Cape Cod Bridges Program

Bourne, Massachusetts

Appendix 4.15
Visual Impact Assessment

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Acronyms and Abbreviations

Acronym/Abbreviation	Definition
FHWA	Federal Highway Administration
FNP	Federal Navigation Project
MA SHPO	Massachusetts Historic Preservation Officer
MassDOT	MassDOT
MRER/EA	Major Rehabilitation Evaluation Report/Environmental Assessment
NRHP	National Register of Historic Places
SUP	shared-use path
USACE	U.S. Army Corps of Engineers
USC	United States Code
VIA	Visual Impact Assessment

1 Introduction

The Visual Impact Assessment (VIA) has been prepared in support of the Draft Environmental Impact Statement for the Cape Cod Bridges Program (the Program), in accordance with the following federal statutes, regulations, and guidance:

- National Environmental Policy Act (NEPA) of 1969, as amended, 42 United States Code (USC) 4321 et seq.
- *Efficient Environmental Reviews for Project Decisionmaking and One Federal Decision*, 23 USC 139.
- Federal Highway Administration's (FHWA) regulations implementing NEPA, *Environmental Impact and Related Procedures* (23 Code of Federal Regulations [CFR] 771), and corresponding guidance, Technical Advisory (T 6640.8A): *Guidance for Preparing and Processing Environmental and Section 4(f) Documents* (October 30, 1987).

2 Summary of Findings

In accordance with FHWA's Guidelines for the Visual Impact Assessment of Highway Projects (FHWA Guidelines), the Massachusetts Department of Transportation (MassDOT) prepared a VIA to assess the potential changes of the Build Alternative upon the Sagamore Bridge and Bourne Bridge Areas of Visual Effect, defined as the areas from which the existing Bourne and Sagamore Bridges and their highway approach networks can be viewed.

MassDOT selected 17 visual inventory locations that consisted of key views of and from the bridges and the highway interchange networks, including views that could be affected by the Program, such as where project horizontal or vertical elements could affect the visual character of the viewshed, including changes to the scale and character of the neighborhood. Simulations were prepared of the Build Alternative at these locations. MassDOT then conducted the assessments of the visual inventory locations with respect to the type of impact, compatibility of the impact, sensitivity to the impact, and degree of impact, per the FHWA Guidelines.

For four visual inventory locations in the interchange approach networks— View from Bourne Park and Ride Lot (SN2), View from Meetinghouse Lane at State Road (SN3), View from Cranberry Highway at Adams Street (SS4), and View from Cumberland Farms Parcel (BS2)—the degree of visual impact was determined to be beneficial. MassDOT determined that **beneficial changes** to the visual quality of the Sagamore Bridge and Bourne Bridge AVEs would result from removing utility poles and overhead signals and wiring at roadway intersections, thereby presenting more harmonious and coherent views to travelers and neighbors; replacing existing intersections or rotaries with roundabouts, resulting in reduced paved areas, increased landscaping, and a sense of orderliness that is not present in the existing condition; and incorporating landscaping and shared use paths (SUP) or pedestrian walkways into the transportation network, thereby providing visual interest and relief from the concrete environment.

For nine visual inventory locations in the interchange approach networks, MassDOT determined that **neutral changes** to the visual quality of the Sagamore Bridge and Bourne Bridge AVEs would result from project impacts. This total number included locations where shifts in the bridge or roadway location and elevation would not be discernible by the viewer—such as View from Church Lane at Cape Pine Road (SN4) and View from Upper Cape Cod Regional Technical High School Scenic Overlook (BS4). It included locations with low to moderate viewer sensitivity where proposed impacts, including the introduction of new infrastructure, would be consistent with the visual character of the existing transportation environment and/or elements—such as View from Scenic Highway at Church Lane (SN1), View from Sandwich Road at Mid-Cape Connector (SS1), View from Sandwich Road, facing south (SS3), and View from Belmont Circle (BN1). A neutral rating was given to one location where the new transportation infrastructure would provide a continuity of access and visibility to commercial neighbors who would be sensitive to project changes – such as View from Nickerson-Bourne Funeral Home (BS1). The visual inventory included two locations where the more dominant and physically imposing transportation elements would introduce incompatible elements into the existing viewshed, thereby altering the roadway's rural visual character with a more urban appearance– such as View from Scenic Highway (BN3) and View from Sandwich Road facing west (BS3). However, at these locations with low viewer sensitivity, the visual changes would be neutralized through the introduction of landscaping and pedestrian/bicycle paths to soften the hardscape and provide visual interest, as well as other improvements, such as increased safety, which would enhance the traveler's driving experience.

For the two visual inventory locations at the bridge sites [View from Motorist on Sagamore and Bourne Bridges (B1) and View of Sagamore and Bourne Bridges from Cape Cod Canal Service Road (B2)], MassDOT determined that with the minimization measures incorporated into the Program, the degree of visual impact was determined to be **neutral**. While the demolition of Sagamore and Bourne Bridges would be an adverse effect on those National Register of Historic Places (NRHP) eligible structures, MassDOT selected a replacement bridge design that would closely resemble the existing structures and complement their settings within Cape Cod Canal, to avoid and/or minimize impacts to the NRHP-eligible Cape Cod Canal Historic District. **Section 7** further describes measures that MassDOT will incorporate into the Program to compensate for the loss of the historic structures.

For two visual inventory locations in the interchange approach networks, MassDOT determined that **adverse changes** to the visual quality of the Sagamore Bridge and Bourne Bridge AVEs would result from project impacts. For the View from Eleanor Avenue (SS2), MassDOT determined that the proposed project impacts—potentially acquiring residences for the construction of the new bridge and demolition of the existing bridge—would adversely affect the sensitivity of the Round Hill residential viewers on the west side of Eleanor Avenue. For the View from Nightingale Road at its intersection with Scenic Highway (BN2), MassDOT determined that the elevated relocated State Route 25 mainline and flyover ramp would introduce incompatible elements to the existing views of residential neighbors, who would be sensitive to their altered views of the landscaped Bourne Scenic Park entrance.

