

4 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This chapter provides an overview of existing conditions and potential environmental effects for the three CARA (Corridor 6, Corridor 7, and Corridor 8) along with the No-Build Alternative. The CARA discussed in this DEIS are two-mile wide corridors crossing the Chesapeake Bay, including enough on-land area on each shore to connect to major roadway infrastructure as described in **Chapter 3**.

Specific roadway alignments were not identified in the Tier 1 phase of the study. The two-mile wide CARA are the primary focus of the environmental analysis in this chapter. Therefore, the evaluation of existing conditions and environmental effects relies primarily on an inventory of environmental resources within the three CARA and a qualitative discussion of the potential for impacts from a new crossing in each. Potential for impacts or avoidance are discussed based on the presence and distribution of environmental resources throughout the corridors. The evaluation of resources primarily relied upon desktop-level assessment of environmental resource data. The study has also considered county planning documents and other relevant land use and environmental studies pertaining to the study area. Field visits were used to collect information on some resources, but no detailed field assessment (such as wetland delineation) was conducted. This general methodology applied to all resource topics reported in this section.

It is important to note that the resource inventories presented here do not reflect the actual impacts of a new crossing. The resources quantified within the two-mile wide CARA are much more extensive than the area that would be impacted by any alternative alignments. The resource quantities are presented for comparative purposes, with the general assumption that corridors with more resources could result in greater impacts. However, this assumption must also be considered in light of the potential for avoidance of resources based on their distribution throughout the corridor. Furthermore, some resources may have a greater importance than others in terms of ecological function or other factors.

Avoidance and mitigation strategies are not considered in this broad level Tier 1 analysis, as specific impacts will not be known until a potential future Tier 2 study. If a corridor alternative is carried forward for further evaluation in Tier 2, multiple alignments would be considered within the corridor based on a variety of engineering, environmental and land use factors. Avoidance and mitigation strategies would be assessed based on the potential impacts identified in Tier 2.

4.1 SOCIOECONOMICS

This section provides an overview of relevant socioeconomic data, including population characteristics, communities and existing land uses, community facilities (such as park, schools, and emergency services), and economic characteristics (such as employment and household income) for the CARA. In addition, this section offers a qualitative summary of potential impacts to these socioeconomic resources, including consideration of minority and low-income populations pursuant to federal requirements.

4.1.1 Introduction and Methodology

The evaluation of socioeconomic resources within each CARA was primarily based on a desktop-level assessment of 2013-2017 American Community Survey (ACS) US Census data, Maryland iMap Geographic Information Systems (GIS) repository, and other available resources. The analysis focused on the presence and distribution of communities and resources throughout each corridor and the potential for transportation improvements to impact these resources.

For demographic analysis (**Sections 4.1.3 and 4.1.4**), a socioeconomic Study Area for the BCS has been developed based on 2010 US Census Tracts to include the contiguous area extending from the northernmost CARA to the southernmost, including any Census Tracts located between the CARA. (Thus, some of the Census Tracts within the Socioeconomic Study Area do not overlap any of the three CARA).

A more detailed discussion of socioeconomic resources, including a broader overview of the full Chesapeake Bay, is included in the [*BCS Socioeconomic Technical Report*](#).

4.1.2 Communities and Land Use

This section considers existing conditions within each of the CARA and a qualitative discussion of how local land uses and community facilities could be directly affected by a new Chesapeake Bay crossing. The assessment also considers the presence and distribution of designated Priority Funding Areas (PFAs) where growth and investment are prioritized. Factors that could inhibit community cohesion are identified and described.

The assessment used the Maryland iMap Statewide Land Use and Land Cover data from the Maryland Department of Planning (MDP). Discussion of zoning within the corridors is included in the [*BCS Socioeconomic Technical Report, Section 5.1*](#).

The No-Build Alternative for this study would require no impacts from construction of transportation improvements. The No-Build Alternative does include currently planned and programmed infrastructure projects as of Project Scoping in 2017 and would be updated during Tier 2 to reflect newly planned and programmed projects that may affect the study area. Moreover, under the No-Build Alternative motor vehicle volumes are forecasted to increase over time and with them are anticipated increases in travel times and delays related to growing traffic congestion. This worsening congestion would have negative effects on communities, businesses, and community facilities. Potential negative effects on motor vehicle-reliant activities such as emergency response services, supply chain/commercial trucking and deliveries, school bus schedules, and workforce commuters could occur from worsening congestion.

4.1.2.1 Community Facilities

This assessment includes identification of the location and type of community facilities present within the CARA. The community facilities evaluated include: public parks and recreational facilities, schools, fire and rescue services, hospitals, police facilities, libraries, post offices, airports, ports, military facilities, and places of worship. Maps of community facilities identified within the CARA are included within **Appendix A**. Identification and evaluation of local community facilities would continue in Tier 2.

Public Parks and Recreational Facilities

Parks and recreational facilities have been identified within the CARA using Maryland iMap GIS data (Maryland iMap GIS Catalog) supplemented with internet searches, as shown in **Appendix A** and **Table 4-1**. Local, state, and national parks are considered. Wildlife refuges are also included as Section 4(f) protected resources (see **Section 4.3** for more information on Section 4(f) resources).

Each of the three corridors contain multiple parks and recreational facilities that could potentially be impacted by an alignment in the corridor. Corridor 6 has eight facilities, Corridor 7 has 14 facilities, and Corridor 8 has 10 facilities. While alignments could potentially be identified in each corridor to avoid some or all of these parks and recreational facilities, it is likely that one or more of the facilities in any of the CARA would be impacted given their prevalence and spatial distribution throughout the corridors. More information is included in the [Socioeconomic Technical Report, Section 5.1.1.1](#).

Schools

Schools were identified within the CARA using Maryland iMap GIS data, which includes information on K-12 public schools. Each of the three corridors contain K-12 public schools that could potentially be impacted by an alignment in the corridor – Corridor 6 has five schools, Corridor 7 has nine schools, and Corridor 8 has seven schools. Although all of the schools are located adjacent to roadways that may be impacted, alternate alignments could potentially be developed to avoid impacts to the schools in each of the corridors. Specific schools in the CARA can be found in the [Socioeconomic Technical Report, Section 5.1.1.2](#).

Fire and Rescue Services

Fire and rescue services were identified within the CARA using Maryland iMap GIS data. Corridor 6 contains two fire stations and Corridor 7 contains four fire stations that could potentially be impacted by an alignment in the corridor – there are none located in Corridor 8. Avoidance and mitigation strategies would be considered if potential impacts to one or more fire stations are identified in Tier 2. Specific fire and rescue services in the CARA can be found in the [Socioeconomic Technical Report, Section 5.1.1.3](#).

Police

Police facilities were identified within the CARA using Maryland iMap GIS data. There are no police facilities located within Corridor 6 or Corridor 8. There are three police facilities located in Corridor 7 that could potentially be impacted by an alignment in the corridor. Avoidance and mitigation strategies would be considered if potential impacts to one or more police facilities are identified in Tier 2. Specific police facilities in the CARA can be found in the [Socioeconomic Technical Report, Section 5.1.1.4](#).

Table 4-1: Parks and Recreational Facilities

CORRIDOR	PARKS AND RECREATIONAL FACILITIES	JURISDICTION
Corridor 6	Beachwood Park	Anne Arundel County
	Jacobsville Park	Anne Arundel County
	Lake Shore Athletic Complex and Recreation Area	Anne Arundel County
	Bodkin Park	Anne Arundel County
	Downs Memorial Park	Anne Arundel County
	Recovery Community Park	Queen Anne's County
	Route 18 Park	Queen Anne's County
	4-H Club Park	Queen Anne's County
Corridor 7	Broadneck Park	Anne Arundel County
	Cape St. Claire Park	Anne Arundel County
	Bay Head Park	Anne Arundel County
	Sandy Point State Park	MDNR
	Terrapin Nature Park	Queen Anne's County
	Old Love Point Park	Queen Anne's County
	Cross Island Trail	Queen Anne's County
	Mowbray Park	Queen Anne's County
	Ferry Point Park	Queen Anne's County
	Long Point Park	Queen Anne's County
	Grasonville Park	Queen Anne's County
	Ewing Pond Park	Queen Anne's County
	Kent Island Research Wildlife Management Area	MDNR
	Kent Narrows Landing	Queen Anne's County
Corridor 8	Kings Branch Park	Anne Arundel County
	Riva Area Park	Anne Arundel County
	Central Ave Park	Anne Arundel County
	Smithsonian Environmental Research Center	Smithsonian Institution
	Lock Haven Park	Anne Arundel County
	Mayo Beach Park	Anne Arundel County
	Beverly Triton Nature Park	Anne Arundel County
	Claiborne Landing	Talbot County
	Talbot County Community Sports Complex	Talbot County
	Hog Neck Golf Course	Talbot County

Libraries

Libraries were identified within the CARA using Maryland iMap GIS data. Each of the three corridors contain libraries that could potentially be impacted by an alignment in the corridor – Corridor 6 has one library, Corridor 7 has four libraries, and Corridor 8 has one library. Although the libraries are located adjacent to roadways that may be impacted, alternate alignments could potentially be developed to avoid impacts to the libraries in each of the corridors. Avoidance and mitigation strategies would be considered if potential impacts to one or more libraries are identified in Tier 2. Specific library facilities in the CARA can be found in the [Socioeconomic Technical Report, Section 5.1.1.5](#).

Places of Worship

Places of Worship were identified within the CARA using information from the United States Geological Survey's (USGS) Geographic Names Information System supplemented with internet searches (USGS, 2019). Each of the three corridors contains numerous places of worship that could potentially be impacted by an alignment in the corridor – Corridor 6 has nine, Corridor 7 has 29, and Corridor 8 has 15. The places of worship are scattered throughout the corridor and adjacent to existing roadways, so alignments developed in Tier 2 could have potential impacts to one or more, depending on the specific alignment. Specific places of worship in the CARA can be found in the [Socioeconomic Technical Report, Section 5.1.1.6](#).

Other Community Facilities

Other community facilities were identified within the CARA including post offices, airports, and community centers. Facilities were identified using Maryland iMap GIS data and web searches. No hospitals are located within any of the CARA. More information is included in the [Socioeconomic Technical Report, Section 5.1.1.7](#).

Each of the three corridors contains community facilities that could potentially be impacted by an alignment in the corridor. Potential alignments could impact the private airport or post office in Corridor 6, the post offices, airport, and/or community center in Corridor 7, and the post offices and/or community center in Corridor 8, depending on the specific alignment. During Tier 2, alternate alignments could potentially be developed to avoid impacts to the various other community facilities in each of the corridors.

4.1.2.2 Land Use

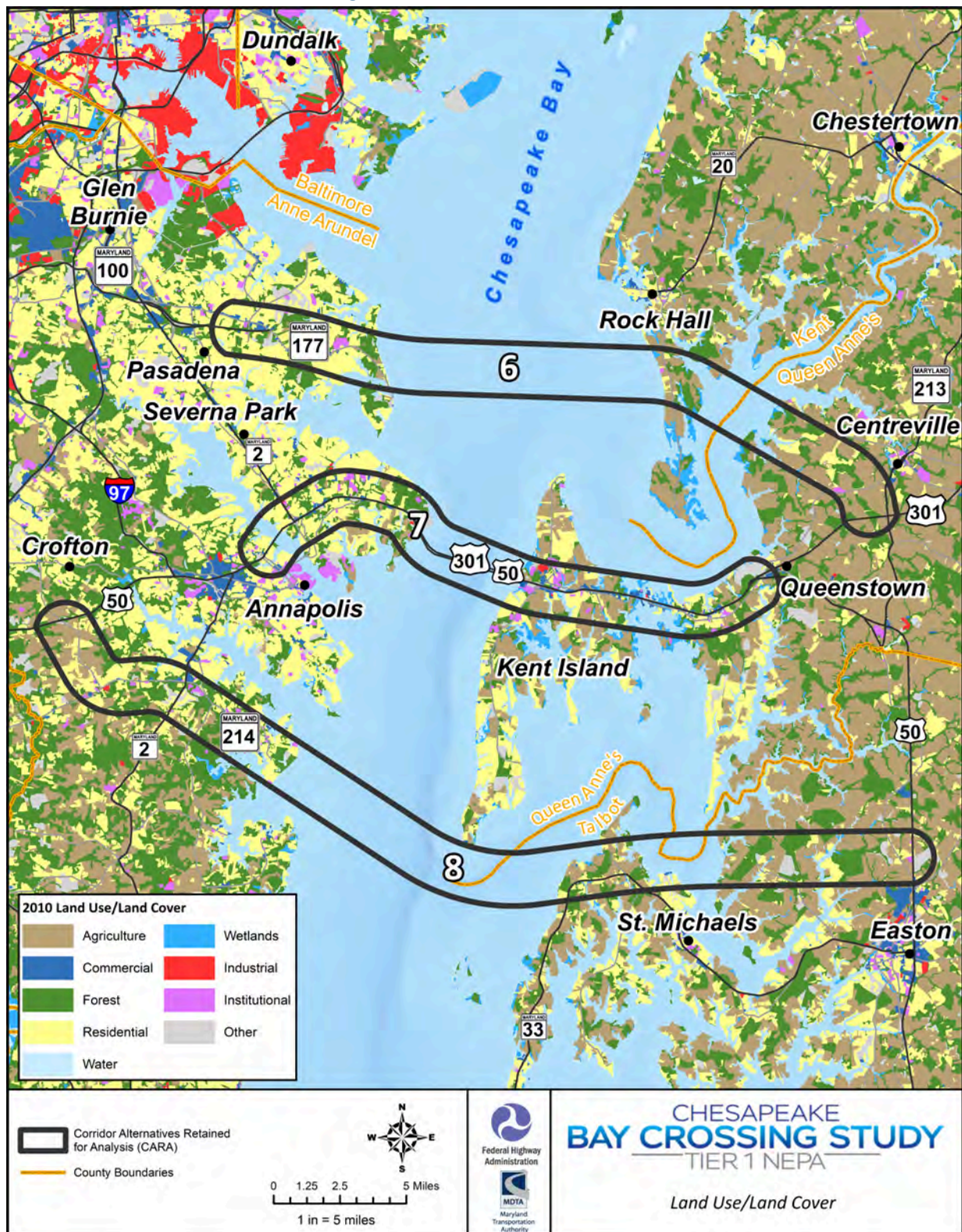
Existing land use within the corridors was identified based on MDP 2010 Land Use/Land Cover data, as shown in **Table 4-2** and **Figure 4-1**. The data was accessed via Maryland iMap (Maryland iMap GIS Catalog, 2018). Additional Land Use/Land Cover maps for the CARA are included within **Appendix A**.

Table 4-2: Land Use/Land Cover

LAND USE/ LAND COVER	CORRIDOR 6		CORRIDOR 7		CORRIDOR 8	
	ACRES	PERCENT	ACRES	PERCENT	ACRES	PERCENT
Agriculture	5,620	16%	3,260	12%	9,250	20%
Commercial	270	1%	930	3%	320	1%
Forest	4,500	13%	4,500	16%	8,520	18%
Residential	5,660	16%	6,560	23%	6,830	15%
Water	18,140	52%	9,660	35%	20,590	44%
Wetlands	280	1%	820	3%	350	1%
Industrial	0	0%	90	<1%	40	<1%
Institutional	280	1%	890	3%	200	<1%
Other	270	1%	1,270	5%	720	2%
Total Area	35,010	100%	27,990	100%	46,810	100%

Note: All values rounded to closest 10 acres or 1%

Figure 4-1: Land Use/Land Cover



Examination of **Table 4-2** generally shows similar percentages of land use/land cover present across all corridors. By percentage, Corridor 6 contains more water than the others, Corridor 7 contains more residential property than the other two, and Corridor 8 contains the most agricultural land.

For each of the three corridors, any Tier 2 alignment would likely impact residential land uses on the Western Shore, which extend through the entire width of the corridors. In Corridor 6, parks and other forested lands that are scattered throughout the corridor would likely be impacted. In Corridor 7, commercial impacts are likely if an alignment is considered along US 50/301. In Corridor 8, impacts would potentially also include farmland and forested areas – additionally, the entirety of the shoreline is occupied by park and residential uses.

On the Eastern Shore, impacts to agricultural land would be prevalent in both Corridor 6 and Corridor 8 for any Tier 2 alignment. In Corridor 7, potential impacts are most likely to commercial, residential, and institutional land uses, as well as some farmland.

4.1.2.3 Priority Funding Areas

PFAs are existing communities and places designated by local governments where investment is intended to support future growth (MDP, 2019). The presence of PFAs within a corridor indicates that new transportation infrastructure may be more compatible with planned land uses. Because PFAs also encompass areas with existing development, the presence of PFAs may also correlate with a greater likelihood of direct impacts to already developed areas. PFAs are shown in **Figure 4-2** and quantified in **Table 4-3**. PFAs are identified based on data from Maryland iMap (Maryland iMap GIS Catalog, 2018).

Table 4-3: Priority Funding Areas (PFAs)

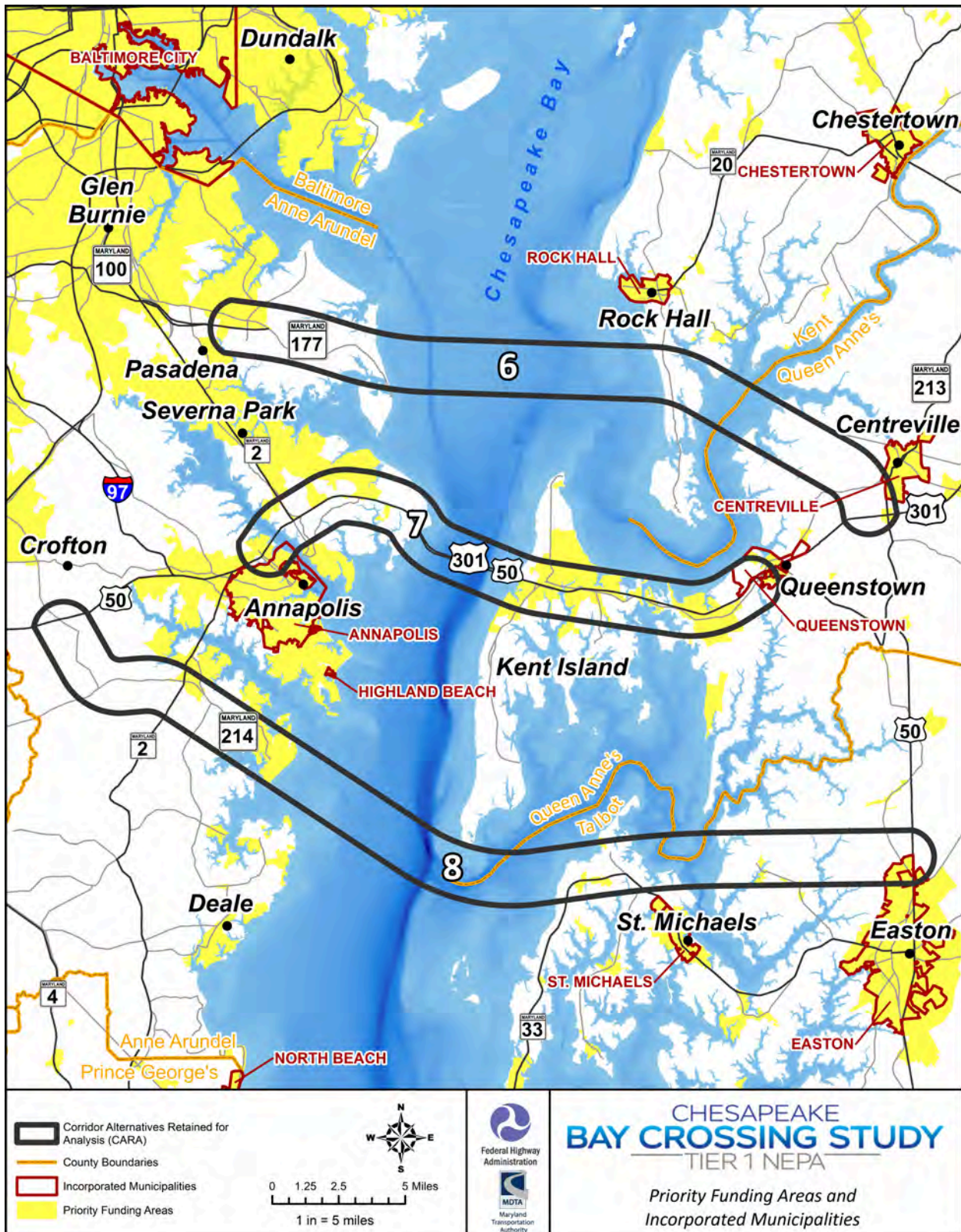
CORRIDOR	ACRES OF PFAS	PFAS PERCENTAGE OF TOTAL AREA
Corridor 6	1,600	5%
Corridor 7	7,900	28%
Corridor 8	3,500	7%

Corridor 7 contains the highest percentage of PFAs by acreage (28 percent), which also correlates with a greater likelihood of direct impacts to developed areas. Corridor 6 (five percent) and Corridor 8 (seven percent) both have a much lower percentage of PFAs by acreage and the majority of these PFAs are located on the Western Shore. Coordination with MDP would continue in a future Tier 2 study.

4.1.2.4 Community Cohesion

This section describes potential impacts to community cohesion that could result from a new crossing within each CARA. Community cohesion was evaluated based on data such as community facilities identified in **Section 4.1.2.1**, MDP 2010 Land Use/Land Cover presented in **Section 4.1.2.2**, and review of aerial imagery (Maryland iMap GIS Catalog, 2018).

Figure 4-2: Priority Funding Areas and Incorporated Municipalities



Potential impacts to community cohesion that could result from a new crossing within each CARA were evaluated as part of this Tier 1 Study, such as a roadway alignment crossing through existing communities, barriers to accessing community facilities, and barriers resulting from limited access roadways. In general, impacts to community cohesion are possible for all three of the CARA, but could potentially be minimized by avoiding, to the extent possible, bisecting residential neighborhoods and locating Tier 2 alignments near the periphery of residential areas where impacts are unavoidable. For all three CARA, it is possible that impacts to community cohesion would result from a new crossing, even with avoidance and minimization measures. Public involvement activities associated with a future Tier 2 Study would further engage project stakeholders, business owners, study area residents and members of potentially impacted communities to provide further input into the presence of and potential impacts on community cohesion.

For both Corridors 6 or 8, the distribution of residential land and the density of residential subdivisions encompassing the full width of the corridor on the Western Shore would make avoidance of residential communities unlikely. A potential Tier 2 alternative within Corridor 6 would cause community impacts on the Western Shore for residential areas located near MD 177. Corridor 8 includes the greatest acreage of residential land. Communities and residential neighborhoods in Corridor 8, particularly in the vicinity of Mayo, Beverly Beach, and St. Michaels, would likely be impacted. A new crossing in Corridors 6 or 8 would thus be more likely to cause substantial community impacts by bisecting residential areas, disrupting local mobility, and causing other potential impacts to community cohesions compared to Corridor 7.

For Corridor 7, impacts to community cohesion could potentially be limited by adding new capacity along the existing US 50/301 roadway. A future Tier 2 alternative that expands capacity along existing roadways in Corridor 7 could also minimize impacts to community cohesion and disruption to residential neighborhoods. Neighborhoods in the vicinity of US 50/301 have generally been developed to the north or south of the highway, often separated by commercial areas or wooded buffers. Thus, new capacity in Corridor 7 could likely avoid bisecting existing residential neighborhoods; impacts would likely be primarily along the periphery of residential areas. Such an alignment would, however, have greater impacts on commercial land uses and community facilities that are more prevalent alongside US 50/301. Access roads to adjacent land uses could also be impacted.

New capacity in any of the corridors could provide greater access for Eastern Shore residents to facilities such as hospitals that are more prevalent on the Western Shore.

4.1.3 Population and Housing

Demographic data on population and housing are identified within each CARA as well as the Socioeconomic Study Area (**Figure 4-3**) and the State of Maryland for comparison. **Table 4-4** presents the US Census Bureau American Community Survey (ACS) 5-Year total population estimates from 2017 (US Census Bureau, 2018). Census Tracts within the Socioeconomic Study Area are shown in **Figure 4-3**. More information on the data sources and methodology used are included in the [*BCS Socioeconomic Technical Report, Section 3.2*](#).

Under the No-Build Alternative, anticipated increases in travel times and delays related to growing traffic congestion may lead to future negative effects for population and housing. The study area could potentially become less desirable for residents and businesses due to the effects of growing traffic congestion.

Table 4-4: Total Population

AREA	STATE OF MARYLAND	SOCIOECONOMIC STUDY AREA TRACTS	CORRIDOR 6 TRACTS	CORRIDOR 7 TRACTS	CORRIDOR 8 TRACTS
Total Population	5,996,079	286,739	76,360	78,181	59,266

Source: US Census Bureau ACS 2013-2017

The Socioeconomic Study Area includes 56 Census Tracts that are located within the CARA and the contiguous area between the CARA. The Socioeconomic Study Area tracts have an estimated total population of 286,739.

Table 4-5 presents housing data for the State of Maryland, Socioeconomic Study Area, and the tracts within each CARA. The Socioeconomic Study Area contains an estimated 119,469 housing units, which are 89.9 percent occupied.

Table 4-5: Housing Units and Occupancy

AREA	STATE OF MARYLAND	SOCIOECONOMIC STUDY AREA TRACTS	CORRIDOR 6 TRACTS	CORRIDOR 7 TRACTS	CORRIDOR 8 TRACTS
Total Housing Units	2,427,014	119,469	30,719	30,492	25,723
Occupied	2,181,093	106,994	27,196	27,359	22,680
Vacant	245,921	12,475	3,523	3,133	3,043
Occupancy Rate	89.9%	89.6%	88.5%	89.7%	88.2%

Source: US Census Bureau ACS 2013-2017

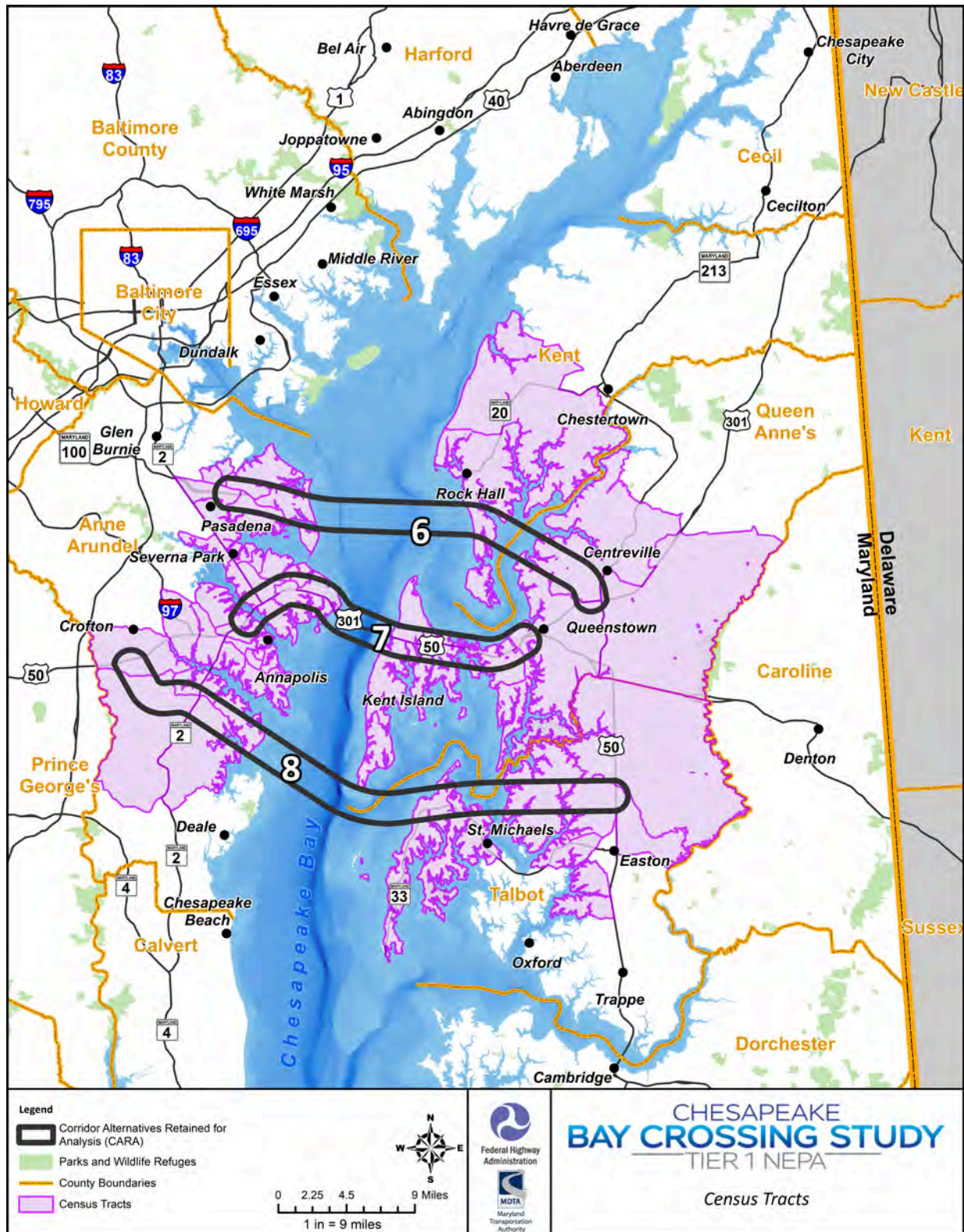
Within the CARA, Corridor 6 and Corridor 7 contain approximately similar estimated total populations (76,360 and 78,181, respectively), while Corridor 8 has a lower population (59,266). In line with the population data, Corridor 6 and Corridor 7 have a comparable number of total housing units (30,719 and 30,492, respectively), while Corridor 8 has fewer (25,723). All three of the CARA have a similar occupancy rate. Residential displacements could potentially be required for Tier 2 alignments in any of the three corridors, especially on the Western Shore. Corridors with greater population could potentially require greater impacts to population and housing; however, future Tier 2 alternatives could be developed to avoid and minimize impacts to populated areas where possible.

4.1.4 Environmental Justice in Minority and Low-Income Populations

The FHWA Title VI Program requires consideration of Executive Order (EO) 12898 – Federal Actions to Address Environmental Justice (EJ) in Minority and Low-Income Populations (1994) to ensure federal programs do not result in disproportionately high and adverse environmental or health impacts to these populations by requiring federal agencies to:

“...promote nondiscrimination in federal programs substantially affecting human health and the environment and provide minority and low-income communities’ access to public information on, and an opportunity for public participation in, matters relating to human health or the environment.”

Figure 4-3: Socioeconomic Study Area Census Tracts



The strategies developed under EO 12898 and the FHWA policies on EJ take the appropriate steps to identify and address disproportionately high and adverse effects of federal transportation projects on the health or environment of minority and/or low-income populations to the greatest extent practicable and permitted by law, while ensuring EJ communities are provided meaningful opportunities for public participation in project development and decision-making.

According to the United States Office of Management and Budget (OMB) Revisions to the Standards for the Classification of Federal Data on Race and Ethnicity (1997), for the purposes of EO 12898, a population is identified as minority in an area affected by the policy action if “either (a) the minority population of the affected area exceeds 50 percent or (b) the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis” (OMB, 1997).

The FHWA and USDOT EJ Orders define a “minority population” as “any readily identifiable groups of minority persons who live in geographic proximity, and if circumstances warrant, geographically dispersed/transient persons (such as migrant workers or Native Americans) who will be similarly affected by a proposed FHWA program, policy, or activity (FHWA 2012).” The Tier 1 analysis includes qualitative assessments, consistent with FHWA’s *Guidance on Environmental Justice and NEPA* (FHWA 2011), of potential effects to EJ populations such as from potential changes to community cohesion, community facilities, socioeconomics, altered travel patterns and parking, access, visual quality, and noise. Land area (in acres) of EJ Census Tracts falling within each corridor alternative was identified and maps were developed to depict the location of EJ Census Tracts in relation to the corridor alternatives. This information is presented in the following sections.

When potential impacts to EJ populations are identified, the impacts are compared to those experienced in non-EJ population areas within each corridor in the CARA. A disproportionately high and adverse effect on minority and low-income populations is defined by the FHWA EJ Order as an impact that:

- Would be predominately borne by a minority and/or low-income population, or
- Will be suffered by the minority population and/or low-income population and is appreciably more severe or greater in magnitude than the adverse effect that will be suffered by the non-minority population and/or non-low-income population.

4.1.4.1 Low-Income Populations

The FHWA and USDOT EJ Orders define a “low-income” individual as a person whose median household income is at or below the Department of Health and Human Services poverty guidelines (FHWA, 2011). The 2017 HHS poverty guidelines identify the poverty level at \$12,060 annual income for a single-person household and \$16,240 for a two-person household. The rate increases by \$4,180 for each additional person in a household beyond two (HHS, 2017). US Census ACS 5-year data on incomes below poverty level and median household income was collected for each Census Tract within the Socioeconomic Study Area. The percentage of the population below the poverty level will be calculated for the study area as a whole, as well as for the State of Maryland.

For this study, Census Tracts are considered potential locations of low-income populations if the population below the poverty level:

1. Is greater than 50 percent; or,
2. Is 10 percentage points or more over the average percentage of the overall Socioeconomic Study Area (all Census tracts that comprise the study area).

All census tracts meeting one or both of the criteria above were identified as potential low-income EJ population areas.

As shown in **Table 4-6**, Maryland has an estimated 9.7 percent of the population below the poverty level, or 566,966 total. The Socioeconomic Study Area includes an estimated population of 15,077 below the poverty level, or 5.4 percent of the total population within the Study Area for whom the poverty status is determined.

Census Tracts that exceed the Socioeconomic Study Area percentage below the poverty level by 10 percentage points or more, or 15.4 percent, are identified as potential low-income EJ Census Tracts. Three such Census Tracts meet this criterion (Census Tract 9505, Tract 8107, and Tract 7064.02). Census Tract 9505 is located within Corridor 6 and Census Tract 8107 is located within Corridor 7. Census Tract 7064.01 is located within the Socioeconomic Study Area but does not fall within any of the three corridors. Corridor 8 does not contain any potential low-income EJ Census Tracts. Complete census tract data and analysis is found in the [BCS Socioeconomic Technical Report](#), **Section 5.3.1**.

Table 4-6: Poverty Status

GEOGRAPHY	TOTAL POPULATION FOR WHOM POVERTY STATUS IS DETERMINED	POPULATION BELOW POVERTY LEVEL	PERCENT POPULATION BELOW POVERTY LEVEL	NUMBER OF LOW-INCOME TRACTS
State of Maryland	5,856,088	566,966	9.7%	N/A
Socioeconomic Study Area	279,059	15,077	5.4%	3
Corridor 6	75,820	3,479	4.6%	1
Corridor 7	72,248	3,787	5.2%	1
Corridor 8	59,046	3,212	5.4%	0

Source: US Census Bureau ACS 2013-2017

Census Tract 9505 is located within Corridor 6 and impacts to the area within the Census Tract could not be avoided as it extends throughout the full width of the corridor. The specific location of low-income residents is not known at this level of detail, but the overall population in this Census Tract is primarily concentrated north of Corridor 6 in the vicinity of Rock Hall. The portion of the Census Tract within Corridor 6 is primarily agricultural and likely sparsely populated. This would minimize the overall impact to all populations, including low-income populations. Further evaluation during Tier 2 would be required to determine whether disproportionately high and adverse impacts could occur from a new crossing in Corridor 6. However, based on the available data, potential impacts to low-income population would not be expected to be disproportionately high and adverse. Avoidance and minimization would be considered in Tier 2 for any potential impacts to low-income populations.

Census Tract 8107 is located within Corridor 7 and impacts to some portion of the land area within this Census Tract could not be avoided because it encompasses the full width of the corridor. Specific Tier 2 alignments could potentially avoid or minimize impacts to populated areas. Tract 8107 encompasses Grasonville and the surrounding area. The existing US 50/301 corridor bisects the tract currently.

Commercial land uses are generally most prevalent directly adjacent to US 50/301 in the vicinity of Grasonville. Residential areas are primarily located along MD 18 (south of US 50/301) and in several subdivisions to the north of US 50/301. Other portions of the Tract include farmland and forested areas. A Tier 2 alternative could help minimize the potential for disproportionately high and adverse effects to low-income population in Tract 8107 by adding new capacity along US 50/301, which would likely impact primarily commercial businesses and would have lesser impacts to community cohesion compared to a roadway along new alignment. A Tier 2 alternative with new alignment to the north or south of US 50/301 could have greater residential and community cohesion impacts. Further evaluation in Tier 2 would be required to determine whether disproportionately high and adverse impacts could result from potential improvements in Corridor 7.

Minority and low-income census tracts within the CARA are shown on **Figure 4-4**.

4.1.4.2 Minority Populations

The USDOT and FHWA EJ Orders define a minority individual as one belonging to one of the following groups: (1) Black: a person having origins in any of the black racial groups of Africa; (2) Hispanic or Latino: a person of Mexican, Puerto Rican, Cuban, Central or South American, or other Spanish culture or origin, regardless of race; (3) Asian American: a person having origins in any of the original peoples of the Far East, Southeast Asia, or the Indian subcontinent; (4) American Indian and Alaskan Native: a person having origins in any of the original people of North America, South America (including Central America), and who maintains cultural identification through Tribal affiliation or community recognition; or (5) Native Hawaiian and Other Pacific Islander: a person having origins in any of the original peoples of Hawaii, Guam, Samoa, or other Pacific Islands (FHWA, 2011). Minority populations were identified at the Census Tract level for the Tier 1 assessment. Minority Race is evaluated separately from Hispanic and Latino ethnicity, because they are considered separately in the US Census.

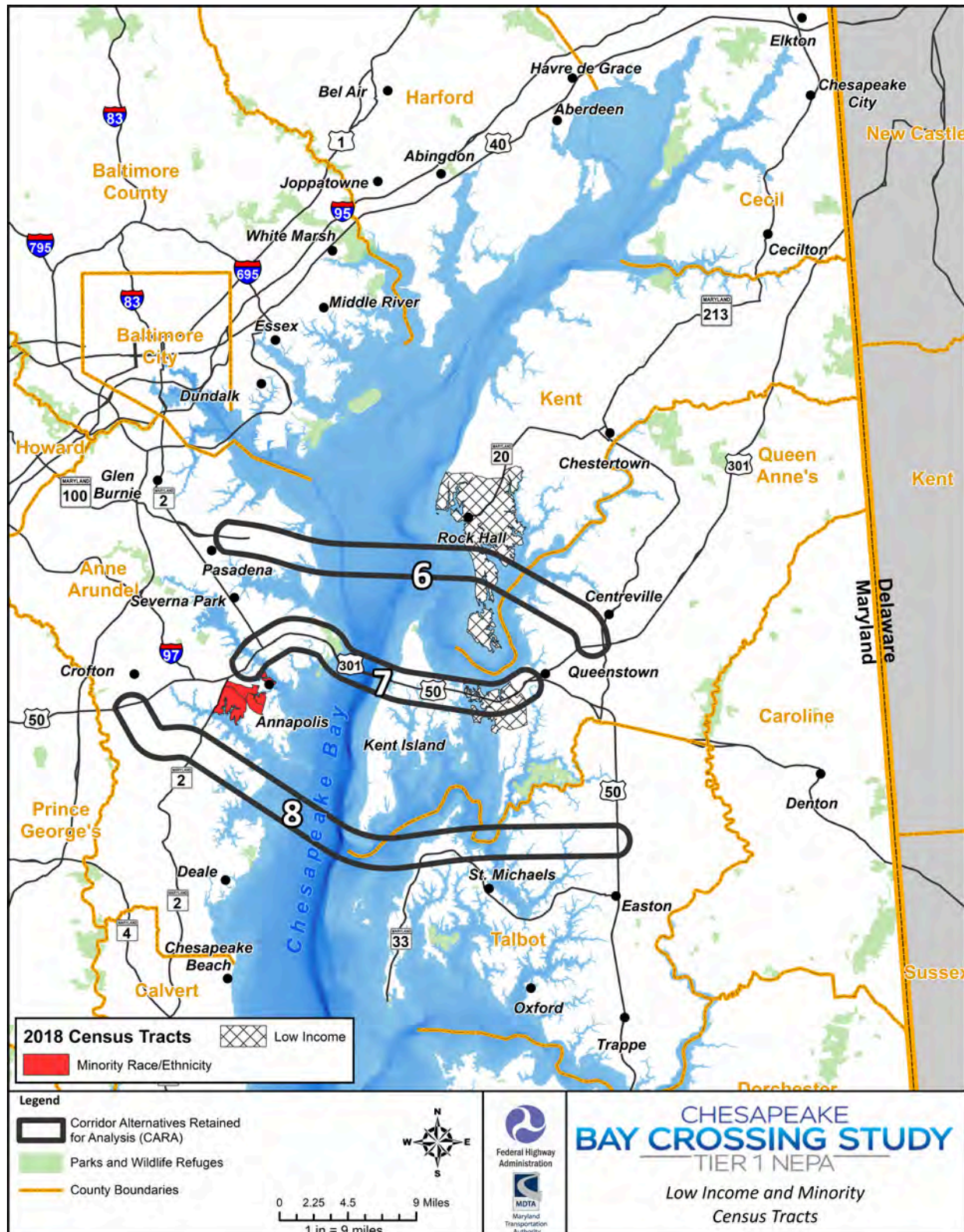
The population of the full Socioeconomic Study Area is approximately 14.5 percent minority race, which is notably lower than the State of Maryland at 43.4 percent. The Socioeconomic Study Area has approximately 6.2 percent population identifying as Hispanic or Latino, which is lower than the State of Maryland at 9.6 percent. **Table 4-7** summarizes the demographic data by corridor alternative.

Table 4-7: Minority Race and Ethnicity

GEOGRAPHY	TOTAL POPULATION	MINORITY RACE POPULATION	MINORITY RACE %	NUMBER OF MINORITY RACE TRACTS	HISPANIC OR LATINO POPULATION	HISPANIC OR LATINO %	NUMBER OF HISPANIC/LATINO TRACTS
State of Maryland	5,996,079	2,600,867	43.4%	N/A	573,303	9.6%	N/A
Socioeconomic Study Area	286,739	41,549	14.5%	5	17,864	6.2%	3
Corridor 6	76,360	7,952	10.4%	0	3,022	4.0%	0
Corridor 7	78,181	10,321	13.2%	1	4,164	5.3%	0
Corridor 8	59,266	6,352	10.7%	0	2,188	3.7%	0

Source: US Census Bureau ACS 2013-2017

Figure 4-4: Minority and Low-Income Census Tracts



Potential minority race and ethnicity populations were identified in this analysis as any Census Tract with a proportion of minority race or ethnicity population 10 percentage points higher than the full Socioeconomic Study Area. Thus, Census Tracts with a minority race population of 24.5 percent or greater and Census Tracts with Hispanic and Latino population greater than 16.2 percent were identified.

The Socioeconomic Study Area contains five Census Tracts identified as potential minority EJ populations, with minority race population greater than 24.5 percent (Census Tracts 7025, 7064.01, 7064.02, 7065, and 7067). Census Tract 7067, which contains African-American, Asian and other minority populations, is located within Corridor 7 – the other tracts are located in the contiguous areas between the CARA and not within the actual corridors. Complete census tract data and analysis is found in the [BCS Socioeconomic Technical Report, Section 5.3.2](#).

Census Tract 7067 is relatively densely developed and accounts for a very small portion of the width of the corridor, as shown in **Figure 4-4** above, leaving space for future Tier 2 alignments that could avoid the Tract. It is expected that a reasonable alignment would avoid impacts to population within the Tract, because other less impactful Tier 2 alignments could likely be developed.

The Socioeconomic Study Area contains three Census Tracts identified as potential minority Hispanic and Latino EJ areas, with a Hispanic and Latino population greater than 16.2 percent (Census Tracts 7064.01, 7064.02, and 7065) – these tracts are located in the contiguous areas between the CARA and not within the actual corridors. No disproportionately high and adverse impacts to potential EJ minority race or Hispanic and Latino populations are expected to occur in Corridors 6, 7, or 8 based on the Census Tract level evaluation. Complete census tract data and analysis is found in the [BCS Socioeconomic Technical Report, Section 5.3.2](#). Further evaluation of potential impacts to Hispanic and Latino populations would be conducted in Tier 2.

4.1.5 Limited English Proficiency

The assessment of EJ populations also includes limited English proficiency (LEP) populations. EO 13166 challenges federal agencies to "implement a system by which [limited English-proficient or "LEP"] persons can meaningfully access... services consistent with, and without unduly burdening, the fundamental mission of the agency." LEP is defined as individuals who do not speak English as their primary language and who have a limited ability to read, speak, write, or understand English (US Department of Justice, 2000). LEP populations are evaluated with consideration of the 2005 USDOT *Policy Guidance Concerning Recipients' Responsibilities to Limited English Proficient (LEP) Persons*. US Census ACS data was collected at the Census Tract level to quantify the presence of LEP populations, as shown in **Table 4-8**.

