3 SUPPLEMENTARY ANALYSIS AND DISCUSSION

In response to public and agency comments on the DEIS, this section provides supplementary analysis and discussion on topics such as traffic, including the impact of COVID 19 and all electric tolling on future traffic volumes and patterns, consideration of climate change/sea level rise and environmental justice, and National Historic Preservation Act (NHPA) Section 106 compliance.

3.1 TRAFFIC

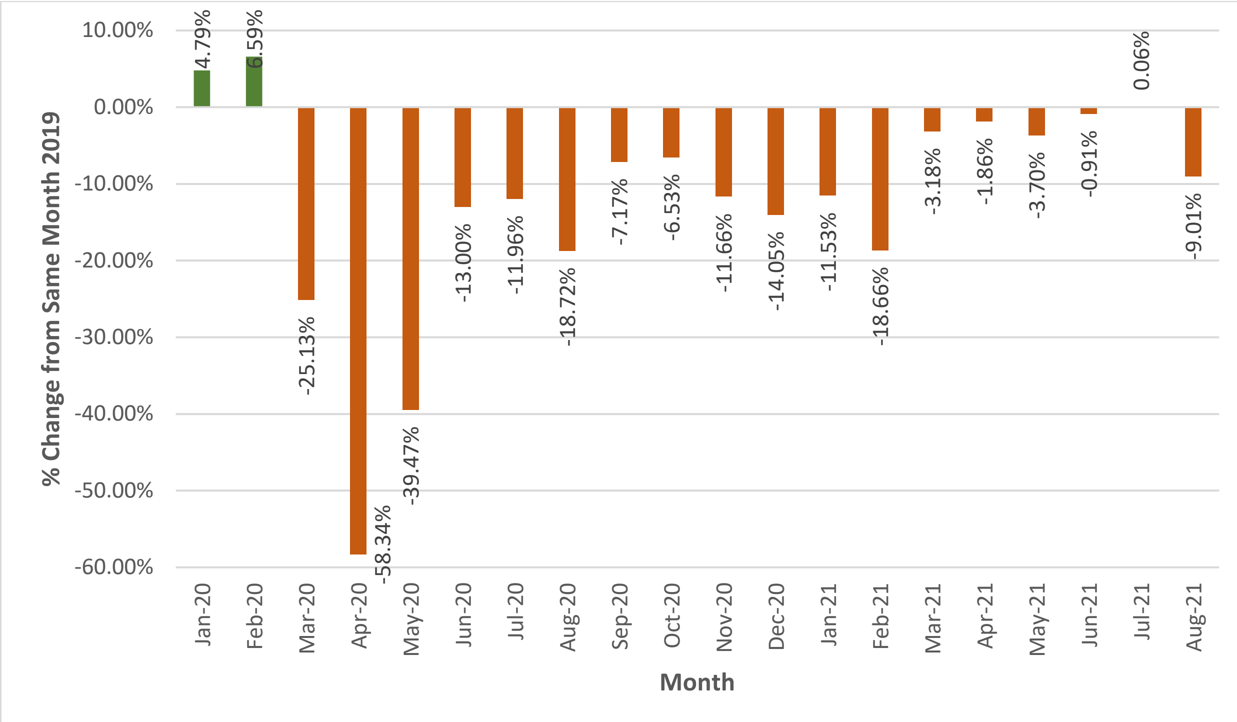
Commenters during public and agency review of the DEIS raised three major traffic-related topics. The first two topics dealt with potential impacts to congestion and travel patterns as a result of changes which have occurred since the time the traffic analyses for the DEIS were performed: the COVID-19 pandemic (which began in March 2020) and commencement of all-electronic tolling at the Bay Bridge (which occurred in the Spring of 2020). The third traffic-related topic addressed the adequacy of traffic volume data collected during August 2017 which was used in the DEIS analyses. These three topics are discussed below.

3.1.1 COVID-19 Pandemic

The COVID-19 pandemic has had an impact on both weekday and weekend travel patterns throughout the nation, including at the Bay Bridge. The short-term impacts of the pandemic continue to evolve, and it is too soon to define or to accurately assess the long-term impacts.

Figure 3-1 shows the percentage change in monthly traffic volumes at the Bay Bridge compared to the same month in 2019. Traffic volumes at the Bay Bridge dropped substantially during March 2020, as the pandemic's effects began to be felt, and dropped even further in April 2020, following issuance of a statewide Stay at Home order on March 30, 2020. Travel restrictions were eased somewhat in May 2020, with the issuance of a Safer at Home public health advisory which was effective on May 15, 2020, and volumes began to increase. Following the end of most COVID-19 restrictions in Maryland in mid-May 2021, volumes at the Bay Bridge have generally continued to increase, with volumes during July 2021 exceeding pre-pandemic levels.

Figure 3-1: Monthly Volumes Comparison on Eastbound US 50 at Bay Bridge



If a Tier 2 NEPA study is performed, the continuing impacts of the pandemic and recovery would be assessed in that Study. Updated traffic volume data would be collected and analyzed to establish a then-current baseline and applied in the calibration of an updated travel demand model used to forecast future traffic volumes. As with this Tier 1 EIS, the updated travel demand model used in Tier 2 NEPA would be based upon the travel demand models in use by regional and State planning agencies at that time.

Those regional and State models would additionally use updated forecasts of population and employment; it is anticipated that those models would either include or would be adapted as part of the Tier 2 NEPA study to incorporate long-term changes in travel behavior, to the extent that those changes are understood at that time. Additionally, a Tier 2 Study would include full consideration of a No-Build Alternative with a corresponding assessment of traffic under the No-Build condition, reflecting post-pandemic-related changes in the updated forecasts.

3.1.2 All-Electronic Tolling

Section 3.1.2.1 of the DEIS (Transportation Systems Management/Travel Demand Management [TSM/TDM]) includes the following text:

> *Implementing All Electronic Tolling (AET)*
>
> *This improvement includes replacing the existing toll booths with an overhead toll gantry that collect electronic tolls at highway speeds. AET commenced at the Bay Bridge in Spring 2020. Following completion of the Draft Tier 1 EIS, and prior to the preparation of the Final Tier 1 EIS,*

additional data collection will be performed to evaluate the effects of AET on eastbound operations.

Multiple comments on the DEIS expressed the opinion that the toll plaza was a major contributing factor to queues and delays on eastbound US 50, if not the only factor. Some felt that, once the toll plaza was removed, traffic operations would be significantly improved, and that lengthy queues would generally not be a problem. To address this concern, MDTA committed to examining in the FEIS the impact of implementing AET. This section discusses results of that additional data collection and analysis.

A direct comparison of "before AET" and "after AET" conditions is complicated by traffic volume changes resulting from the COVID-19 pandemic. A more direct comparison would be possible if traffic volumes immediately following the commencement of AET had been similar to traffic volumes immediately prior to the commencement of AET. However, as discussed in the preceding section of this document, traffic volumes were greatly affected by the onset of the pandemic and the ongoing recovery from it. As a result, the comparison is more complex.

MDTA continuously monitors traffic conditions on both the eastbound and westbound approaches to the Bay Bridge, adjusting the number of eastbound lanes between two and three based on various factors, including volumes in each direction, queue lengths in each direction, weather conditions, and response to incidents. Even at the termination of three eastbound lane operations, the Bay Bridge has recorded lingering queues in the eastbound direction on multiple occasions in June, July and August 2021. **Table 3-1** provides a sample of those queues.

Table 3-1: Observed Eastbound Queue Lengths (2021)

Day	Hour	Eastbound Queue Length at Termination of Three Eastbound Lanes Operation (miles)*
Wednesday, June 16, 2021	2PM	1.5
Friday, June 18, 2021	2PM	7.5
Thursday, June 24, 2021	5PM	4.1
Friday, June 25, 2021	2PM	2.5
Thursday, July 1, 2021	3PM	3.0
Saturday, July 10, 2021	12PM	1.5
Wednesday, July 14, 2021	5PM	6.0
Friday, July 16, 2021	2PM	2.5
Saturday, July 17, 2021	12PM	3.5
Friday, July 23, 2021	3PM	5.5
Saturday, July 24, 2021	12PM	3.0
Friday, July 30, 2021	3PM	3.5
Friday, August 13, 2021	3PM	1.5
Saturday, August 14, 2021	1PM	1.5

Day	Hour	Eastbound Queue Length at Termination of Three Eastbound Lanes Operation (miles)*
Friday, August 27, 2021	2PM	5.5
Saturday, August 28, 2021	2PM	3.5

* **Table 3-1** shows queue lengths at the end of "Three Eastbound Lanes Operation" and the beginning of "Two Eastbound Lanes Operation". Thus, even with three lanes in the eastbound direction, queues still occur. Ideally, "Three Eastbound Lanes Operation" would have continued until there were no longer queues in the eastbound direction. However, "Three Eastbound Lanes Operation" was terminated due to extensive queuing in the westbound direction, weather conditions, or incidents.