MassDOT has developed design-related and construction-related mitigation measures, encompassing minimization, restoration, maintenance, and compensation, to address the adverse change in visual

quality and to provide value to areas where a neutral change in visual quality is anticipated. Design-related mitigation would include designing the replacement bridges to resemble the historic bridges and thereby avoid impacts to the Cape Cod Canal Historic District; incorporating recreational amenities as visual enhancements; landscaping to restore the affected environment and to provide substitute resources; and applying visual/aesthetic treatment of high-visibility bridge abutment walls and retaining walls. To minimize visual impacts in the Sagamore Bridge and Bourne Bridge AVEs during construction, MassDOT would incorporate construction-related mitigation into the Program through permits, special provisions and guidance documents, and its *Standard Specifications for Highways and Bridges*.

As design advances, MassDOT will continue to refine the proposed design- and construction-related mitigation measures, as well as identify additional mitigation measures, in coordination with stakeholders and the public.

3 Proposed Action and Alternatives

3.1 Purpose and Need

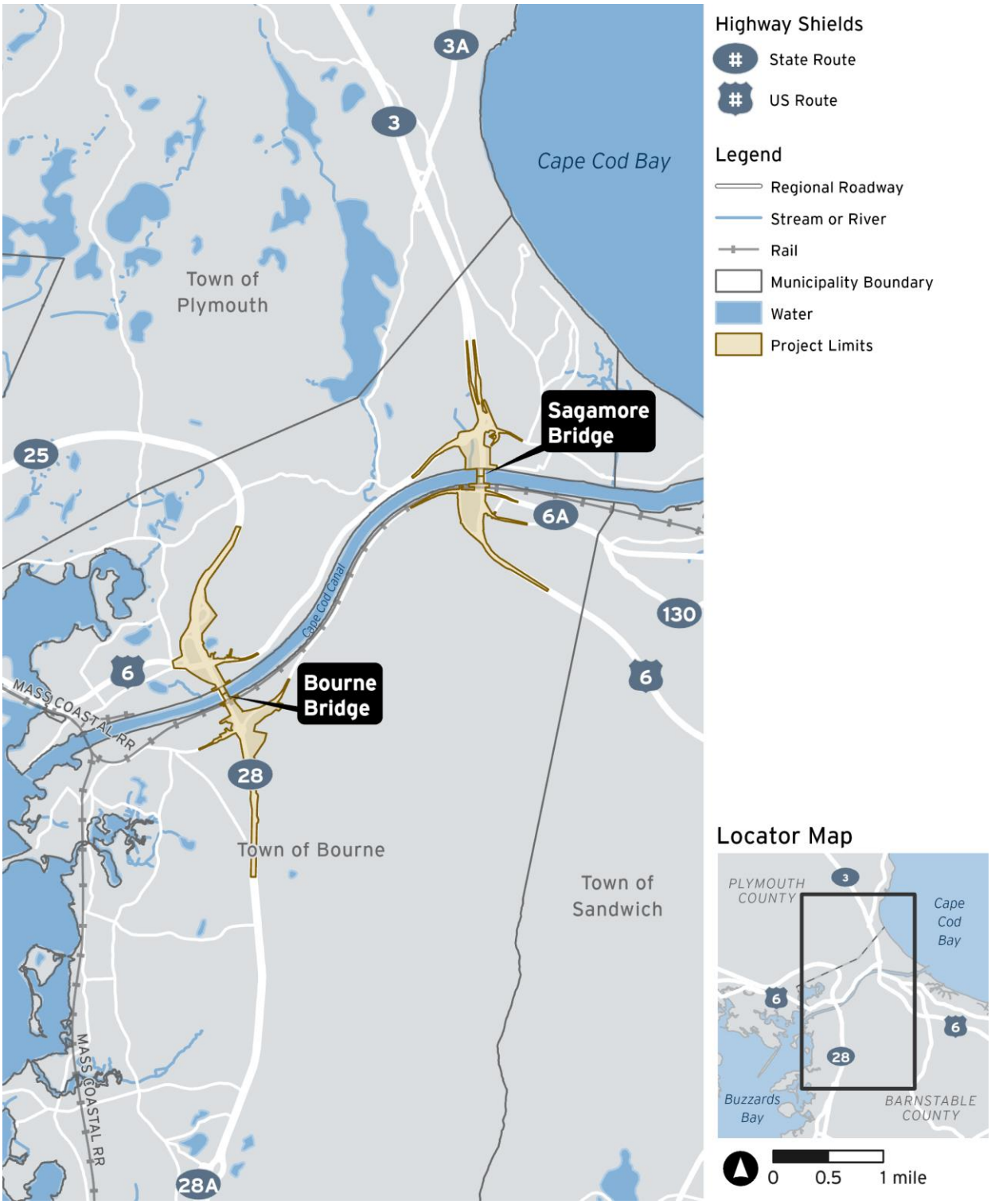
In partnership with the FHWA and the New England District of the U.S. Army Corps of Engineers (USACE), MassDOT proposes advancing the Program in the town of Bourne, Barnstable County, Massachusetts.

The purpose of the Program is to improve cross-canal mobility and accessibility between Cape Cod and mainland Massachusetts for all road users and to address the increasing maintenance needs and functional obsolescence of the aging Bourne and Sagamore Bridges (also known as the Cape Cod Canal highway bridges), which the USACE owns, operates, and maintains as part of the Cape Cod Canal Federal Navigation Project (FNP). The needs for the Program are as follows:

- Address the deteriorating structural condition and escalating maintenance demands of the Bourne and Sagamore Bridges.
- Address the substandard design elements of the Bourne and Sagamore Bridges, the immediate mainline approaches, and their adjacent interchanges and intersections.
- Improve vehicular traffic operations.
- Improve accommodations for pedestrians and bicyclists.

Figure 3-1 shows two distinct Project Limits for the Program.

