3 ALTERNATIVES CONSIDERED

This chapter includes a description of the range of preliminary alternatives considered, a summary of the screening-level environmental inventory, a review of the alternatives screening process and results, and preliminary cost estimates. For more details on the screening process, screening-level environmental inventory and screening results, see the ***BCS Alternatives Report***. Discussion of the MDTA-Recommended Preferred Corridor Alternative (RPCA) is included in **Chapter 5**.

3.1 Development of Preliminary Range of Alternatives

The preliminary range of alternatives for the Bay Crossing Study (BCS) included the No-Build Alternative, four Modal and Operational Alternatives (MOAs), and 14 corridor alternatives.

3.1.1 No-Build Alternative

The No-Build Alternative was included as a baseline for comparison to the corridor alternatives. The No-Build Alternative includes all currently planned and programmed infrastructure projects as of Project Scoping in 2017 and includes regular maintenance at the Bay Bridge. (A current list of projects is provided in **Table 4-46**.) It will be updated as needed during Tier 2 to reflect future projects that were not planned and programmed as of Project Scoping in 2017, such as implementation of all-electronic tolling (AET) or eliminating the physical toll plazas and the option to pay cash at those facilities, which would allow traffic to remain at highway speeds and avoid slowing down to drive through a toll plaza to pay the toll. In addition, transportation system management/travel demand management (TSM/TDM) measures such as improvements to the contraflow operation on the existing bridge may be implemented. As discussed below, AET is in operation at the Bay Bridge as of May 2020. Since the Draft EIS has been in development at the same time that AET has been put in place at the Bay Bridge, it was not feasible to include information regarding its impact on Bridge traffic in the Draft EIS.

3.1.2 Modal and Operational Alternatives (MOAs)

Four MOAs were developed to evaluate if a different mode or operational changes could meet the Purpose and Need for the study as a stand-alone alternative: TSM/TDM, Ferry Service, Bus Rapid Transit, and Rail Transit. The MOAs are referred to as “stand-alone” because the evaluation was intended to determine if any of them could meet the Purpose and Need independently and without the implementation of any other alternatives.

Combinations of alternatives, such as MOAs in combination or in combination with a recommended corridor alternative, will be evaluated in Tier 2 to determine whether such a combination could satisfy the transportation needs in combination with alternative alignments.

3.1.2.1 Transportation Systems Management/Travel Demand Management (TSM/TDM)

This alternative would consist of infrastructure and operational changes aimed at improving performance of the existing roadway network without adding major new highway capacity. TSM/TDM improvements are typically relatively low-cost projects and/or practices that can be implemented without major impacts compared to building new capacity. Specific examples of TSM/TDM improvements could include:

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

Implementing Variable Tolls

This improvement would include adjusting toll rates to encourage a more equal distribution of trips throughout the day. Toll rates would generally be lower during the off-peak period, which could influence some drivers to change their trip times to avoid paying a higher toll.

It is possible that MDTA will implement future TSM/TDM improvements separately from the Bay Crossing Study. The results of this screening analysis do not preclude such improvements from future implementation.

3.1.2.2 Ferry Service

This alternative would consist of implementing a ferry service across the Chesapeake Bay. The alternative would include construction of ferry terminals at one or more locations on each shore. It was assumed that the ferry service would provide one or more alternate crossing routes for vehicles that would otherwise cross the Bay Bridge. This alternative could also necessitate roadway improvements between the existing roadway network and the proposed ferry terminals.

3.1.2.3 Bus Rapid Transit

This alternative would consist of a new Bus Rapid Transit (BRT) service between major destinations on the Western and Eastern Shores. It was assumed that the BRT service would use the existing bridge to cross the Bay.

The potential BRT routes were assumed to service commuters traveling on Non-Summer Weekdays and for leisure travelers on Summer Weekends traveling to/from the Eastern Shore beach areas. For Non-Summer Weekdays, transit travel was assumed to occur from the Eastern Shore, i.e. Kent Island and Queen Anne’s County, to the Western Shore, i.e. Annapolis, Baltimore, and Washington, DC, via the Bay

Bridge in the AM Peak Hour. In the PM Peak Hour, reverse travel was assumed to occur from the Western Shore to the Eastern Shore via the Bay Bridge. The potential BRT routes were identified in consideration of existing travel patterns.

3.1.2.4 Rail Transit

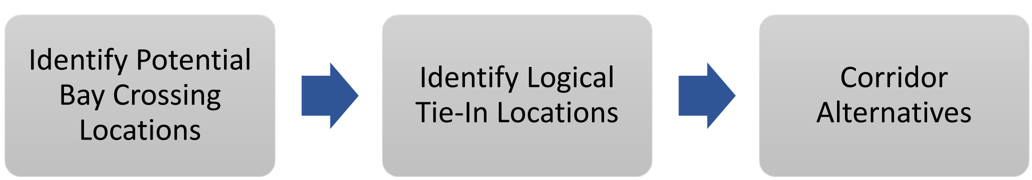
This alternative would consist of construction of a new rail line and implementation of a new rail service between major destinations on the Eastern and Western Shores. It was assumed that a new Chesapeake Bay crossing would need to be constructed to support such a rail line. The Rail transit alternative would include consideration of both Heavy Rail Transit (HRT) and Light Rail Transit (LRT). HRT is a railway transit mode with the capacity for a heavy volume of passengers. It is typically characterized by high speed and rapid acceleration of passenger rail cars operating singly or in multi-car trains on fixed rails, with separate rights-of-way and high platform loading. LRT is a transit mode with a lower volume of passenger capacity compared to HRT, generally characterized by passenger rail cars operating singly or in short trains on fixed rails in shared or exclusive right-of-way, low or high platform loading, and power drawn from an overhead electric line.[1]

As with the BRT Alternative, potential rail transit routes were assumed to service commuters traveling on Non-Summer Weekdays and for leisure travelers on Summer Weekends traveling to/from the Eastern Shore beach areas. For Non-Summer Weekdays, transit travel was assumed to occur from the Eastern Shore, i.e. Kent Island and Queen Anne's County, to the Western Shore, i.e. Annapolis, Baltimore, and Washington, DC, via the Bay Bridge in the AM Peak Hour. In the PM Peak Hour, reverse travel was assumed to occur from the Western Shore to the Eastern Shore via the Bay Bridge.

3.1.3 Corridor Alternatives

The corridor alternatives included potential Chesapeake Bay crossing locations and the approach roadways that would tie into the existing roadway network and followed a logical development methodology illustrated in **Figure 3-1**.

Figure 3-1: Corridor Development Methodology



A structured approach was used to locate the corridor alternatives, including:

- The full extent of the Chesapeake Bay in Maryland was considered for potential crossings.
- A corridor width of two miles was assumed.
- Corridors were developed within the constraints of the Chesapeake Bay geography. Thus, corridors were placed to generally connect peninsulas or long stretches of shoreline while avoiding mouths of rivers or other large bodies of water.

[1] Definitions for HRT and LRT are from the Federal Transit Administration (FTA) National Transit Database Glossary. https://www.transit.dot.gov/ntd/national-transit-database-ntd-glossary

- Corridors were generally not placed in towns or in other developed areas.
- The existing roadway network was considered in corridor placement. Tie-ins to the existing roadway network were based on extending the corridor to the first major intersecting roadway.
- To reduce the length of the crossing and related engineering challenges, corridors were placed perpendicular to the Chesapeake Bay where possible.

Fourteen corridor alternatives were developed that were two miles wide, as shown in **Figure 3-2**. The intent of the Tier 1 phase of the study is to identify a corridor location; the specific alignment of a potential new crossing will not be defined in Tier 1. Additionally, the type of crossing, such as a bridge or tunnel, is not evaluated or identified in Tier 1.

3.1.3.1 Tie-In Locations

For each crossing location, the transportation network tie-in locations were identified based on the following considerations:

Western Shore Tie-ins

1. Corridors started at a limited-access highway where possible.
2. Corridors in southern Maryland, where there are no limited-access highways, followed relatively straight alignments and started at the nearest major regional routes (e.g., MD 2/4 or MD 235).

Eastern Shore Tie-ins

1. All corridors ended at US 50, US 301, or US 13.
2. Corridors followed existing state routes where possible.
3. Most corridors followed a relatively straight alignment from the Chesapeake Bay crossing to the tie-in with US 50, US 301, or US 13.

3.1.3.2 Corridor Alternative Locations

A description of each corridor alternative is presented in **Table 3-1**. The table identifies and provides rationale for the range and location of corridors. The table is ordered from north to south through the study area along the Chesapeake Bay. The identified range of corridor alternatives (as shown in **Figure 3-2**) is highlighted blue in **Table 3-1**. Justification is provided for why corridor alternatives were not identified in locations that are in between.

