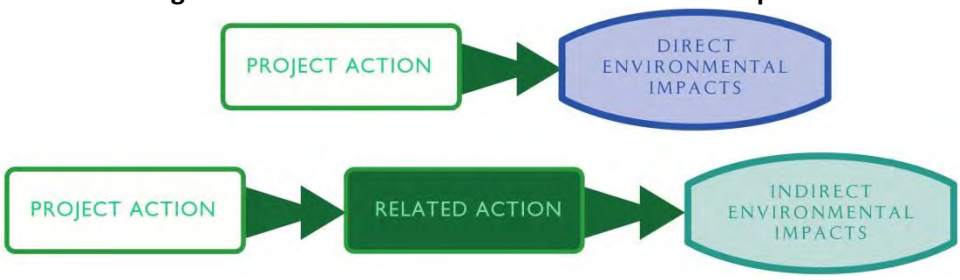
## 3.15 INDIRECT AND CUMULATIVE IMPACTS

### 3.15.1 Regulatory Context and Methodology

NEPA legislation does not mention indirect or cumulative impacts; however, the Council on Environmental Quality (CEQ) regulations for implementing NEPA address federal agency responsibilities applicable to indirect and cumulative considerations, analysis, and documentation requirements (40 CFR 1508.25) for the environmental consequences section of an EIS (40 CFR 1502.16) (FHWA, 2014). In addition to CEQ's regulations, indirect and cumulative effects assessment is conducted in accordance with the requirements and processes outlined in 23 CFR Part 771, FHWA Interim Guidance: Indirect and Cumulative Impacts in NEPA (2003), FHWA Position Paper on Secondary and Cumulative Impact Assessment (1992), FHWA's Questions and Answers on Considering Indirect and Cumulative Impacts in the NEPA Process (2015), the Transportation Research Board's (TRB) National Cooperative Highway Research Program (NCHRP) Report 466: Desk Reference for Estimating the Indirect Effect of Proposed Transportation Projects (TRB, 2002), NCHRP Project 25-25 Task 22: Land Use Forecasting for Indirect Impacts Analysis (TRB, 2005), NCHRP Project 25-25 Task 11: Secondary/Indirect and Cumulative Effects Analysis (TRB, 2006), as well as CEQ's Considering Cumulative Effects under the National Environmental Policy Act (1997) and Guidance on the Consideration of Past Actions in Cumulative Effects Analysis (2005).

CEQ defines indirect effects as "…effects which are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable (40 CFR 1508.8[b]). 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 CFR 1508.8[b]). These induced actions are those that may or may not occur with the implementation of the proposed project, as illustrated in **Figure 3-18**.

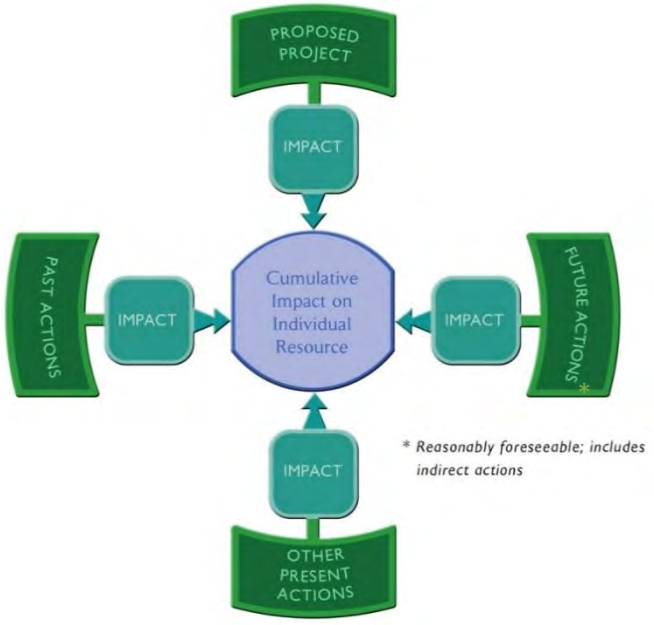
**Figure 3-18: Direct vs. Indirect Environmental Impact**




*Source: Questions and Answers Regarding the Consideration of Indirect and Cumulative Impacts in the NEPA Process, FHWA (2014).*

CEQ defines cumulative effects (or impacts) as, "…the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time" (40 CFR 1508.7). Cumulative effects include the total of all impacts, direct and indirect, experienced by a particular resource that have occurred, are occurring, and/or would likely occur as a result of any action or influence, including effects of a federal activity (EPA, 1999), as illustrated in **Figure 3-19**.

**Figure 3-19: Cumulative Impacts**




*Source: Questions and Answers Regarding the Consideration of Indirect and Cumulative Impacts in the NEPA Process, FHWA (2014).*

**Figure 3-20** presents the Induced Growth ICE Study Area boundaries within which the potential impacts of induced growth are most likely to occur, as described in the indirect effects section. Specific ICE Study Areas were developed for each of the following resources:

- **Socioeconomic Resources:** The Socioeconomic Resources ICE Study Area was established to analyze indirect effects to land use, socioeconomics, and parks/recreational resources/open space. The Socioeconomic Resources ICE Study Area includes those Census Block Groups that lie directly within or partially within the direct impacts study area and the Induced Growth ICE Study Area (**Figure 3-21**).
- **Natural Resources:** The Natural Resources ICE Study Area was established to analyze indirect effects to water resources, wildlife habitat, and threatened and endangered species. The Natural Resources ICE Study Area is based on the Virginia Department of Conservation and Recreation (VDCR) Virginia Hydrologic Unit Explorer subwatershed 12-digit Hydrologic Unit Code (HUC) within the direct impact area (**Figure 3-22**).
- **Historic Resources:** The Historic Resources ICE Study Area was established to analyze indirect effects to architectural and archaeological resources. The Historic Resources ICE Study Area includes the area within which indirect effects to historic properties could occur from altering the setting, feeling, and association contributing to the integrity of the historic property (**Figure 3-23**). Indirect effects such as altering the setting, feeling and association of archaeological and architectural historic properties are considered under Section 106 of the National Historic Preservation Act (NHPA) as reported in the *HRCS Archaeological Assessment* and *Architectural Survey: Management Summary* technical reports. Indirect effects analyzed in this ICE document are those related to potential changes in access and induced growth.

**Figure 3-20: Induced Growth ICE Study Area**

**Figure 3-21: Socioeconomic Resources ICE Study Area**

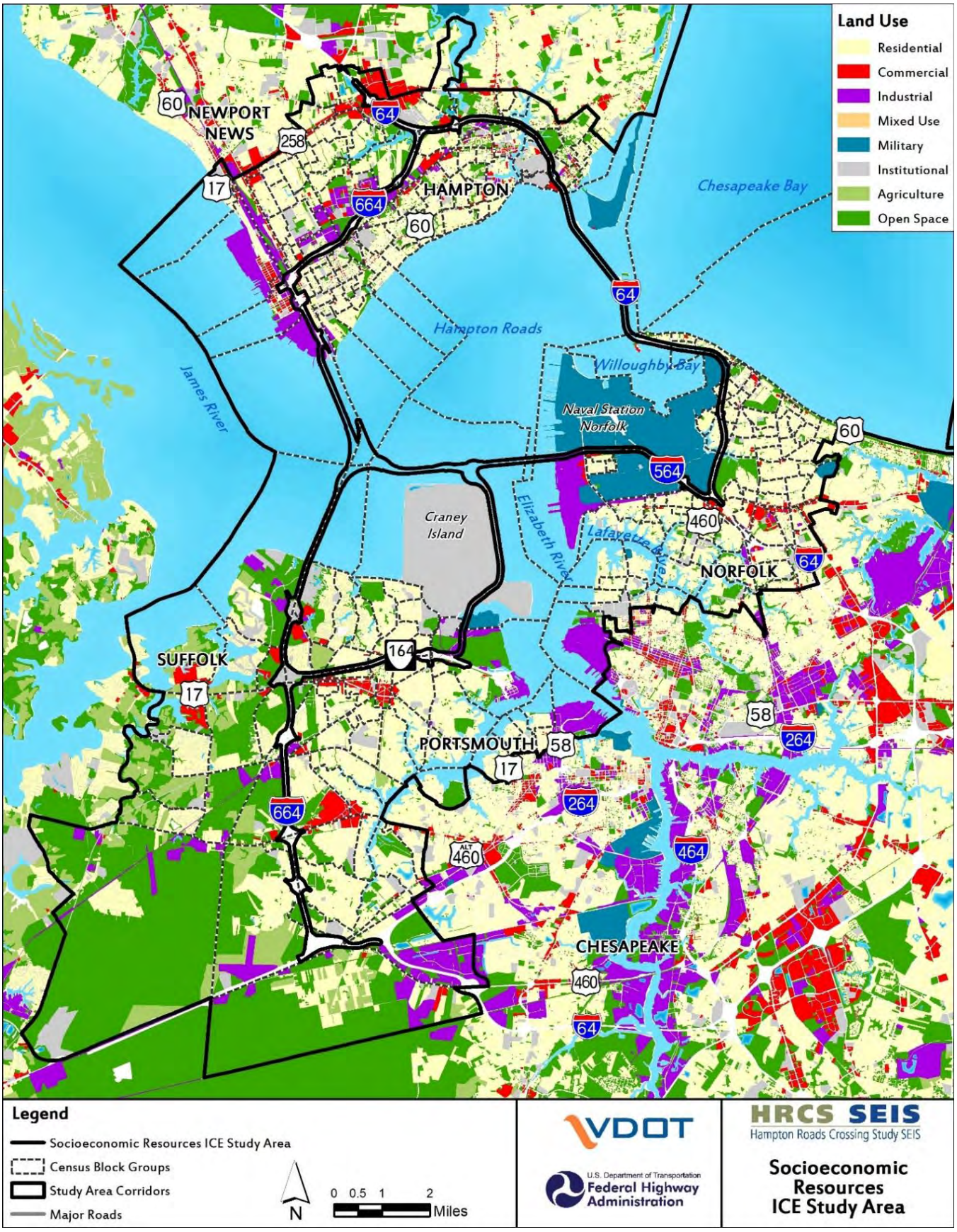


**Figure 3-22: Natural Resources ICE Study Area**

**Figure 3-23: Historic Resources ICE Study Area**

### 3.15.2 Indirect Effects

This section summarizes the indirect effects analysis documented in the *HRCS Indirect and Cumulative Effects Technical Report*. The indirect effects analysis focuses on the potential for socioeconomic and ecological impacts that could occur outside of the area of direct impact as a result of the alternatives. In NCHRP Report 466, TRB states that indirect effects can occur in three broad categories:

- **Encroachment-Alteration Impacts** – Alteration of the behavior and functioning of the affected environment caused by project encroachment (physical, biological, socioeconomics) on the environment;
- **Induced Growth Impacts** – Project-influenced development effects (land use); and,
- **Impacts Related to Induced Growth** – Effects related to project-influenced development effects (impacts of the change of land use on the human and natural environment).

In general, with regard to induced growth, transportation improvements often reduce time and cost of travel, as well as provide new or improved access to properties, enhancing the attractiveness of surrounding land to developers and consumers. Important characteristics for induced growth include existing land use conditions in the project area, increased accessibility that may result from new transportation improvements, local political and economic conditions, the availability of other infrastructure and the rate of urbanization in the region (NCDOT, 2001). The NCDOT guidance indicates induced growth impacts are most often found up to 1 mile around a freeway interchange and 2 to 5 miles along major feeder roads. Two principal factors influencing the likelihood of induced growth noted are the extent and maturity of the existing transportation infrastructure and land availability. The Study Area Corridors are mature transportation infrastructure that have been in place for decades. Hampton, Newport News, Norfolk, and Portsmouth are highly urbanized cities with little vacant land, while Chesapeake and Suffolk have more undeveloped land. Areas over 1-mile distant from the existing interchanges in Norfolk, Hampton, City of Newport News (Newport News) and City of Portsmouth (Portsmouth) have been settled with well-established residential neighborhoods, commercial, and industrial areas; the induced growth effects from transportation improvements of the alternatives would not likely extend to these more distant locations.

The area of influence for induced growth impacts (**Figure 3-20**) and the impacts to other resources related to induced growth are discussed together in the following sections. When the term "induced growth effects" is used in this study, it is specifically referring to potential growth along feeder roads a distance of 1 mile from existing interchanges on all study corridors and a 1,000-foot buffer either side of the feeder roads. The exception is I-64 interchanges west of Settlers Landing interchange in Hampton where there is limited potential for induced development because no mainline improvements are proposed there. With respect to I-664 on the Southside, induced growth effects have been considered up to 2 miles from existing interchanges along feeder roads with a 1,000-foot buffer along either side of the feeder road. This is to assess the greater potential for induced growth in Chesapeake and Suffolk that have more undeveloped land near I-664 interchanges.

The HRCS SEIS study routes and existing interchanges have been in place for many decades; for example, I-64 was constructed in 1957, I-64 and the HRBT were expanded in the 1970s, I-564 was built from 1971

to 1977, the VA 164 Western Freeway was opened in 1992, and I-664 and the MMMBT were constructed in the early 1990s. Other important transportation events for growth in the region (Kozel, 2007) included:

- completion of the Downtown Tunnel in 1952 that was expanded to four lanes in 1989;
- opening the Midtown tunnel on US 58 in 1962;
- the High Rise Bridge opening in 1969 and construction of I-64 through Chesapeake to Bowers Hill by 1969;
- opening I-264 in 1972 with additional connections to the Downtown Tunnel and Berkley Bridge in 1991; and
- replacement of the 1928 two-lane James River Bridge on US 17 with a four-lane bridge in 1982.

As previously discussed in **Section 1.2.1**, the lands adjacent to existing interchanges along I-64 through Norfolk, I-564, I-664 north of the MMMBT and VA 164 are in an advanced stage of development, and the cities of Hampton, Newport News, Norfolk, and Portsmouth are largely built-out. It is therefore expected the greatest potential for induced growth in these areas would be in the form of infill or redevelopment where the natural environment has already been degraded. Lands along I-664 on the Southside are at a slightly lower level of land use intensity and development, resulting in more undeveloped land near the existing I-664 interchanges. Growth along major feeder roads to these interchanges would still be largely infill but potentially could occur slightly further out (up to 2miles) along feeder roads from existing I-664 interchanges. Using these limits to identify the location of potential induced development and associated indirect effects is an attempt to identify where those indirect effects are most probable and could occur as a result of the project. It does not mean that indirect effects from the project would not occur elsewhere, rather, it means that those effects are less reasonably foreseeable.

Indirect and induced growth effects potentially resulting from each alternative were analyzed using planning judgement. Each alternative is comprised of operationally independent sections; however, the assessment of indirect effects has been prepared for the full alternative. As a result, the potential total indirect effects may not be realized until all operationally independent sections of an alternative are implemented. Potential indirect effects that may occur by the year 2040 are considered for all alternatives, including the No-Build Alternative.

#### 3.15.2.1 No-Build Alternative- Encroachment Effects

Socioeconomic Resources

Under the No-Build Alternative, continued and increasing traffic delays and traffic unreliability along and beyond the Study Area Corridors could cause some individuals or businesses to leave the area and locate elsewhere to reduce transportation-related overhead. Increasing congestion and travel unreliability impedes the delivery of and access to goods and services and results in lost economic productivity due to workers being delayed in traffic and increased fuel consumption from increased idling. A recent study of congestion at the HRBT by the Transportation Research Institute at ODU reports congestion and delays are costing the traveling public approximately 1.13 million vehicle hours or $33.2 million annually in lost productivity, vehicle operation cost, and lost fuel (based on 2013 data) (Cetin et al., 2015). Given increasing gridlock in the Socioeconomic Resources ICE Study Area, it is uncertain whether individuals or businesses could be attracted to the area to replace those that may move away. Increased gridlock would cause more visual, noise, and air impacts that could reduce community cohesion and reduce access to community facilities and recreation areas.

The indirect effects to transportation on the Study Area Corridors under the No-Build Alternative are examined in the *HRCS Transportation and Traffic Technical Report*. Under the No-Build Alternative, increased congestion on the larger regional transportation network would occur, leading drivers that would otherwise use the severely congested HRBT crossing to use other Hampton Roads crossings and/or other routes around the region to avoid congestion while trying to reach their destinations.

Natural Resources

The No-Build Alternative would not improve the existing HRCS Study Area Corridors. Although stormwater management along the Study Area Corridors has been updated over the past 25 years and retrofitted with more modern systems as improvements have been made, there are still sections where there are not any stormwater management features or the features are outdated and would not be improved under the No-Build Alternative. Existing indirect effects associated with untreated or poorly treated stormwater runoff would continue.

Terrestrial wildlife habitat adjacent to the Study Area Corridors is highly fragmented in most areas and this would continue under the No-Build Alternative. VIMS assessment of wetland condition within the Natural Resources ICE Study Area indicates NWI wetland habitat is somewhat severely stressed and wetland water quality is severely stressed (VIMS, 2016). No HRCS project-related construction or changes to wetlands would occur in the Study Area Corridors under the No-Build Alternative, thus, no project-related effects to wetlands would result under this alternative. However, existing and planned developments would continue to degrade these wetlands.

Historic Resources

Increasing traffic congestion under the No-Build Alternative could make access to certain historic properties that are open to public visitation more difficult such as the Hampton National Cemetery, Emancipation Oak Tree, and Fort Monroe, making them less attractive to visit.

#### 3.15.2.2 No-Build Alternative- Induced Growth

No induced growth is expected under the No-Build Alternative, as no changes would be made to the Study Area Corridors. Land near existing interchanges may become less desirable due to continued traffic congestion and diminishing travel reliability.

#### 3.15.2.3 Alternative A- Encroachment Effects

Socioeconomic Resources

Direct residential displacements under Alternative A would be relatively few (nine), and no commercial, industrial or community facilities would require relocation. Alternative A would widen I-64 by adding a lane in the eastbound direction for a short distance. Therefore, the residential relocations would be located along the edge of communities that border the I-64 Study Area Corridor. Consequently, Alternative A would have minor indirect effects on community cohesion in the cities of Norfolk and Hampton. The relocation assistance process does not require that a relocated resident locate in a certain area or to a specific structure; however, community cohesion impacts are generally minimized when there is sufficient replacement housing available and relocated residents are able to relocate and remain within or in close proximity to their existing communities. Under Alternative A, the effects to community

cohesion would be minor as relatively few displacements would occur, and adequate replacement housing exists.

Widening I-64 in the Study Area Corridors would relocate some residences, exposing second row homes that were previously "buffered" from the interstate. This could cause some residents or businesses in the new "first row" closest to the interstate to leave the area. However, given the limited improvements to regional connectivity and reduction in congestion realized under Alternative A, others may be attracted to the area, resulting in minimal effects to community cohesion.

Widening I-64 would also marginally increase the separation distance between communities located on either side, but because the relationship between the interstate and the adjoining communities has been established for nearly 60 years and all local road crossings would be maintained, indirect effects to community cohesion would be minor.

Improvements to I-64 under Alternative A would marginally improve access to transportation while reducing congestion along a limited section of the corridor. This would benefit people and businesses by reducing lost productivity from sitting in congested traffic. An improved corridor may make the area more attractive for new businesses or make it more conducive for existing businesses to expand, increasing long-term employment opportunities in the Socioeconomic Resources ICE Study Area.

Generally, when capacity is added, traffic volumes would increase on that facility as it becomes more attractive for travelers. Parallel facilities such as the MMMBT would see traffic divert to the roadway with newly added capacity. Under Alternative A, traffic volumes on the HRBT would increase and traffic volumes on the MMMBT would decrease. Regional traffic patterns would change in concert with the shift in traffic between the HRBT and MMMBT. Additionally, local roadways that parallel the improved I-64 Study Area Corridor and have accommodated excess travel demand could see traffic volume reductions as drivers divert from existing surface streets to the improved corridor where they would find better travel conditions Tolling could also influence the diversion of traffic. While the indirect effects of tolling on traffic cannot be reliably determined at this time because of a number of unknowns (e.g., which facilities would be tolled, the toll rate, etc.), the *HRCS Traffic and Transportation Technical Report* includes a basic toll diversion analysis. Tolling scenarios are based on those developed by the HRTAC (HRTAC, 2015). See the *HRCS Traffic and Transportation Technical Report* for details on the assumptions used for the toll diversion analysis. For Alternative A, one toll scenario was considered, and that scenario involved the implementation of managed lanes (i.e., HOT lanes) on the HRBT; no toll was placed on any other crossing such as the MMMBT that would not be improved as part of the alternative. **Table 3-57** presents the assumed toll-per-mile rates for HOT lanes. The results indicate a slight overall reduction in traffic volumes on the HRBT, with some of the traffic shifting to the MMMBT.

**Table 3-57: Modeled HOT Toll Rates (in dollars per mile) for All Build Alternatives**

| Passenger Car | | Commercial Vehicles (3+ axles) | |
|---|---|---|---|
| Peak | Off Peak | Peak | Off Peak |
| 0.33 | 0.15 | 1.32 | 0.45 |

During construction, short-term road closures, detours, and loss of parking could indirectly affect residents, businesses and the local economy by potentially increasing commute times and emergency vehicle response times and limiting or restricting access to neighborhoods, community facilities or businesses. These effects would be short-term, ending once construction was completed. Conversely,

hiring for construction could increase local employment and money spent by workers could benefit local businesses over the short-term.