Figure 3-1. Program Limits



Source: Massachusetts Department of Transportation, 2024

3.2 Build Alternative

The Program's Build Alternative would incorporate the USACE's Major Rehabilitation Evaluation Report and Environmental Assessment's (MRER/EA) preferred alternative of replacing both highway bridges with new bridges, each with four through-travel lanes and two auxiliary lanes (in-kind bridge replacement that would be updated to comply with federal and state highway and design safety standards). The Program proposes to replace the Bourne and Sagamore Bridges with parallel, twin tied-arch bridge structures that would be supported on delta frames with an approximate 700-foot mainline span length. At both the Bourne Bridge and Sagamore Bridge crossings, the replacement mainline alignment locations would be offline and inboard of the existing bridges on the side of the canal between the bridges. At both canal crossings, the Program would reconfigure the highway interchange approach networks north and south of Cape Cod Canal to align with the replacement bridges. The replacement bridges and their interchange approaches would accommodate shared-use pedestrian and bicycle paths that would connect to the local roadway network on both sides of Cape Cod Canal in the town of Bourne.

Table 3-1 presents a description of the Program elements/design parameters of the recommended Build Alternative: Replacement Highway Bridges Built to Modern Design Standards.

Table 3-1. Description of Design Parameters of the Recommended Build Alternative

Program Element/ Program Design Parameter	MassDOT Assessment(s)	Description of Program
Highway Bridges	Screening of USACE MRER/EA Universe of Alternatives	Replacement of Both Highway Bridges with New Bridges with Four Through-Traffic Lanes and Two Auxiliary Lanes (In-Kind Bridge Replacement, updated to comply with federal and state highway and design safety standards).
Highway Bridge Cross-Section and Shared-Use Path	Highway Bridge Cross-Section and Shared-Use Path Assessments	Each replacement highway bridge would provide four 12-foot-wide through-travel lanes (two in each direction), two 12-foot-wide entrance/exit (auxiliary) lanes, a 4-foot-wide left shoulder, and a 10-foot-wide right shoulder. Right and left barriers would be offset an additional 2 feet beyond the limits of the shoulders. Each crossing location would include one bidirectional pedestrian and bicycle shared-use path, separated from vehicular traffic by the shoulder and barrier. The usable width of the shared-use path would be 14-feet-wide on the bridge main spans, 20-feet-wide on the interchange approaches, and 12-feet-wide on the connecting roadways.

Program Element/ Program Design Parameter	MassDOT Assessment(s)	Description of Program
Bridge Vertical and Horizontal Clearances	Bridge Vertical and Horizontal Clearance Assessments	The replacement bridges would maintain the existing vertical clearance of 135 feet above mean high water and account for fluctuations in relative sea level of 3 feet, for a total vertical clearance of 138 feet above mean high water. The replacement bridges would provide a minimum of 500 feet of horizontal channel width consistent with the existing authorized navigational channel width.
Main Span Length and Bridge Pier Location	Initial and Detailed Main Span Length and Bridge Pier Location Assessments	The replacement bridges would have a main span length of approximately 700 feet, which would locate the bridge piers at the waterline adjacent to the service road (shoreline piers), into the rip rap slope but above the low tide line.
Bridge Deck Configuration	Initial and Detailed Bridge Deck Configuration Assessments	Each crossing (Bourne and Sagamore) would have two separate decks (twin structures).
Mainline Alignment	Mainline Alignment Location Assessment	The mainline alignment locations at both crossings would be offline inboard. Both spans of the replacement highway bridge would be located outside the footprint of the existing bridge, approximately 10 feet apart and parallel to each other (offline), and on the side of the canal between the existing bridges (inboard). The replacement main spans at the Bourne crossing would be east of Bourne Bridge toward Cape Cod Bay. The replacement main spans at the Sagamore crossing would be west of Sagamore Bridge toward Buzzards Bay.
Bridge Type	Initial and Detailed Bridge Type Assessments	The replacement bridges would be twin tied-arch bridges with delta frames supporting an approximate 600-foot arch and 700-foot mainline span.
Interchange Approach Network	Initial and Detailed Highway Interchange Approach Assessments	Interchange approach improvements at each crossing would be as follows: • Sagamore Crossing: Direct Connection to State Road in Sagamore North and Westbound On-Ramp under Route 6 with Cranberry Highway Extension and Sandwich Road Connector in Sagamore South. • Bourne Crossing: Directional Interchange in Bourne North and Diamond Interchange in Bourne South.

3.3 No Build Alternative

Sagamore and Bourne Bridges, as components of the Cape Cod Canal FNP, are federal assets that are managed by the USACE's New England District. The Commonwealth of Massachusetts owns the connecting major highway corridors at the bridges, which consist of the State Route 3/U.S. Route 6 corridor at Sagamore Bridge and the State Route 25/State Route 28 corridor at Bourne Bridge.

In the No Build Alternative, Sagamore and Bourne Bridges would retain their current configuration of four 10-foot-wide travel lanes (two in each direction) with one 6-foot sidewalk and a 2-foot safety curb. The USACE would continue to own Sagamore Bridge and Bourne Bridge and would implement a maintenance and repair program as needed to maintain bridge operations and public safety. MassDOT would continue to own, operate, and maintain the state highway interchange approach networks at the two bridges.

The No Build Alternative would include recently completed and proposed Commonwealth of Massachusetts-sponsored and local transportation improvement projects in and near the Program as indicated in the Federal Fiscal Year 2025-2029 Transportation Improvement Program for the Cape Cod Metropolitan Planning Organization.[1] **Table 3-2** identifies the Transportation Improvement Program projects within and near the Program to be incorporated in the No Build Alternative.

The No Build Alternative represents the "Fix as Fails" Base Condition of the USACE's MRER/EA. In the No Build Alternative, the USACE would implement an ongoing program of continued inspections, maintenance, and repair of both existing bridges as needed to maintain safety. No major rehabilitation efforts involving extensive repairs and replacement of major bridge components would occur. Structural components would be repaired, and critical elements would be replaced only when inspections indicate unsatisfactory reliability ratings. The MRER/EA indicates that Sagamore and Bourne Bridges are in deteriorated condition and well beyond the state in which actions and funding from the USACE's operations and maintenance program could correct the deficiencies and restore and sustain reliability. The USACE has indicated that as the bridges continue to age, routine maintenance and minor component replacement would result in an unacceptable structural condition. As a result, it is likely that lower vehicle weights, traffic volume restrictions, and speed limits would be required and posted to maintain continued bridge safety.