Figure 3-2: Corridor Alternatives

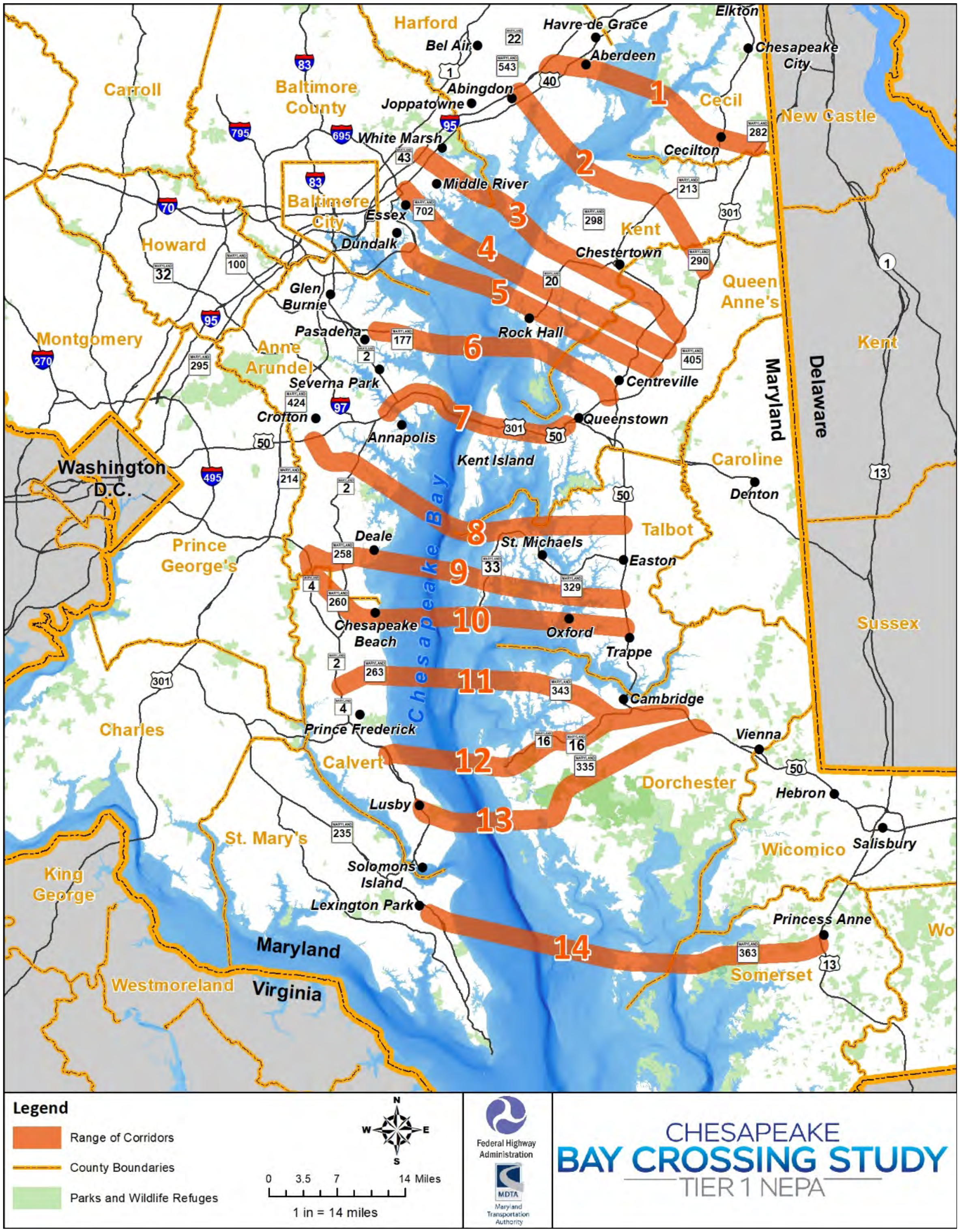


Table 3-1: Corridor Alternative Locations

LOCATION	DESCRIPTION/RATIONALE
North of Corridor 1	• Close to I-95/US 301 route around Bay • Mouth of Susquehanna River • Proximity to Havre de Grace
Corridor 1	• Connects Aberdeen and Cecilton • Follows MD 22 and ties into existing I-95 interchange on Western Shore • Follows MD 282 on Eastern Shore
South of Corridor 1 and North of Corridor 2	• Mouth of Sassafras River • Would pass through developed section of Aberdeen Proving Ground (APG)
Corridor 2	• Connects Abingdon and Chestertown • Undeveloped portion of APG • Follows MD 298/290 on Eastern Shore and ties into existing MD 543/I-95 interchange on Western Shore
South of Corridor 2 and North of Corridor 3	• Would pass through developed section of APG • Mouth of Gunpowder River on Western Shore • Mouth of Bush River on Western Shore
Corridor 3	• Connects White Marsh and Chestertown • Ties into existing MD 43/I-95 interchange on Western Shore; follows portions of MD 20 and MD 405 on the Eastern Shore. Much of the corridor does not follow existing road network on the Eastern Shore, ties into US 301.
South of Corridor 3 and North of Corridor 4	• Proximity to Middle River • Proximity to Martin State Airport on Western Shore
Corridor 4	• Connects Essex and Rock Hall • Follows MD 702 and ties into existing I-695 interchange on Western Shore; does not follow existing road network on the Eastern Shore to tie into US 301.
South of Corridor 4 and North of Corridor 5	• Mouth of Back River on Western Shore
Corridor 5	• Connects Dundalk and Rock Hall • Requires a short connection to I-695 on Western Shore; does not follow existing road network on Eastern Shore to tie into US 301.
South of Corridor 5 and North of Corridor 6	• Mouth of Patapsco River on Western Shore
Corridor 6	• Connects Pasadena and Centreville • Follows MD 177 and ties in with MD 100 on Western Shore; does not follow existing road network on Eastern Shore to tie into US 301.
South of Corridor 6 and North of Corridor 7	• Mouth of Magothy River on Western Shore
Corridor 7	• Follows existing road network along US 50/301 from west of the Severn River on the Western Shore to US 50/301 split on the Eastern Shore. Includes location of existing Bay Bridge
South of Corridor 7 and North of Corridor 8	• Mouth of Severn River on Western Shore • Proximity to Annapolis • South River on Western Shore

LOCATION	DESCRIPTION/RATIONALE
Corridor 8	• Connects Crofton and Easton • Follows MD 214/424 and ties in to existing US 50 interchange on Western Shore. • Does not follow existing road network on Eastern Shore to connect to US 50.
South of Corridor 8 and North of Corridor 9	• Limited infrastructure on both shores • Would pass through St. Michaels
Corridor 9	• Connects Deale and Easton • Follows MD 258 and ties into existing MD 4 interchange on Western Shore; follows portions of MD 329 and MD 33 to tie into US 50 on the Eastern Shore.
South of Corridor 9 and North of Corridor 10	• Proximity to Corridors 9 and 10
Corridor 10	• Connects Chesapeake Beach and Trappe • Follows MD 260 and ties into MD 4 on Western Shore; does not follow existing road network on Eastern Shore to connect to US 50.
South of Corridor 10 and North of Corridor 11	• Mouth of Choptank River on Eastern Shore
Corridor 11	• Connects Prince Frederick and Cambridge • Follows MD 263 on Western Shore • Follows MD 343 on Eastern Shore
South of Corridor 11 and North of Corridor 12	• Mouth of Little Choptank River on Western Shore
Corridor 12	• Connects Prince Frederick and Cambridge • Requires a short connection to MD 2/4 on Western Shore • Follows MD 16 on Eastern Shore
South of Corridor 12 and North of Corridor 13	• Proximity to Corridors 12 and 13
Corridor 13	• Connects Lusby and Cambridge • Requires a short connection to MD 2/4 on Western Shore; follows a portion of MD 335 on the Eastern Shore
South of Corridor 13 and North of Corridor 14	• Mouth of Patuxent River on Western Shore • Proximity to Naval Air Station Patuxent River on Western Shore • Limited infrastructure on Eastern Shore • Proximity to Blackwater National Wildlife Refuge on Eastern Shore
Corridor 14	• Connects Lexington Park and Princess Anne • Requires a short connection to MD 235 on Western Shore • Follows MD 363 on Eastern Shore
South of Corridor 14	• Limited infrastructure on both shores • Southern extent of study area

3.2 Alternatives Screening Process

The BCS Purpose and Need includes three elements: adequate capacity, dependable and reliable travel times, and flexibility to support maintenance and incident management at the existing Bay Bridge. Environmental responsibility and financial viability are additional considerations in the study. All three of these elements and both considerations were used as the basis for evaluating the corridor alternatives and the MOAs.

The MOAs were analyzed differently from the corridor alternatives because they are not location-specific. Potential environmental effects from MOAs were evaluated qualitatively, to compare the relative extent of resources likely to be affected.

Public comment and agency input were critical to the screening of alternatives. Three rounds of public meetings have been conducted so far to correspond with key milestones in the study including scoping, alternatives development, and screening. An extensive program of agency involvement has included 13 Interagency Coordination Meetings held with Cooperating and Interagency Coordination Meeting (ICM) Participating Agencies as detailed in ***Chapter 6***.