It should be noted that queues longer than those shown in **Table 3-1** can and do occur, during three eastbound lanes operation. For example, on Saturday, July 3, 2021, at 9AM, an eastbound queue of 5.5 miles was observed.

Examination of **Table 3-1** shows that queuing is still occurring on eastbound US 50 approaching the Bay Bridge following the commencement of AET and removal of the toll plaza. The ongoing significant queues observed shows that the implementation of AET and toll plaza removal by itself does not eliminate congestion in the eastbound direction. Given the volumes attempting to cross the Bridge during peak periods, the Bridge itself remains a constraint on capacity.

By eliminating the need for vehicles to slow or stop to pay their toll, AET can reduce delays and queuing at the Bay Bridge when low to moderate volumes are present; that is, when the capacity of the Bridge does not constrain traffic flow. However, as volumes approach the capacity of the Bridge, queues and delays still occur, even with AET.

If a Tier 2 NEPA study is performed, new existing conditions data, including traffic volumes and queues, will be obtained. AET will be part of those new existing conditions.

3.1.3 Existing Volumes

Some reviewers of the DEIS criticized the data used to support the traffic analysis. Among these critiques, commenters suggested that only one day of weekend traffic data from August 2017 was collected, that additional traffic data should have been collected, and that the data used in the DEIS were atypically high.

To clarify, seven days of data were collected for summer conditions, starting on August 1, 2017, and ending on August 7, 2017. Because both traditional weekday traffic peaks and summer weekend traffic peaks occur at the Bay Bridge, a week of data was obtained for both summer and non-summer conditions. In collecting traffic volume data for existing conditions, the study team attempted to capture average conditions at the Bay Bridge. Holiday weekends, when volumes and queues are known to be greater than average, were explicitly avoided during the data collection, so that typical conditions could be assessed. The collected data was reviewed for unusual volumes, which could have been indicative of atypical conditions such as major crashes, incidents, construction operations, or extreme weather. No unusual volumes were found. Additional details may be found in Chapter 4 of the Traffic Analysis Technical Report.

In addition, it should be noted that the average summer weekend volumes used in the DEIS analyses are a composite of Friday, Saturday, and Sunday volumes, and represent the highest volume in each hour during that three-day period. During the summer, eastbound traffic is typically much higher on Fridays and Saturdays than on Sundays, due to recreational traffic destined for the Eastern Shore. Similarly, westbound traffic is typically much higher on Sunday than on Fridays or Saturdays, as recreational traffic returns to the Western Shore. Combining the different directions for different days into a single set of data allowed the peak volumes in each direction to be represented, and allowed for concurrent analysis of the two directions, without affecting the integrity of those analyses.

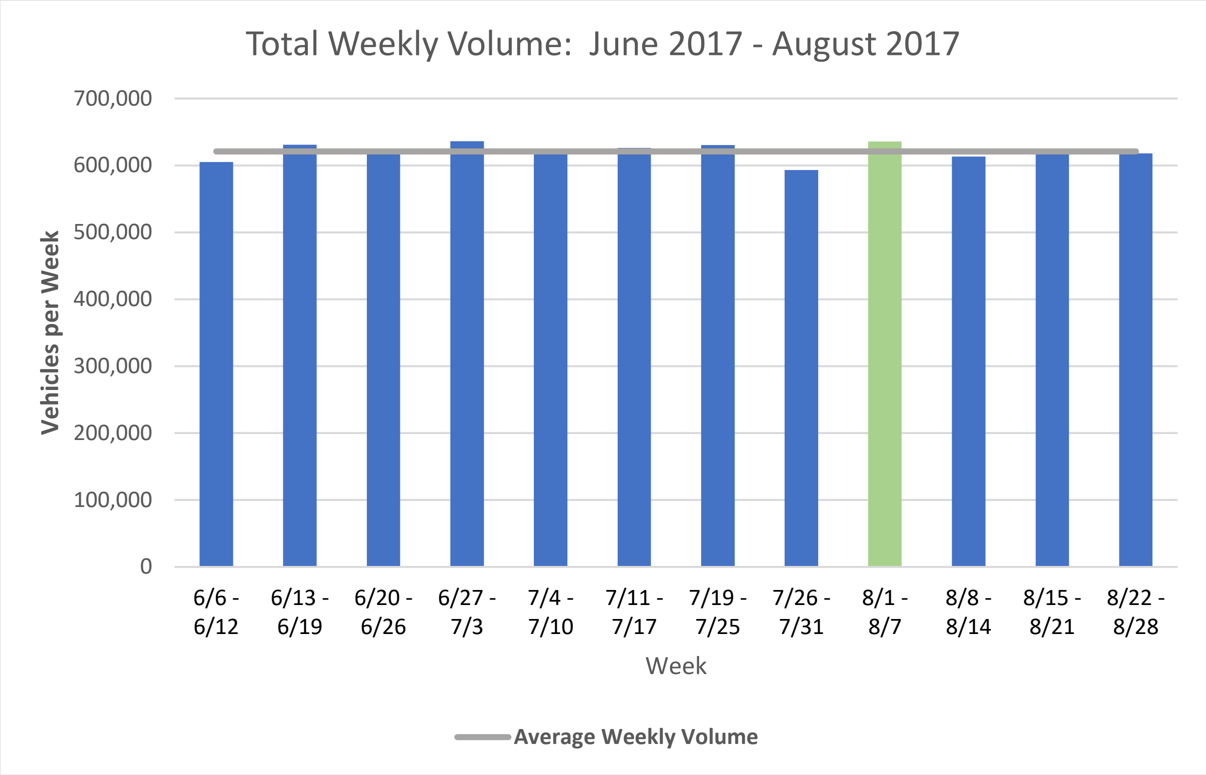
In response to public comments critical of the traffic analysis, data for the Bay Bridge for a wider range of dates, June through August 2017, was reviewed and is summarized in **Table 3-2** and **Figure 3-2** below. The week of data collection used in the DEIS is highlighted.

Table 3-2: Weekly Traffic Volumes on the Bay Bridge, June – August 2017

Week	Total Volume (vehicles)	Percentage Difference from Average Weekly Volume
6/6/17 – 6/12/17	605,053	-2.56
6/13/17 – 6/19/17	630,773	1.58
6/20/17 – 6/26/17	622,043	0.18
6/27/17 – 7/3/17	636,035	2.43
7/4/17 – 7/10/17	617,775	-0.51
7/11/17 – 7/17/17	625,989	0.81
7/18/17 – 7/24/17	630,278	1.5
7/25/17 – 7/31/17	593,258	-4.46
8/1/17 – 8/7/17	635,161	2.29
8/8/17 – 8/14/17	613,146	-1.26
8/15/17 – 8/21/17	624,042	0.5
8/22/17 – 8/28/17	617,914	-0.49
Average	**620,956**	**N/A**

Examination of **Table 3-2** and **Figure 3-2** confirms that the weekly volumes were relatively consistent throughout the summer of 2017. Total volume during the week of 8/1/17 through 8/7/17 was slightly higher than the average weekly volume of the June through August period, but still representative of that time period and not abnormally high. This variation from the average weekly volume is well within a range typically accepted in traffic engineering analyses. For example, in its “VISSIM Modeling Guidance” (August 2017), MDOT SHA requires that “The volume calibrations should not exceed 10% of the count traffic volume…” (page 14). The 2.29 percent difference noted in **Table 3-2** and **Figure 3-2** is well within this range. The volumes used appropriately represent existing conditions, and the analyses appropriately reflect existing conditions.

Figure 3-2: Total Weekly Volumes on Bay Bridge: June 2017 – August 2017



3.2 Climate Change and Sea Level Rise

MDTA received comments from agencies and the public regarding the potential impacts and considerations related to climate change and sea level rise. Greenhouse gas (GHG) emissions, sea level rise vulnerability, and climate change resiliency are all topics relevant to the discussion of a potential new Bay Crossing. MDTA would continue to evaluate these topic areas in a potential future Tier 2 study.

3.2.1 Greenhouse Gas Emissions

GHGs are an emission monitored by the U.S. Environmental Protection Agency (EPA). The primary GHGs in the Earth's atmosphere are Carbon Dioxide (CO_2), Methane (CH_4), Nitrous Oxide (N_2O), and Fluorinated Gases. GHGs are generated through burning fossil fuels and other human and natural sources. These emissions are different from criteria air pollutants since their effects in the atmosphere are global rather than localized, and since they remain in the atmosphere for decades to centuries. GHG emissions from vehicles using roadways are a function of multiple factors such as distance traveled (expressed as vehicle miles traveled [VMT]), vehicle speed, and road grade. GHG emissions are also generated during roadway construction and maintenance activities.