Table 4-8: Limited English-Speaking Households

GEOGRAPHY	TOTAL HOUSEHOLDS	LIMITED ENGLISH-SPEAKING HOUSEHOLDS	PERCENT LIMITED ENGLISH-SPEAKING HOUSEHOLDS
State of Maryland	2,181,093	69,236	3.2%
Socioeconomic Study Area	106,994	1,229	1.1%
Corridor 6	27,196	144	0.5%
Corridor 7	27,359	150	0.5%
Corridor 8	22,680	123	0.5%

Source: US Census Bureau ACS 2013-2017

An estimated 3.2 percent of households in Maryland are identified as limited English-speaking households. The Socioeconomic Study Area includes an estimated 1,229 limited English-speaking households, or 1.1 percent. The Census Tracts within the CARA each have an estimated 0.5 percent limited English-speaking households.

Public engagement measures assuring meaningful language access for identified LEP populations will include written translations of vital documents, and if warranted, the providing of interpreters at public involvement events and other outreach methods, to satisfy the requirements of Executive Order 13166.

4.1.6 Jobs and Industry

This section details employment by industry sector and the overall employment/unemployment totals and rates in Census Tracts that comprise the Socioeconomic Study Area, compared with the State of Maryland as a whole. In addition, employment data was compiled for each of the three corridors.

US Census ACS data was obtained at the Census Tract level to examine employment in the various industry sectors as shown in **Table 4-9**. The top five industry sectors in terms of percentage of total employment within the Socioeconomic Study Area include:

- Educational Services, and Health Care and Social Assistance (22 percent),
- Professional, Scientific, and Management, and Administrative and Waste Management Services (16 percent),
- Public Administration (10 percent),
- Arts, entertainment, and recreation, and accommodation and food services (10 percent); and
- Retail Trade (10 percent).

This data illustrates that the Socioeconomic Study Area is composed of a largely service and knowledge-based economy, which is consistent with the general nationwide trend of declining manufacturing and agriculture. While no specific impacts affecting employment are anticipated from the No-Build Alternative for this study, the No-Build Alternative does include currently planned and programmed infrastructure projects as of Project Scoping in 2017 and would be updated during Tier 2 to reflect newly planned and programmed projects that may affect the study area. Anticipated increases in travel times and delays related to growing traffic congestion forecasted to occur under the No-Build condition could have potential negative effects on economic activity. The potential strain placed upon workforce commuters and supply chain deliveries by delays in motor vehicle travel could ultimately lead to decreases in economic performance as businesses and workers look for alternate locations to operate outside of the study area, distancing themselves from the issues generated by congestion.

With a project of this magnitude, there could also be positive impacts to many of the industry sectors identified in **Table 4-9** within affected communities. Sectors dealing directly with construction, transportation and utilities, real estate, and other growth-oriented development could see economic benefits associated with a new crossing.

As shown in **Table 4-9**, employment percentages by industry sector are generally similar across all three corridors.

US Census ACS data was obtained at the Census Tract level to also determine the total number of employed/unemployed persons over the age of 16 within the various Census Tracts comprising the Socioeconomic Study Area as compared with the State of Maryland. This data was also compiled for the Socioeconomic Study Area as a whole and the various Census Tracts contained partially within the CARA. Complete census tract data and analysis is found in the [BCS Socioeconomic Technical Report Section 5.5](#).

Table 4-9: Employment by Industry Sector

INDUSTRY SECTOR	STATE OF MARYLAND	SOCIOECONOMIC STUDY AREA TRACTS	CORRIDOR 6 TRACTS	CORRIDOR 7 TRACTS	CORRIDOR 8 TRACTS
Civilian employed population 16 years and older	3,040,792	149,241	41,630	39,191	30,222
Agriculture, forestry, fishing and hunting and mining	15,110 (<1%)	1,208 (1%)	553 (1%)	247 (1%)	448 (1%)
Construction	203,192 (7%)	11,429 (8%)	3,569 (9%)	2,492 (6%)	2,613 (9%)
Manufacturing	136,368 (4%)	7,419 (5%)	2,348 (6%)	2,067 (5%)	1,412 (5%)
Wholesale Trade	57,497 (2%)	3,649 (2%)	1,221 (3%)	1,230 (3%)	650 (2%)
Retail trade	292,326 (10%)	14,264 (10%)	4,487 (11%)	3,827 (10%)	2,844 (9%)
Transportation and warehousing, and utilities	137,153 (5%)	4,854 (3%)	1,883 (5%)	1,259 (3%)	957 (3%)
Information	64,760 (2%)	2,906 (2%)	717 (2%)	916 (2%)	443 (1%)
Finance and insurance, and real estate and rental and leasing	187,636 (6%)	9,513 (6%)	2,683 (6%)	2,258 (6%)	2,080 (7%)
Professional, scientific, and management, and administrative and waste management services	468,379 (15%)	23,978 (16%)	5,796 (14%)	6,399 (16%)	4,628 (15%)
Educational services, and health care and social assistance	724,995 (24%)	32,188 (22%)	8,609 (21%)	8,970 (23%)	6,069 (20%)
Arts, entertainment, and recreation, and accommodation and food services	254,958 (8%)	14,401 (10%)	3,519 (8%)	3,487 (9%)	3,152 (10%)
Other services, except public administration	165,095 (5%)	8,285 (6%)	2,118 (5%)	1,966 (5%)	1,924 (6%)
Public administration	333,323 (11%)	15,147 (10%)	4,127 (10%)	4,073 (10%)	3,002 (10%)

Source: US Census Bureau ACS 2013-2017

Demographic data indicates that the unemployment rate within the Socioeconomic Study Area is 4.4 percent, which is lower than the State as a whole (6.1 percent). Notable unemployment rates in individual Census Tracts include: 7014 (10.4 percent) and 7313.03 (9.5 percent). Census Tract 7014 is partially within Corridor 8 and Census Tract 7313.03 is within Corridor 6. Census Tracts within Corridor 8 have the highest current estimated unemployment rate of 5.1 percent. It is important to note that Census Tracts within Corridor 8 also have the lowest total population 16 years and over and consequently the lowest

employment/population ratio (60.4 percent). In contrast, Census Tracts within Corridor 6 have the lowest overall unemployment rate of 3.6 percent.

4.1.7 Transportation

This section includes a qualitative discussion of existing conditions and potential impacts to existing transportation services and facilities in the CARA, including roadways, public transit, railroads, air travel, and water travel. Any transportation-related impacts related to the No-Build Alternative for this study would result from currently planned and programmed infrastructure projects. The No-Build Alternative would include both short-term and long-term improvements documented in the adopted Regional Constrained Long-Range Plans (LRP) for transportation within the Greater Baltimore and Washington, D.C. areas as of Project Scoping in 2017. The No-Build Alternative includes existing TSM/TDM measures including contraflow lanes on the existing bridge, as well as any planned and funded TSM/TDM measures as of Project Scoping in 2017, such as automated contraflow lanes. The No-Build would be updated during Tier 2 to reflect newly planned and programmed projects. Qualitatively, under the No-Build Alternative increases in travel times and delays related to growing traffic congestion are anticipated and could lead to potential future negative effects for all transportation systems within the study area. Mobility and accessibility for commuters, passengers, essential services, and supply chains related to all modes (air, rail, transit, water) could each be further strained by increased inefficiencies of motor vehicle travel.

The arterial surface roadway networks present on both the Western Shore and Eastern Shore provide east-west connections across the Bay via the existing crossing. Corridor 7 may require fewer upgrades and alterations to existing transportation systems and presents the opportunity for utilizing existing roadway infrastructure, depending on the specific alignment chosen. In particular, an alignment to widen US 50/301 would efficiently use existing infrastructure. However, US 50/301 also has local access roads running parallel to much of it, which could be impacted by such an alternative. By comparison, Corridor 6 or 8 would more likely require the construction of new roadways along new alignments for most or all of the corridor length.

Corridor 6 would require new or existing transit services on both shores to be routed/re-routed along the alignment of the new limited access highway and would provide opportunities for park and ride facilities that could support existing and new bus transit system users with enhanced access to employment, commercial and recreational centers. Corridor 7 would potentially augment existing opportunities to introduce bus service across the Chesapeake Bay to connect system users with employment, commercial, and recreational opportunities and the existing public transportation routes on the Western Shore and Eastern Shore would likely experience minimal impact. Corridor 8 would require new or existing transit services on both shores to be routed/re-routed along the alignment of the new limited access highway and would provide opportunities for park and ride facilities that could support existing and new bus transit system users with enhanced access to employment, commercial and recreational centers.

In Corridor 6, a new crossing would provide residents of the central Eastern Shore additional access to MARC and Amtrak via the Northeast Corridor. Construction in Corridor 7 or Corridor 8 would likely have minimal impact on rail traffic.

No air travel operations are affected in Corridor 6. Corridor 7 would have the potential to affect the operation of the Bay Bridge Airport. A new crossing west of the airport would affect the existing airfield traffic pattern. Corridor 8 would have the potential to affect the operation of Lee Airport in Edgewater on the Western Shore and Easton Airport on the Eastern Shore - construction of any limited access highway associated with a new crossing would have the potential to affect the existing airfield traffic pattern of these airports.

With all corridors, any impacts to travel by water would likely be during construction and temporary in nature. More detailed consideration of crossings over navigable waterways will be included in Tier 2.

4.1.8 Children's Health and Safety

Executive Order (EO) 13045, Protection of Children from Environmental Health Risks and Safety Risks requires federal agencies to identify and assess environmental health and safety risks that may disproportionately affect children. In this case, "environmental health and safety risks" are defined as "risks to health or to safety that are attributable to products or substances that the child is likely to come in contact with or ingest (such as the air we breathe, the food we eat, the water we drink or use for recreation, the soil we live on, and the products we use or are exposed to)".

The most likely locations of potential effects on children would be at schools and parks located within the CARA where there are outdoor activity facilities for children. Potential impacts to communities with children could result from a new crossing within each CARA, such as a roadway alignment crossing through existing communities, creating potential concern for traffic safety in relation to pedestrian and bicycle travel by children. Homes and facilities located closer to a roadway alignment would also be a likely location for potential effects related to air quality and noise, but specific impacts cannot be determined at this level of detail.

Each of the three corridors contain multiple parks and recreational facilities that could potentially be impacted by an alignment in the corridor, as discussed in **Section 4.1.2.1**. Corridor 6 has eight facilities, Corridor 7 has 14 facilities and Corridor 8 has 10 facilities. While Tier 2 alignments could potentially be identified in each corridor to avoid some or all these parks and recreational facilities, it is likely that one or more of the facilities would be impacted given their prevalence and spatial distribution throughout each of the corridors.

Each of the three corridors contain K-12 public schools that could potentially be impacted by an alignment in the corridor, as discussed in **Section 4.1.2.1**. Corridor 6 contains five schools, Corridor 7 contains nine schools and Corridor 8 contains seven. Although all the schools are located adjacent to roadways that may be impacted, alternate alignments could potentially be developed to avoid impacts to the schools in each of the corridors.

The study's air quality and noise impacts have also been evaluated as a potential health and safety risk to children. As noted in **Section 4.6.2**, the project would not cause any violations of national ambient air quality standards established by the USEPA to protect human all health and welfare, including children. **Section 4.7.3** identifies the locations of potentially noise sensitive areas that exist within each of the three CARA.

4.2 CULTURAL RESOURCES

4.2.1 Introduction and Methodology

Section 106 of the National Historic Preservation Act of 1966, as amended (NHPA) (Section 106) and its implementing regulations set forth in [36 Code of Federal Regulations \(CFR\) Part 800](#), Protection of Historic Properties (Section 106), requires Federal agencies to take into account the effects of their undertakings on historic properties. The Section 106 process seeks to accommodate historic preservation concerns with the needs of Federal undertakings through consultation among the agency official and other parties with an interest in the effects of the undertaking on historic properties, commencing at the early stages of the project. According to 36 CFR Part 800.16 (I), the term “historic property,” refers to “any prehistoric or historic district, site, building, structure, or object listed in or eligible for inclusion in, the National Register of Historic Places (NRHP).”

NEPA regulations set forth in [40 CFR §1502.25\(a\)](#) require that related surveys and studies be coordinated with Section 106 of the NHPA and other environmental regulations. In considering whether a NEPA action may significantly affect the quality of the human environment, agencies must consider the proximity of the action to historic properties (40 CFR §1508.27(b)(3)). The FHWA and MDTA are complying with Section 106 during the BCS tiered NEPA process with the Tier 1 approach including the phased identification of historic properties.

FHWA initiated Section 106 consultation with the Maryland State Historic Preservation Office (SHPO) (Maryland Historical Trust [MHT]) on May 3, 2018 and received MHT’s response June 25, 2018. FHWA invited ten Federally Recognized Tribes and other potential consulting parties to participate in the Section 106 consultation process via letter on November 29, 2018. A second letter dated April 9, 2019, was sent to those invited parties that had not responded. FHWA completed an inventory of recorded cultural resources within the 14 preliminary study corridors. This information was presented as part of the environmental inventory at the Fall 2019 Open Houses where the public was able to provide comments. FHWA has prepared a [BCS Cultural Resources Technical Report](#) for review and comment. Consulting parties participating in Section 106 consultation, including ten Federally Recognized Tribes were provided with a draft of the technical report on June 24, 2020.

Section 106 regulations at 36 CFR §800.4(b)(2) allow agencies to complete phased identification of historic properties for projects such as the Bay Crossing Study, in which large corridors or land areas are being considered as alternatives. The Section 106 regulations state that final identification and evaluation of historic properties may be deferred “if it is specifically provided for in... documents used by an agency official to comply with the National Environmental Policy Act pursuant to [36 CFR] §800.8.” Phased identification of historic properties in projects with large corridors should establish “the likely presence of historic properties” within the Area of Potential Effects (APE) for each alternative through “background research, consultation and an appropriate level of field investigation, taking into account the alternatives under consideration, the magnitude of the undertaking and its likely effects, and the views of the SHPO /THPO [Tribal Historic Preservation Office] and any other consulting parties” (36 CFR §800.4). Once the alternatives are refined, the agency would proceed with the identification and evaluation process as set forth in 36 CFR §800.4(b)(1) and (c).

In consultation with the Maryland SHPO and the Advisory Council on Historic Preservation (ACHP), FHWA and MDTA have developed a phased approach for complying with Section 106 identification and evaluation requirements during Tier 1 NEPA. Tier 1 Section 106 historic property identification efforts focus on establishing the likely presence of historic properties within the APE (defined as coterminous with the CARA). Since previous historic properties survey and documentation has not been uniform in scale or scope throughout the CARA, the [*BCS Cultural Resources Technical Report*](#) identifies unrecorded resources (unsurveyed and unevaluated resources that meet the NRHP age threshold established in 36 CFR 60.4) within the CARA in addition to evaluated (National Historic Landmark [NHL], NRHP listed or eligible historic properties) and unevaluated resources (such as Maryland Inventory of Historic Properties [MIHP] resources or easement properties without an NRHP evaluation). Unrecorded architectural resources were identified using a 1980 date of construction (inclusive) as a cut off year to identify resources 40 years or older to account for properties that may ultimately meet the age threshold. The results of Tier 1 identification efforts allowed for direct comparison of the CARA when analyzing each corridor alternative; identified significant resources - such as NHLs - that merit avoidance; and provided data that supports and contributes to the Bay Crossing Study.

In accordance with 36 CFR §800.8, Section 106 consultation for the Bay Crossing Study will run concurrently with the NEPA process. Section 106 decisions made during Tier 1 will be recorded in the Tier 1 Final Environmental Impact Statement/Record of Decision (FEIS/ROD). The Bay Crossing Study will coordinate Section 106 and NEPA rather than invoke 36 CFR §800.8(c) "Use of the NEPA process for section 106 purposes." Recorded commitments will include the deferral of historic properties identification and the continuation of the Section 106 process during Tier 2. The FEIS/ROD will also document Section 106 activities completed in Tier 1 and specify that Section 106 consultation will continue only within the Preferred Corridor.

The Section 106 process would continue with a future Tier 2 NEPA study within the Preferred Corridor. If a Preferred Corridor is approved at the conclusion of Tier 1, the APE would be refined during Tier 2 in consultation with MHT and the consulting parties. The refinement of the APE would be determined by the scale and nature of the undertaking as defined by the project alternatives, including considerations such as visual, audible, atmospheric, or other physical impacts. Once identification and evaluation of historic properties is complete as set forth in 36 CFR §800.4(b)(1) and (c), if there are adverse effects to historic properties or effects cannot be determined, then Section 106 consultation will conclude with an agreement document, following 36 CFR §800.6 or §800.14(b).

The three CARA encompass an environmentally diverse and historically rich section of Maryland's Chesapeake Bay Region. Background research about known cultural resources within the CARA was conducted by examining data from the archaeological and architectural layers available on the Maryland Historical Trust (MHT) Medusa Cultural Resource Information System (Medusa). Desktop sources including cultural resources management reports, MHT archaeological site and Maryland Inventory of Historic Properties (MIHP) files, state and local histories, and environmental, geological, and soil data were also consulted.

The cultural resources study synthesizes previous cultural resources studies completed within the CARA, identifies the location and survey status of previously identified resources, and proposes methodologies for intensive identification of potential unrecorded archaeological and architectural resources in a potential future Tier 2 study.

A detailed discussion of environmental setting and historic cultural context is included in the [*BCS Cultural Resources Technical Report*](#). The environmental setting discussion includes topography, geology, hydrology, soils, paleoenvironment and vegetation. The cultural context discussion includes precontact archaeological context and historical cultural context.

4.2.1.1 Archaeological Gap Analysis Methodology

The archaeological gap analysis identified areas within the CARA that have not been subject to archaeological survey or have not been surveyed to meet the current Standards and Guidelines for Archaeological Investigations in Maryland (Schaffer and Cole 1994). For the purposes of this study, surveys conducted prior to 1990 are assumed to not meet current MHT standards and those conducted later as meeting current MHT standards. Both unsurveyed areas and areas surveyed prior to 1990 will be referred to as “unsurveyed areas” throughout the remainder of this document. Areas that were subjected to Phase I archaeological survey in or after 1990 were eliminated from further analysis during this study. However, if Tier 1 concludes with the selection of a Preferred Corridor, the methodology of each previous survey should be verified during a future Tier 2 study to ensure they meet current MHT standards.

The unsurveyed areas within the CARA were assessed to determine if they may require archaeological survey during a future Tier 2 cultural resources study. A desktop analysis using National Resources Conservation Service (NRCS) soil data, topographic relief, and soil drainage was conducted to eliminate areas from consideration based on obvious disturbance or urban/suburban development; no further archaeological survey is recommended for those areas. The remaining areas were assessed for their archaeological potential and recommendations for additional survey were made based on that potential.

Unsurveyed areas were classified as “may require archaeological survey” if they contained:

- No documented disturbance in the NRCS soil data layers;
- Slopes less than or equal to 10 percent on the Eastern Shore;
- Slopes less than or equal to 15 percent on the Western Shore; and
- Moderately well-drained to very well drained soils.

Unsurveyed areas were classified as having “low archaeological potential” if they contained:

- Urban Land or Udothents;
- Slopes in excess of 10 percent on the Eastern Shore;
- Slopes in excess of 15 percent on the Western Shore; and
- Moderately poorly-drained to very poorly drained soils.

An additional precontact and historic archaeological potential assessment is recommended during the Tier 2 study for the areas identified in this study as “may require archaeological survey”. No further archaeological assessment or investigation is recommended for those identified as low potential, pending MHT concurrence.

In an effort to identify additional potential underwater archaeological sites not yet known or recorded by MHT, the National Oceanic and Atmospheric Administration (NOAA) dataset [NOAA Automated Wreck and Obstruction Information System and electronic navigational chart] of shipwrecks was reviewed.

4.2.1.2 Architectural Gap Analysis Methodology

The architectural gap analysis identified recorded and unrecorded architectural resources within the CARA. In Tier 1, the limits of the CARA have been identified as the APE.

Identification of recorded architectural resources began with studying the architecture layers on Medusa, namely NRHP, Determination of Eligibility Short Forms, MIHP, Pending Submittal MIHP, and MHT Easements within the APE. The MIHP layer also includes the Determination of Eligibility (DOE) Forms. Easement records obtained from the MHT Easement Administrator were also studied. Properties with MHT Easements are considered by MHT to be eligible for the NRHP regardless of whether a formal DOE has been prepared. If Tier 1 concludes with the selection of a preferred corridor alternative, resources identified as potentially warranting reevaluation for NRHP eligibility will be studied during Tier 2.

The collected data was organized into four categories to better reflect gap analysis needs: 1) historic properties (resources listed or eligible for inclusion in the NRHP and NHLs); 2) not eligible resources; 3) unevaluated resources; and 4) demolished resources (comprising any resource within the prior three categories that has been demolished). Verification of demolished resources was accomplished via desktop analysis.

Non-contributing elements of listed or eligible historic districts, as well as potentially eligible resources located within not eligible districts, were not identified as part of the gap analysis. If Tier 1 concludes with the identification of a preferred corridor alternative, these resources will be identified and individually evaluated during Tier 2.

Unrecorded architectural resources within the CARA were identified using a 1980 date of construction (inclusive) as a cut off year to identify resources 50 years or older providing a ten-year buffer for project construction. Parcels were identified through GIS desktop analysis conducted of Maryland State Department of Assessments and Taxation (SDAT) build years. Clusters of parcels with build dates of 1980 and earlier that had potential to be an unrecorded historic district received an additional layer of analysis. Using aerial imagery, these clusters were reviewed for their potential as unrecorded districts. Only areas within the CARA were reviewed; these historic districts may extend beyond the CARA. Other than three post-1945 concrete and steel bridges determined eligible by MDOT SHA (QA-542, AA-44, and AA-45), all post-1945 concrete bridges within the APE are exempt due to the ACHP Program Comment Issued for Streamlining Section 106 Review for Actions Affecting Post-1945 Concrete and Steel Bridges (77 FR 68790).

For architectural resources with no recorded build date in SDAT, the analysis extended to the metadata within the SDAT database. Parcels unlikely to have architectural resources, such as those identified as “open space” or “flood plain,” were removed, as were properties that appeared to be vacant lots. Properties likely to contain parks or other recreational facilities were retained. Those properties determined likely to contain a resource received a second level of review using aerial imagery and Google Street View to verify the existence of a building or structure on the parcel. Parcels with structures with and without build dates were then assigned one of five property types based on the land use description metadata within SDAT—agricultural, commercial, industrial, miscellaneous, and residential. Miscellaneous property types aggregate land uses such as: government, education, parks and recreation, religious, and institutional.

4.2.2 Archaeological Resources

To document and assess the potential for archaeological historic properties within each CARA, an archaeological gap analysis evaluation of existing data sources was conducted. The archaeological gap analysis first identified areas within each CARA that had been subjected to Phase I archaeological survey meeting MHT's current standards as presented in *Standards and Guidelines for Archeological Investigations in Maryland* (Shaffer and Cole 1994). For the purposes of this study, all surveys conducted in 1990 or later were considered to meet current standards and those conducted prior to 1990 were considered not to meet current standards. Previously recorded archaeological sites within the CARA were also reviewed for their NRHP status.

4.2.2.1 Corridor 6

There are 43 previously recorded terrestrial archaeological sites within Corridor 6. Of these, 21 are on the Eastern Shore and 22 are on the Western Shore. Of the 43 sites, 20 sites are precontact, 14 sites are historic, and nine are multi-component sites. Of the recorded archaeological sites, one has been determined ineligible for listing in the NRHP. This site is the multi-component Denbigh Farm (18QU218). The other 42 sites have not yet been evaluated for listing in the NRHP.

There are four previously recorded underwater archaeological sites in Corridor 6. Of the four sites, one is precontact, and three are historic. None of the four sites have been evaluated for listing in the NRHP. Two additional underwater sites were recorded in the archaeology quad files maintained by MHT and six shipwrecks were recorded by NOAA within Corridor 6.

4.2.2.2 Corridor 7

There are 127 previously recorded terrestrial archaeological sites in Corridor 7. Eighty-two of the sites are located on the Eastern Shore and 45 of the sites are on the Western Shore. Of the 127 sites, 64 are precontact, 35 sites are historic, 26 sites are multi-component, and two sites are of an unrecorded cultural period.

In Corridor 7, two of the recorded sites are listed in the NRHP, two sites are eligible for listing, and 12 sites are ineligible. The remaining 112 archaeological sites have not yet been evaluated for listing in the NRHP. Of the four sites in Corridor 7 that are listed or determined eligible for listing in the NRHP, one is an historic site and the remaining three are multi-component.

- Martin's Pond (18AN141) is a precontact and historic site in Anne Arundel County and listed in the NRHP under Criterion D¹.
- Sandy Point Farmhouse (18AN534) is an historic site in Anne Arundel County and is listed in the NRHP under Criterion D.
- Sharpe-Ridout-Boone Mill (18AN652) is located in Anne Arundel County and consists of a multicomponent precontact and historic site which is eligible under Criterion D.

¹ NRHP criteria are defined in 36 CFR 60.4. For detailed explanation of NRHP evaluation criteria, see the National Register Bulletin – *How to Apply the National Register Criteria for Evaluation* (https://www.nps.gov/subjects/nationalregister/upload/NRB-15_web508.pdf)

- Gibson's Grant 1 (18QU968) is an historic site located on Kent Island in Queen Anne's County. The site is listed under Criterion D.

There are eight previously recorded underwater archaeological sites in Corridor 7. None of the sites have been evaluated for listing in the NRHP. Nine additional underwater sites were recorded in the archaeology quad files maintained by MHT and 14 shipwrecks recorded by NOAA within Corridor 7.

4.2.2.3 Corridor 8

There are 154 previously recorded terrestrial archaeological sites within Corridor 8. Of these, 32 are on the Eastern Shore and 122 are on the Western Shore. Of the 154 sites, 72 sites are precontact, 58 sites are historic, and 24 are multi-component sites.

In Corridor 8, one of the recorded sites is listed in the NRHP, four sites are eligible for listing, and nine sites are ineligible. The remaining 140 sites have not been evaluated for listing in the NRHP.

- Gresham (18AN571) is an historic site located in Anne Arundel County and listed in the NRHP under Criterion D.
- Smithsonian Pier (18AN284) is a precontact and historic site located in Anne Arundel County and is determined eligible for the NRHP under Criterion D.
- Smithsonian Pier West (18AN285) is a precontact site located in Anne Arundel County and is eligible for the NRHP under Criterion D.
- SH 8 (18TA424) is a precontact and historic site in Talbot County and is eligible for the NRHP under Criterion D.
- SH 9 (18TA425) is a precontact and historic site in Talbot County and is eligible for the NRHP under Criterion D.

There are ten previously recorded underwater archaeological sites in Corridor 8. None of these sites have been evaluated for listing in the NRHP. Eighteen shipwrecks were recorded by NOAA within Corridor 8.

4.2.2.4 Assessment of Archaeological Potential

Unsurveyed areas within the CARA were assessed for future archaeological identification survey needs and categorized as either areas that may require archaeological survey or areas with low archaeological potential. Areas that may require archaeological survey are both terrestrial and underwater. **Table 4-10** presents the results of assessment of terrestrial archaeological potential. More detailed discussion of this analysis is included in the [*BCS Cultural Resources Technical Report, Section 6.2.1.*](#)

All unsurveyed underwater areas within each CARA may require additional underwater archaeological survey. Corridor 6 contains 29,300 acres that may require underwater archaeological survey. Corridor 7 contains 16,160 acres that may require underwater archaeological survey and Corridor 8 contains 31,580 acres that may require underwater archaeological survey.

Table 4-10: Assessment of Terrestrial Archaeological Potential

CORRIDOR	ACRES THAT MAY REQUIRE SURVEY	ACRES WITH LOW POTENTIAL
6	15,740	11,550
7	10,080	19,050
8	17,580	25,910

The areas recommended for additional archaeological survey are mapped in **Appendix A**.

4.2.2.5 Summary of Archaeological Resources

The goal of the Archaeological Gap Analysis was to identify the potential future archaeological survey and evaluation needs of each CARA. To that end, Gap Analysis reviewed soil data, archaeological survey and site data, and maritime data of each CARA that may require additional terrestrial and underwater archaeological survey, the number of archaeological sites listed in or eligible for listing in the NRHP, and the number of archaeological sites or shipwrecks that may require evaluation for eligibility for listing in the NRHP during the Tier 2. A summary of the results are presented in **Table 4-11**.

Table 4-11: Summary of Archaeology Results

CORRIDOR	ACRES THAT MAY REQUIRE ADDITIONAL TERRESTRIAL SURVEY	ACRES THAT MAY REQUIRE ADDITIONAL UNDERWATER SURVEY	NUMBER OF NRHP LISTED OR ELIGIBLE SITES	NUMBER OF UNEVALUATED SITES (INCLUDING QUAD FILES)	NUMBER OF NOAA RECORDED SHIPWRECKS
6	15,740	29,300	0	48	6
7	10,080	16,160	4	124	14
8	17,580	31,580	5	148	18

Note: all acreage numbers rounded to closest 10 acres

4.2.3 Recorded Architectural Resources

4.2.3.1 Corridor 6

A search of existing records identified 61 recorded architectural resources within Corridor 6.

There are two recorded historic properties in Corridor 6, and both are listed on the NRHP (**Table 4-12**). Of the recorded resources in Corridor 6, 20 were determined not eligible for the NRHP.

There are 37 resources in Corridor 6 that have been surveyed for the MIHP, but not individually evaluated for NRHP eligibility. If Corridor 6 is selected as the preferred corridor alternative at the end of Tier 1, resources that fall within the Tier 2 APE would need to be evaluated for NRHP eligibility.

More detailed information on these resources is included in the [BCS Cultural Resources Technical Report, Section 7.1.1](#). Maps of historic structures are included in **Appendix A**.

Table 4-12: Historic Properties in Corridor 6

ID	COUNTY	MIHP	NAME	DATE	SIGNIFICANCE CRITERION
1	Queen Anne's	QA-224	Bachelor's Hope (also Phares Morris Farm)	May 3, 1984	C – Architecture
2	Queen Anne's	QA-5	Reed's Creek Farm	July 7, 1975	C – Architecture

A new crossing within Corridor 6 could impact two recorded historic properties, both of which are located on the Eastern Shore in Queen Anne's County. Bachelor's Hope (also known as Phares Morris Farm) (MIHP QA-224) and Reed's Creek Farm (MIHP QA-5) are both eighteenth and nineteenth-century plantations that may contain extensive lands within their boundaries. Because of their size, both the land and the buildings of the properties may be impacted directly or indirectly. Of the three CARA, selecting Corridor 6 as the preferred corridor alternative would require the second most architectural surveying during Tier 2. An alignment located in the northern half of Corridor 6 would have the potential to avoid impacts to the recorded historic properties.

4.2.3.2 Corridor 7

The search of existing records identified 166 recorded architectural resources within Corridor 7.

There are 13 recorded historic properties in Corridor 7 (**Table 4-13**), including one NHL: the U.S. Naval Academy (AA-359). The U.S. Naval Academy was designated an NHL on July 4, 1961. Properties determined eligible for the NRHP include the Stevensville Historic District.

Of the recorded resources in Corridor 7, 44 were determined not eligible for the NRHP. There are 94 resources in Corridor 7 that have been surveyed for the MIHP, but not individually evaluated to NRHP eligibility. Additionally, there are two roadways in Anne Arundel County that are listed in the MIHP, but for which no documentation has been filed. If Corridor 7 is identified as the preferred corridor alternative at the end of Tier 1, and these resources are within the Tier 2 APE, they would need to be evaluated for NRHP eligibility.

More detailed information on these resources is included in the [BCS Cultural Resources Technical Report, Section 7.1](#). Maps of historic structures are included in **Appendix A**.

A new crossing within Corridor 7 could impact 13 recorded historic properties, including one NHL: the U.S. Naval Academy (MIHP AA-359). Particular attention must be paid to the U.S. Naval Academy per Section 110(f) of the NHPA and 36 CFR 800.10 which requires the agency official to undertake such planning and actions as may be necessary, to the maximum extent possible, to minimize harm to any NHL that may be directly and adversely affected by an undertaking. A Tier 2 alignment within Corridor 7 that is adjacent to the existing US 50/301 corridor on its southern side would have the potential to avoid impacts to the U.S. Naval Academy as well as the Stevensville Historic District and White's Heritage. Of the three CARA, selecting Corridor 7 as the preferred corridor alternative would require the most architectural surveying during Tier 2.

Table 4-13: Historic Properties within Corridor 7

ID	COUNTY	MIHP NO.	NAME	STATUS AND DATE	SIGNIFICANCE CRITERION
1	Anne Arundel	AA-359	U.S. Naval Academy	NRHP Listed 10/15/1966; NHL designated 4/4/1961	C-Historic District
1a	Anne Arundel	AA-359-15	Building 187, Steam Generation Building	Eligible 6/23/2014	C-Contributes to U.S. Naval Academy
2	Anne Arundel	AA-136	Howard's Inheritance	Listed 7/23/1998; Preservation Easement recorded 12/29/1986	C- Architecture
3	Anne Arundel	AA-330	Sandy Point Farm House	Listed 2/11/1972	A-Agriculture C-Architecture
4	Queen Anne's	QA-463	Stevensville Historic District	Listed 9/11/1986; reevaluated 3/19/1998	C-Historic District
5	Queen Anne's	QA-259	Cray House	Listed 5/9/1983; Preservation Easement recorded 2/2/2001	C-Architecture
6	Queen Anne's	QA-212	Christ Church	Listed 7/24/1979; Preservation Easement recorded 7/26/2005	A- Settlement, Religion C-Architecture
7	Queen Anne's	QA-264	Stevensville Bank	Listed 1/3/1985	A-Commerce C-Architecture
8	Anne Arundel	AA-47	William Preston Lane, Jr., Memorial Bridge, Eastbound	Eligible 4/2/2001	A-Association with designer and builder C-Engineering
9	Anne Arundel	AA-48	William Preston Lane, Jr., Memorial Bridge, Westbound	Eligible 4/3/2001	A-Association with designer and builder C-Engineering
10	Anne Arundel	AA-765	Bridge 2081, Weems Creek Bridge	Eligible 6/29/1993	A-Transportation C-Engineering
11	Queen Anne's	QA-222	White's Heritage	Eligible 2/11/1980	C-Architecture
11a	Queen Anne's	QA-222-1	Garage, White's Heritage	Eligible 9/21/2006	C-Contributes to White's Heritage HD
11b	Queen Anne's	QA-222-2	Tenant House, White's Heritage	Eligible 9/21/2006	C-Contributes to White's Heritage HD
11c	Queen Anne's	QA-222-3	Tenant Farm Complex, White's Heritage	Eligible 9/21/2006	C-Contributes to White's Heritage HD
12	Queen Anne's	QA-542	SHA Bridge No. 1700600	Eligible 6/3/2011	C-Engineering
13	Queen Anne's	QA-524	Barnstable Hill, Lowery Farm	Eligible 9/11/1980	A-Agriculture C-Architecture

4.2.3.3 Corridor 8

The search of existing records identified 133 recorded architectural resources within Corridor 8.

There are 15 recorded historic properties in Corridor 8, which are listed in **Table 4-14**. Of these, 12 are listed in the NRHP and three have been determined eligible – two by preservation easement. Properties with MHT Easements are considered by MHT to be eligible for the NRHP regardless of whether a formal DOE has been prepared.

Of the recorded resources in Corridor 8, ten were determined not eligible for the NRHP. There are 102 resources in Corridor 8 that have been surveyed for the MIHP, but not individually evaluated for NRHP eligibility. Additionally, there are seven roadways in Anne Arundel County that are listed in the MIHP, but for which no documentation has been filed. If Corridor 8 is identified as the preferred corridor alternative at the end of Tier 1, resources that fall within the Tier 2 APE, would need to be evaluated for NRHP eligibility.

More detailed information on these properties is included in the [BCS Cultural Resources Technical Report, Section 7.1](#). Maps of historic structures are included in **Appendix A**.

Table 4-14: Historic Properties in Corridor 8

ID	COUNTY	MIHP NO.	NAME	LISTED OR ELIGIBLE	DATE OF DOE	SIGNIFICANCE
1	Anne Arundel	AA-1006	Davidsonville Historic District	Listed	3/27/1992	C-Historic District
2	Anne Arundel	AA- 140	South River Club	Listed	5/15/1969	A-Social C-Architecture
3	Anne Arundel	AA-144	Summer Hill	Listed	7/25/1974	C-Architecture
4	Anne Arundel	AA-160	Mount Airy	Listed	4/13/1973	A-Agriculture C-Architecture
5	Anne Arundel	AA-200	Indian Range	Listed	2/13/1986	C-Architecture
6	Anne Arundel	AA-200A*	Indian Range Servant's Quarter	Listed	2/13/1986	C-Architecture
7	Anne Arundel	AA-150	All Hallow's Church	Listed	5/15/1969	A-Religion C-Landscape Arch., Architecture
8	Anne Arundel	AA-232	Gresham	Listed	9/7/1984	B-Assoc. with Comm. Isaac Mayo
9	Queen Anne's	QA-297	Bloody Point Bar Light	Eligible	2/22/2007	Preservation Easement
10	Talbot	T-244	Sherwood Manor	Listed	4/5/1977	C-Architecture
11	Talbot	T-527	Skipjack CLAUD W. SOMERS	Listed	5/16/1985	A-Commerce and Transportation
12	Talbot	T-90	Hope House	Listed	11/1/1979	C-Architecture
13	Talbot	T-89	Wye Town Farm House	Listed	12/16/1982	C-Architecture

ID	COUNTY	MIHP NO.	NAME	LISTED OR ELIGIBLE	DATE OF DOE	SIGNIFICANCE
14	Talbot	T-381	Unionville	Eligible	3/24/1999	A-African-American settlement C-Historic District, Architecture
15	Talbot	T-211	Rich Neck Manor	Eligible	12/19/1988	Preservation Easement

* Indian Range Servant's Quarters (AA-200A) has a separate MIHP number but is connected to Indian Range (AA-200); both resources are included in the Indian Range NRHP nomination form.

A new crossing within Corridor 8 could impact 14 recorded historic properties. Of the three CARA, selecting Corridor 8 as the preferred corridor alternative would require the least architectural surveying during Tier 2. A Tier 2 alignment that extends through the northern half of Corridor 8 in Anne Arundel County but that extends through the southern half of Queen Anne's County would have the potential to avoid impacts to recorded historic properties.

4.2.3.4 Unrecorded Architectural Resources

For this Tier 1 study, MDTA conducted a preliminary assessment of unrecorded architectural resources with a date of construction in or prior to 1980 located within the CARA (**Table 4-15**).

The study eliminated parcels overlapping with previously surveyed historic architectural resource layers on MHT's Medusa, including: MHT Preservation Easements, National Register of Historic Places, Determination of Eligibility Short Forms, Resources listed in the MIHP, and Resources Pending Submittal to the MIHP. Potential NRHP evaluation or re-evaluation of resources in the aforementioned categories are addressed in **Section 4.2.3**. Additional analysis of these resources by property type and build year is included in [BCS Cultural Resources Technical Report](#), **Section 7.2**. A full list of unrecorded architectural resources and unrecorded architectural resources by property type are included as Appendices T and U of that report.

Table 4-15: Preliminary Unrecorded Architectural Resources in the CARA

CORRIDOR	UNRECORDED RESOURCES BUILT PRE-1980	UNRECORDED HISTORIC DISTRICTS	UNRECORDED RESOURCES WITH NO BUILD YEAR LIKELY TO CONTAIN BUILDINGS	TOTAL UNRECORDED ARCHITECTURAL RESOURCES
6	944	37	89	1,070
7	1,931	38	160	2,129
8	1,115	34	105	1,254

4.2.3.5 Summary of Architectural Resources

Tier 1 architectural resources identification has found that historic properties are distributed evenly between Corridors 7 and 8, with the fewest number of recorded historic properties in Corridor 6. Corridor 6 has 37 unevaluated resources. This is markedly lower than the number of unevaluated resources in Corridor 7 (94) and Corridor 8 (102).

Perhaps spurred by development following the construction of the William Preston Lane, Jr. Memorial Bridges, Corridor 7 has 2,129 resources built prior to 1980 (inclusive), compared to 1,070 in Corridor 6 and 1,254 in Corridor 8 as shown in **Table 4-16**.

Table 4-16: Summary of Historic Properties and Architectural Resources within the CARA

CORRIDOR	RECORDED HISTORIC PROPERTIES	UNEVALUATED MIHP RESOURCES	NOT ELIGIBLE RESOURCES	RESOURCES BUILT PRE-1980
6	2	37	20	1,070
7	13 (including 1 NHL)	94	44	2,129
8	15	102	10	1,254

The analysis of the quantities and locations of recorded historic properties has revealed information regarding potential impacts in each of the three CARA. The presence of the resources shows that each CARA contains numerous areas of the built environment that reflect several hundred years of Maryland's rich history, dating from the seventeenth century to the late twentieth century. While specific impacts to cultural resources will not be determined for each corridor alternative at this stage of the study, the Tier 1 survey results can be used to make recommendations for future research to fill in observed data gaps and for selecting future Tier 2 alignments within each corridor that might avoid impacts to the known and potential cultural resources located there. Additional discussion of potential indirect and cumulative effects on historic properties can be found in **Sections 4.8.2** and **4.8.3**.

4.2.4 Tier 2 Recommendations

If a Bay Crossing Study Tier 2 NEPA study is conducted, the Section 106 process (36 CFR 800 Subpart B) will resume and phased identification of historic properties will continue within the refined APE established within the Preferred Corridor identified during Tier 1 NEPA. The following outlines how phased identification would proceed during the Tier 2 NEPA process. The Tier 1 historic property identification would require review and reevaluation at the start of Tier 2, when more information is available about the specific alignment of the Project and any constraints, such as the project schedule, the project delivery method, or other factors that are currently unknown. Given these constraints, the recommendations in this section are intended to provide a general outline of the remainder of the historic property identification process through a Tier 1 study, as well as to identify additional work that may be needed, based on the findings of the [*BCS Cultural Resources Technical Report*](#).

A future Tier 2 NEPA study would include delineation of an APE based on Tier 2 alignment alternatives (within the Tier 1 Preferred Corridor) and their potential for direct and indirect effects to historic properties. Identification efforts during a Tier 2 study would involve detailed identification of historic properties within the APE of the alignment alternatives and assessment of effects on those historic properties. As part of the identification effort, FHWA and MDTA will continue to work with the consulting parties in identifying knowledgeable individuals and organizations who could provide information that could assist in the identification and evaluation of historic properties within the Tier 2 APE. FHWA and MDTA will continue Section 106 consultation with the ACHP, MHT, Federally Recognized Tribes and consulting parties participating during Tier 1, as well as any consulting parties newly identified during Tier 2, and the general public.

4.2.4.1 Archaeological Resources

It is recommended that a Tier 2 archaeological study include a more detailed assessment of the precontact and historic archaeological potential within the refined APE of the Preferred Corridor.

The detailed archaeological assessment would build on the Tier 1 archaeological assessment by:

- reviewing the methodologies of all the previously conducted archaeological surveys within the APE to determine which surveys conform to MHT's archaeological guidelines and which do not and will require additional survey;
- assessing and verifying the potential for additional ground disturbance within the APE beyond that documented in the soil data through the use of LiDAR and windshield survey;
- developing specific criteria for assessing the areas that may require archaeological survey for their specific precontact and historic terrestrial archaeological potential including a consideration of distance from surface potable water, known archaeological sites, and former shorelines, as well as land use history; and
- conducting a GIS-based predictive terrestrial archaeological potential model.

Tier 2 archaeological studies are recommended to include a Phase I terrestrial archaeological survey of all areas within the APE, identified by the detailed assessment of precontact and historic archaeological potential as having terrestrial archaeological potential. Phase I underwater survey of areas within the refined APE are also recommended where there will be direct impacts. It is also recommended that the locations of all unevaluated sites within the refined APE be reestablished and additional evaluation be conducted based on site integrity and potential significance.

All investigations will be conducted in accordance with the *Standards and Guidelines for Archeological Investigations in Maryland* (Shaffer and Cole 1994), and *Standards and Guidelines for Archeological Investigations in Maryland, Technical Update No. 1* (Morehouse et al. 2018). It is also recommended that Tier 2 investigations for underwater archaeological resources are undertaken in consultation with MHT. Although dependent on the location and nature of the undertaking and consultation with MHT, subsequent investigations may entail geophysical survey operations such as single beam bathymetry, side scan sonar, sub-bottom profiling, and electromagnetic (EM) interrogation of the seabed to identify potential submerged archaeological resources within the Chesapeake Bay.