Natural Resources

Alternative A would widen an existing interstate in a highly urbanized area. Alternative A would cause some habitat loss, particularly in the vicinity of water crossings which tend to have greater integrity than land areas along either side of the I-64 Study Area Corridor that have fewer legal protections. Habitat fragmentation is associated with habitat loss. Habitat fragmentation can have wide-ranging indirect effects to wildlife, resulting in species shifts associated with greater edge habitat and less interior habitat (smaller patch size); lower diversity due to smaller habitat patches; potential isolation of populations; increased vulnerability of species to external competition and predation; potential decreased flow of genetic material through the landscape; restricting wildlife movements that disrupt foraging, breeding/nesting, and migration; increased risk of invasive species establishment; and generally, reduced biological diversity. Roadway noise can result in altered habitat utilization, strained communication, and heightened metabolic rates on wildlife, especially avian communities, indirectly causing wildlife abandonment of the area, increased predation, reduced foraging success, decreased breeding success, and decreased wildlife health.

The most intact habitat within the Study Area Corridor tends to be riparian corridors. Widening of existing bridges and lengthening culverts under Alternative A could indirectly restrict wildlife movement through the riparian corridors crossed by these structures and alter up and downstream hydrologic flow. Direct effects to wetlands, streams, and floodplains may indirectly change hydrologic flow dynamics through adjacent natural communities up or downstream, which sometimes alters these dynamics at the ecosystem level such that the ability of the system to maintain itself is altered. Preserving the hydrodynamic flow systems is important because they are a major pathway for energy flow and dissipation in the Coastal Plain, an area of flat, low-lying land with many rivers, marsh and swampland.

Some of the potential effects that may occur because of changes to natural processes in the wetlands of the Natural Resources ICE Study Area include changes to floodwater storage capacity and retention times, vegetative community composition and structure, nutrient cycling, and aquatic life movement. These indirect effects can alter wetland functions such as habitat, plant community, and carbon cycling as described in the *HRCS Natural Resources Technical Report*. For example, an increase in sunlight in riparian areas due to a new roadway removing forest canopy can alter vegetation community composition (introduction of invasive species, changes in light regime which favor full-sun plants) and water chemistry (decrease in dissolved oxygen and increase in temperature, both which impact nutrient cycling and aquatic life). The obverse could occur as widening existing or constructing new bridges and overpasses can shadow wetlands, altering the plant community, wildlife habitat, and carbon cycling.

Direct impacts from cut/fill would result in loss of all wetland functions within the immediate footprint of the impact and indirectly contribute to habitat fragmentation effects described above. The magnitude of the effects to wetland functions directly and indirectly impacted from conversion and hydrologic alteration/isolation is generally less than effects from cut/fill. However, hydraulic alteration can remove all wetland function if the site is converted to an upland. Filling floodplains would also result in loss of floodplain functions. Floodplain encroachment could alter the hydrology of the floodplain that could increase the severity of flooding in terms of flood height, duration and erosion (FEMA, 2016).

The indirect impacts of Alternative A to hydrology associated with any given stream, wetland, floodplain or open water crossing would be limited as this alternative is confined to widening an existing corridor. Existing culverts would be extended or resized where appropriate and bridges widened or replaced in accordance with design standards. Mitigation efforts discussed later in this document would offset much of the potential indirect impact.

The increased impervious surface of the widened Interstate could indirectly increase the amount and velocity of runoff, amplifying the severity of flooding and erosion. Runoff would also pick up more sediment from disturbed soils and contaminants that could be deposited downstream, reducing water quality that impairs both human and wildlife uses. Runoff from roadways could contain heavy metals, salt, and associated materials, organic compounds, and nutrients. When runoff enters waters that are already impaired, the impacts are cumulative and can result in accelerated changes in the macrobenthic community structure and composition, which in turn, can affect the fish and amphibian populations that rely on them as a food source, as well as the birds and aquatic mammals that prey on the fish and amphibians. The effects can result in changes in community structure at a local level, but may also extend further to include changes in ecosystem structure and function in the absence of proper mitigation.

Threatened and endangered species habitat within the I-64 Study Area Corridor includes the Hampton Roads Bridge-Tunnel Island Conservation Site that is habitat for federally listed shorebirds. As described earlier in this chapter and the *HRCS Natural Resources Technical Report*, this habitat is already fragmented by the existing HRBT and surrounding development. Furthermore, the widespread occurrence of common reed has rendered much of this habitat unsuitable for shorebird foraging. The majority of these estuarine areas would be bridged under Alternative A, limiting the direct loss of habitat, and thereby, indirect effects associated with additional habitat fragmentation. Due to the presence of higher quality foraging habitat outside the Study Area Corridor but within the vicinity of Alternative A, disruption during construction activities should have little to no impact on the shorebird species. Additionally, summer roosting habitat has been confirmed for bat species within Alternative A (NLEB, Little brown bat, Tri-colored bat), and forested habitat is very fragmented. Alternative A would not further degrade the quality of this habitat. Furthermore, no confirmed maternity roosts or hibernacula are located within a 2-mile radius of the I-64 Study Area Corridor, further limiting the potential indirect effects on the species from encroachment.

The design for the tunnels would substantially affect the amount of dredging and fill needed which, in turn, could affect aquatic species, cause habitat loss, and degrade water quality. As Alternative A would construct one additional bridge-tunnel at the HRBT, it would have fewer dredging indirect effects to natural resources and water quality than the other Build Alternatives. The potential indirect effects of Alternative A to hydrodynamics are being evaluated by VIMS and will be provided in the Final SEIS. It is estimated that Alternative A would generate approximately 1.2 million cubic yards of dredge material requiring disposal. Alternative A would also have fewer indirect effects to regional dredge material capacity than the other Build Alternatives. Several options are available to dispose of dredge material that requires testing to evaluate its suitability for various alternative uses and disposal sites. Therefore, the exact effects of dredge material disposal on natural resources and the regional capacity for dredge material disposal is not known at this time. However, with the exception of the initial impacts to benthic communities at the disposal site, the potential for other indirect effects to possibly occur as a result from disposal operations will be site-specific, depending on the characteristics of the dredged material, whether disposal is on land or in water, and the hydrodynamic conditions at the disposal site. These

include indirect impacts from increased or decreased light penetration and potential release of toxicants that may alter feeding, breeding, and nursery habitat as well as affect the life and health of nearby wildlife. These potential effects at the disposal site are minimized as part of the USACE permitting process for the disposal site approval.

Construction and post-construction discharges of stormwater, as well as dredging, potentially contribute to minor, localized increases in the pollutants and nutrients causing impairment as measured by dissolved oxygen, benthic invertebrate communities, aquatic plants, and chlorophyll-a. Drainage design for the new proposed bridge structures would be developed in later design phases and is expected to be in conformance with current stormwater regulations to minimize downstream effects to natural resources and water quality. Alternative A is not expected to disturb soils with *Enterococcus* or fecal coliform, which impair several waterbodies in the area. Therefore, Alternative A is not expected to substantially contribute to the further impairment of any impaired waterbodies from these sources.

Construction can increase the presence of invasive plant species enabled by earth disturbance and spreading from contaminated vehicles, clothing, and shoes. The spread of invasive species would be minimized by following provisions in VDOT's Road and Bridge Specifications. While the Study Area Corridors would be vulnerable to the colonization of invasive plant species from adjacent properties, implementation of the stated provisions would reduce the potential for the establishment and proliferation of invasive species.

Historic Resources

All effects to archaeological and historic architectural properties, including indirect effects, will be considered under Section 106 of the NHPA as described in **Section 3.9** of this SEIS. Portions of the Area of Potential Effects with a high potential for archaeological remains that have not been previously intensively inventoried will be intensively surveyed in later phases of the project. It is not expected that any archeological sites that have not been intensively surveyed would embody characteristics important for preservation in place.

Potentially easier access to historic properties within Norfolk and Hampton from an improved I-64 under Alternative A could foster increased visitation to historic properties. This would be beneficial if access to historic properties is controlled, as increasing historic tourism provides incentives and means for preservation. While not expected, uncontrolled increased visitation may result in overuse to the point of adversely affecting their integrity. Major historic property attractions in the Historic Resources ICE Study Area close to I-64 include Fort Monroe, Fort Wool, the Emancipation Oak Tree at the Hampton University campus, and the Hampton National Cemetery. Access to Fort Monroe, a National Historic Monument, is controlled. Visitation to Fort Wool is naturally limited as its only access is by water. The Emancipation Tree is fenced but otherwise access is not controlled. Access to Hampton National Cemetery is controlled by gates and fencing.

During construction, access to historic properties could be temporarily impacted by temporary road closures, detours, and loss of parking, potentially affecting visitation. These construction effects would be short-term and therefore, minor.

#### 3.15.2.4 Alternative A- Induced Growth Impacts

**Figure 3-24** shows the Induced Growth ICE Study Area for Alternative A. **Table 3-58** contains the interchange key map. Induced growth could occur under Alternative A because it would increase capacity

and reduce congestion, making it more attractive for users and increasing access to surrounding land. It would also improve regional accessibility for customers as well as the delivery of goods and services that facilitates growth. As previously discussed, induced growth would most likely occur around existing interchanges along an improved corridor.

Consideration of induced growth in Hampton along the I-64 Study Area Corridor focused on the Mallory and Settlers Landing interchanges since, under Alternative A, improvements to I-64 would be limited to Settlers Landing interchange. From there westward, I-64 would not be improved.

**Table 3-58: Alternative A Induced Growth ICE Study Area Interchange Map Key**

| Key # | Interchange Description | Key # | Interchange Description | Key # | Interchange Description |
|---|---|---|---|---|---|
| **1** | Exit 267 - US Rt 60/VA143 Settlers Landing Rd & Woodland Rd | **5** | Exit 274 - West Bay Ave to I-64 East/ I-64 to WB West Ocean View Ave | **9** | I-64/I-564 |
| **2** | Exit 268 - VA 169 South Mallory St | **6** | I-64 WB Entrance Ramp from Granby St/Norfolk Naval Station Gate 22/ Forest Lawn Cemetery | **10** | VA 165/VA 170 Little Creek Rd |
| **3** | Exit 272 - West Ocean View Ave/Willoughby Spit | **7** | Exit 276 - I-564 & Granby St/VA 460 | **11** | VA 406/Terminal Blvd to Hampton Blvd |
| **4** | Exit 273 - Rt 60 4th View St | **8** | I-64 EB Entrance Ramp from Norfolk Naval Station Gate 22 | | |

Under Alternative A, the potential for induced growth is limited by the restricted availability of undeveloped land in both Hampton and Norfolk that are virtually built-out, the amount of protected lands present (e.g., RPAs, wetlands, parks), and inaccessible land within military installations like NAVSTA Norfolk, which is controlled by the federal government. In addition, west of the I-64 Study Area Corridor in Norfolk is Chambers Field on NAVSTA Norfolk that includes runway approaches and clear zones outside the boundary of the installation, where the type of development is specifically regulated in the Induced Growth ICE Study Area. **Figure 3-25** shows the extent of developed land within Norfolk and Hampton based on the NLCD. Lands classified as developed or undeveloped in the NLCD could include military or other inaccessible government-controlled lands. Approximately 93 percent of lands are developed within the Induced Growth ICE Study Area of Alternative A. With the lack of undeveloped land, induced growth in built-out areas would therefore be in the form of infill or redevelopment.

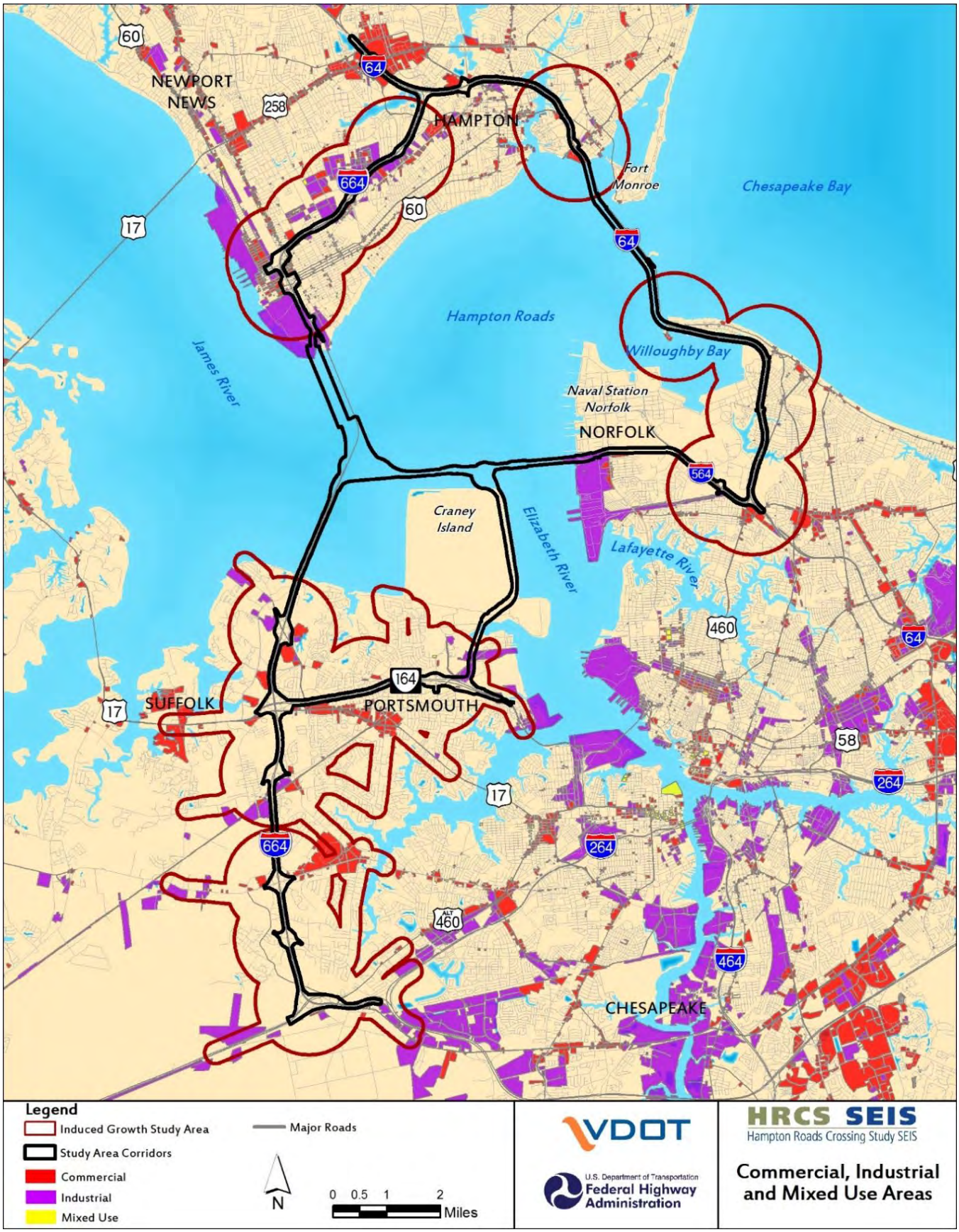
Alternative A improvements to I-64 would most likely lead to growth in the Induced Growth Study Area based on the factors previously discussed. One of these factors is local land use policies and guidance. Areas designated by Hampton and Norfolk as suitable for such growth within the Induced Growth ICE Study Area would likely experience the most growth. **Figure 3-26** shows the designated growth areas, redevelopment areas, and Urban Enterprise Zones in Hampton and Norfolk, and **Figure 3-27** depicts the designated commercial, industrial and mixed use areas in both cities.

**Figure 3-24: Interchanges and Alternative A Induced Growth ICE Study Area**

**Figure 3-25: Developed Lands in the Induced Growth ICE Study Area**

**Figure 3-26: Designated Growth Areas in the Induced Growth ICE Study Area**

**Figure 3-27: Designated Industrial, Commercial, and Mixed-use Areas**



The Induced Growth ICE Study Area also extends outside of designated growth areas. The *HRCS Indirect and Cumulative Effects Technical Report* summarizes characteristics by land use category of the Induced Growth ICE Study Area for Alternative A that extends beyond designated growth areas. Land use is based on HRTPO 2011 regional data. Approximately 40 percent (4,193 acres) of the total Induced Growth ICE Study Area acres extend beyond designated growth areas in Hampton and Norfolk, including areas over water. Of the total acres outside of designated growth areas, the majority are military (38 percent) and residential (36 percent). Induced growth associated with Alternative A is not expected on military lands or areas over water.

Induced growth associated with Alternative A could create pressure on city councils and boards of supervisors to make changes to their land use plans to allow types of development in areas not currently approved for it or to allow greater development densities. This is anticipated to occur at limited levels for several reasons. Improvements to Hampton Roads crossings have been studied for several decades. Area planning (such as comprehensive plans for Norfolk) have considered potential crossing improvements or widening of I-64 (see the *HRCS Indirect and Cumulative Effects Technical Report*), and developed their land use policies with these improvements in mind. Further, the largest acreage of potential induced growth associated with Alternative A outside of designated growth areas is in residential areas where infill would be expected to increase density. The extent of induced residential, commercial, industrial and mixed use growth that could occur under Alternative A is uncertain because many factors other than transportation accessibility affect the decision to develop, such as local development policies and incentives, favorable economic conditions, and ease of financing. Land use policies and guidelines are set by local governments, and Code of Virginia § 15.2-2223 requires updating comprehensive plans for the physical development of land within their jurisdiction every five years. Comprehensive plans are developed in consultation with stakeholders and citizens. These processes reduce the potential for unplanned growth.

Induced growth could benefit socioeconomic resources by increasing business and service providers that lead to increased long-term employment. It could also be negative for others. For example, induced growth could be both beneficial and adverse to low-income populations. New employment opportunities could occur, but gentrification associated with induced growth and development could increase property values and reduce available low-income housing stock.

Development associated with induced growth can adversely affect water quality, impacting human use and ecosystem functions as discussed in the natural resources indirect effects assessment of Alternative A. Approximately 91 waterbodies are impaired within the Natural Resources ICE Study Area, including Hampton Roads. However, federal, state, and local regulations addressing stormwater runoff and protecting water quality could reduce potential adverse impacts associated with induced growth.

Development associated with induced growth under Alternative A in the Induced Growth ICE Study Area could impact wetlands, streams, and floodplain areas. Based on the NWI and National Hydrography Dataset, an estimated 31 acres of wetlands[14], 63,192 linear feet of streams, and 3,090 acres of floodplain are throughout the Induced Growth ICE Study Area of Alternative A. The potential effects of induced growth to wetlands, streams, and floodplains under Alternative A cannot be quantified as the exact impacts of a specific development are unknown at this time. However, should future induced growth and

[14] Approximate based on NWI: some wetlands may have been already impacted.

development in the vicinity of Alternative A interchanges impact regulated waters, wetlands, streams, or floodplains, that individual development could be subject to review, approval, and / or permits from local, state, or federal agencies (including the USACE) before any impacts would occur. New development, in already developed areas, could be required to replace outdated stormwater control and drainage systems and replace impervious surfaces with more permeable surfaces, lessening impacts to water quality that may otherwise occur.

Impacts of induced growth under Alternative A to terrestrial and aquatic wildlife and wildlife habitat would include wildlife loss; habitat loss, fragmentation and degradation; disruption of resting, feeding, movement, breeding and nursery sites; changes in wildlife population density and species richness; alterations of hydrology and species interaction; and imperil protected species. Because the induced growth area of Alternative A is largely built-out, it is highly disturbed, thus the potential adverse effects to wildlife and wildlife habitat from induced growth development would still occur but may be reduced. Any federal or state-sponsored development or development on federal or state land would be regulated to minimize potential impacts to protected wildlife and wildlife habitat. Potential impacts to federally protected species on private property are also regulated as previously described. Proposed modifications to shorelines and wetlands would be federally and state regulated as well, reducing potential adverse effects of induced growth to wildlife and wildlife habitat.

New construction or rehabilitation associated with induced growth has the potential to adversely affect archaeological and architectural historic properties. This could occur from:

- Demolition, excavation, or vibration effects;
- Changing the design, materials, or workmanship
- Altering the setting, feeling and association of historic properties

Development projects funded, permitted, or on lands controlled by federal and state agencies must take into account effects on historic properties by complying with Section 106 of the NHPA and the Virginia Antiquities Act and Burial Law, respectively. Additionally, both the cities of Hampton and Norfolk have historic architectural preservation committees that review and approve individual development projects within historic districts or historic overlay zones under their jurisdictions that apply to private property. These processes would reduce the potential adverse effects to historic properties from induced growth associated with constructing Alternative A.

#### 3.15.2.5 Alternative B- Encroachment Effects

Socioeconomic Resources

Alternative B includes all of the improvements considered under Alternative A. The indirect effects on socioeconomic resources therefore would be similar to those described for Alternative A along the I-64 Study Area Corridor. The area along the I-564 and VA 164 Connector Study Area Corridors is largely controlled by the military and POV. While these agencies would realize the benefits related to reduced congestion, increased port access, and improved travel reliability, it is unlikely that there would be a potential for changes in land use or ownership as there is for the private properties described under Alternative A. Alternative B would result in nine residential displacements (the same as Alternative A) and no commercial relocations of properties bordering I-64, I-564, the I-564 and VA 164 Connectors, and VA 164. Along VA 164, the type of encroachment effects to socioeconomic resources would be similar to those described under Alternative A, as the existing facility is primarily bordered by private properties.

