of these Section 4(f) properties from an alteration of the visual setting.

As discussed in Section 4.10 (Cultural Resources), historic properties within the Study Area would be adversely impacted as a result of the construction and operation of Alternative 1 (Proposed Project). These direct impacts would result in an adverse effect to the USMC Barracks and the CNH Historic District under Section 106, and would constitute direct permanent uses of Section 4(f) properties[102]. To resolve the potential adverse effects to these Section 106 historic properties, consultations with the SHPO have commenced, and a Cultural Resources MOA (Appendix G) was fully executed on May 30, 2018.

Operation of the Navy Base ICTF, including train activity on the northern rail connection through the CNH, would generate vibration and could possibly result in damage to the masonry of the historic properties; however, the vibration analysis discussed in Section 4.12 (Noise and Vibration) found that the ground-borne vibration generated by train activities would produce a negligible impact on

[102] These uses would not qualify as a *de minimis* impact because the Section 106 determination is adverse effect.

the vibration-sensitive receptors along the railroad segments in the Study Area in comparison with the No-Action Alternative. Based on the adjusted reference curve (refer back to Figure 14.12-3), it was determined that only receptors located less than 20 feet from the track centerline would experience rail vibration impacts, which are defined as 80 VdB. Under Alternative 1 (Proposed Project), none of the receptors are located at a distance less than 20 feet from the track centerline. For example, the USMC Barracks and the CNH are located 95 feet and 105–634 feet (depending on location in the CNH building) away from the track centerline, respectively. Therefore, vibration impacts from operation of Alternative 1 (Proposed Project) would have no effect to cultural resources, and there would be no constructive use of the Section 4(f) resources in the Study Area. Vibrations related to construction activities under Alternative 1 (Proposed Project) would be temporary and similar to those that occurred during the operation of Navy Base Charleston or industrial activities that occur today within the CNC. As a result, construction-related vibration would have no effect on historic properties and would not result in a constructive use of the Section 4(f) resources.

Under Alternative 1 (Proposed Project), the Navy Base ICTF would operate within new buildings/structures and transportation corridors; however, these new buildings/structures and infrastructure are industrial in nature and would not alter the character of the nearby historic properties within the CNY and CNYOQ. The former Navy Base Charleston was an industrial facility that built and maintained ships. The historic properties within the CNY and CNYOQ were the location of these industrial activities or supported the operation of the base and its assigned personnel. The industrial activities of Alternative 1 (Proposed Project) support commercial maritime traffic rather than the military maritime traffic of the former navy base. The adaptive reuse of the CNC since the closure of Navy Base Charleston in 1996 has altered the character of the CNC from military to commercial over the last 20 years. Thus, changes in character of the historic properties within the CNY and CNYOQ related to Alternative 1 (Proposed Project) would have no effect.

Under Alternative 1 (Proposed Project), operation of the Navy Base ICTF would also result in higher volumes of rail and road traffic on dedicated rail lines and thoroughfares, increasing noise and vibration. Navy Base Charleston was an industrial facility and generated a great deal of noise and vibration during its operation as a military installation throughout the twentieth century. The noises associated with the operation of the ICTF would create local, long-term, increased noise levels, but would not alter the industrial character and associations of the historic properties within the CNC. Similarly, historic properties in the nearby residential neighborhoods outside the CNC were built in support of the former Navy Base Charleston and witnessed the noises associated with the operation of the military facility. Since the closure of Navy Base Charleston in 1996, these noises have been reduced, but the CNC still contains industrial facilities similar to those that operated at the former Navy Base Charleston. Thus, increased noise levels related to the operation of the Navy Base ICTF would result in long-term, increased noise levels, but would not alter the character and associations of the nearby historic properties outside the CNC. As a result, noise impacts would have no effect on

historic properties within and outside the CNC. Impacts to noise-sensitive receptors are detailed in Section 4.12.3.

As mentioned above, the former Navy Base Charleston was an industrial facility that built and maintained ships. Vertical visual elements such as cranes were common. The historic properties within the CNC were the location of these industrial activities or supported the operation of the base and its assigned personnel. The industrial activities of Alternative 1 (Proposed Project) support commercial maritime traffic rather than the military maritime traffic of the former navy base. The adaptive reuse of the CNC since the closure of Navy Base Charleston in 1996 has altered the character of the CNC from military to commercial over the last 20 years. While construction activities and equipment, as well as the introduction of new vertical elements within the Project site, would be visible from the CNY and CNYOQ historic districts, the alteration of the visual setting would be temporary and have no effect under Section 106 and would not result in a use under Section 4(f).

None of the situations that trigger a 6(f) conversion as discussed in Table 4.18-1 would occur under the Alternative 1 (Proposed Project), therefore there would be no conversion of a 6(f) resource.

4.18.5 Alternative 2: Proposed Project Site (South via Milford / North via S-Line)

No constructive or permanent uses of Section 4(f) resources or conversions of 6(f) resources would occur under Alternative 2. Ancillary impacts would primarily result from noise and visual alterations, though their effect would not result in a substantial impairment of the resources, and thus there would not be a constructive use. Unlike Alternative 1 (Proposed Project), the arrival/departure tracks to the north of the ICTF would utilize the existing out-of-service CSX S-line within CSX ROW along Spruill Avenue and would not traverse through the CNH Historic District. With this new alignment, there would be no permanent use of the USMC Barracks or the CNH historic district (or any other Section 4(f) resource) as these properties would remain in their current state. Alternative 2 would not result in a proximity impact that is so severe that the attributes that qualify the CNH Historic District or the USMC Barracks for protection under Section 4(f) will be substantially impaired. Specifically, Alternative 2 would not affect the CNH Historic District's reflection of Spanish colonial revival, colonial revival, classical revival, bungalow/craftsman, or modern architecture at Naval Base Charleston (NR Criterion C) or the buildings' association with events that have made a significant contribution to the broad patterns of U.S. history (U.S. involvement in WWII) (NR Criterion A). Also, Alternative 2 would not affect the USMC Barracks' reflection of Classical Revival architecture at Naval Base Charleston (NR Criterion C) or the building's association with events that have made a significant contribution to the broad patterns of U.S. history (U.S. involvement in WWII and defense of U.S. Navy installations during first half of twentieth century) (NR Criterion C). Therefore, as Alternative 2 would not permanently incorporate land that is part of the CNH Historic District or the USMC Barracks, temporarily occupy land that is part of the CNH Historic District or the USMC

Barracks, or result in a "constructive use" of the CNH Historic District or the USMC Barracks, the Proposed Project would not result in the use of this Section 4(f) property.

4.18.6 Alternative 3: Proposed Project Site (South via Kingsworth / North via Hospital District)

The design for the northern rail connection of Alternative 3 is the same as Alternative 1 (Proposed Project). Therefore, Alternative 3 would result in the use of same Section 4(f) resources and no conversion of 6(f) resources as Alternative 1 (Proposed Project).

4.18.7 Alternative 4: Proposed Project Site (South via Milford)

The design for the northern rail connection of Alternative 4 is the same as Alternative 1 (Proposed Project). Therefore, Alternative 4 would result in the use of same Section 4(f) resources and no conversion of 6(f) resources as Alternative 1 (Proposed Project).

4.18.8 Alternative 5: River Center Project Site (South via Milford / North via Hospital District)

The CNY historic district, the CNH historic district, and the USMC Barracks lie within the River Center project site, with an additional eight historic properties outside the site but within the Study Area.