4.2.4.2 Architectural Resources

Architectural resources would be surveyed, evaluated, and documented following the standards and guidelines published in the MHT document, *Standards and Guidelines for Architectural and Historical Investigations in Maryland* (MHT 2019). Historic properties would be identified according to criteria outlined in National Register Bulletin 15, *How to Apply the National Register Criteria for Evaluation* (Bulletin 15) (DOI 1990). The NRHP significance criteria will be used to evaluate the historic significance of the resources.

4.2.4.3 Evaluation of Recorded Architectural Resources

Recommended Tier 2 architectural identification efforts would include verifying and updating information gathered during Tier 1 NEPA, to include resource evaluations completed subsequent to this report. Desktop analysis and field survey would be used to document whether resources are extant or any other changes have affected the integrity of the resources. MDTA would complete NRHP evaluations of any unevaluated resources within the refined APE of the Preferred Corridor. Re-evaluations of resources would be completed on a case-by-case basis, particularly if documentation of the eligibility and/or significance of recorded resources does not contain sufficient information to make an effects determination. Resources identified during Tier 1 that may require additional documentation include unevaluated MIHP resources; MHT preservation easement properties without eligibility determinations; historic properties for which new information or historic contexts have become available since its listing or eligibility determination; changes to a resource's integrity; or demolition.

4.2.4.4 Unrecorded Architectural Resources

Identification of unrecorded architectural resources in the Tier 2 APE would begin with desktop GIS analysis to identify all resources constructed 50 years prior to the project's anticipated completion date. Resources will be identified using research tools such as SDAT, current and historic aerial imagery, plat maps, and field survey. MDTA would include consulting parties such as local governments, historic preservation organizations, and other parties with demonstrated interest in the undertaking to assist in the identification of historic properties. MDTA will also continue efforts to consider property types within the Tier 2 APE that may not be adequately represented in the MHT's MIHP, including cultural landscapes and resources associated with historically marginalized populations.

Resources would be grouped and evaluated as districts where appropriate, such as subdivisions; suburban, urban, or rural historic districts; or farm complexes.

Property specific research would be conducted as needed. The evaluations would rely on the existing historic contexts, such as *Suburbanization Historic Context* (KCI 1999) and the *Suburbanization Historic Context Addendum* (Manning et al. 2019) if the Tier 2 APE includes suburban areas. The need for additional historic context development would be assessed for areas or resource types without sufficient existing context to complete NRHP evaluations. The majority of unrecorded resources in all corridors date to after 1950; however, postwar suburban development patterns in Anne Arundel, Kent, Queen Anne, and Talbot Counties differ from those in Montgomery and Prince George's Counties because of their distance from Washington, DC, and lack of limited-access highways. It will likely be necessary to complete a suburbanization historic context addendum for those counties. The goal of an addendum would be to identify patterns of development and character-defining elements for the various types of suburban development within the proposed alternatives. This document would focus heavily on residential development types as they are the majority of resources requiring evaluation. In addition, because of the relatively large number of agricultural resources in Corridor 8, additional agricultural historic contexts may be necessary should that corridor move forward into Tier 2. Few existing contexts are available describing the impact agricultural diversification and mechanization had on twentieth-century farms locally or statewide.

4.2.4.5 Cemeteries

In addition to the archaeological and architectural resources, there are numerous recorded cemeteries and burial grounds within the three CARA. During Tier 2 MDTA will continue phased identification and NRHP evaluation of cemeteries and burial grounds within the Tier 2 APE.

4.3 SECTION 4(F)

4.3.1 Introduction

Section 4(f) of the US Department of Transportation (DOT) Act of 1966 ([49 USC 303\(c\)](#)) is a federal law that protects significant publicly-owned parks, recreation areas, wildlife and waterfowl refuges, or any significant public or privately-owned historic sites. Section 4(f) applies to all transportation projects that require funding or other approvals by the US DOT, such as construction of transportation improvements that could ultimately result from the Bay Crossing Study. FHWA, which is a US DOT agency and the lead federal agency for this Study, will comply with Section 4(f) pursuant to implementing regulations at 23 CFR 774.

The regulations at [23 CFR 774.17](#) define a Section 4(f) property as “publicly owned land of a public park, recreation area, or wildlife and waterfowl refuge of national, state, or local significance, or land of a historic site of national, state, or local significance.” 23 CFR 774.17 further defines “historic site” to include any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places (NRHP). The criteria for defining a site as eligible for inclusion in the National Register is further detailed in **Section 4.2**.

Section 4(f) as amended (49 USC 303(c)) stipulates that the US DOT, including the FHWA, cannot approve a transportation project that uses any Section 4(f) property, unless:

- FHWA determines that there is no feasible and prudent avoidance alternative to the use of land from the property, and the action includes all possible planning to minimize harm to the property resulting from such use (23 CFR 774.3(a)); or
- FHWA determines that the use of the Section 4(f) properties, including any measures to minimize harm (such as avoidance, minimization, mitigation, or enhancements measures) committed to by the applicant, will have a *de minimis* impact on the property (23 CFR 774.3(b)).

4.3.2 Use of Section 4(f) Properties

Pursuant to 23 CFR 774.17, a “use” of Section 4(f) property occurs:

- (i) When land is **permanently incorporated** into a transportation facility;
- (ii) When there is a **temporary occupancy** of land that is adverse in terms of the statute’s preservation purpose as determined by the criteria in 23 CFR 774.13(d); that is, when one of the following criteria for temporary occupancy are not met:
 - The duration of the occupancy must be less than the time needed for the construction of the project, and no change of ownership occurs;

- Both the nature and magnitude of the changes to the Section 4(f) land are minimal;
 - No permanent adverse physical changes, nor interference with activities or purposes of the resources on a temporary or permanent basis, are anticipated;
 - The land must be returned to a condition that is at least as good as existed prior to the project; and
 - There is documented agreement with the appropriate Federal, State, or local officials having jurisdiction over the land that the above conditions have been met.
- (iii) When there is a **constructive use** of a Section 4(f) property. As defined in 23 CFR 774.15, a constructive use occurs when the transportation project does not incorporate land from a Section 4(f) property, but the project's proximity impacts are so severe that the protected activities, features, or attributes that qualify the property for protection under Section 4(f) are substantially impaired. The degree of impact and impairment must be determined in consultation with the officials with jurisdiction in accordance with 23 CFR 774.15(d)(3).
- (iv) A *de minimis* impact involves the use of Section 4(f) property that is generally minor in nature. A *de minimis* impact is one that, after taking into account avoidance, minimization, mitigation and enhancement measures, results in no adverse effect to the activities, features, or attributes qualifying a park, recreation area, or refuge for protection under Section 4(f). For historic properties, a *de minimis* impact is one that results in a Section 106 determination of "no adverse effect" or "no historic properties affected." A *de minimis* impact determination requires agency coordination with the officials having jurisdiction over the Section 4(f) property and opportunities for public involvement. A *de minimis* impact determination may not be made when there is a constructive use.

4.3.3 Identification of Section 4(f) Properties

FHWA must comply with 23 CFR 774.7(e) when tiered NEPA documents such as the Bay Crossing Study Tier I EIS are prepared. A Section 4(f) approval may involve different levels of detail where the Section 4(f) involvement is addressed in a tiered EIS under 23 CFR 771.111(g). When the first-tier, broad-scale EIS is prepared, the detailed information necessary to complete the Section 4(f) approval may not be available at that stage in the development of the action. In such cases, the documentation should address the potential impacts that a proposed action will have on Section 4(f) property and whether those impacts could have a bearing on the decision to be made.

The affected environment under consideration in Tier 1 consists of Corridors 6, 7, and 8, which collectively comprise the CARA. The Tier 1 NEPA Study has defined existing and future transportation conditions and needs at the Bay Bridge, identified broad corridor alternatives, documented the corridor alternative screening process, identified the most reasonable CARA, evaluated the potential environmental impacts of the CARA, and presented recommendations for one preferred corridor alternative to be advanced into a Tier 2 study. The scope of these activities does not provide information sufficient to complete a preliminary Section 4(f) evaluation. Pursuant to 23 CFR 774.7(e) and guidance from the 2012 Section 4(f) Policy Paper, MDTA has inventoried known Section 4(f) properties within the CARA. In the event BCS proceeds to Tier 2, FHWA would prepare a Section 4(f) evaluation to identify and evaluate any potential use of Section 4(f) property, in accordance with 23 CFR 774. This process is outlined below in **Section 0**.

4.3.4 Parks, Recreation Areas, Wildlife and Waterfowl Refuges

A variety of public parks, recreation areas, and wildlife and waterfowl refuges have been identified within the CARA. **Table 4-17** summarizes the number and area of parks, recreation areas, wildlife, and waterfowl refuges that could potentially be affected if Tier 1 concludes with the identification of a corridor as the Selected Alternative. The size of each Section 4(f) property is sourced from the official with jurisdiction (OWJ) over the property or, if no information was available, from SDAT data. Information is provided in acres, unless otherwise noted. The area shown represents the full size of the property, including any area that may be outside the CARA. If the No-Build is identified as the Selected Alternative, no Section 4(f) properties would be affected.

There are eight Section 4(f) public parks, recreation areas, and wildlife and waterfowl refuges in Corridor 6, 12 in Corridor 7, and 11 in Corridor 8. The parks, recreation areas, and wildlife and waterfowl refuges are scattered throughout each of the corridors, though a number are concentrated along the shoreline of the Chesapeake Bay. Owing to the vastness of the Smithsonian Environmental Research Center, the area of Section 4(f) public lands in Corridor 8 is more than twice as much as Corridor 6 and nearly three times greater than in Corridor 7. If a corridor is identified as the Selected Alternative, Tier 2 activities would include further examination of alignments and evaluation of the relevant parks, recreation areas, and wildlife and waterfowl refuges listed below to avoid or minimize impacts.

Table 4-17: Inventory of Section 4(f) Public Lands in the CARA

ID	SECTION 4(f) PROPERTY	TOTAL SIZE (ACRES)	AREA WITHIN CORRIDOR	COUNTY	OFFICIAL WITH JURISDICTION
Corridor 6					
1	Beachwood Park	60	57	Anne Arundel	Anne Arundel County Recreation and Parks
2	Jacobsville Park	30	25	Anne Arundel	Anne Arundel County Recreation and Parks
3	Lake Shore Athletic Complex	180	155	Anne Arundel	Anne Arundel County Recreation and Parks
4	Magothy Greenway Natural Area	390	157	Anne Arundel	Anne Arundel County Recreation and Parks
5	Bodkin Park	20	20	Anne Arundel	Anne Arundel County Recreation and Parks
6	Compass Pointe Golf Courses	~800	334	Anne Arundel	Anne Arundel County Recreation and Parks
7	Downs Park	240	234	Anne Arundel	Anne Arundel County Recreation and Parks
8	Route 18 Park	50	50	Queen Anne's	Queen Anne's County Parks & Recreation
Total Area of Public Lands in Corridor 6				1,032 Acres	

ID	SECTION 4(f) PROPERTY	TOTAL SIZE (ACRES)	AREA WITHIN CORRIDOR	COUNTY	OFFICIAL WITH JURISDICTION
Corridor 7					
1	Broadneck Park	46	46	Anne Arundel	Anne Arundel County Recreation and Parks
2	Bay Head Park	30	24	Anne Arundel	Anne Arundel County Recreation and Parks
3	Cape St. Claire Park	20	15	Anne Arundel	Anne Arundel County Recreation and Parks
4	Sandy Point State Park	790	750	Anne Arundel	Maryland Department of Natural Resources
5	Terrapin Nature Area	280	262	Queen Anne's	Queen Anne's County Parks & Recreation
6	Old Love Point Park	30	30	Queen Anne's	Queen Anne's County Parks & Recreation
7	Cross Island Trail	6 miles ¹	~1.1 miles	Queen Anne's	Queen Anne's County Parks & Recreation
8	Long Point Park	<10	4	Queen Anne's	Queen Anne's County Parks & Recreation
9	Ferry Point Park	40	40	Queen Anne's	Queen Anne's County Parks & Recreation
10	Mowbray Park	20	6	Queen Anne's	Queen Anne's County Parks & Recreation
11	Grasonville Park	40	28	Queen Anne's	Queen Anne's County Parks & Recreation
12	Grasonville School Playground	<10	< 10	Queen Anne's	Queen Anne's County Public Schools
Total Area of Public Lands in Corridor 7				1,215 Acres	
Corridor 8					
1	Riva Area Park	100	60	Anne Arundel	Anne Arundel County Recreation and Parks
2	Kings Branch Park	20	13	Anne Arundel	Anne Arundel County Recreation and Parks
3	Central Avenue Park	40	36	Anne Arundel	Anne Arundel County Recreation and Parks

ID	SECTION 4(f) PROPERTY	TOTAL SIZE (ACRES)	AREA WITHIN CORRIDOR	COUNTY	OFFICIAL WITH JURISDICTION
4	Loch Haven Park	30	4	Anne Arundel	Anne Arundel County Recreation and Parks
6	Beverly Triton Nature Park	340	340	Anne Arundel	Anne Arundel County Recreation and Parks
7	Mayo Beach Park	30	20	Anne Arundel	Anne Arundel County Recreation and Parks
8	Smithsonian Environmental Research Center	2,800	300	Anne Arundel	Smithsonian Institute
9	Talbot County Community Sports Complex	50	50	Talbot	Talbot County Parks and Recreation
10	Hog Neck Golf Course	280	247	Talbot	Talbot County Parks and Recreation
Total Area of Public Lands in Corridor 8				1,143 Acres	

Note: The length of the cross-island trail is not included in the total area of public lands. The true area of the trail is unknown because the width of the trail varies along its distance. Total area of parks is rounded to closest 10 acres. Area of parks within each corridor is rounded to the nearest acre. Acres within the corridor does not reflect the acreage of potential Section 4(f) use.

4.3.5 Historic Sites

MDTA has inventoried 29 recorded historic sites within the CARA. There are two in Corridor 6, 13 in Corridor 7, and 14 in Corridor 8. In addition to the recorded historic sites, MDTA has identified nine additional archaeological sites that are listed in the NRHP or eligible for listing in the NRHP. There are four in Corridor 8 and 5 in Corridor 9. Archaeological sites are only subject to Section 4(f) if they possess value for preservation in place. No determination on whether these sites possess value for preservation in place will be made during Tier 1. Coordination with the official with jurisdiction, MHT, is required to obtain a lack of objection that archaeological sites possess minimal value for preservation in place. This coordination would take place during Tier 2. **Table 4-18** summarizes the known historic sites that could potentially be affected if Tier 1 concludes with the identification of a corridor as the Selected Alternative. If Tier 1 identifies the No-Build as the Selected Alternative, no Section 4(f) Historic Sites would be affected. The official with jurisdiction over historic sites in Maryland is the MHT. The ACHP is also participating in Section 106 Consultation for the Bay Crossing Study and is also an OWJ over Historic Sites. The greatest number of historic sites is within Corridor 8. MDTA has also identified one NHL – the United States Naval Academy, in Corridor 7. The National Park Service is an additional OWJ over NHLs. Impacts to NHLs warrant more stringent consultation under Section 106 as outlined in 36 CFR 800.10, up to and including involvement of the Secretary of the Interior (36 CFR 800.10(c)). Only a small portion of the U.S. Naval Academy is within Corridor 7 and impacts are likely to be avoided.

Table 4-18: Inventory of Section 4(f) Historic Sites

ID	SECTION 4(f) PROPERTY	SIZE (ACRES)	AREA WITHIN CORRIDOR	COUNTY
Corridor 6				
1	Bachelor’s Hope	1	1	Queen Anne’s
2	Reed’s Creek Farm	158	158	Queen Anne’s
Area of Historic Sites in Corridor 6		159		
Corridor 7				
1	Howard’s Inheritance	<1	< 1	Anne Arundel
2	US Naval Academy (NHL)	~270	< 1	Anne Arundel
3	Sandy Point Farm House	18	15	Anne Arundel
4	William Preston Lane Jr Memorial Bridge (EB)	91	91	Anne Arundel
5	William Preston Lane Jr Memorial Bridge (WB)	96	96	Anne Arundel
6	Weems Creek Bridge (Bridge 2081)	2	2	Anne Arundel
7	Stevensville Historic District	57	57	Queen Anne’s
8	Christ Church	1	1	Queen Anne’s
9	Cray House	<1	<1	Queen Anne’s
10	Stevensville Bank	<1	<1	Queen Anne’s
11	White’s Heritage	140	139	Queen Anne’s
12	Barnstable Hill, Lowery Farm	75	52	Queen Anne’s
13	Kent Narrows Bridge (SHA Bridge 170600)	3	3	Queen Anne’s
Area of Historic Sites in Corridor 7		460		
Corridor 8				
1	Davidsonville Historic District	15	15	Anne Arundel
2	South River Club	1	1	Anne Arundel
3	Summer Hill	5	5	Anne Arundel
4	Mount Airy	25	23	Anne Arundel
5	Indian Range	5	5	Anne Arundel
6	All Hallow’s Church	2	2	Anne Arundel
7	Gresham	5	5	Anne Arundel
8	Bloody Point Bar Light	< 1	< 1	Queen Anne’s
9	Sherwood Manor	20	20	Talbot
10	Skipjack Claude W. Somers ¹	2	2	Talbot
11	Hope House	76	76	Talbot
12	Wye Town Farm House	8	6	Talbot
13	Unionville ²	Unknown	Unknown	Talbot
14	Rich Neck Manor	787	~350	Talbot

ID	SECTION 4(f) PROPERTY	SIZE (ACRES)	AREA WITHIN CORRIDOR	COUNTY
Area of Historic Sites in Corridor 8		511		

1. The Claude W. Somers was listed in the NRHP in 1985 at this location. The skipjack was removed to the Reedville Fishermen's Museum in 2000 for restoration. When not in use for fishing or heritage tours, the boat has been moored in Virginia since that time. The boat was listed in the NRHP in Virginia in 2005 and is no longer docked in Talbot County. For purposes of this inventory, however, the area of the historic boundary is included in the additive total.
 2. The MIHP form and NRHP eligibility determination for Unionville does not identify or justify boundaries of the historic district. The area is not included in the total.
 3. There are four recorded archaeological sites in Corridor 7 and five recorded Archaeological sites in Corridor 8 that are listed in the NRHP or have been determined eligible for listing in the NRHP. A determination on whether these archaeological sites have value for preservation in place will be made during Tier 2. To maintain the integrity of archaeological resources, the locations of these archaeological sites are not identified.
- All areas rounded to closest 1 acre.

Should one of the CARA be identified as the Selected Alternative at the conclusion of Tier 1, Tier 2 activities would include identifying additional historic sites through Section 106 consultation per 36 CFR 800.4. The Tier 2 study would include the development and consideration of alignment alternatives within the Selected Corridor to determine if avoidance alternatives would be feasible and prudent.

4.3.6 Section 4(f) Property within the Affected Environment

Table 4-19 presents the total area of Section 4(f) Properties within each of the CARA.

Table 4-19: Total Area of Section 4(f) Properties within Affected Environment

CARA	NUMBER OF SECTION 4(f) PUBLIC LANDS	AREA OF SECTION 4(f) PUBLIC LANDS	NUMBER OF SECTION 4(f) HISTORIC SITES	AREA OF SECTION 4(f) HISTORIC SITES	TOTAL NUMBER OF SECTION 4(f) PROPERTIES	TOTAL AREA OF SECTION 4(f) PROPERTIES
Corridor 6	8	1,030	2	160	10	1,190
Corridor 7	12	1,220	13	460	25	1,680
Corridor 8	10	1,140	14	510	24	1,650

Note: Public lands area and total areas rounded to closest 10 acre. Historic sites area rounded to closest 1 acre.

4.3.7 Subsequent Tier 2 Analysis of Section 4(f) Properties

The area of Section 4(f) property presented in **Table 4-19** is preliminary because identification of historic properties is being phased as part of the Section 106 process. No new identification of historic properties has taken place during Tier 1. Evaluation of historic significance of unevaluated properties would take place during Tier 2.

During environmental compliance efforts associated with Tier 2, a project-level Section 4(f) evaluation will be completed, and permanent and temporary uses, as well as *de minimis* impact determinations, will be prepared. Coordination with the official(s) with jurisdiction over historic sites would determine if any of the archaeological sites listed in the NRHP or eligible for listing in the NRHP has value for preservation in place. The Section 4(f) evaluation would include development of avoidance alternatives, identification of

measures to minimize harm and potentially a least overall harm analysis, as required. Consultation with officials with jurisdiction over Section 4(f) properties will continue during Tier 2 activities. According to FHWA guidance, “like Section 4(f), Section 106 of the National Historic Preservation Act (NHPA) of 1966 also mandates consideration of a project's effect on historic sites. The most important connection between the two statutes is that the Section 106 process is generally the method by which historic properties are identified that would be subject to consideration under Section 4(f). The results of the identification step under Section 106 - including the eligibility of the resource for listing on the NRHP, the delineation of NRHP boundaries, and the identification of contributing and non-contributing elements within the boundary of a historic district—are a critical part of determining the applicability of Section 4(f) and the outcome of the Section 4(f) evaluation. Whereas Section 106 is concerned with adverse effects, Section 4(f) is concerned with use. The two terms are not interchangeable and an adverse effect determination under Section 106 does not automatically equate to a Section 4(f) use of the property” (FHWA Environmental Review Toolkit, Section 4(f) Tutorial).

4.3.8 Section 6(f) Properties

This section provides a preliminary assessment of Section 6(f) properties as part of this Tier 1 Draft EIS. If a corridor is identified as the Selected Alternative, FHWA will determine the need for additional Section 6(f) evaluation as part of Tier 2 NEPA.

Section 6(f) is part of the Land and Water Conservation Fund Act (LWCF) of 1965, which provides funds and matching grants to federal, state, and local governments for the acquisition of land and water for recreational purposes. Section 6(f) states those properties acquired or improved with LWCF appropriations shall not be converted to a use other than public outdoor recreation without the approval of the U.S. Secretary of the Interior, acting through the NPS and at the request of the state delegate/state liaison officer. Under the LWCF Act, if a Section 6(f) property or a portion of a property is converted to non-recreational use, replacement of the property is required.

Section 6(f) properties are solely classified based on acquisition or improvements made using LWCF money. This makes properties difficult to identify with certainty at a desktop level. In Tier 1, the public lands inventoried for Section 4(f) (**Table 4-17**) have the potential to be Section 6(f) properties. FHWA and MDTA will coordinate with State and local governments in Tier 2 to determine if LWCF appropriations were used in the acquisition or improvements of any public lands that could be impacted by a future Tier 2 alternative.

If one of the CARA is selected in the Tier 1 ROD, the Tier 2 alignments could result in impacts to Section 6(f) properties. Potential mitigation, minimization and avoidance strategies could include design or construction modifications to avoid the conversion of all or a portion of a Section 6(f) property to a non-recreational use; the incorporation of natural design features such as landscape plantings or earthen berms; and/or identifying replacement parklands.

Analysis conducted as part of Tier 2 NEPA would conclude whether a conversion of any Section 6(f) property would occur and identify mitigation strategies and measures that would avoid or minimize these impacts. Under LWCF, any conversion of Section 6(f) property to a non-recreational use must meet the following requirements:

- A conversion request must be made by the state liaison to the appropriate regional office of the NPS.
- All practical measures to avoid the conversion shall be evaluated.
- The fair market value of the property shall be established
- The property proposed for replacement must be “reasonably equivalent” in terms of usefulness and location of the property being converted.
- The property being converted shall be evaluated to identify which recreational needs are being fulfilled and opportunities available. Likewise, it also requires that property being proposed for replacement shall be evaluated to determine if it would meet the needs of the recreational opportunities lost.
- All other relevant agency coordination has been completed, including Section 4(f).
- The proposed conversion and replacement are in accordance with each state’s Statewide Comprehensive Outdoor Recreation Plan.

4.4 NATURAL RESOURCES

4.4.1 Introduction and Methodology

This section of the DEIS provides a broad view of key sensitive natural resources within the limits of the three CARA via an examination, using existing GIS resources, of where those natural resources are most prevalent. Sensitive resources determined to be relevant for this level of analysis include the following:

- Wetlands, Surface Waters, Water Quality and Drinking Water Supply
- Federal Emergency Management Administration 100-Year Floodplains
- Chesapeake Bay Critical Area
- Terrestrial Habitat
- Unique and Sensitive Areas (including Rare, Threatened and Endangered Species)
- Aquatic Resources
- Topography, Geology & Soils
- Sea Level Rise

Natural resources within the two-mile wide corridors were identified based on agency input throughout the scoping process, review of existing available scientific literature, GIS databases and mapping, and field reconnaissance of the corridor study areas conducted in June 2019. The agency input included recommendations from federal and state agencies concerning the natural resources relevant to this study and the datasets and information available for the associated natural resource. Field reconnaissance was conducted to document general characteristics and existing conditions but did not involve detailed investigations to determine the limits of jurisdictional resources. The [*BCS Natural Resource Technical Report, Appendix A*](#) includes a series of photos that generally depict existing natural resources within each corridor, concentrating on large undisturbed forested areas, areas within the Critical Area, wetlands and open waters, and public lands.

Table 4-20 below is a summary table of existing mapped natural resources for each corridor. This table summarizes the information on the individual tables provided for each natural resource category in **Section 4.4** below.

Existing natural resources have been quantified using the limits of the study area for each of the three corridors and overlaying existing GIS-based natural resource data layers. This level of analysis provides a relative comparison of existing natural resources associated with each study area corridor but does not quantify actual impacts associated with a defined limit of disturbance.

Table 4-20: Summary of Existing Natural Resources

NATURAL RESOURCE	CORRIDOR 6	CORRIDOR 7	CORRIDOR 8
NWI Non-Tidal Wetlands	1,340	1,520	2,270
MDNR Non-Tidal Wetlands	1,200	1,500	2,080
MDNR Tidal Wetlands	18,460	10,870	24,940
WSSC	80	10	0
Surface Waters*	344,380	394,020	471,890
100-Year FEMA Floodplain	3,050	6,640	3,950
Critical Area	4,910	9,810	8,120
FIDS	7,020	6,900	11,410
FCA Easements	140	130	110
SSPRA	2,720	2,180	8,630
Green Infrastructure	4,880	4,480	11,450
EFH	18,080	9,600	20,480
SAV	40	270	460
Oyster Resources	11,130	3,460	7,960
Oyster Sanctuaries	6,470	1,580	2,090
Steep Slopes	2,090	0	3,090
Hydric Soils	3,580	5,390	8,250
Highly Erodible Soils	5,560	9,280	9,050
Sea Level Rise 2050	350	1,310	680
Sea Level Rise 2100	1,470	3,230	1,620

*Listed as Linear Feet. All Other Resources Listed in Acres. All values rounded to closest 10.

The following federal and state agencies were consulted for information regarding natural resources within the limits of the study area corridors:

- Chesapeake Bay Critical Area Commission (CAC)
- Federal Emergency Management Administration (FEMA)
- Federal Highway Administration (FHWA)
- Maryland Dept. of the Environment (MDE)
- Maryland Dept. of Natural Resources (MDNR)
- Maryland Natural Heritage Program (MHT)
- National Oceanic and Atmospheric Administration (NOAA)

- U.S. Army Corps of Engineers (USACE)
- U.S. Dept. of Transportation (USDOT)
- U.S. Environmental Protection Agency (USEPA)
- U.S. Fish and Wildlife Service (USFWS)

4.4.2 Wetlands, Surface Waters, Water Quality and Drinking Water Supply

Wetlands and Surface Waters

At the Federal level, jurisdictional Waters of the U.S. (WOTUS), which includes wetlands and surface waters, are afforded regulatory protection under numerous sections of the Clean Water Act (CWA), including Section 404. Regulations adopted pursuant to CWA Section 404 also identify jurisdictional wetlands as Special Aquatic Sites. Special Aquatic Sites are defined in part in [40 CFR Part 230.3](#) (q-1) as “areas possessing special ecological characteristics of productivity, habitat, wildlife protection, or other important and easily disrupted ecological values.” The U.S. Environmental Protection Agency (USEPA) and U.S. Army Corps of Engineers (USACE) share responsibility for implementing Section 404, which specifically regulates dredge and fill activities affecting WOTUS.

The term WOTUS can be used to describe all waters that are currently used, were used in the past, or may be susceptible to use in interstate or foreign commerce; including; navigable waters, interstate waters, territorial seas, rivers, streams, tributaries, and wetlands.

Section 404 regulations at 40 CFR Part 230.3(t) defines a jurisdictional wetland as follows:

"Wetlands are areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas."

The Maryland legislature passed the Non-tidal Wetlands Protection Act in 1989. The Act, administered by Maryland Department of the Environment (MDE) via [Code of Maryland Regulations \(COMAR\) Title 26.23](#), mandates the establishment of a statewide program for the conservation, enhancement, regulation, creation, and monitoring of non-tidal wetlands in the state. MDE also regulates activities in a 25-foot wetland buffer around non-tidal wetlands. The 25-foot wetland buffer is expanded to 100 feet for non-tidal Wetlands of Special State Concern (WSSC). Impacts to jurisdictional wetlands, wetland buffers, and waters require authorization from MDE and USACE via the Joint Permit Application (JPA) or Individual Permit process, depending on the level of jurisdictional impact.

The Maryland Tidal Wetlands Act restricts construction and development actions in tidal wetlands. Tidal wetlands are administered by MDE via [COMAR Title 26.24](#) and provides protection against unregulated activities that would affect adversely the value of the tidal wetland as a source of nutrients to finfish, crustacea, and shellfish of significant economic value.

The limits of the study areas associated with Corridors 6, 7, and 8 were overlain with the U.S. Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI) and the Maryland Department of Natural Resources (MDNR) wetlands, Wetlands of Special State Concern (WSSC), and mapped surface waters GIS

layers to provide a comparative analysis of existing conditions and potential impacts associated with each two-mile wide corridor.

The total amount of mapped non-tidal wetlands, tidal wetlands, which includes open waters of the Bay, and linear feet of surface water resources associated with tributary rivers and streams located within each of the three study corridors is provided in **Tables 4-21, 4-22, and 4-23** below. Also provided in the tables is the percentage of mapped resource area to total corridor study area.

The Watershed Resources Registry (WRR) is a planning level tool that identifies and prioritizes watershed resources, including wetlands, by their potential for restoration and preservation. The State of Maryland, with input from multiple state and federal natural resource and transportation agencies, developed the WRR as a tool to evaluate watershed resource impacts associated with large-scale transportation projects during the project planning stages.

The WRR provides a comparative analysis by assigning a point value between one and five, with five representing the highest value, to potential wetland preservation areas. The limits of the study areas were overlain with the WRR Wetland Preservation GIS layer to determine the total acreage of wetland preservation areas with a point value of four or five. An assigned value of four or five represents the wetland areas with the highest potential to provide ecological benefits to their associated watershed. The results of this comparative analysis are provided in **Table 4-22** below.

Table 4-21: Mapped Non-Tidal Wetlands and WSSC

CORRIDOR	NWI NON-TIDAL WETLANDS (ACRES)	MDNR NON-TIDAL WETLANDS (ACRES)	WETLANDS OF SPECIAL STATE CONCERN (ACRES)	NON-TIDAL WETLAND PERCENTAGE OF TOTAL CORRIDOR STUDY AREA	HIGH VALUE WRR WETLAND PRESERVATION AREAS (ACRES)
6	1,340	1,200	80	4%	56
7	1,520	1,500	10	5%	4
8	2,270	2,080	0	5%	50

Note: values rounded to closest 10, except WRR wetlands which are rounded to the closest acre.

Table 4-22: Mapped Tidal Wetlands

CORRIDOR	MDNR TIDAL WETLANDS (ACRES)	TIDAL WETLAND PERCENTAGE OF TOTAL CORRIDOR STUDY AREA
6	18,460	53%
7	10,870	39%
8	24,940	53%

Note: values rounded to closest 10.

Table 4-23: Mapped Surface Waters

CORRIDOR	RIVER AND STREAM SURFACE WATERS (LF)	SURFACE WATERS OF THE BAY (ACRES)	SURFACE WATER PERCENTAGE OF TOTAL CORRIDOR STUDY AREA
6	344,380	18,080	52%
7	394,020	9,600	34%
8	471,890	24,480	52%

Note: values rounded to closest 10.

Table 4-24 below provides a breakdown of the MDNR mapped wetlands within each corridor by the associated Cowardin wetland classification code and percentage of the wetland classification area relative to the total amount of mapped resource. Cowardin wetland classification codes used for this analysis are as follows:

- ES – Estuarine
- L – Lacustrine
- PEM – Palustrine Emergent
- PFO – Palustrine Forested
- PSS – Palustrine Scrub/Shrub
- PUB – Palustrine Unconsolidated Bottom
- PUS – Palustrine Unconsolidated Shore

According to the data, the vast majority of mapped MDNR wetlands identified within the corridors are classified as Estuarine (ES) followed by a relatively large percentage of PFO wetlands. ES wetlands consist of deepwater tidal habitats and adjacent tidal wetlands that are typically semi-enclosed by land. MDE defines tidal wetlands as all State and private tidal wetlands, marshes, submerged aquatic vegetation, lands, and open water within the Chesapeake and its tidal tributaries, the Coastal Bays and their tidal tributaries, and the Atlantic Ocean to a distance of 3 miles offshore of the low water mark. The remaining classifications are all associated with non-tidal wetland or waters. The percentage distribution of wetland types is relatively uniform between the three corridors (**Table 4-24**).

Table 4-24: Mapped MDNR Wetlands by Cowardin Wetland Classification/Percentage of Total

CORRIDOR	ES	L	PEM	PFO	PSS	PUB	PUS
6	89.2%	0.2%	0.7%	8.8%	0.3%	0.9%	0%
7	88.0%	0%	0.7%	10.3%	0.5%	0.6%	<0.1%
8	88.6%	0%	0.2%	10.0%	0.4%	0.8%	<0.1%

Water Quality

Surface waters in Maryland are assigned a use class ([Code of Maryland Regulations \(COMAR\) 26.08.02](#)), a set of designated uses that define an intended human and aquatic life objective, use, or goal for a water body. The determination of designated use includes consideration of existing conditions and potential uses which may be made possible by anticipated improvements in water quality. The specific designated use classes are as follows:

- Use Class I – Water Contact Recreation, Protection of Non-tidal Warm Water Aquatic Life
- Use Class I-P – Use Class I Designated Uses and Public Water Supply
- Use Class II – Support of Estuarine and Marine Aquatic Life and Shellfish Harvesting
 - Shellfish Harvesting Subcategory
 - Seasonal Migratory Fish Spawning and Nursery Subcategory (Chesapeake Bay only)
 - Seasonal Shallow-Water Submerged Aquatic Vegetation Subcategory (Chesapeake Bay only)
 - Open-Water Fish and Shellfish Subcategory (Chesapeake Bay only)
 - Seasonal Deep-Water Fish and Shellfish Subcategory (Chesapeake Bay only)
 - Seasonal Deep-Channel Refuge Use (Chesapeake Bay only)
- Use Class II-P – Use Class II Designated Uses and Public Water Supply
- Use Class III – Non-tidal Cold Water
- Use Class III-P – Use Class III Designated Uses and Public Water Supply
- Use Class IV – Recreational Trout Waters
- Use Class IV-P – Use Class IV Designated Uses and Public Water Supply

Because certain periods of the year are considered crucial for the growth and propagation of aquatic species, each Use Class designation incorporates a timing restriction or stream closure period identifying when instream activities are not permitted.

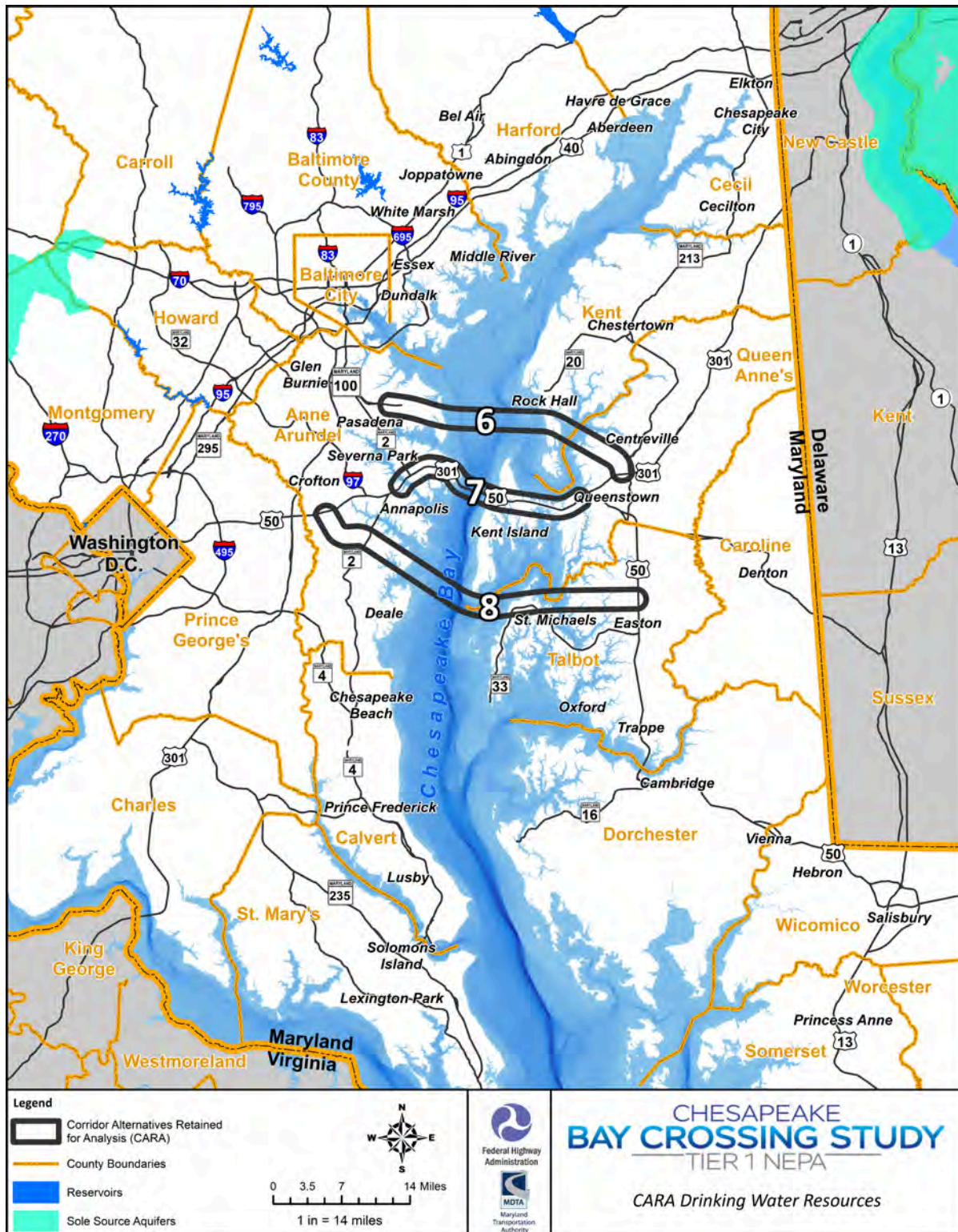
[Chesapeake Bay Executive Order \(EO\) 13508](#), Chesapeake Bay Protection and Restoration, dated May 12, 2009 required a Federal Leadership Committee to prepare and publish a multi-phased strategy to guide efforts to protect and restore the Chesapeake Bay. One of these strategies is how to improve the overall water quality. EO 13508 was issued because, despite significant efforts by Federal, State, and local governments, existing State water quality standards and the “fishable and swimmable” goals of the CWA have not been attained for the Chesapeake Bay. Part 3 of the EO defines the Water Pollution Control Strategies and how the EO can “make full use of its authorities under the Clean Water Act to protect and restore the Chesapeake Bay and its tributary waters and, as appropriate, shall consider revising any guidance and regulations.” Project alternatives carried forward to a Tier 2 analysis must address how it complies with all applicable aspects of EO 13508, including water quality.

Drinking Water

A search of online resources was conducted to determine whether the study area corridors intersected with any Sole Source Aquifers (SSA) or drinking water reservoirs. According to the EPA’s National GIS database there were no SSA’s within the study area limits of the three study area corridors (**Figure 4-5**). Also, according to MDNR’s Maryland Geological Survey, there are no drinking water supply reservoirs within the limits of study area corridors (**Figure 4-5**). GIS layers of Wellhead Protection Areas (WHPA) are not available for Maryland.

WHPAs require a field delineation or a request can be made to MDE's Water Supply Program to assist in defining the area. MDE will review all delineations in accordance with the standard methods developed for different hydrogeologic conditions. Assessment of WHPAs would occur during a Tier 2 NEPA study.

Figure 4-5: CARA Drinking Water Resources



4.4.2.1 Corridor 6

Corridor 6 contains approximately 1,340 acres of mapped non-tidal NWI wetlands, 1,200 acres of mapped non-tidal MDNR wetlands, and 80 acres of mapped WSSC. Mapped non-tidal wetlands constitute approximately 4 percent of the total area associated with Corridor 6. Corridor 6 also contains approximately 18,460 acres of mapped tidal wetlands, of which, 18,080 acres consist of open waters of the Bay. The remaining tidal wetlands consist of coastal wetlands influenced by the tidal range of the Chesapeake Bay. Tidal wetlands constitute approximately 52 percent of the total corridor study area..

The majority of the mapped wetlands, excluding the tidal open waters, associated with Corridor 6 are located east of the Bay, just south of Rock Hall, MD (**Figures 4-6 and 4-7**). The extreme western portion of the corridor, along MD 177, is highly developed and consists largely of retail establishments and residential development along both sides of the roadway with little to no mapped wetlands. The largest concentration of mapped NWI and MDNR wetlands within the western portion of Corridor 6, west of the Bay, are located between North Shore Road and Hickory Point Road and were identified both north and south of MD 177. This area also contains the 80 acres of mapped WSSC. The WSSC are associated with Fresh Pond, the Magothy Greenway Natural Area, and the North Greys Creek Bog Tributary. The eastern side of the Bay is more rural in nature and consists largely of farmland and low-density residential housing. The majority of the mapped wetlands in this area are located east of MD 445 (Eastern Neck Island Road). On the eastern side of the Chester River, near the town of Centreville, the mapped wetlands are concentrated along the river shoreline with sparse concentrations as the corridor continues east. Based on the location of mapped wetland resources within Corridor 6, the largest amount of impacts would likely occur within the eastern section of the corridor just south of Rock Hall with the least amount of potential impacts within the western section of the corridor, between Pasadena, MD and the western shoreline of the Bay.

Corridor 6 contains approximately 344,380 linear feet of mapped surface waters associated with tributary rivers and streams, (**Figure 4-8**). Beginning in the western section, before reaching the Bay, the corridor intersects multiple mapped surface waters including, from west to east, Baily's Branch, Rock Creek, Brookfield Branch, Beachwood Branch, Nanny's Branch, Main Creek, South Greys Creek, North Greys Creek, Cornfield Creek, and Locust Cove Creek. Generally, surface waters on the north side of MD 177 drain north while surface waters on the south side of MD 177 drain south. The surface waters west of the Bay are classified as Use Class I until they reach the limits of tidal influence where they are classified as Use Class II. On the east side of the Bay, between the Bay and the Chester River, Corridor 6 intersects with the lower stem of the Chester River, Church Creek, and Grays Inn Creek. On the east side of the Chester River, near the town of Centreville, the corridor intersects with Corsica River tributaries, Chester River tributaries, Grove Creek, Reed Creek, Earle Creek, Mill Stream and Gravel Run. Mill Stream and Gravel Run are classified as Tier II High Quality Waters. The surface waters located west of the Bay are classified as Use Class I until they reach the limits of tide where they become Use Class II.