Although indirect effects would occur over a larger area than Alternative A, those effects would be distributed along a narrow corridor along existing transportation infrastructure through several different communities, limiting adverse effects to community cohesion in an individual neighborhood or city.

Alternative B indirect effects on the larger regional transportation network would consist of decreases in congestion and improved travel reliability. The alternative would also offer a new crossing of the Elizabeth River and a more direct connection between the HRBT and the MMMBT, further improving travel reliability and connectivity in the region. Under Alternative B, traffic volumes on the HRBT would increase and traffic volumes on the MMMBT would decrease. Congestion at peak travel times at Hampton Roads crossings would still occur. Regional traffic patterns would shift as described for Alternative A, because increased capacity of the widened Study Area Corridors would reduce excess travel demand on parallel local streets, resulting in traffic volume reductions on those roads. Tolling could also influence how traffic is diverted to other crossings. While the indirect effects of tolling on traffic cannot be reliably determined at this time because of a number of unknowns (e.g., which facilities would be tolled, the toll rate, etc.), the *HRCS Traffic and Transportation Technical Report* includes a basic toll diversion analysis. Tolling scenarios are based on those developed by the HRTAC (HRTAC, 2015). See the *HRCS Traffic and Transportation Technical Report* for details on the assumptions used for the toll diversion analysis. Two toll scenarios were considered for Alternative B. Under the first scenario, a toll was placed on the new Elizabeth River crossings (i.e., the I-564 and VA 164 Connectors). Under the Elizabeth River toll-only scenario, a fixed toll of $1 was coded on the I-564 and VA 164 connectors. However, because vehicles would always need to travel on at least two of these connectors to cross the Elizabeth River, the effective toll on the crossing is $2. The results indicate that volumes on the HRBT and MMMBT may increase slightly, as tolls on the new Elizabeth River connectors improve the attractiveness of the HRBT and MMMBT to drivers. A slight shift in traffic to the James River Bridge is indicated as well. Volumes on the I-564 and VA 164 Connectors would decline substantially, indicating that the additional cost of a toll may not outweigh travel time savings provided by these new connections. Under the second scenario, a managed lane scenario (i.e., HOT Lanes with the toll rates shown in **Table 3-57**) was considered where widening occurs; the fixed toll on the Elizabeth River crossing was retained as well. Under this scenario for Alternative B, the volume reduction on the HRBT would be slightly larger, with almost the entire volume shift being absorbed by the MMMBT. Traffic volumes on the I-564 and VA 164 Connectors would be essentially unchanged from the volumes under the first scenario.

Alternative B construction would occur over a larger area than Alternative A. Much of the additional work under this alternative would occur over water or within or around lands managed by government agencies. Therefore, indirect effects to socioeconomic resources during construction would be short-term and are not expected to be much greater than Alternative A.

Natural Resources

Alternative B would have similar types of indirect effects to natural resources as described for Alternative A. However, Alternative B would also construct on new alignment the I-564 and VA 164 Connectors. The I-564 Connector would involve constructing a tunnel extending from the Norfolk shoreline across the mouth of the Elizabeth River, a tunnel portal island north of CIDMMA, and trestle bridges. The hydrodynamic indirect effects related to the new tunnel are being evaluated by VIMS and will be presented in the Final SEIS. The design for the tunnels would substantially influence the amount of dredging and fill needed which, in turn, could affect aquatic species, cause habitat loss and degrade water quality from sedimentation, resuspension of sediment in the water column (turbidity), and potential

release of toxicants from water bottom disturbance. As Alternative B would construct two new tunnels (alongside HRBT and the I-564 Connector), it would have more dredging indirect effects to natural resources and raise regional dredge material disposal capacity issues than Alternatives A and C, but fewer than Alternative D. It is estimated that Alternative B would generate approximately 4.1 million cubic yards of dredge requiring disposal. Several options are available to dispose of dredge material that requires testing to evaluate its suitability for various alternative uses and disposal sites. Therefore, the exact effects of dredge material disposal on natural resources, and the regional capacity for dredge material disposal is not known at this time. However, with the exception of the initial impacts to benthic communities at the disposal site, which is inevitable, the potential for other effects to possibly occur as a result from disposal operations will be site-specific, depending on the characteristics of the dredged material, whether disposal is on land or in water, and the hydrodynamic conditions at the disposal site. These include impacts from increased or decreased light penetration and potential release of toxicants that may alter feeding, breeding, and nursery habitat as well as affect the life and health of nearby wildlife. These potential effects at the disposal site are minimized as part of the USACE permitting process for the disposal site approval. Unlike the I-564 Connector, the VA 164 Connector would be constructed on new alignment, but it is being proposed that it not be on structure and over water. The potential for the VA 164 Connector to be placed on structure was not considered for the ICE analysis, but if it is included in the Preferred Alternative, the possibility would be evaluated, if needed, to accommodate US Navy and US Coast Guard security requirements.

In the absence of an elevated facility, the VA 164 Connector under Alternative B could result in habitat loss and fragmentation. The *HRCS Natural Resources Technical Report* describes the habitat, species diversity, protected species and wetland functions found in this area. Habitat loss resulting in habitat fragmentation may have wide-ranging effects to wildlife and biological diversity as described under Alternative A. The Craney Island Conservation Site is also habitat for federally protected shorebirds (Piping plover, gull-billed tern, Wilson's plover, and Red knot). The VA 164 Connector would be constructed on the eastern edge of the CIDMMA with more suitable habitat to the west. Therefore, the potential indirect effects of habitat fragmentation to wildlife and protected shorebird species is expected to be minimal in the vicinity of the VA 164 Connector. However, the alignment south of the island through government-controlled lands to its connection with VA 164 would have more severe habitat fragmentation indirect effects to wildlife. Summer roosting habitat for federally protected bats occurs there and, although some larger tracts of forest do exist in the Study Area Corridor along Coast Guard Boulevard north of VA 164, the potential indirect effects of Alternative B to bat roosting and foraging habitat would be similar to the types described for Alternative A. Canebrake rattlesnake habitat is located in forest habitat on the Coast Guard property; however, the habitat area is isolated, and it is believed that the area is not able to support a viable population of the species long term. This area of the VA 164 Connector was clear cut in the 1990s which likely eliminated any Canebrake rattlesnake population at that time. Therefore, Alternative B is not expected to have any indirect effects to the Canebrake rattlesnake.

Palustrine wetlands within CIDMMA are routinely disturbed. Those along the proposed VA 164 Connector south of CIDMMA are generally in better condition but still altered. A large palustrine wetland north and south of Coast Guard Boulevard on the Station would be fragmented by Alternative B, disconnecting the northern portion from estuarine wetlands, and substantially reducing the overall function of the wetland, especially plant communities. Under Alternative B, a large palustrine wetland would be fragmented on the Station south of Coast Guard Boulevard, resulting in a small western

fragment with substantially reduced plant community function. These direct effects would reduce and fragment wetland habitat that indirectly impacts wetland-dependent species.

Alternative B could increase impacts to water quality from highway runoff and increased impervious surfaces. Replacing outdated stormwater and drainage systems and constructing new facilities designed to achieve minimal increases in stormwater runoff should reduce adverse indirect effects to water quality under Alternative B.Historic Resources

Similar to Alternative A, improved access to historic properties open to the public could occur as a result of the Alternative B improvements with similar benefits and impacts as discussed under Alternative A. In addition to those historic properties mentioned for Alternative A, the Norfolk Naval Base Historic District, the Battle of Craney Island, the Battle of Sewell's Point, the Captain John Smith Chesapeake National Historic Trail and the Washington Rochambeau Revolutionary Route National Historic Trail are found along the I-564 and the I-564 and VA 164 Connectors portions of Alternative B.

Temporary indirect effects from the construction of Alternative B would be similar to those discussed for Alternative A, namely, access to historic properties could be temporarily impacted. These impacts would be short term and therefore minor.

#### 3.15.2.6 Alternative B- Induced Growth

**Figure 3-28** presents the Induced Growth ICE Study Area for Alternative B and **Table 3-59** contains the interchange map key. Alternative B would have the same type of induced growth effects along existing I-64 and VA 164 described for Alternative A.

Induced growth of Alternative B would be constrained along I-564 by the extent of military lands and crash and noise zones associated with Chambers Field. Induced growth would be further constrained through CIDMMA, the US Naval Supply Center, Coast Guard Station, and the VIG that are under government control. **Figure 3-25** shows the extent of developed land within the Induced Growth ICE Study Area of Alternative B. Lands classified as developed or undeveloped in the NLCD could include military or other inaccessible government-controlled lands. Approximately 87 percent of lands are developed within the Induced Growth ICE Study Area of Alternative B. With the lack of undeveloped land, induced growth in built-out areas would more likely be in the form of infill or redevelopment.

Alternative B improvements to VA 164 would most likely lead to growth in the Induced Growth Study Area based on the factors discussed for Alternative A. For the reasons discussed for Alternative A, areas designated by Hampton, Norfolk, and Portsmouth as suitable for such growth within the Induced Growth ICE Study Area would likely experience the most growth. **Figure 3-26** shows the designated growth areas, redevelopment areas, and Urban Enterprise Zones in these cities, and **Figure 3-27** depicts the designated commercial, industrial and mixed use areas.

**Table 3-59: Alternative B Induced Growth ICE Study Area Interchange Map Key**

| Key # | Interchange Description | Key # | Interchange Description | Key # | Interchange Description |
|---|---|---|---|---|---|
| **1** | Exit 267 - US Rt 60/VA143 Settlers Landing Rd & Woodland Rd | **8** | I-64 EB Entrance Ramp from Norfolk Naval Station Gate 22 | **15** | Cedar Ln |

| Key # | Interchange Description | Key # | Interchange Description | Key # | Interchange Description |
|---|---|---|---|---|---|
| **2** | Exit 268 - VA 169 South Mallory St | **9** | I-64/I-564 | **16** | Towne Point Rd |
| **3** | Exit 272 - West Ocean View Ave/Willoughby Spit | **10** | VA 165/VA 170 Little Creek Rd | **17** | VA 135/College Dr |
| **4** | Exit 273 - Rt 60 4th View St | **11** | VA 406/Terminal Blvd to Hampton Blvd | **18** | Exit 9A - US Route 17 North/Bridge Rd/ James River Bridge |
| **5** | Exit 274 - West Bay Ave to I-64 East/ I-64 to WB West Ocean View Ave | **12** | I-564 Connector | **19** | I-664/VA164 Interchange |
| **6** | I-64 WB Entrance Ramp from Granby St/Norfolk Naval Station Gate 22/ Forest Lawn Cemetery | **13** | VA-164 Connector | **20** | Exit 9B - VA 164 East /US Rt 17 South/Portsmouth |
| **7** | Exit 276 - I-564 & Granby St/VA 460 | **14** | Virginia International Gateway Blvd | | |

The Induced Growth ICE Study Area of Alternative B also extends outside of designated growth areas. The *HRCS Indirect and Cumulative Effects Technical Report* summarizes characteristics by land use category of the Induced Growth ICE Study Area for Alternative B that extends beyond designated growth areas. Land use is based on HRTPO 2011 regional data. Approximately 38 percent (6,896 acres) of the total Induced Growth Ice Study Area acres extend beyond designated growth areas in Hampton and Norfolk, including areas over water. Of these, the majority are residential (47 percent) and military lands (24 percent). As seen in **Figure 3-25**, much of the open space (14 percent) in the Induced Growth ICE Study Area of Alternative B is on military and other government-controlled lands such as CIDMMA. Induced growth associated with Alternative B is not expected on military or government lands, nor areas over water. Similar to Alternative A, transportation improvements of Alternative B may increase pressure on city councils and boards of supervisors to make changes to their land use plans to allow development in areas not currently authorized for it or to allow greater development densities. Similar to Alternative A, most of the Induced Growth ICE Study Area outside of designated growth areas are within residential areas. Induced growth in these residential areas would most likely be infill or redevelopment that increases residential density. However, the extent of induced residential, commercial, industrial and mixed use growth that could occur under Alternative B is also uncertain, as many factors other than transportation accessibility affect the decision to develop. Land use policies and guidelines are set by local governments, and Code of Virginia § 15.2-2223 requires updating comprehensive plans for the physical development of land within their jurisdiction every five years. Comprehensive plans are developed in consultation with stakeholders and citizens. These processes reduce the potential for unplanned growth.

**Figure 3-28: Interchanges and Alternative B Induced Growth ICE Study Area**

Alternative B would not provide a new crossing over the entire Hampton Roads as would occur under Alternatives C and D. Therefore, it would have fewer beneficial indirect socioeconomic effects from induced growth than Alternatives C and D. The planned Craney Island Marine Terminal on eastern CIDMMA would connect to the VA 164 Connector that is proposed under Alternative B. Plans for the development of the new port terminal have been ongoing for some time. The facility is not dependent upon implementing Alternative B; rather, it is contingent on funding that is projected to be available in the 2030/2040 timeframe. While plans for this expansion have set aside right–of-way for the alignment of the VA 164 Connector, that expansion is not considered induced growth of Alternative B.

Based on the NWI and NHD, 370 wetland acres, 98,932 linear feet of streams, and 3,656 floodplain acres are throughout the Induced Growth ICE Study Area of Alternative B. Although induced growth associated with Alternative B could potentially adversely affect more aquatic resources than Alternative A, this potential should be minimized over much of the corridor by the government-controlled land use along I-564 and the proposed VA 164 Connector, as well as water regulations that apply to private land. Induced growth along VA 164 would primarily be in developed neighborhoods, which reduces the potential adverse effects to wildlife and wildlife habitat.

The types of potential effects to historic properties from induced growth associated with Alternative B would be similar to those described for Alternative A. In addition, no city-designated historic districts are within the Portsmouth portion of the Induced Growth ICE Study Area of Alternative B; therefore, no City regulation of development impacts to historic properties from induced growth under Alternative B would apply there. However, regulation of potential impacts to historic properties that apply to federal and state undertakings would still apply.

Both the potential beneficial and adverse effects of induced growth would be greater under Alternative B than Alternative A because the construction of Alternative B would occur over a larger area. Similarly, because the potential induced growth area of Alternative B is smaller than either Alternative C or D, the relative potential indirect effects to land use, socioeconomic resources, natural resources, and historic properties from induced growth would be fewer under Alternative B than those alternatives.

#### 3.15.2.7 Alternative C- Encroachment Effects

Socioeconomic Resources

The indirect effects to socioeconomic resources under Alternative C would be similar to those described for Alternatives A and B. The types of impacts along I-664 would be similar to those described along I-64 for Alternative A. Up to 11 residential and 5 commercial relocations would occur in areas adjacent to the Alternative C corridor. In some locations, the I-664 corridor on land is not as developed and mature as the I-64 corridor. Therefore, impacts to community cohesion may be less of a concern and the factors that influence individuals leaving or coming into the area may also be different. The socioeconomic impacts along the I-664, I-564, and VA 164 Connectors would be similar to those described for the connectors under Alternative B.

The increased capacity with the associated reduction in congestion and increase in the reliability of the regional transportation system achieved under Alternative C would have similar types of indirect effects and benefits to socioeconomic resources as described for Alternatives A and B. But because construction would occur over a larger area relative to Alternatives A and B, these effects would be experienced over a larger area, impacting more socioeconomic resources. Increased transit capacity and the competitive

travel time advantage achieved through the transit-only lanes included in Alternative C relative to the other Build Alternatives would benefit transit-dependent populations more than Alternatives A and B.

Alternative C effects on the larger regional transportation network would consist of decreases in congestion and improved travel reliability. This alternative would also include a new crossing over the entire Hampton Roads and a more direct connection between the HRBT and the MMMBT, further improving travel reliability and connectivity in the region. Traffic would increase on the MMMBT and decrease on the HRBT under this alternative. Congestion at Hampton Roads crossings at peak travel times would still occur. Regional traffic patterns would shift as described for Alternative A, because increased capacity of the widened Study Area Corridors would reduce excess travel demand on parallel local streets, resulting in traffic volume reductions on those roads. Tolling could also influence how traffic is diverted to other crossings. While the indirect effects of tolling on traffic cannot be reliably determined at this time because of a number of unknowns (e.g., which facilities would be tolled, the toll rate, etc.), the *HRCS Traffic and Transportation Technical Report* includes a basic toll diversion. Two toll scenarios were considered for Alternative C. Tolling scenarios are based on those developed by the HRTAC (HRTAC, 2015). Under the first scenario, a toll was placed on the new Elizabeth River crossings (i.e. the I-564, I-664, and VA 164 Connectors). A fixed toll of $1 was coded on the I-564, I-664 and VA 164 connectors. However, because vehicles would always need to travel on at least two of these connectors to cross the Elizabeth River, the effective toll on the crossing is $2. See the *HRCS Traffic and Transportation Technical Report* for details on the assumptions used for the toll diversion analysis. The results indicate that traffic volumes on the MMMBT would decline slightly while traffic volumes on the HRBT would increase. This pattern occurs despite the relatively larger capacity increase on the MMMBT. This indicates that the HRBT is the preferred means of crossing Hampton Roads, in particular when the trip between the Peninsula and the Norfolk area via the HRBT remains toll-free compared to a trip travelling via the MMMBT that would involve the (tolled) I-664 and I-564 Connectors.

Traffic volumes on the VA 164 Connector would likely see the largest decline with the implementation of a toll, indicating that travelers using the VA 164 Connector would find alternate, lower cost routes to and from the Norfolk area from areas to the south. Under the second scenario, a managed lane scenario (i.e., HOT Lanes with the toll rates shown in **Table 3-57**) was considered where widening occurs; the fixed toll on the Elizabeth River crossing was retained as well. HOT lanes would cause volumes on the MMMBT to be substantially less under Alternative C. This is likely due to the longer distance that drivers would experience traveling between the Peninsula and Norfolk and the higher toll cost they would incur. It is also an indication that congestion on the MMMBT is projected to be lower under Alternative C because the toll scenario assumed that four general purpose lanes would remain, and the fifth lane would be converted from a transit-only lane to a HOT lane. When congestion in the general purposes lanes is relatively low, there is little incentive for drivers to pay for a trip using the HOT lanes. Short-term indirect effects to socioeconomic resources from the construction of Alternative C would be similar to those described for Alternative A, but would be experienced over a larger area and in more communities than for Alternatives A and B. Conversely, as Alternative C is shorter than Alternative D, it would have fewer temporary indirect effects to socioeconomic resources.

Natural Resources

Alternative C would be constructed in the highly urbanized area of Norfolk along I-564 and highly urbanized and industrialized portions of Newport News. However, areas along I-664 in Suffolk and Chesapeake (the Southside) are less developed. Indirect effects to natural resources along I-664 in

Hampton and Newport News would be similar to the types of impacts along I-64 under Alternative A. Impacts from widening the MMMBT and the I-564, I-664, and the VA 164 Connectors over the water and on the CIDMMA would be similar to the types of impacts described under Alternative B.

Much of the undeveloped land to either side of I-664 on the Southside is forested wetland, swamps, and marshes. South of the VA 164 interchange, a rail line enters the median of I-664 and continues south to the end of the Study Area Corridor. Alternative C would widen I-664 on the Southside from four to six lanes. This alternative would improve existing I-664 where habitat has been fragmented from previous road and rail infrastructure. It would impact the edge of the forested habitat bordering the interstate right-of-way and thus would have limited habitat fragmentation effects in this area. These impacts would be greater than experienced under Alternative A, as some of the areas surrounding I-664 on the Southside are less developed. However, as I-664 is an existing interstate facility with a rail line running through the median, the impacts would not be as great as those described under Alternative B for the VA 164 Connector south of CIDMMA.

Alternative C would have similar types of indirect effects to protected shorebirds along I-664 as described for I-64 / HRBT under Alternative A. It would also have similar effects to threatened and endangered species as Alternative B near the VA 164 Connector. Alternative C would have increased habitat fragmentation effects to Mabees salamander habitat present on either side of I-664 on the Southside from reduction of forested buffers, and alteration of a pond that is habitat for this species. This would result in indirect effects to light and temperatures from forest loss. An impact to the Mabees salamander would not occur if two consecutive years of survey document the species is not present. Although more summer roosting bat habitat is present in the Alternative C Study Area Corridor, potential indirect effects on bat roosting and foraging habitat would be similar to those described for Alternative B. Canebrake rattlesnake habitat to either side of I-664 on the Southside would not likely experience increased fragmentation as no habitat corridors currently connect these areas. Peregrine falcons have no documented use of the Alternative C Study Area Corridor for breeding, thus this alternative would have no indirect effects on this species.

Alternative C is estimated to require disposal of approximately 7.1 million cubic yards of dredge material. This amount would be more than all the other Build Alternatives, thus Alternative C would have the most indirect dredging effects to natural resources and raise greater regional dredge material disposal capacity issues. Several options are available to dispose of dredge material that require testing to evaluate its suitability for various alternative uses and disposal sites. Therefore, the exact effects of dredge material disposal on natural resources and the regional capacity for dredge material disposal is not known at this time. However, with the exception of the initial impacts to benthic communities at the disposal site, which is inevitable, the potential for other effects to possibly occur as a result from disposal operations will be site specific, depending on the characteristics of the dredged material, whether disposal is on land or in water, and the hydrodynamic conditions at the disposal site. These include impacts from increased or decreased light penetration and potential release of toxicants that may alter feeding, breeding, and nursery habitat as well as affect the life and health of nearby wildlife. These potential effects at the disposal site are minimized as part of the USACE permitting process for the disposal site approval.