Similar to Alternative 1 (Proposed Project), there would be no direct or constructive uses of the Section 4(f) or conversion of 6(f) parks within the Study Area under Alternative 5 because of the distance between the parks and the construction and operation activities associated with the alternative. Placement of the ICTF on the River Center project site would, however, result in the permanent incorporation of historic properties, and thus permanent use of Section 4(f) resources (Section 4.10.7). Construction activities associated with Alternative 5 would require the removal of multiple elements from the CNY and CNH historic districts, as well as the removal of the USMC Barracks. Specifically, CNC Buildings 64, NSC 66, NSC 67 (all three are storehouses that contribute to the NRHP eligibility of the district), and CNC Building 1655 (a modern storage building that does not contribute to the district). Fourteen elements of the CNH Historic District lie completely within Alternative 5 and would be impacted. These elements include CNC Buildings M-3A, M6/M7, NH-45, NH-46, NH-47, NH-49, NH-51, NH-53, NH-55, NH-61, NH-68, and 758 (treatment facilities, storehouses, residences, and a garage that contribute to the NRHP eligibility of the district); CNC Building NH-62 (a storehouse) does not contribute. The NRHP-eligible USMC Barracks also stands within Alternative 5, and its demolition would result in an adverse effect to this historic building. These direct impacts would result in an Adverse Effect under Section 106, and would constitute direct permanent uses of Section 4(f) properties. The altered visual setting with the River Center ICTF adjacent to the CNYOQ historic district would result in an Adverse Effect and a "use" under Section 4(f). The CNYOQ district is listed on the NRHP under Criteria A and C, and retains integrity of

location, setting, design, workmanship, materials, association, and feeling. The planned park-like nature of the residential area serves as a defining characteristic of its setting and design. Industrial facilities needed to build and operate Alternative 5 will intrude on this setting, altering viewsheds to the west on Noisette Creek. Structures designed to mitigate noise and direct views of the ICTF will alter the setting of the district, detracting from its park-like feel and design. Therefore, the construction of the ICTF and associated noise wall would alter the residential and landscape character of the CNYOQ historic district to the effect that these attributes would be substantially impaired.

Ancillary impacts would primarily result from noise and visual alterations, though their effect would not result in a substantial impairment of any Section 4(f) resource, and thus there would not be a constructive use. None of the situations that trigger a 6(f) conversion as discussed in Table 4.18-1 would occur under Alternative 5, therefore there would be no conversion of a 6(f) resource.

4.18.9 Alternative 6: River Center Project Site (South via Kingsworth / North via Hospital District)

Constructive and permanent uses of Section 4(f) resources and conversion of 6(f) resources under Alternative 6 would be the same as those described under Alternative 5.

4.18.10 Alternative 7: River Center Project Site (South via Milford)

Constructive and permanent uses of Section 4(f) resources and conversion of 6(f) resources under Alternative 7 would be the same as those described under Alternative 5.

4.18.11 Related Activities

Construction and operation activities associated with the Related Activities would not result in adverse impacts to Section 4(f) resources or conversion of Section 6(f) resources because they would not occur near or within them. As a result, the Related Activities would not result in constructive or permanent uses of Section 4(f) resources or conversion of 6(f) resources.

4.18.12 Feasible and Prudent Avoidance Alternatives

Before approving the use of a Section 4(f) property, FRA must first determine whether there are feasible and prudent alternatives to avoiding the use. As described above, only one of the Build Alternatives evaluated in detail in the Draft EIS would completely avoid the use of a Section 4(f) property. That alternative, Alternative 2, was evaluated by USACE for comparison purposes and was carried forward in response to scoping meeting comments (Appendix C). In this section, FRA analyzes whether Alternative 2 and the No-Action Alternative are feasible and prudent avoidance alternatives applying the factors described in Section 3.18.1.

Table 4.18-2 provides a summary of uses of Section 4(f) resources and conversion of Section 6(f) resources within the Study Area. For purposes of this analysis, FRA is assuming construction and operation the No-Action Alternative is feasible. FRA has determined that the No-Action Alternative would not meet the Proposed Project's purpose and need (Section 2.4.1). Alternative 2 was evaluated in this document for comparative analysis purposes and its design includes the potential use of an existing, inactive CSX-owned rail ROW known as the S-Line.

Before discussing whether Alternative 2 is feasible, it is important to first ascertain whether the northern rail connection is necessary to meet the Proposed Project's purpose and need. According to the Applicant, "The proposed design of the NBIF calls for the use of the northern trackage both for potential access by either Class I railroad and/or operationally by Palmetto Railways to switch, stage and build trains moving into and out of the NBIF" (see Appendix B Palmetto Railways' response to FRA comments, January 29, 2018). The Applicant has consistently affirmed that northern access to the ICTF is "necessary for efficient operation of the NBIF (ICTF), even if neither Class I chooses to immediately utilize that access, because Palmetto Railways' analysis has demonstrated that the entire length of northern trackage is necessary for the efficient operation of the facility. This trackage allows for full switching capability at the NBIF (ICTF)…. In addition to its use for switching, the northern trackage are also necessary for the arrival/departure functionality, i.e., the accommodation of 10,000 ft. trains, of the [ICTF]" (see Appendix B Palmetto Railways' response to FRA comments, January 29, 2018). Further, without the northern rail connection, the Applicant has stated that "a 10,000-foot train would not be possible…multiple trains would result (e.g., two 5,000-foot trains) because the cargo volume would remain the same. With more trains traversing the communities, then more signal and crossing delays result" (see Appendix B Palmetto Railways' response to FRA comments, January 29, 2018).

An alternative is not feasible if it cannot be built as a matter of sound engineering judgment. According to the Applicant, "Palmetto Railways conducted an evaluation of the feasibility of using the CSX "S-Line" and its ROW as a part of its analysis of feasible alternatives. As a part of that evaluation, Palmetto Railways determined that utilization of the S-Line in its ROW alignment would be challenging due to the horizontal and vertical curvature of the track. From an engineering perspective, the radius of a curve on a track should not be more than 10 degrees, and should also not be combined with a grade change (as is presented by the topography of that area) in order to allow for mainline engines and intermodal railcars to traverse safely around the curve. Multiple-well articulating intermodal railcars, which are the type of railcars that the Class I carriers utilize for intermodal transport that will be arriving and departing the NBIF [ICTF], and which are typically much longer than standard railcars and cannot traverse the tighter degree curves that shorter railcars can, even at the lower speeds that are seen within city limits. The combination of curves tighter than 10 degrees, topography changes, and longer railcars increases the possibility of derailment occurrences exponentially. The existing curvature of the S-Line connection exceeds the safety tolerances that Palmetto Railways can accept because of the increased derailment risk to

railcars that would traverse the northern lead in the S-Line alignment" (see Appendix B Palmetto Railways' response to FRA comments, January 29, 2018). After independent review of the design by FRA engineers, FRA agrees that the alignment of Alternative 2 presents operational challenges, specifically sharp reverse curves, that would make it difficult for Alternative 2 to meet the purpose and need of the Project.

Access to the S-line is problematic because it is owned and operated by CSX. In general, Class I railroads are independently owned and neither the Applicant nor the Corps nor FRA can make decisions on their behalf or force them to contribute ROW through condemnation or provide operational control of their facilities for use in this Project. The Applicant attempted to purchase CSX ROW at the north end of the Project site referred to as the S-line (Shipyard Creek to Bexley Avenue) in 2012 (see Appendix B, Response to Request for Additional Information, October 17, 2016, Exhibit 1); however, CSX in a November 2, 2012, letter to the Applicant stated "CSXT respectively declines SCPR's offer at this time. Changing market conditions dictate that CSXT retain its current infrastructure in Charleston for the foreseeable future" (see Appendix B Response to Request for Additional Information, October 17, 2016, Exhibit 2). In a DEIS comment letter from CSX dated July 15, 2016, CSX again stated their position on the S-Line: "CSX will also continue to preserve the S-Line corridor, and will work with Palmetto to assure that the corridor south of the planned ICTF can be shared where practical, provided that CSX's operations and access to Cooper Yard are not compromised. CSX also plans to continue to serve the existing and future customers and industrial sites accessible from Cooper Yard and will retain the ability to reactivate the S-Line north of that yard in the future" (see Appendix O). In a January 29, 2018, response to a request for information from the FRA, the Applicant indicated "CSX declined Palmetto Railways' inquiries and has, to date, declined to further negotiate Palmetto Railways' offer to either acquire the trackage rights to or purchase the S-Line" (see Appendix B Palmetto Railways' response to FRA comments, January 29, 2018). As such, the Applicant is unable to gain ownership or operational control of this track from CSX. According to the Applicant, "…the term "operational control" means, simply, complete control over operations […]. Operational control would mean that Palmetto Railways would have the complete, autonomous authority to conduct, perform, manage and maintain all rail operations and activities on or associated with the subject line without the input or directives from third parties, regardless of the line's ownership" (see Appendix B Palmetto Railways' response to FRA comments, January 29, 2018). Further, "[…] if "operational control" or "operational control with ownership" is not achieved, and CSX would maintain ownership or some measure of operational control, then CSX would perpetually maintain a singular advantage over its competitors with respect to pricing, usage, and operational fluidity of train movements at the [ICTF]. Thus, equal access would either be unachievable or subject to the discretion of CSX, thereby impacting a primary characteristic and criteria of the project" (see Appendix B Palmetto Railways' response to FRA comments, January 29, 2018). Equal access is part of the Applicant's defined purpose and need (Section 1.4.1).