Figure 4-6: NWI Resources

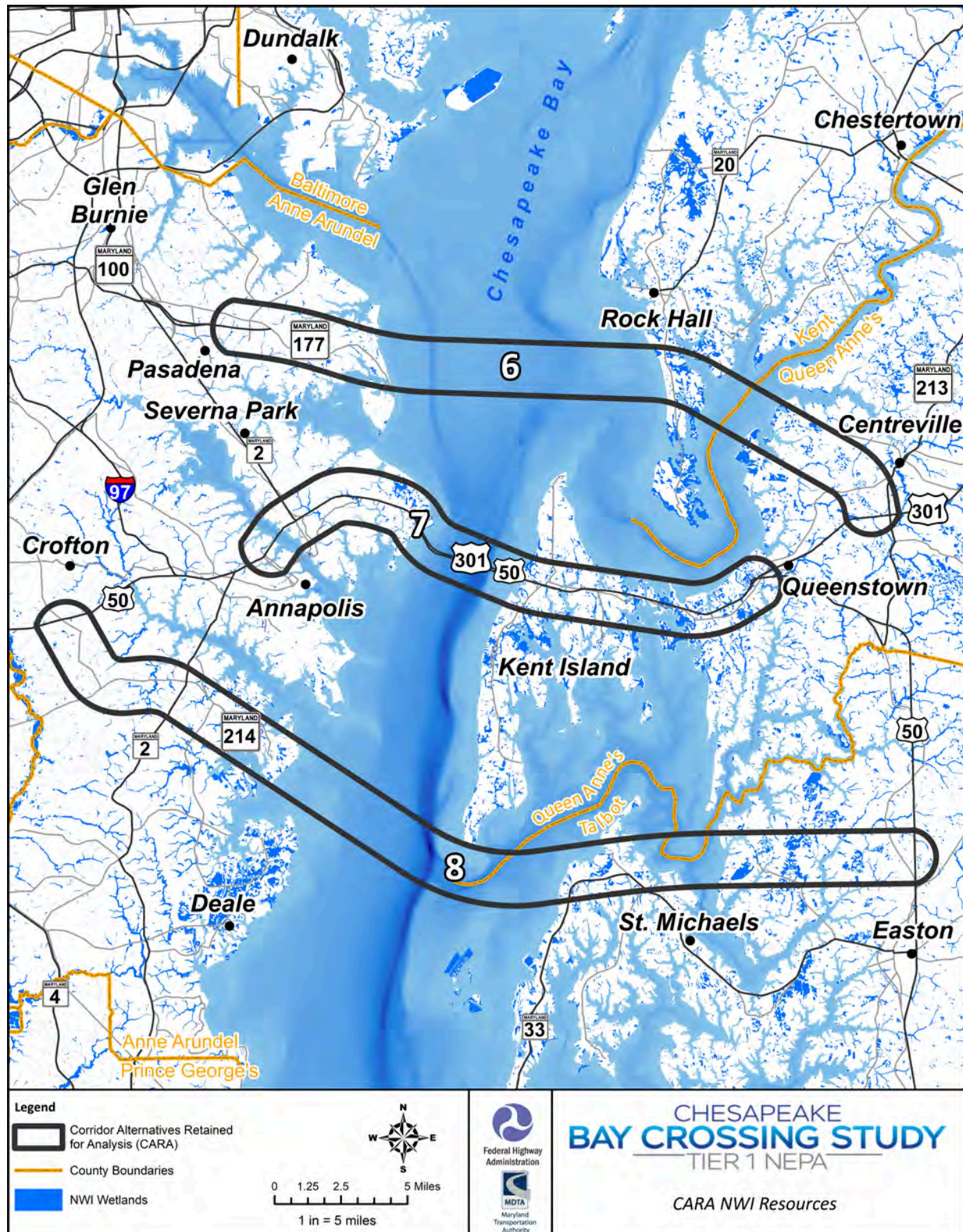


Figure 4-7: DNR Wetlands and Wetlands of Special State Concern

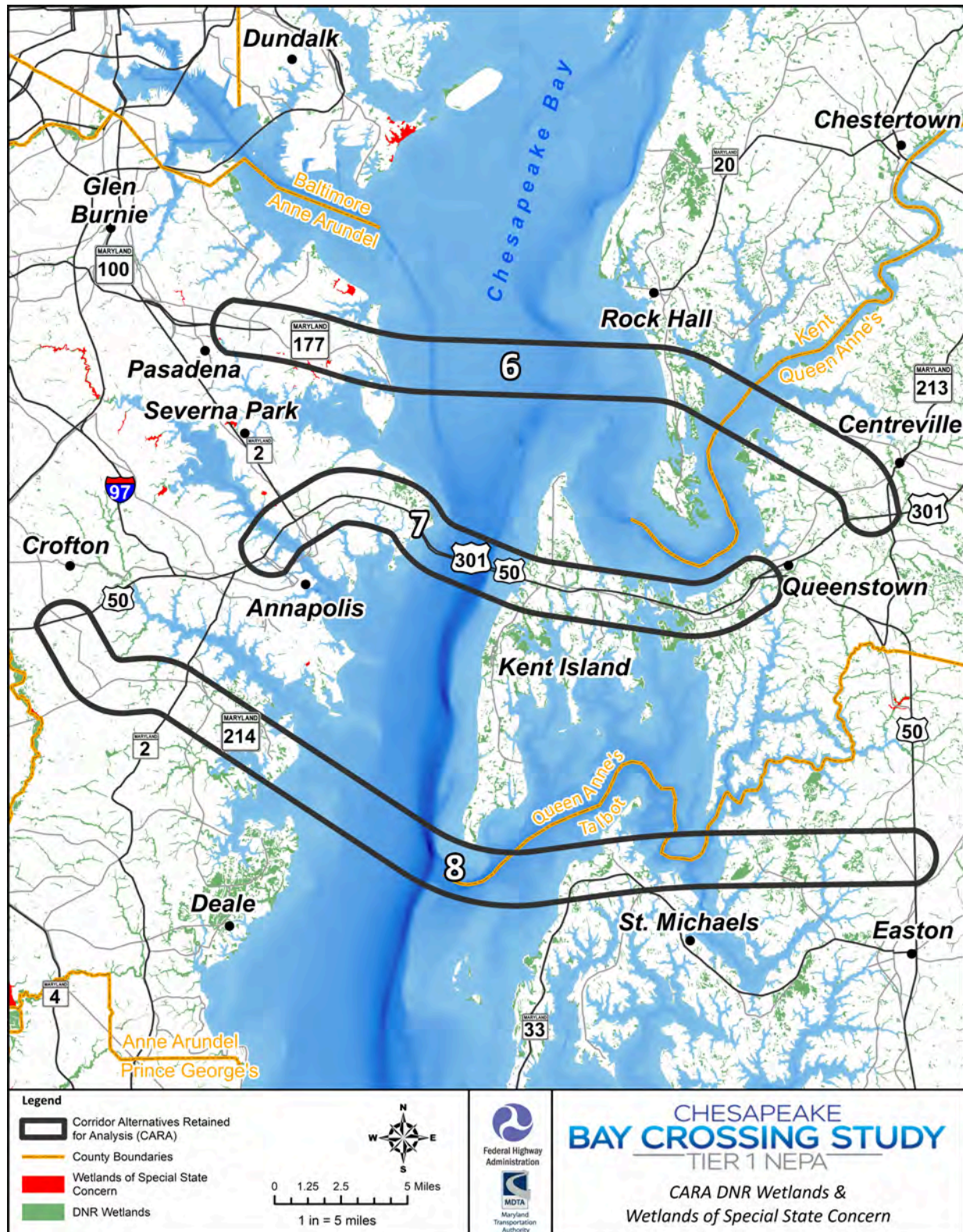
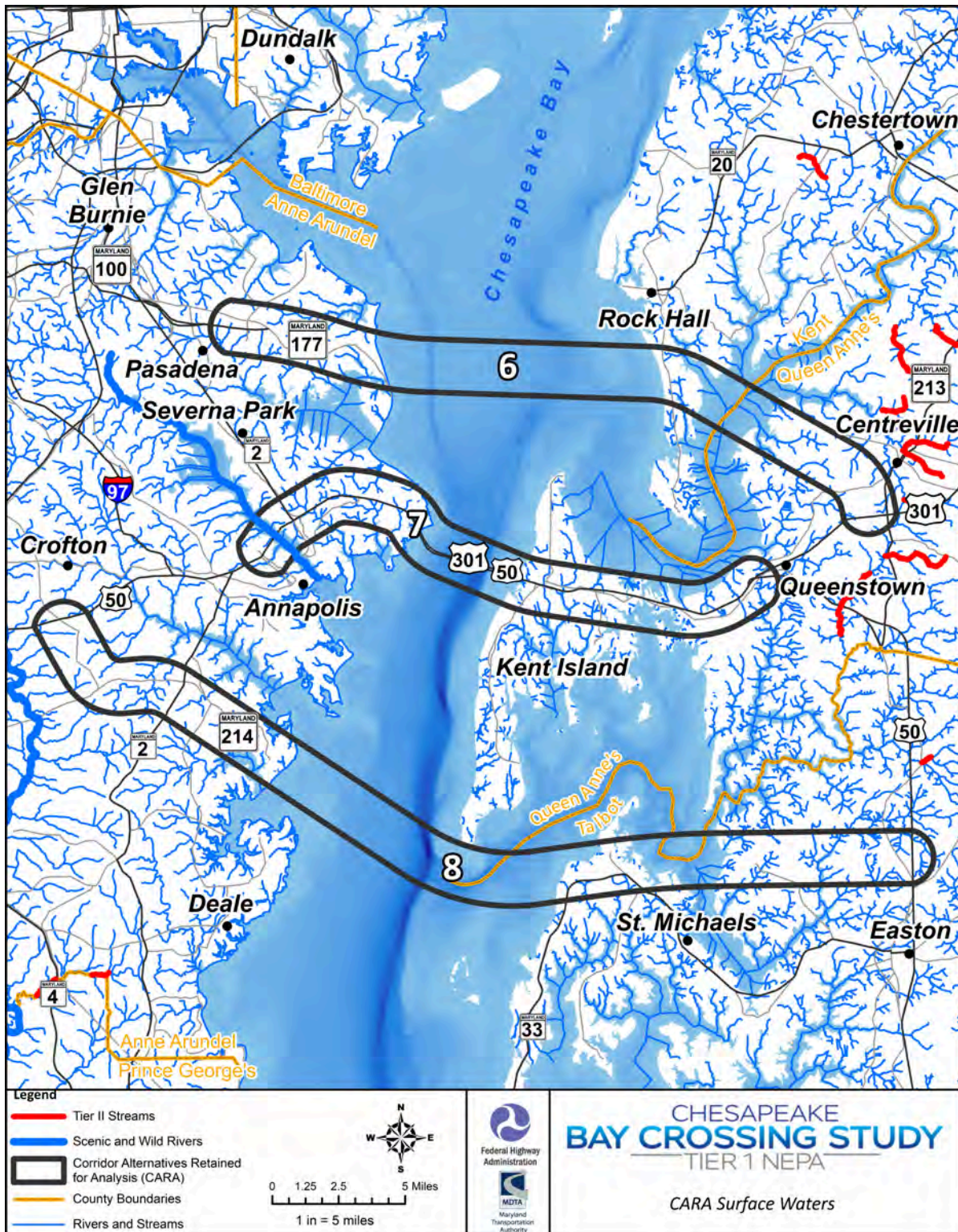


Figure 4-8: Surface Waters



4.4.2.1 Corridor 7

Corridor 7 includes the existing Bay Bridge alignment and contains approximately 1,520 acres of mapped non-tidal NWI wetlands, 1,500 acres of mapped non-tidal MDNR wetlands, and 10 acres of mapped WSSC.

Mapped non-tidal wetlands constitute approximately 5 percent of the total area associated with Corridor 7. Corridor 7 also contains approximately 10,870 acres of mapped tidal wetlands, of which, 9,600 acres consist of open waters of the Bay. The remaining tidal wetlands consist of coastal wetlands influenced by the tidal range of the Chesapeake Bay. Tidal wetlands constitute approximately 34 percent of the total corridor study area.

The western portion of Corridor 7, west of the Bay, consists largely of residential development and associated retail establishments with relatively large areas of undeveloped forested areas. The majority of the mapped wetlands west of the Bay are located north of the US 50/301 alignment and within Sandy Point State Park. Very little mapped wetland resources were identified on the south side of US 50/301 west of the Bay. The central portion of Corridor 7 spans Kent Island. Although Kent Island is highly developed, a relatively high concentration of mapped wetland resources were identified both north and south of the US 50/301 alignment. Wetland resources on Kent Island were concentrated around the existing tidal waterways which bisect the corridor. The highest concentration of mapped wetlands associated with Corridor 7 were identified east of Kent Island and along the Eastern Shore. This section of the corridor is typical of Eastern Shore communities and transitions to low-density residential and farmlands just west of Queenstown. The highest concentration of mapped wetlands on the Eastern Shore were identified south of the US 50/301 alignment, west of Perry's Corner Road and along the shoreline of Marshy Creek. Based on the location of mapped wetland resources within Corridor 7, the largest amount of potential impacts would occur within the section of the corridor along Kent Island and the eastern extent of the corridor, between Queenstown, MD and the Bay. Impacts to mapped wetlands within the western section of Corridor 7 can be minimized by avoiding the northern portion of the corridor, just west of the Bay.

Corridor 7 contains approximately 394,020 linear feet of mapped surface waters associated with tributary rivers and streams, (**Figure 4-8**). The western portion of the corridor intersects with the Severn River and multiple tributaries to the Severn River within the extreme western portion of the study area. The Severn River is classified as a Wild and Scenic River. Because of this classification, potential impacts to the Severn River and its viewshed would need to be coordinated with MDNR at a later phase. Continuing east, Corridor 7 intersects with Mill Creek, Whitehall Creek, and Meredith Creek before spanning the Bay. As it continues east across the Bay, Corridor 7 intersects with Thompson Creek and Cox Creek on Kent Island, and the Wye River and Wye River East within the eastern portion of the corridor. The Wye River is classified as a Tier II High Quality Water. The larger, tidal waters associated with Corridor 7 are classified as Use Class II waters, while the smaller, non-tidal tributaries are classified as Use Class I.

4.4.2.2 Corridor 8

Corridor 8 contains approximately 2,270 acres of mapped non-tidal NWI wetlands, 2,080 acres of mapped non-tidal MDNR wetlands. Mapped non-tidal wetlands constitute approximately 5 percent of the total area associated with Corridor 8. Corridor 8 also contains approximately 24,940 acres of mapped tidal wetlands, of which, 24,480 acres consist of open waters of the Bay. The remaining tidal wetlands consist

of coastal wetlands influenced by the tidal range of the Chesapeake Bay. Tidal wetlands constitute approximately 53 percent of the total corridor study area. This represents the highest total of mapped NWI and MDNR wetlands of the three corridors (**Figures 4-6 and 4-7**). There are no WSSC identified within the limits of Corridor 8.

The western portion of Corridor 8 begins just south of Crofton, at the intersection of US 50/301 and MD 424 and extends southeast to the Bay. This portion of the corridor consists largely of low density residential development and farmland. The majority of the mapped wetlands within the western section of the corridor are located adjacent to the Bay with sparsely mapped wetlands west of MD 2. The highest concentration of mapped wetlands within Corridor 8 are located north of MD 33, near the town of St. Michaels, and between the Bay and US 50, along the Eastern Shore. This section of Corridor 8 consists primarily of low-density residential and farmland. Based on the location of mapped wetland resources within the limits of Corridor 8, the largest amount of potential impacts would occur within the eastern extent of the corridor, along the Eastern Shore. The least amount of potential impact would occur within the western extent of the corridor, west of MD 2.

Corridor 8 contains approximately 471,890 linear feet of mapped surface water. (**Figure 4-8**). Between US 50 and the Bay, Corridor 8 bisects several smaller streams including Tarnans Branch, several unnamed tributaries to the Patuxent River, Flat Creek, Chandlers Branch, Kings Branch, Marriots Branch, Davidsonville Branch, Beards Creek, Glebe Branch, Pocahontas Creek, Bear Neck Creek, Sellman Creek, and, as the corridor approaches the bay, the tidal South River and the Rhode River. The non-tidal tributaries in this area are classified as Use Class I while the tidal systems are classified as Use Class II. As it continues east across the Bay, Corridor 8 intersects with the tidal Harris Creek, Broad Creek, Edge Creek, Tred Avon River, the Choptank River, and several non-tidal tributaries to these systems. The non-tidal tributaries in this area are classified as Use Class I while the tidal systems are classified as Use Class II. There are no mapped Wild and Scenic Rivers within the limits of Corridor 8. The watershed for Kings Creek, a Tier II High Quality Water, is located within eastern portion of Corridor 8.

4.4.2.3 Conclusions

Results of the GIS based mapping data for wetlands and surface waters indicate that the highest total of mapped non-tidal, tidal wetland, and waters resources are associated with Corridor 8. This includes the total surface area of open waters of the Bay. Corridor 8 also contains the highest amount of mapped tributary rivers and streams. The lowest total amount of mapped non-tidal and tidal wetlands is associated with Corridor 7.

Impacts to jurisdictional tidal or non-tidal WOTUS will require coordination with MDE and USACE once a limit of disturbance associated with a more defined project alignment is established. In cases where mapped resources span the width of the corridor study area, impacts would be unavoidable. In these cases, avoidance and minimization efforts will be employed to the maximum extent practicable consistent with permitting and other regulatory requirements. These efforts include incorporation of specific avoidance strategies and use of Best Management Practices (BMP).

For unavoidable impacts, mitigation will follow the replacement guidelines associated with the regulatory permit requirements applicable at the time of construction. Typically, mitigation includes replacing the impacted wetland areas with wetlands of similar functions and values, ideally as geographically close to

the area of the impacted wetlands as possible. The ratio of replacement wetland to acres of impacts varies depending on whether the mitigation provides for similar functions and values, occur in the same watershed, and other factors. For impacts to streams, maintaining naturalized stream corridors and aquatic passage at newly constructed road crossings or road widening areas will be a priority.

4.4.3 FEMA 100-Year Floodplain

The 100-year floodplain is the land that is predicted to flood during a 100-year storm, which has a 1-percent chance of occurring in any given year. Based on the expected 100-year flood flow rate, the flood water level can be mapped as an area of inundation. The resulting floodplain map is referred to as the 100-year floodplain. Impacts to the jurisdictional 100-year floodplain associated with non-tidal waters are authorized via the USACE/MDE Joint Permit Application process. The majority of mapped 100-year floodplains throughout all three corridors are tidal with lesser concentrations of non-tidal floodplain associated with smaller, non-tidal creeks and tributaries.

Figure 4-9 provides a graphic depiction of the location and distribution of the 100-year floodplain within each of the three corridor study areas. **Table 4-25** below provides a breakdown of the total area, in acres, of 100-year floodplain within each of the corridors and a percentage of the total study area encompassed by the 100-year FEMA floodplain. **Appendix A** includes maps that depict a more detailed view of the FEMA 100-Year Floodplain within each corridor.

Table 4-25: 100-Year FEMA Floodplain

CORRIDOR	100-YEAR FEMA FLOODPLAINS (ACRES)	PERCENTAGE OF TOTAL CORRIDOR STUDY AREA
6	3,050	9%
7	6,640	24%
8	3,950	8%

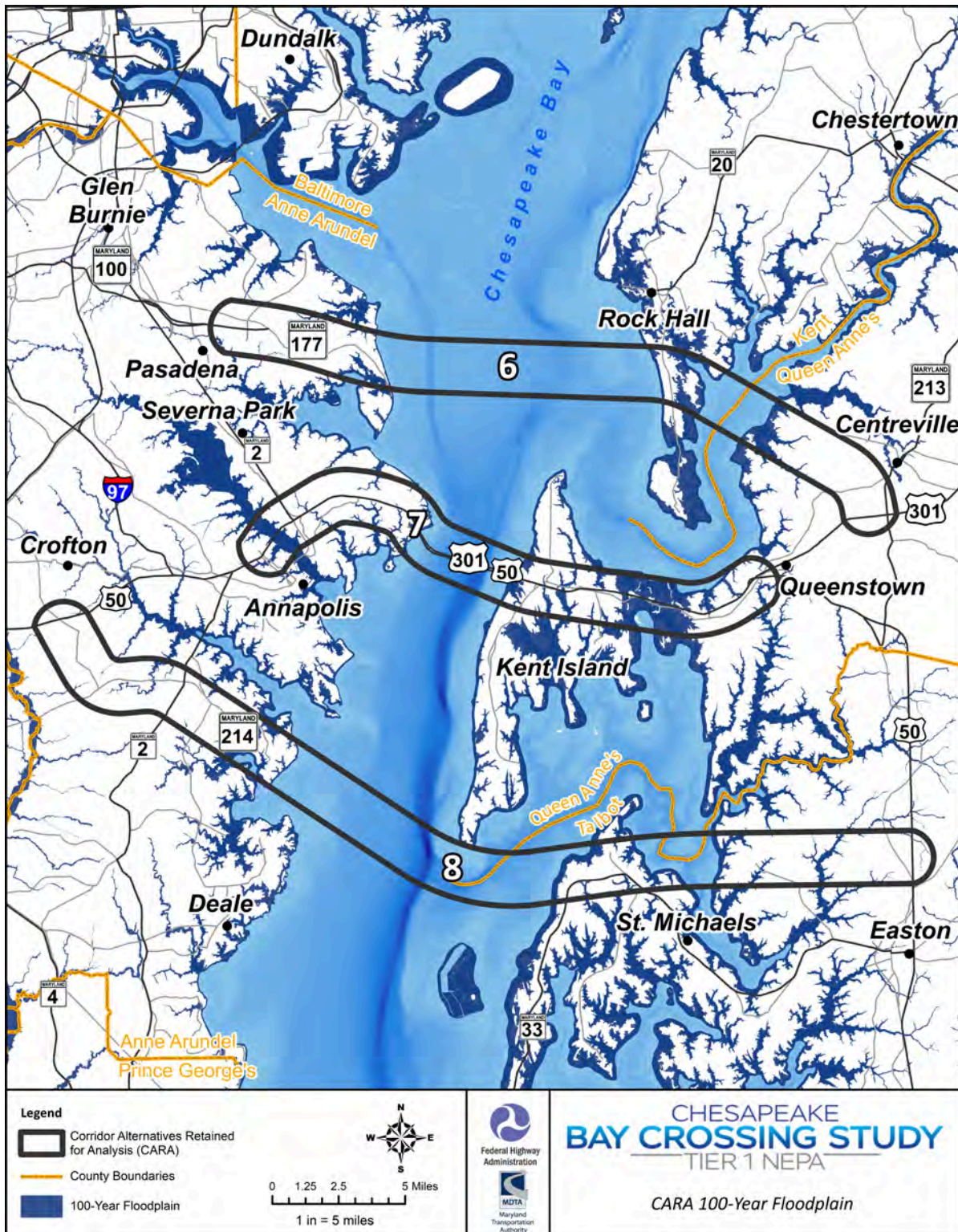
Note: values rounded to closest 10 acres.

4.4.3.1 Corridor 6

Corridor 6 contains approximately 3,050 acres of 100-year FEMA floodplain and intersects the least amount of mapped floodplain of the three corridors (**Figure 4-9**). The western portion of Corridor 6 contains very little mapped floodplain with the exception of the area associated with Sillery Bay, the Magothy River, and the Chesapeake Bay. The eastern side of the corridor, along the Eastern Shore contains large areas of mapped floodplain which are primarily associated with tidal waters of the Chester River and the Chesapeake Bay. Mapped floodplain within the eastern extent generally spans the entire corridor width.

Based on the distribution of 100-year FEMA floodplain within the limits of Corridor 6, the area with the highest potential for impacts is located just south of Rock Hall, MD and along the west bank of the Chester River. The majority of the floodplain within the western section of Corridor 6 could be minimized by placing an alignment within the central portion of the corridor.

Figure 4-9: 100-Year Floodplain



4.4.3.2 Corridor 7

Corridor 7 contains approximately 6,640 acres of mapped 100-year FEMA floodplain and intersects the largest area of floodplain of the three corridors (**Figure 4-9**). Within the western portion of Corridor 7, along US 50, the largest area of floodplain spans the entire width of the study area and is associated with tidal portions of the Severn River and the non-tidal floodplains associated with several Severn River tributaries. Further east, Corridor 7 intersects with the tidal floodplains associated with Mill Creek, Whitehall Creek, Meredith Creek, and the floodplain adjacent to the Bay. Extensive areas of tidal wetlands are located on Kent Island within Corridor 7, primarily between Kent Island and the Eastern Shore. The tidal floodplains identified on Kent Island are those associated with the shoreline on both sides of the Island, Thompson Creek, Cox Creek, Crab Alley Creek, and Kirwan Creek. Mapped FEMA floodplain acreages associated with Corridor 7 are higher than Corridors 6 and 8 in part because much of the mapped areas are associated with open waters of the Severn River and the near shoreline areas around Kent Island. The portion of Corridor 7 that spans the Eastern Shore intersects with tidal floodplains associated with the Chester River and Winchester Creek along the northern side of the alignment, and the Wye River along the southern side.

Based on the distribution of 100-year FEMA floodplain within the limits of Corridor 7, the area with the highest potential for impacts is located within the eastern section of the corridor, between Kent Island and the Eastern Shore.

4.4.3.3 Corridor 8

Corridor 8 contains approximately 3,950 acres of mapped 100-year floodplain (**Figure 4-9**). Within the western portion, Corridor 8 intersects with the floodplain associated Flat Creek, King's Branch, and Beards Creek. Further east, Corridor 8 intersects floodplain associated with several tidal waters including Bear Neck Creek, Whitmarsh Creek, Sellman Creek, Muddy Creek, Williamson Branch, Mill Swamp Branch, and the mapped floodplain adjacent to the Bay. After spanning the open waters of the Bay, Corridor 8 intersects the tidal floodplain associated with the shoreline of the Bay, Harris Creek, the Miles River, the Tred Avon River, and the Choptank River. The mapped floodplains within the limits of Corridor 8 generally extend the entire width of the corridor.

Based on the distribution of 100-year FEMA floodplain within the limits of Corridor 7, the area with the highest potential for impacts is located just south of MD 14, within the western section of the corridor.

4.4.3.4 Conclusions

According to FEMA floodplain mapping, the highest amount of mapped 100-year floodplain is associated with Corridor 7. However, much of the mapped floodplain is associated with the open waters of the Severn River and open waters of the Bay in the vicinity of Kent Island.

Measures to limit potential effects to the mapped floodplains should be incorporated into the planning and design process should a corridor alternative be carried forward for further evaluation during a Tier 2 evaluation. Impacts to the jurisdictional 100-year floodplain associated with non-tidal waters are authorized by MDE via the JPA process. The majority of mapped 100-year floodplains throughout all three corridors are tidal with lesser concentrations of non-tidal floodplain associated with smaller, non-tidal

creeks and tributaries. Because the mapped floodplain spans the entire width of the corridor study areas in several places, impacts to floodplain resources would be unavoidable.

Avoidance and minimization efforts should be employed to the maximum extent practicable consistent with permitting and other regulatory requirements and Executive Order 11988 measures should be incorporated into the project planning process. EO 11988, Floodplain Management, requires federal agencies to implement effective planning measures designed to avoid long- and short-term adverse impacts associated with development and modification of the 100-year floodplain, and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative. EO 11988 further states that each agency shall take appropriate action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health, and welfare, and to restore and preserve the natural and beneficial values served by floodplains.

4.4.4 Chesapeake Bay Critical Area

The Chesapeake Bay Critical Area encompasses land that is within 1,000 feet of the mean high tide line of the bay and adjacent streams and rivers. Within the Critical Area, three land classifications have been designated: Intensely Developed Areas (IDAs), Limited Development Areas (LDAs), and Resource Conservation Areas (RCAs). Each of these areas has specific regulations that dictate future development while accounting for the current surrounding land use and land cover. The Critical Area also has two additional areas identified as Corporate Land (CL) and Federal Land (FED). These designations are for lands that are corporately owned or owned by the federal government and are not classified as RCA, LDA, or IDA because activities on these lands are not directly regulated through the state's Critical Area Program but are regulated through the Coastal Zone Management Act. The Critical Area Commission (CAC) also regulates a 100-foot buffer which consists of the first 100-foot landward of tidal waters, tidal wetlands, or tributary streams. For further protection, the 100-foot buffer is expanded to include steep slopes, adjacent non-tidal wetlands, and hydric or highly erodible soils.

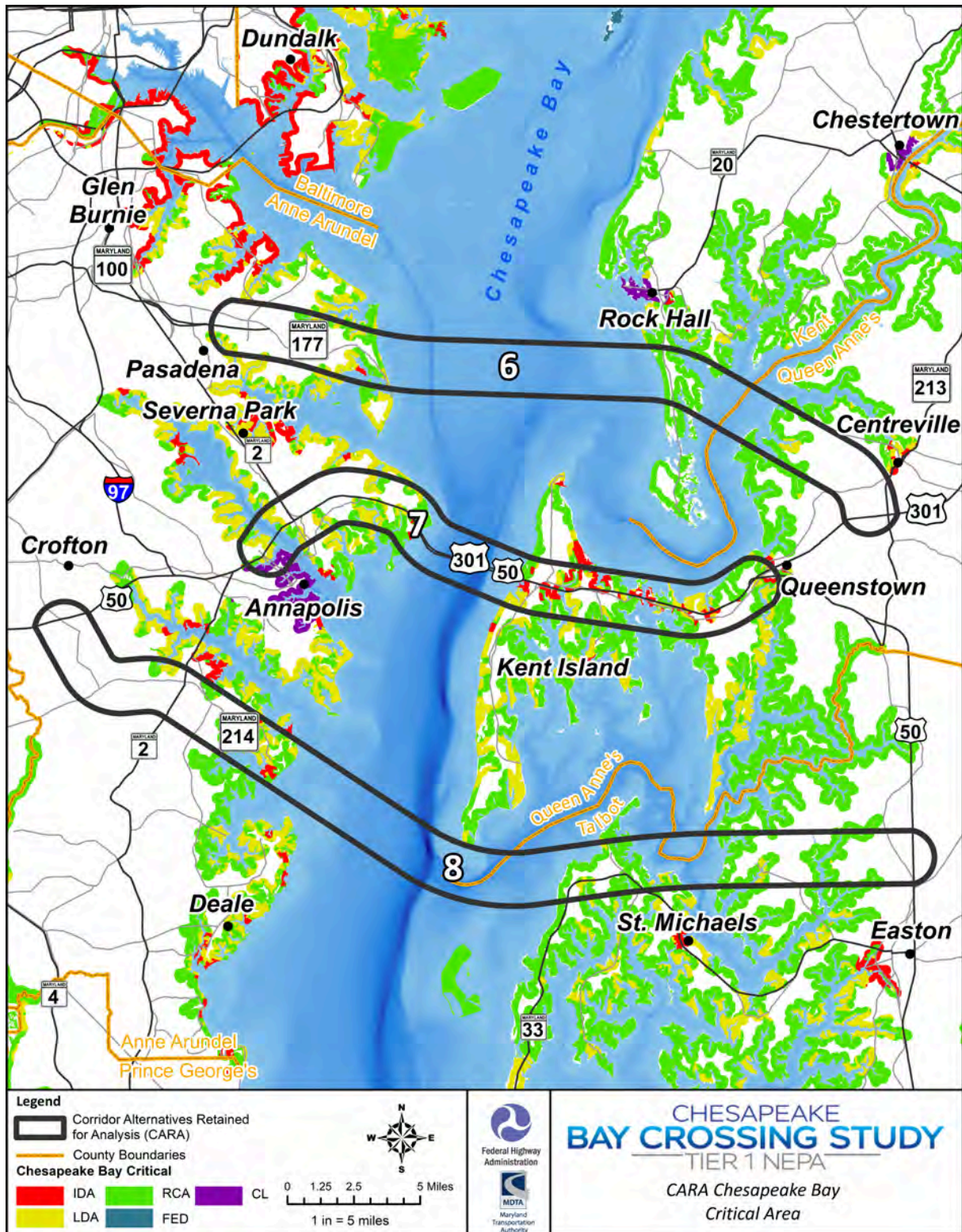
Figure 4-10 provides a graphic depiction of the location and distribution of Critical Area within the limits of the three study area corridors. This data was obtained from the Maryland iMap GIS data portal. **Table 4-26** below provides a breakdown of total area, in acres, of IDA, LDA, and RCA located within the limits of the three study area corridors. **Appendix A** includes detailed maps of the Critical Area within each corridor.

Table 4-26: Chesapeake Bay Critical Area

CORRIDOR	IDA (ACRES)	LDA (ACRES)	RCA (ACRES)	TOTAL WITHIN CORRIDOR (ACRES)	PERCENTAGE OF TOTAL CORRIDOR STUDY AREA
6	50	1,080	3,780	4,910	14%
7	1,300	3,370	5,140	9,810	35%
8	160	1,420	6,540	8,120	17%

Note: values rounded to closest 10 acres.

Figure 4-10: Chesapeake Bay Critical Area



4.4.4.1 Corridor 6

Corridor 6 contains approximately 4,910 acres of land area that falls within the limits of the Critical Area, the overall majority of which is classified as RCA (**Figure 4-10**). Within the western extent, the Critical Area is generally limited to the northern and southern edges of the corridor until it spans the Western Shore area of the Bay. The majority of Critical Area within the western extent of Corridor 6 is classified as RCA with lesser concentrations of LDA. One small roughly 50-acre section of IDA was identified within the western portion of the Corridor 6 and was associated with the Long Point neighborhood along Sillery Bay. The eastern portion of Corridor 6 intersects Critical Area along the entire width at the eastern shoreline of the Bay and along both banks of the Chester River. Mapped Critical Area along the Eastern Shore is primarily RCA with lesser concentrations of LDA.

4.4.4.2 Corridor 7

Corridor 7 contains approximately 9,810 acres of land that falls within the limits of the Critical Area. The majority is classified as RCA but the corridor also contains relatively high levels of both LDA and IDA (**Figure 4-10**). Within the western extent, the Critical Area is primarily associated with the Severn River and the western shoreline of the Bay. A large portion of the western extent of Corridor 7, primarily along the northern corridor border, is located outside the limits of the Critical Area. A large area of CL is mapped within the western portion of Corridor 7, just north of Annapolis, MD. Impacts to CL are administered under the Coastal Zone Management Act, not the Critical Area Program.

The majority of the section of Corridor 7 that spans Kent Island is located within the limits of the Critical Area and due to the high level of existing development, the majority of IDA identified within Corridor 7 occurs on Kent Island. The eastern extent of the corridor intersects with the Critical Area associated with the Wye River and the south bank of the Chester River.

4.4.4.3 Corridor 8

Corridor 8 contains approximately 8,120 acres of land that falls within the limits of the Critical Area (**Figure 4-10**). The western extent of Corridor 8 contain relatively little Critical Area with the exception of where the corridor spans the western shore of the Bay. A small area of IDA is also located within the western portion of the corridor, just south of MD 214.

The majority of mapped Critical Area associated with Corridor 8 is located within the eastern portion of the Corridor, along the Eastern Shore. RCA constitutes the majority of Critical Area within Corridor 8. Lesser concentrations of LDA were also mapped with the majority occurring within the western portion of the corridor along the Bay.

4.4.4.4 Conclusions

According to the GIS mapping sources, the highest total amount of land in the Critical Area within the CARA is within the limits of Corridor 7. Due to the nature of the proposed project, Critical Area impacts would not be completely avoidable for a new crossing within any of the CARA.

Coordination with the CAC Staff and local jurisdictions would be required to evaluate potential impacts and associated mitigation should a corridor alternative be carried forward for further evaluation. During

the planning process, special attention must be paid to areas with steep slopes and highly erodible soils as these areas will be subject to Critical Area buffer expansion.

The Maryland Assembly enacted the Critical Area Act (CAA) in 1984 to address the increasing pressure placed on the Bay associated with land use and population growth. The CAA allows state and local governments to work together to address land development impacts on aquatic habitats and resources by developing specific local programs that would minimize adverse impacts to water quality caused by pollutants in runoff, conserve fish, wildlife and plant habitat within the critical area, and establish land use policies which would accommodate growth.

For any selected corridor alternative, the majority of mapped Critical Area occurs in areas identified as RCA. RCAs consist primarily of natural areas or areas where resource utilization activities are taking place. Because RCAs make up most of the Critical Area and provide the greatest opportunity for meeting the goals of the Critical Area Program, the land use regulations are the most restrictive.

4.4.5 Terrestrial Habitat

The corridor study areas encompass various types of terrestrial habitat, including; upland and riparian forested areas, scrub-shrub and herbaceous uplands, agricultural lands, freshwater wetlands, beaches, marshes, tidal flats, and large areas of urban and suburban development. The GIS mapping for terrestrial habitat focuses on upland habitats that are afforded regulatory protection, including Forest Conservation Act (FCA) easements and forest interior dwelling species (FIDS) habitat. Wetlands areas were evaluated in **Section 4.4.2** of this document. FIDS habitat within the Critical Area is subject to specific mitigation requirements as determined by the local jurisdiction with input from MDNR and the Critical Area Commission staff.

The total amount of FIDS habitat and FCA easements within each of the three study corridors is presented in **Table 4-27**. Data were obtained from the MDNR GIS Data Portal and identifies the largest amount of FIDS habitat within Corridor 8 with the highest concentration located within the western portion of the proposed corridor. Corridor 6 contains the largest amount of area within existing FCA easements, all of which are located within the western portion of the corridor.

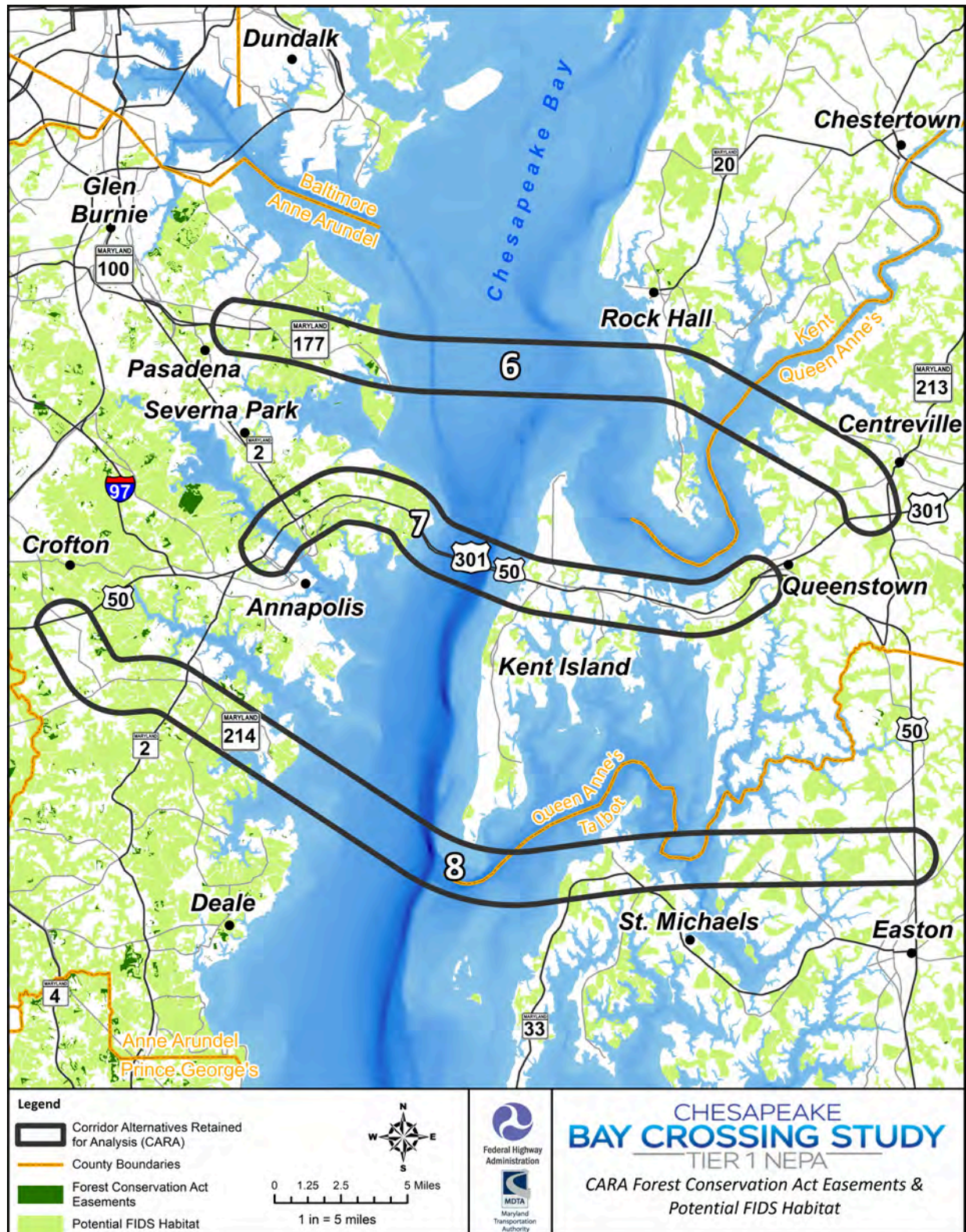
Table 4-27: FIDS & FCA Easements

CORRIDOR	FIDS (ACRES)	FCA EASEMENTS (ACRES)	PERCENTAGE OF TOTAL CORRIDOR STUDY AREA
6	7,020	140	20%
7	6,900	130	25%
8	11,410	110	25%

Note: values rounded to closest 10 acres.

Figure 4-11 provides a visual depiction of the location of the most concentrated forest resources within the corridor limits, identifying FCA easements and areas of potential FIDS habitat. FCA easements protect forest cover on private land by placing restrictive covenants and limiting certain activities. Easements are generally created as part of a forest conservation plan. FIDS habitat identifies areas of large contiguous forest blocks at least 300 feet from a forested edge.

Figure 4-11: Forest Conservation Act Easements and Potential FIDS Habitat



4.4.5.1 Corridor 6

Corridor 6 contains approximately 7,020 acres of potential FIDS habitat with the largest concentrations occurring within the western portion of the corridor, on the Western Shore of the Bay (**Figure 4-11**). This section of the corridor still contains relatively large areas of forest interspersed with residential development. Corridor 6 also intersects with 140 acres of FCA Easements, all of which are located along the MD 177 corridor, within the western extent of the corridor. The eastern portion of Corridor 6 also contains areas of potential FIDS habitat but in lesser concentrations, largely due to the presence of substantial areas of open fields areas associated with agricultural production.

4.4.5.2 Corridor 7

Corridor 7 contains approximately 6,900 acres of potential FIDS habitat with the largest concentrations occurring within the western portion of the corridor. Corridor 7 also intersects with 130 acres of FCA Easements, all of which are located within the western portion of the corridor (**Figure 4-11**). This section of the corridor still contains relatively large areas of forest interspersed with residential development. As a result, this area has the lowest potential for impacts to FIDS resources. The eastern portion of Corridor 7, just west of Queenstown, also contains areas of potential FIDS habitat but in lesser concentrations, largely due to the presence of substantial areas of open fields associated with agricultural production.

4.4.5.3 Corridor 8

Corridor 8 contains approximately 11,410 acres of potential FIDS habitat, the largest amount of the three corridors with the largest concentrations located within the western portion of the corridor. This section of the corridor still contains relatively large tracts of forest areas, particularly along the MD 24 alignment, west of MD 2. Corridor 8 also contains several FCA easements, all of which are located within the extreme western portion of the Corridor study area, west of MD 2 (**Figure 4-11**). The eastern portion of Corridor 8 also contains areas of potential FIDS habitat but in lesser concentrations, largely due to the presence of substantial areas of open fields associated with farming activities.

4.4.5.4 Conclusions

For any corridor alternative selected for further analysis, impact assessment must consider potential changes and effects to terrestrial resources based on ecological importance and their likelihood to be adversely affected by Project activities. FIDS resources and FCA easements are important terrestrial habitats because they represent areas with the ability to support a wide variety of vegetation, wildlife, and species of concern. Project activities that may affect terrestrial resources during construction include demolition of existing infrastructure, vegetation removal, and construction of Project-related infrastructure.

According to the GIS mapping sources, Corridor 8 contains the highest total of FIDS resources. FCA easement totals do not vary significantly between the corridor study areas. Because resources generally span the width of the study area corridors, impacts are likely unavoidable. Coordination with MDNR and County planning agencies would be required during a Tier 2 NEPA study to evaluate potential impacts and associated mitigation should a corridor alternative be carried forward for further evaluation in a more detailed Tier 2 analysis. Minimization and avoidance strategies would be implemented once a limit of disturbance associated with a more defined project area is established.

4.4.6 Unique and Sensitive Areas

For the purposes of this Tier 1 analysis, Unique and Sensitive Areas are defined as habitats and biological resources that have special environmental attributes worthy of protection and retention. **Figure 4-12** identifies the location of Sensitive Species Project Review Areas (SSPRAs) and represents the general locations of various types of areas of concern statewide, including; Targeted Ecological Areas (TEA), Natural Heritage Areas (NHA), listed species sites, locally significant habitat areas, colonial waterbird sites, non-tidal wetlands of special state concern, green infrastructure, and geographic areas of particular concern.

SSPRA is a digital map data layer which represents the general locations of documented rare, threatened and endangered species in Maryland. Created and updated by staff of the MDNR Wildlife and Heritage Service, this data layer identifies approximate areas but does not delineate or strictly represent habitats of threatened and endangered species. The data layer incorporates various types of regulated areas under the Critical Area Criteria and other areas of concern statewide, including: Natural Heritage Areas, Listed Species Sites, Other or Locally Significant Habitat Areas, Colonial Waterbird Sites, Non-tidal Wetlands of Special State Concern, and Geographic Areas of Particular Concern.