Currently, there are no federal mandated project planning requirements regarding the consideration of GHG impacts for transportation projects. Maryland also does not require GHG analysis at the project level. However, the CEQ provides guidance on considering GHGs in NEPA, which the MDTA has applied to this Tier 1 Study. Pursuant to Executive Order (EO) 13990, *Protecting Public Health and the Environment and*

Restoring Science to Tackle the Climate Crisis, CEQ rescinded its 2019 Draft *NEPA Guidance on Consideration of Greenhouse Gas Emissions* and is reviewing, for revision and update, the 2016 *Final Guidance for Federal Departments and Agencies on Consideration of Greenhouse Gas Emissions and the Effects of Climate Change in National Environmental Policy Act Reviews*. As recommended in the 2016 guidance, a qualitative analysis of GHGs is being provided for this Tier 1 NEPA Study because tools, methodologies, or data inputs are not reasonably available to support calculations for a quantitative analysis as part of this Tier 1 study.

3.2.1.1 GHG Qualitative Analysis for Tier 1 NEPA Study

An assessment of broad-scale effects of GHG emissions was identified as the appropriate level of review for this Tier 1 NEPA Study because the analysis of broad corridor locations for a potential Bay crossing does not include details on specific alignments within the Corridor Alternatives. To perform a GHG analysis, affected road networks would need to be identified and traffic characteristics for those networks would be required, such as VMT and vehicle mix. Therefore, an analysis of GHG emissions during a Tier 1 NEPA Study would not produce meaningful results to provide the public and decision-makers with useful information regarding differences in Corridor Alternatives. The following assessment explores transportation factors that could produce either an increase or a decrease in GHG emissions. Since there are factors that could influence emissions in both directions, the resulting net increase or decrease in GHG emissions cannot be definitively determined at this time.

Factors Likely Increasing GHG Emissions

Under both the No-Build and CARA, VMT in the region is expected to increase between 2015 and 2040, the current projected design year; it is likely that GHG emissions will also increase between 2015 and 2040. Additionally, because the projected increase in truck volumes within Corridor 7 is slightly higher than the projected increase in Corridors 6 and 8, it is possible that Corridor 7 could result in greater vehicle emissions than Corridors 6 and 8.

Construction and subsequent maintenance of a new crossing would also generate GHG emissions. The sequence of construction is unknown during the current Tier 1 phase, therefore GHG emission during construction would be more appropriately analyzed during a potential future Tier 2 NEPA study.

Factors Likely Decreasing GHG Emissions

When traffic speeds and flow are optimized, less idling occurs; thereby reducing excessive emissions, including GHGs. The longest vehicle queues expected in year 2040 - where more idling would occur - are seen in the No-Build Alternative in both directions of travel at the existing crossing. As a No-Build Alternative would not address traffic speed and flow, excessive emissions from queuing would not be reduced under the No-Build Alternative.

By contrast, a new crossing in any of the CARA would be expected to draw some traffic from the existing Bay Bridge. Corridor 7 presents the best scenario for the predicted 2040 queue length at the existing crossing. Generally, the daily maximum queue length increases at the existing Bay Bridge the farther the Corridor Alternative is located from the existing crossing. Since Corridor 7 would result in the best congestion relief at the existing crossing location, with less queuing and idling, it would likely result in lower GHG emissions from queuing than Corridors 6 and 8.

A major factor in mitigating the GHG emissions associated with transportation is more stringent fuel economy standards, which would occur under the Build and No-Build scenarios. The federal Energy Information Administration (EIA) projects that vehicle energy efficiency (and thus, GHG emissions) on a per-mile basis will improve by 28 percent between 2012 and 2040. Under a Build Alternative, more efficient vehicles along with reduced congestion could offset some GHG emissions from the transportation network.

3.2.1.2 Future GHG Analysis for Potential Future Tier 2 NEPA Study

Projected GHG emissions may be further analyzed for alternative alignments during a potential future Tier 2 NEPA analysis if warranted and practicable. As noted previously, to perform a meaningful GHG analysis, affected road networks would need to be identified and traffic characteristics for those networks would be required, such as VMT and vehicle mix. Alternative alignments within the Tier 1 PCA could be evaluated for GHG emissions and compared to the No-Build Alternative in a Tier 2 NEPA study.

If necessary, mitigating measures could be explored during a potential future Tier 2 NEPA study to help offset any potential increase in GHG emissions associated with construction of a new crossing.

3.2.1.3 Mitigation Measures for GHG Reduction

The Maryland Department of Transportation (MDOT) is exploring strategies and programs aimed at reducing GHG emissions in conjunction with Maryland's Greenhouse Gas Emissions Reduction Act (GGRA), which requires a 40 percent reduction of emissions from 2006 levels by 2030. In 2019, Maryland's GGRA Plan was updated to strive for a 50 percent reduction in GHG emissions by 2030. MDE's emissions analysis shows that the 2030 GGRA Plan will come very close to achieving a 50 percent reduction by 2030 without accounting for some anticipated new federal government policies to reduce emissions.

This section includes a discussion of broad-scale efforts by MDOT to reduce GHG emissions from the transportation sector, including electric vehicle (EV) stations, infrastructure design, transportation technology, congestion mitigation, and VMT reduction. GHG reduction efforts related to installation of EV stations and infrastructure design (i.e., cashless tolling) at the existing Bay Bridge would be realized within Corridor 7, whereas reductions in GHG emissions related to transportation technology, congestion mitigation, and VMT reduction would be realized at a larger, statewide scale.

Electric Vehicle (EV) Stations

As of early August 2021, there were over 1,000 EV charging stations in Maryland according to the Maryland Zero Emission Electric Vehicle Infrastructure Council (ZEEVIC), which are powered by "the grid," comprised of energy generated from multiple sources including coal, nuclear, solar and wind. MDOT is in the preliminary stages of developing a task order for solar development at MDOT SHA facilities. EV charging infrastructure is anticipated to be installed as a part of the contract; however, the potential solar development would be grid connected, and thus not for the sole purpose of powering EV charging stations.. The 140-mile US 50 corridor between MD 528 in Ocean City and Washington, D.C., which includes the Bay Bridge, has been designated as an Electric Vehicle Alternative Fuel Corridor by FHWA. MDTA commissioned feasibility studies for EV charging stations in 2016 at five MDTA facilities including the Baltimore Harbor Tunnel, Fort McHenry Tunnel, Point Breeze, the Maryland House Travel Plaza, and the Chesapeake House Travel Plaza. EV charging stations have been installed at four of the five facilities that were studied, including the Baltimore Harbor Tunnel, Fort McHenry Tunnel, Maryland House Travel Plaza, and the Chesapeake House Travel Plaza. Additionally, MDTA and Baltimore Gas & Electric are in a partnership to install charging stations at the existing Bay Bridge facility.

Infrastructure Design

MDOT continues to emphasize the importance of reducing emissions through design principles including practical and innovative project implementation. MDOT infrastructure design initiatives with potential GHG benefits include:

- MDTA implemented permanent full-time all-electronic (cashless) tolling at all toll facilities across Maryland.
- MDOT Transportation Secretary's Office (TSO) published design guidance for projects applying for MDOT Kim Lamphier Bicycle Program, which provides grant support for a wide range of bicycle network development activities.
- Transportation Alternatives (TA) Program: a reimbursable, federally funded program for local sponsors to complete transportation-related community projects designed to strengthen the intermodal transportation system. The program provides funding for projects that enhance the cultural, aesthetic, historic, and environmental aspects of the intermodal transportation system. The program can assist with projects that create bicycle and pedestrian facilities, restore historic transportation buildings, convert abandoned railway corridors to pedestrian trails, mitigate highway runoff, and other transportation related enhancements.
- Recreational Trails Program: a federally funded program MDOT SHA administers on a reimbursement basis. Like the TA Program, the Recreational Trails Program may reimburse a local project sponsor up to 80% of the project's total eligible costs to develop community-based, motorized and non-motorized recreational trail projects.

Transportation Technology

As a leader in implementing emerging transportation technologies, MDOT is promoting various initiatives including the Maryland ZEEVIC, connected and automated vehicle (CAV) technology, and renewable energy. Total registered EVs in Maryland stands at 36,080 as of August 2, 2021. MDOT's Fleet Innovation Plan supports the conversion of its light-duty and bus fleet to Zero Emission Vehicles (ZEV).

Congestion Mitigation

MDOT continues its comprehensive and innovative approach to mitigating congestion and improving travel and freight reliability through various initiatives, including those within Transportation Systems Management and Operations (TSMO). In 2019, the Coordinated Highways Action Response Team (CHART) Program cleared 31,750 traffic incidents and assisted 39,500 motorists on Maryland highways.