In determining whether an alternative is prudent, the FRA may consider whether the alternative would result in any of the following: (1) compromise the project to a degree that is unreasonable for proceeding with the project in light of its stated purpose and need, (2) unacceptable safety or operational problems, (3) after reasonable mitigation the project results in severe social, economic, or environmental impacts; severe disruption to established communities; severe disproportionate impacts on minority or low-income populations; or severe impacts on environmental resources protected under other federal statutes, (4) additional construction, maintenance, or operational costs of an extraordinary magnitude, (5) other unique problems or unusual factors, (6) multiple factors that, while individually minor, cumulatively cause unique problems or impacts of extraordinary magnitude[103].

Alternative 2 would require additional infrastructure when compared with Alternative 1 and other project alternatives. According to the Applicant, the "additional infrastructure alterations and improvements in the City of North Charleston, [are] including, but not limited to:

- the permanent closure of St. John's Avenue, south of the Turnbull gate;
- the construction of an arrival/departure track on the S-line right of way (ROW) in order to connect the NBIF to the existing CSX line and ROW;
- the replacement and reactivation of track within the existing CSX ROW that runs parallel to Spruill Avenue;
- the construction of a new multiple track rail bridge [replacing the existing single-track bridge] within the existing ROW across Noisette Creek;
- improvements to ROW and construction of new trackage east of Spruill and Aragon Avenues to connect to existing North Charleston Terminal Company track along Virginia Avenue; and
- the construction of a [new] rail bridge [to replace the existing inadequate structure] across Noisette Creek between O'Hear and NCTC ROW along Virginia Avenue.

These additional infrastructure improvements would substantially increase the cost of the NBIF [ICTF] to Palmetto Railways" (Jan. 11, 2017, Palmetto Railways – NBIF Responses to Dec. 13, 2016, Corps of Engineers RFAI).

The problems with safety and operations associated with Alternative 2 are described above. Alternative 2 would result in increased impacts to the natural environment over Alternative 1 (Proposed Project) and other project alternatives as it would require a new multiple track bridge over Noisette Creek to replace the existing single-track bridge. Alternative 2 has the most (17.92 acres) impacts to waters of the U.S. (Table 4.5-10) and EFH (Table 4.7-2) compared with Alternative 1 (Proposed Project) and other project alternatives. Related Activities as defined in Section 2.4.9 would be required for all alternatives to connect the ICTF to existing Class I carrier rail networks. For

[103] 23 C.F.R. 774.17

the Related Activity associated with the northern rail connection of Alternative 2, impacts to waters of the U.S. would be greater (an additional 1.99 acres) than Alternative 1 (Proposed Project) and other project alternatives, due to a crossing of Noisette Creek to tie into the NCTC tracks as part of the Related Activity (Table 4.5-9). This additional impact to waters of the U.S. ranges between 4 and 9 acres greater than other project alternatives. The impacts to waters of the U.S. exceed the impact limits for the available Corps' Nationwide Permits (greater than 0.5 acre of non-tidal waters of the U.S.; greater than 0.33 acre of tidal waters of the U.S.), therefore an Individual Permit would be required. This magnitude of impact would be major permanent adverse for all alternatives (Table 4.5-10).

Alternative 2 would result in impacts that are similar in magnitude compared with Alternative 1 (Proposed Project) and other project alternatives for other environmental resources such as vegetation and wildlife (Table 4.4-10), protected species (Table 4.6-4), water quality (Table 4.3-2), hydrology (Table 4.2-2), and geology and soils (Table 4.1-2).

Alternative 2 would result in increased impacts to the human environment over Alternative 1 (Proposed Project). The northern rail connection in Alternative 2 is located in an Environmental Justice community. An Environmental Justice analysis has been conducted (see Section 3.16 and 4.16) to access whether the population meets the criteria for the presence of minority and/or low-income population. This area of potential impact is located within block groups CT 37 BG 3 and CT 55 BG 1 (see Figure 4.18-1). CT 37 BG 3 and CT 55 BG 1 both have Black or African American minority Environmental Justice populations (see Table 3.16-19). In addition, CT 55 BG 1 also has a low-income Environmental Justice population (see Table 3.16-20). As a result, impacts within this section of the study area would result in additional impacts to an Environmental Justice community. Specifically, Alternative 2 would have the most residential relocations (167) compared to Alternative 1 (Proposed Project) (134) and other project alternatives.

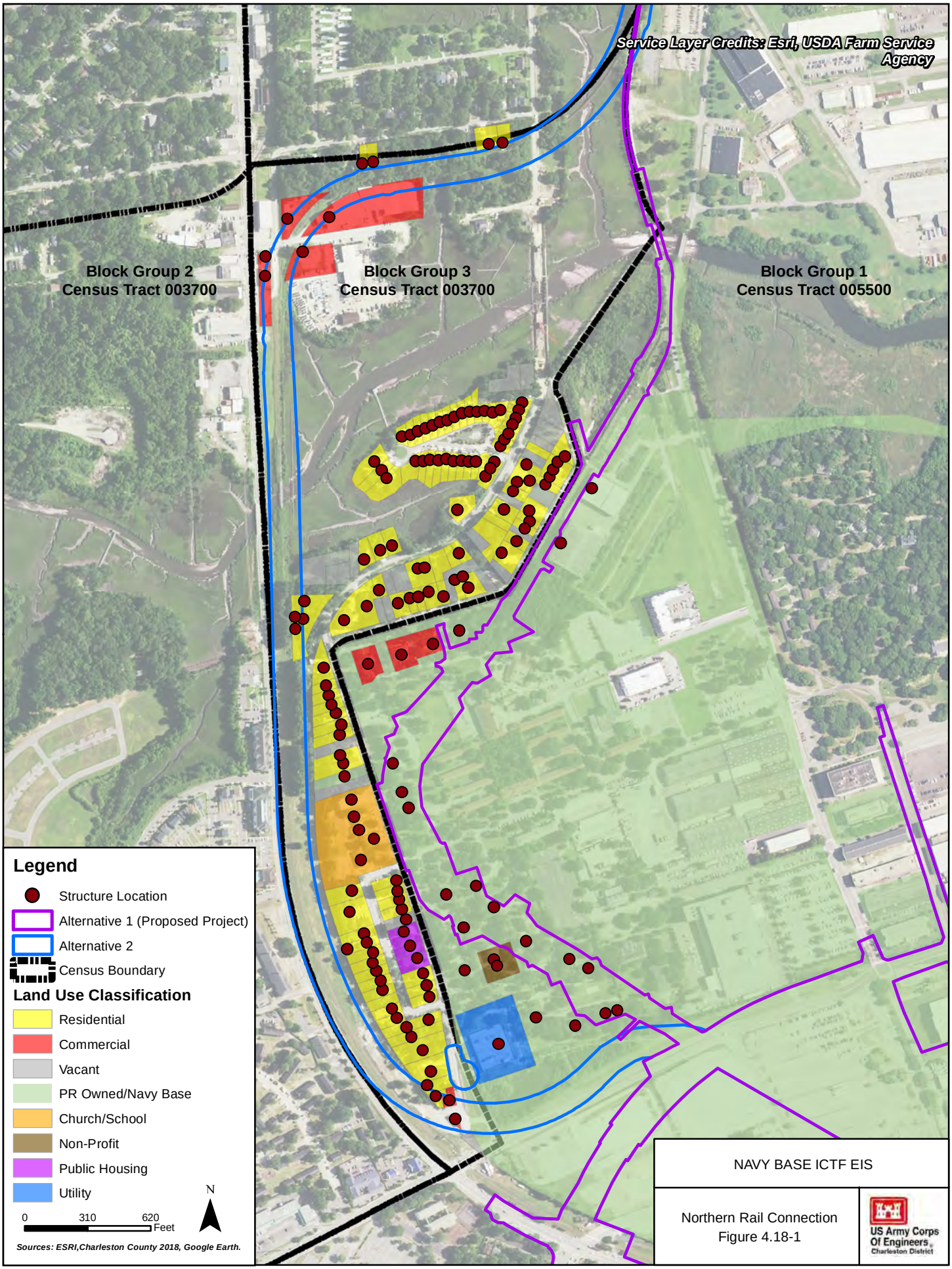
Increased traffic impacts would result under Alternative 2 with an additional at-grade crossing at O'Hear Avenue (Table 4.8-23). The northern rail connection would route trains along residences along St Johns Avenue, Reddin Road, O'Hear Avenue, and Bexley Street and in proximity to Edmund A. Burns Elementary School (outside of the 4(f) study area). Alternative 2 would also result in a major noise impact [above 10 dB(A)] for land uses such as residential homes and St. John Catholic Church and School along the new build rail segment from O'Hear to the ICTF facility (Section 4.12.4.2). Finally, additional socioeconomic impacts would result from the closure of St. Johns Avenue and creation of a cul-de-sac at St. Johns Avenue and McMillian Avenue affecting access and mobility (Section 4.16.4). Further, according to the Applicant, "although the S-line alternative may avoid Section 4(f) properties, it would require displacement of a greater number of residences in areas with a greater percentage of homes from a minority community. In addition to the safety and disruption concerns caused by the S-line route, the acquisition costs associated with the condemnation (or diminution in value) of required commercial and residential structures along the proposed ROW of