NOAA Fisheries has implemented an interactive, GIS-based online tool called the ESA Section 7 Mapper to identify ESA listed species and critical habitat in marine areas along the east coast from Maine to North Carolina. While this tool does not replace the Section 7 consultation process, the mapper provides technical assistance for agencies to use as a first step in determining if a proposed Federal action occurs within an area associated with a listed species or critical habitat. Within the Section 7 Mapper, Consultation Areas represent NOAA's best estimate of the spatial and temporal range of listed species' life stages, behaviors, and critical habitat in the Greater Atlantic Regional Fisheries Office (GARFO) region.

MDNR's GIS Data Portal's SSPRA coverage layer was used to provide a comparative analysis of unique and sensitive areas within each of the three study corridors (**Table 4-28**). Corridor 8 contains the highest concentration of SSPRA, with the majority located within the Eastern Shore portion of the corridor. There is also a relatively large concentration of SSPRA located within the western section of Corridor 6 (**Figure 4-12**).

Table 4-28: Sensitive Species Project Review Areas (SSPRA)

CORRIDOR	SSPRA (ACRES)	PERCENTAGE OF TOTAL CORRIDOR STUDY AREA
6	2,720	6%
7	2,180	8%
8	8,630	11%

Note: values rounded to closest 10 acres.

Figure 4-12: Sensitive Species Project Review Areas

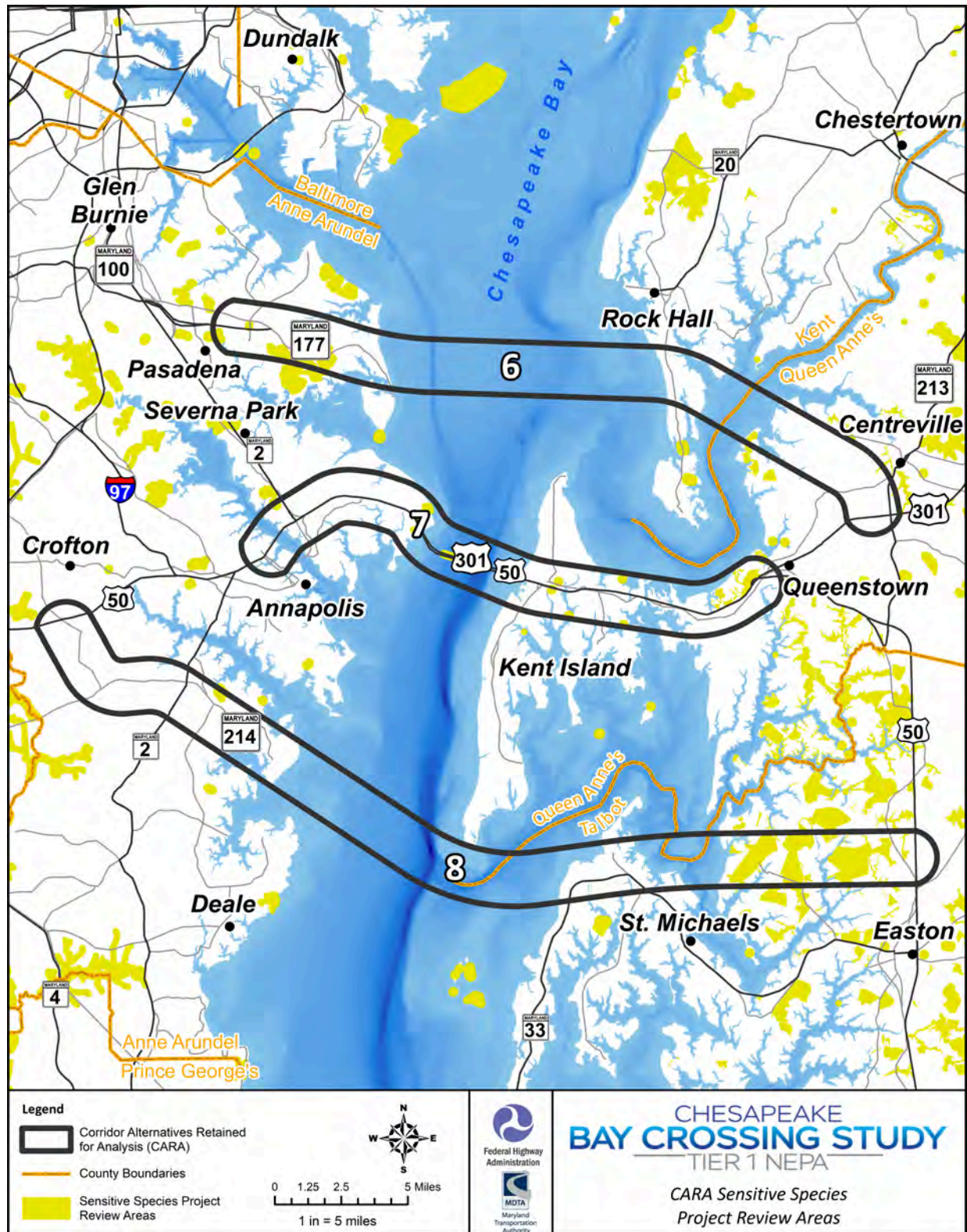


Figure 4-13 identifies the location of Green Infrastructure (GI) hubs and corridors within the limits of the three study corridors. This data was obtained from the MD iMap Data Portal. Areas identified include unfragmented natural areas, called “hubs.” Hubs were defined as contiguous forest blocks and wetland complexes of at least 250 acres, rare or sensitive species habitats, biologically important rivers and streams, and existing conservation lands managed for natural values. “Corridors” are linear stretches of land, at least 1,100 feet wide, which follow the best ecological or most natural routes between hubs to help animals, plant seeds, water, and other important resources move between hubs.

Table 4-29 provides a comparative analysis of existing GI areas identified within the limits of the three study corridors. As indicated, Corridor 8 contains the highest amount of GI and contains a significant amount of GI hubs (**Figure 4-13**). Corridor 6 contains the highest amount of GI corridors which generally span the width of the corridor on both the Western and Eastern Shores of the Bay.

Table 4-29: Green Infrastructure

CORRIDOR	GREEN INFRASTRUCTURE CORRIDORS (ACRES)	GREEN INFRASTRUCTURE HUBS (ACRES)	TOTAL WITHIN CORRIDOR (ACRES)	PERCENTAGE OF TOTAL CORRIDOR STUDY AREA
6	3,150	1,730	4,880	14%
7	1,260	3,220	4,480	16%
8	2,100	9,350	11,450	25%

Note: values rounded to closest 10 acres.

FEDERALLY LISTED SPECIES

An online search of the USFWS iPaC system to determine the presence of federally-listed rare, threatened or endangered species or habitat and migratory birds was conducted for each of the study area corridors. The results of the search identified the presence of Northern Long-eared Bat (*Myotis septentrionalis*, federally-listed threatened) within the limits of all three corridors. The iPaC results also identified several migratory birds within all three corridor study areas that are protected under the Migratory Bird Treaty Act. Copies of the USFWS iPaC correspondence are provided in **Appendix B**. Coordination with the USFWS will be required for potential impacts to Northern Long-eared Bat and migratory birds for any corridor carried forward to a Tier 2 analysis.

The NOAA Section 7 Mapper was utilized to determine the presence of federally-listed marine species or critical habitat within the limits of the corridor study areas. The search yielded the same results for all three study area corridors. The following list identifies the federally-listed RTE species, protection status, species life stage, and critical habitat identified within the corridor study areas.

- Loggerhead Turtle (*Caretta caretta*)/Threatened/Adults and Juveniles/migrating and foraging
- Green Sea Turtle (*Chelonia mydas*)/Threatened/Adults and Juveniles/migrating and foraging
- Kemp’s Ridley Sea Turtle (*Lepidochelys kempii*)/Endangered/Adults and Juveniles/migrating and foraging
- Leatherback Sea Turtle (*Dermochelys coriacea*)/Endangered/Adults and Juveniles/migrating and foraging

- Shortnose Sturgeon (*Acipenser brevirostrum*)/Endangered/Adult/overwintering, migrating and foraging
- Atlantic Sturgeon (*Acipenser oxyrinchus oxyrinchus*)/Endangered/Subadult, Juvenile, Adult/migrating and foraging

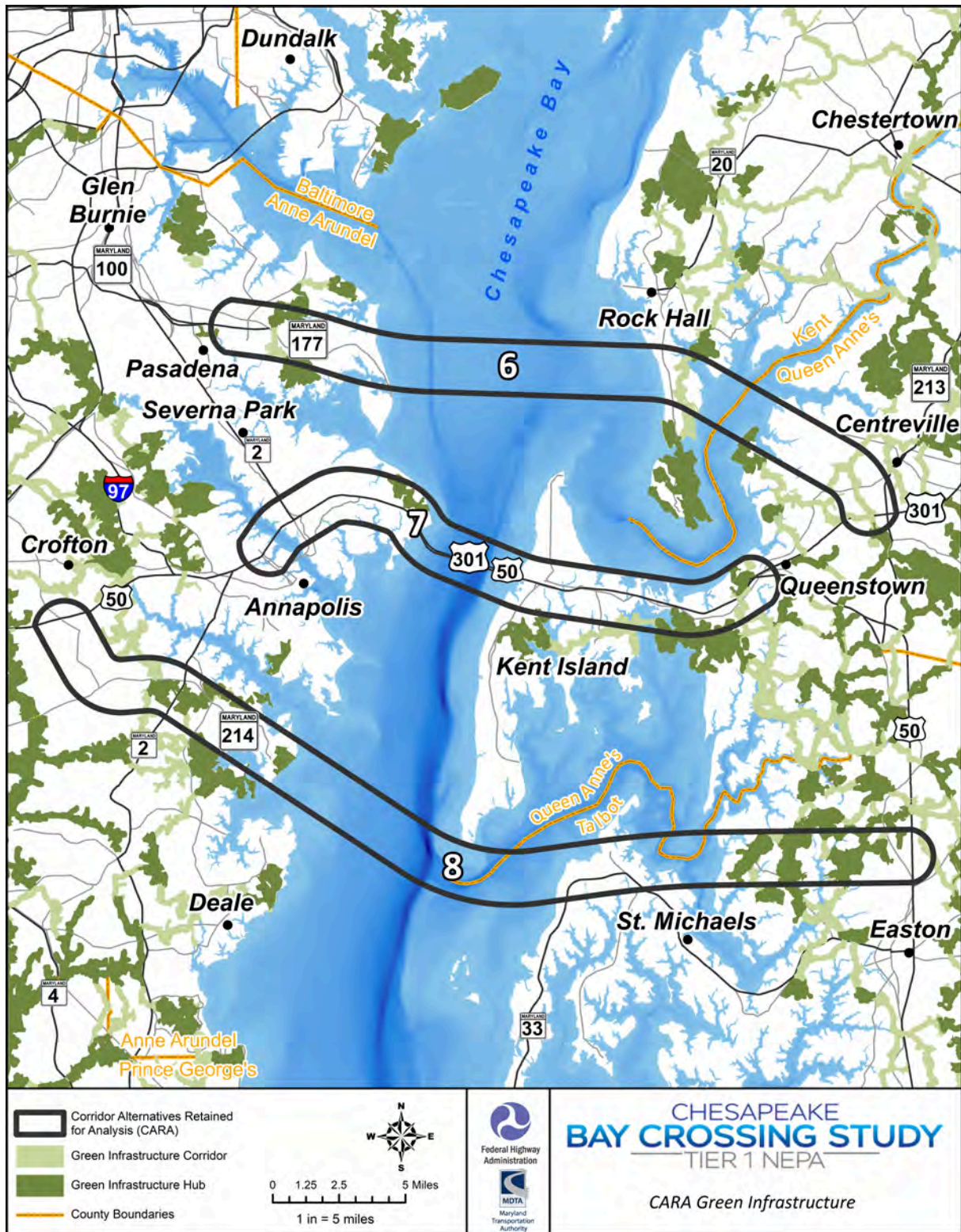
STATE LISTED SPECIES

Correspondence was submitted to MDNR to determine the presence of state-listed rare, threatened or endangered species or habitat within the limits of the study areas for the three potential corridors. The results of this request are summarized in **Table 4-30** and in the Corridor discussions below and detailed in the [Natural Resources Technical Report; Section 5.6](#).

Table 4-30: MDNR Listed Species

CORRIDOR	SPECIES SCIENTIFIC NAME	SPECIES COMMON NAME	STATE STATUS
6	<i>Chamaedaphne calyculata</i>	Leatherleaf	Threatened
6	<i>Castanea dentata</i>	American Chestnut	Rare
6	<i>Eriocaulon parkeri</i>	Seven-angle Pipewort	Endangered
6	<i>Sarracenia purpurea</i>	Northern Pitcherplant	Threatened
6	<i>Utricularia cornuta</i>	Horned Bladderwort	Highly Rare
6	<i>Juncus pelocarpus</i>	Brown-fruit Rush	Endangered
6	<i>Sagittaria spatulata</i>	Spongy Arrowhead	Rare
6	<i>Nehalennia integricolis</i>	Southern Sprite	Highly Rare
6	<i>Nehalennia gracilis</i>	Sphagnum Sprite	Rare
6	<i>Erythrodiplox minuscula</i>	Little Blue Dragonlet	Highly Rare
6	<i>Nannothemis bella</i>	Elfin Skimmer	Endangered
6	<i>Ladona exusta</i>	White Corporal	Endangered
6	<i>Arundinaria tecta</i>	Switch Cane	Rare
6	<i>Carex exilis</i>	Coast Sedge	Endangered
7	<i>Homalosorus pycnocarpus</i>	Glade Fern	Threatened
7	<i>Sternula antillarum</i>	Least Tern	Threatened
7	<i>Laterallus jamaicensis</i>	Black Rail	Endangered
7	<i>Porzana carolina</i>	Sora	Rare
7	<i>Falco peregrinus anatum</i>	Peregrine Falcon	In Need of Conservation
8	<i>Hylodesmum pauciflorum</i>	Few-flowered Trick-trefoil	Endangered
6, 7, 8	<i>Sciurus niger cinereus</i>	Delmarva Fox Squirrel	In Need of Conservation

Figure 4-13: Green Infrastructure



4.4.6.1 Corridor 6

Corridor 6 contains approximately 2,720 acres of area mapped as SSPRA, with a relatively large area within the western section of the corridor, directly adjacent to MD 177. This area is generally associated with the Magothy Greenway Natural Area and the areas directly adjacent. The eastern portion of Corridor 6 contains relatively sparse areas of SSPRA which are located along the western bank of the Chester River (**Figure 4-12**). These SSPRA are labeled as MDNR Targeted Ecological Areas. Targeted Ecological Areas are lands and watersheds of high ecological value that have been identified as conservation priorities by MDNR for natural resource protection. As SSPRA generally extends the width of the western portion of Corridor 6, impacts would be unavoidable in this area. Impacts to SSPRA within the eastern portion of Corridor 6 could potentially be avoided by siting a potential alignment within the central portion of the corridor study area.

Corridor 6 contains approximately 3,150 acres of GI corridors and 1,730 acres of GI hubs. The GI corridors were identified on both sides of the Bay and generally extend the corridor width. The majority of the GI hubs within Corridor 6 were identified on the Western Shore of the Bay with smaller concentrations on the Eastern Shore, adjacent to the Chester River (**Figure 4-13**). Avoiding impacts to the GI hubs would require siting the alignment within the central portion of the corridor. As the GI corridors span the entire width of Corridor 6, impacts would be unavoidable.

The MDNR identified several non-tidal wetland areas associated with Corridor 6 collectively known as the Mountain Road Bogs that are known to contain RTE species. These areas include the Upper Magothy Marshes, Main Creek Bog, South Gray's Bog, Cockey Creek Swamp, Blackhole Creek Bog, Fresh Pond, and North Gray's Bog Complex. The Mountain Road Bogs were identified west of the Bay in Anne Arundel County near MD 177. Also identified within the limits of Corridor 6 was an area of Delmarva Fox Squirrel (*Sciurus niger cinereus*) habitat located east of the Bay in Queen Anne's County, along Mill Stream Branch.

Waterfowl Concentration Areas (WCA) were identified within the limits of all three study area corridors. These are recognized areas of open water and wetlands adjacent to land that are utilized by significant numbers of ducks, geese, and swans for feeding and resting during the winter months. WCAs may be subject to construction-related time of year restrictions. Coordination with the MDNR will be required for potential impacts to state-listed RTE species or habitat, habitat protection areas, or waterfowl concentration areas for any corridor carried forward to a Tier 2 analysis.

4.4.6.2 Corridor 7

Corridor 7 contains approximately 2,180 acres of SSPRA with the largest concentrations located on Kent Island and further east along the Eastern Shore (**Figure 4-12**). The SSPRA identified on Kent Island is associated with Targeted Ecological Areas located south of US 301 and a small area identified as the Terrapin Nature Area, north of US 301. Further east, SSPRA were identified on the Eastern Shore, west of Queenstown, and were associated with Targeted Ecological Areas south of US 301 along the eastern shoreline of Prospect Bay and the Queenstown Harbor Lakes Course, north of US 301, along the eastern bank of the Chester River. A relatively small amount of mapped SSPRA was also identified within the western portion of Corridor 7 and is associated with Sandy Point State Park, located on the north side of US 301, along the west bank of the Bay. SSPRA impacts associated with the western section of Corridor 7 would be minimal and could be completely avoided by remaining south of Sandy Point State Park.

Avoiding impacts within the eastern section would be difficult as a majority of mapped SSPRA within Corridor 7 is located on Kent Island and the Eastern Shore, and is evenly distributed throughout the width of the corridor.

Corridor 7 contains approximately 1,260 acres of GI corridors and 3,220 acres of GI hubs. GI corridors were identified along the southern portion of Corridor 7, on Kent Island, and within the eastern section of the Corridor 7, just west of Queenstown. No GI corridors were identified within the western section of Corridor 7. GI hubs were identified within the western section of Corridor 7 and were associated with Sandy Point State Park. GI hubs were also identified within the eastern section of Corridor 7, just west of Queenstown (**Figure 4-13**). Avoiding impacts to GI hubs within the western portion of Corridor 7 would require siting the alignment on the south side of US 301. Siting the alignment within the central portion of Corridor 7, along Kent Island and the Eastern Shore, would minimize potential impacts to GI hubs within the central and eastern sections of the corridor. GI corridor impacts associated with Corridor 7 would be relatively minimal and associated with one section, west of Queenstown, where the GI corridor spans the entire width of Corridor 7.

Within the limits of Corridor 7, the MDNR identified a wetland area called Rucker's Ravine within the Pines-on-Severn community in Anne Arundel County that supports the State-listed threatened Glade Fern (*Homalosorus pycnocarpus*). Several Great Blue Heron colonies were identified in Queen Anne's County and another south of Sandy Point State Park in Anne Arundel County. Habitat protection areas for Least Tern (*Sternula antillarum* – State threatened), Black Rail (*Laterallus jamaicensis* – State endangered), and Sora (*Porzana Carolina* – State rare) was also identified in Sandy Point State Park. The MDNR also lists the Bridge itself and building rooftops in the Stevensville area as nesting habitat for several bird species. Finally, Delmarva Fox Squirrel habitat is identified in Queen Anne's County in the area north of US 50. Waterfowl Concentration Areas were identified, as described above under Corridor 6.

4.4.6.3 Corridor 8

Corridor 8 contains approximately 8,630 acres of SSPRA which constitutes the largest total amount of SSPRA of the three corridors with the vast majority located within the extreme eastern portion of the corridor study area, along the Eastern Shore (**Figure 4-12**). One small area of SSPRA was identified within the western portion of Corridor 8, along the northern corridor edge just north of MD 214 and is associated with a Targeted Ecological Area adjacent to the eastern bank of Glebe Creek. The eastern portion of Corridor 8 intersects with several Targeted Ecological Areas that generally span the entire width of the corridor and constitutes the vast majority of land area within the section between US 50 and the Eastern Shore of the Bay. The western section of Corridor 8 contains very small areas of mapped SSPRA along the northern extent of the corridor. Impacts could be avoided by siting the alignment within the central or southern portion of the corridor. Avoiding impacts within the eastern section would be difficult as a majority of mapped SSPRA within Corridor 8 is located on the Eastern Shore, and is fairly evenly distributed throughout the width of the corridor.

Corridor 8 contains approximately 2,100 acres of GI corridors and 9,350 acres of GI hubs. The majority of these resources were identified within the eastern section of the corridor, along the Eastern Shore, with lesser but still significant resources identified within the western section of the corridor (**Figure 4-13**). Impacts to GI corridors and GI hubs within Corridor 8 would be unavoidable as these resources generally extend the width of the corridor on both sides of the Bay.

Within the limits of Corridor 8, MDNR identified several areas designated as habitat protection areas, or areas known or suspected to provide habitat for RTE species. These areas include Glebe Creek Woods in Anne Arundel County, Copperville Wet Woods in Talbot County along the Miles River, and Third Haven Woods along Goldsborough Neck Road in Talbot County. Delmarva Fox Squirrel habitat was identified within the limits of Corridor 8 in Talbot County north of Easton. Waterfowl Concentration Areas were identified, as described above under Corridor 6.

4.4.6.4 Conclusions

Utilizing the SSPRA and Green Infrastructure GIS data layers provides a broad view of existing areas classified, for the purposes of this document, as sensitive and unique. The SSPRA data depicts the general location of threatened and endangered species habitat, Natural Heritage Areas, Colonial Waterbird Sites, non-tidal WSSC, and Geographic Areas of Particular Concern. Green Infrastructure mapping identifies forested hubs and corridors. These include large, undisturbed tracts of forest and the corridors that provide the ecological connection. According to these data sources, Corridor 8 contains the largest areas of mapped SSPRA and Green Infrastructure both by total land area. Within the Eastern Shore section of Corridor 8, mapped SSPRA and Green Infrastructure resources span the entire width of the study area and impacts would be unavoidable. For unavoidable impacts, minimization efforts and coordination with multiple resource agencies will be required should a corridor alternative be carried forward to a Tier 2 evaluation.

4.4.7 Aquatic Resources

The Chesapeake Bay supports a vast array of aquatic resources, including, 348 species of finfish, 173 species of shellfish, and 2,700 species of plants species. However, to quantify potential impacts associated with each corridor study area, this analysis relies on available mapped GIS resources to provide a comparative analysis. These mapping sources include GIS layers for Essential Fish Habitat (EFH), Submerged Aquatic Vegetation (SAV), Natural Oyster Bars (NOB), and oyster sanctuaries. This data was gathered from the MD iMap database from 2018. A more comprehensive analysis of potential impacts to all aquatic resources, including sea turtles, Atlantic Sturgeon, aquatic mammals, sea birds, etc. should be performed if a corridor alternative is carried forward to a Tier 2 analysis and a more defined study area is defined.

A breakdown of aquatic resources identified within the limits of the three study corridors, including data associated with EFH, SAV, and oyster resources is provided in **Table 4-31**. Oyster resources were identified by whether they were mapped as Natural Oyster Bars (NOB) or Oyster Sanctuaries. Sanctuaries are areas where the wild harvest of oysters is prohibited and are provided more stringent protective measures. NOBs are also called “public” oyster bars. MDNR regulates the harvesting of oysters in NOBs and places timing restrictions and quantity limits for both commercial and recreational harvesting.

While much of the larger study area is considered EFH for several species, all mapped areas are not equivalent in their potential for aquatic resource productivity. Both oyster reefs and SAV are considered particularly valuable habitat for federally managed species and their prey. SAV has been designated as a habitat area of particular concern (HAPC) for summer flounder by the Mid-Atlantic Fishery Management Council. HAPCs are subsets of EFH identified based on one or more of the following considerations: 1) the importance of the ecological function; 2) extent to which the habitat is sensitive to human-induced

degradation; 3) whether and to what extent, development activities are stressing the habitat type; and/or 4) rarity of habitat type [\(50 CFR 600.815\(a\)\(8\)\)](#).

The EFH data were obtained from the NOAA EFH Data Inventory that categorizes EFH by fish species. The categories include habitat for Atlantic butterfish (*Peprilus triacanthus*), black sea bass (*Centropristis striata*), bluefish (*Pomatomus saltatrix*), scup (*Stenotomus chrysops*), and summer flounder (*Paralichthys dentatus*). For the purposes of this comparative analysis, these fish species have been combined into a single EFH category. **Appendix A** includes detailed maps of SAV within each corridor.

Table 4-31: Aquatic Resources

CORRIDOR	EFH (ACRES)	EFH PERCENTAGE OF TOTAL CORRIDOR STUDY AREA	SAV (ACRES)	NATURAL OYSTER BARS (ACRES)	NATURAL OYSTER BARS PERCENTAGE OF TOTAL CORRIDOR STUDY AREA	MDNR OYSTER SANCTUARIES (ACRES)
6	64,320	52%	40	11,130	32%	6,470
7	36,650	34%	270	3,460	12%	1,580
8	87,680	44%	460	7,960	17%	2,090

Note: values rounded to closest 10 acres.

4.4.7.1 Corridor 6

Corridor 6 contains approximately 64,320 acres of mapped EFH with a large area associated with the open waters of the Bay and, within the eastern portion of the corridor, where the corridor spans the lower portion of the Chester River (**Figure 4-14**). The portion of Corridor 6 that spans the main channel of the Bay is mapped as EFH for scup (*Stenotomus chrysops*), Atlantic butterfish (*Peprilus triacanthus*), summer flounder (*Paralichthys dentatus*), black sea bass (*Centropristis striata*), and bluefish (*Pomatomus saltatrix*). The eastern portion of the Bay and within the lower Chester River, is mapped as EFH for summer flounder and bluefish.

Corridor 6 also contains approximately 11,130 acres of mapped NOBs, with the largest concentrations located adjacent to the Eastern Shore and within the lower portions of the Chester River. NOBs were also mapped within the open waters of the Bay and the lower portions of the Magothy River and Sillery Bay (**Figure 4-15**). Of the 11,130 acres of mapped oyster resources, 6,470 acres consist of protected oyster sanctuaries. The largest concentration of oyster sanctuaries associated with Corridor 6 are located along the bank of the Eastern Shore (**Figure 4-15**). Relatively small amounts of SAV (40 acres) were identified within the limits of Corridor 6 with one small section located within the eastern portion of the corridor, within the lower stem of the Chester River (**Figure 4-15**).

4.4.7.2 Corridor 7

Corridor 7 contains the least amount of total area spanning open waters and contains the least amount of EFH at approximately 36,650 acres (**Figure 4-14**). The largest concentrations occur within the area spanning the main channel of the Bay and within the coves and inlets in and around Kent Island and the Eastern Shore. The main channel of the Bay is mapped as EFH for scup, Atlantic bluefish, summer flounder, black sea bass, and bluefish. The open water areas adjacent to Kent Island and the Eastern Shore are mapped as EFH for summer flounder, scup, and black sea bass. Relatively small areas of EFH for bluefish, scup, and summer flounder are also mapped within the western portion of the Corridor 7, within the Severn River.

Figure 4-14: Essential Fish Habitat

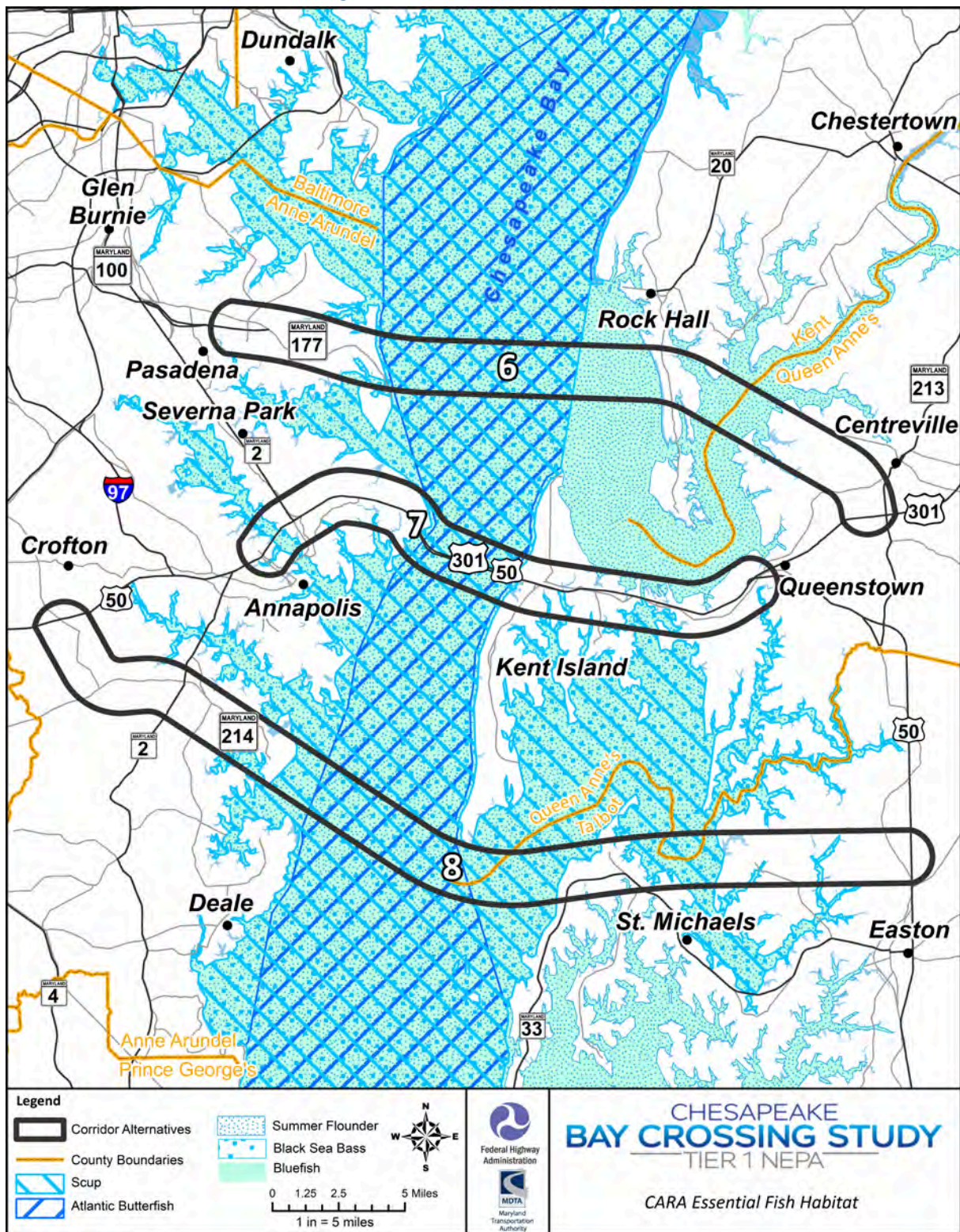
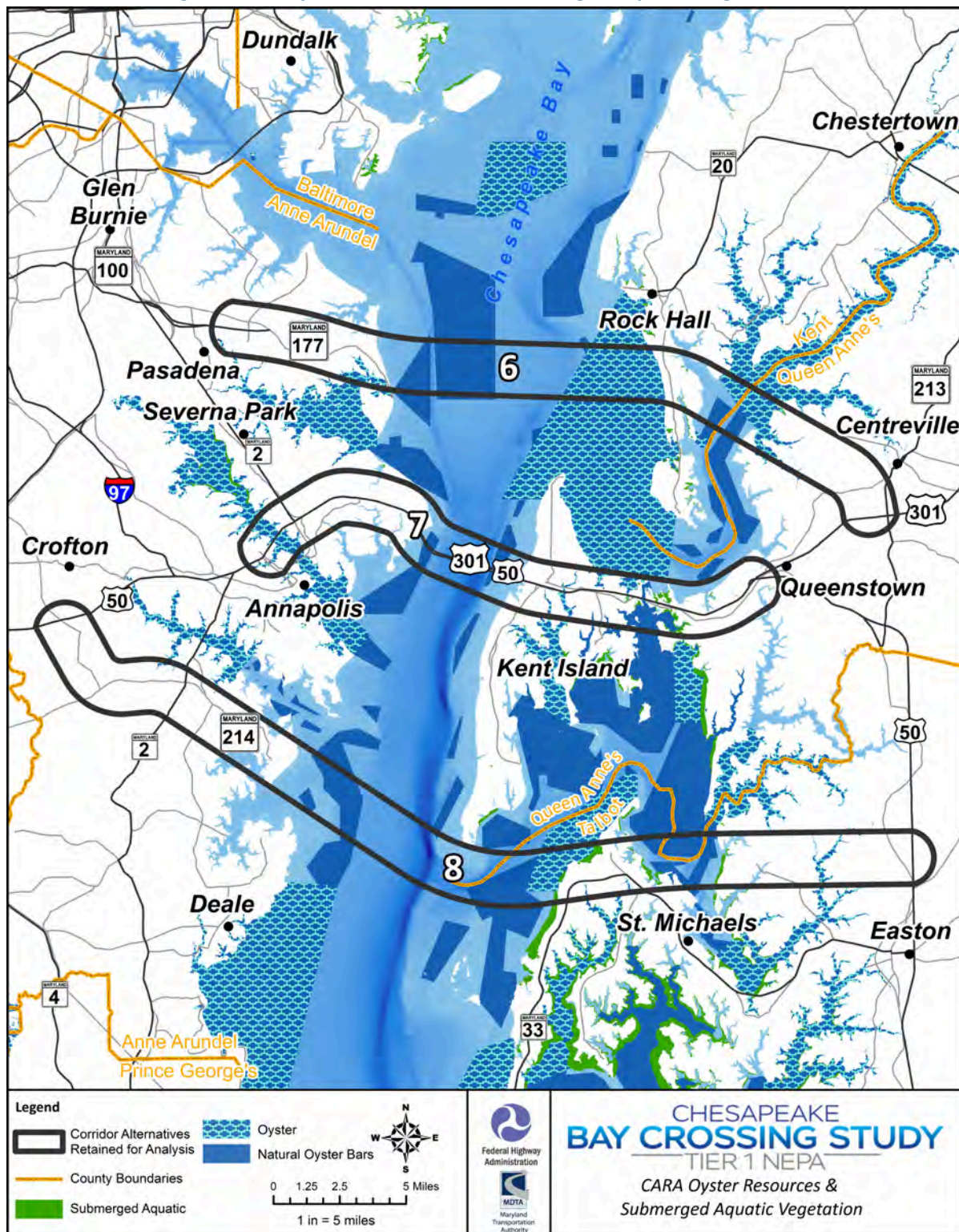


Figure 4-15: Oyster Resources and Submerged Aquatic Vegetation



Corridor 7 also contains the least amount of oyster resources at approximately 3,460 acres with the largest mapped areas associated with the Severn River in the western portion of the corridor and within the coves and inlets of Kent Island and Eastern Shore within the central and eastern portions of the corridor (**Figure 4-15**). Of the 3,460 acres of mapped NOB's, 1,580 acres consist of protected oyster sanctuaries. The largest concentration of oyster sanctuaries associated with Corridor 7 are associated with the Severn River (**Figure 4-15**). A relatively large concentration of SAV (approximately 270 acres) was identified within the eastern portion of Corridor 7, between Kent Island and the Eastern Shore (**Figure 4-15**).

4.4.7.3 Corridor 8

Corridor 8 contains the largest amount of area spanning open water and therefore contains the highest acreage total of EFH at approximately 87,680 acres. The western portion of the corridor, within and adjacent to the Rhode River is mapped as EFH for bluefish, black sea bass, summer flounder, and scup. The main channel of the Bay, within the limits of Corridor 8 is mapped as EFH for scup, Atlantic butterfish, summer flounder, black sea bass, and bluefish. The eastern portion of Corridor is mapped as EFH for scup, summer flounder, black sea bass, and bluefish (**Figure 4-14**).

Corridor 8 also contains 7,960 acres mapped as NOB's with the majority occurring in the near shore areas adjacent to the Eastern Shore (**Figure 4-15**). Of the 7,960 acres of mapped NOB's, 2,090 acres consist of protected oyster sanctuaries. The largest concentration of oyster sanctuaries associated with Corridor 8 are located along the bank of the Eastern Shore (**Figure 4-15**). Corridor 8 contains the largest areas of mapped SAV which are concentrated exclusively along the shoreline areas within Marshy Creek and the Chester River, within the eastern portion of the corridor study area (**Figure 4-15**).

4.4.7.4 Conclusions

Based on the results of the mapping resources for EFH, SAV, NOB, and Oyster Sanctuaries, Corridors 6 and 8 have the highest potential for impacts due to the associated amount of open water areas. Because all three corridors span large expanses of open water associated with the Bay and large tidal tributaries to the Bay, impacts to aquatic resources would be unavoidable. Permanent impacts to aquatic resources could result from the placement of piers and pilings, and the areas filled for approaches and scour protection measures. The placement of piers and pilings often introduce concussive forces which have adverse effects on fish with swim bladders. Other permanent impacts include those associated with an increase in noise and vibration from vehicle traffic associated with a new bay crossing structure. Increased noise and vibration can inhibit fish communication, mating behavior, detection of prey and predators, orientation and migration, and habitat selection.

Temporary impacts could result from cofferdams, causeways or temporary roads, work bridges or barges, dredge material dewatering and disposal, construction staging areas, and removal of benthos which could alter foraging behaviors. During the construction phase, specifically during dredging and filling activities for bridge and pier construction, adjacent areas can be affected based on the tides and currents due to the re-suspension of sediment in the water column. Local and temporary siltation and turbidity may reduce the photic zone in areas of SAVs, may release contaminants in the sediment, and would result in the temporary loss of benthic communities which provide food sources for fish.

Impacts to individual EFH species would vary based on the habitat considered essential for that species. Following is a list of the EFH species identified in **Section 4.4.7** and the associated habitat that may be impacted by any of selected corridor alternatives.

- Summer Flounder – Bottom habitats with a substrate of silt, mud, or fine sand
- Bluefish – Estuaries within the mixing and seawater zones from April through November
- Atlantic Butterfish – Bay, estuaries, and brackish backwaters
- Black Sea Bass – Estuaries within the mixing and seawater zones during the spring and summer
- Scup – Featureless bottoms within the bay floor during the spring and summer

The corridor study areas intersect with larger tributaries that serve as critical spawning habitat for anadromous fish including American Shad. Corridor 6 spans the Chester River along the Eastern Shore and provides the largest area of critical spawning habitat of the three corridor study areas. Corridor 6 also spans a small section of Magothy River spawning habitat, located along the Western Shore. Corridor 8 spans a relatively large area of critical spawning habitat associated with the Eastern Bay and Miles River, also along the Eastern Shore. Corridor 7 contains the least amount of critical spawning area and is associated with the Severn River, along the Western Shore near Annapolis, MD.

The corridor study areas also encompass large areas associated with open waters of the Bay and bay tributaries that are important to the commercial and recreational fishing industries. Commercial fishing areas include crabbing grounds, pound net locations, and natural oyster bars. Important recreational fishing areas include the smaller tributary systems, artificial reefs within the Bay, and public access areas and boat ramps. Potential impacts to these areas will require further investigation should a corridor alternative be carried forward for further evaluation in a more detailed Tier 2 analysis.

NOAA Fisheries is responsible for the stewardship of the Bay's resources and the associated habitat to ensure productive and sustainable fisheries, safe sources of seafood, the recovery and conservation of protected resources, and healthy ecosystems. Coordination with the Chesapeake Bay Oyster Alliance, MDNR, the Virginia Marine Resources Commission, USACE, USFWS, and NOAA, among others, would be required during a Tier 2 NEPA study to evaluate potential aquatic resource impacts and associated mitigation should a corridor alternative be carried forward for further evaluation in a more detailed Tier 2 analysis. Minimization and avoidance strategies would be implemented once a limit of disturbance associated with a more defined project area is established.

The Marine Mammals Protection Act (MMPA) prohibits the "taking" of marine mammals and enacts a moratorium on the import, export, and sale of any marine mammal, along with any marine mammal part or product within the United States. The Act defines "take" as "the act of hunting, killing, capture, and/or harassment of any marine mammal; or, the attempt at such." The MMPA defines harassment as "any act of pursuit, torment or annoyance which has the potential to either injure a marine mammal in the wild or disturb a marine mammal by causing disruption of behavioral patterns, which includes, but is not limited to, migration, breathing, nursing, breeding, feeding, or sheltering." The MMPA provides for enforcement of its prohibitions, and for the issuance of regulations to implement its legislative goals.

Several large marine mammals are known to spend a portion of their life cycle within the Chesapeake Bay, including the Bottlenose Dolphin (*Tursiops truncatus*) which is regularly seen in the lower and middle portions of the Bay during the summer months. Other mammals that are at least part time visitors to the Bay include Humpback Whales (*Megaptera novaeangliae*) and Florida Manatees (*Trichechus manatus latirostris*).

Authority to manage the MMPA is divided between the Secretary of the Interior through the USFWS, and the Secretary of Commerce, who in turn delegated this responsibility to the National Oceanic and Atmospheric Administration (NOAA). Subsequently, the Marine Mammal Commission (MMC), was established to review existing policies and make recommendations to the Service and NOAA to better implement the MMPA. Coordination between these three federal agencies is necessary in order to provide the best management practices for marine mammals.

“Special Aquatic Sites” are regulated under Section 404 of the CWA as a subset of WOTUS and are classified as areas which possess special ecological characteristics of productivity, habitat, wildlife protection, or other important and easily disrupted ecological values. NOB’s, oyster sanctuaries, and SAV are all considered Special Aquatic Sites under Section 404. These sites are generally recognized as significantly influencing or positively contributing to the overall environmental health of the entire ecosystem and receive special attention under EPA’s Section 404 (b) (1) guidelines. Because degradation or destruction of these areas may result in an irreversible loss of valuable aquatic habitat, emphasis must be placed on avoidance and minimization should a corridor alternative be carried forward for further evaluation in a more detailed Tier 2 analysis.

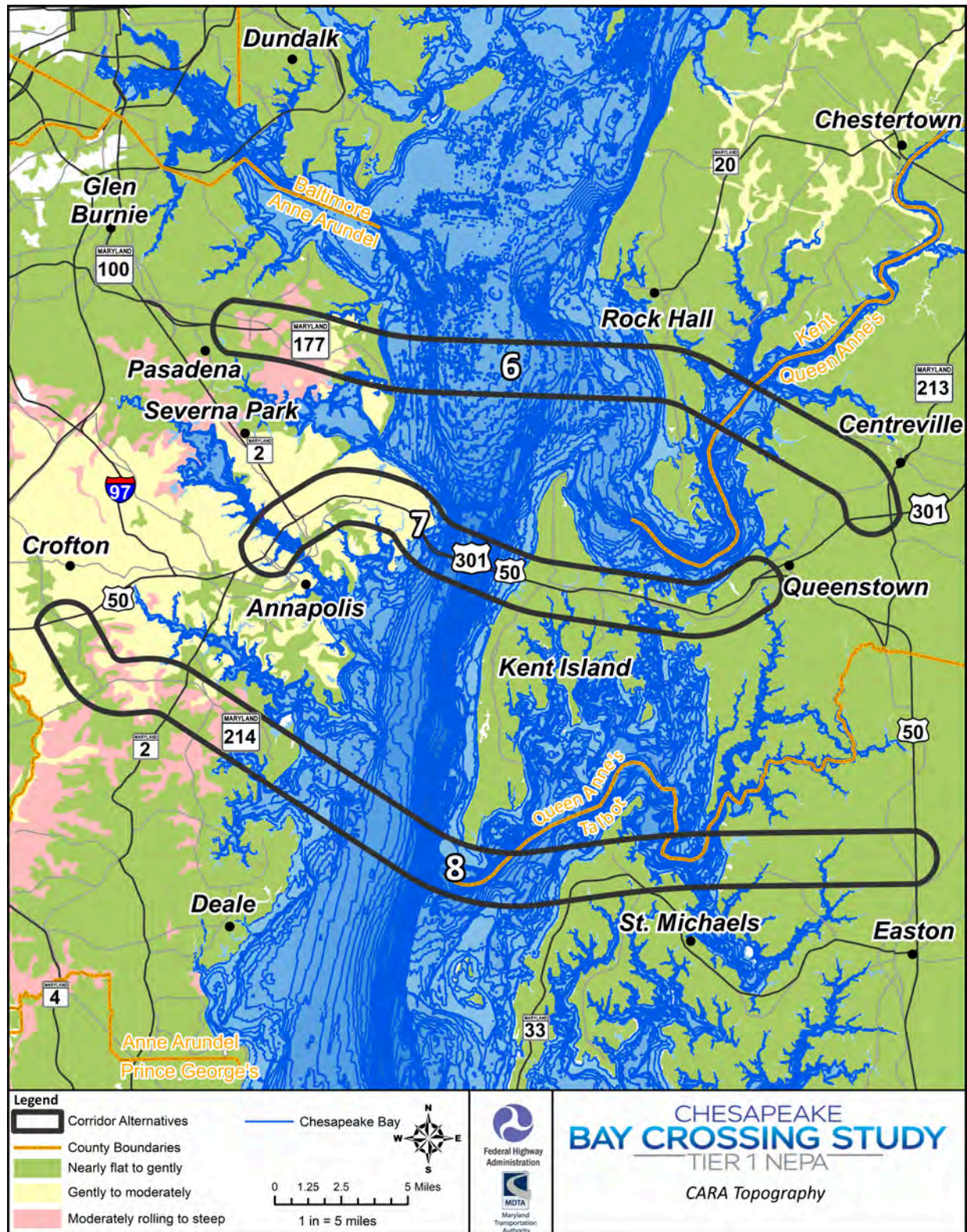
4.4.8 Topography, Soils and Geology

To provide a comparative analysis of potential impacts associated with topography, this study concentrated on areas mapped as steep slopes. The United States Department of Agriculture (USDA) Natural Resource Conservation Service defines steep slopes as those with gradients of 15 percent or greater. However, projects located in the Chesapeake Bay Critical Area may be subject to a more restrictive definition of steep slopes. Slopes provide an environment for movement of soils and pollutants during land disturbance activities. While soils have varying degrees of erodibility, all soils are subject to movement especially on steep slopes. Preservation of steep slopes adjacent to watercourses is especially important because of the potential of adverse effects on water quality and aquatic habitat.