Table 3-2. Transportation Improvement Program Projects, 2025-2029

Project Number	Year	Transportation Project	Project Description	Status
606900	2020	Belmont Circle Traffic and Multimodal Improvements	Traffic and multimodal improvements at Belmont Circle at U.S. Route 6 and State Route 25 and State Route 28	Completed

[1] The Transportation Improvement Program was endorsed on May 20, 2024, with subsequent amendments on November 18, 2024; December 16, 2024; February 24, 2025; and an adjustment on March 24, 2025.

Project Number	Year	Transportation Project	Project Description	Status
608422	2022	Trail Improvements – Sandwich	Shared-use path on Service Road (State Route 130 to Chase Road)	Underway
610542	2023	Bourne Rotary Improvements	• Restriping Bourne Rotary to two lanes and adding a channelized right-turn lane from State Route 28 northbound to Sandwich Road eastbound • Adding signs at Bourne Rotary • Installing flashing beacons at the Bourne Rotary approaches	Underway
613195	2024	Bridge Systematic Maintenance	Bridge deck replacement of the Quaker Meetinghouse Road Bridge over U.S. Route 6/Mid-Cape Highway as part of an overall bridge preservation strategy	Programmed
609262	2025	Bourne Rail Trail, Phase 1	First phase of four planned phases of the Bourne Rail Trail connection to the Shining Sea Bikeway to the south in Falmouth and to the Cape Cod Canal path (Canal Service Road) in the town of Bourne; Phase 1 is approximately one-half mile long within the existing right-of-way of the Old Colony Railroad (Woods Hole branch line) from the Canal Service Road to Monument Neck Road.	Programmed
610673	—	Bourne Rail Trail, Phase 2	Phase 2 of four planned phases of the Bourne Rail Trail connection to Shining Sea Bikeway to the south in Falmouth and to the Cape Cod Canal path (Canal Service Road) in the town of Bourne; Phase 2 is approximately 2 miles long from Monument Neck Road to Monk's Park/ Valley Bars Road.	Not Programmed
---	—	Bourne Rail Trail, Phase 3 and Phase 4A	Phase 3 and Phase 4A of four planned phases of the Bourne Rail Trail connection to Shining Sea Bikeway to the south in Falmouth	Not Programmed
607394/ 611998	—	Bourne Rail Trail, Phase 4B	Phase 4B of four planned phases of the Bourne Rail Trail connection to the Shining Sea Bikeway to the south in Falmouth and to the Cape Cod Canal path (Canal Service Road) in the town of Bourne; Phase 4B is approximately 1 mile long, extending the Shining Sea Bikeway from its current terminus in North Falmouth into the town of Bourne.	Not Programmed

Project Number	Year	Transportation Project	Project Description	Status
606082	2025–2028	U.S. Route 6 Scenic Highway Median Installation	• Resurfacing • Safety improvements, including a raised center median and expanded shoulders to separate eastbound and westbound travel lanes • Drainage improvements • Traffic signal improvements at two intersections • Shared-use path	Programmed
612053	2025	Bourne/Sandwich, Resurfacing and Related Work on U.S. Route 6	Improvements to pavement serviceability, condition, and roadway safety on U.S. Route 6 from Sagamore Bridge to the Sandwich town line (8.55 miles)	Programmed
613200	2026	Chase Road over U.S. Route 6 Bridge	Bridge deck replacement of Chase Road over U.S. Route 6 (Mid-Cape Highway) bridge structure in the town of Sandwich	Programmed
612063	2028	State Route 28 Resurfacing and Related Work	Improvements to pavement serviceability, condition, and roadway safety on MacArthur Boulevard (State Route 28) from Bourne Rotary to Otis Rotary	Programmed
613199	2028	U.S. Route 6 over State Route 130 Bridge	Bridge deck replacement of U.S. Route 6 (Mid-Cape Highway) bridge structure over State Route 130 in the town of Sandwich	Programmed
613271	—	Shared-use path, State Route 130 to Canal Service Road	Shared-use path from State Route 130 to Canal Service Road in the town of Sandwich	Not Programmed

Note: **Table 3-2** includes only those projects in the Study Areas that are part of the No Build Alternative. It does not include Project S13144, the replacement of the Sagamore Bridge, which was added to the Federal Fiscal Year (FFY) 2025-2029 Transportation Improvement Program as Amendment #2, December 9, 2024.

— No date available.

The No Build Alternative would not meet any of the Program's identified needs:

- It would not address the deteriorating structural condition and escalating maintenance demands of the existing bridges.
- It would not address the substandard design elements of the bridges, the immediate mainline approaches, and their adjacent interchanges and intersections.
- It would not improve vehicular traffic operations.
- It would not improve accommodations for pedestrians and bicyclists.

Per NEPA requirements, the No Build Alternative is included in the Environmental Impact Statement as the base condition against which the Build Alternative is compared and evaluated.

3.4 Regulatory Context

This VIA follows FHWA's guidelines for assessing visual impacts described in its Guidelines for the Visual Impact Assessment of Highway Projects (2015).[2] The FHWA Guidelines contain a Comparative Matrix Table that is used to determine the level of VIA required based on the character of the Program. Using this table, MassDOT determined that a Standard VIA would be the appropriate level of analysis.

In addition to the FHWA Guidelines, the following provide the regulatory context and guidance for the Program's VIA:

- Section 106 of the National Historic Preservation Act, 36 CFR 800[3]
- Programmatic Agreement between the U.S. Army Corps of Engineers (USACE) and the Massachusetts Historic Preservation Officer (MA SHPO) regarding the Cape Cod Canal Highway Bridges Project, March 11, 2022, executed concurrently with the Finding of No Significant Impact for the USACE's MRER/EA[4]
- Section 4(f) of the U.S. Department of Transportation Act of 1966, 23 CFR 774[5]
- MassDOT, Project Development and Design Guide, Context Sensitive Design[6]
- Town of Bourne Open Space and Recreation Plan, February 8, 2018[7]
- Town of Bourne Local Comprehensive Plan, approved October 29, 2019[8]
- Cape Cod Commission, Cape Cod Regional Policy Plan, December 2018[9]