Input on a range of topics such as the methodologies of technical studies, key resources to consider, data sources, and specific concerns within corridors have been considered in the alternatives screening process. In particular, much of the public and agency input emphasized the importance of potential indirect effects of a new crossing on land use and development, particularly on the Eastern Shore. Agency input also emphasized the sensitivity of important aquatic resources throughout the Chesapeake Bay, and the most important sources of data to include in the environmental inventory.

3.2.1 MOA Screening

The MOAs were evaluated relative to their ability to meet the BCS Purpose and Need, along with financial feasibility and environmental considerations. Some or all of the MOAs evaluated would be considered in Tier 2 in combination with one or more other proposed build alternatives.

The MOAs were developed as part of the range of alternatives to determine if a different mode, or operational changes, could meet the Purpose and Need as stand-alone alternatives. In other words, this Tier 1 screening is intended to determine if any of these MOAs could meet the Purpose and Need independent of other corridor alternatives or MOAs.

The MOAs were evaluated based on the Purpose and Need elements of adequate capacity, dependable and reliable travel times, and flexibility to support maintenance and incident management at the existing Bridge.

3.2.2 Corridor Alternative Screening

A two-phased screening approach was employed to narrow the corridor alternatives. Corridors that met the adequate capacity metric and avoided major practical challenges in the Phase 1 analysis were advanced to Phase 2. The corridor alternative screening approach is summarized in **Table 3-2** and detailed in the sections below.

Table 3-2: Corridor Alternatives Screening Criteria

PHASE 1 SCREENING	PHASE 2 SCREENING
• Adequate Capacity o 2040 Summer Weekend Average Daily Traffic (ADT) at the Existing Crossing o 2040 Non-Summer Weekday ADT at the Existing Crossing	• Dependable and Reliable Travel Times o 2040 Summer Weekend – Daily hours with queue length of 4 miles or greater o 2040 Non-Summer Weekday – Daily hours with queue length of 1 mile or greater o 2040 Summer Weekend – Hours with LOS E or F o 2040 Non-Summer Weekday – Hours with LOS E or F
• Practical Challenges o Unavoidable impacts to major resources (such as Aberdeen Proving Ground or Blackwater National Wildlife Refuge)	• Flexibility to Support Maintenance and Incident Management at the Existing Bridge o Additional travel time required to divert from the existing bridge to a new crossing • Screening-Level Environmental Inventory, Indirect and Cumulative Effects • Financial Viability

The Purpose and Need emphasizes that a new crossing within any proposed corridor needs to address existing and future traffic conditions at the existing Bay Bridge, taking into account both non-summer weekday and high-volume summer weekend conditions. A traffic analysis was conducted to analyze whether each corridor alternative could meet the Purpose and Need.

From the perspective of traffic relief and congestion management, the calculation of adequate capacity for summer weekend and non-summer weekday Average Daily Traffic (ADT) was an effective means of distinguishing the performance of the identified potential corridors relative to the stated BCS Purpose and Need. Assessment of this measure, in addition to identification of high-level practical challenges associated with existing land uses within the potential corridors helped narrow the range of reasonable corridors. However, with respect to at least five of the potential corridors, additional traffic analysis and further land use considerations were recommended to further screen corridors for detailed analysis in the Tier 1 Draft EIS.

Environmental and financial information was developed for all 14 corridors prior to the two-phase screening. Environmental considerations included information from the screening-level environmental inventory and the potential for indirect effects. Financial considerations were assessed by analyzing engineering factors such as the length and complexity of each crossing. Sensitive lands identified in the screening-level environmental inventory were included in Phase 1 of the screening; other environmental and financial considerations were applied in Phase 2.

The environmental inventory portion of the screening identified natural, socioeconomic, and cultural resources present in the two-mile wide corridor alternatives. It should be emphasized that creation of an environmental *inventory* is distinguished from a detailed analysis of environmental *impacts*; an inventory consists of determining the total amount of each resource present within each two-mile wide corridor. Specific alignments will not be developed during Tier 1; thus, the screening-level environmental inventory was used as an indicator of the types of resources that would be anticipated to be present, their overall prevalence, and the magnitude of potential impacts in comparison to other corridor alternatives. Specifically, concentrations of existing natural resources have been quantified using the limits of the study area for each of the corridors and overlaying existing GIS-based natural resource data layers. This level of analysis provides a relative comparison of potential impacts associated with each corridor but does not quantify actual impacts associated with a defined limit of disturbance. Moreover, crossing alignments identified during Tier 2 would require a much smaller footprint than a two-mile wide corridor. The smaller Tier 2 footprint would have a greater level of engineering detail including more precise limits of disturbance associated with proposed project elements and construction activities. The more precise limits of disturbance would then be used to specifically delineate and quantify potential impacts to properties and sensitive resources. Once these potential impacts are known, additional engineering refinements would be made to avoid, minimize, and mitigate the effects.

For some resources, it was possible to determine that no avoidance could likely occur within a corridor alternative, such as where a resource covers the full width of the corridor alternative. However, for most resources, there may be opportunities to avoid and minimize impacts based on the location of the resource relative to a specific alignment (identified during Tier 2). The resources considered in the screening-level environmental inventory are listed below and described in more detail in **Chapter 4**.

- Total Area of Corridor
- Sensitive Lands: Military, Parks and Wildlife Refuges
- Community: Residential Land Use, Priority Funding Areas, Low Income and Minority Census Tracts
- Prime Farmland
- Known Cultural Resources
- Aquatic Resources: Area of Open Water, Submerged Aquatic Vegetation, Natural Oyster Bars
- Wetlands, Perennial Streams, and Floodplains
- Terrestrial Habitat: Forested Land, Chesapeake Bay Critical Areas, Sensitive Species Project Review Areas
- Coastal Barrier Resources Act (CBRA) Protected Lands
- Description of Potential Indirect Effects

3.2.2.1 Phase 1 Corridor Alternative Screening

For Phase 1, the quantitative measure of ADT in 2040 was first applied to measure the ability of each corridor alternative to provide adequate capacity to reduce congestion at the existing bridge. In addition to this traffic evaluation, other practical considerations were included in Phase 1 to determine if one or more practical challenges rendered a proposed corridor alternative unreasonable, such as unavoidable impacts to critical resources. Upon completion of the Phase 1 analysis, corridor alternatives that met the capacity metric and did not demonstrate major practical challenges were evaluated in a Phase 2 analysis to further distinguish among the various proposed corridor alternatives.

Adequate Capacity to Relieve Congestion at the Existing Bridge

Corridor alternatives that reduced the 2040 ADT at the Bay Bridge below existing (2017) ADTs on either non-summer weekdays or summer weekends were deemed to meet the Purpose and Need element for adequate capacity. In 2017, the existing bridge experienced ADT volumes of 118,600 vehicles per day (vpd) on summer weekends and 68,600 vpd on non-summer weekdays.

The traffic analyses used the 2017 existing conditions and modeled 2040 No-Build conditions for comparison. The traffic screening was based on travel demand forecasting using the Maryland Department of Transportation State Highway Administration (MDOT SHA) Maryland Statewide Transportation Model (MSTM).

The screening included modeling summer weekend traffic and non-summer weekday traffic because of the differing origin and destination (O&D) patterns corresponding to these time frames. Summer weekend ADT reflected the increased demand resulting from travelers to summer vacation destinations such as Ocean City, MD. Non-summer weekday ADT reflected more typical conditions, with more of the demand from commuters. A more detailed discussion of O&D data can be found in ***Section 2.2.1.1***.

To understand how many vehicles would use each corridor alternative, the traffic projections were based on an unconstrained model that did not limit the capacity of the corridor alternative. Traffic estimates included existing and currently planned land use. The traffic projections were based on currently approved future land use and regional travel demand modeling.

Practical Challenges

An additional consideration for the Phase 1 analysis was whether a corridor alternative could face major practical challenges due to its location. Corridor alternatives that would pass through large areas of sensitive lands, such as Aberdeen Proving Ground or Blackwater National Wildlife Refuge (NWR), were identified in this step. While numerous smaller areas of sensitive or protected land were identified in the screening-level environmental inventory, this step identified only sensitive or protected lands that would extend the entire two-mile width of a corridor and well beyond, thus resulting in no potential for avoidance. Smaller areas of sensitive or protected land would not pose the same degree of practical challenge as those that encompass the full width of a corridor.

3.2.2.2 Phase 2 Corridor Alternative Screening

In Phase 2, the corridor alternatives that met the Phase 1 capacity criteria were evaluated to determine how they would impact performance at the existing crossing based on queue lengths/durations, hours of unacceptable LOS, and diversion travel times. This Phase 2 analysis also considered financial viability and environmental factors present in each corridor alternative, including the potential for indirect environmental effects. Queue lengths/durations and hours of unacceptable LOS were used to measure the Purpose and Need element of dependable and reliable travel times; diversion travel times were used to measure the Purpose and Need element of flexibility to support maintenance and incident management at the existing bridge.