To provide a comparative analysis of potential impacts associated with soils, this study focuses on soils that are classified as hydric, partially hydric, or highly erodible. Hydric and partially hydric soils are typically those associated with jurisdictional wetlands. Highly erodible soils are defined as soils with an erodibility factor K greater than 0.35 and with a slope greater than 5 percent. K factor is the soil erodibility factor which represents both susceptibility of soil to erosion and the rate of runoff.

A comparison of the amount of steep slopes, hydric or partially hydric soils, and highly erodible soils located within each of the three study corridors is presented in **Table 4-32**. Steep slopes are depicted on **Figure 4-16** and defined as slopes of 15 percent or greater. This steep slope and soils information was obtained from the Maryland iMap dataset. The source for the soils data was the *Soil Survey Geographic Database for Maryland*. Topography relative to aquatic habitat is also represented on **Figure 4-16**. Deep water habitats were identified within the limits of Corridors 7 and 8. These deep water areas may serve as refuge areas for fish and shellfish as discussed in **Section 4.4.7**. Deep water habitat was not identified within the limits of Corridor 6.

Figure 4-16: Topography



The land that comprises Maryland is part of six physiographic regions. A physiographic region is an underlying area in which the geology and climate history have resulted in landforms that are distinctly different from adjacent areas. The study area for the CARA corridors are located entirely within the Atlantic Coastal Plain physiographic region. The Atlantic Coastal Plain is underlain by unconsolidated sediments including gravel, sand, silt, and clay which overlaps the rocks of the eastern Piedmont along an irregular line of contact known as the Fall Zone.

A graphic depiction of the underlying geology associated with the three study corridors is provided in **Figure 4-17**.

Table 4-32: Topography & Soils

CORRIDOR	STEEP SLOPES (ACRES)	STEEP SLOPES PERCENTAGE OF TOTAL CORRIDOR STUDY AREA	HYDRIC & PARTIALLY HYDRIC SOILS (ACRES)	HYDRIC AND PARTIALLY HYDRIC SOILS PERCENTAGE OF TOTAL CORRIDOR STUDY AREA	HIGHLY ERODIBLE SOILS (ACRES)	HIGHLY ERODIBLE SOILS PERCENTAGE OF TOTAL CORRIDOR STUDY AREA
6	2,090	6%	3,580	10%	5,560	16%
7	0	0%	5,390	20%	9,280	33%
8	3,090	7%	8,250	18%	9,050	19%

Note: values rounded to closest 10 acres.

4.4.8.1 Corridor 6

Corridor 6 intersects with approximately 2,090 acres of land identified as having moderately rolling to steep slopes (**Figure 4-16**). Relatively large areas of steep slopes were identified within the western portion of Corridor 6, adjacent to MD 177. This constitutes a relatively large percentage of the total land area within this section of the corridor. The section of Corridor 6 that spans the Eastern Shore is mapped entirely with nearly flat to gently rolling soils with no mapped steep slopes.

Corridor 6 contains approximately 3,580 acres of mapped hydric and partially hydric soils and 5,560 acres of mapped highly erodible soils. The vast majority of these areas are located within the eastern portion of the corridor, along the Eastern Shore (**Figure 4-18**).

4.4.8.2 Corridor 7

No steep slope areas were identified within the limits of Corridor 7 (**Figure 4-16**). The slopes within the western portion of the corridor are generally mapped as gently to moderately rolling while the section of Corridor 7 that spans Kent Island and the Eastern Shore are almost entirely mapped as nearly flat to gently rolling slopes.

Corridor 7 does contain large areas of highly erodible soils (approximately 9,280 acres), primarily within the western portion of the corridor, adjacent to the Bay and on Kent Island, with lesser concentrations along the Eastern Shore near Queenstown, MD. Corridor 7 also contains approximately 5,390 acres of mapped hydric and partially hydric soils with large areas identified on Kent Island and the Eastern Shore with lesser concentrations within the western portion of the corridor study area (**Figure 4-18**).

Figure 4-17: Geology

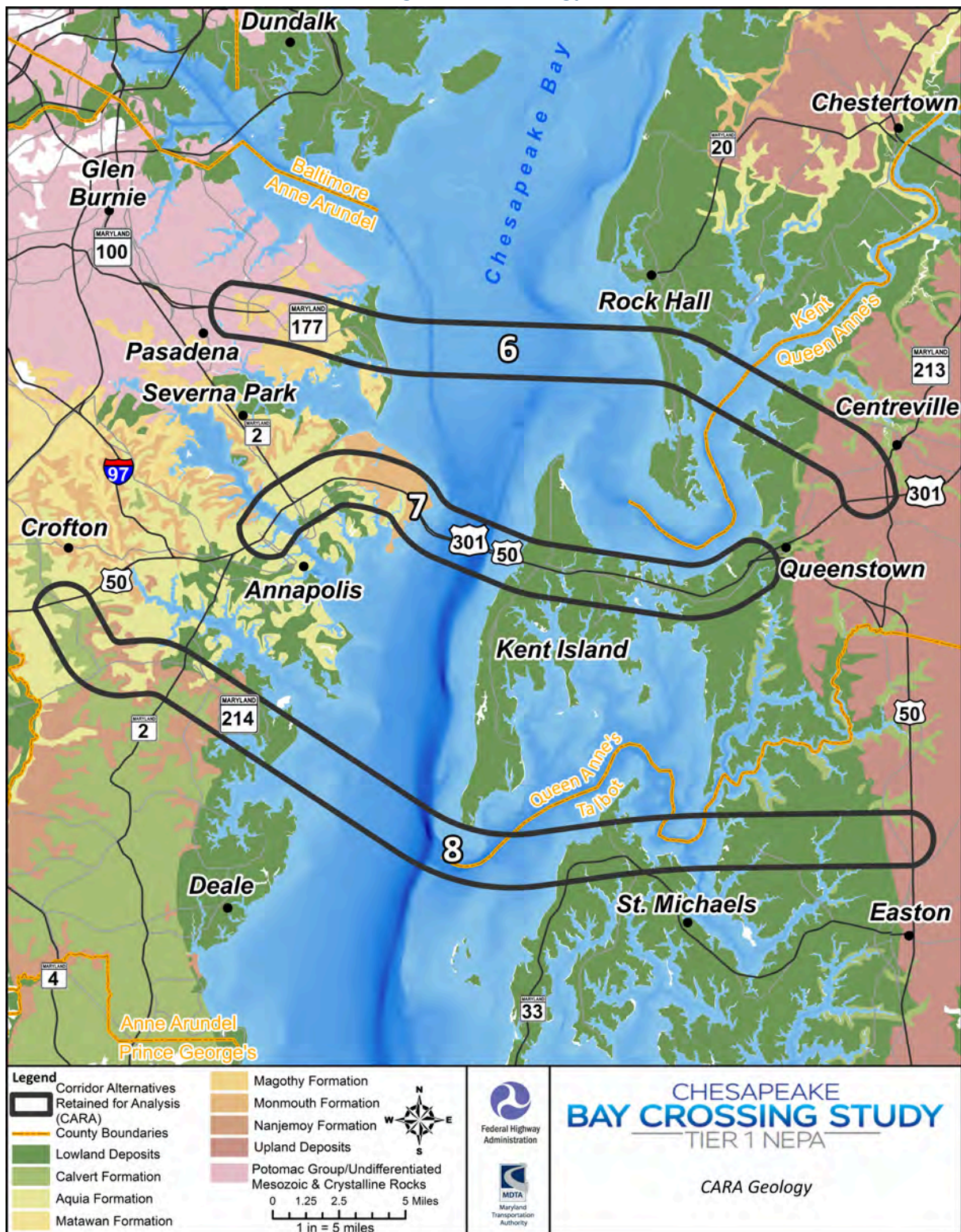
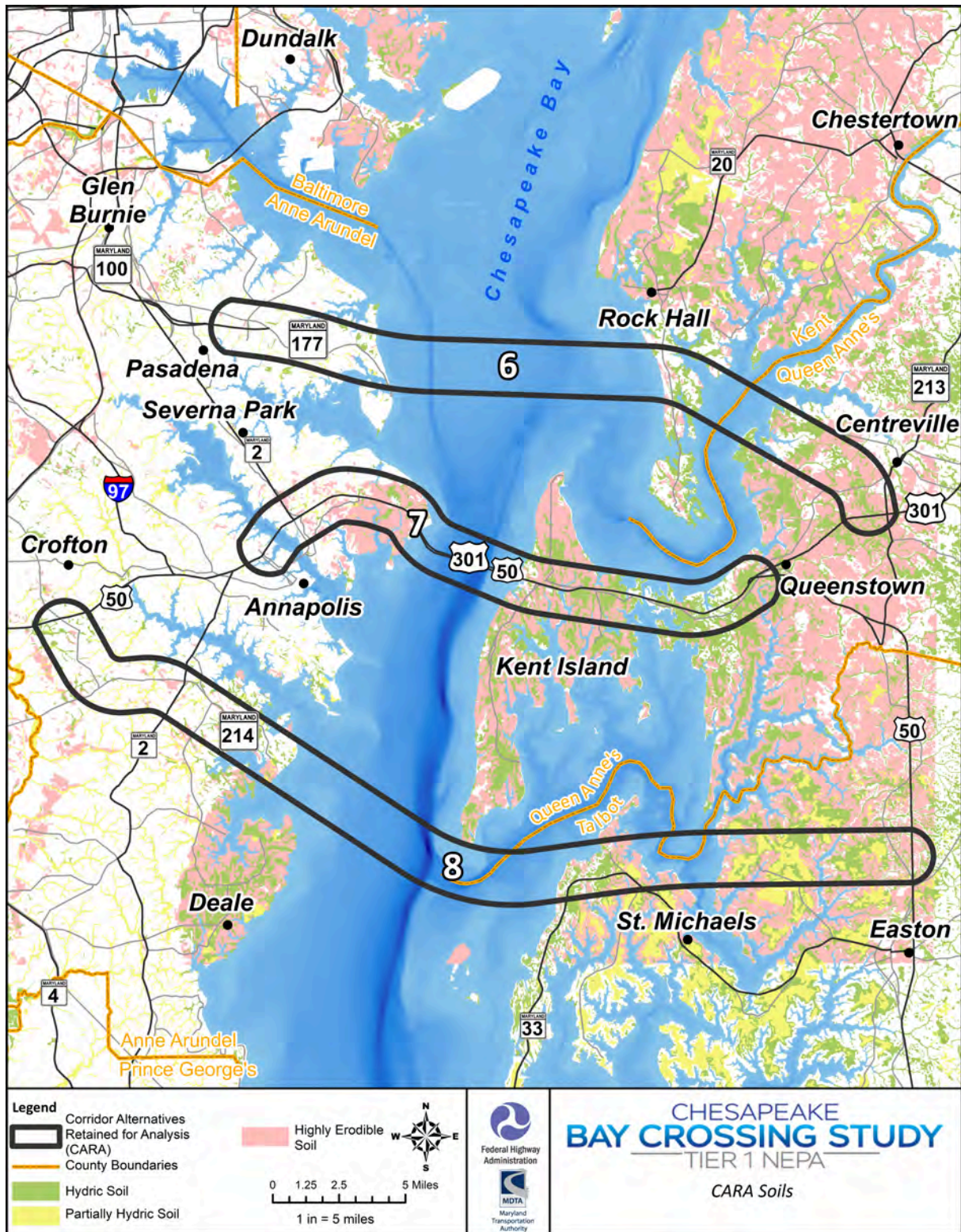


Figure 4-18: Soils



4.4.8.3 Corridor 8

Corridor 8 intersects with approximately 3,090 acres of land mapped as steep slopes and are almost exclusively located within the western portion of the corridor. No steep slopes were mapped within the eastern portion of the corridor (**Figure 4-16**).

Corridor 8 contains approximately 8,250 acres of mapped hydric and partially hydric soils, the majority of which were identified within the eastern portion of the corridor, near the town of St. Michaels and further east within the corridor. Also, the majority of the 9,050 acres of mapped highly erodible soils were identified within the eastern portion of the corridor (**Figure 4-18**).

4.4.8.4 Conclusions

According to the GIS mapping resources Corridor 8 contains the highest amount of steep slopes, hydric and partially hydric soils. Corridor 7 contains the highest amount of highly erodible soils.

Slope length and steepness are key influences on both the volume and velocity of surface runoff. Longer slopes deliver more runoff and steeper slopes increase runoff velocity. Preservation of steep slopes adjacent to watercourses is especially important because of the potential of adverse effects on water quality and aquatic habitat. Activities occurring within areas with steep slopes or highly erodible soils must adhere to the standards set forth in the [2011 Maryland Standards and Specifications for Soil Erosion and Sediment Control](#). Further minimization and avoidance strategies would be implemented once a limit of disturbance associated with a more defined project area is established.

Although this Tier 1 study limited soils analysis to hydric, partially hydric, and highly erodible soils, the presence of other soils, including acidic soils, will require a more detailed analysis should a preferred corridor be carried forward to a more comprehensive Tier 2 study. Land disturbance within areas of acidic soils (pH lower than 5.5) will require strict adherence to stormwater management and erosion and sediment control requirements as well as other possible special handling procedures.

Understanding the geologic conditions underlying a project area is important in determining whether a project would be exposed to potential geologic hazards including landslides or seismic effects. Geologic hazards are defined by the USGS as “naturally occurring phenomena capable of causing loss or damage”. According to the USGS, the study areas for all three corridors are located within a geologic region with a low to medium risk for seismic hazard. A low to medium risk is further defined as an area with an expected number of damaging seismic activities of 4 to 10 every 10,000 years.

4.4.9 Sea Level Rise

Climate change is a result of increased greenhouse gases emissions associated with human activities. One of the effects of climate change is the rise in sea levels. According to NOAA, global sea levels have risen approximately 2.6 inches since the advent of satellite sea level tracking in 1993 and continue to rise at a rate of one eighth of an inch per year. Sea level rise is the result of thermal expansion caused by warming oceans and increased melting of land-based ice. In the United States, approximately 40 percent of the population live in high-density coastal areas that are vulnerable to the effects of sea level rise. With over 3,100 miles of bay and coastline, Maryland is especially vulnerable to rising sea levels.

The Maryland Commission on Climate Change (MCCC) was established by Executive Order (EO 01.01.2007.07) and charged with the development of an action plan for mitigation and adaptation to the projected consequences of climate change including the associated rise in sea level. The MCCC action plan emphasizes the need for strategic planning for transportation-related projects as proposed new routes can channel development patterns for decades or even centuries. The action plan provides the basis for guiding and prioritizing state-level activities with respect to both climate science and adaptation policy over the near and long term. The action plan was the catalyst for the Greenhouse Gas Emissions Act (GGRA) of 2009. The GGRA requires the State to reduce greenhouse gas emissions by 25 percent from a 2006 baseline by 2020. Supported by subsequent MCCC reports, the GGRA was extended in 2016 to achieve the goal of reducing emissions by 40 percent by 2030.

A comparative analysis of the total amount of land area susceptible to sea level rise was performed for the three study area corridors. **Table 4-33** below identifies the total area of land, in acres, susceptible to sea level rise based on projections for 2050 and 2100. This data was obtained from the Maryland iMap GIS portal using the *Maryland Sea Level Rise by County in 2050 & 2100* datasets.

Table 4-33: Sea Level Rise

CORRIDOR	LAND AREA SUSCEPTIBLE TO SEA LEVEL RISE (2050) (ACRES)	PERCENTAGE OF TOTAL CORRIDOR STUDY AREA SUSCEPTIBLE TO SEA LEVEL RISE (2050)	LAND AREA SUSCEPTIBLE TO SEA LEVEL RISE (2100) (ACRES)	PERCENTAGE OF TOTAL CORRIDOR STUDY AREA SUSCEPTIBLE TO SEA LEVEL RISE (2100)
6	350	1%	1,470	4%
7	1,310	5%	3,230	12%
8	680	1%	1,620	3%

Note: values rounded to closest 10 acres.

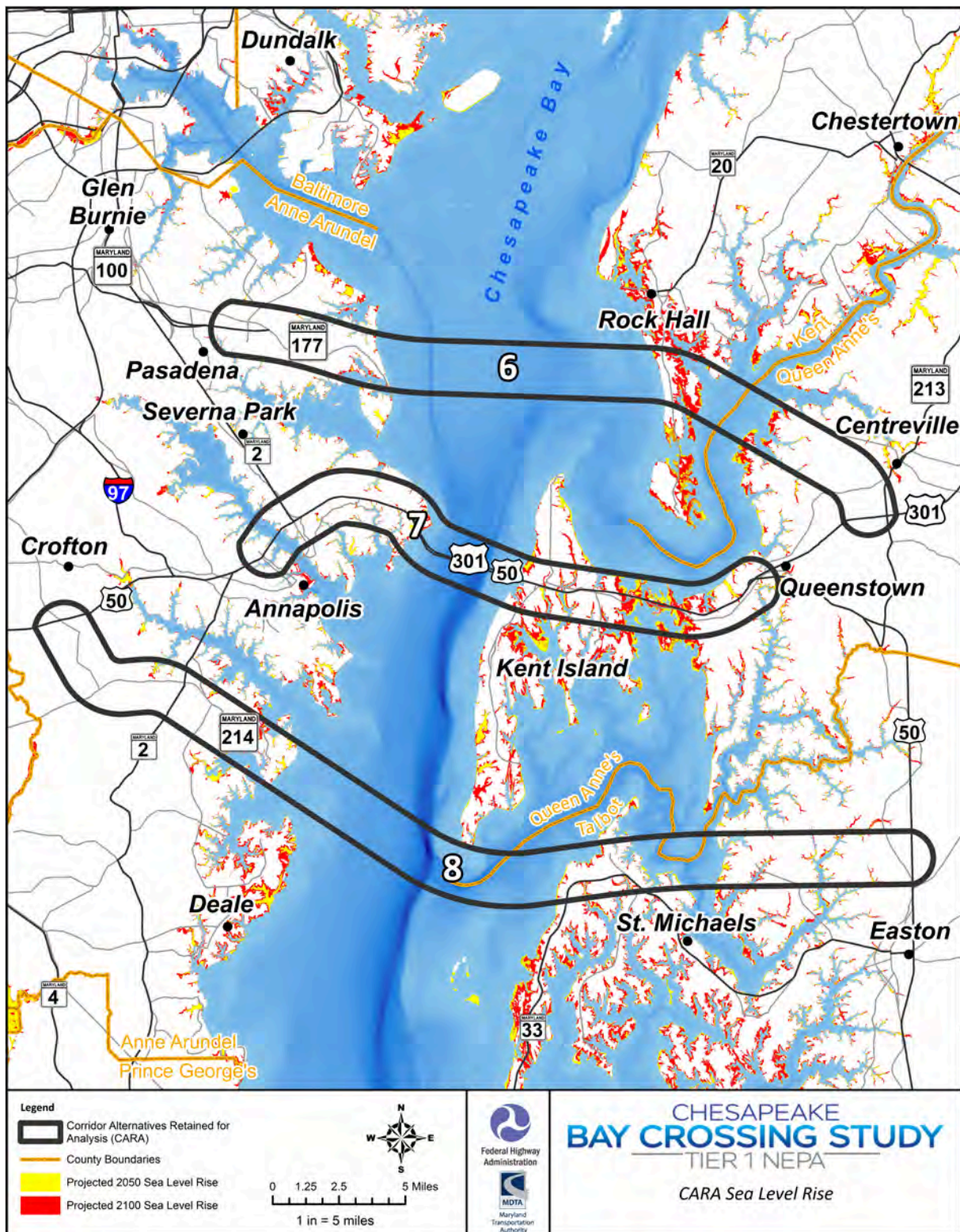
4.4.9.1 Corridor 6

Corridor 6 contains the least amount of total land area susceptible to sea level rise based on the projections for 2050 and 2100. The highest concentrations are located within the eastern section of the corridor and are generally associated with Eastern Neck Island and the shoreline of the Chester River (**Figure 4-19**).

4.4.9.2 Corridor 7

Corridor 7 contains the highest amount of total land area susceptible to sea level rise based on the projections for 2050 and 2100. The highest concentrations are located within the section of the corridor that spans Kent Island and at Kent Narrows and the Chester River in the eastern portion of the corridor (**Figure 4-19**).

Figure 4-19: Sea Level Rise



4.4.9.3 Corridor 8

Relative to the length of the corridor, Corridor 8 contains a comparatively small amount of total land area susceptible to sea level rise based on projections for 2050 and 2100. The highest concentrations are located within the western section of the corridor and are generally associated with the tidal inlets and waterways adjacent to the Bay (**Figure 4-19**).

4.4.9.4 Conclusions

According to the GIS mapping resources, Corridor 7 contains the highest amount of land area susceptible to a rise in sea level, both in total land area and total area relative to the corridor size. However, because of the coastal location of the three corridor study areas, spanning areas susceptible to sea level rise is unavoidable.

Over time, sea level rise and the associated tidal and storm surges will have impacts on coastal transportation infrastructure. Therefore, comprehensive analysis and adaptation to these potential impacts will be an important component of medium and long-range planning, and project development. It will also become increasingly important to continually incorporate adaptive management processes into planning as more updated data becomes available. According to FHWA, adaption strategies are actions taken to respond to vulnerabilities associated climate change and an associated rise in sea levels to ensure transportation reliability and resiliency. FHWA examples of adaptive strategies associated with transportation planning, include:

- Installation of flood barriers
- Elevating specific elements of critical infrastructure above the projected flood elevations
- Moving facilities to higher ground
- Designing assets for quick restoration after an extreme weather event
- Evacuation route planning

Because of the coastal location of the three corridor study areas, spanning areas susceptible to sea level rise is unavoidable. Over time, sea level rise and the associated tidal and storm surges will have impacts on coastal transportation infrastructure. Therefore, comprehensive analysis and adaptation to these potential impacts will be an important component of medium and long-range planning and project development. It will also become increasingly important to continually incorporate adaptive management processes into planning as more updated data becomes available.

4.5 HAZARDOUS MATERIALS

4.5.1 Introduction and Methodology

Under NEPA, evaluation of hazardous materials, solid waste, and pollution prevention includes the evaluation of:

- Waste streams that would be generated by a project, potential for the wastes to impact environmental resources, and the impacts on waste handling and disposal facilities that would likely receive the wastes;

- Potential hazardous materials that could be used during construction and operation of a project, and applicable pollution prevention procedures;
- Potential to encounter existing hazardous materials at contaminated sites during construction, operation, and decommissioning of a project; and
- Potential to interfere with any ongoing remediation of existing contaminated sites at the proposed project site or in the immediate vicinity of a project site.

Several federal laws ensure remediation of contaminated sites. Two of the most prominent laws include the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA or "Superfund") and the Resource Conservation Recovery Act (RCRA), which includes the Underground Storage Tank (UST) program and the Oil Pollution Act (OPA). In general, CERCLA applies to contaminated sites, while RCRA's focus is on controlling the ongoing generation and management of particular waste streams. RCRA, like CERCLA, has provisions to require cleanup of contaminated sites that occurred in the past. At the State level, analogous Maryland programs include the Maryland Department of the Environment (MDE) Land Restoration Program (LRP), MDE Voluntary Cleanup Program (VCP), and MDE Controlled Hazardous Substance (CHS) Enforcement Division. More detailed discussion of the regulatory context is included in the [BCS Hazardous Materials Technical Report, Section 3.0](#).

Both federal (USEPA) and State (MDE) environmental databases were reviewed for current and/or historical contamination or hazardous materials concerns within the CARA. The investigation included a desktop evaluation of readily accessible records involving properties with environmental concerns and a cross-check of location data to ensure parcel and address information was accurate. The database review was performed in accordance with the requirements of the Council on Environmental Quality (CEQ) regulation section 1508.9, Environmental Assessment, as required by NEPA. Sites only needed to be identified in one governmental database to be included, although several sites were identified in multiple databases. Additionally, although some of the reviewed databases may contain similar or duplicative information on sites of concern, all of the data, as well as descriptions for each database retained for review, is included in the [BCS Hazardous Materials Technical Report](#) for relative comparison among the CARA.

Due the large volume of facilities/sites identified during the database review, it was important to designate a specific priority ranking to each facility/site based on the likelihood that they could potentially impact construction activities. While facilities/sites may have characteristics applicable to more than one rank, for the purposes of this Study, each site was assigned the highest applicable priority ranking as a default.

Each identified facility/site was assigned a Low, Moderate or High priority ranking based on the characteristics outlined below. Additionally, the characteristic criteria are ranked based on potential to impact construction activities (1- least impact, 11- most impact).

- Low Priority
 - No history of contamination or spills
 - Site is a USEPA Regulated Facility
 - Site with an MDE case that is closed with details outlining final determination
 - Site is in the Maryland Hazardous Waste Program

- Moderate Priority
 - Substantial property size (> 10 acres)
 - Insufficient information available
 - Federal Military Installation
 - Site with an MDE case that is closed with insufficient explanation outlining final determination
 - Site has a history of contamination, dumping and/or spills
- High Priority
 - MDE case and the site is open;
 - Superfund NPL listing

4.5.2 Hazardous Materials Database Review

Data within the following databases was accessed on January 27, 2020:

- Federal Military Installations;
- Facility Registry System (FRS)
 - Assessment, Cleanup and Redevelopment Exchange System (ACRES)
 - Compliance and Emissions Data Reporting Interface (CEDRI)
 - Federal Facility Hazardous Waste Compliance Docket (FFDOCKET)
 - Leaking Underground Storage Tank- American Recovery and Reinvestment Act (LUST-ARRA)
 - Maryland- Resource Conservation and Recovery Act Information System (MD-RCRA)
 - Maryland- Tools for Environmental Management and Protection Organizations (MD-TEMPO)
 - National Compliance Data Base (NCDB)
 - RCRAInfo
 - Risk Management Plan (RMP)
 - Superfund Enterprise Management System (SEMS) Search
 - Toxics Release Inventory System (TRIS)
 - Toxic Substances Control Act (TCSA)
- Maryland Department of the Environment (MDE) Land Restoration Program (LRP)
 - Voluntary Cleanup Program (VCP)/ Brownfields Division
 - Controlled Hazardous Substance (CHS) Enforcement/Fund Lead Site Assessment Division

As a result of the CARA analysis, 176 facilities/sites were identified which could potentially impact construction activities; 41 facilities/sites in Corridor 6, 99 facilities/sites in Corridor 7, and 34 facilities/sites in Corridor 8. Facility/site information including site names, addresses, GPS coordinates, database and environmental interest, reason for priority ranking, priority ranking, reference URLs (if applicable), and current status (active, inactive, unknown) are included in the [BCS Hazardous Materials Technical Report](#). Figures illustrating the physical location in relation to Corridors 6, 7, and 8 are included in **Appendix A**.

4.5.3 Summary

To summarize, an evaluation within Corridor 6, Corridor 7, and Corridor 8 was completed to identify facilities/sites with current and/or historical contamination or hazardous materials concerns. Identified facilities/sites were then further evaluated to determine their potential to affect corridor planning and impact construction activities. A low, moderate, or high priority ranking was applied to each facility/site based on their probability of presenting concerns from a corridor or alignment planning perspective. The results are summarized below in **Table 4-34**. Maps of the identified facilities/sites are included in **Appendix A**.

Table 4-34: Results Summary

	LOW PRIORITY	MODERATE PRIORITY	HIGH PRIORITY	TOTAL
Corridor 6	24	17	0	41
Corridor 7	63	33	3	99
Corridor 8	28	7	1	36

At this time, it is unknown how many potential hazardous materials sites would be impacted or be able to be avoided by a specific alignment. Based on the desktop database evaluation, all identified sites can potentially be avoided during the alignment planning phase. Accordingly, as the project progresses through subsequent phases of detailed CARA analysis and beyond to a Tier 2 Study, MDTA will investigate reasonable and feasible hazmat avoidance, minimization, and mitigation options. In the event that known hazmat sites cannot be avoided during alignment planning, studies will be conducted to identify containment and remediation/mitigation options to minimize the release of potential hazmat elements.

4.6 AIR QUALITY

4.6.1 Regulatory Context and Methodology

Various federal and state regulations and guidance require potential impacts on air quality be considered during the NEPA review of transportation projects. Major regulations and guidance related to the potential air quality impacts of transportation projects include:

- [The Clean Air Act \(CAA\) and Amendments, 42 U.S.C. 7401 *et seq.*](#)
- [The Transportation Conformity Rule, 40 CFR part 93 subpart A](#)
- [Environmental Protection Agency \(USEPA\) Transportation Conformity Guidance for the South Coast II Court Decision](#) (November 2018)
- [FHWA Updated Interim Guidance on Mobile Source Air Toxic Analysis in NEPA Documents](#) (October 18, 2016)
- [The Greenhouse Gas Reduction Act of 2009, Md. ENVIRONMENT Code Ann. § 2-1201 - § 2-1211](#)
- [General Emissions Standards, Prohibitions, and Restrictions - Particulate Matter, COMAR 26.11.06.03](#)

The goal for the BCS Tier 1 Study air quality assessment was to provide comparison among the CARA regarding the potential air quality impacts from alternative alignments to be developed in a future Tier 2 study. The methodology used to analyze potential differences includes consideration of CAA transportation conformity requirements, mobile source air toxics, traffic characteristics, greenhouse gases, and construction emissions. This Tier 1 air quality assessment involved reviewing existing EPA National Ambient Air Quality Standard (NAAQS) designations within the CARA to determine what transportation conformity requirements would apply in a potential future Tier 2 NEPA analysis. Likely Mobile Source Air Toxics analysis needs for a potential future Tier 2 NEPA analysis were considered by examining predicted traffic volumes. The traffic characteristics of speeds and truck volumes were compared as they correlate to potential vehicle emissions. Greenhouse gas and construction requirements were qualitatively considered.

4.6.2 Clean Air Act

4.6.2.1 Requirements

The CAA outlines transportation conformity requirements for highway projects involving FHWA approval to ensure air quality goals will be met with project implementation. Transportation conformity applies in geographic areas identified by the USEPA as having exceeded NAAQS for transportation related pollutants. For projects in these areas a transportation conformity determination must be completed prior to approval of the final NEPA document, in this case during a potential future Tier 2 analysis, to demonstrate these requirements are met and show the project will not:

- cause new NAAQS violations,
- worsen existing NAAQS violations, or
- delay timely attainment of relevant NAAQS or interim milestones (42 U.S.C. 7506(c)).

The purpose of these requirements is to ensure the project conforms to, or is consistent with, the State Implementation Plan (SIP). A SIP is a collection of regulations and documents used by a state, territory, or local air district to reduce air pollution in nonattainment/maintenance areas and ensure NAAQS implementation, maintenance, and enforcement. NAAQS dictate pollutant levels which protect public and environmental health. Attainment areas are designated where pollutant levels do not exceed the NAAQS. Nonattainment areas are designated where pollutant levels exceed NAAQS. Maintenance areas are designated where pollutant levels have improved from NAAQS nonattainment to attainment and require monitoring to ensure air quality programs maintain pollutant levels which do not exceed the NAAQS.

NAAQS have been established for five pollutants emitted from transportation activities:

- Ozone (O₃);
- Coarse particulate matter (PM₁₀);
- Fine particulate matter (PM_{2.5});
- Nitrogen dioxide (NO₂); and
- Carbon monoxide (CO).

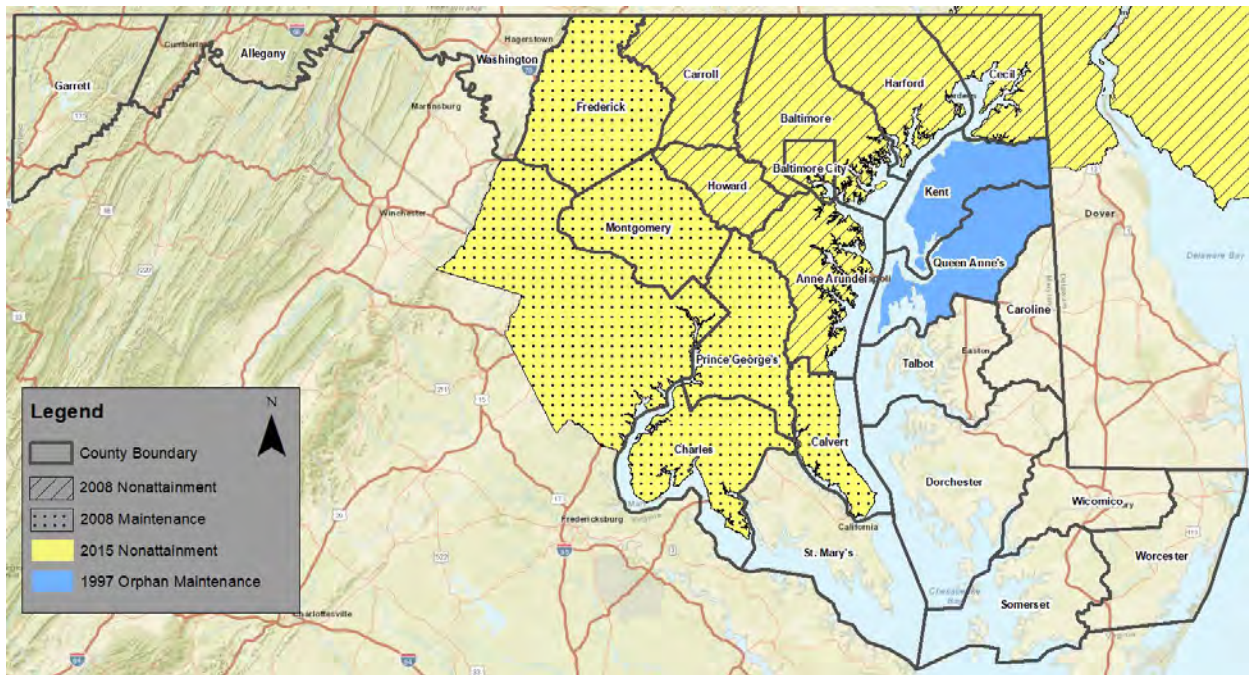
USEPA periodically establishes new NAAQS and rescinds existing NAAQS based on rigorous scientific review, resulting in multiple NAAQS for some pollutants. When discussed, NAAQS are generally distinguished by year of USEPA establishment and time over which pollutant measurements are averaged.

4.6.2.2 Existing Conditions

As currently designated by USEPA, Maryland is in attainment of the PM₁₀, PM_{2.5}, NO₂ and CO NAAQS. Baltimore City and 11 Maryland counties (Anne Arundel County, Baltimore County, Calvert County, Carroll County, Cecil County, Charles County, Frederick County, Harford County, Howard County, Montgomery County, and Prince George's County) are in 2015 O₃ 8-hour NAAQS nonattainment areas (**Figure 4-20**). Baltimore City and 6 Maryland counties (Carroll County, Baltimore County, Harford County, Cecil County, Howard County, and Anne Arundel County) are also in 2008 O₃ 8-hour NAAQS nonattainment areas, while 5 Maryland counties (Frederick County, Montgomery County, Prince George's County, Charles County, and Calvert County) are within a 2008 O₃ 8-hour NAAQS maintenance area. Kent County and Queen Anne's County are located in an orphan 1997 O₃ 8-hour NAAQS maintenance area. The term "orphan" notes that although the 1997 O₃ 8-hour NAAQS was revoked in 2015, this area is still subject to transportation conformity requirements (USEPA 2018 *Transportation Conformity Guidance for the South Coast II Court Decision*).

4.6.2.3 Assessment

West of the Bay, Corridors 6, 7, and 8 are located in Anne Arundel County, which is in both 2008 and 2015 O₃ NAAQS nonattainment areas. East of the Bay, Corridors 6, 7, and 8 are located partially in Queen Anne's County, which is in a 1997 O₃ NAAQS orphan maintenance area. A conformity determination would be completed for the preferred alternative identified during a potential future Tier 2 NEPA analysis regardless of the Corridor since Corridors 6, 7, and 8 each would be located within O₃ 2008 and 2015 NAAQS nonattainment areas as well as 1997 orphan maintenance. Conformity determination requirements for projects within an O₃ 8-hour nonattainment/maintenance area, as well as O₃ 8-hour orphan maintenance areas, are fulfilled when the project is included in both the applicable conforming Long-Range Transportation Plan (LRTP) and Transportation Improvement Program (TIP) with descriptions consistent with the current design concept and scope (40 CFR 93.109). An LRTP is a federally mandated planning document for urbanized areas which describes long-term plans to operate, maintain, and expand transportation infrastructure over a minimum planning horizon of 20 years. A TIP, complementary to the LRTP, is a federally mandated planning document for urbanized areas which describes short-term transportation infrastructure plans over a planning horizon of at least four years. Additional detail is included in the [*BCS Air Quality Technical Report*](#).

Figure 4-20: Maryland O₃ 8-Hour NAAQS Nonattainment and Maintenance Areas

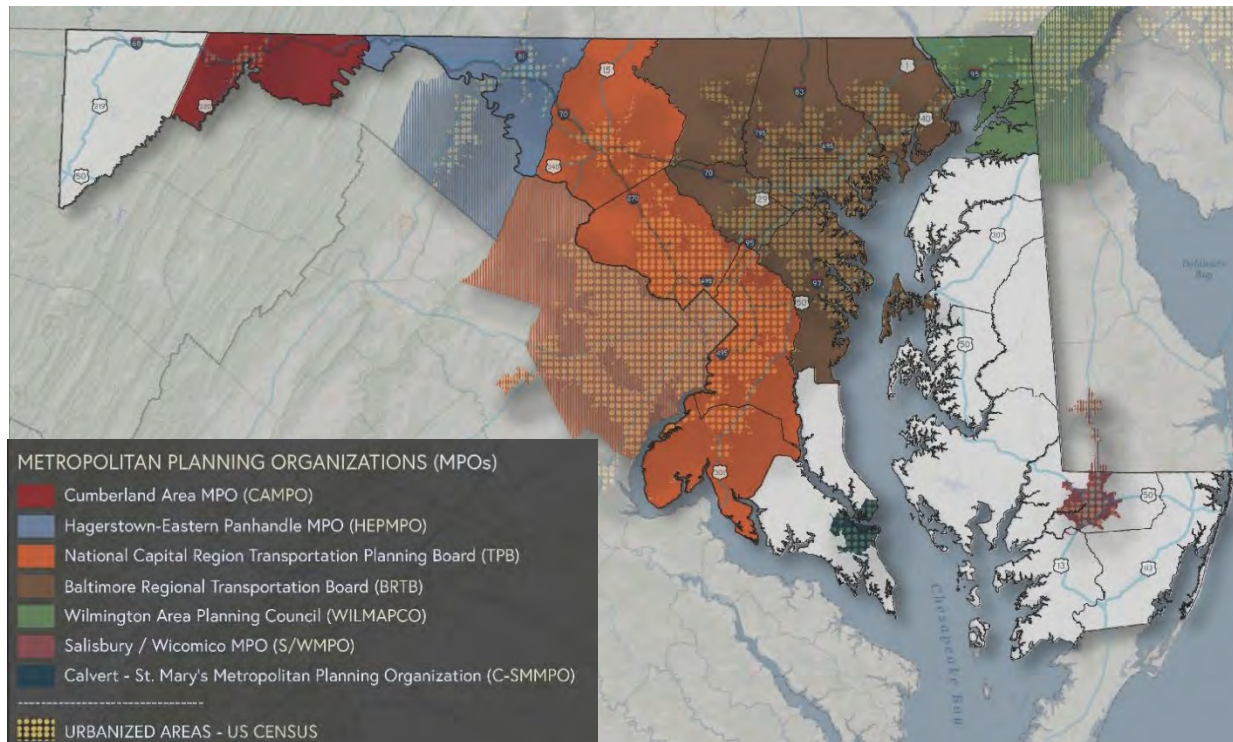
LRTP and TIP documents are developed by the governing Metropolitan Planning Organization (MPO), which is also responsible for ensuring the LRP and TIP conform to the SIP. An MPO is a federally mandated and federally-funded transportation policy-making organization made up of representatives from local governments and governmental transportation authorities. For O₃ 8-hour nonattainment/maintenance areas, the project must be included in the conforming TIP and LRTP for the region as part of the determination that the project also conforms to the SIP. There are seven MPO authorities in Maryland (**Figure 4-21**). Corridors 6, 7, and 8 are located partially within the area under the jurisdiction of the Baltimore Regional Transportation Board (BRTB) MPO and any preferred alternative identified during a potential future Tier 2 NEPA analysis would need to be properly included in the BRTB financially constrained TIP and LRTP descriptions to satisfy conformity determination requirements. This may require an amendment to the TIP and LRTP. A new bay crossing is not listed in either the current BRTB 2020-2023 TIP or Maximize 2045 LRP. The preferred alternative will need to meet the conformity requirements of the Clean Air Act Section 176(c) as appropriate.

4.6.3 Mobile Source Air Toxics

4.6.3.1 Requirements

In conjunction with the CAA Amendments of 1990, Congress mandated USEPA regulate 188 hazardous air pollutants. Of these pollutants, USEPA identified the following nine compounds with significant contributions from mobile sources that are among the national and regional-scale cancer risk drivers or contributors and non-cancer hazard contributors: 1,3-butadiene; acetaldehyde; acrolein; benzene; diesel PM; ethylbenzene; formaldehyde; naphthalene; and polycyclic organic matter. While FHWA currently considers these the priority Mobile Source Air Toxics (MSAT), the list is subject to change and may be adjusted in consideration of future USEPA rules.

Figure 4-21: Maryland MPO Authorities



Depending on project scope and anticipated changes in traffic volumes due to the project, either a qualitative discussion, qualitative analysis, or quantitative analysis must be included in NEPA documentation (FHWA 2016 *Updated Interim Guidance on Mobile Source Air Toxic Analysis in NEPA Documents*). Qualitative MSAT discussion is recommended for projects with no meaningful impacts on traffic volumes, which are considered by FHWA to have no potential MSAT effects. Qualitative MSAT analysis is recommended for projects that improve highway operations which impact traffic volumes without adding substantial new capacity and have design year annual average daily traffic estimates below 140,000 vehicles per day (VPD). Such projects are considered by FHWA to have low potential MSAT effects. Quantitative MSAT analysis is recommended for projects located in proximity to populated areas which either create new capacity or create significant additional capacity that is above 140,000 VPD in the design year. Such projects are considered by FHWA to have higher potential MSAT effects. Both quantitative and qualitative analyses would involve comparing a preferred alternative alignment to the No-Build Alternative during a potential future Tier 2 NEPA analysis.

4.6.3.2 Assessment

Tables 4-35 and 4-36 display projected design year 2040 ADT volumes for the CARA on non-summer weekdays and summer weekends. Shaded cells represent the values utilized for MSAT considerations. The No-Build Alternative was not used in determining likely MSAT analysis needs. The No-Build Alternative would be considered in the potential future Tier 2 NEPA analysis, regardless of the Corridor. These values are indicative of the likely level of MSAT analysis needed for any preferred alternative alignment identified during a potential future Tier 2 NEPA analysis.