Alternative C would also construct the I-664 Connector comprised of trestle bridges over the open waters of Hampton Roads north of CIDMMA, between the I-564 Connector and the MMMBT. The indirect effects to aquatic resources related to this over-water structure are being addressed in the hydrodynamic study in development by VIMS and will be included in the Final SEIS.

Indirect effects of Alternative C to wetlands would be the same as Alternatives A and B where they overlap. Wetland habitat would not be substantially altered along I-664 in Hampton and Newport News because the few wetlands present have been previously altered or fragmented. Thus, indirect effects to wildlife and wildlife habitat in these areas would be reduced. More unaltered wetlands are present in the Suffolk portion of the I-664 corridor, but because direct effects would occur to a narrow fringe along existing right-of-way, limited indirect impacts to wetland habitat would occur there to accommodate the proposed widening of the interstate. Indirect effects to estuarine wetlands would be similar as described for Alternatives A and B.

Historic Resources

Alternative C would improve access to historic properties better than Alternatives A or B. As discussed for Alternative A, greater access may benefit historic properties by increasing visitation that supports historic preservation. In addition to the historic properties noted under Alternative B in the I-564, I-564 and VA 164 Connectors areas, the St. Vincent de Paul Catholic Church, the Noland Company Building, Brown Manufacturing Coca-Cola Bottling Works-Daily Press Building, and Sunray Agricultural Historic District are located within the Historic Resources ICE Study Area along I-664 through Newport News and the Southside.

#### 3.15.2.8 Alternative C- Induced Growth

The interchanges and Induced Growth ICE Study Area boundaries of Alternative C are shown in **Figure 3-29** and the interchange map key is presented in **Table 3-60**. **Figure 3-25** shows the extent of developed lands (79 percent) in the Induced Growth ICE Study Area of Alternative C. Lands classified as developed or undeveloped in the NLCD could include military or other inaccessible government-controlled lands. Induced growth is not expected along I-564 or the I-664, I-564, or VA 164 Connectors because these areas are either primarily under government control or over water. **Figure 3-27** depicts the designated commercial, industrial and mixed use areas.

The Induced Growth ICE Study Area of Alternative C extends beyond planned growth areas as identified by the planning documents of the cities of Chesapeake, Hampton, Newport News, Norfolk, Portsmouth and Suffolk (see **Figure 3-26**). The *HRCS Indirect and Cumulative Effects Technical Report* provides a breakdown of Induced Growth ICE Study Area acreage outside designated growth areas by land use category. Approximately 27 percent (7,343 acres) of the total Induced Growth Ice Study Area acres extend beyond designated growth areas in the cities crossed by Alternative C, including areas over water. Of the land uses, the majority are residential (51 percent), open space (18 percent), and military lands (14 percent). As seen in **Figure 3-26**, the Induced Growth ICE Study Area of Alternative C in Suffolk and Chesapeake is mostly within designated growth areas, which also includes more open space than in either Hampton, Newport News, Norfolk or Portsmouth. However, much of this open space is within wetlands and the Great Dismal Swamp that are more difficult and costly to develop because of protective regulations. The Induced Growth ICE Study Area boundaries of Alternative C in Hampton, Newport News and Norfolk includes more acreage outside designated growth areas than elsewhere. Because these cities are largely built-out, induced growth associated with Alternative C is expected to occur more as redevelopment and infill in these communities. As discussed for Alternatives A and B, induced growth of Alternative C is anticipated to occur in areas designated for such growth, but pressure to change land use or increase density beyond what is currently planned may occur in the future, primarily in residential areas. It is difficult to predict the extent of the induced growth associated with Alternative C as

transportation is but one of many factors that influence growth and development. As discussed for Alternative A, land use policies and guidelines are set by local governments and are required by the Code of Virginia § 15.2-2223 to be updated every five years. This process reduces the potential for unwanted growth or unplanned land use.

**Table 3-60: Alternative C Induced Growth ICE Study Area Interchange Map Key**

| Key # | Interchange Description | Key # | Interchange Description | Key # | Interchange Description |
|---|---|---|---|---|---|
| **6** | I-64 WB Entrance Ramp from Granby St/Norfolk Naval Station Gate 22/ Forest Lawn Cemetery | **21** | I-664 Connector | **32** | Exit 10 - VA 659 Pughsville Rd |
| **7** | Exit 276 - I-564 & Granby St/VA 460 | **22** | Exit 1A - Williamsburg/Richmond | **33** | Exit 11A - VA 337 West/ Portsmouth Blvd |
| **8** | I-64 EB Entrance Ramp from Norfolk Naval Station Gate 22 | **23** | Exit 1B - Downtown Hampton/ Norfolk/Virginia Beach | **34** | Exit 12 - VA 663/ Dock Landing Rd |
| **9** | I-64/I-564 | **24** | Exit 2 - Power Plant Pkwy/ Powhatan Pkwy | **35** | Exit 13A - US Rt 13 South/ US Rt 58 West/ US Rt 460 West/ Suffolk |
| **10** | VA 165/VA 170 Little Creek Rd | **25** | Exit 3 - Aberdeen Rd | **36** | Exit 13B - US Rt 58 East to US Rt 13 North/ US Rt 460 Alt/ US Rt 460 East/ Bowers Hill Military Hwy |
| **11** | VA 406/Terminal Blvd to Hampton Blvd | **26** | Exit 4 - Chestnut Ave | **37** | Exit 15B - I-64/ Chesapeake/Virginia Beach |
| **12** | I-564 Connector | **27** | Exit 5 - 35th St | **38** | Exit 15A - I-264 East/ Portsmouth/Norfolk |
| **13** | VA-164 Connector | **28** | Exit 7 - Terminal Ave | **39** | Exit 14 - US Rt 13 North/ US Rt 460 East/ Military Hwy |
| **15** | Cedar Ln | **29** | Exit 6 - 26th St/ 27th St | **40** | Exit 11B - VA 337 East/ Portsmouth Blvd |
| **16** | Towne Point Rd | **30** | Exit 8B - VA 135 South/ College Dr/Churchland | **41** | Exit 8A - VA 135 North /College Dr |
| **17** | VA 135/College Dr | **31** | Exit 9 - US Rt 17 North/ Bridge Rd | | |

**Figure 3-29: Interchanges and Alternative C Induced Growth ICE Study Area**

Induced growth could potentially take place over a larger area under Alternative C compared to Alternatives A and B. Therefore, the related effects of induced growth would have more widespread potential benefits to socioeconomic resources and adverse effects to natural and historic resources than Alternatives A and B. The types of indirect effects to these resources in the Peninsula portion of the I-664 corridor under Alternative C would be similar to those discussed for Alternative A along I-64. Greater benefits to socioeconomic resources along I-664 on the Southside are expected under Alternative C from more extensive induced growth than on the Peninsula because more undeveloped land could be developed. Therefore, impacts to natural resources are expected to be greater on the Southside than on the Peninsula. Most of this development would be in areas designated for growth.

Based on NWI and NHD data, an estimated 490 wetland acres, 167,048 linear feet of streams, and 3,545 floodplain acres are throughout the Induced Growth ICE Study Area of Alternative C. The federal and state regulations protecting water resources as discussed under Alternatives A and B, as well as the previously discussed government-controlled land use along I-564 and the proposed VA 164 Connector, would apply to development in the Alternative C Induced Growth ICE Study Area and substantially reduce the amount of land available for induced growth. Modern stormwater measures would replace older stormwater systems under this alternative, neutralizing potential indirect impacts and leading to downstream improvement in water quality by treating runoff. More induced growth under Alternative C could have greater adverse impact to wildlife, wildlife habitat, and protected species as described under Alternative A and B, but less than Alternative D. This potential should still be minimized as the type of induced growth is expected to be infill or redevelopment within previously disturbed areas designated in regional and local planning for such type of development. State and local governments have identified priority areas for preservation of wildlife habitat and implemented land use policies to preserve many of these areas.

Induced growth under Alternative C would occur over a larger area than Alternatives A and B. Therefore, potential adverse effects to historic properties from Alternative C would be more widespread. These effects should be similarly minimized by regulations as described under Alternatives A and B. In addition, Chesapeake has a historic preservation commission that maintains and updates a list of historic sites and reviews architectural projects in historic and cultural preservation overlay districts, including the Sunray Historic District south of the I-664 Bowers Hill interchange area. Newport News has a historic architectural review board that reviews proposed projects in the North End / Huntington Heights Historic District southwest of I-664 and northeast of the Newport News Shipbuilding shipyard. Suffolk has a Historic Landmarks Commission but no Historic Overlay District in the Induced Growth ICE Study Area of Alternative C.

#### 3.15.2.9 Alternative D- Encroachment Effects

Socioeconomic Resources

Alternative D would combine elements of the other Build Alternatives and would have indirect effects similar to those facilities described above. This alternative would have a narrower footprint along I-664 than Alternative C, but with little difference in indirect effects to socioeconomic resources. This alternative would not offer the competitive travel time advantage for transit that the dedicated transit lanes in Alternative C provide. Therefore, Alternative D would have fewer benefits for transit-dependent populations.

Alternative D includes all the other Build Alternatives, and therefore would provide the greatest benefits when it comes to reducing congestion and increasing regional travel reliability and connectivity. Under Alternative D, which includes widening on both the HRBT and the MMMBT, the overall increase in traffic volumes would be balanced between the two bridge-tunnels. Congestion would still occur during peak hour travel times at the Hampton Roads crossings. Regional traffic patterns would shift as described for Alternative A, because increased capacity of the widened Study Area Corridors would reduce excess travel demand on parallel local streets, resulting in traffic volume reductions on those roads. Tolling could also influence how traffic is diverted to other crossings. While the indirect effects of tolling on traffic cannot be reliably determined at this time because of a number of unknowns (e.g., which facilities would be tolled, the toll rate, etc.), the *HRCS Traffic and Transportation Technical Report* includes a basic toll diversion analysis. Tolling scenarios are based on those developed by the HRTAC (HRTAC, 2015). Two toll scenarios were considered for Alternative D.. Under the first scenario, a toll was placed on the new Elizabeth River crossings (i.e. the I-564, I-664, and VA 164 Connectors). A fixed toll of $1 was coded on the I-564, I-664 and VA 164 connectors. However, because vehicles would always need to travel on at least two of these connectors to cross the Elizabeth River, the effective toll on the crossing is $2. See the *HRCS Traffic and Transportation Technical Report* for details on the assumptions used for the toll diversion analysis. The results indicate that traffic volumes on the MMMBT would decline slightly while traffic volumes on the HRBT would increase. This pattern occurs despite the relatively larger capacity increase on the MMMBT. This indicates that the HRBT is the preferred means of crossing Hampton Roads, in particular when the trip between the Peninsula and the Norfolk area via the HRBT remains toll-free compared to a trip travelling the MMMBT that would involve the (tolled) I-664 and I-564 Connectors.

Traffic volumes on the VA 164 Connector would likely see the largest decline with the implementation of a toll, indicating that travelers using the VA 164 Connector would find alternate, lower cost routes to and from the Norfolk area from areas to the south. Under the second scenario, a managed lane scenario (i.e., HOT Lanes with the toll rates shown in **Table 3-57**) was considered. HOT lanes would cause volumes on the MMMBT to be substantially less under Alternative D. This is likely due to the longer distance that drivers would experience traveling between the Peninsula and Norfolk, as well as the higher toll cost they would incur.

Temporary indirect effects to socioeconomic resources during construction would be similar to those described for Alternative A, but would occur over a larger area than the other Build Alternatives. These effects would end once construction is completed and therefore are considered minor.

Natural Resources

Alternative D would combine elements of the other Build Alternatives and would have indirect impacts similar to those facilities described above. This alternative would have a narrower footprint along I-664 than Alternative C. This reduction in footprint, however, would not substantially decrease the indirect effects to natural resources relative to Alternative C.

Alternative D would potentially generate approximately 6.1 million cubic yards of dredge material requiring disposal, fewer relative to Alternative C, but more than the other Build Alternatives. For the same reasons cited for the other alternatives, the exact indirect dredging effects to natural resources and regional disposal capacity are not known at this time. However, with the exception of the initial impacts to benthic communities at the disposal site, which is inevitable, the potential for other effects to possibly occur as a result from disposal operations would be site specific, depending on the characteristics of the dredged material, whether disposal is on land or in water, and the hydrodynamic conditions at the disposal site. These include impacts from increased or decreased light penetration and potential release of toxicants that may alter feeding, breeding, and nursery habitat as well as affect the

life and health of nearby wildlife. These potential effects at the disposal site are minimized as part of the USACE permitting process for the disposal site approval.

Historic Resources

As Alternative D would construct improvements over a larger area, it would have the most indirect benefits and adverse indirect effects to historic properties among the Build Alternatives. Compared to the other Build Alternatives, Alternative D would increase capacity and regional accessibility the most, and therefore would make historic properties in the Historic Resources ICE Study Area more accessible. This could increase historic tourism the most relative to the other alternatives, but also may have greater adverse effects to historic properties that do not limit access, as discussed under Alternative A.

### 3.15.2.10 Alternative D- Induced Growth

Alternative D would combine elements of the other Build Alternatives and would have induced growth effects similar to those described for those alternatives. However, Alternative D would not include an additional dedicated transit lane as proposed by Alternative C. **Figure 3-30** shows the existing and proposed interchanges and Induced Growth ICE Study Area of Alternative D with the interchange map key in **Table 3-61**. Alternative D would improve all the Study Area Corridors. Therefore, the potential for induced growth effects would be over a larger area than all of the other Build Alternatives.

Developed lands within the Induced Growth ICE Study Area for Alternative D are shown in **Figure 3-25**. Lands classified as developed or undeveloped in the NLCD could include military or other inaccessible government-controlled lands. Approximately 81 percent of the Induced Growth ICE Study Area of Alternative D on land is developed. **Figure 3-27** depicts the designated commercial, industrial and mixed use areas.

The Induced Growth ICE Study Area for this alternative extends beyond areas designated for growth by the cities transected by Alternative D (**Figure 3-26**). The *HRCS Indirect and Cumulative Effects Technical Report* presents the land use category of the Induced Growth ICE Study Area extending out of designated growth areas under Alternative D. Approximately 27 percent (9,453 acres) of the total Induced Growth Ice Study Area acres extend beyond designated growth areas in the cities crossed by Alternative D, including areas over water. Of these, the majority are residential (48 percent), military (18 percent), and open space (17 percent). It is not expected that induced growth would occur on military lands or areas over water. As discussed for the other Build Alternatives, induced growth in the largely built-out cities of Hampton, Newport News, Norfolk and Portsmouth would occur as infill or redevelopment most likely within areas designated for such growth. However, some induced growth associated with Alternative D could occur outside of designated growth areas, especially in Hampton, Newport News, Norfolk and Portsmouth. This could occur primarily on residential lands. In these areas, induced growth associated with Alternative D could increase pressure to increase density or change land use classification. Induced growth in Suffolk and Chesapeake associated with Alternative D would occur almost entirely within designated growth areas (**Figure 3-26**). This may change existing land use, but in accordance with comprehensive plans. Besides transportation accessibility, other factors affect the decision to develop; hence, the extent of induced growth associated with Alternative D is uncertain. As discussed for Alternative A, land use policies and guidelines are set by local governments and are required by the Code of Virginia § 15.2-2223 to be updated every five years. This process reduces the potential for unwanted growth or unplanned land use.

**Figure 3-30: Interchanges and Alternative D Induced Growth ICE Study Area**

**Table 3-61: Alternative D Induced Growth ICE Study Area Interchange Map Key**

| Key # | Interchange Description | Key # | Interchange Description | Key # | Interchange Description |
|---|---|---|---|---|---|
| **1** | Exit 267 - US Rt 60/VA143 Settlers Landing Rd & Woodland Rd | **16** | Towne Point Rd | **31** | Exit 9 - US Rt 17 North/ Bridge Rd |
| **2** | Exit 268 - VA 169 South Mallory St | **17** | VA 135/College Dr | **32** | Exit 10 - VA 659 Pughsville Rd |
| **3** | Exit 272 - West Ocean View Ave/Willoughby Spit | **18** | Exit 9A - US Route 17 North/Bridge Rd/ James River Bridge | **33** | Exit 11A - VA 337 West/ Portsmouth Blvd |
| **4** | Exit 273 - Rt 60 4th View St | **19** | I-664/VA164 Interchange | **34** | Exit 12 - VA 663/ Dock Landing Rd |
| **5** | Exit 274 - West Bay Ave to I-64 East/ I-64 to WB West Ocean View Ave | **20** | Exit 9B - VA 164 East /US Rt 17 South/Portsmouth | **35** | Exit 13A - US Rt 13 South/ US Rt 58 West/ US Rt 460 West/ Suffolk |
| **6** | I-64 WB Entrance Ramp from Granby St/Norfolk Naval Station Gate 22/ Forest Lawn Cemetery | **21** | I-664 Connector | **36** | Exit 13B - US Rt 58 East to US Rt 13 North/ US Rt 460 Alt/ US Rt 460 East/ Bowers Hill Military Hwy |
| **7** | Exit 276 - I-564 & Granby St/VA 460 | **22** | Exit 1A - Williamsburg/Richmond | **37** | Exit 15B - I-64/ Chesapeake/Virginia Beach |
| **8** | I-64 EB Entrance Ramp from Norfolk Naval Station Gate 22 | **23** | Exit 1B - Downtown Hampton/ Norfolk/Virginia Beach | **38** | Exit 15A - I-264 East/ Portsmouth/Norfolk |
| **9** | I-64/I-564 | **24** | Exit 2 - Power Plant Pkwy/ Powhatan Pkwy | **39** | Exit 14 - US Rt 13 North/ US Rt 460 East/ Military Hwy |
| **10** | VA 165/VA 170 Little Creek Rd | **25** | Exit 3 - Aberdeen Rd | **40** | Exit 11B - VA 337 East/ Portsmouth Blvd |
| **11** | VA 406/Terminal Blvd to Hampton Blvd | **26** | Exit 4 - Chestnut Ave | **41** | Exit 8A - VA 135 North /College Dr |
| **12** | I-564 Connector | **27** | Exit 5 - 35th St | **42** | Exit 264 - I-664 |
| **13** | VA-164 Connector | **28** | Exit 7 - Terminal Ave | **43** | Exit 263B - VA 258 North/VA 134 South/ Mercury Blvd/Hampton Coliseum |

| Key # | Interchange Description | Key # | Interchange Description | Key # | Interchange Description |
|---|---|---|---|---|---|
| **14** | Virginia International Gateway Blvd | **29** | Exit 6 - 26th St/ 27th St | **44** | Exit 263 - Mercury Blvd/ VA 258 South James River Bridge/ VA 258 North/ VA 134 South Coliseum |
| **15** | Cedar Ln | **30** | Exit 8B - VA 135 South/ College Dr/Churchland | **45** | Exit 265 - VA 167/VA 134 - LaSalle Ave/ North Armistead Ave & Rip Rap Rd |

NWI and NHD data indicate 511 acres of wetlands, 211,837 linear feet of streams and 6,058 floodplain acres are throughout the Induced Growth ICE Study Area. Alternative D would have the greatest potential to adversely affect these resources. Modernized stormwater management systems and implementation of BMPs such as limiting increases impermeable surfaces to previously developed areas could reduce the impacts to water resources from induced growth. Aside from induced development associated with Alternative D occurring as infill and redevelopment in primarily previously disturbed areas, federal, state, and local regulations should minimize the potential adverse effects to these aquatic resources as described for the other alternatives.

Alternative D would also have the greatest potential to adversely affect wildlife, wildlife habitat, and protected species compared to the other Build Alternatives because it has the potential to induce growth over the largest area. As described under the other Build Alternatives, this potential would be minimized because expected growth would occur mostly in previously developed areas and some development would be subject to federal, state, or local regulations that require minimizing or mitigating impacts.

The potential effects of Alternative D's induced growth to historic properties would include all those discussed for the other Build Alternatives as Alternative D includes elements of all the other Build Alternatives.

### 3.15.3 Cumulative Effects

#### 3.15.3.1 Cumulative Effects Analysis

This section summarizes the cumulative effects analysis documented in the *HRCS Indirect and Cumulative Effects Technical Report*. Cumulative impacts consist of the direct and indirect impacts of the alternatives under consideration in the HRCS SEIS in combination with the impacts of past, present, and reasonably foreseeable actions. The geographic boundaries of the Cumulative Effects Study Area are shown in **Figure 3-31**. The temporal boundaries for the cumulative effects study spans from 1955, when construction of I-64 within the Study Area Corridors began, to 2040, which is the modeled design year used for the Build Alternatives in the HRCS SEIS. Past, present, and reasonably foreseeable actions have already impacted or have the potential to impact the same socioeconomic, natural, or historic resources as the proposed project. These potential impacts are taken into consideration in the following discussions of the alternatives' cumulative effects.