Dependable and Reliable Travel Times

Travel times during congested conditions are highly variable, so queue lengths and durations were used to provide an assessment of the Purpose and Need element of dependable and reliable travel times. The analysis considered the duration of time that queue lengths of more than one mile on non-summer weekdays and more than four miles on summer weekends would be present at the existing bridge in 2040. Currently, the queue lengths at the existing bridge do not extend more than one mile for more than one hour on non-summer weekdays, and not more than four miles for more than one hour on summer weekends. The one-mile for more than one hour and four-mile for more than one-hour queue length criteria were selected to allow direct comparison, as these are the queue lengths/durations that occur in existing conditions. These queue lengths are expected to worsen by 2040 in the No-Build condition, with the existing bridge expected to experience queue lengths extending more than one mile for nine hours on non-summer weekdays and extending four miles or greater for nine hours on summer weekends. Corridor alternatives with one-mile and four-mile queues for lengths/durations that are not greater than one hour above existing conditions were deemed to sufficiently meet this Purpose and Need element.

The number of hours the existing bridge will experience LOS of E or F in 2040 was evaluated to provide a comparison of the ability of the corridor alternatives to meet the need of improving travel times and is shown in **Table 3-3**. 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).

Table 3-3: Hours with LOS E or F

TIMEFRAME	NON-SUMMER WEEKDAYS – HOURS WITH LOS E OR F			SUMMER WEEKEND – HOURS WITH LOS E OR F		
	EASTBOUND	WESTBOUND	TOTAL	EASTBOUND	WESTBOUND	TOTAL
Existing (2017)	3	0	3	10	9	19
No-Build (2040)	5	2	7	12	10	22

Flexibility to Support Maintenance and Incident Management at the Existing Bridge

Flexibility to support maintenance and incident management at the existing bridge was measured by estimating the additional travel time required for vehicles diverted from the existing bridge to a new crossing in the event of a full or partial bridge closure. Diversion was measured from the US 50/US 301 split near Grasonville on the Eastern Shore to the US 50/US 301/MD 3 interchange near Bowie on the Western Shores. The current travel time between these end points is approximately 36 minutes. This 36-minute travel time was used as a benchmark for evaluation of travel time diversion. Given that the goal of a potential new crossing is to improve flexibility, it would not be reasonable for a corridor alternative to more than double the existing travel time between these end points to divert from the existing bridge to a new crossing. Such a crossing, therefore, will not sufficiently meet the Purpose and Need element of providing an adequate level of flexibility for maintenance and incident management.

Corridor alternatives located the furthest from the existing bridge will provide minimal opportunity for traffic diversion during maintenance and incident management. Corridor alternatives closer to the existing bridge will be better for diverting traffic during maintenance. Potential alignments within the corridors have not been studied in Tier 1. A new Bay crossing in Corridor 7 could conceivably utilize existing US 50/US 301 for much of its approach. If this were to be the case, and if a closure were to occur on the US 50/US 301 approach rather than on the Bay Bridge itself, both crossings (the existing Bay Bridge and a new crossing) could be closed. This possibility would be considered in the development and analysis of alternative alignments during Tier 2.

Environmental Considerations

Environmental responsibility is an additional consideration of the Purpose and Need. Each corridor alternative contains substantial environmental resources, as identified in the screening-level environmental inventory. Additionally, a new crossing within a corridor would likely lead to indirect effects on environmental resources resulting from pressure for land use changes and new development. The extent of the pressure will vary based on factors such as proximity to major employment centers and availability of undeveloped land.

The screening-level inventory of environmental features and evaluation of potential indirect and cumulative effects were completed for all corridors, regardless of whether they were eliminated in Phase 1 of the screening. As described below, all corridors contain substantial environmental resources. Because the composition of the screening-level inventory within each corridor is markedly different, a suitable differentiation between corridors on the basis of environmental considerations could not be made at this stage absent a specific alignment which would be designed to avoid such impacts if possible. More detailed assessment of environmental resources within the Corridor Alternatives Retained for Analysis (CARA) is included in **Chapter 4.**

In certain situations, environmental resources considered in the screening-level inventory such as military land and Blackwater NWR spanning the full width of a corridor were given particular consideration due to the practical difficulties they would pose.

Cost and Financial Considerations

In addition to the needs described in the Purpose and Need, financial viability was identified as an additional important project consideration. Cost and financial considerations were developed for all corridors, regardless of whether they were carried forward past Phase 1 of the screening, to ensure complete information for the full range of corridors. The cost of a new crossing is a key factor in the financial viability of a new crossing. Engineering factors were used to compare the potential magnitude of cost among alternatives. The cost and financial considerations are presented in two categories: complexity of crossing and scope of approach infrastructure. Cost and financial considerations are described below.

Complexity of Crossing

Complexity of crossing was intended to evaluate the overall degree of complexity required to build the crossing of the Chesapeake Bay. It is expected that corridor alternatives that would require crossings of greater length, with longer deep-water crossings, and with more channel crossings would require greater expense to construct. The following elements were considered:

- **Approximate Length of Chesapeake Bay Crossing** - The approximate length of Chesapeake Bay crossing was estimated by measuring the distance across the Chesapeake Bay along the centerline of each corridor alternative.
- **Approximate Length of Deep-Water Crossing** - The approximate length of deep-water crossing was defined as the longest continuous portion of the crossing where the water depth is greater than 50 feet. The deep-water area was estimated using Geographic Information System (GIS) bathymetry contour data. Deep water crossings are anticipated to be generally more complex to construct, requiring deeper piers and longer spans (for bridges) or deeper tunnels relative to shallower areas of the Bay.
- **Number of Channel Crossings** - Navigational channels were identified using digital nautical navigation mapping along the Chesapeake Bay and adjacent waterways within the corridor alternatives. Channel crossings would potentially increase the complexity of the structures required because a potential new crossing would need to achieve adequate clearance to maintain navigability. This could potentially require higher structures and longer spans in these locations.

Scope of Approach Infrastructure

The scope of approach infrastructure criteria was intended to estimate the overall length and complexity of infrastructure required to tie into logical termini on both sides of the Bay. The following elements were considered:

- **Approximate Length of On-Land Improvements** - Estimated length in miles of the on-land improvements was measured along the centerline of the corridor alternative and included all areas that are not major water crossings.
- **Approximate Length of Other Water Crossings** - The approximate length of other water crossings is the total distance required to cross all other major waterways aside from the Chesapeake Bay. The total was estimated based on 2010 MDP Land Use/Land Cover (LULC) data, so only waterways which are large enough to be included as open water in the LULC dataset are counted. Minor crossings such as small streams were not included.

The screening results for alternatives eliminated from consideration are summarized below in **Section 3.3,** with the MOA eliminated from consideration summarized in **Table 3-4** and the corridor alternatives eliminated summarized in **Table 3-9**. The corridor alternatives retained are summarized below in **Section 3.4** and **Table 3-10**.

3.3 Alternatives Eliminated from Further Consideration

3.3.1 Modal and Operational Alternatives

Based on the MOA screening analysis results, all MOAs are recommended to be eliminated from further consideration as stand-alone alternatives. TSM/TDM, Ferry Service, BRT, and Rail Transit each fail to meet the Purpose and Need of the study because they would not provide adequate capacity to relieve congestion at the existing bridge, provide dependable and reliable travel times, or provide flexibility to support maintenance and incident management at the existing bridge. (See **Table 3-4**)

However, three of the MOAs – TSM/TDM, BRT and Ferry Service – will be considered in combination with other alternatives during the Tier 2 Bay Crossing Study. Rail will not be further evaluated due to high cost and low ridership expected. MDTA will also consider the TSM/TDM, Ferry Service and BRT MOAs in combination with new roadway capacity in the Preferred Corridor location during Tier 2.

MDTA will continue to implement existing TSM/TDM measures on the existing Bay Bridge. Any corridor alternative advanced from Tier 1 of the Bay Crossing Study will be evaluated with TSM/TDM measures during Tier 2. Furthermore, TSM/TDM could be implemented on either the Bay Bridge or a new corridor alternative should MDTA complete future, separate studies that determine these improvements are warranted.