VMT Reduction

MDOT invests in low-emissions travel modes (transit, bicycle, and pedestrian) and provides commuting incentives and information under the Commuter Choice Maryland Travel Demand Management Program. MDOT initiatives related to VMT reduction and low-emissions travel modes include:

- MDOT Maryland Transit Administration (MTA) continues its railcar replacement program, replacing 78 railcars to improve passenger comfort and travel time reliability, and enhancing safety components on the Metro SubwayLink system.
- MDOT MTA launched real-time tracking for MARC Train service in August 2020 to improve traveler information and system management.

3.2.2 Sea Level Rise Vulnerability

Maryland has over 3,100 miles of tidal shoreline associated with the Chesapeake Bay, its tributaries, the Atlantic Ocean, and coastal bays, and is especially vulnerable to the adverse effects associated with sea level rise (Boesch et al 2018). Some of these adverse effects are becoming apparent and include an increase in shoreline erosion, deterioration of tidal wetlands, and saline contamination of low-lying farm fields. “Nuisance” tidal flooding, also referred to as high tide flooding, historically occurred a few days per year, but now occurs 40 or more days per year in some areas, including Annapolis. Surges from tropical storms or Nor’easters also spread farther and higher, inundating roads and infrastructure further inland due to higher sea levels (Boesch et al 2018).

Sea level is rising more rapidly in Maryland than in some other coastal areas because land subsidence is occurring simultaneously (EPA 2016). Projections vary, but forecasters generally believe that sea level along Maryland coastal areas will rise 16 inches to four feet within the next 100 years from expansion of the ocean due to warming and the melting of polar ice sheets and glaciers. While thermal expansion accounted for much of the measurable sea level rise during the 20th century, the melting of polar ice sheets and mountain glaciers is responsible for more than 50 percent of the measured rise since 1993 (Climate.gov 2016).

In 2012, Maryland Governor Martin O’Malley signed an EO entitled, *Climate Change and ‘Coast Smart’ Construction* requiring state agencies, including MDOT, to consider risks associated with sea level rise in state capital budget projects. The Coast Smart Guidelines recommend designing new major infrastructure projects to avoid or minimize future impacts from sea level rise, storm surge, and coastal flooding over the intended lifetime of the project. These siting guidelines are intended to guide infrastructure development in vulnerable areas, and include the following recommendations:

- Avoid construction or reconstruction of infrastructure projects in areas likely to be inundated within 50 years.
- Avoid locating state “critical or essential facilities” within Special Flood Hazard Areas as designated for the National Flood Insurance Program (NFIP).
- Protect these facilities from damage resulting from a 500-year flood.

In coordination with the FHWA, MDOT, NOAA, US Army Corps of Engineers (USACE), and other agencies, MDOT State Highway Administration (SHA) developed the GIS-based *Climate Change Vulnerability* application as a tool to aid engineers and planners in identifying sea level change and the predicted effects on roads and roadway infrastructure in Maryland. The geospatial application provides a means of visually depicting the extent of flooding and roadway inundation based on projected storm event scenarios for the years 2050 and 2100. For the purposes of this study, figures were prepared to depict the following:

- Flooding based on the Mean Higher High Water (MHHW) for the 50-year storm event in 2050 and 2100
- Flooding based on the MHHW for the 100-year storm event in 2050 and 2100.

The 50-year storm event is expected to have a 2 percent chance of occurring annually while the 100-year storm event has a 1 percent chance of occurring annually. MHHW is defined as the average height of the highest tide recorded at a tide station each day during the recording period.

Figures 3-3 through **3-6** depict the extent of stillwater depth based on the 50- and 100-year storm events projected to occur in 2050 and 2100 associated with the three corridor alternatives. Stillwater is the flood level; not including the effects of waves but including storm surge and astronomic tide.

As indicated in **Figures 3-3** through **3-6**, large portions of the study areas associated with all three corridor alternatives will be subjected to extensive stillwater inundation under both the 50- and 100-year MHHW events projected for 2050 and 2100. Because a new Bay crossing structure would be expected to be in service for decades, engineers and designers would consider the potential range of future impacts into the design, maintenance, and construction of a crossing for any of the three corridor alternatives. A potential future Tier 2 study would include more detailed assessment of sea level rise in the design, engineering, and comparison of alternatives in Tier 2. This would include an evaluation of opportunities to reduce risk and vulnerability to inundation to the extent possible. Some examples of the opportunities to be explored under a Tier 2 analysis include:

- Nature-Based Solutions – Nature-based solutions use natural materials or processes to reduce erosion, wave damage, and flood risks. Examples include conservation, restoration, or construction of coastal dunes, coastal wetlands and marshes, and maritime forest areas (Webb et al 2019).

- Design-Based Solutions – Design-based solutions are those incorporated into the planning and design phases of a project as a means of accounting for projected future conditions. Examples of design-based solutions include raising existing roadways, bridge height considerations, sea walls, incorporating a stormwater pumping system, and incorporating resilience strategies to reduce post-storm flood recovery durations.

With the implementation of the 2012 *Climate Change and 'Coast Smart' Construction* EO**,** sea level rise adaptation and response must now be incorporated into the planning process for Maryland's coastal transportation infrastructure projects. Because the past can no longer be used as a predictor of future conditions, planning must also account for the inherent uncertainties associated with both sea level rise projections and extreme weather events. The 'Coast Smart' Guidelines, established in consultation between the Maryland Department of Natural Resources (MDNR) and MDOT, are intended to guide transportation infrastructure in vulnerable areas. The design guidelines pertain to construction of the structure or infrastructure and recommend designing new major infrastructure projects to avoid or minimize future impacts from sea-level rise, coastal flooding, and storm surge over the project lifetime. The Bay Crossing Study provides an opportunity to incorporate the comprehensive and science-based planning strategies established under the 'Coast Smart' design criteria.