the alternative would be significantly higher than the proposed alternative [Alternative 1 (Proposed Project)], where Palmetto Railways already owns a significant portion of the land and structures required for the route, which mostly avoids the impacts to majority minority communities that would be caused by adopting the S-line route" (Jan. 11, 2017, Palmetto Railways – NBIF Responses to Dec. 13, 2016, Corps of Engineers RFAI). For the northern rail connection, Alternative 1 (Proposed Project) would result in impacts to 14 structures, none of which are residential and all Palmetto Railways owned, while Alternative 2 would result in impacts to 17 structures, 8 of which are residential (3 are multi-family).

After review, FRA has determined that Alternative 2 would compromise the Proposed Project to an unreasonable degree, in light of the Proposed Project's purpose and need and would result in unacceptable operational problems. In addition, Alternative 2 results in severe impacts to environmental resources and the human environment, which includes Environmental Justice communities. After considering these factors, FRA has determined that Alternative 2 is not prudent.

As detailed above, Alternative 2 presents safety and operational challenges, specifically sharp curves, that present serious operational challenges. According to the Applicant, "in order to reduce such risk, substantial improvements to the CSX ROW would be required in order to soften these curves. These improvements would increase the cost of the project, as well as cause additional impacts to adjacent communities due to the wider scope of the ROW. Additionally, as stated above, any improvements to CSX ROW require CSX approval, which has not been offered or obtained" (Jan. 11, 2017, Palmetto Railways – NBIF Responses to Dec. 13, 2016, Corps of Engineers RFAI).

Assuming CSX would allow work on the S Line, if Alternative 2 was realigned to more acceptable track curvatures, the realigned Alternative 2 would require all of the same infrastructure improvements noted above, but would result in similar impacts. In addition, an undetermined number of additional residential and commercial structures would have to be removed, all of which are in the Environmental Justice community depicted in Figure 4.18-1. In that Environmental Justice community, there are approximately 155 structures, which include 113 residential, 14 other (Palmetto Railways owned), eight commercial, five church and school, three public housing, two non-profit, and one utility. Several of the residential structures are Section 8 public housing units owned by the North Charleston Housing Authority. These units are referred to as the Phoenix Apartments (16 units) located at 3835 St Johns Avenue. Impacts to or required relocation of this site would clearly result in an impact to the Environmental Justice community.


Service Layer Credits: Esri, USDA Farm Service Agency
Block Group 2
Census Tract 003700
Block Group 3
Census Tract 003700
Block Group 1
Census Tract 005500
Legend
Structure Location
Alternative 1 (Proposed Project)
Alternative 2
Census Boundary
Land Use Classification
Residential
Commercial
Vacant
PR Owned/Navy Base
Church/School
Non-Profit
Public Housing
Utility
N
0
310
620
Feet
Sources: ESRI,Charleston County 2018, Google Earth.
NAVY BASE ICTF EIS
Northern Rail Connection
Figure 4.18-1
US Army Corps Of Engineers
Charleston District
Structure_Removal_Update04242018.mxd JNL 04.24.2018

4.18.13 Summary of Impacts Table

Table 4.18-2 provides a summary of uses of Section 4(f) resources and conversion of Section 6(f) resources within the Study Area.

Table 4.18-2
Summary of Impacts, Section 4(f) Resources and Section 6(f) Resources

Alternative	Section 4(f)[1] and 6(f) Resources[2]
No-Action	No constructive or permanent use of any 4(f) resource. No conversion of 6(f) resources.
1: *Proposed Project: South via Milford / North via Hospital District*	Uses of Section 4(f) resources: permanent use of CNH Historic District from demolition of contributing elements of the historic district and permanent use of the parade ground of the USMC Barracks. No conversion of 6(f) resources.
2: *South via Milford / North via S-line*	Not prudent (per 23 C.F.R. 774.17). See Section 4.18 for analysis and full details.
3: *South via Kingsworth / North via Hospital*	Same as Alternative 1 (Proposed Project).
4: *South via Milford*	Same as Alternative 1 (Proposed Project).
5: *River Center Project Site: South via Milford / North via Hospital District*	Uses of Section 4(f) resources: permanent use of CNH Historic District, CNY Historic District, and USMC Barracks from demolition of contributing elements of the historic district. Use of CNYOQ Historic District from altered setting of the historic district. No conversion of 6(f) resources.
6: *River Center Project Site: South via Kingsworth / North via Hospital*	Same as Alternative 5.
7: *River Center Project Site: South via Milford*	Same as Alternative 5.

1. Section 4(f) resources in the Study Area include: unnamed community park, Chicora-Cherokee Community Park, Charleston Navy Yard (CNY) Historic District, Charleston Naval Hospital (CNH) Historic District, Charleston Navy Yard Officers' Quarters (CNYOQ) Historic District, Ben Tillman Homes, Chicora Elementary School, Ben Tillman Graded School, Six Mile Elementary School, GARCO Residences [Resources 1663 and 1664], Charleston Freedman's Cottages [Resources 4306 and 4309]), and the former U.S. Marine Corps Barracks.
2. Section 6(f) resources in the Study Area include: unnamed community park.

4.18.14 Mitigation

4.18.14.1 Applicant's Proposed Avoidance and Minimization Measures

The Applicant has committed to several measures that avoid and/or minimize potential impacts of Alternative 1 (Proposed Project). These measures are taken from Palmetto Railways Mitigation Plan provided in Appendix N. Some of these measures are required under federal, state, and local permits; others are measures that Palmetto Railways has incorporated into the design and operations of

Alternative 1 (Proposed Project). Each mitigation measure is also designated as one that either helps to avoid an impact or one that minimizes an impact.