**Figure 3-31: Cumulative Effects Study Boundary**

3.15.3.2 Past, Present and Reasonably Foreseeable Actions

Past Actions

Development since 1955 has transformed a rural landscape into an urban/suburban environment that is largely built-out in the Cumulative Effects Study Area. Historic topographic maps and aerials most readily illustrate the pace and extent of growth in the Hampton Roads region since the mid-Twentieth century. The maps and aerials also show the progression and extent of development impacts to the natural environment and historic properties. Topographic maps or aerials prior to 1955 are not widely available. However, the US Geological Survey (USGS) historical topographic maps are available for the years 1955, 1964, 1965, 1973, and 1986 and aerials for the years of 1963, 1982, 1983, 1990, 1991, 1994, 2002 and 2010 are included in **Appendix F**. Aerial imagery from Google Earth was also reviewed to assess recent change in land use and development. Prior to 1955, growth and development in the Hampton Roads region was historically driven by European colonialism, river transportation and shipping, development of the railroad system, and military investments. The development of highways, bridges, and tunnels in the late 1950s through 1990s enabled the linking of residential areas to commercial, industrial, and military activity centers of the six study cities, with the suburban growth occurring near the newer highway interchanges. As described below, the once rural landscape has been transformed to residential neighborhoods, shopping centers, port facilities, military and industrial facilities, and business parks by years of rapid development following the construction of I-64, I-564, I-664, and VA 164.

According to USACE data for the lower James River from March 28, 2006 to March 28, 2016, the USACE Norfolk District has permitted the following:

- Permits issued: 1,723
- Authorized fill acres: 149
- Acres of permanent loss: 44
- Authorized dredge removal acres: 1,030
- Required mitigation acres: 137

VDOT records also provide some insight into impacts to wetlands and streams. Since 2007, VDOT has received permits for the following impacts[15]:

Streams

- 3,157 cubic yards of dredge material
- 4,231 cubic yards of permanent fill
- 6,635 linear feet of permanent fill

Wetlands

- 8 acres of dredge material
- 30 acres of fill

The following identifies specific past actions that have contributed to existing conditions within the Cumulative Effects Study Area. The following past transportation, major development, military and port activities are focused upon as the most relevant to understanding the potential cumulative impacts of the HRCS alternatives. Permit data is not available for many of these projects; however, some of these developments are clearly visible in the historic mapping and aerials included in **Appendix F**.

[15] Data as of March 23, 2016

Past major roadway projects include:

- I-64, with the initial section in the Hampton Roads region opened in 1957. The section in Newport News and Hampton was widened from four to six lanes in two projects between 1979 and 1988 (Roads to the Future, 2016). I-64 is the only interstate into and out of the Hampton Roads region.
- I-264 was originally located between two interchanges with I-64 between Bowers Hill in Chesapeake and the junction in Norfolk, and was designated in the late 1950s. The stretch of I-264 to the east, now known as the Virginia Beach Expressway, was originally built in 1967 as a toll road with four lanes and was widened to six lanes in the 1980s and to eight lanes in the early 1990s. I-264 connects Portsmouth and Norfolk through the Downtown Tunnel and Berkley Bridge that were constructed in 1952.
- I-464 connects I-64 in Chesapeake to I-264 in downtown Norfolk at the Berkley Bridge and Downtown Tunnel, just outside the Natural Resources ICE Study Area boundary. Military Highway opened in 1967 between I-64 and US 13 and extended north in 1987, I-464 connects directly to the Virginia 168 Chesapeake Expressway, which comprises a limited access facility southward to the North Carolina State Line for travelers headed to the Outer Banks.
- I-564 connects NAVSTA Norfolk to the east to I-64 for a total of approximately 3 miles. I-564 was completed in the early 1970s and is also known as Admiral Taussig Boulevard.
- I-664 starts at the junction of I-64 and I-264 at Bowers Hill in Chesapeake and continues north for approximately 21 miles to I-64 in Hampton. I-664 crosses Hampton Roads on the MMMBT, which was completed in 1992. The roadway between I-64 and Aberdeen Road in Hampton was first completed in 1971, while the section south of Aberdeen Road was completed in 1989 prior to construction of the MMMBT. The roadway south of the MMMBT was partially completed in 1990 and connected with Bowers Hill in 1993.
- VA 164 known as the Western Freeway is approximately 7 miles long and connects I-664 and Route 17 in Suffolk with US 58 in Portsmouth. This roadway includes a crossing of the Western Branch of the Elizabeth River on the West Norfolk Bridge. The West Norfolk Bridge was part of the first section of the Western Freeway to be completed in 1979 in order to replace an outdated bridge originally built in the 1920s. The last part of the roadway, west of the bridge, was completed in 1992.
- US 17 James River Bridge was originally completed as a two lane bridge in 1928, later replaced with a new four-lane bridge in 1982. The bridge connects Newport News across the James River with Isle of Wight County.

Five large bridge tunnels have been constructed within the Cumulative Effects Study Area since 1950 that have served to connect the Hampton Roads region. Given the age of most of these improvements, permitted impacts are not available. These projects include:

- The 3.5-mile long HRBT opened with the first set of lanes in 1957; the second set of lanes was opened in 1976.
- The Chesapeake Bay Bridge Tunnel (CBBT) constructed in 1964 connecting Northampton County on the Eastern Shore to Virginia Beach
- The 4.6-mile long MMMBT opened in 1992 connecting Chesapeake with Newport News.
- The Midtown Tunnel opened in 1962, connecting Portsmouth with Norfolk via Route 58. A second set of lanes and parallel tunnel is currently under construction.

- The Downtown Tunnel opened in 1952, connecting Portsmouth with Norfolk via I-264, and expanded to four lanes in 1989. Traffic can continue north over the Eastern Branch of the Elizabeth River using the Berkley Bridge into Norfolk, or can turn south and travel on I-464 towards Chesapeake. The existing Berkeley Bridge was completed in 1952 along with the Downtown Tunnel and subsequently widened in 1989.

Recently completed transportation projects within the Cumulative Effects Study Area are listed in **Table 3-62.**

**Table 3-62: Recently Completed Transportation Projects**

| Project |
|---|
| Gilmerton Bridge replacement and additional channel clearance to limit bridge openings, larger bridge deck to accommodate future widening of Military Highway, Chesapeake |
| South Norfolk Jordan Bridge replacement with a higher, fixed span bridge, Chesapeake |
| Wesleyan Drive, widen to 4 lanes from Northampton Boulevard to Baker Road, Norfolk to Virginia Beach |
| Hampton Boulevard Railroad Grade Separation - Hampton Blvd in Norfolk was lowered below the existing railroad tracks, thus eliminating interruptions to vehicular traffic |

Several military facilities are located within the Cumulative Effects Study Area that were constructed or expanded since 1955. They include:

- NAVSTA Norfolk – 4 miles of waterfront space and 7 miles of pier and wharf space of the Hampton Roads peninsula known as Sewell's Point. Established in 1917, by the end of World War II, the base became much more industrial in nature, including becoming a major supplier of aircraft parts and a rework plant. The Naval Aviation Depot Norfolk plant was closed in 1996 as part of the Congressional Base Realignment and Closure Act.
- Naval Support Activity (NSA) Hampton Roads – Located east of NAVSTA Norfolk and north of Terminal Boulevard, NSA Hampton Roads hosts fleet headquarters administrative and communication facilities with 6,000 personnel and several major tenant commands. It is located where the Atlantic Fleet Headquarters Support Activity was established in 1977, and reorganized in 2000 to Naval Support Activity Norfolk, which subsequently changed its name to NSA Hampton Roads in 2011.
- Mid-Atlantic Military Family Housing – Located south of Little Creek in Norfolk near the Joint Expeditionary Little Creek-Fort Story Base is a small area of military housing across from Tarralton Elementary School.
- Craney Island US Naval Supply Center – Depicted as a US Naval Reservation on the 1955 historical topographic map near the mouth of the Elizabeth River opposite Lambert's Point. By 1964, construction of the US Army Disposal Center had begun to the north of what was now depicted as the US Naval Supply Center. The northern portion of CIDMMA was completed using dredged materials sometime before 1973. The Craney Island Fuel Terminal located at the southeastern corner of the island, possesses 1,100 acres of above- and below- ground fuel storage tanks providing fuel, lubricants and fuel related service to approximately 256 fleet ships. Facilities include 60 storage tanks and over 100 miles of pipeline.
- US Coast Guard Base Portsmouth – Land was purchased in 1974 south of the Craney Island Naval Supply Center along the coast of the Elizabeth River and construction underway in 1983.

- Joint Staff Suffolk Complex – Newly assembled after dissolution of the Joint Forces Command in 2011, the Joint Staff Suffolk Complex replaced the Joint Warfighting Center in North Suffolk near the I-664 and College Drive interchange. It contains elements of Navy Cyber Forces, Navy Cyber Defense Operations Command, and Naval Network Warfare Command.

Listed below are state-run and private ports in the Cumulative Effects Study Area, major shipyards, a dredged material management area, and the Hampton Roads:

- Hampton Roads – The Norfolk Harbor and Channels, Virginia project is a long-term effort in partnership with USACE and the Virginia Port Authority initiated in 1986. It is a network of federally managed navigation channels that has been constructed in separable elements including the Outbound Element completed in 1989; the 50-foot Anchorage in 1999, and 50-Foot Inbound Element in 2007 (USACE, 2015). All federal navigation channels are continually maintained by dredging. The USACE is currently conducting a study to determine if a number of these channels should be dredged to meet or exceed their Congressionally-authorized depths.
- Portsmouth Marine Terminal (PMT) – 287 acres of land located on the west bank of the Elizabeth River, the terminal was largely built upon reclaimed land from dredged material from construction of the Midtown Tunnel which was completed in 1962.
- Norfolk International Terminals (NIT) – Located south of NAVSTA Norfolk in the Hampton Roads on 567 acres along the Elizabeth and Lafayette Rivers, NIT is the POV's largest terminal. The land was originally a military site that Norfolk purchased in 1965. The terminal originally had one berth and one crane but was upgraded starting in the early 1970s with a second container berth and two more cranes. The terminal continued to expand until 2008 when the three newest and largest cranes were installed. Thousands of trucks are processed through the existing 17 interchange lanes. The port has plans for expansion up to 26 interchange lanes.
- Virginia International Gateway (VIG) – Opened in 2007, VIG is the largest privately-owned container terminal in the US at 576 acres. It is leased by the POV. The port has plans to add approximately 60 additional acres of space to the terminal.
- Newport News Marine Terminal (NNMT) – The NNMT has 165 acres of land on the north bank of the James River, just off I-664 in downtown Newport News, with easy access to I-64. The port was established in the late 1880's. Expansion of the terminal facilities included a second pier in the late 1960s, a third pier in 1972, and additional expansions in the 1990s and 2011.
- Major Private Ports – Kinder Morgan, Dominion Terminal Associates, and CSX (Chesapeake and Ohio Railroad) all hold port facilities southeast of NNMT at the southernmost tip of the Peninsula, directly southwest of I-664. Kinder Morgan and Dominion are coal port facilities.
- Major Private Shipyards – Newport News Shipbuilding/Huntington Ingalls is the nation's sole-industrial designer, builder, and re-fueler of nuclear-powered aircraft carriers located at the tip of the Peninsula just south of I-664. Established for 130 years but with changing ownership, the shipyard is a major employer in the Hampton Roads region.
- Craney Island Dredged Material Management Area (CIDMMA) – Completed in 1957, the USACE used dikes to create an area to accept dredging material from the Elizabeth River and Hampton Roads to maintain the shipping channels. When funding becomes available, planned expansion of the CIDMMA would extend eastward. The POV plans to construct a new Craney Island Marine Terminal on top of the expanded CIDMMA, increasing the ports capacity by 20 percent (Virginia Places, 2016).

A recent major improvement project in the ICE study areas was the US Navy dredging of the Elizabeth River Channel from Lambert's Point to Norfolk Naval Shipyard in 2011 that established a 600- foot wide channel, deepening it from 40 feet to between 47 to 50 feet deep. The potential environmental effects of this action were evaluated in an EIS concluding with the ROD issued in 2009 [74 FR 46583, September 9, 2009].

Many residential developments were built following the construction of I-64 through Hampton, I-664 through Hampton, Newport News, Suffolk, and Chesapeake, and VA 164 through Portsmouth and Suffolk (see **Appendix F** aerials). Other major developments in the Cumulative Effects Study Area since 1955 include:

- Hampton Coliseum: The first large multi-purpose arena in the Hampton Roads region and the state of Virginia, the Hampton Coliseum opened in 1970.
- Chesapeake Square: Anchored by the Chesapeake Square Mall that opened in 1989, the Chesapeake Square area is a mixed commercial and residential development in north Chesapeake.
- Harborview: Located in north Suffolk near the I-664/US Route 17 interchange, Harborview is a mixed development of retail, medical services, and residential development designed in concert with development of I-664 in the early 1990s.
- Hampton Roads Crossing: On the border of Suffolk and Portsmouth in the area northeast of the I-664/VA 164 interchange, Hampton Roads Crossing is a mixed use development of housing, commercial uses, and the MAST Center, a regional technology campus that opened in 2007.
- Peninsula Town Center: Officially opened in 2010 on the former Coliseum Mall location in Hampton, Peninsula Town Center features specialty retailers, restaurants, a movie theater and bowling alley.

One commercial airport and one military airfield are located in the Socioeconomic Resources ICE Study Area that were constructed before 1950, but continue to be updated and expanded:

- Hampton Roads Executive Airport – A public use, privately owned airport that is located near the intersection of I-64, I-664, I-264 and Route 58 in Chesapeake. A runway expansion project was completed in 2014.
- NAVSTA Norfolk Chambers Field – Located along the north side of I-564 on NAVSTA Norfolk, aircraft operating out of Chambers Field also utilize other Navy installations in the Hampton Roads region of southeastern Virginia, including Naval Auxiliary Landing Field (NALF) Fentress in Chesapeake, Virginia. Recently, Norfolk and NAVSTA Norfolk have been addressing incompatible development surrounding Chambers Field.

Present and Reasonably Foreseeable Future Actions

There are a number of development actions that are occurring and/or are planned to occur that could contribute to cumulative effects on resources affected by the alternatives. In addition to the Hampton Roads Crossing under consideration in this SEIS, there are numerous VDOT actions planned within the Cumulative Effects Study Area, as identified in VDOT's Six-Year Improvement Program (SYIP). In addition,

the HRTPO CLRP, *2034 Long-Range Transportation Plan* (HRTPO, 2012)[16] lists regional projects that add capacity to the transportation network. The 2034 Long-Range Transportation Plan (LRTP) is the currently approved plan. The 2034 LRTP lists committed projects (which are currently in VDOT's SYIP) and regionally funded construction projects (which evolved through a prioritization process). Projects on these lists are treated as reasonably foreseeable actions because future construction funds have been set aside for them in the planning process. Due to scarce financial resources, projects that do not have identified funding may not be constructed, and are therefore not reasonably foreseeable. **Table 3-63** lists all of the present and reasonably foreseeable future transportation projects that would add capacity within the Cumulative Effects Study Area and notes the status of each project. These projects would all contribute to cumulative impacts related to socioeconomic, natural and historic resources.

The I-564 IC shares a similar footprint and LOD as portions of the improvements proposed under Alternatives B, C, and D. At this stage, it is not appropriate to make decisions on which areas are shared impacts, as the I-564 IC may have permit modifications and this study is based on limited engineering. It is worth noting, however, that some of the impacts assumed under Alternatives B, C, and D may occur under the I-564 IC.

When conducting a cumulative effects analysis, FHWA and VDOT consider "Reasonably Foreseeable Future Actions" to be those actions that are fiscally constrained in the region's LRTP. At this time, efforts are underway to finalize and adopt the region's 2040 LRTP. This action has the potential to modify the reasonably foreseeable future projects considered in this document. One potential project listed in the in the Draft 2040 LRTP, is the Air Terminal Interchange (ATI) on the I-564 IC. The ATI would represent a new interchange on the proposed I-564 IC to service NAVSTA Norfolk, NSA Hampton Roads, and the public. As this project is not funded in the current, approved LRTP and an IJR has not been completed to confirm its location and layout, it is not considered in the cumulative effects analysis. However, given its proximity to Study Area Corridors, it is noted in this document.

**Table 3-63: Present and Reasonably Foreseeable Future HRTPO Transportation Projects within the Cumulative Effects Study Area**

| Project | Status |
|---|---|
| Elizabeth River Tunnels Project – addition of a new two-lane tunnel adjacent to the existing Midtown Tunnel, maintenance and safety improvements to the existing Midtown and Downtown tunnels, extension of the Martin Luther King (MLK) Freeway from London Boulevard to I-264, and interchange modifications at Brambleton Avenue and Hampton Boulevard | Under Construction |
| I-564 IC – Extends I-564 to connect to Norfolk Naval Base and Norfolk International Terminals, Norfolk | Under Construction |
| Portsmouth Boulevard improvements widen to 4 lanes between Jolliff Road and Suffolk City line, Chesapeake | In Design |
| Conventional Passenger Rail Service from Norfolk to Richmond/Northeast Corridor, along existing Norfolk Southern and CSX tracks, Norfolk | In Design |
| I-64 Widening Segment 1 from Jefferson Avenue Exit 255 to Yorktown Road Exit 247 | Under Construction |
| I-64 Interchange at Lasalle Avenue ramp widening to allow dual left turn lanes and right turn lane, Hampton | In Design |

[16] The 2040 LRTP has not yet been approved at the time of the preparation of this report.

| Project | Status |
|---|---|
| Military Highway widening from Robin Hood Road to Lowery Road, Norfolk | In Design |
| Turnpike Road widening from 0.13 miles east of Frederick Boulevard to Constitution Avenue, Portsmouth | Under Construction |
| Nansemond Parkway widening from Chesapeake City Line to Norfolk Southern Railroad, Suffolk | In Design |
| Chesapeake Bay Bridge-Tunnel Parallel Thimble Shoal Tunnel – addition of a new 2-lane tunnel, Virginia Beach to Northampton | In Design |

*Source: HRTPO 2034 Long Range Transportation Plan; VDOT Six-Year Improvement Program.*

Numerous studies are being conducted in Hampton Roads region to further develop transportation in the region. The I-64 / High Rise Bridge Corridor Study culminated in an EA in 2014. This study looks to relieve traffic conditions by expanding 8 miles of I-64 between the I-464 interchange and the I-664 / I-264 interchanges at Bowers Hill including the G.A. Treakle Memorial Bridge (High Rise Bridge). Hampton Roads Transit is studying the expansion of light rail to NAVSTA Norfolk and ODU in Norfolk, and rapid transit on the Peninsula (Peninsula Fixed Guideway Corridor Study). Amtrak and HRT are studying building a Newport News Multimodal Center to include a new Amtrak station and HRT bus facility.

Other local non-transportation projects being studied by other state and federal agencies and private developments have been identified by examining local and regional plans and capital improvement project lists and are described in **Table 3-64**. These projects would all contribute to cumulative impacts related to socioeconomics, natural and historic resources.