Table 3-4: Summary of MOA Screening Results

MOA ALTERNATIVE	STATUS	RATIONALE *(Note: All corridor alternative traffic estimates are for year 2040 scenario.)*
MOA TSM/TDM	Eliminate as Stand-alone Alt.	Given the anticipated increase in ADT at the Bay Bridge by 2040 (15,700 additional vehicles per day during non-summer weekdays and 16,700 additional vehicles on summer weekends), the TSM/TDM alternative does not meet the needs for adequate capacity or improved travel times as a stand-alone alternative. TSM/TDM improvements would be feasible to implement with relatively low-cost and minimal environmental impacts compared to new infrastructure. **The TSM/TDM alternative would not meet the Purpose and Need as a stand-alone alternative.**
MOA Ferry Service	Eliminate as Stand-alone Alt.	The 2019 Ferry Service Report (***Appendix A*** of the ***BCS Alternatives Report***) found that one ferry route (with multiple trips per day) could convey a maximum estimated capacity of 972 vehicles per day. These numbers do not represent actual demand but give an indication of the total number of potential trips a ferry route could provide. By 2040, daily volumes at the Bay Bridge are expected to increase by an additional 15,700 on non-summer weekdays and an additional 16,700 on summer weekends. Thus, a ferry service operating at maximum capacity could accommodate less than five percent of the growth in volume and would not

MOA ALTERNATIVE	STATUS	RATIONALE *(Note: All corridor alternative traffic estimates are for year 2040 scenario.)*
		reduce existing volumes. Given the anticipated increase in ADT at the Bay Bridge by 2040, it is not expected that a ferry service would effectively relieve congestion and improve travel times at the existing Bay Bridge. Therefore, ferry service, as a stand-alone alternative, does not meet the Purpose and Need of the Tier 1 study. The improvements required to implement a ferry service, including terminals on both sides of the Bay, would be relatively low cost compared to construction of a new crossing. The study estimated that fare revenues generated by most ferry route locations would not be enough to cover operational costs. Environmental impacts of a ferry service would be dependent on location and the number of terminals but would likely be less extensive overall compared to a new crossing. Need for roadway approach infrastructure upgrades could require additional environmental impact. **Ferry service would not meet the Bay Crossing Study Purpose and Need as a stand-alone alternative.**
MOA Bus Rapid Transit	Eliminate as Stand-alone Alt.	In MDTA's 2019 Transit Service Report (***Appendix B*** of the ***BCS Alternatives Report***), the potential BRT ridership was estimated for the existing and future years for both Non-Summer Weekdays and Summer Weekends, and the ridership was converted into a number of daily equivalent vehicle trips due to transit to evaluate traffic relief at the Bay Bridge. BRT would have potential to remove an average of 588 cars from the Bay Bridge on weekdays and 1,548 cars on summer weekends in 2040. Given the anticipated increase in ADT at the Bay Bridge by 2040 (15,700 additional vehicles per day during non-summer weekdays and 16,700 additional vehicles on summer weekends), it is not expected that BRT would effectively relieve congestion and improve travel times at the existing Bay Bridge. BRT service operating in existing facilities would require relatively minimal infrastructure improvements such as maintenance facilities. Most or all cost of the alternative would be related to operation of the bus service. BRT service operating on a dedicated transitway would likely require more substantial capital expense. BRT operating on existing roadways and using the existing Bay Bridge would result in minimal impacts to environmental features. BRT operating on a dedicated transitway would likely require greater environmental impacts. **BRT would not meet the Bay Crossing Study Purpose and Need as a stand-alone alternative.**

MOA ALTERNATIVE	STATUS	RATIONALE *(Note: All corridor alternative traffic estimates are for year 2040 scenario.)*
MOA Rail Transit	Eliminate as Stand-alone Alt.	Similar to BRT, rail transit (including LRT or HRT) was evaluated in the 2019 Transit Service Report. The ridership estimates were developed to also reflect the potential ridership of a rail transit alternative. Rail transit would have the same limited potential for traffic relief as BRT. LRT or HRT would have potential to remove an average of 588 cars from the Bay Bridge on an average weekday and 1,548 cars on an average summer weekend in 2040. Given the anticipated increase in ADT at the Bay Bridge by 2040 (15,700 additional vehicles per day during non-summer weekdays and 16,700 additional vehicles on summer weekends), it is not expected that LRT or HRT would effectively relieve congestion and improves travel times at the existing Bay Bridge. Rail transit would require substantial infrastructure improvements, including construction of a new crossing and approach infrastructure. Additionally, this alternative may include the cost of acquiring new transit vehicles and operational costs. Construction of new rail transit facilities would likely require substantial environmental impacts due to the need for a new crossing structure and approach infrastructure. **Rail transit would not meet the Purpose and Need for the Bay Crossing Study as a stand-alone alternative.**

3.3.2 Corridor Alternatives

The results of the Phase 1 and Phase 2 alternative screening determined that many of the proposed crossing locations would not adequately meet the study Purpose and Need. The traffic metrics determined the level of demand for each corridor alternative and whether the trips through each corridor alternative would divert traffic away from the Bay Bridge. The results showed that the diversion of traffic away from the Bay Bridge is greatest for corridor alternatives in closest proximity to the existing Bay Bridge, and lowest for those farthest away. More specifically, the traffic related screening results show Corridors 1 through 4 and 10 through 14 do not meet the Purpose and Need because they would not provide adequate capacity to reduce 2040 congestion at the existing crossing below current levels, as measured by the Phase 1 evaluation of ADT. Corridors 2 and 13 will also result in substantial practical challenges due to their locations passing through Aberdeen Proving Ground and Blackwater National Wildlife Refuge, respectively. Therefore, Corridors 1 through 4 and 10 through 14 were eliminated in Phase 1. **Table 3-5** below includes the results of the Phase 1 traffic analysis, measuring each corridor alternative's ability to meet the project need of providing adequate capacity to relieve congestion at the existing Bay Bridge. The existing conditions (2017) and No-Build 2040 scenario are included for comparison.

Table 3-5: Screening Results – 2040 ADT

CORRIDOR ALTERNATIVE	2040 SUMMER ADT				2040 WEEKDAY ADT			
	EXISTING BRIDGE	EXISTING BRIDGE: CHANGE FROM 2017	PROPOSED CROSSING	COMBINED CROSSINGS	EXISTING BRIDGE	EXISTING BRIDGE: CHANGE FROM 2017	PROPOSED CROSSING	COMBINED CROSSINGS
Measure	ADT	Change in ADT	ADT	ADT	ADT	Change in ADT	ADT	ADT
Existing (2017)	118,600	N/A	N/A	118,600	68,600	N/A	N/A	68,600
No-Build (2040)	135,300	+16,700	N/A	135,300	84,300	+15,700	N/A	84,300
Corridor 1	130,300	+11,700	36,400	166,700	82,800	+14,200	16,000	98,800
Corridor 2	128,400	+9,800	32,700	161,100	81,900	+13,300	11,100	93,000
Corridor 3	123,500	+4,900	33,900	157,400	78,500	+9,900	10,700	89,200
Corridor 4	121,300	+2,700	35,200	156,500	76,600	+8,000	12,000	88,600
Corridor 5	116,600	-2,000	40,800	157,400	73,600	+5,000	15,000	88,600
Corridor 6	111,200	-7,400	45,700	156,900	69,600	+1,000	18,200	87,800
Corridor 7	79,700	-38,900	79,700	159,400	44,900	-23,700	44,900	89,800
Corridor 8	104,300	-14,300	55,200	159,500	68,100	-500	20,000	88,100
Corridor 9	118,300	-300	36,800	155,100	76,900	+8,300	9,100	86,000
Corridor 10	121,300	+2,700	32,200	153,500	78,600	+10,000	7,100	85,700
Corridor 11	125,300	+6,700	25,700	151,000	80,500	+11,900	5,000	85,500
Corridor 12	127,200	+8,600	22,300	149,500	81,500	+12,900	4,100	85,600
Corridor 13	129,000	+10,400	18,400	147,400	82,700	+14,100	2,900	85,600
Corridor 14	133,000	+14,400	8,500	141,500	83,800	+15,200	1,200	85,000

Note: all ADTs are presented in vehicles per day (vpd)

Phase 2 considered Corridors 5 through 9 in more detail. More detailed traffic analysis, as documented in the ***BCS Traffic Analysis Technical Report*** and summarized in the ***BCS Alternatives Report***, showed that for Corridors 5 through 9, queue lengths/durations and hours with LOS of E or F increase as the corridor alternatives get further away from the existing Bridge. Additionally, corridor alternatives located closer to the existing Bridge would provide better flexibility to support maintenance and incident management at the existing Bridge because traffic could more easily divert to a new crossing.

More specifically, the Phase 2 evaluations showed that Corridor 5 does not provide an acceptable level of flexibility for incident diversion and would cause potentially major indirect effects on the Eastern Shore. Corridor 9 also requires substantial additional travel time for incident diversion and would result in unreasonably long duration of queues on summer weekends at the existing crossing (six hours with queues of one mile or greater on non-summer weekdays). Both Corridors 5 and 9 will only provide a minimal level of improvement to hours of LOS E or F at the existing crossing in 2040. **Table 3-6** summarizes the diversion travel times. In addition, Table **3-7** and **Table 3-8** provide a summary of the queue lengths/durations and hours with LOS E or F at the existing bridge

Table 3-6: Diversion Travel Times

CORRIDOR ALTERNATIVE	ADDITIONAL TRAVEL TIME FOR DIVERSION (MIN)
5	43
6	26
7	0
8	26
9	40

Table 3-7: Queue Lengths/Durations

CORRIDOR ALTERNATIVE	NON-SUMMER WEEKDAY – HOURS WITH 1 MILE QUEUE OR GREATER	SUMMER WEEKEND – HOURS WITH 4 MILE QUEUE OR GREATER
5	3	0
6	1	0
7	0	0
8	1	0
9	6	1

Table 3-8: Hours with LOS E or F at the Existing Bridge

CORRIDOR ALTERNATIVE	NON-SUMMER WEEKDAY HOURS* WITH LOS E OR F (CHANGE FROM EXISTING)	SUMMER WEEKEND HOURS* WITH LOS E OR F (CHANGE FROM EXISTING)
5	+2	-1
6	+1	-5
7	-3	-19
8	+1	-9
9	+2	-1

*Total of eastbound and westbound hours combined

The ability of Corridors 5 and 9 to only partially meet the Purpose and Need is especially challenging given the anticipated magnitude of cost for a new corridor alternative, expected to be multiple billions of dollars. Therefore, while Corridors 5 and 9 each partially meet the Purpose and Need, they are not recommended to be retained for analysis in the Draft EIS and have been eliminated.