- Minimize and avoid impacts to buildings and structures on the CNC, where possible. (Avoidance and Minimization)
- Minimize and avoid direct interaction with historic buildings and structures, where possible. (Avoidance and Minimization)
- Consulted with multiple agencies (state and federal) and historic organizations regarding potential impacts and mitigation for cultural resources. (Minimization)
- Executed a Cultural Memorandum of Agreement (MOA) regarding effects of the Project on historic properties (May 30, 2018) between the Corps, the Federal Railroad Administration (FRA), Palmetto Railways, the Advisory Council on Historic Preservation (ACHP), the Muscogee (Creek) Nation, and the State Historic Preservation Office (SHPO). The Cultural Resources MOA commits the Applicant to the following requirements:
  - The Applicant shall monitor adversely affected historic properties for vibration damage during construction and for a period of 2 years during operation of the facility. If damage does occur during construction, the Applicant or its contractors shall be responsible for repairs of vibration damage to historic properties, in coordination with the Corps and SHPO and in accordance with the Secretary of the Interior Standards. (Minimization)
  - Construction activities shall occur in accordance with local noise regulations, policies, and guidance to minimize adverse noise effects. (Minimization)
  - The Applicant will develop and erect three state historical markers regarding the history of the USMC Barracks, CNH, and CNYOQ within 2 years of the execution of the Cultural Resources MOA and in coordination with SHPO. (Minimization)
  - The Applicant shall prepare a nomination of the USMC Barracks to the National Register of Historic Places (if deemed appropriate by SHPO) within 1 year of the execution of the Cultural Resources MOA. (Minimization)
  - The Applicant shall establish the Charleston Naval Base Historical Trust (CNB Historical Trust). The CNB Historical Trust governing board shall consist of at least one representative from the City of North Charleston, each concurring party, the Redevelopment Authority, Palmetto Railways, and SHPO. (Minimization)
  - The Applicant shall provide funding in the amount of $2 million for the CNB Historical Trust for use in preserving and rehabilitating the Charleston Naval Hospital and USMC Barracks. (Minimization)
  - The Applicant shall fund an additional historic resource survey of the study area under the oversight of SHPO, which is intended to update and catalogue changes to the properties listed in the Programmatic Agreement for use by the signatories on a going forward basis. (Minimization)
  - The Applicant shall lease the CNH and/or USMC Barracks to the CNB Historical Trust for a nominal fee as long as they are actively implementing rehabilitation and preservation

efforts. A transfer of title shall be provided upon satisfaction of certain conditions. (Minimization)

- The Applicant shall work with the CNB Historical Trust to place appropriate restrictive covenants on the CNH and/or USMC Barracks to reasonably protect the historic and cultural value of such structures for any rehabilitation or use to be held by the CNB Historical Trust if such properties are transferred or leased to any third party (or held by an appropriate third party), if title is retained by the CNB Historical Trust. Rehabilitation and reuse may include use for residential, commercial, office, mixed-use, and retail space and which may include an exhibit of historic or cultural interest. (Minimization).
- The Applicant will cause rehabilitation and reuse of the Power House (CNC Building 32 – Central Power Plant), which may include use for commercial, office, and retail space which may include an exhibit or other recognition of CNC objects of historical, scientific, artistic, or cultural interest, including but not limited to the transfer of title to any appropriate entity to accomplish these tasks upon reasonable request, subject to SHPO's prior consent approval. The Applicant has sold the Powerhouse to a private ownership entity with the stipulation that it be redeveloped within 4 years of purchase or returned to Palmetto Railways. (Minimization)
- The Applicant shall follow post-review discovery requirements and suspend construction operations if cultural resources are found and notify relevant parties for consultation including the Corps, SHPO, Muscogee (Creek) Nation, Catawba Indian Nation, and the FRA. (Minimization).
- The Applicant shall prepare an Annual Report documenting actions carried out in the MOA and distribute to the signatories and concurring parties. (Minimization)

The complete list of Applicant-proposed avoidance and minimization measures for the Navy Base ICTF is provided in Chapter 6, Table 6.1.

4.18.14.2 Additional Potential Mitigation Measures

Alternative 1 (Proposed Project) and Alternatives 3-7 would result in an Adverse Effect to Section 106 historic properties, and as such, a use of Section 4(f) resources. The Corps' proposed mitigation measures to mitigate for these Adverse Effects (and use) include:

- The Applicant will comply with the terms, conditions, and mitigative actions outlined in the Cultural Resources MOA.
- If any previously unknown historic, cultural, or archaeological remains or artifacts are discovered during construction, the District Engineer for the Charleston District, U.S. Army Corps of Engineers, must be notified immediately. Construction activity in the area should be avoided until required coordination has occurred.

Additional avoidance, minimization, and mitigation may be considered by the Corps in its decision-making process. Final mitigation measures may be adopted as conditions of the DA permit and documented in the Record of Decision (ROD).

4.18.15 Least Overall Harm Analysis

Since FRA has determined there are no feasible and prudent alternatives that would avoid a use of a Section 4(f) resource, FRA has conducted an analysis to determine which alternative causes the least overall harm to Section 4(f) resources. Table 4.18-3 and the following discussion identifies the least overall harm alternative using the following factors:

- The ability to mitigate adverse impacts to each Section 4(f) property (including any measures that result in benefits to the property);
- The relative severity of the remaining harm, after mitigation, to the protected activities, attributes, or features that qualify each Section 4(f) property for protection;
- The relative significance of each Section 4(f) property;
- The views of the official(s) with jurisdiction over each Section 4(f) property;
- The degree to which each alternative meets the purpose and need for the project;
- After reasonable mitigation, the magnitude of any adverse impacts to resources not protected by Section 4(f); and
- Substantial differences in costs among the alternatives.

4.18.15.1 Alternative 1: Proposed Project: South via Milford / North via Hospital District

Alternatives 1, 3, and 4 have the same design of the northern rail connection and therefore would have the same degree of construction and operation related impacts to the Section 4(f) resources. The alternatives differ in the design of the southern rail connection, which would not result in uses to any Section 4(f) resources. Alternatives 1, 3, and 4 meet the purpose and need for the project. The magnitude of any adverse impacts to resources (after reasonable mitigation) not protected by Section 4(f) would be similar for all alternatives. Cost estimates have not been developed for the alternatives. Since there is similarity between Alternatives 1, 3, and 4 in the impact to Section 4(f) resources, meeting purpose and need, magnitude of any adverse impacts to resources, and the lack of cost estimate information, the least overall harm alternative analysis is based on the other factors described in 23 C.F.R. 774.3(c).

Uses of Section 4(f) resources associated with Alternative 1 (Proposed Project) include a permanent use of CNH Historic District from demolition of contributing elements of the historic district and permanent use of the parade ground of the USMC Barracks. Specifically, the northern rail connection passes through the southwest corner of the parade ground of the USMC Barracks and then passes through or very close to several buildings in the CNH Historic District (CNC Buildings M-5, M-6/M-7, M-8/M-9, AA/LL, BB/CC, DD/EE, FF/GG, HH/II, JJ/KK, 762, and 763). The northern rail connection will separate CNC Buildings M-6/M-7, M-8/M-9, FF/GG, HH/II, JJ/KK, and 758-763 from the remaining elements of the CNH. All of these buildings are contributing elements of the CNH Historic District, and originally served as residences for hospital staff. The northern rail connection also

would pass through the southwest corner of the USMC Barracks, altering the setting of this building and reducing the open lawn that served as a parade ground when the building housed the USMC detachments assigned to Navy Base Charleston.

The CNH Historic District is an intact collection of thirty-two buildings located in the northwest corner of the former Charleston Navy Base. This collection of extant buildings provides a good representation of the significance of the Charleston Naval Hospital and forms a cohesive district with a high degree of integrity (Appendix G - NRHP CNC Registration Form). The former USMC Barracks (CNC Building M17) on the CNC stands north of a grassed lawn on Marine Street. The lawn served as a parade ground when the barracks was occupied. Building M17 was built in 1910 and served as the residence of USMC enlisted personnel throughout the operation of Navy Base Charleston. In a letter dated July 7, 2016, the SHPO stated, "For six of the seven alternatives, the report states that adverse effects on historic properties will occur and will require mitigation, as well as possible monitoring for long-term effects. Alternative 2 is the only alternative that may avoid adverse effects to historic properties. We concur with the report that if an alternative that causes adverse effects is selected, a MOA will need to be developed outlining mitigation and possible monitoring of indirect effects."

Adverse impacts to each Section 4(f) property will be mitigated as per the Cultural Resources MOA (Appendix G), which was fully executed on May 30, 2018. The Cultural Resources MOA addresses adverse impacts to the CNH Historic District and the USMC Barracks. Details of the MOA are included in Appendix G; however, the Cultural Resources MOA generally plans for monitoring of vibratory effects, ensures compliance with noise rules, erects state historical markers, nominates the USMC Barracks to the National Register of Historic Places, requires an additional historic resource survey, and funds the CNB Historical Trust for use in preserving and rehabilitating the CNC and surrounding cultural resources. Currently demolition, vandalism and unsympathetic alterations have affected the historic characteristics of some of the individual resources on the CNC (Appendix G – NRHP CNC Registration Form); therefore, the implementation of the stipulations in the Cultural Resources MOA will improve conditions in the remaining elements of the CNC and surrounding cultural resources. The relative severity of the remaining harm, after mitigation, to the Section 4(f) properties is unknown now; however, monitoring of vibratory effects is included in the Cultural Resources MOA. The magnitude of impacts to 4(f) resources is less than Alternative 5 (as discussed below); therefore, Alternative 1 (Proposed Project) is the least overall harm alternative.