**Table 3-64: Present and Reasonably Foreseeable Future Non-Transportation Projects within the Cumulative Effects Study Area**

| Project Name | Project Type | Project Description |
|---|---|---|
| **Chesapeake** | | |
| Stormwater & Drainage | Stormwater & Drainage | Various Stormwater and drainage projects – Citywide. |
| Oceaneering International | Energy Facility | An oilfield engineered services and products provider primarily to offshore oil and gas industry will expand to a new 150,000 square foot facility in Greenbrier North Commerce Park |
| Kroger Marketplace | Retail Development | Located at South Military Highway and I-64, will include four retail stores |
| Lidl Grocer | Retail Development | 36,000 sq foot development in Chesapeake Square |
| Hoffman Beverage | Commercial Development | 195,000 sq foot warehouse expansion at 4105 South Military Highway |
| Sonny Merryman Inc. | Commercial Bus Facility | 37,000 sq foot bus service facility in Cavalier Industrial Park |
| **Hampton** | | |
| Multi-Use Trails | Recreation | Trail construction of Newmarket Creek Trail & Pine Chapel Road Trail |
| Waterway Projects | Stormwater, Drainage & TMDL | Improvements to and maintenance of the waterways in Hampton, including the City's compliance with the Chesapeake Bay TMDL requirement – Citywide |

| Project Name | Project Type | Project Description |
|---|---|---|
| Coliseum Crossing | Commercial Development | 8,225 sq foot expansion on Coliseum Drive |
| Riverpointe Shopping Center | Commercial Development | Overhaul of old Riverdale Plaza to include a 123,000 sq foot Kroger Marketplace and 91,000 sq foot At Home |
| **Isle of Wight** | | |
| Eagle Harbor Apartments | Residential Development | New apartments and detached garages on 15.93 acre site off US Route 17 |
| **Newport News** | | |
| Downtown Initiatives | Community Development | Waterfront redevelopment and enhancements to Historic Downtown |
| Southeast Community Development | Community Development | General urban developments which include survey of existing buildings, acquisition, demolition, relocation, infrastructure to improve the overall quality of life for citizens and revitalize the community |
| 32nd Street Drainage Improvements | Stormwater Drainage | Rehab or replacement of drainage system to ensure the efficiency to the entire drainage network –less resources will be needed to respond and repair to recurring sinkholes |
| River Road Shoreline Stabilization | Stormwater Drainage | Reduce erosion of the existing embankments, loss of shoreline and protection of the City's roadway and underground utilities |
| Watershed Protection Improvements | Stormwater, Drainage | Citywide project will design and construct regional wet detention ponds to improve water quality of runoff into the reservoirs |
| Upper Newmarket Creek Drainage Improvements | Stormwater, Drainage | Project to reduce the flooding during the 10-year and 50-year storm events along the upper section of the watershed |
| Huntington Ingalls Industries | Commercial Development | Adding a 22,000 sq foot health center at Newport News Shipbuilding |
| Printpack | Commercial Development | 50,000 sq foot warehouse facility expansion to 10.7 acres in Oakland Industrial Park |
| Newport News Shipbuilding | Commercial Development | 52,000 sq foot headquarters expansion at 4104 Washington Avenue |
| Brooks Crossing | Mixed use Development | Redevelopment area along Jefferson Avenue between 14th and 35th Street constructing Jim's Local Market and the completed South Police Precinct facility |
| **Norfolk** | | |
| Citywide Stormwater Quality Initiative | Stormwater, Drainage | Citywide effort to continue best practice used to reduce storm water related pollutants entering local waterways, rivers and the Chesapeake Bay |
| Develop Bicycle, Pedestrian Greenways, Sharrows and Complete Street | Recreation | Develop citywide transportation connectivity initiatives. Construction of new bike and pedestrian trails and curb improvements |
| Stormwater Waterfront Facilities | Stormwater | Citywide effort to initiate non-routine inspections, repair, rehabilitation and replacement of deteriorated bulkheads |

| Project Name | Project Type | Project Description |
|---|---|---|
| Improve Downtown Corridor Streetscaping | Community Development | Streetscaping and corridor improvements in the Central Business District. Curb installation, sidewalks and paths to encourage pedestrian friendly environment |
| Norfolk Premium Outlet Mall | Retail Development | 350,000 sq foot retail outlet mall near Northampton Boulevard and I-64 |
| Ikea | Retail Development | 331,000 sq foot store on 19 acres at the northwestern corner of I-64 and Northampton Boulevard. Will involve interchange modification on I-64 |
| Waterside | Retail Development | Overhaul of Waterside District in downtown |
| Automatic Data Processing Inc. | Office Development | New headquarters near downtown Waterside expected to bring 1,800 jobs |
| Sentara Norfolk General Hospital | Institutional Development | Revamping and adding three floors to existing structures dating from 1950s to 2006 |
| The Main | Commercial Development | A new mixed use entertainment, meeting, dining and hotel destination at the corner of Main and Granby |
| Movement Mortgage | Commercial/ Office Development | Moving to Military Circle and overhauling the former JC Penney site |
| The Railyard | Retail/Office Development | New retail and office center on 13 acres at Lambert's Point |
| **Portsmouth** | | |
| Citywide Stormwater Drainage Improvements | Utilities | Upgrade existing facilities and install new infrastructure |
| Multi-purpose Recreation Field/Facility at Greenland Road (Former Stump Dump) | Community Development | Converting the former "stump dump" facility on Greenland Road into a multi-purpose regulation-sized outdoor recreation field with artificial turf and include parking and trail access for the Hampton Branch Trail System |
| Dredging of Lakes/Ponds | Stormwater | Enhance water quality by re-establishing original lake/pond depths by removing organic materials and sediment by dredging |
| Closing Craney Island Landfill | Utility | This facility will be at capacity by 2017 and is planned to be closed by 2018. |
| InterChange Group, Inc. | Industrial Development | New industrial site on 12.5 acres at 2175 Elmhurst Lane |
| ZPMC | Industrial Development | 7,500 sq foot facility at 4018 Seaboard Court in the Greenwood/Elmhurst Industrial Corridor |
| PER Properties | Industrial Development | New concrete facility on 16 acres along the Elizabeth River |
| Vane Brothers Company | Office Development | Expansion of waterfront facility at 4565 Burtons Point Road |
| Bon Secours Maryview | Institutional Development | Located in Midtown, plans include 60,000 sq foot expansion |

| Project Name | Project Type | Project Description |
|---|---|---|
| MAST Center Office Park | Institutional/Retail/Office/ Residential Development | Technology park on the Portsmouth/Suffolk boundary off College Drive |
| **Suffolk** | | |
| Water Source Development and Water Treatment Expansion – Suffolk | Utilities | Improvements to water supply infrastructure and G. Robert House treatment plant |
| Sanitary Sewer System Upgrades – Suffolk | Utilities | Improvements and upgrades to City's sanitary sewer system and including drainage facilities |
| Hampton Roads Crossing | Retail/Office/ Residential Development | 148 acre mixed use development off College Drive |
| Tidewater Community College Real Estate Foundation | Mixed Use Development | Planning for best use of the historic Pig Point Depot now owned by Tidewater Community College |
| Harbour View | Mixed Use | Continuing mixed use development in retail and residential areas such as Riverfront and Harbour View Golf community |
| **Others** | | |
| The Norfolk Harbor and Channels Deepening Project Environmental Assessment – (USACE and POV) | Facilities | A 3-year feasibility study and Environmental Assessment for the deepening of the federal navigation channels extending from the Atlantic Ocean through the Chesapeake Bay into the Port of Hampton Roads. The study is anticipated to include an evaluation of a range of Norfolk Harbor Channels' dimensions |
| The Elizabeth River Project | Environmental Restoration | Various steps to restore the Elizabeth River through a series of projects that include the Money Point Revitalization, Paradise Creek Restoration, and the Lafayette River Project |
| USACE CIDMMA Eastward Expansion (partnered with the POV) | Facilities | Dredge material placement; future Craney Island Marine Terminal |
| Expansion of the NIT and VIG Terminals | Facilities | The POV requested $350 million from Virginia to expand the NIT and VIG Terminals in Norfolk and at CIDMMA in order to handle growing volume. |
| Intergovernmental Planning Pilot Project (Old Dominion University) | Plan | Develop a regional “whole of government” and “whole of community” approach to sea level rise preparedness and resilience planning in Hampton Roads region |

| Project Name | Project Type | Project Description |
|---|---|---|
| National Disaster Resilience, US Department of Housing and Urban Development | Environmental Restoration / Facilities | Hampton Roads area will be receiving more than $120.5 million as part of the National Disaster Resilience Competition to help prepare for the effects of climate change, sea level rise, flooding and storms. Includes combination of natural infrastructure and integration with traditional resilience and storm hazard reduction strategies. |

### 3.15.3.3 Cumulative Impacts

Cumulative impacts consist of the direct and indirect impacts of the alternatives under consideration in the HRCS SEIS in combination with the impacts of past, present, and reasonably foreseeable actions. This analysis relies on CEQ guidance to assess the severity of an impact based on context and intensity. Context may be geographic at multiple scales such as society as a whole, an affected region, affected interests, and specific localities. Intensity, as defined by CEQ, is the severity of impact with regard to multiple factors, including:

- impacts both beneficial and adverse
- degree of public health and safety impacted
- unique characteristics of the geographic area
- degree of controversy surrounding that action and the effect
- potential to set precedent for future actions
- cumulative effects which may be significant, even though the action itself would not create significant impacts
- whether there is a violation of Federal, State, or local law or requirements meant to protect the environment

Impacts with respect to each of the intensity criteria can be described in various levels of severity (**Table 3-65**). The significance or importance of impacts is determined by evaluating the proposed action against existing environmental standards, thresholds, guidelines, or objectives established by Federal, State, and local agencies. These impact significance factors are applied to all resource areas.

**Table 3-65: General Effects Determination Matrix**

| Severity | Extent | Duration | Likelihood |
|---|---|---|---|
| Major | Large | Long | Probable |
| Moderate | Medium | Medium | Possible |
| Minor | Small | Short | Unlikely |

A large extent would be statewide, medium would be regional (Hampton Roads) and small would be local. For most resources, a long duration corresponds to over five years, a medium duration would be one to five years, and a short duration would be less than one year. These potential effects are taken into consideration in the following discussions of cumulative effects of the alternatives to different resources. The following briefly discusses the cumulative effects to land use, socioeconomic, natural and historic resources.

The following briefly discusses the cumulative effects to socioeconomic, cultural, and natural resources.

Socioeconomic Resources and Land Use

Past and present actions have been both beneficial and adverse to socioeconomic resources and land use, and it is expected reasonably foreseeable future actions could as well. Past and present growth and development has increased the standards of living for communities that benefited community cohesion, and provided community facilities and recreational resources. Such growth and development has benefited local economies by improving access to markets and customers. Some past and present developments have resulted in large-scale residential, community facility, and business relocations that adversely affected community cohesion, such as construction of the interstate system and other major freeways. Transportation facilities such as I-64, I-664, and VA 164 have divided and isolated communities, reducing access to neighbors and services. As seen on historic aerials in Appendix F, I-64 was constructed through the previously established neighborhoods of Willoughby Spit, West Ocean View, and Northside through Norfolk. In Hampton, construction of I-64 separated Kings Square from Olde Hampton, and I-664 was built through the Hampton Terrace, Azalea Gardens, Powhatan Park and Park Place neighborhoods. In Newport News, I-664 construction impacted the Newsome Park, Huntington, Jefferson Park, Marshall, and Tucker Creek neighborhoods. In Portsmouth, construction of VA 164 separated Ebony Heights (a historically African American community) and Edgewood Park from Merrifields and Pepperwood in Churchland. I-664 is on the edge of Suffolk and Chesapeake, and therefore its construction did not substantially divide neighborhoods at that time, but as development has increased to either side of I-664, access has been limited to few interchanges and roads that cross under or over the interstate. Minority and low-income populations have historically been adversely affected by past interstate construction (Karas, 2015). Future actions that lead to growth and development are expected to be beneficial for some, but not for others. For example, growth could increase employment opportunities, but require relocations to accommodate. Current federal regulations require that adverse effects of federal actions consider and incorporate mitigation into decisions that adversely affect communities.

Past growth and development has also led to widespread land use change as the region transitioned from a largely dispersed agricultural society to intensified commercial, residential, industrial, and other land uses in the modern urbanized area of the Hampton Roads region. Since 1955, this has led to four of the six cities in the Socioeconomic Resources ICE Study Area to be largely built-out, with future growth expected to occur as infill or redevelopment. Chesapeake and Suffolk are at a slightly less intensive growth progression than the other cities, with future growth constrained by wetlands and conservation lands.

*No-Build Alternative*

The No-Build Alternative would not improve the HRCS Study Area Corridors and therefore would not result in any incremental effect to community cohesion, community facilities and recreation resources, land use local economies, or environmental justice populations in the Cumulative Effects Study Area.

*Alternative A*

Past and present growth and development has resulted in largely built-out cities of Hampton and Norfolk along the I-64 Study Area Corridor comprising Alternative A. Growth of these cities has resulted in a loss of natural ecosystems and previously maintained agricultural land uses. Alternative A would improve an existing interstate, limiting the effects of converting other land uses to transportation compared to

improvements on new alignment. The Induced Growth ICE Study Area of Alternative A is 93 percent built-out. Induced growth associated with Alternative A is expected to be limited to infill and redevelopment, primarily within urban areas designated by Hampton and Norfolk as suitable for such development. However, induced growth associated with Alternative A could also occur in areas outside of designated growth areas in Norfolk and Hampton that are primarily residential. This would likely lead to increased density rather than changes to land use type. Because transportation is only one element that can contribute to growth, it is difficult to predict the extent of induced growth associated with Alternative A. Code of Virginia § 15.2-2223 requires local land use planning to be updated every five years, limiting the potential for unplanned or unwanted growth.

Reasonably foreseeable transportation and other development projects are expected to convert more land use to future transportation and other uses in the Induced Growth ICE Study Area. The incremental contribution of Alternative A to cumulative land use changes would be minor as limited right-of-way would be required along an existing facility, and potential induced growth would be limited to infill and redevelopment in built-out cities.

Past and present growth and development has positively contributed to community cohesion in the cities of Norfolk and Hampton traversed by the I-64 Study Area Corridor by improving the standard of living for these communities. However, original construction of I-64 and the expansion of controlled access facilities such as military installations like NAVSTA Norfolk have separated neighboring communities. Future growth and development is expected to continue, benefiting community cohesion from increased productivity and services. Widening I-64 would marginally increase the separation distance between communities located on either side, but because the relationship between the interstate and adjoining communities has been established for nearly 60 years and all local road crossings would be maintained, indirect effects to community cohesion would be minor. Alternative A would also relocate some residences that border the I-64 right-of-way; however, the number of affected residences would be low (nine) and dispersed among the Willoughby Spit and Commodore Park neighborhoods on the edge of these communities. Relocated residents would receive relocation assistance and comparable replacement housing is available in the affected communities, therefore, limited community cohesion effects would result. Future transportation and redevelopment projects could potentially result in residential relocations within the Cumulative Effects Study Area. The incremental contribution of Alternative A to cumulative effects to community cohesion would be minor because the direct and indirect effects would be minor.

Past growth and development also led to the provision of community facilities and recreational resources, and benefited local economies and long-term employment from increased access to markets and business customers. Both Hampton and Norfolk comprehensive planning provide for recreational opportunities in their communities. Past and present transportation improvements benefit community facilities and recreational resources by increasing access. Existing severe congestion impacts access to these facilities and recreation areas. Future transportation projects and development would continue to increase access to community facilities and recreational resources while potentially displacing others. Alternative A would improve an existing interstate, minimizing potential effects to community facilities and recreational areas, while improving their accessibility. Construction of Alternative A would result in minor right-of-way acquisition near Hampton University and less than 0.1 acre at the Willoughby Boat Ramp. The access to and functions of these community and recreation facilities would be unchanged. Other potential temporary effects from construction could occur to community facilities from detours

and loss of parking. Overall, the incremental contribution of Alternative A to cumulative effects to community facilities and recreational resources would be minor because the direct and indirect effects would be minor. Past, present and future actions would continue to have both positive and adverse cumulative effects to community facilities and recreation.

Minority and low-income populations have historically been adversely affected by large infrastructure projects such as interstate construction. Since 1994, federal regulations require federal actions to avoid disproportionate and highly adverse effects to minority and low-income populations. Future federal and non-federal development would continue to have potential disproportionate and highly adverse impacts to minority and low-income populations, as well as benefits. Federal regulations would continue to avoid disproportionate and highly adverse effects of their authorized actions to minority and low-income populations whenever possible. Minority or low-income populations reside all along Alternative A through Hampton and Norfolk. Beneficial effects to minority or low-income populations as well as other travelers would be realized from reduced congestion and improved access to transportation under Alternative A. The residential relocations (nine) would occur within some of these areas designated as minority or low-income populations; however, it is not known at this time whether affected individuals could be minorities or low-income (see Table 3-20). Approximately 74 percent and 69 percent of the resident population in the two Census Block Groups where relocations would occur under Alternative A identified themselves as non-minorities. The relocated households would receive relocation assistance and similar replacement housing exists in the potentially affected areas. It is possible the potential effects to minority and low-income populations would be reduced with refined design in advanced phases of the project, and that relocations would not impact individual minority or low-income residents, reducing the potential for disproportionate impacts in the Alternative A corridor. Temporary, short-term construction effects of increased noise, dust, and visual changes would not be high and adverse to the affected EJ community. Future federal infrastructure and development projects may have effects to protected EJ populations; however, EO 12898 should continue to minimize adverse effects. Alternative A would have incremental effects to minority and low-income populations resulting in cumulative effects. Past, present and foreseeable future actions would continue to have both beneficial and adverse cumulative effects to minority and low-income populations.

Increased commerce and employment from past and present growth and development, including original construction of I-64, has benefited economic resources in Hampton and Norfolk along the Alternative A Study Area Corridor. Existing severe congestion reduces access to markets and customers, thereby reducing commerce and employment that could otherwise occur. Continued growth and development is expected to have a positive impact to local economies from increased customer demand and long-term employment opportunities. Alternative A would result in moderate improvements to transportation accessibility and reduced congestion providing greater capacity for efficient movement of more goods and people that benefits productivity and local economies in Hampton and Norfolk. Few residential and no commercial relocations would result under this alternative. Short-term construction effects to businesses from temporary detours and lost parking could occur that could cause some customer losses and make deliveries more difficult, but these effects would be temporary and minimized by advance notice of closures and directional signing, resulting in minor effects. Alternative A would have minor adverse and moderately positive incremental effects to local economies. Past, present, and future growth and development in Hampton and Norfolk is expected to result in positive cumulative effects to commerce and employment.

*Alternative B*

For largely the same reasons as described for Alternative A, Alternative B would have minor incremental effects to cumulative land use impacts. In addition to I-64, Alternative B would continue along I-564 in Norfolk, the I-564 Connector across the Elizabeth River, and the VA 164 Connector and VA 164 freeway in Portsmouth. These latter areas are also largely built-out from prior developments and induced growth associated with Alternative B could occur as infill and redevelopment. Much of the land along I-564 is owned by the military, and the VA 164 Connector traverses CIDMMA and other military and state controlled lands. It is expected that no land use change from induced growth potentially related to Alternative B would occur in these latter locations.

Alternative B would also have moderate incremental effects to community cohesion. Its direct and indirect effects along I-64 would be similar to those described for Alternative A. Improvements along I-564 and VA 164 would be to existing roadway facilities where communities have been previously separated by their original construction, or later grew around them. Improvements to these corridors would be at the periphery of established communities and would not bisect residential areas or create new impediments to travel through communities. The I-564 Connector proposed under Alternative B would be over water and the VA 164 Connector would be primarily across government-controlled lands with little potential for community cohesion direct or indirect effects. Up to nine residential relocations and no commercial relocations would occur under Alternative B (the same as Alternative A). The majority of the residential relocations would occur in the Willoughby Spit neighborhood in Norfolk. Both affected Census Block Groups are minority population areas. Similar to Alternative A, the race and/or ethnicity of potentially relocated persons is not known at this time. These relocations would occur on the edge of these communities near the existing roadway facilities. As stated in the Socioeconomic Resources section, the estimated right-of-way needed for Alternative B is conservative, and would be refined in more advanced design that may reduce relocation effects. Relocated residents would receive relocation assistance and comparable replacement housing is available in the affected communities. The incremental effects of Alternative B to community cohesion in Hampton and Norfolk would be minor, and moderate in Portsmouth, based on the number of relocations per community. Past, present, and future transportation projects and other actions are expected to have both positive and adverse cumulative effects to community cohesion.

Alternative B direct effects to community facilities and recreation resources would consist of minor right-of-way acquisitions (less than 12 acres) from six facilities including parks and recreation facilities, and a cemetery in Portsmouth, however, without affecting their access or functions. The majority of the impacts would occur at Fleet Park on NAVSTA Norfolk. No community facility relocations would occur under Alternative B. Other indirect temporary construction effects similar to those described for Alternative A could occur to community and recreational facilities and would be minor. The I-564 IC project currently in design would impact Fleet Park on NAVSTA Norfolk. Future actions are expected to provide additional recreational and facilities while potentially relocating others. The incremental contribution of Alternative B to community facility and recreation resources cumulative effects would be minor because the direct and indirect effects of this alternative would be minor.

I-64, I-564, and VA 164 encompassed by Alternative B were originally constructed prior to 1994 when EO 12898 became effective. Similar to Alternative A, minority or low-income populations reside all along I-64 through Hampton and Norfolk, thus Alternative B would have similar direct and indirect effects in these areas. Additionally, minority populations reside along VA 164 through Portsmouth. These

communities would benefit from the proposed transportation improvements under Alternative B that increases access to transportation. Relocated households (nine, the same as Alternative A) would receive relocation assistance and similar replacement housing exists in the potentially affected areas. Although all relocations under Alternative B would occur in two Census Block Groups that meet the threshold for an EJ population (see Table 3-20), the minority or low-income status of potential relocated residents is not known at this time. Approximately 74 percent and 69 percent non-minority residents live in the two Census Block Groups with potential relocations. It is possible the potential effects to minority and low-income populations would be reduced with refined design in advanced phases of the project, and that relocations would not impact individual minority or low-income residents, reducing the potential for disproportionate impacts under Alternative B. Temporary effects from construction including increased noise, dust, and visual changes would not be high and adverse to the affected EJ community. Future federal infrastructure and development projects may have effects to protected EJ populations, however, EO 12898 would continue to minimize adverse effects. Alternative B could have incremental contributions to cumulative effects on minority and low-income populations in the Cumulative Effects Study Area.

Alternative B would result in moderate improvements to transportation accessibility and reduced congestion providing greater capacity for efficient movement of more goods and people that benefits productivity, long-term employment and local economies. No commercial relocations would result under this alternative. Short-term construction effects to businesses from temporary detours and lost parking could occur that could cause some customer losses and make deliveries more difficult, but these effects would be temporary and minimized by advance notice of closures and directional signing. Temporary job increases associated with construction of Alternative B would occur that would benefit the local economies of Hampton, Norfolk, and Portsmouth. Alternative B would have minor adverse and moderate positive incremental effects to local economies. Past, present and future transportation and other development actions are anticipated to have primarily positive cumulative effects to the economy of the Hampton Roads region.