Table 4-35: 2040 Non-Summer Weekday Projected Average Daily Traffic Volumes (VPD)

CROSSING	NO-BUILD	CORRIDOR 6	CORRIDOR 7	CORRIDOR 8
Existing Bay Bridge	84,300	69,600	44,900	68,100
New Crossing	N/A	18,200	44,900	20,000
Total – Existing Bridge and New Crossing	84,300	87,800	89,800	88,100

Note: Shaded cells represent the values considered in determining the likely MSAT analysis needs

Table 4-36: 2040 Summer Weekend Projected Average Daily Traffic Volumes (VPD)

CROSSING	NO-BUILD	CORRIDOR 6	CORRIDOR 7	CORRIDOR 8
Existing Bay Bridge	135,300	111,200	79,700	104,300
New Crossing	N/A	45,700	79,700	55,200
Total – Existing Bridge and New Crossing	135,300	156,900	159,400	159,500

Note: Shaded cells represent the values considered in determining the likely MSAT analysis needs

On both non-summer weekdays and summer weekends, a new crossing within Corridor 6 is projected to have an ADT below 140,000 VPD, yet since a new crossing within Corridor 6 would add capacity, the alternative alignment in a Tier 2 NEPA analysis would have low potential MSAT effects and a qualitative MSAT analysis would be considered.

Corridor 7 encompasses the Bay Bridge. Therefore, the combined total projected ADT at both the new crossing and the Bay Bridge would be considered in determining the type of MSAT analysis that would likely be most appropriate for Corridor 7. On non-summer weekdays Corridor 7 does not exceed 140,000 VPD but does exceed 140,000 VPD on summer weekends in 2040. Additionally, Corridor 7 is located in proximity to populated areas in both Annapolis and Kent Island. Therefore, any alternative alignment in a Tier 2 NEPA analysis would have a higher potential MSAT effect and a quantitative MSAT analysis be considered.

Similar to Corridor 6, a new crossing within Corridor 8 has projected traffic volumes less than 140,000 VPD on both non-summer weekdays and summer weekends, and a new crossing within Corridor 8 would add capacity. Therefore any alternative alignment in a Tier 2 NEPA analysis in this corridor would have a low potential MSAT effect and a qualitative MSAT analysis would be considered.

4.6.4 Traffic Characteristics

4.6.4.1 Assessment

Projected traffic characteristics from alternatives under consideration may also be indicators of relative levels of vehicle emissions. Two of these characteristics include travel speed and truck percentage.

Tables 4-37 and 4-38 reflect the average daily 2040 design year non-summer weekday and summer weekend vehicle speeds in each direction for the CARA and No-Build alternatives at the respective crossing of the Bay.

Table 4-37: 2040 Non-Summer Weekday Average Daily Vehicle Speeds (MPH)

CROSSING		NO-BUILD	CORRIDOR 6	CORRIDOR 7	CORRIDOR 8
Existing Bay Bridge	Eastbound	42	45	45	45
	Westbound	43	45	45	45
New Crossing	Eastbound	N/A	55	55	55
	Westbound	N/A	55	55	55

Note: Speeds rounded to closest 1 MPH

Table 4-38: 2040 Summer Weekend Average Daily Vehicle Speeds (MPH)

CROSSING		NO-BUILD	CORRIDOR 6	CORRIDOR 7	CORRIDOR 8
Existing Bay Bridge	Eastbound	35	41	45	44
	Westbound	37	45	45	45
New Crossing	Eastbound	N/A	55	55	55
	Westbound	N/A	55	55	55

Note: Speeds rounded to closest 1 MPH

These tables indicate average vehicle speeds would be greater at the Bay Bridge with any of the CARA; Corridor 7 has the highest projected vehicle speeds on summer weekends in 2040. Higher speeds with a reduction in congestion are typically related to lower vehicle emissions for certain pollutants.

Tables 4-39 and 4-40 compare the average daily number of trucks crossing the Chesapeake Bay in the 2040 design year non-summer weekday and summer weekends for the CARA and No-build conditions. Shaded cells in the tables represent the values compared for potential emissions considerations.

Table 4-39: 2040 Non-Summer Weekday Projected Average Daily Truck Volumes (VPD)

CROSSING	NO-BUILD	CORRIDOR 6	CORRIDOR 7	CORRIDOR 8
Existing Bay Bridge	12,730	10,510	5,810	10,290
New Crossing	N/A	2,750	7,750	3,010
Total - Existing Bridge and New Crossing	12,730	13,260	13,560	13,300

Note: Shaded cells represent the values compared for potential emissions considerations

Table 4-40: 2040 Summer Weekend Projected Average Daily Truck Volumes (VPD)

CROSSING	NO-BUILD	CORRIDOR 6	CORRIDOR 7	CORRIDOR 8
Existing Bay Bridge	11,230	9,230	5,670	8,660
New Crossing	N/A	3,790	7,560	4,580
Total – Existing Bridge and New Crossing	11,230	13,020	13,230	13,240

Note: Shaded cells represent the values compared for potential emissions considerations

Corridors 6 and 8 do not encompass the Bay Bridge and therefore only truck volumes at the new crossing are compared to the No-Build. Since Corridor 7 encompasses the Bay Bridge, the total truck volume of the Bay Bridge and New Crossing are considered. These tables indicate Corridors 6 and 8 would result in lower truck volumes than the No-Build Alternative, whereas Corridor 7 would increase the number of projected daily truck crossings. Higher truck volumes are typically related to greater vehicle emissions.

4.6.5 Greenhouse Gases

4.6.5.1 Requirements

Currently, there are no federal mandated project planning requirements regarding the consideration of greenhouse gas (GHG) impacts for transportation projects. Maryland also does not require GHG analysis at the project level. However, MDOT is exploring strategies and programs aimed at reducing GHG emissions in conjunction with Maryland's Greenhouse Gas Emissions Reduction Act, which requires a 40 percent reduction of emissions from 2006 levels by 2030.

4.6.5.2 Assessment

Projected GHG emissions may be qualitatively discussed for a preferred alternative during a potential future Tier 2 NEPA analysis if warranted and practicable.

4.6.6 Construction Emissions

4.6.6.1 Requirements

The construction phase of any project has the potential to impact the local ambient air quality by generating fugitive dust through activities such as demolition and materials handling. MDOT has addressed this possibility by establishing procedures to be followed by contractors involved in transportation project site work through publishing the *Standard Specifications for Construction and Materials*. Through consultation with the MDE Maryland Air and Radiation Management Administration, MDOT determined the adequacy of the specifications in terms of satisfying the requirements of the *Regulations Governing the Control of Air Pollution in the State of Maryland*.

4.6.6.2 Assessment

As indicated by COMAR 26.11.06.03 D, all appropriate measures to minimize construction impacts on the air quality of the area would be incorporated during the construction of any resulting improvements. Mobile source emissions can also be minimized during construction by prohibiting idling delivery trucks or other equipment during periods of unloading or other non-active use. The existing number of traffic lanes would be maintained during construction to avoid traffic congestion and idling to the maximum extent possible, and construction schedules would be planned in a manner to avoid traffic disruption and an increase in air pollutants. Application of these measures could help to minimize the construction emission impact of any transportation improvement project. Regardless of the CARA selected, the same measures to minimize construction emissions would be required during project construction.

4.7 NOISE

4.7.1 Regulatory Context

FHWA regulations at [23 CFR 772.7](#) require highway agencies to develop noise policies for the study and possible abatement of traffic noise impacts from highway projects requiring FHWA approval, regardless of funding source. FHWA provides agencies additional guidance for the application of 23 CFR 772 within FHWA's "Highway Traffic Noise: Analysis and Abatement Guidance". MDTA currently utilizes the existing The Maryland Department of Transportation State Highway Administration (MDOT SHA) "[Highway Noise Abatement Planning and Engineering Guideline](#)" for the evaluation of potential noise impacts resulting from highway projects, which received FHWA approval April 17, 2020. The analysis of noise impacts and evaluation of abatement measures during a future Tier 2 NEPA analysis are anticipated to be completed under the MDOT SHA Highway Noise Abatement Planning and Engineering Guidelines.

A project involving construction of a new highway, capacity additions to the existing highways, major operational improvements, or the construction or modification of specific highway related facilities is considered a Type I project. For Type I projects, the Highway Noise Guidelines state a traffic noise impact is identified when design year traffic noise levels are projected to equal or exceed the appropriate Noise Abatement Criteria (NAC) for each activity category. The NAC for each "Activity Criteria" is shown in the following **Table 4-42** from the Highway Noise Guidelines. The BCS Tier 1 study is being treated as a Type I project for purposes of the assessment of potential noise sensitive areas. If a Tier 2 study is initiated it will be a Type I project, and as such the entire project area will be treated as a Type I Project.

The MDOT SHA Highway Noise Abatement Planning and Engineering Guidelines define traffic noise impact criteria based upon the identified activity category (see **Table 4-41**) in areas where frequent human use occurs within various land use types. Activity Categories A through E are considered noise sensitive land use types, and Activity Categories F and G are considered non-noise sensitive land use types. A noise impact is defined as noise levels that approach or exceed the applicable NAC, and/or experiences a substantial noise level increase of 10-15 dB(A) depending upon the existing noise level. FHWA regulations and the MDOT SHA *Highway Noise Guidance* require that noise abatement be investigated at all Noise Sensitive Areas (NSAs) where impacts have been identified. Where noise abatement is warranted for consideration, additional criteria is examined to determine if the abatement is feasible and reasonable. The assessment of noise abatement feasibility, in general, focuses on whether it is physically possible to build an abatement measure (i.e. noise barrier) that achieves a minimally acceptable level of noise reduction. Barrier feasibility considers three primary factors: acoustics, safety & access, and site constraints. The assessment of noise abatement reasonableness, in general, focuses on whether it is practical to build an abatement measure. Barrier reasonableness considers three primary factors: viewpoints, design goal, and cost effectiveness. Traffic noise impacts and noise abatement measures have not been determined in the Tier 1 study, but would be investigated if a Tier 2 study is initiated.

Table 4-41: Noise Abatement Criteria (NAC) [Hourly A-Weighted Sound Level in Decibels db(A)]

ACTIVITY CATEGORY	ACTIVITY CRITERIA ¹ LEQ(H) ²	MARYLAND SHA APPROACH CRITERIA	EVALUATION LOCATION	DESCRIPTION OF ACTIVITY CATEGORY
A	57	56	Exterior	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B	67	66	Exterior	Residential
C	67	66	Exterior	Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, daycare centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreation areas, Section 4(f) sites, schools, television studios, trails, and trail crossings.
D	52	51	Interior	Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios.
E ³	72	71	Exterior	Hotels, motels, offices, restaurants/bars, and other developed lands, properties or activities not included in A-D or F.
F	--	--	--	Agriculture, airports, bus yards, emergency services, industrial, logging maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities (water resources, water treatment, electrical), and warehousing.
G	--	--	--	Undeveloped lands that are not permitted

1. The Leq(h) Activity Criteria values are for impact determination only and are not design standards for noise abatement measures.
2. The equivalent steady-state sound level which in a stated period of time contains the same acoustic energy as the time-varying sound level during the same time period, with Leq(h) being the hourly value of Leq.
3. Table is adapted from Table 1 in 23 CFR 772. 23 CFR 772 specifies that Highway agencies establish an approach level to be used when determining a traffic noise impact. The approach level shall be at least 1 dB(A) less than the NAC for activity categories A to E.
4. Includes undeveloped lands permitted for this activity category.

Generally, the loudness of traffic noise is increased by heavier traffic volumes, higher speeds, and greater numbers of trucks. FHWA has established the following vehicle categories to use in traffic noise analyses:

- Automobiles - vehicles with two axles and four tires;
- Medium trucks - all cargo vehicles with two axles and six tires;
- Heavy trucks - all cargo vehicles with three or more axles;
- Buses - all vehicles designed to carry more than nine passengers; and
- Motorcycles - all vehicles with two or three tires and an open-air driver/passenger compartment

Noise levels are affected by distance from the noise source, terrain between the noise source and receptor, vegetation and other natural or manmade obstacles between the noise source and receptor.

4.7.2 Methodology

Since the Tier 1 study area consists of approximately two-mile wide corridors and does not identify a specific alignment within these corridors the Tier 1 traffic noise assessment for the BCS identified land use types in the CARA based on local planning agency land use or zoning designations. Noise sensitive areas within the retained corridors were identified based on the NAC categories shown in **Table 4-41**. A detailed analysis of traffic noise impacts and abatement would be completed during a subsequent Tier 2 evaluation as the scale and scope of this project is narrowed using the analysis methodology of Type I projects as defined by the Highway Noise Guidelines. A subsequent Tier 2 evaluation would also consider potential impacts from the construction of the project together with measures to minimize or eliminate adverse construction impacts to the community. The Bay Crossing Study Tier 1 assessment included:

- Identifying land uses based on local planning agency land use cover mapping and categorization of the land into Activity Categories within each CARA; and
- Quantifying the number and percentage of noise sensitive areas (NSAs) within each CARA.

Additionally, a description of noise implications for potential alignments considered in a Tier 2 study within these NSAs is provided. NSAs will be further refined and delineated for the Tier 2 study. Identification of areas of potential noise receptor locations for traffic noise monitoring and initiation and completion of field noise measurements will be conducted in Tier 2.

4.7.3 Land Use Designations and Noise Implications

The land within each CARA has been classified into Activity Categories as defined in **Table 4-41** based on the Maryland Department of Planning 2010 Land Use/Land Cover Update. The 2010 Land Use data is the most recent available data as of the writing of the [*BCS Highway Noise Qualitative Assessment*](#). New developments may have occurred since this data was generated; however, it would only affect a relatively small amount of acres compared to the overall size of each corridor. Each corridor is two miles wide and encompasses an area of approximately 35,000 acres for Corridor 6, 28,000 acres for Corridor 7, and 47,000 acres for Corridor 8. A large portion of this area is open water which does not fall into any of the Activity Categories and will not require any consideration for the noise analysis. Because the nature of the land uses varies between the Western Shore and Eastern Shore, the percentage breakdowns of land use activity have been divided into separate tables for each shore. Only Categories B, C, and E (considered noise sensitive areas) and F and G (considered non-noise sensitive areas) have been identified based upon the land use data. Category A and D activities are not yet identified because they require a field inspection

of the activities present within each parcel, which would occur during a future Tier 2 NEPA analysis. Land use data has not been verified in the field for the Tier 1 assessment, but would be verified and updated during a future Tier 2 NEPA analysis.

4.7.3.1 Land Uses within Corridor 6

Corridor 6 would connect MD 100 on the Western Shore to US 301 on the Eastern Shore. On the Western Shore, the study area is located in the vicinity of Pasadena, Jacobsville, and Lake Shore in Anne Arundel County. A majority of the land use on the Western Shore is residential, with the commercial land uses primarily located along Mountain Road (MD 177). There are several schools and churches located within the corridor, as well as Compass Pointe Golf Course and the Lake Shore Athletic Complex. On the Eastern Shore, Corridor 6 first passes through Eastern Neck Road (MD 445), just south of Rock Hall in Kent County. This area includes approximately 20 single family residences and the Bayshore Campgrounds, while the rest of the corridor is agricultural or undeveloped in nature. The corridor then crosses the Chester River and connects to US 301 in the vicinity of Centreville in Queen Anne's County. There are two recreational areas, the Queen Anne's County 4-H Park and Route 18 Park located within the corridor; the rest of the area is primarily agricultural in nature. See **Table 4-42** and the **Appendix A** mapping for a summary of the land uses.

Table 4-42: Land Use Activity Category Areas and Summary: Corridor 6

WESTERN SHORE				EASTERN SHORE			
NOISE SENSITIVE AREAS	ACTIVITY CATEGORY	ACRES	PERCENTAGE	NOISE SENSITIVE AREAS	ACTIVITY CATEGORY AREAS	ACRES	PERCENTAGE
Yes (60.9%)	B	4178	55.0%	Yes (8.2%)	B	682	7.4%
	C	427	5.6%		C	78	0.8%
	E	26	0.3%		E	1	0.0%
No (39.1%)	F	511	6.7%	No (91.8%)	F	5576	60.3%
	G	2456	32.3%		G	2910	31.5%

4.7.3.2 Land Uses within Corridor 7

Corridor 7 generally follows the existing US 50/301 corridor between Parole and Annapolis in Anne Arundel County and Queenstown in Queen Anne's County alongside the existing Bay Bridge. On the Western Shore, the land is primarily split between residential and agricultural/commercial uses. There are several schools and churches located within the corridor, including a portion of the US Naval Academy, as well as Sandy Pointe State Park and Broadneck Park. On the Eastern Shore, the land is primarily agricultural/commercial in nature. There are also several schools and churches located within the corridor, as well as Queenstown Harbor Golf Course and Old Love Point Park. This corridor passes through the towns of Stevensville, Chester, Kent Narrows, Grasonville, and Queenstown. See **Table 4-43** and the **Appendix A** mapping for a summary of the land uses.

Table 4-43: Land Use Activity Category Areas and Summary: Corridor 7

WESTERN SHORE				EASTERN SHORE			
NOISE SENSITIVE AREAS	ACTIVITY CATEGORY	ACRES	PERCENTAGE	NOISE SENSITIVE AREAS	ACTIVITY CATEGORY AREAS	ACRES	PERCENTAGE
Yes (50.0%)	B	3560	41.8%	Yes (31.9%)	B	2111	21.4%
	C	645	7.6%		C	907	9.2%
	E	52	0.6%		E	129	1.3%
No (50.0%)	F	3263	38.3%	No (68.1%)	F	4752	48.1%
	G	1001	11.8%		G	1976	20.0%

4.7.3.3 Land Uses within Corridor 8

Corridor 8 would connect US 50/301 near Crofton in Anne Arundel County on the Western Shore to US 50 just north of Easton in Talbot County on the Eastern Shore. On the Western Shore the corridor roughly follows MD 424 to Davidsonville, then follows MD 214 to Mayo and the shoreline. A majority of the land is non-noise sensitive agricultural, undeveloped forest land, and industrial uses. There are several schools and churches located within the corridor, as well as recreation centers including: Riva Area Park, The Golf Club at South River, The YMCA Camp Letts, Camp Wabanna, and Mayo Beach Park. On the Eastern Shore, the corridor first passes through Claiborne and McDaniel before crossing the Eastern Bay towards Easton. This area is almost entirely non-noise sensitive agricultural land and undeveloped forest land, with some small pockets of residential areas. The Harbortowne Country Club is the only recreational facility identified in this area. After the corridor crosses the Eastern Bay and ties into the mainland at US 50, the land is also almost entirely non-noise sensitive agricultural land and undeveloped forest land, with some small pockets of residential areas. Along US 50 there are three Category C land uses, including the Discovery Christian Church, the Talbot County Community Center, and Hog Neck Golf Course. See **Table 4-44** and the **Appendix A** mapping for a summary of the land uses.

Table 4-44: Land Use Activity Category Areas and Summary: Corridor 8

WESTERN SHORE				EASTERN SHORE			
NOISE SENSITIVE AREAS	ACTIVITY CATEGORY	ACRES	PERCENTAGE	NOISE SENSITIVE AREAS	ACTIVITY CATEGORY AREAS	ACRES	PERCENTAGE
Yes (33.7%)	B	3831	28.9%	Yes (9.6%)	B	897	7.0%
	C	604	4.6%		C	320	2.5%
	E	28	0.2%		E	15	0.1%
No (66.3%)	F	3795	28.7%	No (90.4%)	F	7106	55.2%
	G	4981	37.6%		G	4527	35.2%

4.7.3.4 Noise Implications

In general, lands that fall within approximately 500 feet of a proposed alignment would need to be considered as a part of the noise impact study area, but study limits can be extended if potential impacts are found to extend further from the alignment. At a distance of 500 feet traffic noise from the studied alignment will rarely result in an impact, and background noise sources such as local traffic, wind, animal, bird, insect noises, as well as traffic noise from other adjacent highways and arterials will begin to be the predominate noise sources. Whether a proposed roadway improvement involves widening of an existing

roadway or a roadway on a new alignment will also affect the types of noise impacts that may be identified. Since existing roadways contribute to the noise environment, widening projects typically do not result in substantial increases in noise levels, so impacts are primarily based upon the NAC. However, when a roadway is constructed on a new alignment, there is a greater potential to identify substantial increases adjacent to the new alignment due to the absence of an existing noise source.

Concentrations of potentially noise sensitive areas exist within each of the three CARA. Noise impact analysis must be conducted for all Category B residential land uses that fall within the study limits. Category C and E land uses will require verification of active outdoor land use areas in order to be considered noise sensitive. This primarily includes activities such as outdoor dining and recreational areas. However, locations where the activities may generate noise themselves, or where the uses may be transient in nature may not be considered noise sensitive. Per MDOT SHA Highway Noise Guidelines, Category C land uses that include large recreational areas are assigned an equivalent residence value based upon the amount of linear frontage they have adjacent to the proposed roadway. A determination is made that the typical uses would be of sufficient frequency and duration, and the equivalent residence value can be weighted based upon this “intensity of use” determination. If upon further investigation a Category C area contains no outdoor land uses, however indoor noise sensitive uses are present, these areas will be reclassified as Category D. The interior noise levels are analyzed for Category D areas by applying a building noise reduction factor based on the type of construction materials used for the structure to estimate the interior noise levels from the exterior noise levels just outside the building.

Lands that have been identified as non-noise sensitive using the land use cover data may also need further identification of potential noise sensitive areas. For Category F agricultural areas there are typically dwelling structures located within the lots, and the areas directly adjacent to these dwelling structures would need to be considered as a Category B noise sensitive area. Locations within the forest land identified as Category G may also contain recreational areas which may fall into a Category C.

The mapping in **Appendix A** identifies the Land Use Activity within each of the CARA. Every parcel within each CARA has been classified based on the Maryland Department of Planning 2010 Land Use/Land Cover Update and shaded accordingly. Land Use/Land Cover data will be updated and field verified as needed in a future Tier 2 NEPA analysis. Open water is not considered noise sensitive, but does not fall into any of the Activity Categories and has not been included with the shading and these areas have also been excluded in the results. Land-locked freshwater lakes have been included in the results. The shaded areas correspond to the acreage and percentages shown in **Tables 4-42 through 4-44**.

4.8 INDIRECT AND CUMULATIVE EFFECTS

This section presents the assessment of Indirect and Cumulative Effects (ICE) of the alternatives evaluated in the Tier 1 EIS for the three CARA and the No-Build Alternative. **Section 4.8.1** provides the introduction and the methodology for the ICE analysis, including the scoping process and ICE analysis boundary. **Section 4.8.2** provides information on resource identification and data collection used for the ICE analysis. **Section 4.8.3** covers the indirect effects analysis, and **Section 4.8.4** discusses the cumulative effects analysis. More detailed information is available in the [*BCS Indirect and Cumulative Effects Technical Report*](#).

4.8.1 Introduction and Methodology

The ICE analysis was implemented consistent with the Council on Environmental Quality's (CEQ) [*Considering Cumulative Effects under the National Environmental Policy Act*](#) (CEQ, 1997) and Maryland State Highway Administration's (MDOT SHA) [*Indirect and Cumulative Effects Analysis Guidelines for Environmental Impact Statements and Environmental Assessments and Categorical Exclusions*](#) (MDOT SHA, 2007).

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)).

For the purposes of this EIS, indirect effects can occur in three broad categories. For this analysis, the term "indirect effects" refers to all three of these categories:

- 1) Encroachment-Alteration Impacts – Alteration of the behavior and functioning of the affected environment caused by study encroachment (physical, biological, socioeconomics) on the environment;
- 2) Induced Growth Impacts – Project-influenced development effects (land use); and
- 3) 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).

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). In simplest terms, analyzing cumulative impacts means considering and accounting for the impacts of a proposed action to important natural and socio-economic resources in the study area in the context of other public or private actions that could affect those same resources.

To document cumulative effects for this study, the analysis followed the five-part evaluation process as described in FHWA's Guidance: [*Questions and Answers Regarding the Consideration of Indirect and Cumulative Effects in the NEPA Process*](#) (FHWA, 2014):

- 1) What is the geographic area affected by the study?
- 2) What are the resources affected by the study?
- 3) What are the other past, present, and reasonably foreseeable actions that have impacted these resources?
- 4) What were those impacts?
- 5) What is the overall impact on these various resources from the accumulation of the actions?

Indirect and cumulative effects were analyzed both qualitatively and quantitatively. The indirect effects analysis is also based on an understanding of the proposed infrastructure, the resources, trends and existing conditions in the study area, professional experience, past scientific studies of the effects of similar projects, and input from the public and appropriate regulatory agencies during the scoping process.

4.8.1.1 ICE Analysis Boundary

The CARA evaluated in the EIS are two miles wide and extend far enough to connect to existing roadway infrastructure on both sides of the Bay. Specific alignments within these corridors were not identified during Tier 1. Corridors 6, 7, and 8 were used to develop the ICE Analysis Boundary. A single ICE Analysis Boundary was established for assessing indirect and cumulative effects to capture the area of influence for the corridors. This ICE Analysis Boundary was developed to allow for flexibility in comparing the corridors, encompassing the following sub-boundaries: potential induced growth areas, watershed boundaries, and US Census Tracts.

Induced Growth Study Areas were developed to reflect areas that could potentially experience induced growth from a new crossing (as described in **Section 4.8.1.2**). Areas on the Eastern Shore within 30 to 45 minutes, or 45 to 60 minutes of travel time via the Bay Bridge or a new crossing location are considered in the induced growth analysis.

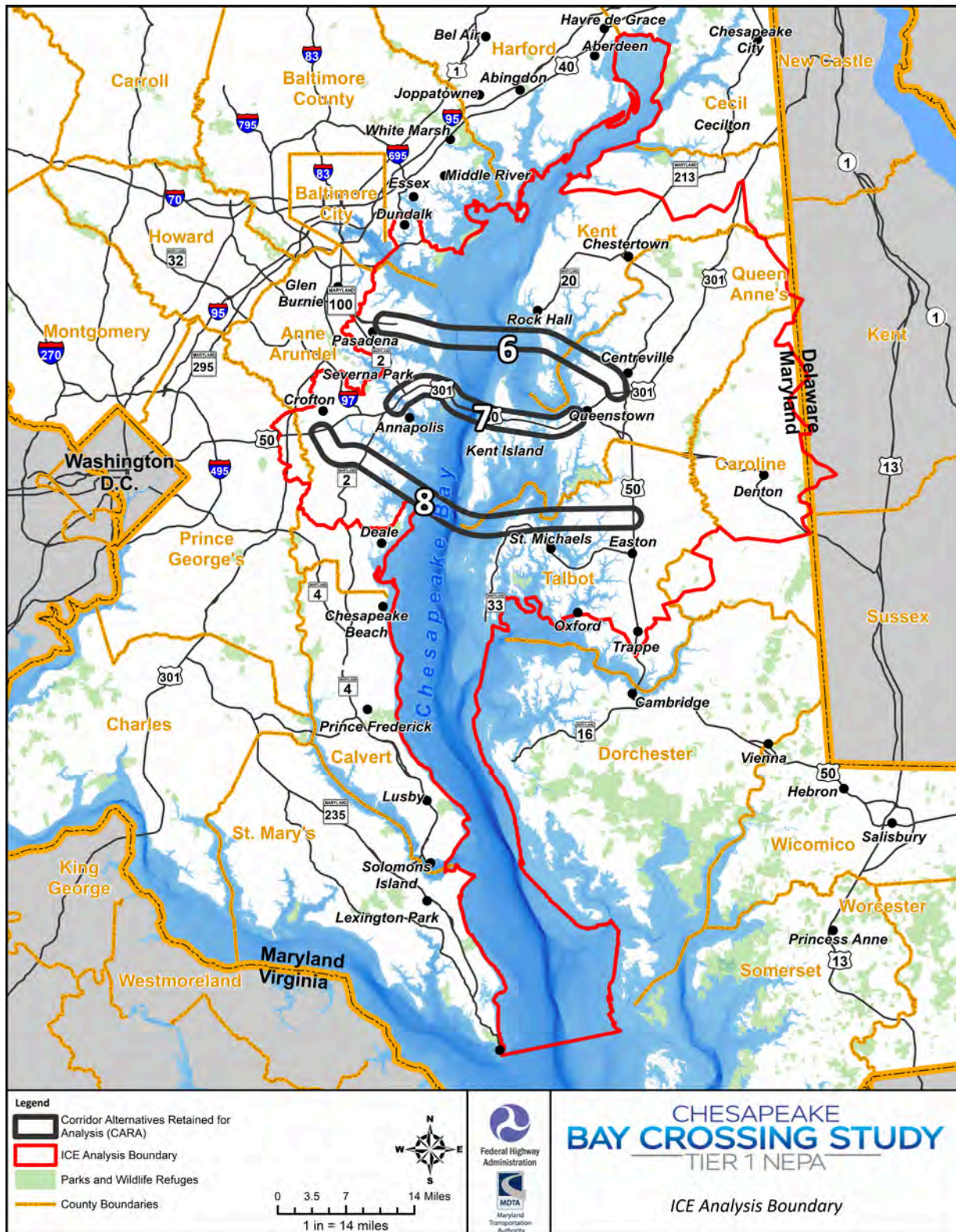
The boundaries of those Census tracts overlapping the corridor alternatives, including the geographically contiguous area between the corridors, were considered in development of the ICE Analysis Boundary to ensure inclusion of relevant socioeconomic resources such as communities, community facilities, businesses and employers, and housing. The outermost edges of the overlaid sub-boundaries (US Census Tracts, Induced Growth Study Areas, and watershed boundaries) comprise the overall ICE Analysis Boundary as shown on **Figure 4-22**.

The watersheds used to develop the ICE Analysis Boundary include those that contain the corridor alternatives and the full open water area of the Chesapeake Bay. The ICE Analysis Boundary is sized to capture potential direct effects of those transportation improvements evaluated in the EIS, and the indirect, downstream effects which may occur. The watersheds covering the full open water area of the Chesapeake Bay were included to ensure the important aquatic Chesapeake Bay resources are captured in the analysis.

4.1.1.1 Temporal Study Boundary

The temporal boundaries, or time frame, of the analysis is based on factors including data availability, relevant historical events, and the anticipated year of implementation for improvements being evaluated in the Tier 1 EIS. The temporal limits for the cumulative effects analysis are from 1970 to 2040. 1970 was selected as the early timeframe because the second span of the Bay Bridge was built in 1973 and based on the availability of past land use data from 1973 and decennial census data from 1970. 2040 was selected as the latter time frame based on the anticipated year of implementation for the potential improvements.

Figure 4-22: ICE Analysis Boundary



4.1.1.2 Indirect Effects Induced Growth Analysis

Construction of a new crossing would result in new connectivity across the Bay. Some areas on the Eastern Shore, such as Kent County, are relatively geographically isolated from areas on the Western Shore due to a lack of direct connections across the Bay. Those areas on the Eastern Shore which would experience greater access to Western Shore employment centers due to the connection of a new crossing would potentially be the most likely to experience development pressure. For more detailed description of the induced growth analysis, refer to the [*BCS ICE Technical Report*](#), **Section 5.3**.

This analysis considered the following employment centers relevant to Corridors 6, 7, and 8:

- Baltimore;
- Annapolis;
- Washington, DC ; and
- I-95 between Baltimore and Washington, DC (capturing employment areas along I-95 such as Columbia).

The analysis considered the potential for induced growth through the use of 0 to 30, 30 to 45, and 45 to 60-minute travel bands extending from major employment centers. Each travel band reflects the area that would be within a range of driving time to an employment center, as defined by the existing roadway network and any proposed improvements for each corridor. These travel bands, or the Induced Growth Study Areas, would be made accessible within a 0-30, 30-45, or 45-60 minute drive of the employment centers based on distance and speed limits for the existing and proposed segments of roadway network. Areas that are currently within these specified drive times under existing conditions (based on distance and speed limits) were excluded from the Induced Growth Study Areas.

This analysis examines areas on the Eastern Shore that could be potentially susceptible to development pressure. In particular, areas for which travel times to the Western Shore would be reduced to roughly 60 minutes or less via a proposed new crossing within Corridor 6 or Corridor 8 are considered likely to experience indirect effects. Areas for which travel times to major employment centers would be reduced to 45 minutes or less would likely be more susceptible. These assumptions are based on the analysis of regional commuting data, included in the [*BCS ICE Technical Report*](#). No 30-minute or less travel bands extend to the Eastern Shore for either corridor.

The induced growth analysis associated with a new crossing in Corridor 7 differs from the other two CARA evaluated. Induced growth resulting from a new crossing in Corridor 7 is considered qualitatively because the Bay Bridge within the corridor already provides access to Western Shore employment centers. The Induced Growth Study Areas methodology, which considers access to employment centers based on distance and speed limits, would not identify any areas of greater access on the Eastern Shore resulting from Corridor 7 beyond those already provided by the Bay Bridge. However, induced growth could still occur as a result of reduced traffic congestion in Corridor 7, which was considered qualitatively. Similarly, areas on the Western Shore were also considered qualitatively for their potential to experience Induced Growth.

4.8.2 Resource Inventory and Data Collection

Data were collected to cover the established ICE Analysis Boundary and the temporal boundaries. This study considered key resources including socioeconomic resources (including land use, community cohesion, community facilities, recreational facilities, low-income and minority [EJ] populations, businesses, farmlands); natural resources (including streams, wetlands, water quality, floodplains, wildlife and wildlife habitat, and threatened or endangered species) and historic resources.

The resource inventory and data collection effort also included information on resource planning, patterns, policies and trends to inform the analysis of indirect and cumulative effects. This information is used to establish a context for past, present and future conditions within the ICE Study Area, identify trends in land use planning, cultural and natural resources, and provide other important information needed to identify indirect and cumulative effects.

Because of the geographic extent of the ICE Analysis Boundary and the broad level of analysis in this Tier 1 EIS, much of the data presented in this section is aggregated at the county level. Evaluation at a finer level of detail would occur during Tier 2 study.

4.8.2.1 Socioeconomic Resources

Existing socioeconomic information, as documented for the CARA in **Section 4.1**, was used to inform the analysis of ICE and includes data such as:

- Population and employment trends based on census and geographic data;
- Growth trends based on reports, historic maps, and aerial imagery;
- Planning and forecasting documents concerning past, present, and future economic development; employment; land use; zoning; transportation; resource protection; and recreation;
- Section 4(f) and Section 6(f) Resources, such as parks, refuges and historic sites.

More detailed discussion of socioeconomic resources within the ICE Analysis Boundary is included in the [BCS ICE Technical Report](#).

4.8.2.2 Natural Resources

The Natural Resources section of this document, **Section 4.4**, provides a detailed description of the existing conditions and regulatory basis and methodology used for the analysis of direct effects of potential improvements within the corridor alternatives on natural resources.

The ICE Analysis Boundary encompasses numerous classes of natural communities including mesic forests, maritime forests, alluvial wetlands, non-alluvial wetlands, tidal wetlands, and riverine aquatic beds (Maryland Wildlife and Heritage Service, 2016). Key wildlife habitat in the ICE Analysis Boundary includes mixed hardwood forests, coastal plain oak-pine forests, coastal bluffs, coastal beaches, coastal plain floodplains, flatwoods, depression swamps, and seepage swamps, Delmarva bays, vernal pools, tidal forests, marshes, and shrublands, intertidal mudflats and sandflats, coastal plain, and blackwater streams and rivers, shellfish beds, submerged aquatic vegetation (SAV) areas, and pelagic-open water habitat.

Prior development in the ICE Analysis Boundary has resulted in significant loss of natural areas, wildlife and wildlife habitat, and caused negative impacts to water quality. Today, the comprehensive plans from study area localities define objectives, goals, or strategies to minimize loss and degradation of environmental resources such as forest lands, wetlands, streams and rivers, water quality, floodplains, and wildlife habitats. More detailed discussion of natural resources within the ICE Analysis Boundary is included in the [BCS ICE Technical Report](#).

4.8.2.3 Cultural Resources

The Cultural Resources section of this document, **Section 4.2**, provides a detailed description of the existing conditions and regulatory basis and methodology used for the analysis of direct effects of the potential improvements within the corridor alternatives on cultural resources.

The NHPA defines a historic property as any “prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the NRHP, including artifacts, records, and material remains related to such a property or resource.” For the evaluation of ICE historic architectural and archaeological resources listed in the NRHP were identified within the ICE Analysis Boundary. According to NRHP data, a total of 236 historic properties listed in the NRHP are in the ICE Analysis Boundary.

The ICE Analysis also considered the recorded historic properties identified within the CARA, as described in **Section 4.2**. The FHWA and MDTA have initiated the Section 106 consultation process and will implement the phased identification of historic properties. This Tier 1 EIS involves the identification of recorded historic properties within the CARA, as defined in **Section 4.2.1**. There are two recorded historic properties in Corridor 6. There are 17 historic properties in Corridor 7, including three historic districts: Stevensville Historic District, White’s Heritage, and U.S. Naval Academy. The U.S. Naval Academy is also an NHL, the only such resource identified in the CARA. There are 20 historic properties in Corridor 8, including two historic districts: Davidsonville Historic District and Unionville. One of the historic properties in Corridor 8 is the skipjack Claud W. Somers, a ship that has not been docked within its historic boundary since relocating to Virginia in 2000 for restoration. Nonetheless, it is included in the initial inventory of historic properties.

4.8.2.4 Air Quality

The Air Quality section of this document, **Section 4.6**, provides a detailed description of the existing conditions and regulatory basis and methodology used for the analysis of direct effects of the potential improvements within the corridor alternatives on air quality. The ICE Analysis relies on the same information presented in **Section 4.6**.

4.8.3 Indirect Effects Analysis

This Tier 1 analysis includes consideration of the resources within the CARA and the ICE Analysis Boundary, and qualitative discussion of the most likely type of indirect effects that could occur from implementing a crossing within the corridors. The No Build Alternative was also considered. Because an alignment for each alternative would not be determined until a potential Tier 2 study, it was not feasible to specify resources that could be affected by a given alignment in Corridors 6, 7 or 8. For more details on the indirect effects analysis results, see the [BCS Indirect and Cumulative Effects Technical Report, Section 5.0](#).

4.8.3.1 *Types of Indirect Effects Considered*

The indirect effects analysis focused on the potential for effects that could occur outside of the area of direct impact caused by the construction and operation of a new crossing in Corridor 6, Corridor 7, or Corridor 8. Three broad categories of indirect effects are considered (as described in **Section 4.8.1**): encroachment effects, induced growth, and effects related to induced growth.

In general, 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, potentially resulting in demand for new growth. Possible indirect and induced growth effects resulting from potential improvements in Corridor 6, Corridor 7, and Corridor 8 are presented below.

Transportation improvements can also have various effects on community economics including direct effects such as business relocations, and indirect effects such as induced growth from improved or new accessibility, or temporary delays during construction which may affect flow of goods, and employee and patron access to businesses. Some effects can be positive such as a new or expanded highway facility can increase a community's access to other areas that increases the labor pool and reduces costs for input and output of materials and services expanding markets. Improved accessibility may increase workers' access to education and employment opportunities.

Community cohesion is a loosely defined concept of community identity potentially based on shared ethnicity; coherent design features in a community's layout and aesthetics; and spatial cohesion gained by accessibility to neighbors, community facilities, goods and services. The level of cohesion in communities may vary depending on how long residents have stayed or plan to stay in the area and the accessibility to services and community facilities. Transportation impacts to community cohesion "may be beneficial or adverse, and may include splitting neighborhoods, isolating a portion of a neighborhood or an ethnic group or separating residents from community facilities" (FHWA, 1987). Construction and expansion of existing transportation corridors can disrupt community cohesion by changing connectivity between residential neighborhoods (i.e., physically dividing communities); displacing residents; disrupting access to community facilities, either on a temporary or permanent basis; and introducing noise and visual elements incompatible with existing surrounding conditions (FHWA, 1998). Transportation projects also may enhance access within communities by improving connectivity, contributing to a community's layout and aesthetics through design features and amenities such as pocket parks, and improving accessibility to new goods and services.

The induced growth analysis concentrates on identifying where future development would be most likely to occur associated with new crossings and connecting road network improvements in Corridor 6, Corridor 7, and Corridor 8, compared to the No-Build Alternative.

4.8.3.2 *Summary of Potential Indirect Effects*

No-Build Alternative Summary

The No-Build Alternative would result in increasingly poor traffic conditions at the Bay Bridge and approach roadways by 2040. Traffic analysis conducted for the Bay Crossing Study determined that under the No-Build Alternative, ADT volumes are expected to increase by 16,700 vehicles per day by 2040 on summer weekends, and 15,700 vehicles per day on non-summer weekdays. Currently, the Bay Bridge

experiences three hours with LOS E or F on non-summer weekdays (all in the eastbound direction) and 19 hours on summer weekends (with 10 hours in the eastbound direction and nine hours in the westbound direction). This is expected to worsen by 2040 to seven hours on non-summer weekdays (with five hours in the eastbound direction and two hours in the westbound direction) and 22 hours on summer weekends (with 12 hours in the eastbound direction and 10 hours in the westbound direction).

The indirect effects of worsening traffic congestion could include loss of economic productivity, changes in community cohesion resulting from reduced access and delays, effects on the desirability of communities, and potential changes to individual decisions about where to live and work. While no resources are anticipated to be directly impacted by a No-Build Alternative for this study, the No-Build Alternative does include currently planned and programmed infrastructure projects and would be updated during Tier 2 to reflect planned and programmed projects that may affect the study area. Moreover, under the No-Build Alternative motor vehicle volumes are forecasted to increase over time and with them are anticipated increases in travel times and delays related to growing traffic congestion. These qualitative increases would be expected to have potential negative effects on motor vehicle-reliant activities, such as; emergency response services, supply chain/commercial trucking and deliveries, school bus schedules, and workforce commuters.

The No-Build Alternative would not result in project-related construction or any associated property acquisitions; therefore, no encroachment effects on land use, communities, community facilities, population, housing, EJ populations, or economics would occur from property acquisition.

Under the No-Build Alternative, no project-related roadway improvements would occur in the ICE Analysis Boundary; therefore, no indirect effects to natural resources would occur.

The No-Build Alternative would have no direct physical impact on archaeological or architectural resources as no construction would occur; therefore, no indirect effects would occur to historic properties.

As no improvements are proposed with the No-Build Alternative, no project-related induced growth impacts would be expected under the No-Build Alternative. Worsening traffic congestion could lead to reduced demand for new growth in areas affected by frequent congestion and limited access to employment areas. Because no induced growth would occur under the No-Build Alternative, no related indirect effects would occur to natural resources or historic properties.

CARA Summary

A crossing in a new location over the Chesapeake Bay could allow new access to rural, undeveloped areas on the Eastern Shore. This new access, considered in light of the major employment centers on the Western Shore, would likely lead to induced growth of residential and commercial development on the Eastern Shore. For any of the corridors, the extent of induced growth would be dependent on various other factors such as economic conditions and local land use regulation.

Corridor 6 would likely have the greatest potential for induced growth, given its close proximity to the Baltimore metropolitan area. Over 40,000 acres of undeveloped land would be within a roughly 30 to 45 minute-drive of Baltimore as a result of a new crossing in Corridor 6, much of which is identified by MDP as vulnerable to residential development. Corridor 8 would also likely have substantial induced growth

effects, given its proximity to Annapolis and somewhat more distant proximity to Washington, DC. Over 70,000 acres of undeveloped land on the Eastern Shore would be within a roughly 45- to 60-minute drive of Washington, DC as a result of a new crossing in Corridor 8.

Corridor 7 would likely have the least extent of indirect effects due to the presence of the existing crossing and associated infrastructure in Corridor 7. Growth and development have already occurred along Corridor 7, so a new crossing within the corridor would likely continue, and perhaps accelerate, existing land use development patterns as they presently occur. More detailed discussion of the induced growth analysis, including maps of the Induced Growth Study Areas, is included in the [*BCS ICE Technical Report*](#), **Sections 5.6.2, 5.7.2, and 5.8.2.**

Induced growth effects could also occur on the Western Shore as a result of a new crossing. The magnitude of such an effect would likely be lower than on the Eastern Shore, because the Western Shore is already connected to employment centers such as Baltimore and Washington by the existing roadway network without the barrier of the Chesapeake Bay. This new infrastructure could attract new or more intensive commercial development along the new roadway, and along existing roads with access points to the new roadway. Additionally, commute times to employment centers could be marginally reduced for some Western Shore areas connecting to the new roadway, due to the presence of new capacity. Existing residential communities and undeveloped lands along major roadways connecting to the new roadway could see pressure for greater development. This effect would be particularly expected for Corridor 8, which would require the longest portion of new roadway on the Western Shore among the CARA.

Potential induced growth effects could have both adverse and beneficial socioeconomic impacts. For example, induced residential growth could lead to commercial and institutional types of growth to service new residents in the long term. This could be beneficial to local employment and the local economy. New growth could also put pressure on services provided by local governments such as schools, water and sewer service. It could also indirectly impact community cohesion, changing the character and use of neighborhoods and rural areas. The existing communities in the Induced Growth Study Areas are largely rural in character, with expanses of open space afforded by agricultural and natural resource lands interspersed with farmsteads and small communities. Development pressures from the new access created by a crossing in could substantially alter the rural setting, impacting community cohesion.