4.18.15.2 Alternative 2: South via Milford / North via S-line

Because Alternative 2 is not prudent per 23 C.F.R. 774.17, a least harm analysis is not required and Alternative 2 is not discussed further in this section.

4.18.15.3 Alternative 3: South via Kingsworth / North via Hospital

Impacts to Section 4(f) resources associated with Alternative 3 are the same as Alternative 1 (Proposed Project); therefore, an additional least harm analysis is not required.

4.18.15.4 Alternative 4: South via Milford

Impacts to Section 4(f) resources associated with Alternative 4 are the same as Alternative 1 (Proposed Project); therefore, an additional least harm analysis is not required.

4.18.15.5 Alternative 5: River Center Project Site: South via Milford / North via Hospital District

Alternatives 5, 6, and 7 have similar design of the northern rail connection (except Alternative 7's northern rail connection stops short of Noisette Creek) and therefore would have the same degree of construction and operation related impacts to the Section 4(f) resource. The alternatives differ in the design of the southern rail connection, which would not result in uses to any Section 4(f) resources. Alternatives 5, 6, and 7 meet the purpose and need for the project. The magnitude of any adverse impacts to resources (after reasonable mitigation) not protected by Section 4(f) would be similar for all alternatives. Cost estimates have not been developed for Alternatives 2-7. Since there is similarity between Alternatives 5, 6 and 7 in the impact to Section 4(f) resources, meeting purpose and need, magnitude of any adverse impacts to resources, and the lack of cost estimate information, the least overall harm alternative analysis is based on the other factors described in 23 C.F.R. 774.3(c).

Uses of Section 4(f) resources associated with Alternative 5 include a permanent use of CNH Historic District, CNY Historic District, and USMC Barracks from demolition of contributing elements of the historic districts. Specifically, fourteen elements of the CNH Historic District lie completely within Alternative 5. These elements include CNC Buildings M-3A, M6/M7, NH-45, NH-46, NH-47, NH-49, NH-51, NH-53, NH-55, NH-61, NH-68, and 758 (treatment facilities, storehouses, residences, and a garage that contribute to the NRHP eligibility of the district); and CNC Building NH-62 (a storehouse) that does not contribute. Four elements of the CNY Historic District lie within Alternative 5. These elements are CNC Buildings 64, NSC 66, NSC 67 (all three are storehouses that contribute to the NRHP eligibility of the district), and CNC Building 1655 (a modern storage building that does not contribute to the district).

The CNH Historic District and USMC Barracks have the same significance as stated in (Section 4.18.13.1). The CNY Historic District was listed in the NRHP in 2006 and contains 86 buildings, structures, and objects that are a cohesive representative example of permanent naval industrial construction that reflect the major trends in United States naval development between 1900 and 1945. The views of the SHPO with jurisdiction over each Section 4(f) property is included in (Section 4.18.13.1). Details of how adverse impacts to each Section 4(f) property in Alternative 5 will be mitigated is unknown, but could be assumed to be similar to the details provided in the Cultural

Resources MOA. However, the magnitude of impacts to 4(f) resources is greater than Alternative 1 (Proposed Project); therefore Alternative 5 is not the least overall harm alternative.

4.18.15.6 Alternative 6: River Center Project Site: South via Kingsworth / North via Hospital

Impacts to Section 4(f) resources associated with Alternative 6 are the same as Alternative 5; therefore, an additional least harm analysis is not required.

4.18.15.7 Alternative 7: River Center Project Site: South via Milford

Impacts to Section 4(f) resources associated with Alternative 7 are the same as Alternative 5; therefore, an additional least harm analysis is not required.

Table 4.18-3
Least Overall Harm Analysis

Alternative	Mitigation	Harm After Mitigation	Significance	Views of Officials	Purpose and Need	Adverse Impacts to other Resources	Cost Differences
No-Action	N/A	N/A	N/A	N/A	Does not meet purpose and need	N/A	N/A
1: Proposed Project: South via Milford / North via Hospital District	See Cultural MOA.	Unknown	The CNH Historic District is an intact collection of thirty-two buildings located in the northwest corner of the former Charleston Navy Base. This collection of extant buildings provides a good representation of the significance of the Charleston Naval Hospital and forms a cohesive district with a high degree of integrity (Appendix G - NRHP CNC Registration Form). The former USMC Barracks (CNC Building M17) on the CNC stands north of a grassed lawn on Marine Street. The lawn served as a parade ground when the barracks was	Letter dated July 7, 2016, from SHPO: dated July 7, 2016, the SHPO stated, "For six of the seven alternatives, the report states that adverse effects on historic properties will occur and will require mitigation, as well as possible monitoring for long-term effects. Alternative 2 is the only alternative that may avoid adverse effects to historic properties. We concur with the report that if an	Meets purpose and need	See Table 4.18-4	Unknown

Alternative	Mitigation	Harm After Mitigation	Significance	Views of Officials	Purpose and Need	Adverse Impacts to other Resources	Cost Differences
			occupied. Building M17 was built in 1910 and served as the residence of USMC enlisted personnel throughout the operation of Navy Base Charleston.	alternative that causes adverse effects is selected, a MOA will need to be developed outlining mitigation and possible monitoring of indirect effects."			
3: South via Kingsworth / North via Hospital	N/A	Unknown	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1	See Table 4.18-4	Unknown
4: South via Milford	N/A	Unknown	Same as Alternative 1	Same as Alternative 1	Same as Alternative 1	See Table 4.18-4	Unknown
5: River Center Project Site: South via Milford / North via Hospital District	N/A	Unknown	The CNH Historic District and USMC Barracks have the same significance as stated above for Alternative 1. The CNY Historic District was listed in the NRHP in 2006 and contains 86 buildings, structures, and objects that are a cohesive representative example of permanent naval industrial construction that reflect the major trends in United States naval development between 1900 and 1945.	Same as Alternative 1	Meets purpose and need	See Table 4.18-4	Unknown
6: River Center Project Site: South via Kingsworth / North via Hospital	N/A	Unknown	Same as Alternative 5	Same as Alternative 1	Same as Alternative 5	See Table 4.18-4	Unknown
7: River Center Project Site: South via Milford	N/A	Unknown	Same as Alternative 5	Same as Alternative 1	Same as Alternative 5	See Table 4.18-4	Unknown

Source: Atkins 2018.

4.18.15.8 Summary of Least Overall Harm Analysis

The magnitude of impacts to 4(f) resources for Alternative 1 (Proposed Project), 3, and 4 (Proposed Project Alternatives) are less than Alternatives 5, 6, and 7 (River Center Alternatives). Specifically, uses of Section 4(f) resources by the Proposed Project Alternatives include a permanent use of the CNH Historic District from demolition of contributing elements to the historic district and the permanent use of the parade ground of the USMC Barracks, whereas uses of Section 4(f) resources for River Center Alternatives include the permanent use of the CNH Historic District, CNY Historic District, and USMC Barracks from demolition of contributing elements to the historic districts and the use of the CNYOQ Historic District from altered setting of the historic district. Therefore, the Proposed Project Alternatives have the least overall harm to Section 4(f) resources. Between the Proposed Project Alternatives, impacts to Section 4(f) resources are the same because the design of the northern rail alternative is the same in each alternative. However, the alternatives differ in the magnitude of any adverse impacts to resources not protected by Section 4(f) after reasonable mitigation.