*Alternative C*

Alternative C would be constructed through the cities of Hampton, Suffolk, Chesapeake, Portsmouth, and Norfolk. Improvements would be made primarily along existing roadways. Therefore, right-of-way requirements would consist of narrow corridors along existing facilities with less potential conversions of existing land use to transportation. Hampton, Portsmouth and Norfolk are largely built-out, thus any indirect induced growth associated with Alternative C construction could occur as infill or redevelopment in these cities. For the same reasons as discussed for Alternative B, no substantial land use change is expected to occur from implementation of Alternative C along I-564, and the proposed I-564 and VA 164 Connectors surrounded principally by government-controlled lands or over water. The area along I-664 through Suffolk and Chesapeake is less developed, but much of the undeveloped land bordering the interstate interchanges and feeder roads is within wetlands and conservation lands that would pose challenges to development. Nevertheless, induced growth pressures in these areas would likely be greater under Alternative C. Population growth is forecasted to increase approximately 136 percent in Suffolk and 50 percent in Chesapeake from 2009 levels to the year 2040 (HRTPO, 2013). Further, almost all of the Induced Growth Study Area through Suffolk and Chesapeake is within designated areas for growth. Current land use in Suffolk and Chesapeake may change that is in part due to construction of Alternative C, but would be limited to within a few miles of I-664 interchanges, and would not conflict

with local comprehensive land use planning. The incremental contribution of Alternative C to cumulative land use change in the Cumulative Effects Study Area would therefore be moderate.

Alternative C would primarily widen along existing transportation corridors and therefore would not further bisect residential areas or create new impediments to travel through communities. The only proposed new alignment on land is through the CIDMMA and southward along the VA 164 Connector, the majority of which is government land. Alternative C would result in ten residential relocations in the Hampton Terrace community of Hampton (near the I-64/I-664 interchange) and one relocation in Newsome Park, Newport News. Relocated households would receive relocation assistance and similar replacement housing exists in the potentially affected areas. In addition, five commercial relocations would occur. Future transportation and redevelopment projects could potentially result in residential and commercial relocations within the Cumulative Effects Study Area. Alternative C would have moderate incremental contributions to cumulative effects on community cohesion.

Alternative C direct effects to community facilities and recreation resources would consist of minor right-of-way acquisitions (10 acres) from four facilities including one religious facility, one school, and two park and recreation facilities. All but 1 acre of these effects would be at Fleet Park on NAVSTA Norfolk. This property would also be impacted by the I-564 IC currently in design. Other direct effects of Alternative C to community facilities and recreation resources include potential temporary construction impacts from detours and reduced parking. Based on the limited direct and indirect effects of Alternative C to community facilities and recreation resources, the incremental contribution of Alternative C to cumulative effects of this alternative to these resources would be minor. As described for Alternative A, past, present and reasonably foreseeable transportation and other actions would continue to have both positive and negative cumulative effects to community facilities and recreation resources.

I-564, I-664, and VA 164 encompassed by Alternative C were originally constructed prior to 1994 when EO 12898 became effective. Similar to the other Build Alternatives, minority populations reside all along the Alternative C alignment, with some low-income population Census Block Groups located in the Newport News and Norfolk portions of the Socioeconomic ICE Study Area. Several of the low-income Census Block Groups in Newport News are adjacent to I-664 at the tip of the Peninsula. These communities would benefit from the proposed transportation improvements under Alternative C that increases access to transportation. Under Alternative C, residential relocations (11) would occur in minority population areas, primarily in the Hampton Terrace area of Hampton as described above (see **Table 3-20**). Although all relocations under Alternative C would occur in Census Block Groups that meet the thresholds for an EJ population, the minority status of potentially displaced residents is not known at this time. Approximately 0-33 percent of residents in the three affected Census Block Groups are non-minority. It is possible the potential effects to minority populations would be reduced with refined design in advanced phases of the project, and that relocations would not impact individual minority residents, reducing the potential for disproportionate impacts in the Alternative C corridor. Temporary, short-term construction effects of increased noise, dust, and visual changes would not be high and adverse to the affected EJ community. Future federal infrastructure and development projects may have effects to protected minority and low-income populations, however, EO 12898 would continue to minimize adverse effects. Alternative C would have incremental effects contributing to cumulative effects on minority and low-income populations in the Cumulative Effects Study Area.

Alternative C would result in moderate improvements to transportation accessibility and reduced congestion providing greater capacity for efficient movement of more goods and people that benefits

productivity, long-term employment and local economies. Five commercial relocations could result from this alternative, but affected businesses would receive relocation assistance. Short-term construction effects to businesses from temporary detours and lost parking could occur that could cause some customer losses and make deliveries more difficult, but these effects would be temporary and minimized by advance notice of closures and directional signing. Temporary job increases associated with construction of Alternative C would occur that would benefit the local economies of Chesapeake, Newport News, Norfolk, Portsmouth and Suffolk. Alternative C would have moderate incremental contributions to positive cumulative effects on local economies because the benefits would be moderate and adverse direct and indirect effects of this alternative would be minor.

*Alternative D*

Alternative D would include elements of all the other Build Alternatives, except it would not include additional dedicated transit lanes as proposed under Alternative C. As such, Alternative D would have similar incremental contributions to cumulative effects on land use, community cohesion, community facilities, recreation resources, environmental justice populations, and local economies as described for the other individual Build Alternatives.

Natural Resources

Past, present, and reasonably foreseeable future growth and development actions in the Natural Resources ICE Study Area have been primarily adverse to natural resources. Intensification of land use in the Hampton Roads region since 1955 has resulted in reduced water quality with many waters impaired for human and wildlife use; loss of wetlands, streams, and floodplains; substantial wildlife population loss from overexploitation and loss of habitat; fragmented habitat; and degraded habitat quality. Impacts that occurred early in the development of the region had a greater impact than more recent projects, given the pristine and undisturbed nature of the environment and absence of environmental regulations. The best indicators for cumulative effects on water resources is the extent of impaired waters in the Hampton Roads region – 111 waterbodies within the Cumulative Effects Study Area are impaired, including Hampton Roads and the James and Elizabeth Rivers.

All of these past and present actions have limited and/or degraded the quality of habitat for existing species. This has led to some species becoming threatened and endangered with extinction. Federal, state, and local regulations enacted over the last 50 years have done much to slow the loss of remaining wildlife and wildlife habitat, improve wildlife habitat and water quality, and recover protected species. These regulations require consideration of avoidance, minimization, and mitigation of adverse effects to natural resources. Past and present private conservation efforts have also positively contributed to natural resources in the region, such as at the Hoffler Creek Nature Preserve in Portsmouth and non-governmental organizations such as the Chesapeake Bay Foundation, the James River Association, the Elizabeth River Project, and Nansemond River Preservation Alliance. Future growth and development in the Natural Resources ICE Study Area is limited because of the lack of developable land and land use policies that aim to concentrate growth while preserving natural lands. The effects of growth and development would also be limited because its effects would be primarily within previously disturbed areas.

*No-Build Alternative*

The No-Build Alternative would not improve the existing HRCS Study Area Corridors. Although stormwater management along the Study Area Corridors has been updated over the past 25 years with retrofitted and more modern systems as improvements have been made, there are still sections where there are not any stormwater management features or the features are outdated that would not be improved under the No-Build Alternative. Existing indirect effects associated with untreated or poorly treated stormwater runoff would continue. Under the No-Build Alternative, the existing fragmented and limited wildlife habitat existing within and adjacent to the Study Area Corridors would continue to degrade.

*Alternative A*

As previously discussed, past growth and development has diminished natural resources within the Natural Resources ICE Study Area encompassing Alternative A. However, current federal, state, and local regulations and non-governmental conservation efforts lessen the effects of such development.

Alternative A would widen an existing interstate in a highly urbanized area that has been previously disturbed. Alternative A would directly impact approximately 8 acres of wetlands, 113 acres of floodplain, 147 acres of navigable waters, 12 acres of maintained navigable channels, and 1 acre of RPA. This alternative would not directly impact known streams. Indirect effects to these resources could include reduced water quality as discussed below, as well as changes to floodwater storage capacity and retention times, vegetative community composition and structure (which affects wetland functions), and nutrient cycling. The direct and indirect effects of these impacts would be minimized by implementation of BMPs and possibly compensatory mitigation as discussed in the Natural Resources direct effects section of this SEIS.

Under Alternative A, construction and post-construction discharges of stormwater, as well as dredging, would potentially contribute to minor, localized increases in the pollutants and nutrients causing impairment as measured by dissolved oxygen, benthic invertebrate communities, aquatic plants, and chlorophyll-a. Drainage design for the new proposed bridge structures would be developed in later design phases and is expected to be in conformance with current stormwater regulations in order to minimize downstream effects to natural resources and water quality. Alternative A is not expected to disturb soils with *Enterococcus* or fecal coliform, which impair several waterbodies in the area. Furthermore, because Alternative A would upgrade existing systems that pre-date more stringent stormwater management regulations, impacts to water quality from highway runoff would be reduced compared to current conditions. Therefore, Alternative A is not expected to substantially contribute to the further impairment of any impaired waterbodies. Ongoing present actions that could affect water quality include maintenance dredging of navigable channels in the Chesapeake Bay and Hampton Roads, and watershed protection and stormwater and drainage projects completed by cities in the Hampton Roads region (**Table 3-64**). Near future impacts could occur from the Norfolk Harbor and Channels Deepening Project administered by the USACE and POV. The adverse incremental effects of Alternative A to cumulative water quality is anticipated to be moderate.

Dredging under Alternative A would be conducted to place the new tunnel for the HRBT. The new tunnel and bridges could potentially alter hydrodynamics and possibly affect aquatic habitat and navigation. The potential indirect effects of Alternative A to hydrodynamics are being evaluated by VIMS and will be presented in the Final SEIS. Dredging under Alternative A would generate approximately 1.2 million cubic

yards of dredge material requiring disposal. Alternative A would have fewer indirect effects to regional dredge capacity than the other Build Alternatives. Several options are available to dispose of dredge material that require testing to evaluate its suitability for various alternative uses and disposal sites. Therefore, the exact effects of dredge material disposal to natural resources and the regional capacity for dredge material disposal is not known at this time but would be determined upon advancing a preferred alternative. Ongoing, routine maintenance of navigable channels in the Chesapeake Bay and Hampton Roads, as well as future projects such as the Norfolk Harbor and Channels Deepening Project would continue to potentially impact hydrodynamics and regional dredging capacity in the Natural Resources ICE Study Area near the Alternative A alignment. Therefore, it can be anticipated short-term increases in the level of suspended sediment can give rise to changes in water quality that can affect marine flora and fauna, both favorably and unfavorably, such as increased turbidity and the possible release of organic matter, nutrients and or contaminants, depending upon the nature of the material in the dredging area. Generally, sediments settle within the vicinity of the dredged area, where they are likely to have little effect on the recently disturbed communities, particularly in areas where dredging is a well-established activity which has occurred within Hampton Roads for decades. These potential effects should be minimized by adherence to federal and state regulations. Although the exact effects of Alternative A to hydrodynamics and regional dredge material capacity are unknown at this time, it is expected this alternative would not have substantial incremental contributions to cumulative effects to hydrodynamics and regional dredge material capacity due to the limited proposed tunnel footprint.

Past development and original construction of I-64 through Hampton and Norfolk has led to little remaining intact terrestrial wildlife habitat in the Alternative A Study Area Corridor and the Natural Resources ICE Study Area as a whole. Remaining habitat is highly fragmented along I-64 that is associated with habitat loss. Alternative A would cause some habitat loss, particularly near water crossings that tend to have greater integrity than areas on land along either side of the I-64 Study Area Corridor that have fewer legal protections. Alternative A would impact approximately 15 acres of forested terrestrial habitat. Habitat fragmentation can have wide-ranging indirect effects to wildlife, resulting in species shifts associated with greater edge habitat and less interior habitat (smaller patch size); lower diversity due to smaller habitat patches; potential isolation of populations; increased vulnerability of species to external competition and predation; potential decreased flow of genetic material through the landscape; restricting wildlife movements that disrupt foraging, breeding/nesting and migration; increased risk of invasive species establishment; and generally, reduced biological diversity. Roadway noise can result in altered habitat utilization, strained communication, and heightened metabolic rates on wildlife, especially avian communities, indirectly causing wildlife abandonment of the area, increased predation, reduced foraging success, decreased breeding success, and decreased wildlife health. Widening of existing bridges and lengthening culverts under Alternative A could indirectly restrict wildlife movement through the riparian corridors crossed by these structures and alter up and downstream hydrologic flow. Direct effects to wetlands, streams and floodplains may indirectly change hydrologic flow dynamics through adjacent natural communities up or downstream, which sometimes alters these dynamics at the ecosystem level such that the ability of the system to maintain itself is altered. Preserving the hydrodynamic flow systems is important because they are a major pathway for energy flow and dissipation in the Coastal Plain, an area of flat, low-lying land with many rivers, marshes and swamplands.

All of these effects to terrestrial wildlife habitat can be reduced with appropriate mitigation and minimization measures as discussed in the Natural Resources direct effects section of this document. Continued growth and development would potentially reduce and degrade terrestrial habitat. Federal,

state, and local regulations would continue for the foreseeable future to require minimization, mitigation and compensation for terrestrial habitat direct and indirect impacts. The direct and indirect incremental contribution to cumulative on terrestrial habitat would be moderate under Alternative A.

Construction can increase the presence of invasive plant species enabled by earth disturbance and spreading from contaminated vehicles, clothing and shoes. The spread of invasive species will be minimized by following provisions in VDOT's Road and Bridge Specifications. These provisions require prompt seeding of disturbed areas with mixes that are tested in accordance with the Virginia Seed Law and VDOT's standards and specifications to ensure that seed mixes are free of noxious species. While the study area would be vulnerable to the colonization of invasive plant species from adjacent properties, implementation of the stated provisions would reduce the potential for the establishment and proliferation of invasive species. Future development actions could spread invasive species, and accidental releases of invasive species could occur. Adherence to the VDOT specifications under Alternative A would result in minor contributions to cumulative effects on habitat from invasive species.

Past development along the shoreline, bridges and tunnels, as well as navigation improvements and commercial and recreational fishing have impacted aquatic habitat. Impaired water quality associated with point and non-point pollution, and upstream obstructions along the James River have impacted aquatic wildlife and habitat in the vicinity of Alternative A. For example, archaeological evidence and historical records indicate anadromous fish species such as herring and shad migrated into the upper reaches of all major drainages in Virginia, including the James, Elizabeth, and Nansemond Rivers that meet in Hampton Roads (VDGIF, 2016). Heavy fishing pressure, dams, canals, and other obstructions have substantially reduced anadromous fish populations. By 1990, the shad harvest was only approximately six percent of the total harvest documented at the beginning of the 20th Century.

Alternative A would impact 156 acres of aquatic habitat, 43 acres of shallow tidal water habitat, 154 acres of benthic habitat, 138 acres of EFH, HAPC and Anadromous Fish Use Areas, and 2 acres of SAV. In addition, any construction activity under Alternative A on the HRBT islands that generates noise or sediment could also potentially impact waterbird colonies. However, the colonies have demonstrated the ability to persist at this location amid disturbances from cars, boats, airplanes, constant shipping traffic, as well as coastal storms. Strict adherence to time-of-year restrictions and erosion and sediment control measures, would minimize (to the maximum extent practicable) impacts to waterbird colonies. Surveys to locate existing waterbird colonies could also be required. While beach disturbance during construction may temporarily make areas inadequate for nesting waterbirds, Alternative A could ultimately augment the existing beach habitat, providing an opportunity for increased suitable nesting habitat along the I-64 corridor. Loss of habitat and direct impacts to any existing benthic communities could result from dredging associated with the tunnels, installation of bridge foundations, and the enlargement of the portal islands. Runoff from roadways could contain heavy metals, salt and associated materials, organic compounds, and nutrients. When runoff enters waters that are already impaired, the impacts are cumulative and can result in accelerated changes in the macrobenthic community structure and composition. In turn, this can affect the fish and amphibian populations that rely on them as a food source, as well as the birds and aquatic mammals that prey on the fish and amphibians. The effects can result in changes in community structure at a local level, but may also extend further to include changes in ecosystem structure and function in the absence of proper mitigation. In addition, existing SAV beds occur along the eastern side of the north island of the HRBT, just west of Fort Monroe, as well as along the north shore of Hampton Roads between I-64 and I-664. SAV can be indirectly impacted by reduced

water quality from stormwater runoff, and increased sedimentation and photic zone impacts from turbidity associated with dredging. Stormwater runoff treatment along I-64 would be improved under Alternative A, potentially neutralizing adverse effects of roadway runoff.

The adverse effects of Alternative A to aquatic habitat and wildlife would be minimized, mitigated, and possibly compensated as described in the Natural Resources direct effects section of this SEIS. Ongoing dredging associated with navigation maintenance in Hampton Roads would continue to effect aquatic wildlife and habitat near Alternative A, as would the proposed Norfolk Harbor and Channels Deepening Project. The relatively small increases in siltation away from the immediate dredging area of Alternative A are generally considered unlikely to have long-term adverse effects on benthic populations in areas that are routinely dredged. Based upon the direct and indirect effects of Alternative A, this alternative would have moderate incremental contributions to adverse cumulative effects on aquatic wildlife habitat occurring from past, present and future actions.

Past development and harvesting of wildlife has led to the very existence of some wildlife species to be threatened and endangered. Passage of the Virginia Endangered Species Act in 1972 and the federal Endangered Species Act in 1973 required state and federal agencies to avoid and minimize potential effects to designated rare, threatened, and endangered species and their critical habitat. Threatened and endangered species habitat within the I-64 Study Area Corridor includes the Hampton Roads Bridge-Tunnel Island Conservation Site that is habitat for federally listed shorebirds. As previously described, this habitat is already fragmented by the existing HRBT and surrounding development. Further, the widespread occurrence of common reed has rendered much of this habitat unsuitable for shorebird foraging. The majority of these estuarine areas would be bridged under Alternative A, limiting the direct loss of habitat, and thereby, indirect effects associated with additional habitat fragmentation. Due to the presence of higher quality foraging habitat outside the Study Area Corridor but in the vicinity of Alternative A, disruption during construction activities should have little to no impact on the shorebird species. Additionally, summer roosting habitat has been confirmed for bat species within Alternative A (NLEB, Little brown bat, Tri-colored bat), and forested habitat is very fragmented. Alternative A would not further degrade the quality of this habitat. Moreover, no confirmed maternity roosts or hibernacula are located within a two-mile radius of the I-64 Study Area Corridor, further limiting the potential indirect effects on the species from encroachment. Future growth and development would occur in the Natural Resources ICE Study Area that could degrade threatened and endangered species habitat. State and federal regulations would continue to require their actions to avoid and minimize effects to threatened and endangered species. Based on the limited direct and indirect effects of Alternative A to protected species, the incremental contribution of Alternative A on threatened and endangered species cumulative effects would be moderate.

*Alternative B*

Along existing I-64, Alternative B would have similar incremental effects to natural resources as described for Alternative A. However, Alternative B would also improve I-564, construct the I-564 and VA 164 Connectors on new alignment, and widen VA 164.

Alternative B would directly impact approximately 73 acres of wetland, 213 acres of floodplain, 215 acres of navigable waters, 24 acres of maintained navigable channels, and 16 acres of RPA. No impacts to known streams would result under Alternative B. The type of cumulative impacts to these water resources would be similar as described under Alternative A. Past development along the Norfolk

shoreline has impacted water resources from the construction of the NAVSTA Norfolk docks and NIT. Water resources were also substantially impacted by decades of expansion of Craney Island using disposed dredge material (see Appendix F historic aerials). Continual maintenance of the CIDMMA affects wetlands along the shore of Craney Island. Future projects such as the Norfolk Harbor and Channels Deepening Project and the planned expansion of CIDMMA to the east, development of the Craney Island Marine Terminal (CIMT), and expansion of VIG and the NIT Terminals would also continue to impact wetlands and navigable waters. The incremental contribution of Alternative B to adverse cumulative effects on wetlands, floodplains, navigable waters, and RPA would be moderate.

The I-564 Connector would involve constructing a tunnel extending from the Norfolk shoreline across the mouth of the Elizabeth River, a tunnel portal island north of CIDMMA, and trestle bridges. This area has been previously impacted by dredging and maintenance of the Norfolk Harbor Channel up the Elizabeth River, as well as expansion of CIDMMA to the east, and development along the Norfolk shoreline. The designs for the new HRBT and I-564 Connector tunnels would substantially influence the amount of dredging and fill needed that in turn could affect aquatic habitat, benthic species, EFH, HAPC and Anadromous Fish Use Areas, SAV, and threatened and endangered species. Together with improvements at the HRBT, Alternative B could impact 241 acres of benthic habitat and 214 acres of EFH, HAPC and Anadromous Fish Use Areas. No SAV is present along the I-564 Connector, so the effects of Alternative B to SAV (2 acres) would be the same as Alternative A. This alternative could result in direct aquatic habitat loss (201 acres), 59 acres of shallow tidal habitat, and indirect degraded water quality from sedimentation, resuspension of sediment in the water column (turbidity), and potential release of toxicants from water bottom disturbance by dredging for the new tunnel and bridge facilities along the I-564 Connector. However, potential direct and indirect effects to aquatic habitat and wildlife would be minimized and mitigated as described in the Natural Resources direct effects section. Future expansion of CIDMMA further to the east, construction of the CIMT, expansion of the VIG and NIT, and the Norfolk Harbor and Channels Deepening Project would continue to impact aquatic habitat. The incremental contribution of Alternative B to adverse cumulative effects on aquatic habitat and wildlife would be moderate.