Figure 3-3: 2050 MHHW – 50-Year Storm

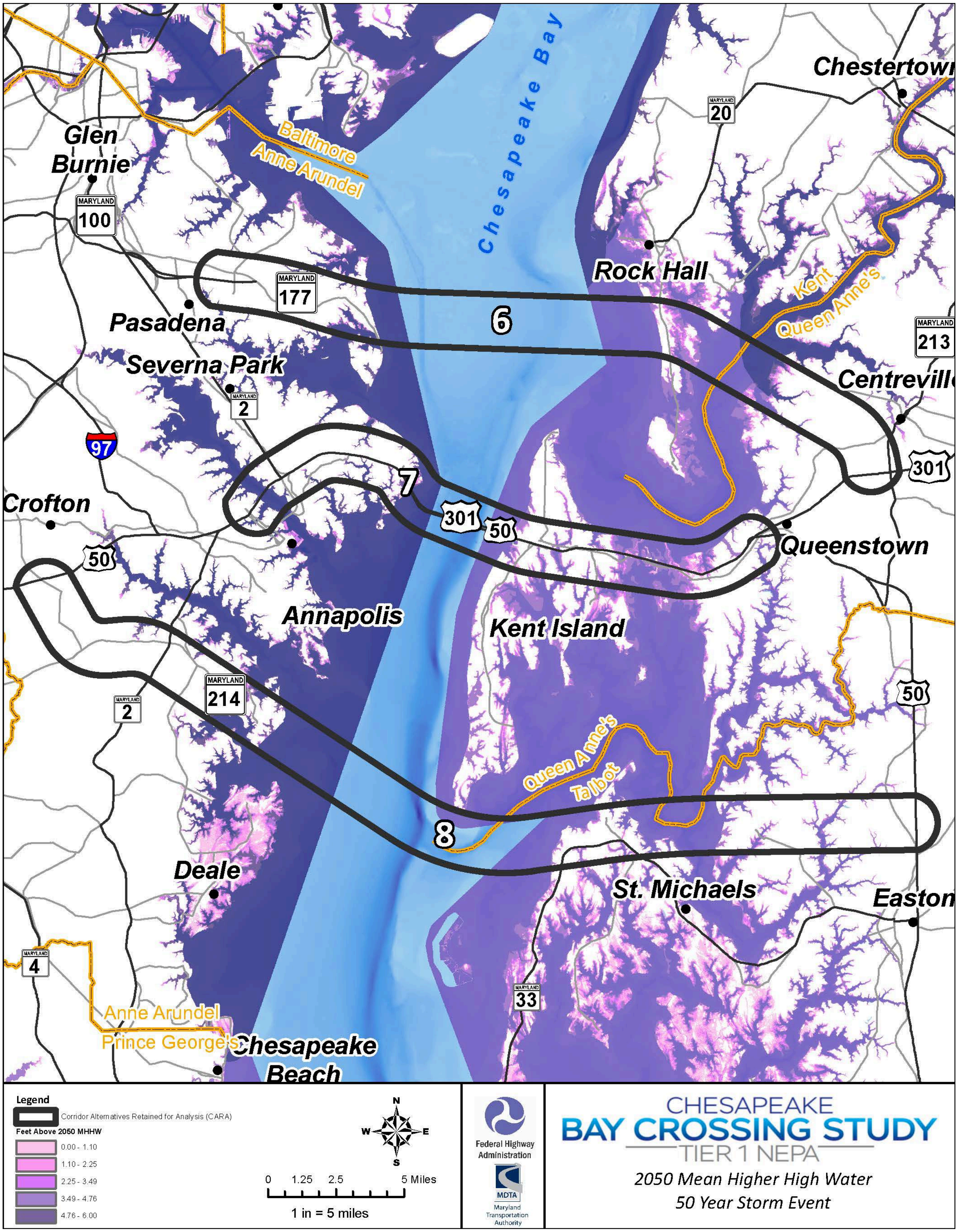


Figure 3-4: 2050 MHHW – 100-Year Storm

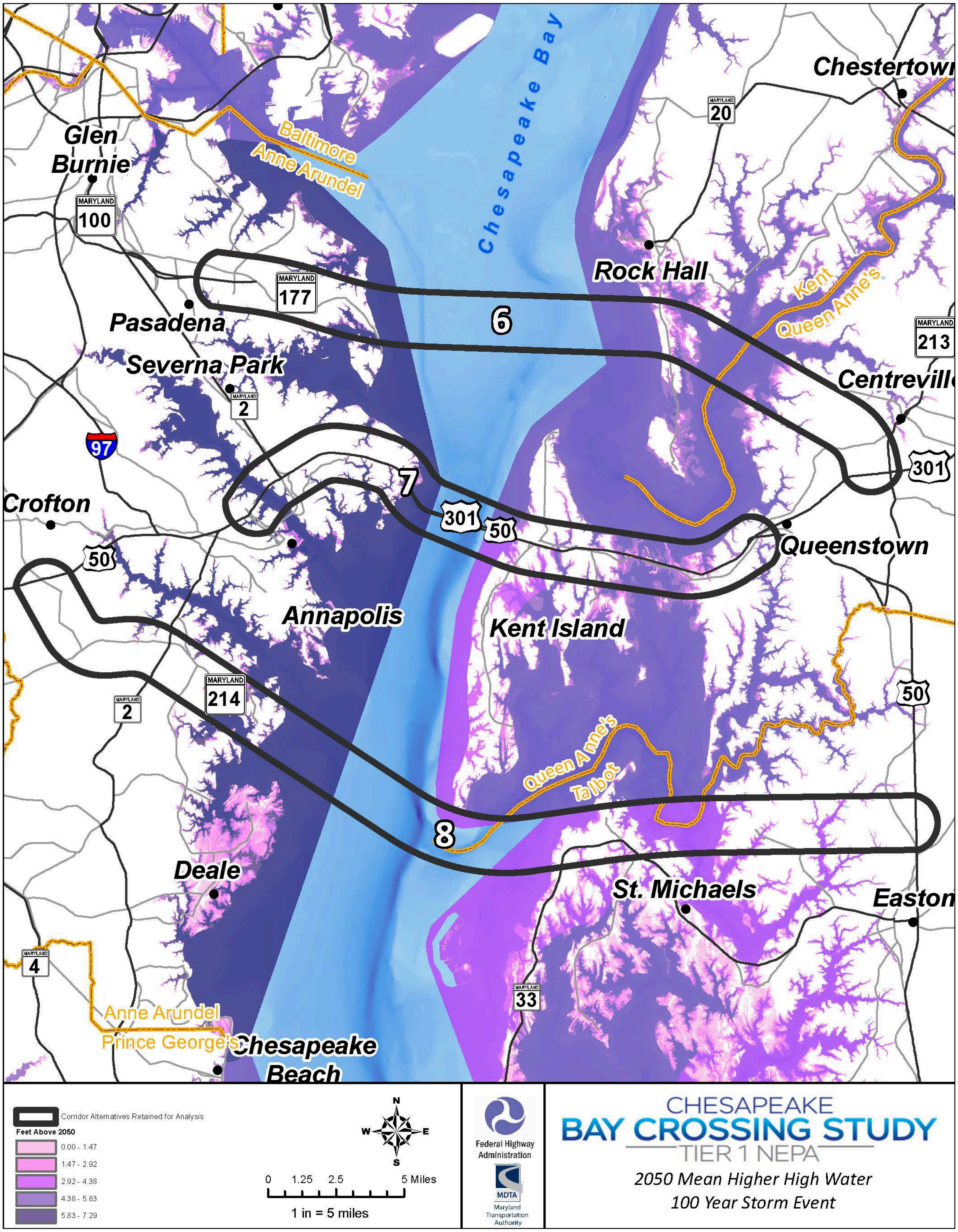


Figure 3-5: 2100 MHHW – 50-Year Storm

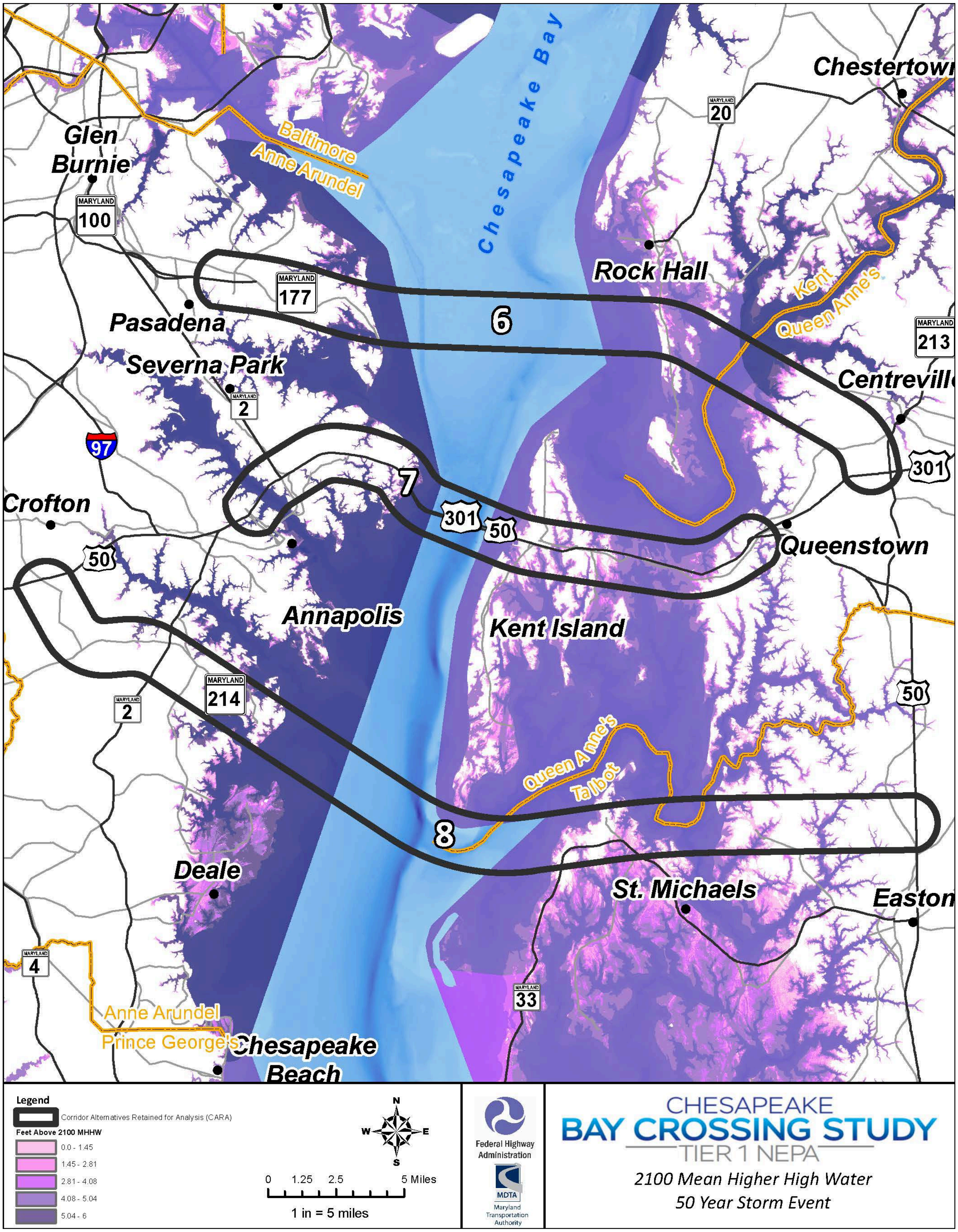
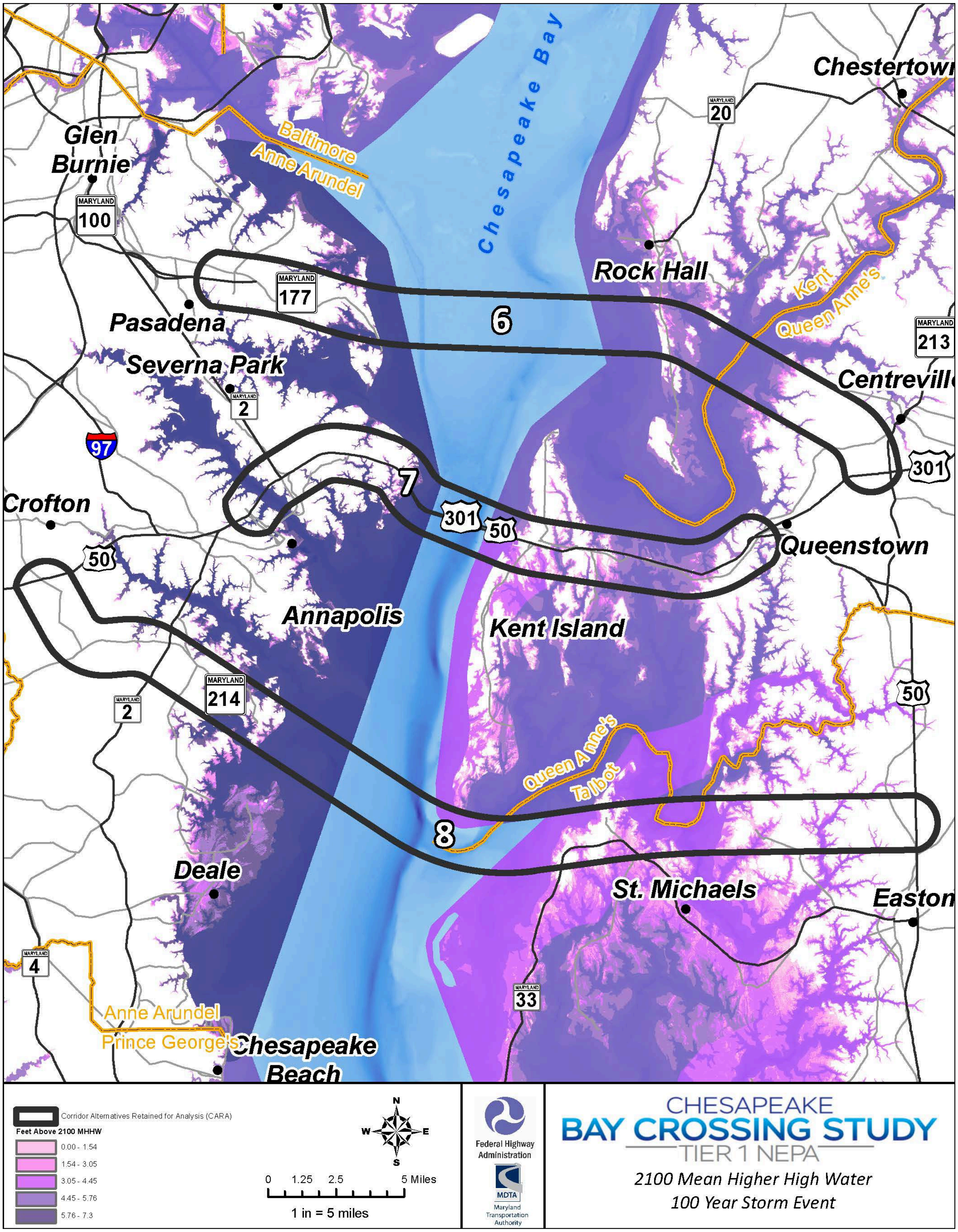