[2] https://www.environment.fhwa.dot.gov/env_topics/other_topics/VIA_Guidelines_for_Highway_Projects.aspx#ap
[3] https://www.achp.gov/digital-library-section-106-landing/section-106-regulations
[4] https://www.nae.usace.army.mil/Portals/74/docs/Topics/Cape Cod Canal Bridges/Reports/MRER-Appendix-K.pdf
[5] https://www.environment.fhwa.dot.gov/env_topics/4f_tutorial/overview.aspx?h=e
[6] https://www.mass.gov/manual/massdot-project-development-and-design-guide
[7] https://www.townofbourne.com/sites/g/files/vyhlif12841/f/uploads/open_space_and_rec_plan_final_2018.pdf
[8] https://www.townofbourne.com/planning/news/local-comprehensive-final-certified-plan
[9] https://www.capecodcommission.org/our-work/rpp/

3.5 Definitions of Visual Impact Assessment Terms

The FHWA Guidelines considers visual quality as a result of the interaction between viewers and their environment. A visual impact is therefore defined as a change to the environment, which is measured by the compatibility of the impact; or a change to the viewers, which is measured by their sensitivity to the impact. Together, the compatibility of the impact and the viewer's sensitivity to the impact determine the degree of impact to visual quality. This section presents the terms that the FHWA Guidelines uses to assess visual impacts.

3.5.1 Compatibility of the Impact with the Environment

Compatibility of the impact is defined as the ability of the environment to visually absorb the proposed project, because the project and the environment have compatible visual characters (elements). A project's compatibility is measured by the following:

- **Project size and scale** refers to the size of the project
- **Project form** refers to the project design
- **Project materials** refers to the materials used to construct the project

The FHWA Guidelines assigns the ratings for compatibility of the proposed impacts as compatible or incompatible.

3.5.2 Viewer Sensitivity to the Impact

Viewer sensitivity to the impact is defined as the ability of viewers to see and care about a project's impacts. Viewer sensitivity to an impact is the result of viewer exposure to the impact and viewer awareness of the impact. The greater the exposure and awareness, the more viewers will be concerned about visual impacts (i.e., higher viewer sensitivity).

Viewer exposure to the impact is measured by:

- **Physical proximity** refers to closeness versus distance to the impact. In general, the farther a viewer is from an impact, the less exposure the viewer has and the less sensitive the viewer is to the impact. In contrast, the closer the viewer is to the impact, the more sensitive the viewer is to the impact.
- **Extent** refers to the number of people who have views of the impact. An impact with fewer viewers, or where potential views of a project are screened or filtered by intervening terrain, has less viewer sensitivity. An impact that is highly prominent, open to view, and with a high number of viewers has high viewer sensitivity.
- **Duration** refers to how long viewers see the impact. In general, there is less viewer sensitivity when a view is of short duration, such as a commuter on the highway who sees a visual change for a short time. In contrast, there is higher viewer sensitivity when a view is of a longer duration, such as a park where scenery is the primary focus or in a residential neighborhood where the visual change is viewed from a stationary viewpoint for long periods of time.

Viewer awareness of the impact is measured by:

- **Attention** refers to whether a view is routine or unique. In general, the more routine the view is, the less sensitive the viewer is to the view.
- **Focus** refers to whether a view has a focal point (single visual element) or multiple visual elements. In general, the more the viewer is focused on a single or limited number of visual elements, the more sensitive the viewer is to the details within the viewshed.
- **Protections** refers to whether the resource being viewed has protections, such as historic or ecological value.

The FHWA Guidelines assigns the ratings for viewer sensitivity to proposed impacts as low, moderate, or high sensitivity.

3.5.3 Degree of Impact

The result of the compatibility of the impact with the environment and the viewer's sensitivity to the impact determine the degree of the impact. The FHWA Guidelines assigns the ratings for degree of proposed impacts as beneficial, neutral, or adverse.

3.5.3.1 Beneficial Change

A beneficial change to the visual quality indicates the following:

- The project impact would enhance visual resources or create better views, would improve the community's aesthetic character, would advance the community's aesthetic goals, and/or would improve the character of the surrounding area.
- The project impact would enhance visual quality by removing undesirable (inharmonious, disorderly, or incoherent) visual resources; by rehabilitating formerly desirable (harmonious, orderly, or coherent) visual resources that are in disrepair; and/or by adding desirable visual resources.
- The project impact would enhance visual quality by limiting exposure to and awareness of undesirable views or by improving exposure to and awareness of desirable views.

3.5.3.2 Neutral Change

A neutral change to the visual quality indicates the following:

- The project impact would neither benefit nor degrade the existing visual resources.
- The project impact would not affect the visual resources of the natural, cultural, and project environments, nor would the impact affect the ability of the affected populations to view visual resources.

3.5.3.3 Adverse Change

An adverse change to the visual quality indicates the following:

- The project impact would degrade visual resources or obstruct or alter desired views, would create adverse impacts on visual quality by adversely affecting the sensitivity of viewers; and/or would create adverse impacts on visual quality through changes to the visual resources of the natural, cultural, and project environments.
- The project impact would be inconsistent with the community's aesthetic character and goals, would contrast strongly with the character of the surrounding area, and/or would have an adverse effect on the Cape Cod Canal Historic District, or a park, recreational destination, or other area defined as an important visual resource under Section 4(f) of the U.S. Department of Transportation Act of 1966.

3.6 Methodology

To develop the Areas of Visual Effect (AVEs) for Sagamore and Bourne Bridges, MassDOT performed a viewshed analysis by identifying areas where the proposed bridges would be visible using geographic information system (GIS) software. The GIS software accounted for visual obstructions (such as topography, vegetation, and buildings) when developing the viewsheds. The results of the analysis were compared to the areas where the existing bridges are visible to identify the influence of the proposed bridge design.

To ascertain the visual quality of the Program AVEs, MassDOT reviewed local and regional policy and planning documents addressing visual quality and the viewshed-related stipulations of the Programmatic Agreement between the USACE and the MA SHPO regarding the Program. Additionally, MassDOT polled the public to assess viewers' preferences during its public meetings presenting optional bridge types.