It is estimated Alternative B would generate approximately 4.1 million cubic yards of dredge material requiring disposal. As discussed for Alternative A, several options are available to dispose of dredge material that requires testing to evaluate its suitability for various alternative uses and disposal sites. Therefore, the exact direct and indirect effects of dredge material disposal to natural resources and the regional capacity for dredge material disposal is not known at this time, hence, the incremental addition to cumulative effects is unknown. However, we can anticipate short-term increases in the level of suspended sediment that can give rise to changes in water quality that affect marine flora and fauna, both favorably and unfavorably, such as increased turbidity and the possible release of organic matter, nutrients and or contaminants, depending upon the nature of the material in the dredging area. Generally, sediments settle within the vicinity of the dredged area, where they are likely to have little effect on the recently disturbed communities, particularly in areas where dredging is a well-established activity which has occurred within Hampton Roads for decades.

Alternative B incremental effects to terrestrial wildlife and habitat along I-64 would be the same as described for Alternative A. The area along I-564 is highly developed with highly fragmented habitat. Alternative B is estimated to impact 73 acres of forested habitat and 112 acres of threatened and endangered species habitat. Unlike the I-564 Connector, the VA 164 Connector would be constructed on

new alignment, but it is being proposed for construction on land, not on structure and over water. The potential for the VA 164 Connector to be placed on structure was not considered for the ICE analysis, but if it is included in the Preferred Alternative, the possibility would be evaluated (if needed) to accommodate US Navy and US Coast Guard security requirements. In the absence of an elevated facility, the VA 164 Connector under Alternative B could result in habitat loss and fragmentation. Habitat loss resulting in habitat fragmentation may have wide-ranging effects to wildlife and biological diversity as described under Alternative A. The Craney Island Conservation Site is also habitat for federally protected shorebirds (Piping plover, gull-billed tern, Wilson's plover, and Red knot) potentially impacted by Alternative B. The VA 164 Connector would be constructed on the eastern edge of the CIDMMA with more suitable habitat to the west. Therefore, the potential indirect effects of habitat fragmentation to wildlife and protected shorebird species is expected to be minimal near the VA 164 Connector. However, the alignment south of the island through government-controlled lands to its connection with VA 164 would have more severe habitat fragmentation indirect effects to wildlife. Summer roosting habitat for federally protected bats occurs along I-64 as described for Alternative A. Although some larger tracts of forest do exist in the Study Area Corridor along Coast Guard Boulevard north of VA 164, the potential indirect effects of Alternative B to bat roosting and foraging habitat would be similar to the types described for Alternative A. Canebrake rattlesnake habitat is located in forest habitat on the Coast Guard property; however, the habitat area is isolated and it is thought the area is not able to support a viable population of the species long term. This area of the VA 164 Connector was also clear cut in the 1990s that likely eliminated any Canebrake rattlesnake population at that time. Therefore, Alternative B is not expected to have any direct or indirect effects to the Canebrake rattlesnake.

Future projects such as the I-564 IC currently in design, the expansion of CIDMMA and construction of the CIMT, and expansion of VIG would continue to impact terrestrial wildlife habitat within the Alternative B Study Area Corridor, as would other future development in the Cumulative Effects ICE Study Area. In combination with past, present and future actions, Alternative B would have moderate incremental contributions to cumulative impacts on terrestrial wildlife. It is anticipated further consultation with USFWS would result in measures to reduce effects of Alternative B to protected species.

*Alternative C*

As Alternative C would be the same width along I-564 and the VA 164 Connector as Alternative B, it would have the same cumulative effects to natural resources in these areas. With the addition of two dedicated transit lanes, Alternative C cumulative impacts to natural resources along the I-564 Connector would be the same type as described for Alternative B, but over a larger area. Alternative C would also widen the entire length of I-664, construct an additional tunnel alongside the MMMBT, and construct the I-664 Connector. No improvements would be made to the I-64 corridor and improvements to VA 164 would only include tying in the VA 164 Connector.

Past development and construction of the I-664 and the MMMBT as well as navigation improvements have impacted water resources in the Alternative C Study Area Corridor. Water quality has been impaired by previous and ongoing point and non-point pollution. The types of cumulative effects of Alternative C to wetlands, floodplains, navigation channels and RPA's would be the same as described for Alternative A and B, but would occur on a larger scale. Alternative C is estimated to directly impact 112 acres of wetlands, 370 acres of navigable waters, 57 acres of maintained navigable channels, and 127 acres of RPA. In addition, it could impact 548 linear feet of streams along I-664. Alternative C would impact 213

acres of floodplains. The types of indirect effects to these water resources under Alternative C would be similar to the type of indirect effects identified for Alternatives A and B. Minimization, mitigation and potentially compensatory measures as described in the Natural Resources direct effects section of this SEIS would lessen adverse effects to water resources. Future effects to water resources could occur from the planned expansion of CIDMMA further to the east, construction of the CIMT, expansion of the VIG and NIT, and the Norfolk Harbor and Channels Deepening Project. Federal, state, and local regulations protecting water resources would continue in the foreseeable future. With mitigation, the incremental contribution of direct and indirect effects of Alternative C to adverse cumulative effects on water resources would be moderate.

Alternative C is estimated to require disposal of approximately 7.1 million cubic of dredge material. As discussed for the other Build Alternatives, the exact direct and indirect effects to regional dredge material disposal capacity is unknown at this time, therefore, the incremental cumulative effects are unknown. However, anticipated short-term increases in the level of suspended sediment can give rise to changes in water quality that can affect marine flora and fauna, both favorably and unfavorably, such as increased turbidity and the possible release of organic matter, nutrients and or contaminants, depending upon the nature of the material in the dredging area. Generally sediments settle within the vicinity of the dredged area, where they are likely to have little effect on the recently disturbed communities, particularly in areas where dredging is a well-established activity that has occurred within Hampton Roads for decades. In addition to the I-564 Connector, Alternative C would construct another tunnel alongside the MMMBT and the I-664 Connector on structure over water. This alternative is estimated to impact approximately 573 acres of aquatic habitat, 29 acres of shallow water habitat, 665 acres of benthic habitat, and 565 acres of EFH, HAPC, and Anadromous Fish Use Areas. No known existing or historic SAV areas occur within the Alternative C Study Area Corridor. The types of indirect effects to these resources by construction of Alternative C would be similar to the effects described for Alternative A and B, but would occur on a larger scale. Minimization, mitigation, and possibly compensatory measures would lessen direct and indirect adverse effects to aquatic wildlife and habitat from Alternative C. Future projects as described in the above paragraph could further impact aquatic habitat, but federal, state, and local regulations should minimize negative effects of these actions to aquatic habitat. The incremental contribution of Alternative C to adverse cumulative effects on aquatic wildlife and habitat would be moderate when combined with past, present, and future actions.

Direct and indirect impacts to terrestrial wildlife and wildlife habitat along I-564 and the VA 164 Connector would be the same as described for Alternative B as the footprint of Alternative C would be the same in these areas. Alternative C would widen the entire length of I-664 and thus could have additional terrestrial wildlife habitat effects. Past development in Hampton and the Newport News areas along I-664 has resulted in very little intact natural habitat in these portions of the Natural Resources ICE Study Area. Habitat along I-664 has also been fragmented from previous construction of I-664 and the rail line in the median. As land use is slightly less intensive along the I-664 Study Area Corridor on the Southside, more intact natural habitat is present in this area. Alternative C would impact 180 acres of terrestrial wildlife habitat and 164 acres of threatened and endangered species habitat. Habitat fragmentation along I-664 on the Southside would occur on the edge of the forested habitat bordering the interstate right-of-way; consequently, although the interstate corridor would be wider, it would not substantially change the fragmented condition of wildlife habitat in this area. The incremental contribution of Alternative C to cumulative effects on wildlife and wildlife habitat would be moderate.

Alternative C would have similar types of direct and indirect effects to protected shorebirds along the VA 164 Connector and the MMMBT as described for I-64 under Alternative A. It would also have similar effects to threatened and endangered species as Alternative B near the VA 164 Connector. Alternative C would have increased habitat fragmentation effects to Mabees salamander habitat present on either side of I-664 on the Southside from reduction of forested buffers, and alteration of a pond that is habitat for this species resulting in indirect effects to light and temperatures from forest loss. An impact to the Mabees salamander would not occur if two consecutive years of survey document the species is not present. Although more summer roosting bat habitat is present in the Alternative C Study Area Corridor, potential indirect effects on bat roosting and foraging habitat would be similar to that described for Alternative B. Canebrake rattlesnake habitat to either side of I-664 on the Southside would not likely experience increased fragmentation as no habitat corridors currently connect these areas. Peregrine falcons have no documented use of the Alternative C Study Area Corridor for breeding, thus this alternative would have no indirect effects on this species. Impacts to protected species would be avoided, minimized, and mitigated as described in the Natural Resources direct effects section of this SEIS. The incremental contribution of Alternative C to cumulative effects on threatened and endangered species is expected to be reduced to a moderate level in consultation with USFWS.

The Norfolk Harbor and Channel Deepening Project, expansion of CIDMMA, NIT, and VIG, and construction of the CIMT within and near the Alternative C Study Area Corridor could also have adverse direct and indirect effects to terrestrial wildlife and protected species. Federal, state, and local laws and regulations would require these actions to avoid, minimize, and mitigate their effects to terrestrial wildlife and protected species, which would continue into the foreseeable future. With mitigation, Alternative C would have moderate incremental contributions to cumulative effects on these resources.

*Alternative D*

Alternative D includes elements of all the other Build Alternatives except it would not include additional dedicated transit lanes as proposed under Alternative C; **Table S-1** presents the direct effects of Alternative D to environmental resources. Alternative D would generate 6.1 million cubic yards of dredge material, fewer than Alternative C, but more than the other Build Alternatives. Alternative D would have similar incremental contributions to cumulative effects on natural resources as the other Build Alternatives.

Historic Resources

With human occupation of the Hampton Roads region extending thousands of years into the past and ongoing today, archaeological and architectural historic properties have been continuously created and destroyed by succeeding developments over time in the Historic Resources ICE Study Area. This has occurred more extensively since 1955 in the growing Hampton Roads region that is expected to continue to grow in the future. Transportation improvements and other actions potentially adversely affect archaeological and architectural historic properties by destruction or altering the integrity of their historically important characteristics. Federal and state laws requiring agencies to take into account effects to historic properties have slowed the loss of historic properties. Section 4(f) of the DOT Act of 1966 affords some protection to historic properties by requiring DOT agencies to avoid using archaeological and architectural historic properties important for preservation in place and only authorizing a use if there is no prudent and feasible avoidance alternative. Further, some of the six cities in the Historic Resources ICE Study Area regulate potential effects to historic properties by creating

historic overlay zones and districts within which proposed projects are reviewed by committees and boards to minimize adverse effects to historic resources.

Transportation improvements can also increase visitation to historic properties open to the public, sustaining historic resources tourism and providing incentives for preservation. Other incentives for historic preservation are offered by federal, state, and local governments in the form of grants and tax breaks.

*Build Alternatives*

All direct and indirect effects to archaeological and historic architectural properties have been considered under Section 106 of the NHPA as described in the archaeological and historic architectural sections of this SEIS. The NRHP eligibility determinations for a few historic architectural resources are pending further documentation and consultation with SHPO. Portions of the Area of Potential Effects with a high potential for archaeological remains that have not been previously intensively inventoried would be intensively surveyed in later phases of the project. It is not expected that any archeological sites identified from later intensive survey would embody characteristics important for preservation in place.

Past and present development actions have directly and indirectly impacted archaeological and historic architectural historic properties. Mitigation measures for adverse effects to historic properties under each Build Alternative would be developed in consultation with the SHPO and ACHP and stipulated in a Programmatic Agreement. Future actions in the Historic Resources ICE Study Area such as redevelopment projects conducted by local governments, the I-564 IC, expansion of NIT and VIG, and various transportation and other present and reasonably foreseeable projects could have adverse effects to historic properties. Federal, state, and local regulations should continue to minimize potential adverse effects to historic properties from their actions. Section 4(f) requires federal DOT agencies to avoid adversely impacting historic properties important for preservation in place and authorizes adverse effects only if there is no other prudent and feasible alternative. The incremental contribution of the Build Alternatives to cumulative effects on historic properties would be moderately adverse.

#### 3.15.3.4 Summary of Cumulative Effects

**Table 3-66** summarizes the potential incremental contribution of the Build Alternatives to cumulative effects on the resources evaluated. As previously discussed for each Build Alternative, the racial or ethnic status of potentially relocated households is not presently known, although all the potential relocations for the Build Alternatives would occur in minority population areas. The more relocations an alternative would have, the greater the potential incremental effect to minority populations. A determination will be made in the Final SEIS as to whether a disproportionate impact would occur and if mitigation would be required. As such, **Table 3-66** presents the number of relocations in minority population Census Block Groups, per alternative.

As described in **Section 3.9.3**, the NRHP eligibility of a few historic architectural resources is yet to be determined and complete archaeological investigations are awaiting selection of a Preferred Alternative and more advanced preliminary design. Therefore, only the potential indirect effects to access and induced growth impacts are addressed in this cumulative effects analysis. Incremental effects of the alternatives contributing to cumulative socioeconomic, natural, and historic resources would range from none to moderately adverse.

Past and present actions have shaped the current state of land use and socioeconomic, natural, and historic resources within the Cumulative Effects Study Area. These actions have been both beneficial and adverse to land use, socioeconomic, natural and historic resources within the Cumulative Effects Study Area. Future actions would be both beneficial and adverse to socioeconomic resources and land use, and primarily adverse to natural and historic resources. Coupled with past, present, and future actions, the overall cumulative effects of the Build Alternatives would be both beneficial and moderately adverse to socioeconomic resources, including land use. Overall cumulative effects of the Build Alternatives in combination with past, present and foreseeable future actions to natural and historic resources would be primarily adverse.

**Table 3-66: Summary of Build Alternative Incremental Contribution to Cumulative Effects**

| Resource | Alternative A | Alternative B | Alternative C | Alternative D | Cumulative Effect |
|---|---|---|---|---|---|
| Land Use | Minor | Minor | Moderate | Moderate | Adverse |
| Community Cohesion | Minor | Moderate | Moderate | Moderate | Adverse |
| Community Facilities and Recreation Resources | Minor | Minor | Moderate | Moderate | Adverse |
| Environmental Justice | 9 residential relocations | 9 residential relocations | 11 residential relocations | 20 residential relocations | Adverse |
| Local Economy | Moderate | Moderate | Moderate | Moderate | Positive |
| Wetlands | Minor | Moderate | Moderate | Moderate | Adverse |
| Floodplains | Moderate | Moderate | Moderate | Moderate | Adverse |
| Streams | 0 | 0 | Moderate | Moderate | Adverse |
| Navigable waters | Moderate | Moderate | Moderate | Moderate | Adverse |
| Resource Protection Areas | Minor | Moderate | Moderate | Moderate | Adverse |
| Water Quality | Moderate | Moderate | Moderate | Moderate | Adverse |
| Hydrodynamics/Regional Dredge Material Disposal Capacity | Moderate | Moderate | Moderate | Moderate | Adverse |
| Hampton Roads Aquatic Habitat | Moderate | Moderate | Moderate | Moderate | Adverse |
| Benthic Communities | Moderate | Moderate | Moderate | Moderate | Adverse |
| EFH, HAPC, & Anadromous Fish Use Areas | Moderate | Moderate | Moderate | Moderate | Adverse |
| SAV | Moderate | Moderate | 0 | Moderate | Adverse |
| Terrestrial Habitat | Minor | Moderate | Moderate | Moderate | Adverse |
| Threatened & Endangered Species | Moderate | Moderate | Moderate | Moderate | Adverse |
| Historic Architectural | Moderate | Moderate | Moderate | Moderate | Adverse |
| Archaeological | Moderate | Moderate | Moderate | Moderate | Adverse |

## 3.16 SHORT-TERM VERSUS LONG-TERM IMPACTS

Short-term impacts to resources in relation to long-term productivity have been evaluated in accordance with NEPA (42 USC 4332(C)(iv)) and guidelines published by CEQ on implementing NEPA (40 CFR 1502.16). This analysis qualitatively discusses the relationship between short-term impacts to and use of resources, and the long-term benefits and productivity of the environment. For this document, short-term refers to the estimated five-to-seven-year period of construction, the time when the largest number of temporary environmental effects is most likely to occur. Long-term refers to the more than 100-year life span estimated for the proposed improvements. This chapter discusses whether the short-term uses of environmental resources by the proposed improvements would affect (either positively or negatively) the long-term productivity of the environment.

### 3.16.1 Short-Term Impacts

The **No-Build Alternative** would not result in short-term impacts.

Construction of **Alternative A, B, C, or D** would result in short-term impacts, as described in **Section 3.14**. However, the Preferred Alternative would be constructed as a series of OISs. Thus, in general, construction of each OISs would be of relatively short duration compared to the longer term duration of the overall alternative. In addition, each alternative would have variable levels of short term impacts, depending on such factors as the length of the alternative (longer alternatives would be constructed over a longer period of time); whether the alternative consists of widening of existing roadway or construction on new alignment (new alignment alternatives could take longer to construct), and the proportion of the alternative consisting of roadway, bridges, and tunnels (complex structures such as bridges and tunnels will require longer construction time).

Furthermore, the to-be-determined sequence of OISs would affect how short term impacts occur. If the OISs of a Preferred Alternative are implemented sequentially without interruption, the duration of impact would be continuous. However, if there are gaps in OIS implementation, then multiple periods of short-term impacts would be separated by periods of no short-term impact.

Gains

An increase in employment and job opportunities for construction workers, suppliers, and inspectors would result during construction of a Build Alternative. In addition, short-term employment, use of materials to construct the improvements, and purchases of goods and services generated by construction could create a short-term improvement in the local economy that would diminish once the construction is completed. Workers who live in the region may fill these new positions or it is possible that people may move to the area as a result of the job opportunities created by the study. The concentration of workers within the area would stimulate the local economy by increasing business at area commercial and retail establishments. Increased sales tax would be derived from the commercial sales and from the sales of materials required for construction.

Losses

When construction is complete the positions created by the study may be eliminated. As a result of this job loss some residents may move in search of work or may remain in the area and file for unemployment benefits; both scenarios would have a negative effect on the local economy. Sales tax revenues would also decrease as a result.

During construction detours may be required, rerouting travelers to other area roadways. Some travelers may choose to take alternate routes to avoid construction areas and further delays. The use of alternate routes may increase fossil fuel usage and could result in loss of business for commercial establishments thereby lowering sales tax revenues. Rerouting may lead to increased congestion and delays on the detour routes. There may be access modifications during construction.

New roadway alignments, materials storage areas, and movement of construction vehicles may result in the removal of existing vegetation. A temporary increase in soil disruption, air quality, and noise is expected. Water resources would also be needed for construction activities including mixing aggregate materials, road wetting, and landscaping.

### 3.16.2 Long-Term Impacts

Gains

The long-term benefits of the implementation of the study would remain for the duration of the facility's life. The increased capacity in the Study Area Corridors and reduced traffic congestion would result in more efficient use of fossil fuels. Improved transit access and regional accessibility would result in quicker trips and commutes for drivers. Enhanced emergency evacuation capability and decreased response time for emergency services would provide for better security and increased safety in the region. Reducing traffic on local roadways would result in decreased noise levels and air pollution along these roadways. The decrease in traffic along area roadways would also improve access to the existing businesses, port facilities, and military installations along these routes. These effects would result in an enhanced overall environment for the communities along these roadways.

Losses

The implementation of the study would require permanent conversion of property to transportation uses. Real estate taxes paid of those properties would be eliminated. Any commercial properties that are displaced by the study may result in the loss of employment at those locations. These long-term loses may be offset by areas adjacent to the improvements that experience induced growth.

## 3.17 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

This section has been prepared in accordance with 40 CFR 1502.16. The construction of any of the Build Alternatives would result in the commitment of natural, physical, and financial resources that would be irreversible and irretrievable.

Land used in the construction of the proposed facility is considered an irreversible commitment during the time period that the land is used for a transportation facility. However, if a greater need arises for use of the land or if the transportation facility is no longer needed, the land can be converted to another use. At present, it is not anticipated such a conversion would ever be necessary or desirable.

Significant amounts of fossil fuels, labor and highway construction materials would be irretrievably expended for the construction of any of the Build Alternatives. Anticipated construction materials may include aggregates, asphalt, bituminous pavement, cement, gravel, and sand. Concrete and steel would be required for the bridges, tunnels, and other structures including retaining walls. Fuel, electricity, and labor required to manufacture, transport and install these materials would be irretrievably lost. As of the

time of this document these construction materials are not in short supply and their use would not have an adverse effect upon the continued availability of these resources.

Another consideration is the loss of real estate/land which would result in the loss of tax revenues to the counties and cities. As described in Section 3.1, the Build Alternatives would require between 28 and 345 acres of land to be converted to transportation use (depending on the alternative). Due to the relative sizes of the taxing entities, it has been determined that the losses incurred as a result of the implementation of a Build Alternative would not have long-term adverse effects to the respective tax bases.

Construction of a Build Alternative would also require a substantial expenditure of both state and federal funds, which are not retrievable. In addition to the costs of construction and right-of-way, costs would increase for the maintenance of transportation facilities, such as the roadway, bridges, tunnels, signs and markers, electrical systems, and stormwater facilities.

The commitment of these resources is based on the concept that residents in the immediate area, region, and state would benefit from the improved quality of the transportation system. These benefits would consist of reduced congestion and improved accessibility, as described in Chapters 1 and 2 of this Draft SEIS, which are expected to outweigh the commitment of these irreversible and irretrievable resources.