The cost and financial feasibility considerations, as measured by engineering metrics such as length and complexity, were highly dependent on location. No corridor alternatives were shorter overall compared to Corridor 7, where the existing Bay Bridge is located, due to a relatively short crossing location and availability of existing on-land infrastructure for tie-in locations.

The screening-level environmental inventory showed that every corridor contains substantial environmental resources, and no new crossings could be built without likely causing substantial environmental impacts. The screening-level environmental inventory did not provide a suitable differentiation between the corridors. Corridors that are shorter overall such as Corridor 7 would likely result in fewer overall direct impacts. Corridor alternatives near the southern end would likely have the most substantial impacts due to the prevalence of sensitive resources such as wetlands and wildlife refuges. All corridors would have indirect effects, but some corridor alternatives such as Corridors 3, 4 and 5 would have potentially greater indirect effects resulting from demand for new development on the Eastern Shore.

Table 3-9: Corridor Alternatives Eliminated from Consideration

CORRIDOR ALTERNATIVE	STATUS	RATIONALE *(Note: All corridor alternative traffic estimates are for year 2040 scenario.)*
1	Eliminate (Phase 1)	Corridor 1 would not draw enough traffic to relieve traffic congestion on the Bay Bridge relative to existing conditions and would therefore not meet the need of providing adequate capacity. Weekday non-summer crossings at the existing bridge would increase by 14,200 vpd and summer weekend crossings would increase by 11,700 vpd over existing conditions. Corridor 1 contains substantial environmental resources, including 3,300 acres of Submerged Aquatic Vegetation (SAV), the highest among all corridors, and 1,600 acres of parks and wildlife refuges. **Corridor 1 would not meet the Bay Crossing Study Purpose and Need.**
2	Eliminate (Phase 1)	Corridor 2 would not draw enough traffic to relieve traffic congestion on the Bay Bridge relative to existing conditions and would therefore not meet the need of providing adequate capacity. Weekday non-summer crossings at the existing bridge would increase by 13,300 vpd and summer weekend crossings would increase by 9,800 vpd over existing conditions. Corridor 2 passes through the Aberdeen Proving Ground, a United States Army facility located adjacent to Aberdeen, Maryland, with no apparent potential for avoidance resulting in major practical challenges. Corridor 2 contains substantial environmental resources, including 16,100 acres of prime farmland. **Corridor 2 would not meet the Bay Crossing Study Purpose and Need.**

CORRIDOR ALTERNATIVE	STATUS	RATIONALE *(Note: All corridor alternative traffic estimates are for year 2040 scenario.)*
3	Eliminate (Phase 1)	Corridor 3 would not draw enough traffic to relieve traffic congestion on the Bay Bridge relative to existing conditions and would therefore not meet the need of providing adequate capacity. Weekday non-summer crossings at the existing bridge would increase by 9,900 vpd and summer weekend crossings would increase by 4,900 vpd over existing conditions. Corridor 3 would potentially cause major indirect effects on the Eastern Shore resulting from increased demand for urban development. Corridor 3 would create a direct new connection from the Baltimore area employment center to Kent County, and expose large areas of undeveloped farmland to substantial new pressure for development. Corridor 3 contains substantial environmental resources, including 17,800 acres of prime farmland and 60 miles of perennial streams. **Corridor 3 would not meet the Bay Crossing Study Purpose and Need.**
4	Eliminate (Phase 1)	Corridor 4 would not draw enough traffic to relieve traffic congestion on the Bay Bridge relative to existing conditions and would therefore not meet the need of providing adequate capacity. Weekday non-summer crossings at the existing bridge would increase by 8,000 vpd and summer weekend crossings would increase by 2,700 vpd over existing conditions. Corridor 4 could potentially cause major indirect effects on the Eastern Shore resulting from increased demand for urban development. Corridor 4 would create a direct new connection from the Baltimore area employment center to Kent County, and expose large areas of undeveloped farmland to substantial new pressure for development. Corridor 4 contains substantial environmental resources, including 1,600 acres of parks and wildlife refuges, 19,300 acres of prime farmland, and 12,200 acres of Chesapeake Bay Critical Area. **Corridor 4 would not meet the Bay Crossing Study Purpose and Need.**

CORRIDOR ALTERNATIVE	STATUS	RATIONALE *(Note: All corridor alternative traffic estimates are for year 2040 scenario.)*
5	Eliminate (Phase 2)	Corridor 5 would provide some traffic benefit on summer weekends, but weekday non-summer traffic would increase compared to existing conditions on the Bay Bridge. Summer weekend crossings at the existing Bridge would be reduced by 2,000 vpd over existing conditions. Weekday non-summer crossings at the existing Bridge would result in an increase of 5,000 vpd over existing conditions. Because it improves summer weekend ADT below existing conditions, Corridor 5 meets the need for adequate capacity. Corridor 5 would result in a queue of one mile or greater at the existing crossing for three hours on non-summer weekdays. These queues would be longer than currently occur at the existing bridge and are considered unreasonable particularly in comparison to other corridor alternatives such as 6, 7 and 8. Corridor 5 contains substantial environmental resources including 14,900 acres of prime farmland, 6,200 acres of forested land, 15,200 acres of open water, and 1,500 acres of parks and wildlife refuges. Corridor 5 could potentially cause major indirect effects on the Eastern Shore resulting from increased demand for urban development. Corridor 5 creates a direct new connection from the Baltimore area employment center to Kent County, and exposes large areas of undeveloped farmland to substantial new pressure for development. **Corridor 5 would not meet the Bay Crossing Study Purpose and Need.**

CORRIDOR ALTERNATIVE	STATUS	RATIONALE *(Note: All corridor alternative traffic estimates are for year 2040 scenario.)*
9	Eliminate (Phase 2)	Corridor 9 would provide some traffic benefit on summer weekends, but weekday non-summer traffic would increase compared to existing conditions on the Bay Bridge. Weekday non-summer crossings at the existing bridge would increase by 8,300 vpd over existing conditions. Summer weekend crossings would be reduced by 300 vpd. Because it improves summer weekend ADT below existing conditions, Corridor 9 meets the need for adequate capacity. Corridor 9 would result in a queue of four miles or greater at the existing crossing for one hour per day during summer weekends, and a queue length of one mile or greater at the existing crossing for six hours on non-summer weekdays. These queues would be much longer than currently occur at the existing bridge and are considered unreasonable particularly in comparison to other corridor alternatives such as 6, 7 and 8. Corridor 9 would also be expected to have LOS E or LOS F conditions for five hours on non-summer weekdays (with three hours in the eastbound direction and two hours in the westbound direction) and 18 hours on summer weekends (with 10 hours in the eastbound direction and eight hours in the westbound direction). This would be a greater number of hours than at the existing bridge today on non-summer weekdays, and a slightly lower number of hours at the existing bridge on summer weekends. This improvement of LOS, combined with the increase in hours with LOS E or F on non-summer weekdays, is considered unreasonable particularly in comparison with other corridor alternatives such as 6, 7 and 8. Overall, Corridor 9 does not sufficiently meet the need for dependable and reliable travel times. Corridor 9 would require an estimated additional travel time of 40 minutes for vehicles diverted from the existing bridge, resulting in a total travel time of 76 minutes. Because this would more than double the existing travel time of 36 minutes, Corridor 9 would not sufficiently meet the need for flexibility to support maintenance and incident management at the existing bridge. Corridor 9 contains substantial environmental resources, including 8,600 acres of natural oyster bars and 11,100 acres of Chesapeake Bay Critical Areas. **Corridor 9 would not meet the Bay Crossing Study Purpose and Need.**