Figure 3-6: 2100 MHHW – 100-Year Storm



3.2.3 Climate Change Resiliency

Climate change presents a growing risk to the reliability, sustainability, and safety of transportation infrastructure. Building resilience into the planning process will aid in recovery from increased hazardous weather events associated with climate change as climate-related disruptions may lead to increased and cascading commuter delays, emergency system failures, and significant economic impacts (EPA 2016). The Coastal Zone Management Act of 1972, as amended, states that "because global warming may result in a substantial sea level rise with serious adverse effects, coastal states must anticipate and plan for such an occurrence." Additionally, the Biggert-Waters Flood Reform Act of 2012 allows the Federal Emergency Management Agency (FEMA) to update its federal insurance rate maps (FIRMs) to include "relevant information and data" on flood hazards caused by land-use changes and "future changes in sea levels, precipitation, and intensity of hurricanes."

Because of the combination of land subsidence and sea level rise, the Chesapeake Bay is one of the nation's most vulnerable regions to the effects of climate change (EPA 2016). Some of these effects have already been observed and the region is expected to experience further shifts in environmental conditions in the coming decades. FHWA publication, FHWA-HEP-17-028, defines "resilience" as "the ability to anticipate, prepare for, and adapt to changing conditions and withstand, respond to, and recover rapidly from disruptions." The Fixing America's Surface Transportation (FAST) Act, signed into law in December 2015, requires transportation agencies to take resiliency into consideration during transportation planning processes.

Transportation infrastructure in coastal areas is especially vulnerable to climate-related events due to the exacerbated flooding associated with more frequent and intense coastal storm surges and rising sea levels. As a result, it is no longer practical to address potential impacts based on historical climate data. Engineers and planners must now understand the potential range of future impacts based on scientific projections of conditions expected in the next 50 years and beyond (EPA 2016).

The 2015 Maryland Commission on Climate Change (MCCC) Act required the MCCC and its participating agencies, including MDOT, to develop an action plan and firm timetable for mitigation of and adaptation to the likely consequences and impacts of climate change in Maryland (MDOT 2020). MDOT prepared and released its 2020 status report outlining several goals that help advance the department's approach to adapt to and combat climate change. These goals include:

- Delivery of the State's transportation infrastructure program that conserves and enhances Maryland's natural, historic, and cultural resources.
- Improving resilience and transitioning to a more efficient transportation system.
- Commitment to multimodal accessibility and mobility for all transportation system users that helps mitigate congestion and shift travel to less emission intensive modes.

As required by the 2015 Act, MDOT must continue to develop comprehensive approaches for reducing transportation asset climate change vulnerabilities and optimize resiliency planning and implementation. MDOT's activities are required to adapt to the potential impacts of a changing climate through planning, maintenance, management, and response.

Climate change is already causing more frequent road flooding, snowstorms, and heat- and cold-related pavement and communication failures. These capacity and performance issues are only expected to worsen. Transportation modernization efforts must promote infrastructure that is built or retrofitted to revised design standards that take the anticipated climate of the region into account (CMAP, No Date).

Comments related to climate change were prevalent among the agency and public comments on the DEIS, and this supplementary analysis has been provided to recognize the potential impacts and considerations related to sea level rise and climate change resiliency at a new Chesapeake Bay crossing. Over time, tidal and storm surges will have impacts on coastal transportation infrastructure, including the existing Bay Bridge and any future crossings. Therefore, comprehensive analysis and adaptation to these potential impacts will be an important component of medium- and long-range planning and project development.

Given the coastal locations of the three CARA, construction within areas most susceptible to the effects of climate change would be unavoidable. Generally, the potential sea level rise and climate change resiliency evaluation presented here has not resulted in the identification of any substantial new distinguishing factors among the CARA that would influence the identification of Corridor 7 as the PCA. Any of the three CARA would face largely similar issues which would require adaptive measures and forward-thinking design to ensure that new crossing infrastructure would withstand the potential effects of sea level rise. A more detailed analysis of opportunities to incorporate resiliency into the selected alternative would be undertaken in a potential future Tier 2 analysis.

3.3 ENVIRONMENTAL JUSTICE

3.3.1 Introduction

Environmental justice (EJ) is the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies (EPA, 2021). EO 12898, *Federal Actions to Address Environmental Justice (EJ) in Minority and Low-Income Populations* (1994), directs federal agencies to identify and address the potential effects of their programs, policies, and activities on minority and low-income populations and ensure that those populations do not suffer disproportionately high and adverse effects from those actions. US Department of Transportation (USDOT) Order 5610.2(a) (2012) and FHWA Order 6640.23A (2012) implement EO 12898 and establish policies to avoid, minimize, or mitigate disproportionately high and adverse environmental or public health effects on minority and low-income populations from USDOT and FHWA programs, policies, and activities (USDOT, 2012; FHWA 2012). EO 14008, *Tackling the Climate Crisis at Home and Abroad*, which was issued on January 27, 2021, directs federal agencies to make the achievement of environmental justice part of their missions by developing programs, policies, and activities to address the disproportionately high and adverse human health, environmental, climate-related and other cumulative impacts on disadvantaged communities, as well as the accompanying economic challenges of such impacts. DOT Order 5610.2C was issued on May 14, 2021 to update USDOT EJ procedures.