To determine the Program's visual impacts, MassDOT photographed existing conditions from different viewpoints of the bridge's AVEs and abutting the existing roadways in the four Program quadrants: Sagamore North, Sagamore South, Bourne North, and Bourne South. These viewpoints include static viewsheds (defined as what neighbors of the bridges or roadways would see from their stationary location) and dynamic viewsheds (defined as what travelers on the bridge or road would see as they travel through the Project Limits). Using these photographs, MassDOT identified 17 visual inventory locations across the four Program quadrants, including the bridges and highway interchange networks. MassDOT focused on views that could be affected by the Program, such as where project horizontal or vertical elements could affect the visual character of the viewshed, including changes to the scale and character of the neighborhood. Based on the preliminary design plans and in accordance with the FHWA Guidelines, MassDOT selected views within each Program quadrant that would present the greatest impact to the greatest number of representative viewers, and represent a cross-section of viewers, including residential, commercial, recreational, and institutional neighbors and travelers.

Simulations were prepared of the Build Alternative at these 17 locations. Proposed 3D design models were imported from Computer Aided Design (CAD) software and placed into the environment with

proper geospatial alignment, resulting in an accurate representation of how the completed project will appear from any vantage point.

MassDOT then conducted the assessments of the visual inventory locations with respect to the type of impact, compatibility of the impact, sensitivity to the impact, and degree of impact, per the FHWA Guidelines.

The Program's VIA comprises the following phases:

- **Section 4, Establishment of Baseline Conditions**, defines the Program setting and viewsheds.
- **Section 5, Inventory of Existing Conditions**, determines who has views of the proposed Program, defines the visual quality, and identifies key viewpoints (visual inventory locations) for the assessment of visual impacts.
- **Section 6, Impacts Analysis**, assesses the Program's visual impacts.
- **Section 7, Mitigation**, proposes methods to mitigate adverse visual impacts.

4 Establishment of Baseline Conditions

4.1 Purpose

The purpose of the Baseline Conditions phase of the VIA is to establish the baseline conditions for the assessment of visual impacts by identifying the existing visual character, including establishing the AVEs. **Section 3.6** presents the methodology for defining visual impacts.

4.2 Existing Visual Character

The section provides an overview of the existing visual character of the Program, which consists of Sagamore and Bourne Bridges and their highway interchange networks on both sides of Cape Cod Canal. The bridges are nearly identical. Both bridges have a vertical clearance of 135 feet above mean high water and a 500-foot horizontal clearance. At each bridge, the rise of the arch is approximately 128 feet above the deck, resulting in a total rise of approximately 263 feet above mean high water. Both bridge main spans are supported on each side by two granite-stone facing concrete piers. The piers are 24 feet by 24 feet at the base and taper to 15 feet by 15 feet. The bridges each consist of four 10-foot-wide vehicular travel lanes separated by a double yellow centerline, a single 6-foot-wide sidewalk on one side, and a 2-foot-wide safety curb on the opposite side; the total main span width at each crossing is 54 feet.

Sagamore Bridge is a 3-span steel truss bridge with a length of 1,408 feet connecting U.S. Route 6 (Scenic Highway) in the south with State Route 3/Pilgrims Highway in the north, with an arched 616-foot center span supported on concrete piers within the waterway and flanked by 396-foot truss spans.

There are hollow abutments at either end of the bridge of approximately 220 feet that are vaulted and consist of concrete T-beams.[10]

Bourne Bridge is a 7-span steel truss bridge of 2,384 feet connecting State Route 28 in the south with State Route 25 in the north, with an arched 616-foot center span supported on concrete piers within the waterway and flanked by three truss spans, measuring 398.5 feet, 274.5 feet, and 242 feet on the southern side, and 398.5 feet, 244.5 feet, and 210 feet on the northern side. There are hollow abutments at either end of the bridge of approximately 150 feet that are vaulted and consist of concrete T-beams.[11]

At both canal crossings and in both directions, there is a steep grade from the highway interchange approaches to the bridges. Approaching Sagamore Bridge in the southbound direction (Sagamore North quadrant), State Route 3 carries two 12-foot-wide travel lanes in each direction with an eight-foot-wide shoulder in each direction separated by a grassed median. It then narrows to a single lane as State Route 3 approaches the bridge. The single lane from State Route 3 is joined by an add-lane from the entrance ramp from Scenic Highway (U.S. Route 6), to form the two lanes that are carried over the bridge. Approaching the bridge in the northbound direction (Sagamore South), U.S. Route 6 carries two 12-foot-wide travel lanes toward Sagamore Bridge.

Approaching Bourne Bridge in the southbound direction (Bourne North), State Route 25 carries three 12-foot-wide travel lanes per direction, with an 8-foot-wide shoulder in each direction separated by a grassed median. State Route 25 then narrows to two travel lanes approaching the bridge. State Route 25 eastbound terminates at the State Route 25/U.S. Route 6 (Scenic Highway) interchange in Bourne, where the highway designation changes to State Route 28 and immediately crosses Cape Cod Canal on the bridge. Continuing south from Bourne Bridge is the Bourne Rotary, which handles traffic from several roadways, including State Route 28, Sandwich Road, and Trowbridge Road. Approaching Bourne Bridge in the northbound direction (Bourne South quadrant), State Route 28 carries two 12-foot-wide travel lanes in each direction, with a 10-foot-wide shoulder separated by a forested median.

Located approximately 3.5 miles apart, Sagamore and Bourne Bridges are interchangeably used by local and regional travelers. Both bridges and the four interchange approach networks are heavily traveled. Scenic Highway generally carries two lanes of east-west traffic per direction and connects Bourne Bridge with Sagamore Bridge on the north side of the canal. Sandwich Road generally carries one lane of east-west traffic per direction connecting the bridges on the south side of the canal.

The Program's proposed visual changes would include the following:

- Removal and replacement of the existing bridges, including the bridges, piers, and abutments
- Improvements and new connections to the highway interchange approach networks, including state routes and local roadways

[10] MassDOT, Bridge Type Selection Worksheet, Bridge No. B-17-005, Sagamore Bridge Arch/Delta Spans, April 2025. Draft.
[11] MassDOT, Bridge Type Selection Worksheet, Bridge No. B-17-004, Bourne Bridge Arch/Delta Spans, May 2025. Draft.

New SUPs at the bridge crossings would provide connections to the existing pedestrian and bicycle networks in the four Program quadrants.