CORRIDOR ALTERNATIVE	STATUS	RATIONALE *(Note: All corridor alternative traffic estimates are for year 2040 scenario.)*
10	Eliminate (Phase 1)	Corridor 10 would not draw enough traffic to relieve traffic congestion on the Bay Bridge relative to existing conditions and would therefore not meet the need of providing adequate capacity. Weekday non-summer crossings at the existing bridge would increase by 10,000 vpd and summer weekend crossings would increase by 2,700 vpd over existing conditions. Corridor 10 contains substantial environmental resources including a large area of open water within the corridor (23,400 acres), due to relatively long crossings required. Corridor 10 also includes 7,600 acres of residential land use and 9,600 acres of natural oyster bars. **Corridor 10 would not meet the Bay Crossing Study Purpose and Need.**
11	Eliminate (Phase 1)	Corridor 11 would not draw enough traffic to relieve traffic congestion on the Bay Bridge relative to existing conditions and would therefore not meet the need of providing adequate capacity. Weekday non-summer crossings at existing bridge would increase by 11,900 vpd and summer weekend crossings would increase 6,700 vpd over existing conditions. Corridor 11 contains substantial environmental resources, including 5,100 acres of residential land use, 1,400 acres of SAV, and 4,000 acres of wetlands. **Corridor 11 would not meet the Bay Crossing Study Purpose and Need.**
12	Eliminate (Phase 1)	Corridor 12 would not draw enough traffic to relieve traffic congestion on the Bay Bridge relative to existing conditions and therefore does not meet the need of providing adequate capacity. Weekday non-summer crossings at the existing bridge would increase by 12,900 vpd and summer weekend crossings would increase by 8,600 vpd over existing conditions. Corridor 12 contains substantial environmental resources, including 2,500 acres of parks and wildlife refuges, 6,200 acres of wetlands, 18,100 acres of prime farmland, 8,000 acres of Chesapeake Bay Critical Areas, and 12,200 acres of Sensitive Species Project Review Areas (SSPRAs). **Corridor 12 would not meet the Bay Crossing Study Purpose and Need.**

CORRIDOR ALTERNATIVE	STATUS	RATIONALE *(Note: All corridor alternative traffic estimates are for year 2040 scenario.)*
13	Eliminate (Phase 1)	Corridor 13 would not draw enough traffic to relieve traffic congestion on the Bay Bridge relative to existing conditions and would therefore not meet the need of providing adequate capacity. Weekday non-summer crossings at the existing bridge would increase by 14,100 vpd and summer weekend crossings would increase by 10,400 vpd over existing conditions. Corridor 13 contains substantial environmental resources, including 5,000 acres of parks and wildlife refuges, 7,800 acres of wetlands, 16,600 acres of forested land, 19,200 acres of prime farmland, 13,200 acres of Chesapeake Bay Critical Areas, and 22,800 acres of SSPRAs. Corridor 13 passes through Blackwater National Wildlife Refuge, with no apparent opportunity for avoidance of the resource and resulting in major practical challenges. **Corridor 13 would not meet the Bay Crossing Study Purpose and Need.**
14	Eliminate (Phase 1)	Corridor 14 would not draw enough traffic to relieve traffic congestion on the Bay Bridge relative to existing conditions and would therefore not meet the need of providing adequate capacity. Weekday non-summer crossings at the existing bridge would increase by 15,200 vpd and summer weekend crossings would increase by 14,400 vpd over existing conditions. Corridor 14 would attract low volumes from the existing bridge, resulting in minimal improvement over the No-Build condition. Corridor 14 requires the longest Chesapeake Bay crossing (17.1 miles) of all the corridor alternatives. Corridor 14 contains substantial environmental resources, including 5,600 acres of parks and wildlife refuges, 28,700 acres of open water, 1,200 acres of SAV, 4,300 acres of natural oyster bars, 4,500 acres of wetlands, 8,700 acres of Chesapeake Bay Critical Areas, and 8,600 acres of SSPRAs. **Corridor 14 would not meet the Bay Crossing Study Purpose and Need.**

3.4 Corridor Alternatives Retained for Analysis (CARA)

The results of the alternative screening presented a clear pattern among the corridor alternatives and resulted in the identification of four Corridor Alternatives Retained for Analysis (CARA), including the No-Build. The results show Corridors 6, 7, and 8 have a greater ability to meet the Purpose and Need than all the other corridor alternatives. The No-Build Alternative will be retained throughout the NEPA process to serve as a baseline of comparison. These CARA were then further analyzed and evaluated to identify a single MDTA-RPCA, which is discussed in detail, below in **Chapter 5**.

Public input collected at the Fall 2019 Open Houses reinforced the emphasis on reducing congestion as a key factor in identifying the CARA. Members of the public identified “reducing congestion” most often as a priority for identifying corridors to carry forward. Corridors 6, 7 and 8 achieve the goal of reducing congestion better than all other corridors. For more detailed information on the public involvement activities and comments received from the public, see **Chapter 6.**

Corridor Alternatives 6, 7 and 8 are the only corridors to sufficiently meet all elements of the Purpose and Need including adequate capacity, dependable and reliable travel times, and provide flexibility to support maintenance and incident management at the existing bridge.

While Corridors 6, 7, and 8 are all recommended to be carried forward for further evaluation, the screening results show that Corridor 7 has advantages over Corridors 6 and 8. The advantages of Corridor 7 include better congestion relief at the existing Bay Bridge, more effective reduction of duration of unacceptable LOS, more effective backup reduction at the Bay Bridge, the best diversion route, and better compatibility with existing land-use patterns likely resulting in fewer indirect effects.

Corridor Alternatives 6, 7, and 8 were recommended to be carried forward as the CARA as described in **Table 3-10** and shown on **Figure 3-3**.

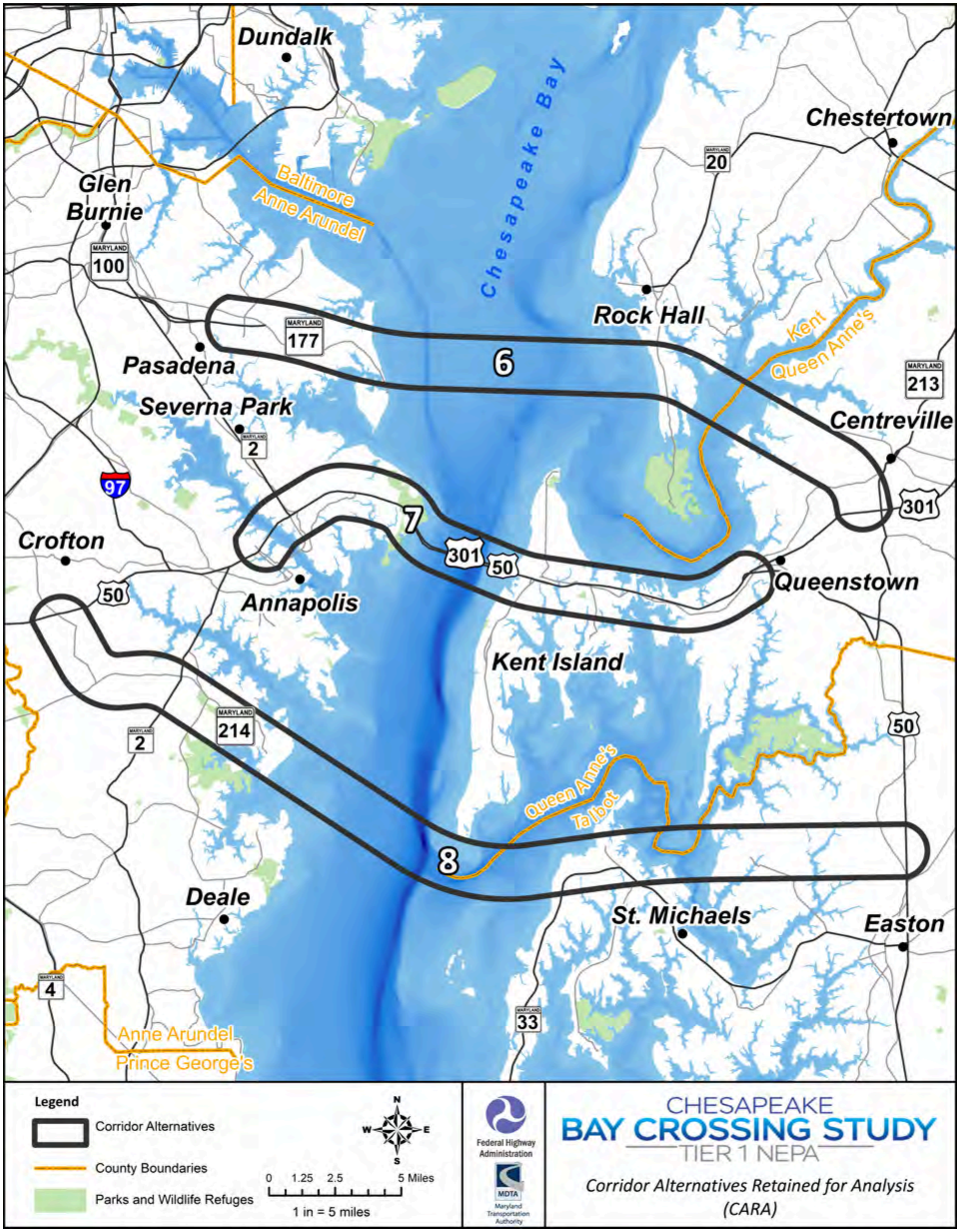
Table 3-10: Corridor Alternatives Retained for Analysis