3.3.2 Summary of Tier 1 Draft EIS EJ Analysis

In accordance with EOs 12898 and 14008 and applicable USDOT and FHWA EJ orders, an EJ analysis was performed for the Tier 1 Draft EIS to identify potential EJ populations in the socioeconomic study area. US Census Bureau data was analyzed at the Census tract level to identify notably high concentrations of minority and low-income populations that could indicate the potential presence of EJ communities. Census tracts are statistical subdivisions of a county that contain an average of approximately 4,000 people.

The Tier 1 Draft EIS EJ analysis identified three Census tracts with potential low-income EJ populations (Tracts 9505, 8107, and 7064.02) and five tracts with potential minority EJ populations (Tracts 7025, 7064.01, 7064.02, 7065, and 7067). Of these tracts, a small portion of the western end of Tract 7067 is crossed by Corridor 7; the remaining tracts are in the larger Tier 1 Socioeconomic Study Area and are not crossed by any of the CARA. Potential low-income and minority EJ Census tracts are shown on **Figure 4-4** in the Tier 1 Draft EIS. Additional information about the EJ analysis, including thresholds used to identify potential EJ Census tracts, is provided in **Section 4.1.4.2** of the Tier 1 Draft EIS and **Section 5.3.2** of the Bay Crossing Study Socioeconomic Technical Report.

3.3.3 EPA Comments on the Tier 1 Draft EIS

EPA provided the following comments on the Tier 1 Draft EIS EJ analysis:

> EJSCREEN's EJ Index metrics indicate potentially elevated impacts to people of color populations in the context of both air pollutants and traffic proximity at the block group level. Numerous block groups in the area reflect EJ Index values that exceed the 80th percentile nationally for air pollutants and traffic proximity.
>
> [EPA] *Recommendations*: EPA reiterates its recommendation to utilize EJSCREEN and further recommends screening local communities at the block group level rather than the Census tract level where feasible. Given that EJSCREEN provides screening-level data at the block group level, the tool may provide greater data granularity than analyses of Census tracts. EPA also suggests engaging communities to address and verify screening-level findings.

EJSCREEN is an interactive online EJ mapping and screening tool that was developed by EPA to provide a nationally consistent dataset and approach for combining environmental and demographic information. Information in EJSCREEN is primarily provided at the Census block group level, which is a smaller subdivision of Census tracts. Therefore, to address EPA's comments, the EJSCREEN tool was consulted to supplement the Tier 1 Draft EIS EJ analysis and help identify potential EJ communities in the Tier 1 socioeconomic study area at the smaller Census block group level that may not have been identified by the initial review at the somewhat larger Census tract level. The results of the EJSCREEN review will also help inform the methodology and approach for additional EJ analysis and public engagement efforts that would be performed during a potential future Tier 2 NEPA study.

Additional information about EJSCREEN and the results of the EJSCREEN review are discussed below. EPA's comments are provided in **Appendix B**.

3.3.4 EJSCREEN Overview

EJSCREEN is an online pre-decisional screening and mapping tool that is intended to highlight places that may be candidates for further review, analysis, or outreach to support environmental justice initiatives. EJSCREEN does not, by itself, determine the existence or absence of environmental justice concerns in a given location. ESCREEN results should be supplemented with additional information and local knowledge to develop a better understanding of the issues in a selected location.

EJSCREEN provides information for 11 Environmental Indicators, 6 Demographic Indicators, and 11 EJ Indexes. Examples of information provided by EJSCREEN include the following:

- **Environmental Indicators** – air pollution, traffic proximity and volume, and proximity to regulated hazardous waste facilities.
- **Demographic Indicators** – percentage of low-income households, percentage of people of color, and percentage of individuals living in linguistically isolated households based on US Census 2018 American Community Survey (ACS) 5-year data.
- **EJ Indexes** – combine demographic factors with a single environmental factor.

EJSCREEN Index and Indicator values are provided as percentiles. Generally, these percentiles are higher for block groups that have larger concentrations of low-income and/or minority residents and higher Environmental Indicator values. For example, a Census block group with a Demographic Indicator at the 80th national percentile for people of color population means that the percentage of the people of color population in that block group is equal to or higher than where 80 percent of the US population lives.

3.3.5 Summary of EJSCREEN Review

EPA and EJSCREEN do not establish thresholds for identifying groups or communities that are substantially more at risk of experiencing disproportionately adverse impacts. However, EPA identified the 80th percentile as an initial starting point in early applications of EJSCREEN. Also, as discussed in **Section 3.3.3**, EPA comments on the Tier 1 Draft EIS referenced the 80th national percentile for air pollution and traffic proximity EJ Indexes with respect to populations that could experience potentially elevated impacts from a new Bay Crossing. Therefore, based on EPA's comments, the EJSCREEN tool was consulted to identify Census block groups in the Tier 1 Draft EIS socioeconomic study area that exceed the 80th national percentile for the following EJ Indexes:

- Particulate Matter (Fine Particles) ($PM_{2.5}$)
- Ozone
- National-Scale Air Toxics Assessment (NATA) Diesel Particulate Matter (PM)
- NATA Air Toxics Cancer Risk
- NATA Respiratory Hazard Index
- Traffic Proximity and Volume

These EJ Indexes were considered the most relevant to conditions that could be affected or influenced by a new Bay Crossing. Additional information about the environmental indicators that these EJ Indexes represent is available on the EJSCREEN website at https://www.epa.gov/ejscreen/overview-environmental-indicators-ejscreen.

The EJSCREEN review identified 7 block groups in the Tier 1 socioeconomic study area that exceed the 80th or 90th national percentiles for one or more of the EJ Indexes listed above. These block groups are listed in **Table 3-3** and shown on **Figure 3-7**. Two block groups (7064.01.2 and 7064.01.3) meet or exceed the 80th national percentile for all 7 EJ Indexes that were reviewed. Three block groups (7025.00.3, 7061.01.3, and 7066.00.5) meet or exceed the 90th national percentile for the Traffic Proximity and Volume EJ Index. Three block groups (7064.01.1, 7065.00.1, and 7066.00.5) have multiple air pollution EJ Indexes in the upper 70th national percentile, indicating that potential exposure to these conditions is higher than over 75 percent of the national population. Two block groups (7061.01.3 and 7066.00.5) were identified in EJSCREEN as having populations that are more than 80 percent low-income and more than 90 percent people of color. Two of these 7 block groups (7061.01.3 and 7066.00.5) are outside the Census tracts that were previously identified as potential minority EJ communities in the Tier 1 Draft EIS (**Section 3.3.2**; **Figure 3-7**).

All the block groups listed in **Table 3-3** are concentrated near the western end (but outside the limits) of Corridor 7 (**Figure 3-7**). The presence of block groups with EJ Indexes exceeding the 80th or 90th percentile in this area likely reflects their more intensively urbanized setting in Annapolis relative to other portions of the Tier 1 socioeconomic study area, and their proximity to major roads such as US 50 and MD 2.

Table 3-3: Census Block Groups Exceeding the 80th or 90th National Percentiles for Selected EJSCREEN EJ Indexes