4.3 Areas of Visual Effect

The study areas for this assessment, referred to as the Visual Resources AVEs, include the areas from which the existing Bourne and Sagamore highway bridges and their highway approach networks can be viewed. Given the topography of the surrounding area, and their height, the viewing distance of the bridges is substantial. The AVEs of the highway intersection network at the four Program quadrants include the areas abutting or along the roadways within the visual range of different viewers, including residential, recreational, commercial, and institutional and civic viewers, and travelers through the Program limits. **Figure 5-1** presents the Sagamore Bridge and Bourne Bridge AVEs.

5 Inventory of Existing Conditions

5.1 Purpose

This section consists of the Inventory Phase of the VIA. It defines the existing conditions of the AVEs, including the existing visual resources and environment, the affected populations (neighbors) of the bridges and roadways, and the visual quality. It also includes visual inventory locations in the four Program quadrants that are assessed in this section.

5.2 Existing Visual Environment

This section describes the existing visual environment within the Sagamore Bridge and Bourne Bridge AVEs in terms of visual resources, consisting of the following:

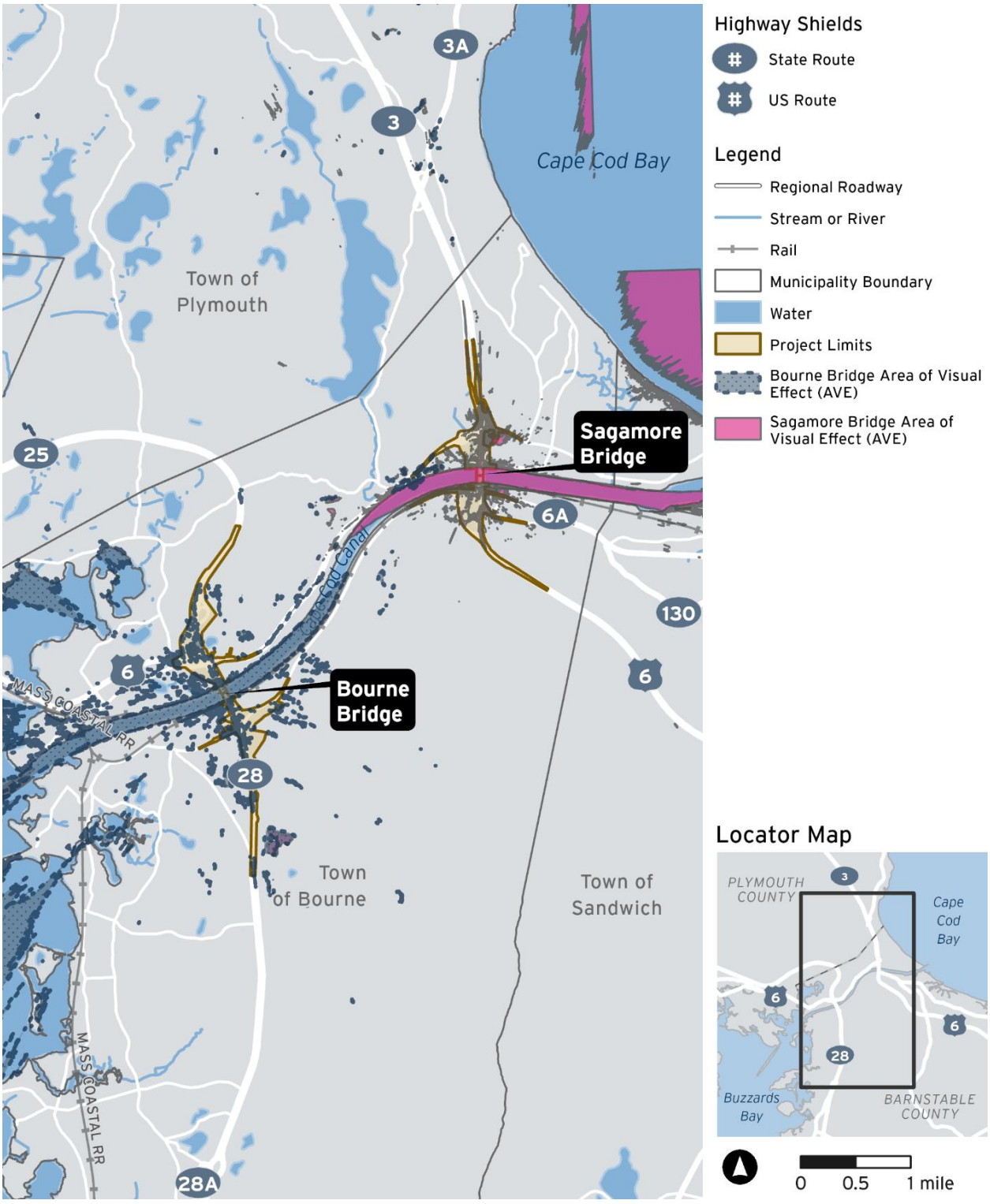
- Natural visual resources are areas with limited human-made structures
- Cultural visual resources refer to the built environment
- Project-related visual resources are the elements of the visual environment that directly relate to the project

Cape Cod Canal is the most prominent natural visual resource within the Sagamore Bridge and Bourne Bridge AVEs. Sagamore and Bourne Bridges are the most prominent cultural visual resources. In addition to the bridges, project-related visual resources consist of the Sagamore Bridge and Bourne Bridge highway interchange networks on both sides of the canal.

This section also describes the existing visual environment in terms of landscape units. In accordance with the FHWA Guidelines, a landscape unit is defined as a geographic unit on which impacts on visual character, viewers, and visual quality are assessed. Landscape units are “defined areas within the AVE that have similar visual features and homogeneous visual character and frequently, a viewshed.” Cape Cod Canal and Bourne and Sagamore Bridges each represent separate landscape units. The Sagamore Bridge and Bourne Bridge highway interchange networks on both sides of the canal also represent

separate landscape units. It is important to note that the existing terrain varies greatly and includes several steep bluff areas, altering viewsheds throughout the AVEs. As noted in the FHWA Guidelines, and applicable to the areas of the Sagamore North and Sagamore South and Bourne North and Bourne South quadrants highway interchange networks, a landscape can be heterogeneous with more than one viewshed or landscape type. **Section 5.5** further describes the different viewsheds and landscape type that comprise the landscape units within the Sagamore Bridge and Bourne Bridge AVEs.