Since the magnitude of impacts to 4(f) resources for Alternative 1 (Proposed Project), 3, and 4 (Proposed Project Alternatives) are less than Alternatives 5, 6, and 7 (River Center Alternatives), the magnitude of any adverse impacts to resources not protected by Section 4(f) were compared for Proposed Project Alternatives. The following resources have impacts that are similar between the Proposed Project Alternatives: geology and soils, hydrology, vegetation and wildlife, water quality, EFH, air quality, and climate change (Table 2.5-1). Impacts for remaining resources are presented in Table 4.18-4 and discussed below. For waters of the U.S., Alternative 3 has the least impact (11.80 acres), followed by Alternative 1 (Proposed Project) (15.84 acres), and Alternative 4 (15.98 acres) (Section 4.5.11). Impacts to protected species are similar between Alternative 1 (Proposed Project) and Alternative 3; however, the potential for impacts associated with Alternative 4 are expected to be less than Alternative 1 and 3 because there would be no in-water construction over Noisette Creek (Section 4.6.11).

Impacts to traffic and transportation for Alternative 3 and Alternative 4 are the same as Alternative 1 (Proposed Project) for I-26, I-526, US 17, and North Charleston intersections (Section 4.8.11). For impacts due to at-grade rail crossings, Alternative 1, 3, and 4 would result in moderate, permanent adverse impact on the opening year 2018 and major, permanent adverse impact for design year 2038 at-grade crossing operations as Proposed Project alternatives would increase the frequency and number of train occurrences in North Charleston. Alternative 1 (Proposed Project) would have one new at-grade crossing, while Alternative 3 would have two (Meeting Street and Spruill Avenue at Kingsworth Avenue). Alternative 4 would have double (8/day) the number of train occurrences as Alternative 1 on the southern rail connection because all trains would enter and exit the ICTF utilizing a parallel southern rail connection (Section 4.8.11).

Alternative 1 (Proposed Project) and Alternative 4 have similar impacts to land use and infrastructure. Alternative 3 is similar to Alternative 1 (Proposed Project) except off-site roadway and rail improvements would cause the demolition of approximately 2 more structures (Section 4.9.11).

For visual resources, impacts are similar between Alternative 1 (Proposed Project) and Alternative 4; however, there would be no renovated rail bridge over Noisette Creek and a negligible effect resulting from nighttime train head lamps due to lack of curvatures (and affected residences) on the southern arrival/departure tracks (Section 4.11.11). Alternative 1 (Proposed Project) and Alternative 3 would result in a minor, permanent adverse impact from light and glare associated with nighttime train head lamps in areas of the northern rail connection where train headlights could shine into residential windows at points where the track curves (Section 4.11.3).

Impacts from noise are similar among Alternative 1 (Proposed Project), Alternative 3, and Alternative 4 for traffic noise, construction noise, and operational noise (Section 4.12.11). Noise impacts for Alternative 4 differ slightly from Alternative 1 (Proposed Project) as rail noise impacts would be concentrated in the southern rail connection, but the magnitude of impacts is the same (minor to moderate impact [3 to 10 dB(A)] along several segments). Vibration impacts for Alternative 3 differ slightly from Alternative 1 (Proposed Project) as there is potential impact for one or two receptors near the curved track at Kingsworth Avenue; all other impacts are negligible (below 80 VdB). Alternative 4 would have no additive noise impacts. Alternative 1 (Proposed Project) and Alternative 3 would have an additive noise impact from traffic and rail noise in the rail segment from North of Virginia Avenue to Avenue B (negligible) and St. Johns Avenue between O'Hear Avenue and McMillan Avenue (minor to moderate) (Section 4.12.11).

For HTRW, impacts from Alternative 4 are similar to Alternative 1 (Proposed Project). Alternative 3 differs from Alternative 1 (Proposed Project) in that there are fewer contaminated sites requiring investigation, approximately 10 fewer buildings requiring demolition/renovation/potentially asbestos containing materials and metals-based paints, and 12 fewer sites with potential soil contamination (Section 4.15.11).

Impacts to socioeconomics and environmental justice from Alternative 4 are similar to Alternative 1 (Proposed Project) except for localized moderate impacts to emergency response from Alternative 4. Alternative 3 differs from Alternative 1 (Proposed Project) in that approximately eight additional residential displacements would occur, two new at-grade crossings would be located in the vicinity of Kingsworth Avenue at Meeting Street and Spruill Avenue, there would be localized moderate impacts to emergency response, and a few businesses north of Milford Street would be avoided (Section 4.16.11).

After balancing the factors included in a least overall harm analysis, Alternative 1 (Proposed Project) has the least overall harm in light of the Section 4(f) statute's preservation purpose and identified appropriate measures to minimize harm, and is thus the least overall harm Alternative. Alternative 1

(Proposed Project) incorporates all possible planning to minimize harm to Section 4(f) properties, as documented in the above evaluation. Alternative 1 (Proposed Project) has been designed to minimize harm to Section 4(f) resources and to minimize impacts to other resources such as environmental justice communities. Mitigation measures in the Cultural Resources MOA (Appendix G) will be used to further address impacts to Section 4(f) properties that could not be avoided or minimized. Although Alternative 1 (Proposed Project) has greater wetland impact than Alternative 3, the minimization of impacts to the environmental justice community outweighs the remaining harm, after mitigation, to Section 4(f) properties. Substantial mitigation measures included under Alternative 1 (Proposed Project), developed in consultation with Consulting Parties and described in the MOA (Appendix G), will mitigate the impacts to Section 4(f) resources resulting from Alternative 1 (Proposed Project).

Table 4.18-4
Summary of Potential Impacts by Alternative and Environmental Resource

Resource Area	Alternative 1 (Proposed Project)	Alternative 3	Alternative 4
Waters of the United States	Major adverse impacts to Waters of the U.S. Direct impacts from fill/shading activities during construction would result in the permanent impact of approximately 15.84 acres of Waters of the U.S., including 6.65 acres of tidal salt marsh, 8.01 acres of freshwater wetlands, 1.14 acres of tidal open waters, and 0.04 acre of non-tidal open waters.	Major adverse impacts to Waters of the U.S. Similar to Alternative 1 (Proposed Project) but would result in the permanent impact of approximately 11.81 acres of Waters of the U.S. including 6.66 acres of tidal salt marsh, 3.86 acres of freshwater wetlands, 1.14 acres of tidal open waters, and 0.15 acres of non-tidal open waters.	Major adverse impacts to Waters of the U.S. Similar to Alternative 1 (Proposed Project) but would result in the permanent loss of approximately 15.98 acres of Waters of the U.S. including 6.66 acres of tidal salt marsh, 8.22 acres of freshwater wetlands, 1.03 acres of tidal open waters, and 0.07 acre of non-tidal open waters.
Protected Species	Negligible effect on habitat alteration/fragmentation of Protected Species with implementation of avoidance and minimization measures during construction activities. Potential exists for direct and indirect short-term species displacement effects during construction; but negligible with implementation of Applicant's prescribed avoidance and minimization measures in combination with the additional Corps mitigation measures listed in Section 4.6.12.	Same as Alternative 1 (Proposed Project).	Habitat alteration/fragmentation impacts would be same as Alternative 1 (Proposed Project). Species displacements impacts would be similar to Alternative 1 (Proposed Project) but in-water construction activities would be limited to Shipyard Creek.

Resource Area	Alternative 1 (Proposed Project)	Alternative 3	Alternative 4
Traffic and Transportation	Negligible short-term impact during construction to I-26, I-526, US 17, and at-grade rail crossings; minor short-term adverse impact during construction to North Charleston intersections. Negligible permanent impact on majority of I-26 corridor in the opening year 2018 and design year 2038; beneficial or adverse permanent impact on a few segments due to a LOS change. Negligible permanent impact on majority of I-526 corridor in the opening year 2018 and design year 2038; beneficial or adverse permanent impact on a few segments due to a LOS change. Negligible permanent impact on the opening year 2018 and design year 2038 US 17 operations as Alternative 1 (Proposed Project) would have minimal influence on the US 17 traffic volumes. Minor permanent adverse impact on the opening year 2018 and design year 2038 North Charleston intersection operations. Traffic patterns would change but slightly more intersections would degrade than improve operations. Moderate permanent adverse impact on the opening year 2018 and major permanent adverse impact design year 2038 at-grade crossing operations as the Proposed Project would increase the frequency and number of train occurrences in North Charleston. Additionally, one new at-grade crossing would be created.	Same as Alternative 1 (Proposed Project) except for: different number of new at-grade rail crossings, locations (2-Meeting Street and Spruill Avenue at Kingsworth Avenue), and operations.	Same as Alternative 1 (Proposed Project) except for: Impacts to at-grade rail crossings are similar to Alternative 1 (Proposed Project) but with different at-grade rail crossing locations and operations as this Alternative would have double (8/day) the number of train occurrences on the southern rail connection as Alternative 1.