CORRIDOR ALTERNATIVE	STATUS	RATIONALE *(Note: All corridor alternative traffic estimates are for year 2040 scenario.)*
No-Build	**Retain**	The No-Build Alternative will not relieve traffic congestion and improve travel times on the existing Bay Bridge and will not impact environmental resources. The No-Build Alternative will be retained throughout the NEPA process to serve as a baseline of comparison. The No-Build Alternative includes existing TSM/TDM measures such as contraflow lanes on the existing bridge, as well as any planned and funded TSM/TDM measures such as automated contraflow lanes.
6	**Retain**	Corridor 6 would provide traffic benefit on summer weekends, but weekday non-summer traffic would increase compared to existing conditions on the Bay Bridge. Summer weekend crossings would be reduced by 7,400 vpd over existing conditions. Weekday non-summer crossings at the existing bridge would increase by 1,000 vpd. Because it improves summer weekend ADT below existing conditions, Corridor 6 meets the need for adequate capacity. Corridor 6 would not result in greater queue lengths/durations at the existing crossing than currently exists on summer weekends although it would result in a longer queue for one hour on non-summer weekdays. Corridor 6 would result in LOS E or LOS F conditions at the existing bridge for four hours on non-summer weekdays (with three hours in the eastbound direction and one hour in the westbound direction) and 14 hours on summer weekends (with nine hours in the eastbound direction and five hours in the westbound direction). This would be a greater total number of hours than at the existing bridge today on non-summer weekdays, but a lower number of hours than at the existing bridge today

CORRIDOR ALTERNATIVE	STATUS	RATIONALE *(Note: All corridor alternative traffic estimates are for year 2040 scenario.)*
		on summer weekends. Corridor 6 would therefore meet the need for dependable and reliable travel times. It is estimated that Corridor 6 would require only 26 minutes of additional travel time for vehicles diverted from the existing bridge. Thus, Corridor 6 meets the need for flexibility to support maintenance and incident management at the existing bridge. Corridor 6 contains substantial environmental resources, including 18,000 acres of open water, 5,400 acres of natural oyster bars, and 900 acres of parks and wildlife refuges. Corridor 6 would have indirect effects, but likely less induced growth compared to Corridors 3, 4, and 5. **Corridor 6 meets the Bay Crossing Study Purpose and Need.**
7	**Retain**	Corridor 7 would meet the need of providing adequate capacity; providing benefit for both non-summer weekdays and summer weekends. Corridor 7 would result in an estimated reduction of 23,700 vpd on non-summer weekdays on the Bay Bridge compared to existing conditions, and a reduction of 38,900 vpd on summer weekends on the Bay Bridge compared to existing conditions. Corridor 7 would not result in greater queue lengths/durations than existing conditions at the existing crossing on summer weekends or on non-summer weekdays. In addition, there would be no hours of LOS E or F operation at the existing bridge on summer weekends or non-summer weekdays. Corridor 7 would therefore meet the need for dependable and reliable travel times. Additionally, it is estimated that Corridor 7 would meet the need for flexibility to support maintenance and incident management at the existing bridge, requiring no additional travel time to divert vehicles from the existing crossing to the new crossing. Among all corridors, Corridor 7 has the lowest total area (28,000 acres), and the lowest area of forested land (4,500 acres). It also compares favorably to other corridors in other categories including prime farmland (5,600 acres), area of open water (9,600 acres), wetlands (1,500 acres), and length of streams (30 miles). Corridor 7 would result in adding 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. Corridor 7 would have indirect effects, but likely less induced growth compared to Corridors 3, 4 or 5. **Corridor 7 meets the Bay Crossing Study Purpose and Need.**

CORRIDOR ALTERNATIVE	STATUS	RATIONALE *(Note: All corridor alternative traffic estimates are for year 2040 scenario.)*
8	**Retain**	Corridor 8 would meet the need of providing adequate capacity; providing traffic benefit on both non-summer weekday and summer weekends. Weekday non-summer crossings at the existing bridge would be reduced by 500 vpd, and summer weekend crossings would be reduced by 14,300 vpd over existing conditions. Corridor 8 would not result in greater queue lengths/durations than existing conditions at the existing crossing on summer weekends although it would result in a longer queue for one hour on non-summer weekdays. Corridor 8 would be expected to have LOS E or LOS F conditions at the existing bridge for four hours on non-summer weekdays (with three hours in the eastbound direction and one hour in the westbound direction) and 10 hours on summer weekends (with eight hours in the eastbound direction and two hours in the westbound direction). This would be a greater number of hours than at the existing bridge today on both non-summer weekdays, and a lower number of hours at the existing bridge on summer weekends. Overall, Corridor 8 would meet the need for dependable and reliable travel times. Additionally, it is estimated that Corridor 8 would require 26 minutes of additional travel time for vehicles diverted from the existing bridge. Thus, Corridor 8 meets the need of providing flexibility to support maintenance and incident management at the existing bridge. Corridor 8 contains substantial environmental resources, including 20,400 acres of open water, 6,500 acres of natural oyster bars, and 8,600 acres of forested land. Corridor 8 would have indirect effects, but likely less induced growth compared to Corridors 3, 4, or 5. **Corridor 8 meets the Bay Crossing Study Purpose and Need.**

Figure 3-3: Corridor Alternatives Retained for Analysis (CARA)



3.5 Preliminary Cost Estimates

Conceptual project cost estimates were developed for Corridors 6, 7, and 8. The cost estimates included construction, preliminary engineering, and right-of-way for a project that would extend for the entire length of each corridor, including the Western Shore and Eastern Shore approach roadways. Since detailed alignments have not yet been developed, the cost estimates are high-level in nature and account for a range of possibilities. The major structure costs were calculated separately from the approach roadways to account for the uniquely large and complex crossings that would exist within each corridor.

A cost estimate range was developed for each corridor to account for several factors that are unknown at this time, including the number of new lanes and whether the new lanes would be along a new alignment or along an existing roadway. Cost estimates were developed for each combination of factors to determine the ranges. In addition, a low and high cost per mile unit price was used for each estimate to account for unknown design considerations that could affect the project costs.

The traffic modeling results were used to estimate a range in the number of new lanes that would be needed within each corridor to reach a certain level of transportation performance. The lower limit of the range was the number of new lanes that would meet Level of Service (LOS) D, and the upper limit of the range was the number of lanes that would meet LOS C on a new crossing. For Corridor 6, it was assumed that four new lanes would be needed. For Corridor 7, it was assumed that as few as four and as many as seven lanes would be needed, depending on if the new lanes are along a new alignment or if the existing US 50/301 alignment is widened. For Corridor 8, it was assumed that four or six new lanes would be needed. No reversible lanes were assumed.

For each corridor, two cost estimates were developed and incorporated into the overall range. First, cost estimates were developed for each corridor that assumed the new lanes would be completely on new alignment. Additionally, cost estimates were developed for each corridor that assumed a portion of the new lanes would follow an existing roadway and widen the existing infrastructure where possible.

Independent cost estimates were developed for each major structure within each corridor. The major structures include the Chesapeake Bay in all three corridors and other large water crossings. The other large water crossings include the Chester River in Corridor 6, the Severn River and the Kent Narrows in Corridor 7, and two crossings of the Miles River in Corridor 8. The major structure estimates are based on a cost per square foot methodology instead of the cost per mile approach.

Since it has not been determined whether a new Chesapeake Bay crossing would be a bridge or a bridge-tunnel, cost estimates were developed for both structure types. A tunnel-only option was not considered due to the anticipated high cost relative to the other crossing types.

Tables 3-11 and **3-12** present the range of cost estimates developed for each corridor based on the factors described above. The costs in **Table 3-11** assume a bridge across the Chesapeake Bay and the costs in **Table 3-12** assume a bridge-tunnel across the Chesapeake Bay.

Table 3-11: Total Project Costs Assuming a Bridge across the Chesapeake Bay (2020 dollars)

CORRIDOR	LOW END OF RANGE - TOTAL COST IN BILLIONS	HIGH END OF RANGE (IN BILLIONS) – TOTAL COST IN BILLIONS	LOW END OF RANGE MAJOR STRUCTURES COST IN BILLIONS	HIGH END OF RANGE - MAJOR STRUCTURES COST IN BILLIONS	LOW END OF RANGE – ON LAND INFRASTRUCTURE COST IN BILLIONS	HIGH END OF RANGE – ON LAND INFRASTRUCTURE COST IN BILLIONS
6	$6.6	$7.2	$3.9	$3.8	$2.7	$3.4
7	$5.4	$8.9	$3.7	$4.6	$1.7	$4.3
8	$11.7	$15.7	$7.4	$9.6	$4.3	$6.1

Table 3-12: Total Project Costs Assuming a Bridge-Tunnel across the Chesapeake Bay (2020 dollars)

CORRIDOR	LOW END OF RANGE – TOTAL COST IN BILLIONS	HIGH END OF RANGE – TOTAL COST IN BILLIONS	LOW END OF RANGE MAJOR STRUCTURES COST IN BILLIONS	HIGH END OF RANGE - MAJOR STRUCTURES COST IN BILLIONS	LOW END OF RANGE – ON LAND INFRASTRUCTURE COST IN BILLIONS	HIGH END OF RANGE – ON LAND INFRASTRUCTURE COST IN BILLIONS
6	$12.7	$13.3	$9.5	$9.5	$3.2	$3.8
7	$8.0	$13.1	$6.1	$8.5	$1.9	$4.6
8	$13.2	$18.0	$8.8	$11.7	$4.4	$6.3