The areas likely impacted by induced growth on the Eastern Shore include substantial important natural resources such as wetlands, floodplains, streams, and Chesapeake Bay Critical Areas. The impacts of induced growth could 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 the imperilment of protected species. Development associated with induced growth can adversely affect water quality by increasing impervious surfaces leading to more stormwater and subsequent pollutant loading of nearby streams, increasing the need for water treatment, and exposing soil to erosion and the sedimentation of nearby waters, affecting human use and ecosystem functions.

Development of new land uses or more intensive land uses could lead to destruction or degradation of cultural resources, as older structures are cleared to make way for new construction, or agricultural and rural areas are converted to more intensive urban and suburban uses with resulting changes in land use

context surrounding cultural resources. Archaeological sites could also be impacted by new construction accompanying land development.

In addition to the induced growth potential described within the ICE Analysis Area, indirect effects resulting from greater tourism to beach destinations such as Ocean City could occur as a result of a new crossing. The Bay Bridge is a main route for travelers from Maryland, Washington, DC and Virginia traveling to destinations on the Atlantic coast in Maryland and Delaware. Greater access to these beach resort areas could increase demand for tourism, spurring new economic growth and land use development. The extent and location of such potential induced growth in tourist areas cannot be determined with certainty; such growth could have both positive and adverse effects. This potential indirect effect from increased tourism would be expected under any of the CARA.

Encroachment effects from a new crossing within each of the corridors could also result in indirect effects to socioeconomic, natural, and cultural resources. In particular, a new crossing could have indirect impacts by altering traffic flows and potentially altering the character and cohesion of communities. Changes to local roadway networks may be required to accommodate traffic volumes on the approaches to the new crossing while maintaining local circulation. New interchanges, overpasses, or other changes to local roadways adjacent and connecting to a new crossing could have indirect effects on local communities such as altered traffic patterns, changes in local access and noise.

New waterway crossings and new impervious surfaces could have potential for indirect effects on natural resources such as downstream impacts to water quality and aquatic resources, and effects from habitat fragmentation. An increase in the extent of impervious surface from a new crossing could indirectly increase the amount and velocity of stormwater runoff into streams located in, and downstream of, the direct impacts area, impacting water quality and human and wildlife uses. If dredging is required for construction, dredging and disposal activities could affect water quality by increasing turbidity in the water, indirectly affecting benthic and pelagic species, including anadromous fish, and the EFH, SAV habitat, fish spawning and nursery habitat, and oyster resources in the corridor. Impacts to aquatic habitat could affect commercial and recreational fishing or crabbing locations. Minimization would be included in the later stages of planning and design if a corridor is carried forward for Tier 2 evaluation, such as a comprehensive stormwater management plan in compliance with applicable regulations.

Land use conversion could indirectly affect wildlife through water quality impacts and habitat fragmentation. Habitat fragmentation can have wide-ranging indirect effects to sensitive wildlife. A new crossing could restrict wildlife movement through the riparian corridors crossed by the infrastructure, and potentially alter up and downstream hydrologic flow. Corridor 7 could potentially have lower indirect impacts to natural resources due to the shorter crossing and overall corridor length and the presence of the existing Bay Bridge crossing. Potential indirect effects to natural resources are discussed in more detail in the [BCS ICE Technical Report](#).

4.8.4 Cumulative Effects Analysis

Cumulative effects consist of the direct and indirect effects of the potential improvements in the corridor alternatives in the context of the impacts of past, present, and reasonably foreseeable actions. Past, present, and reasonably foreseeable actions have already affected or have the potential to impact land use and socioeconomic, natural, or historic resources. Past trends and forecasts impacting the human and

natural environmental resources evaluated in the ICE, while other present and reasonably foreseeable actions are included in **Table 4-45** and **Table 4-46**, below. If no direct or indirect impacts from a proposed action would occur, then no incremental cumulative effect would occur. These potential effects are considered in the following discussions of cumulative effects of the alternatives to different resources. The following briefly discusses the cumulative effects to socioeconomic, natural and historic resources. For more details on the cumulative effects analysis results, see the [BCS ICE Technical Report, Section 6.4](#).

Table 4-45: Major Present and Reasonably Foreseeable Future Non-Transportation Projects within the ICE Analysis Boundary

PROJECT	LOCATION	DESCRIPTION	STATUS
Western Shore			
Hancock's Resolution	Pasadena, Anne Arundel County	This work will include the construction of a new visitor center, SWM, landscaping parking, and associated amenities	Construction scheduled to be completed in 2020
South Shore Trail	Anne Arundel County	Multi-phase construction will consist of: Phase I (Waterbury to MD 3), Phase II (MD 3 to Odenton), Phase III (Bestgate to Eisenhower Golf Course), Phase IV (Eisenhower Golf Course to Waterbury Road) and Phase V (Bestgate Road to City of Annapolis). These phases will create a new paved multi-use Trail in Anne Arundel County.	Phase I complete. Phase II and IV Feasibility Study complete. Phase II design underway. Phase V complete.
Broadneck Peninsula Trail	Anne Arundel County (partially within Corridor 7)	Multi- phased project to create multi use paved trail in Anne Arundel County	Phase III final design, Phase II under construction, Phase IB in design, Phase IA open
Annapolis Regional Library	1410 West Street, Annapolis, Anne Arundel County	New library construction	Planned to open in 2020
New Galesville Fire Station	6920 Owensville Road, Galesville, Anne Arundel County	New fire station construction	Under construction
Eastport Shopping Center	Annapolis, Anne Arundel County	Shopping centers and apartments	Under construction
Westfield Annapolis mall	Annapolis, Anne Arundel County	Mall additions and reconfigurations	Under construction
Shipley's Choice Dam	Anne Arundel County	Rehabilitation	Under construction
Eastern Shore			
Paul S. Sarbanes Ecosystem Restoration Project at Poplar Island	Talbot County	Restoration of Poplar Island using dredged material	Under construction

PROJECT	LOCATION	DESCRIPTION	STATUS
K Hovnanian's Four Seasons at Kent Island	Kent Island, Queen Anne's County	Residential development	Phase one of construction complete
South Kent Island Wastewater Sub-district	Kent Island, Queen Anne's County	Sewer service expansion	Estimated completion in 2025
Kent Island Library	Kent Island, Queen Anne's County	Library expansion	Partially funded
Village at Slippery Hill	Grasonville, Queen Anne's County	Commercial development	Under construction

Table 4-46: Major Present and Reasonably Foreseeable Future Transportation Projects within the ICE Analysis Boundary

PROJECT	SOURCE	LOCATION	DESCRIPTION	STATUS
Chesapeake Bay and Existing Bay Bridge				
US 50/301 Bay Bridge Deck Rehabilitation and Miscellaneous Modifications	CTP	Bay Bridge	Rehabilitation and Miscellaneous Modifications	Added to construction program
US 50/301 Bay Bridge - Crossover Automated Lane Closure System	CTP	Bay Bridge	Installation of Automated Lane Closure System	Added to construction program
US 50/301 Bay Bridge Cable Replacement	CTP	Bay Bridge	Replace 5KV Feeder Cable on Eastbound Span	Added to construction program
Dredge Material Placement and Monitoring	CTP	Chesapeake Bay	Involves the placement and monitoring of material dredged from the Port of Baltimore channels	Continuous over next 6 years
Western Shore				
US 301 Corridor (Bowie)	Visualize 2045	Prince George's County	Upgrade and widen US 301 from north of Mount Oak Road to US 50	Expected to have funding by 2045
US 301 Southern Corridor	Visualize 2045	Prince George's County	Multi-modal corridor study to consider highway/transit improvements from the Potomac River to Mount Oak Road (US 50/US 301 interchange)	Expected to have funding by 2045
MD 450 Corridor	Visualize 2045	Prince George's County	Widen MD 450 from Whitfield Chapel Road to west of MD 3	Expected to have funding by 2045
US 50; MD 70 TO MD 2	Baltimore Metropolitan Council (BMC)	Anne Arundel County	US 50, from MD 70 to MD 2 (north), including the Severn River/Pearl Harbor Memorial Bridge	Partially funded
Port of Baltimore Enhancements	BMC	Baltimore	Improvements to the Port of Baltimore	Funded

PROJECT	SOURCE	LOCATION	DESCRIPTION	STATUS
MD 151/MD 151B, Sparrows Point Boulevard	CTP	Baltimore	Replace bridge 0309900 on MD 151 and bridge 0335000 on MD 151B. Replace bridge deck on bridge 0335100 on MD 151B.	Under Construction
Hart-Miller Island Related Projects	CTP	Hart-Miller	Design wildlife habitat at the North Cell of the island; dewatering and site improvements	Continuous over next 6 years
Cox Creek Dredged Material Containment Facility Expansion and Related Projects	CTP	Bay	Expansion and raising dikes at the existing 144-acre Dredged Material Containment Facility	Continuous over next 6 years
MD 3, Robert Crain Highway	CTP	Anne Arundel County	US 301, North of Mount Oak Road to US 50 and MD 450, Stonybrook Drive to west of MD 3	Planning on hold
Mountain Road Corridor Revitalization - Phase I	CTP	Anne Arundel County	MD 177 (Mountain Road) corridor between Solley Road and Edwin Raynor Boulevard. Phase 1, Catherine Avenue to Edwin Raynor	Funding for Phase I, 2022 completion date
US 50, from MD 70 to MD 2 (north)	CTP	Anne Arundel County	Capacity improvements including the Severn River/Pearl Harbor Memorial Bridge MD 175, Annapolis Road	Planning
Eastern Shore				
MD 291, Cypress Street	MDOT SHA	Kent County	Roadway Rehabilitation along MD 291 from West of School Street to East of Crane Street	Under construction 2019
MD 213, Centerville Road	MDOT SHA	Queen Anne's	Rehabilitate Bridge 1702000 over Gravel Run and Replace Bridge over Old Mill Stream	Under construction
US 50, Ocean Gateway	MDOT SHA	Queen Anne's	6-lane divided reconstruct	8 phases not funded
US 301, construct interchange at MD 304	CTP	Queen Anne's	Construct interchange	Project on hold

4.8.4.1 Socioeconomic Resources

Numerous past actions have contributed to development and population growth within the ICE Analysis Boundary and are discussed in **Section 4.8.2**. These actions have been both beneficial and adverse to socioeconomic resources and land use, and it is expected that reasonably foreseeable future actions could be as well. Past and present growth and development has led to greater connectivity and access to employment and recreation. Such growth and development has benefited local economies by improving access to markets and customers. However, 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.

Roadway infrastructure associated with the existing conditions and US 50/301 on either side of the Bay has likely had socioeconomic impacts by providing new accessibility and economic opportunity, but also by negatively impacting community cohesion in the vicinity of the infrastructure. Transportation facilities can reduce access in areas directly adjacent to the highways.

Infrastructure development can also have detrimental impacts on community character, as rural landscapes are transformed into developed land uses, especially the suburban housing development and commercial uses that often accompany major new roadway infrastructure. Conversion of farmland to other uses can also impact local agricultural economies. Construction of the Bay Bridge has likely spurred growth in areas on the Eastern Shore such as Kent Island, with both positive and negative socioeconomic impacts.

Minority and low-income populations have historically been adversely affected by past roadway construction (Karas, 2015). Future transportation and other actions are expected to be beneficial for some, but not for others. For example, transportation improvements could increase efficiency that in turn could increase employment opportunities but require relocations to accommodate. Current federal regulations require that federally funded or federally authorized actions avoid disproportionate high and adverse effects of their authorized actions to minority and low-income populations whenever possible.

Summary of Potential Cumulative Socioeconomic Resource Effects

No-Build Alternative

Under the No-Build Alternative, a new Bay Crossing between the Western and Eastern Shores of the Chesapeake Bay in Maryland would not be built. The No-Build Alternative would result in increasingly poor traffic conditions at the Bay Bridge and approach roadways by 2040. Traffic analysis conducted for the Bay Crossing Study determined that under the No-Build Alternative, ADT volumes are expected to increase by 16,700 vehicles per day by 2040 on summer weekends, and 15,700 vehicles per day on non-summer weekdays. Currently, the Bay Bridge experiences three hours with LOS E or F on non-summer weekdays (all in the eastbound direction) and 19 hours on summer weekends (with 10 hours in the eastbound direction and nine hours in the westbound direction). This is expected to worsen by 2040 to seven hours on non-summer weekdays (with five hours in the eastbound direction and two hours in the westbound direction) and 22 hours on summer weekends (with 12 hours in the eastbound direction and 10 hours in the westbound direction).

Other present or reasonably foreseeable future projects are occurring, or may occur, some of which may result in cumulative induced growth within the ICE Analysis Boundary.

CARA

Any of the three CARA would potentially result in incremental contributions to cumulative socioeconomic effects when considered in the context of past, present and future actions. A new crossing in any location would be a substantial project with a magnitude of direct and indirect effects greater than most other individual infrastructure and development projects.

Corridors 6 and 8 are located in areas with fewer existing major limited-access roadways. Therefore, a new crossing and the subsequent impacts to community cohesion would be a substantial incremental increase relative to the somewhat smaller-scale past roadway infrastructure projects more typical of Corridors 6 and 8. In contrast, a new crossing in Corridor 7 that utilizes the existing US 50/301 corridor could result in a relatively lower incremental increase in community cohesion effects, but the effects would be felt largely by the same communities that are already impacted by US 50/301. A new crossing along a new parallel alignment in Corridor 7 would result in substantial community effects, which would further contribute to the cumulative effects in the context of the existing US 50/301 roadway.

Relocations and other community impacts could be of a larger magnitude than other actions in all three CARA, potentially resulting in a substantial incremental contribution.

The cumulative effect of induced growth from a new crossing, particularly in Corridors 6 and 8, could be substantial when considered in the context of past, present and future development occurring on the Eastern Shore. Corridor 7 could likely have lower indirect effects from induced growth, but the effects would incrementally contribute to the substantial past effect of induced growth resulting from the existing Bay Bridge.

None of the CARA would be expected to have disproportionate incremental effects to low-income or minority populations. Further analysis would be required in a Tier 2 NEPA Study.

All three of the CARA would be expected to have beneficial local economic effects from more direct connections to services and commercial areas, and increased employment indirectly related to more direct access to employment centers on the Western Shore. This could have an incremental cumulative effect considered in the context of other past, present, and reasonably foreseeable development and infrastructure projects with beneficial economic impacts for all three CARA.

4.8.4.2 *Natural Resources*

Past, present, and reasonably foreseeable future growth and development actions in the ICE Analysis Boundary have been, and primarily would be, adverse to natural resources. Intensification of land use particularly on the Western Shore 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. This has led to some species becoming threatened and endangered. On the Eastern Shore, agricultural production has resulted in degraded terrestrial and aquatic habitat due to forest clearing, filling, and draining of wetlands, piping and rerouting of streams, and reduction in water quality due to sediment, microbe, and nutrient laden runoff. This habitat alteration has had a negative effect on wildlife in the area. However, federal, state, and local regulations enacted over the last 50 years have done much to slow this loss of wildlife and wildlife habitat, improve wildlife habitat and water quality, and recover protected species.

NEPA regulations require avoidance, minimization, and compensation for adverse effects to water quality, WOTUS, wildlife and protected species, and wildlife habitat. Past and present private conservation efforts have also positively contributed to natural resources in the region. Future growth and development in the ICE Analysis Boundary is more limited on the Western Shore due to the lack of developable land. The effects of growth and development would also be limited because its effects would be primarily within

previously disturbed areas. However, future growth and development on the Eastern Shore has a higher potential due to the greater presence of undeveloped, or less intensively developed land. Further, communities have land use plans in place that aim to concentrate growth while preserving important natural resources.

Past growth, development, and agricultural practices have diminished natural resources within the ICE Analysis Boundary. Urban and suburban development and infill has occurred, predominately on the Western Shore, with suburban and rural development occurring on the Eastern Shore. Past development in the ICE Analysis Boundary has included shoreline commercial and residential development and roadway construction and widening projects on both sides of the Chesapeake Bay. This development and practices have impacted aquatic and terrestrial habitat and impaired water quality. The prevailing trend has been habitat loss in regard to wetlands and streams (Tiner and Burke, 1995; MDE, 2006), and forestland (Ferris and Newburn, No date), with more intense development occurring on the Western Shore and agricultural use on the Eastern Shore. Developed lands eliminate habitat and natural cover, increase impervious surface area, prevent natural infiltration, and increase stormwater runoff. Results from USGS research and monitoring projects in agricultural landscapes indicate that there are environmental issues associated with agricultural production including changes in the hydrologic cycle; introduction of toxic chemicals, nutrients, and pathogens; reduction and alteration of wildlife habitats; and invasive species (USGS, 2007).

Aquatic impacts occurring in the ICE Analysis Boundary have included dredging (including the April 2019 completion of the dredging of approximately 2.6 million cubic yards of sediment from multiple channels that lead into Baltimore Harbor), stream piping, relocation, channelization, and flow alteration. Further aquatic impacts causing impediments to fish passage have included the damming of many waterways. Consequences of aquatic habitat loss have included approximately 100 percent decreases in historic anadromous fish catches in Maryland (MDNR, No Date (c)); losses in SAV (Orth et al., 1984); poor waterway health (MDE, 2019, DNREC, 2018); and threatened existence of vulnerable aquatic species (USFWS, 1993). Losses in forestland have displaced, or extirpated, species dependent on forested interiors (MDNR, 2000) and caused habitat fragmentation.

Many major waterways, including the Chesapeake Bay within the ICE Analysis Boundary, are designated as impaired for one or more uses (MDE, 2019). Causes of impairment of these sensitive rivers, streams, open water areas, or waterbodies are due to the presence of *Escherichia coli* in the waters, the amount of total suspended solids, chloride, nutrients such as sulfate, total phosphorous, and/or, total nitrogen, alterations such as channelization or lack of riparian buffers, contaminants in fish tissue, and/or causes unknown. The major suspected sources of the impairments are livestock (grazing or feeding operations), agriculture, urban runoff/storm sewers, municipal point source discharges, nonpoint source discharges, atmospheric deposition, urban development, and/or causes unknown.

Past development and harvesting of wildlife have led to the very existence of some wildlife species to be threatened and endangered. However, passage of the Maryland Nongame and Endangered Species Conservation Act and the federal ESA requires state and federal agencies to avoid and minimize potential impacts to designated threatened and endangered species and their critical habitat.

The terrestrial habitat along the waterways in the ICE Analysis Boundary has been fragmented, primarily by agriculture on the Eastern Shore and developed land uses on the Western Shore. Habitat fragmentation can have wide-ranging indirect effects to wildlife, possibly 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. Bridge lighting along the shore could negatively affect nesting sea turtles and their hatchlings. New bridges and culvert improvements could indirectly restrict wildlife movement through the riparian corridors crossed by these structures and alter upstream and downstream hydrologic flow.

Current and reasonably foreseeable future development in the ICE Analysis Boundary could encroach on WOTUS and contribute to their loss (**Table 4-45** and **Table 4-46**). These include projects to construct and widen roadways, commercial center construction, or expansion, and planned commercial, institutional, and residential development. Cumulative negative effects on WOTUS could occur; however, local, state, and/or federal permits require avoidance and minimization of impacts, and compensation for permanent losses.

Current and future growth and development, and the expansion of agricultural uses, could possibly further reduce and degrade terrestrial and aquatic habitat for the long term. Federal, state, and local regulations would continue for the foreseeable future and could continue to require minimization, avoidance, and compensation for terrestrial and aquatic habitat direct and indirect effects.

One current and future project in the ICE Analysis Boundary would restore remote island habitat lost in the Chesapeake Bay due to erosion. Construction of the Paul S. Sarbanes Ecosystem Restoration Project at Poplar Island began in the 1990s and continues today in the Chesapeake Bay portion of Talbot County, Maryland. Dredge material is being used to restore lost habitat and the final project will be designed to contain about 68 million cubic yards of material, resulting in a total of 1,715 acres of remote island habitat. The final project will consist of approximately 776 acres of tidal wetlands, including low marsh and high marsh habitat, bird nesting islands, and open water ponds, and an upland portion of approximately 829 acres. The final expansion plan includes a new habitat feature for the site, a 110-acre open water embayment with a depth of up to 12 feet. The Bay bottom in this area will remain primarily undisturbed, limiting impacts to the benthic habitat. This semi-protected fisheries habitat will provide a vital trophic link between open water and restored wetlands, where wetlands will provide a food source and nursery habitat for larger fish species. Three breakwater structures will protect the embayment and provide additional habitat for fish as well as bird nesting habitat on the breakwaters' sandy crests. Large rock reefs within the open water embayment will add further complexity (Maryland Environmental Service, 2017). One of the considerations of the Poplar Island project construction and expansion was the displacement of commercial fishing and crabbing grounds. Construction of a new crossing may result in a cumulative loss of these resources in the short or long term.

Summary of Potential Cumulative Natural Resource Effects

No-Build Alternative

Under the No-Build Alternative, a new Bay Crossing connecting the Western and Eastern Shores of the Chesapeake Bay in Maryland would not be built. Other present or reasonably foreseeable future projects are occurring, or may occur (**Table 4-45** and **Table 4-46**), and some of these may result in effects to natural resources within the ICE Analysis Boundary. However, no incremental cumulative effects to the natural environment would occur as a result of the No-Build Alternative.

CARA

A new crossing within any of the CARA would contribute incrementally to the negative effects of past, present and future actions on natural resources.

While the distribution of different types of natural resources varies within each of the CARA, Corridor 7 would require the shortest crossing and shortest overall length of improvements compared to Corridors 6 and 8, and thus would likely have lower overall potential for direct impacts from construction of crossing improvements. Corridor 7 could also potentially make use of more existing infrastructure compared to Corridors 6 and 8 by following the existing US 50/301 roadway. Corridor 7 is somewhat more developed compared to Corridors 6 and 8, so impacts in Corridor 7 could incrementally contribute in the context of greater past impacts to natural resources.

Corridor 8 would require the longest crossing, and longest overall length of improvements. This would likely influence the overall amount of impacts to natural resources such as habitat, wetlands, streams, and forests that could occur, and thus the extent of contribution to cumulative negative effects on natural resources from other actions.

Overall, Corridors 6 and 8 have higher potential for direct and indirect impacts to natural resources compared to Corridor 7. Thus, despite the potentially greater past impacts to natural resources within Corridor 7 from other actions, the overall cumulative effect of natural resources impacts would likely be lower for Corridor 7 compared to Corridors 6 and 8.

4.8.4.3 Historic Resources

With human occupation of the Maryland Chesapeake Bay region extending thousands of years into the past and ongoing today, archaeological and architectural historic properties have been continuously altered by succeeding developments over time in ICE Analysis Boundary. Transportation improvements and other actions potentially adversely affect archaeological and architectural historic properties by destruction or altering the integrity of their historically significant characteristics. Federal and state laws requiring agencies to take into account effects to historic properties have slowed their loss. Section 4(f) of the USDOT Act of 1966 affords some protection to historic properties by requiring USDOT agencies to avoid the use of architectural and certain archaeological historic properties unless there is no prudent and feasible alternative.

Summary of Potential Cumulative Cultural Resource Effects

No-Build Alternative

Under the No-Build Alternative, a new Bay crossing between the Western and Eastern Shores of the Chesapeake Bay in Maryland would not be built in either Corridor 6, Corridor 7 or Corridor 8, and the existing Bay Bridge would not be improved. No direct or indirect effects to historic properties would occur under the No-Build Alternative; therefore, no incremental cumulative impacts to cultural resources would occur.

CARA

Each of the three CARA would likely have detrimental impacts on cultural resources and would potentially incrementally contribute to cumulative impacts on cultural resources from other past, present, and future actions. The relative magnitude of the direct impacts to cultural resources cannot be determined during this Tier 1 Study.

Past impacts to cultural resources within Corridor 7 have likely been more substantial than Corridors 6 or 8 due to the presence of the existing Bay Bridge and the associated development along the US 50/301 corridor, particularly on Kent Island.

Corridors 6 and 8 would likely have greater induced growth effects on the Eastern Shore compared to Corridor 7, and this induced growth would likely occur in more rural areas where past land use changes and infrastructure projects have had lower impacts on cultural resources. The presence of existing development and infrastructure within Corridor 7 along the US 50/301 corridor has likely impacted many cultural resources, and any induced growth from Corridor 7 would not likely result in major land use changes. Thus, the incremental contribution from induced growth for Corridor 7 would likely be relatively small compared to the cumulative effect of past, present and future actions. Corridors 6 and 8, in contrast, would have greater direct impacts, contributing incrementally in the context of lower past effects from other actions.

4.8.4.4 Air Quality

No cumulative air quality effects have been identified or determined at this phase of Tier 1 analysis. It is assumed that a single Preferred Corridor Alternative will potentially be identified at the conclusion of the Tier 1 EIS process. Alternative alignments within the Preferred Corridor Alternative would be evaluated and compared to the No-Build Alternative in a Tier 2 NEPA analysis; such improvements would be subject to CAA transportation conformity, MSAT, GHG, and construction emissions requirements. Under the CAA, any Tier 2 preferred alternative alignment within a Preferred Corridor Alternative would require a conformity determination in either Corridor 6, 7, or 8 during Tier 2. Because the appropriate transportation conformity requirements would take into account the potential for air quality impacts in consideration of other existing and planned sources of air emissions (such as future transportation projects), it would serve as an assessment of the incremental cumulative contribution of a future Tier 2 alternative.

Any Tier 2 alternative alignments within Corridors 6 and 8 would likely be considered to have low potential MSAT effects and involve a qualitative MSAT analysis in Tier 2. Any Tier 2 alternative alignments within Corridor 7 would likely be considered to have higher potential MSAT effects and involve a quantitative MSAT analysis in Tier 2 due to the location of the existing Bay Bridge in Corridor 7. Based on projected travel speeds, Corridor 7 may result in lower emissions for some pollutants than Corridors 6 and 8. However, based on projected truck volumes, Corridor 7 could also result in higher emissions for some pollutants than Corridors 6 and 8. GHG and construction emissions may be qualitatively considered in Tier 2 regardless of the Corridor selected as the Preferred Corridor Alternative. The preferred alternative will meet the conformity requirements of the Clean Air Act Section 176(c) as appropriate.

4.9 SUMMARY

At the conclusion of Tier 1, MDTA and FHWA will identify a Selected Corridor Alternative. More detailed analysis of the affected environment and environmental consequences for alternatives within the Selected Corridor Alternative would be conducted in a potential future Tier 2 NEPA study. Likely impacts of alternatives within the Selected Corridor Alternative would be determined based on roadway alignments and limits-of-disturbance developed during Tier 2 and would be documented in a Tier 2 EIS.

Overall, the information presented in **Chapter 4** shows that substantial environmental resources are present within each of the three CARA. The types of resources most prevalent in each of the CARA can be related to factors such as the location and land uses, overall length, and the relative amount of land or water within each corridor. Corridor and crossing lengths are provided for reference in **Table 4-47**.

Table 4-47: Corridor and Crossing lengths

CORRIDOR ALTERNATIVE	APPROXIMATE LENGTH OF CHESAPEAKE BAY CROSSING	APPROXIMATE LENGTH OF DEEP WATER CROSSING	APPROXIMATE LENGTH OF ON-LAND IMPROVEMENTS	APPROXIMATE LENGTH OF OTHER WATER CROSSINGS	TOTAL CORRIDOR LENGTH
Measure	Miles	Miles	Miles	Miles	Miles
Existing	4	2	N/A	N/A	N/A
Corridor 6	11	0	14	3	28
Corridor 7	4	2	17	1	22
Corridor 8	12	2	21	4	37

4.9.1 No-Build Alternative

The No-Build Alternative would include no transportation improvements beyond those already planned, so direct impacts to resources such as agriculture, residential properties, businesses, community facilities, wetlands, streams, forest and wildlife habitat would not occur from new crossing construction. However, the traffic analysis estimates showed that traffic conditions at the existing Bay Bridge are expected to continue to deteriorate by 2040. Greater volumes of travelers and potentially increased need for maintenance at the bridge will cause greater unpredictability, longer backups, and slower travel times across the Bridge resulting in reduced mobility. Community and economic impacts from worsening congestion could potentially include reduced economic efficiency, reduced community desirability and impacts to tourism on the Eastern Shore. The No-Build Alternative would not be expected to result in impacts to the resources quantified in **Table 4-48**, therefore no column is included for the No-Build.

4.9.2 CARA

Table 4-48 provides a summary of the environmental resource inventory presented in **Section 4.1** through **4.8**. Note that these values reflect existing conditions within the two-mile wide CARA and are not reflective of actual impacts. The inventory of environmental features is, however, a useful indicator at the Tier 1 level of detail for comparing among broad corridor alternatives. Generally speaking, corridors with greater acreage or numbers of a resource are expected to be more likely to result in impacts to those resources.

In some instances, the geographic distribution of resources throughout a corridor also informs the qualitative discussion of potential impacts. For example, resources clustered along the edge of a corridor could allow a greater possibility of avoidance compared to resources that span the full width of a corridor. This kind of qualitative analysis will be detailed throughout the DEIS and technical reports and is summarized below for the purposes of this report. In general, the discussion focuses on resources that showed some distinction among the corridors.

Table 4-48: Environmental Resources Inventory Summary

RESOURCE	UNIT	CORRIDOR 6	CORRIDOR 7	CORRIDOR 8
Total Area	Acres	35,010	27,990	46,810
Land	Acres	16,840 (48%)	18,330 (65%)	26,230 (56%)
Open Water	Acres	18,140 (52%)	9,660 (35%)	20,590 (44%)
<i>Socioeconomic Resources</i>				
Community Facilities Total	Count	27	70	37
Parks and Recreation	Count	8	14	10
Schools (K-12 Public)	Count	5	9	7
Fire Stations	Count	2	4	0
Police Facilities	Count	0	3	0
Libraries	Count	1	4	1
Places of Worship	Count	9	29	15
Other	Count	2	7	3
Land Use/Land Cover Total	Acres	35,010	27,990	46,810
Agriculture	Acres	5,620 (16%)	3,260 (12%)	9,250 (20%)
Commercial	Acres	270 (1%)	930 (3%)	320 (1%)
Forest	Acres	4,500 (13%)	4,500 (16%)	8,520 (18%)
Residential	Acres	5,660 (16%)	6,560 (23%)	6,830 (15%)
Water	Acres	18,140 (52%)	9,660 (35%)	20,590 (44%)
Wetlands	Acres	280 (1%)	820 (3%)	350 (1%)
Industrial	Acres	0 (0%)	90 (<1%)	40 (<1%)
Institutional	Acres	280 (1%)	890 (3%)	200 (<1%)
Other	Acres	270 (1%)	1,270 (5%)	720 (2%)
Priority Funding Areas (PFAs)	Acres	1,600	7,900	3,500
Environmental Justice (EJ) Census Tracts	Count (Census Tracts)	1 Low-income 0 Minority Race/Ethnicity	1 Low-income 1 Minority Race/Ethnicity	0 Low-income 0 Minority Race/Ethnicity
<i>Section 4(f) Resources</i>				
Parks and Wildlife Refuges	Count	8	12	10

RESOURCE	UNIT	CORRIDOR 6	CORRIDOR 7	CORRIDOR 8
Area of Parks and Wildlife Refuges	Acres	1,030	1,220	1,140
Historic Sites	Count	2	13	14
Area of Historic Sites	Acres	160	460	510
Total Section 4(f) Resources	Count	10	25	25
Total Area of Section 4(f) Resources	Acres	1,190	1,680	1,650
Cultural Resources				
Recorded NRHP Eligible or Listed Properties	Count	2	13	14
Resources Listed in MIHP and Not Previously Evaluated for NRHP	Count	37	94	102
Land Areas Potentially Requiring Archaeological Survey	Acres	15,740	10,080	17,580
Natural Resources				
MDNR Non-Tidal Wetlands	Acres	1,200	1,500	2,080
MDNR Tidal Wetlands	Acres	18,460	10,870	24,940
NWI Non-Tidal Wetlands	Acres	1,340	1,520	2,270
Wetlands of Special State Concern (WSSC)	Acres	80	10	0
Surface Waters	Linear Feet	344,380	394,020	471,890
100-Year Floodplain	Acres	3,050	6,640	3,950
Chesapeake Bay Critical Area	Acres	4,910	9,810	8,120
FIDS Habitat	Acres	7,020	6,900	11,410
Forest Conservation Act (FCA) Easements	Acres	140	130	110
Sensitive Species Project Review Areas (SSPRAs)	Acres	2,720	2,180	8,630
Green Infrastructure - Total	Acres	4,880	4,480	11,450
Green Infrastructure Corridors	Acres	3,150	1,260	2,100
Green Infrastructure Hubs	Acres	1,730	3,220	9,350
Essential Fish Habitat (EFH)	Acres	18,080	9,600	20,480
Submerged Aquatic Vegetation (SAV)	Acres	40	270	460
Oyster Resources	Acres	11,130	3,460	7,960
MDNR Oyster Sanctuaries	Acres	6,470	1,580	2,090
Steep Slopes	Acres	2,090	0	3,090
Hydric Soils	Acres	3,580	5,390	8,250
Highly Erodible Soils	Acres	5,560	9,280	9,050
Land Susceptible to Sea Level Rise – 2050	Acres	350	1,310	680
Land Susceptible to Sea Level Rise – 2100	Acres	1,470	3,230	1,620
Noise				
Noise-Sensitive Areas	Acres	5,390	7,400	5,700

RESOURCE	UNIT	CORRIDOR 6	CORRIDOR 7	CORRIDOR 8
Hazardous Materials				
Hazardous Materials Sites of Concern - Total	Count	41	99	36
Low Priority	Count	24	63	28
Moderate Priority	Count	17	33	7
High Priority	Count	0	3	1

Sources: Data Sources: Maryland iMap GIS, MDP LULC 2010, NWI, USGS Web Soil Survey, USEPA Facility Registry Service, US Census Bureau, MIHP. Acreage values rounded to closest 10.

4.9.2.1 Corridor 6

The on-land area within Corridor 6 primarily encompasses a mix of communities, community facilities and other developed land uses on the Western Shore, along with many natural resources, agricultural areas and low-density residential uses on the Eastern Shore. Corridor 6 contains more agricultural land than Corridor 7, but less than Corridor 8.

Corridor 6 has the lowest total amount of residential land among the CARA. However, the distribution of residential land and the density of residential subdivisions encompassing the full width of the corridor on the Western Shore would make avoidance of these communities unlikely. A potential Tier 2 alternative within Corridor 6 would cause community impacts on the Western Shore for residential areas located along MD 177 by bisecting residential areas, disrupting local mobility, and causing other potential impacts to community cohesion. The amount of on-land natural resources within Corridors 6 and 7, such as forested land, surface waters, MDNR wetlands, FIDS habitat, SSPRAs, and green infrastructure, are relatively similar and both lower than Corridor 8.

Corridors 6 and 8 would require a Bay crossing of roughly 11 and 12 miles respectively, compared to an approximate length of four miles for Corridor 7. As a result, the amount of open water in Corridors 6 and 8 (18,140 acres and 20,590 acres respectively) is substantially greater than Corridor 7 (9,660 acres). Subsequently, aquatic resources associated with open water such as EFH and oyster resources are more prevalent in Corridors 6 and 8 compared to Corridor 7. EFH and oyster resources encompass the full width of the corridors in some locations, and thus could not be avoided.

The Cultural Resources evaluation found that recorded NRHP listed or eligible properties (as described in **Section 4.2**) are distributed relatively evenly between Corridors 7 and 8, with the fewest number of recorded historic properties in Corridor 6. Evaluation of additional properties would need to occur within any of the three corridors, and potential avoidance of historic properties would be possible. This Tier 1 analysis identified data gaps where further evaluation of historic properties would need to be conducted, as described in the [BCS Cultural Resources Technical Report, Sections 6.0 and 7.0](#).

Corridor 6 would potentially have substantial indirect effects. Corridor 6 would provide new access to areas within a roughly 30-45 minute distance of Baltimore, potentially resulting in increased demand for residential development on the Eastern Shore. The ICE analysis indicated that areas likely to experience new development pressure include important natural and agricultural resources, areas vulnerable to residential development (according to MDP data), and areas largely outside of PFAs.

4.9.2.2 Corridor 7

Because Corridor 7 follows the existing US 50/301 Bay Bridge crossing, the on-land portions of the corridor encompass a greater number of community facilities and a greater acreage of commercial and institutional land uses compared to Corridors 6 and 8. Corridor 7 also has substantially greater area of PFAs compared to the other CARA. Many of the commercial and institutional land uses and community facilities are located in close proximity to US 50/301. Improvements identified under a Tier 2 alternative would result in impacts to community facilities, commercial areas and institutional land uses. Corridor 7 has the highest acreage of noise-sensitive land uses due to the greater prevalence of developed land uses in the corridor.

Residential land uses are relatively similar among all three corridors, with Corridor 7 falling in between the acreages of Corridors 6 and 8. The existing US 50/301 infrastructure within Corridor 7 could potentially facilitate a future Tier 2 alternative with lower overall community impacts. A future Tier 2 alternative to expand capacity along existing roadways in Corridor 7 could minimize impacts to community cohesion and local mobility, and disruption from bisecting residential neighborhoods relative to Corridors 6 or 8. Neighborhoods in the vicinity of US 50/301 have generally been developed to the north or south of the highway, often separated by a commercial area or wooded buffers. Thus, new capacity in Corridor 7 could likely avoid bisecting existing residential neighborhoods; impacts would likely be primarily along the periphery of residential areas. Such an alignment would, however, have greater impacts on commercial land uses and community facilities that are more prevalent alongside US 50/301. Access roads to adjacent land uses could also be impacted. Building a new limited access roadway where one does not currently exist, as would be required in Corridors 6 and 8, would generally be expected to cause greater impacts to existing residential communities. However, a future Tier 2 alternative in Corridor 7 located away from US 50/301 would likely cause substantial impacts to developed land uses and communities comparable to a potential new alignment within Corridors 6 or 8.

As noted above, Corridor 7 would require a much shorter crossing of the Chesapeake Bay compared to Corridors 6 and 8, which could result in lower potential impacts to open water of the Bay and other major waterways. Aquatic resources associated with open water such as Essential Fish Habitat (EFH), tidal wetlands and oyster resources are more prevalent in Corridors 6 and 8 compared to Corridor 7. EFH and oyster resources encompass the full width of the corridor in some locations, and thus impacts could not be avoided. Overall, the longer crossing is likely to result in greater impact on the Chesapeake Bay and associated aquatic resources compared to Corridor 7. Consideration of all the environmental factors suggests that Corridor 7 would potentially result in fewer environmental impacts to sensitive aquatic resources of the Chesapeake Bay such as open water, fish habitat, and oysters.

Corridor 7 includes more coastline relative to the other corridors, due to the geography of Kent Island within the Corridor. Thus resources associated with coastal areas are generally more prevalent in Corridor 7 such as Chesapeake Bay Critical Area and 100-Year Floodplain. Furthermore, the prevalence of coastline within Corridor 7 results in a greater on-land area vulnerable to sea level rise.

Additionally, the presence of the existing US 50/301 corridor could allow for less impactful new infrastructure in Corridor 7. Corridors 6 and 8 would both require a major, new limited-access roadway largely on a new alignment through areas that are currently not impacted by major transportation infrastructure. However, a future Tier 2 alternative could be developed in Corridor 7 that expands the

existing US 50/301 infrastructure. Much of the land adjacent to the existing US 50/301 roadway is developed, so utilizing this infrastructure potentially minimizes overall impacts to on-land natural resources.

Corridor 7 contains a somewhat higher number of potential hazardous materials sites (99) compared to Corridors 6 or 8 (41 and 36, respectively), reflecting its more developed land uses. However, much of the difference between the corridors is due to the high number of low priority sites (63) within Corridor 7. At this time, it is unknown how many potential hazardous materials sites would be impacted or be able to be avoided by a specific alignment. Based on the desktop database evaluation, any identified sites could potentially be avoided during the Tier 2 planning phase.

Corridor 7 would likely result in additional new capacity to the existing transportation network in relative proximity to the Bay Bridge, which would be more compatible with existing land use patterns and plans compared to Corridor 6 or Corridor 8. Corridor 7 would potentially have indirect effects, but would likely have lower induced growth effects compared to Corridors 6 or 8. When it was constructed, the existing Bay Bridge resulted in growth in areas such as Kent Island and Queenstown due to accessibility to these areas. The pattern of growth that began from the Existing Bay Bridge would continue with a new crossing in Corridor 7. New capacity in the vicinity of the existing crossing would potentially increase the demand for development, but would be expected to result in more incremental change within the existing pattern of land use and demand for development, rather than substantially depart from existing patterns. More area in proximity to Corridor 7 is designated as PFA relative to Corridors 6 or 8, indicating that growth in these locations would be more compatible with planned future land uses compared to Corridors 6 or 8.

4.9.2.3 Corridor 8

Corridor 8 has the greatest overall length of the three CARA, and also includes the longest crossing. As a result, Corridor 8 generally includes the highest amount of many natural resources relative to Corridors 6 and 7. Corridor 8 has the highest amount of agricultural land, forested land, open water, tidal and non-tidal wetlands, surface waters, FIDS habitat, SSPRAs, green infrastructure, EFH, SAV, hydric soils, and highly erodible soils. Thus, it is likely that a new crossing within Corridor 8 would be the most environmentally impactful compared to alternatives within Corridors 6 and 7, particularly to natural resources.

Corridor 8 also includes the greatest acreage of residential land. Communities and residential neighborhoods particularly in the vicinity of Mayo, Beverly Beach and St. Michaels would likely be impacted, as their density and distribution would make avoidance difficult. Thus, a Tier 2 alternative in Corridor 8 would likely result in community disruption, bisect residential neighborhoods, impact local mobility, and cause other community cohesion impacts in this vicinity.

Corridor 8 would also result in potential substantial indirect effects. Corridor 8 would provide new access to areas within a roughly 45-60 minute distance of Washington DC, potentially resulting in increased demand for residential development on the Eastern Shore. The ICE analysis showed that areas within Corridor 8 that could potentially to experience new development pressure include important natural and agricultural resources, areas vulnerable to residential development (according to MDP data), and areas largely outside of PFAs.

4.10 NEXT STEPS

Based on the evaluation of engineering, traffic, cost, and environmental considerations along with public and agency input, MDTA has identified an MDTA-Recommended Preferred Corridor Alternative, discussed in Section 5 below.

After holding a public hearing and providing opportunity for public comments on this DEIS, a Final Environmental Impact Statement (FEIS) and Record of Decision (ROD) will be prepared. The FEIS and ROD will respond to public comments on this DEIS. MDTA has conducted regular coordination with Cooperating and Participating agencies as outlined in **Chapter 6**. Coordination with agencies will continue through the remainder of the Tier 1 process, providing opportunity for agency input on the FEIS and ROD.

The FEIS and ROD will also include a discussion of how the Tier 2 process would be conducted including the development and evaluation of alternatives, environmental analysis, and the evaluation of avoidance, minimization, and mitigation to be conducted in Tier 2. Agency and public involvement would continue through the Tier 2 process. A Tier 2 study would include coordination with natural resource agencies regarding the permitting and review processes applicable to resources that could be impacted by a Tier 2 alternative. Examples include, but are not limited to:

- Impacts to jurisdictional WOTUS will require coordination with the USACE and MDE and are authorized under the JPA process or Individual Permit process, depending on the level of jurisdictional impact.
- Impacts to the jurisdictional, non-tidal 100-year FEMA floodplain are authorized by MDE via the JPA process.
- Impacts to lands within 1,000 feet of the mean high water line of tidal waters of the Chesapeake Bay and its tributaries require authorization from the Critical Area Commission.
- Use of publicly-owned parks, recreation areas, wildlife and waterfowl refuges, or any significant public or privately-owned historic sites will require adherence to Section (4)f of the USDOT Act of 1966, Section 6(f) of the LWCF Program, and/or MDNR's Program Open Space.
- Coordination with MDNR and county planning agencies would be required during a Tier 2 NEPA study to evaluate potential impacts to forested areas and FIDS habitat.
- SAV and oyster resources and regulated by MDNR but are also classified as Special Aquatic Sites and regulated by MDE and USACE under Section 404 of the CWA.
- Coordination with the MHT and consulting parties would occur as appropriate regarding potential effects to historic resources in accordance with Section 106.
- Coordination with the USFWS would be required for any potential effects on listed endangered or threatened species in accordance with Section 7 of the Endangered Species Act (ESA).
- Coordination with the Chesapeake Bay Oyster Alliance, MDNR, the Virginia Marine Resources Commission, USACE, USFWS, and NOAA, among others, may be required during a Tier 2 NEPA study to evaluate potential aquatic resource impacts.