Resource Area	Alternative 1 (Proposed Project)	Alternative 3	Alternative 4
Land Use and Infrastructure	Major permanent impact on land use change. Rezoning of the residential area along the western boundary of the ICTF and rezoning of portions of the project site from Institutional future land use. Comprehensive Plan amendment also required. Major permanent impact on displacement of structures. Approximately 88 non-Palmetto Railways owned or specially designated structures would have to be displaced or demolished. Additional off-site roadway and rail improvements would cause the displacement of approximately 19 structures. Negligible short-term impact on infrastructure and utilities as any interruption of service to local area residents and businesses would be less than 12 hours.	Similar to Alternative 1 (Proposed Project) except additional off-site roadway and rail improvements would cause the demolition of approximately 21 structures.	Similar to Alternative 1 (Proposed Project)
Cultural Resources	Adverse effect on Charleston Naval Hospital (CNH) Historic District from demolition of contributing elements of the Historic District, and altered setting of the District. No effect on Charleston Naval Yard (CNY) Historic District, Charleston Navy Yard Officer's Quarters (CNYOQ) Historic District, or other historic properties outside the Charleston Naval Complex (CNC). Adverse effect from altered setting for U.S. Marine Corps (USMC) Barracks.	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project)

Resource Area	Alternative 1 (Proposed Project)	Alternative 3	Alternative 4
Visual Resources and Aesthetics	Minor, permanent adverse impact to scenic views from renovation and slight elevation of existing rail over Noisette Creek along Noisette Boulevard. Major, permanent adverse impact to scenic resources from the removal of contributing elements of the CNH Historic District and mature trees, as well as the altered setting of the USMC Barracks. Major, permanent adverse impact to visual quality and character from demolition of contributing elements of the CNH historic district and altered setting of the USMC Barracks. Moderate, permanent adverse impact from new vertical elements in the VRSA (wide-span gantry cranes and high mast lighting). Minor, permanent adverse impact to visual quality and character from renovation and slight elevation of existing rail bridge) over Noisette Creek. Negligible impact to visual quality and character from the arrival/departure tracks to the south of the ICTF. Negligible impact to visual quality and character from the realignment of Hobson Ave/Bainbridge Ave and construction of the drayage road; minor, permanent adverse impact from the removal of the Viaduct Road Overpass. Minor, permanent adverse impact to visual quality and character from the construction of the earthen berm adjacent to the Chicora-Cherokee neighborhood. Minor, permanent adverse impact from light and glare associated with the new 85-foot tall mast lighting that will be illuminated from dusk to dawn, and from nighttime train head lamps.	Same as Alternative 1 (Proposed Project).	No impact to scenic views. Same impacts to scenic resources as Alternative 1 (Proposed Project). Similar impacts to visual quality and character as described under Alternative 1 (Proposed Project), but without renovated rail bridge over Noisette Creek. Similar impacts from light and glare as those described under Alternative 1 (Proposed Project), but negligible effect resulting from nighttime train head lamps due to lack of curvatures (and affected residences) on the southern arrival/departure tracks.

Resource Area	Alternative 1 (Proposed Project)	Alternative 3	Alternative 4
Noise and Vibration	Negligible traffic noise impacts with negligible beneficial effect for several streets. Minor to moderate rail noise impact along several segments due to increased rail activity and new track builds. Negligible rail vibration impact. Minor to moderate construction noise impact in the vicinity of noise berm. Minor to Moderate exterior daytime operational noise impact and major exterior nighttime operational noise impact. Refer to subsection 4.12.3.5 for information on exterior to interior noise reduction. Interior noise levels are not anticipated to disrupt sleep. Negligible additive noise impacts (Virginia Avenue - Traffic + Rail Noise) and minor to moderate additive noise impacts (St. Johns Avenue - Traffic + Rail Noise)	Similar to Alternative 1 (Proposed Project), except additional potential for rail vibration impact for one or two receptors near the curved track at Kingsworth Avenue.	Similar to Alternative (Proposed Project) except minor to moderate rail noise impact along several segments due to increased rail activity in the southern alignment.

Resource Area	Alternative 1 (Proposed Project)	Alternative 3	Alternative 4
Hazardous, Toxic, and Radioactive Waste	Eight active monitoring sites with contamination (15 requiring investigation) for a total of 23. Approximately 107 buildings requiring demolition/ renovation. Potential minor adverse impacts to soil (contamination) from excavation activities (after compliance with the Navy's permitting process, RCRA Permit #SC0 170 022 560 and all applicable laws for testing and disposal of contaminated soils). 24 potentially contaminated sites would be impacted. Potential minor adverse impacts to groundwater (contamination) from dewatering in excavation areas (after compliance with the Navy's permitting process, RCRA Permit SC0 170 022 560, and all applicable laws for treatment and disposal of dewatering effluent. Multiple areas with groundwater monitoring would be impacted and potentially contaminated sites would be impacted. No anticipated involvement with the Macalloy Superfund Site. Potential minor adverse impact from demolition of approximately 107 structures with asbestos and/or metals-based paints (after survey and applicable abatement measures). Potential for minor and/or major adverse impacts from accidental spills resulting from use of above ground storage tanks (ASTs) (diesel fuel), storage of other minor amounts of solvents on the premises, and from containers containing hazardous materials.	Similar to Alternative 1 but with: Eight active monitoring sites with contamination, three requiring investigation for a total of 11. Approximately 109 buildings requiring demolition/renovation. 13 fewer potentially contaminated sites would be impacted. Impact approximately 109 buildings through demolition of structures with asbestos and/or metals-based paints (after survey and applicable abatement measures).	Similar to Alternative 1

Resource Area	Alternative 1 (Proposed Project)	Alternative 3	Alternative 4
Socio-economics and Environ-mental Justice	Major short-term and indirect long-term benefit to local and regional economy; minor indirect adverse impact to local businesses adjacent to project (access, relocations, and aesthetics). Minor short-term adverse impacts from construction; minor adverse access impacts for Chicora-Cherokee residents; minor adverse mobility impacts from new at-grade rail crossings and increased delay at intersections and at-grade crossings. Potential minor adverse emergency response time impacts due to delay at at-grade crossings compared to No-Action however, alternate routes are available. Potential minor safety impacts due to additional conflict points at Meeting Street at-grade crossing. Negligible impact from displacement of Sterett Hall and surrounding arts facilities as they would be displaced with or without Alternative 1 (Proposed Project). Major adverse impacts to Chicora-Cherokee neighborhood from approximately 134 residential displacements; minor to moderate adverse impact from visual and noise impacts. Minor indirect impact from exacerbation of housing and population loss. Minor adverse impacts to Olde North Charleston and minor to moderate impacts to Howard Heights, Union Heights, and Windsor neighborhoods from noise. Negligible impact in terms of new barriers to the elderly and handicapped. Environmental Justice considerations are applicable: Major adverse impact from displacement of approximately 134 residential units would result in a disproportionately high and adverse impact to Chicora-Cherokee neighborhood.	Similar to Alternative 1 (Proposed Project) except: Businesses north of Milford Street would be avoided. Location of 2 new at-grade crossings are located at Meeting Street and Spruill Avenue at Kingsworth Avenue. Localized moderate impacts to emergency response. Approximately 8 additional residential displacements from Union Heights neighborhood.	Similar to Alternative 1 (Proposed Project). except: Localized moderate impacts to emergency response.

Resource Area	Alternative 1 (Proposed Project)	Alternative 3	Alternative 4
Section 4(f)/6(f)	Uses of Section 4(f) resources: permanent use of CNH Historic District from demolition of contributing elements of the historic district and permanent use of the parade ground of the USMC Barracks. No conversion of 6(f) resources.	Same as Alternative 1 (Proposed Project)	Same as Alternative 1 (Proposed Project).

Source: Atkins 2018.