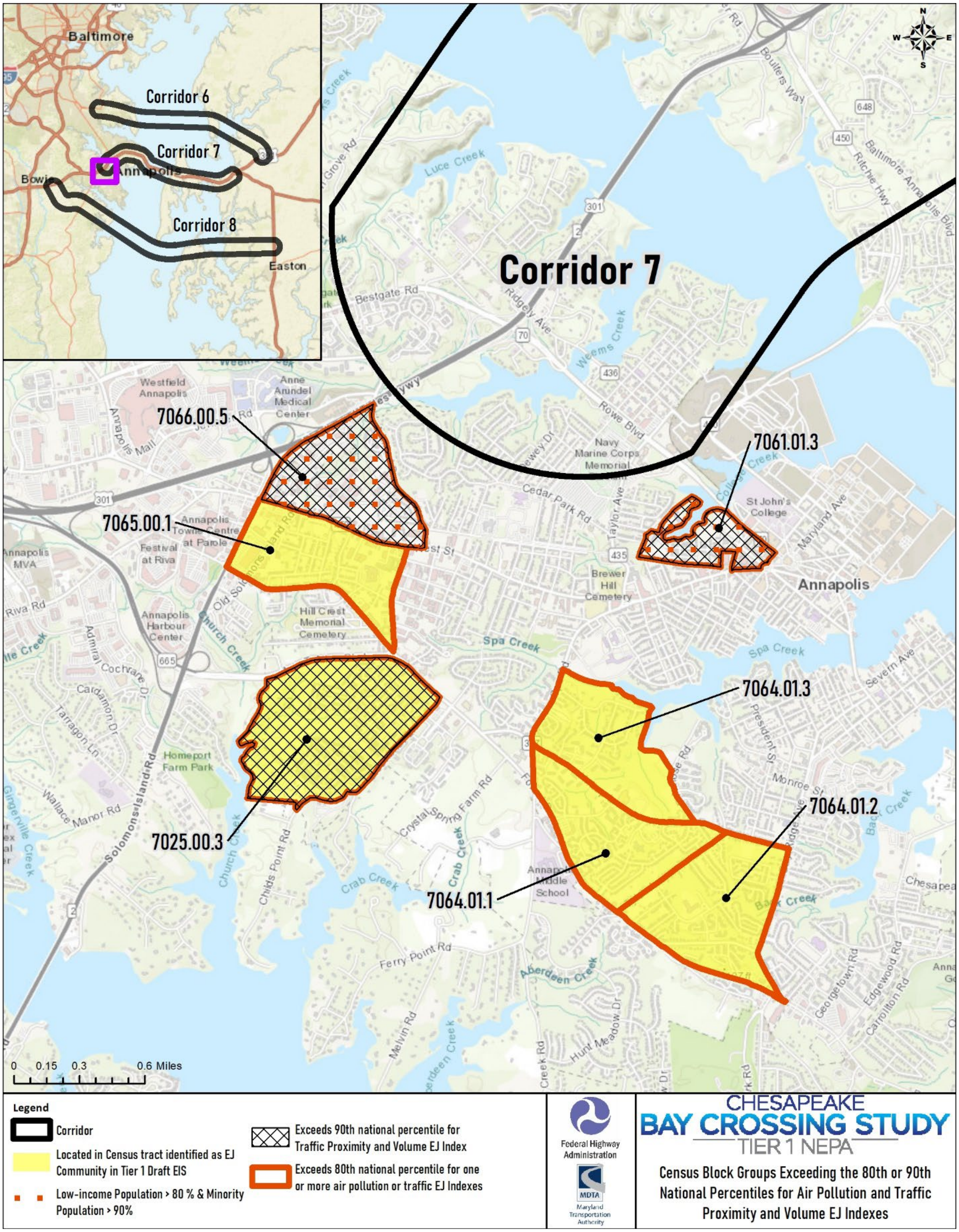
CENSUS BLOCK GROUP	EJSCREEN EJ INDEX (NATIONAL PERCENTILE)					
	$PM_{2.5}$	OZONE	NATA DIESEL PM	NATA AIR TOXICS CANCER RISK	NATA RESPIRATORY HAZARD INDEX	TRAFFIC PROXIMITY AND VOLUME
7025.00.3	83rd	86th	83rd	82nd	81st	90th
7061.01.3	82nd	85th	83rd	81st	81st	92nd
7064.01.1	81st	84th	81st	80th	(79th)	88th
7064.01.2	82nd	84th	81st	80th	80th	87th
7064.01.3	82nd	85th	82nd	81st	80th	82nd
7065.00.1	(77th)	(79th)	80th	(76th)	(76th)	86th
7066.00.5	(79th)	82nd	82nd	(79th)	(78th)	93rd

Source: EPA EJSCREEN Mapping Tool, https://ejscreen.epa.gov/mapper/.

None of the block groups listed in **Table 3-3** are in the CARA. Other than those listed in **Table 3-3**, no other block groups in the Tier 1 Draft EIS socioeconomic study area exceed the 80th or 90th percentile for any EJ Index in EJSCREEN.

The indices not covered in detail above consist of Lead Paint Indicator, Superfund Proximity, Risk Management Plan (RMP) Proximity, Hazardous Waste Proximity, and Wastewater Discharge Indicators. None of the block groups within or crossed by the 3 CARA exceed the 80th State or National percentile for these indices.

Figure 3-7: Census Block Groups Exceeding the 80th or 90th National Percentiles for Selected EJSCREEN EJ Indexes



3.3.6 Conclusion

Seven Census block groups in the Tier 1 Draft EIS socioeconomic study area were identified by the EJSCREEN review as exceeding the 80th or 90th percentiles for one or more EJ Indexes associated with air pollution and traffic proximity and volume (**Section 3.3.4**, **Table 3-3**, **Figure 3-7**). These exceedances indicate the presence of minority or low-income populations with an elevated potential for exposure to air pollution and/or other adverse effects associated with traffic. Two of the 7 block groups identified by the EJSCREEN review (7061.01.3 and 7066.00.5) are outside the Census tracts that were previously identified as potential minority EJ communities in the Tier 1 Draft EIS.

MDTA would further evaluate impacts on the Census tracts and block groups identified as potential EJ communities in a future Tier 2 Study. Other minority, low-income, and disadvantaged or overburdened communities will also be identified, as necessary, through the review of available data and continuing public engagement. This would potentially include EJ communities identified through the detailed review of data from the US Census Bureau, State of Maryland, EPA EJSCREEN, and other applicable sources. More detailed data analysis and public engagement efforts would be developed and performed during a future Tier 2 NEPA study and would be informed and supported by additional opportunities for public and agency input.

3.4 NHPA Section 106

This section provides a brief overview of NHPA Section 106 activities completed concurrently with the Tier 1 NEPA Study, including updated Section 106 coordination since the publication of the DEIS.

FHWA initiated Section 106 consultation with the Maryland State Historic Preservation Officer (SHPO) (Maryland Historical Trust [MHT]) on May 3, 2018 and received MHT's response June 25, 2018. FHWA initiated consultation with ten Federally Recognized Tribes and invited 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. Consulting parties who participated in Tier 1 Section 106 consultation include:

1) Anne Arundel County Office of Environmental and Cultural Resources
2) Four Rivers Heritage Area (aka ALTSCHA, Inc.)
3) Baltimore Heritage
4) Rockaway Beach Improvement Association, Inc.
5) American Chestnut Land Trust
6) Cecil County Planning Commission
7) Eastern Shore Land Conservancy
8) Lower Susquehanna Heritage Greenway
9) Heart of Chesapeake Country Heritage Area
10) Delaware Nation
11) Kent Conservation and Preservation Alliance
12) Kent County Department of Planning, Housing, and Zoning
13) Center for the Environment and Society, Washington College
14) Stories of the Chesapeake Heritage Area (aka Eastern Shore Heritage Inc.)
15) Queen Anne's County Department of Public Works

16) Patuxent Tidewater Land Trust
17) Lower Eastern Shore Heritage Council
18) Lower Shore Land Trust
19) Preservation Maryland
20) Advisory Council on Historic Preservation (ACHP)
21) Chesapeake Bay Foundation
22) City of Annapolis Historic Preservation Division

In consultation with the Maryland SHPO and the Advisory Council on Historic Preservation (ACHP), FHWA and MDTA developed a phased approach for complying with Section 106 historic properties identification requirements during Tier 1 NEPA. Tier 1 Section 106 historic property identification focused on establishing the likely presence of historic properties within the APE (defined as coterminous with the CARA). For more detailed information on the Section 106 methodology and consultation, refer to **Chapter 4.2 of the DEIS** and the **Cultural Resources Technical Report**.

FHWA and MDTA completed an inventory of recorded cultural resources within the 14 Corridor Alternatives. This information was presented as part of the environmental inventory at the Fall 2019 Open Houses where the public was able to provide comments. Once the CARA were identified, FHWA and MDTA 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. FHWA and MDTA received comments from the MD SHPO, Anne Arundel County Office of Planning and Zoning, Talbot County Department of Planning and Zoning, and the Kent Conservation and Preservation Alliance. Comments received from the MD SHPO and consulting parties were reviewed and considered by FHWA and MDTA, and revisions were made to the report in response.

Section 106 consultation continued in conjunction with the public availability of the Tier 1 DEIS in February 2021. MDTA distributed the Tier 1 DEIS and the final Cultural Resources Technical Report to consulting parties via email links. The DEIS included the identification of the MDTA-RPCA (Corridor 7). Consulting parties were invited to comment on the document in numerous ways that included submitting an email to the BCS email address, visiting the project website and leaving a comment through the online comment form; sending a letter to the MDTA; through private testimony which was available via voicemail during all testimony sessions; and through live public testimony at one of the six testimony sessions.

The MD SHPO responded to the DEIS in May 2021 and acknowledged that their comments provided in August 2020 had been incorporated into the technical report and DEIS. The following consulting parties provided comments on the DEIS: Queen Anne's County, who did not provide comments related to Section 106, and the Kent Conservation and Preservation Alliance, who expressed general concern for the impact to cultural and historic resources. These comments have been considered in the FEIS and ROD. Section 106 consultation would resume during a potential future Tier 2 NEPA study with continued historic properties identification, assessment of adverse effects, and resolution of any adverse effects. Discussion of commitments for Tier 2 is included in the **ROD, Section 7.4**.