Figure 5-1. Areas of Visual Effect (Sagamore Bridge and Bourne Bridge)



Source: Massachusetts Department of Transportation, 2024

5.2.1 Cape Cod Canal

Cape Cod Canal and the coasts of Cape Cod Bay and Buzzards Bay comprise the town of Bourne's most unique natural visual resource. Cape Cod Canal, the dominant landscape unit in the AVEs and both a natural and a cultural visual resource, defines the boundary of the Cape Cod region and is referred to as the "gateway to Cape Cod." Nearly the entirety of the Cape Cod Canal land cut (8.1 miles) is within the town of Bourne. Cape Cod Canal comprises the Cape Cod Canal Historic District, which is listed on the State Register of Historic Places and is eligible for listing on the National Register of Historic Places (NRHP). Cape Cod Canal and its abutting lands, including the Canal Service Roads paralleling the waterway north and south of the canal, are part of the FNP, owned and operated by the U.S. Army Corps of Engineers (USACE). **Exhibit 5-1** and **Exhibit 5-2** show different views of Cape Cod Canal.

Exhibit 5-1. View of Cape Cod Canal, facing west to Bourne Bridge and Buzzards Bay

Source: Massachusetts Department of Transportation, 2024

Exhibit 5-2. View of Cape Cod Canal, facing east to Sagamore Bridge and Cape Cod Bay

Source: Massachusetts Department of Transportation, 2024

5.2.2 Sagamore and Bourne Bridges

Sagamore and Bourne Bridges are iconic historic structures in the town of Bourne that, along with the waterway, serve as the "gateways to Cape Cod," connecting mainland Massachusetts to Cape Cod over Cape Cod Canal. The historic plaques at the entrances to the bridges reinforce the sense of a "portal gateway" to travelers entering or leaving Cape Cod. Constructed in 1933, Sagamore and Bourne Bridges are individually eligible for listing in the NRHP and are contributing resources to the Cape Cod Canal Historic District. **Exhibit 5-3** shows the historic plaque at the entrance to the Bourne Bridge**.** **Exhibit 5-4** and **Exhibit 5-5** present views of Sagamore and Bourne Bridges.

Exhibit 5-3. Historic Plaque on Bourne Bridge

Source: Massachusetts Department of Transportation, 2024

Exhibit 5-4. Sagamore Bridge

Source: Massachusetts Department of Transportation, 2024

Exhibit 5-5. Bourne Bridge

Source: Massachusetts Department of Transportation, 2024

5.2.3 Sagamore Bridge Interchange Network Visual Environment

The Sagamore Bridge interchange network is in the Sagamore Beach and Sagamore communities of Bourne. North of Cape Cod Canal, State Route 3 abuts medium-density residential development, such as the Canalside Apartments, with commercial development located primarily around the Canal Road and Meetinghouse Road intersection. MassDOT's Bourne Park and Ride commuter lot is located west of State Route 3 and northeast of Sagamore Bridge. The Sagamore North quadrant includes Scenic Highway east of State Route 3, which consists of low-density residential and commercial development, recreational areas, and scenic overlooks with views of Cape Cod Canal. **Exhibit 5-6** presents an aerial view of typical existing conditions in the Sagamore North quadrant.

South of the canal, large commercial developments (such as Market Basket and Factory Outlet Road development to the west and the former Christmas Tree Shops development to the east) are interspersed among low-density residential development east of the Mid-Cape Connector to Cranberry Highway. Extending south from Sagamore Bridge, U.S. Route 6 abuts forested and natural areas of the Camp Edwards Wildlife Management Area, located within the boundaries of Joint Base Cape Cod, to the west; to the east, U.S. Route 6 abuts medium-density residential development and a portion of the Shawme-Crowell State Forest. The Sagamore South Project Limits include Sandwich Road east and west of U.S. Route 6. Sandwich Road includes a mix of low-density residential and commercial development, recreational areas, and institutional uses. **Exhibit 5-7** presents an aerial view of typical existing conditions in Sagamore South.

5.2.4 Bourne Bridge Interchange Network Visual Environment

The Bourne Bridge interchange network is in the Buzzards Bay community of the town of Bourne. North of Cape Cod Canal, State Route 25 abuts forest and natural areas. Commercial development is centered around Belmont Circle, which is located immediately west of the State Route 25 approach to the bridge; roadway approaches to Belmont Circle include Scenic Highway, Main Street, Buzzards Bay Bypass, Head of the Bay Road, and State Route 25 ramps. East of State Route 25, Bourne North Project Limits include Scenic Highway and the entrance to Bourne Scenic Park. **Exhibit 5-8** presents an aerial view of typical existing conditions in Bourne North.

South of the canal at Bourne Rotary, the Cape Cod hedge sign welcomes southbound travelers from Bourne Bridge to Cape Cod. Development adjacent to the Bourne Rotary includes low- to medium-density commercial development and the Massachusetts State Police barracks. Extending south from the Bourne Rotary, State Route 28 is bordered to the west by the Bourne High School, flanked on both sides by commercial development, and to the area east by natural and forested areas of the Camp Edwards Wildlife Management Area. The Bourne South quadrant includes Sandwich Road, which includes low-density residential development, recreation areas, and Upper Cape Cod Regional Technical High School. **Exhibit 5-9** presents an aerial view of typical existing conditions in the Bourne South quadrant.

Exhibit 5-6. State Route 3, facing southwest to Sagamore Bridge (Sagamore North Quadrant)

Source: Massachusetts Department of Transportation, 2024

Exhibit 5-7. U.S. Route 6 facing northwest to Sagamore Bridge (Sagamore South Quadrant)

Source: Massachusetts Department of Transportation, 2024

Exhibit 5-8. Belmont Circle, facing southeast to Bourne Bridge (Bourne North Quadrant)

Source: Massachusetts Department of Transportation, 2024

Exhibit 5-9. Bourne Rotary, facing north to Bourne Bridge (Bourne South Quadrant)

Source: Massachusetts Department of Transportation, 2024

5.3 Affected Populations

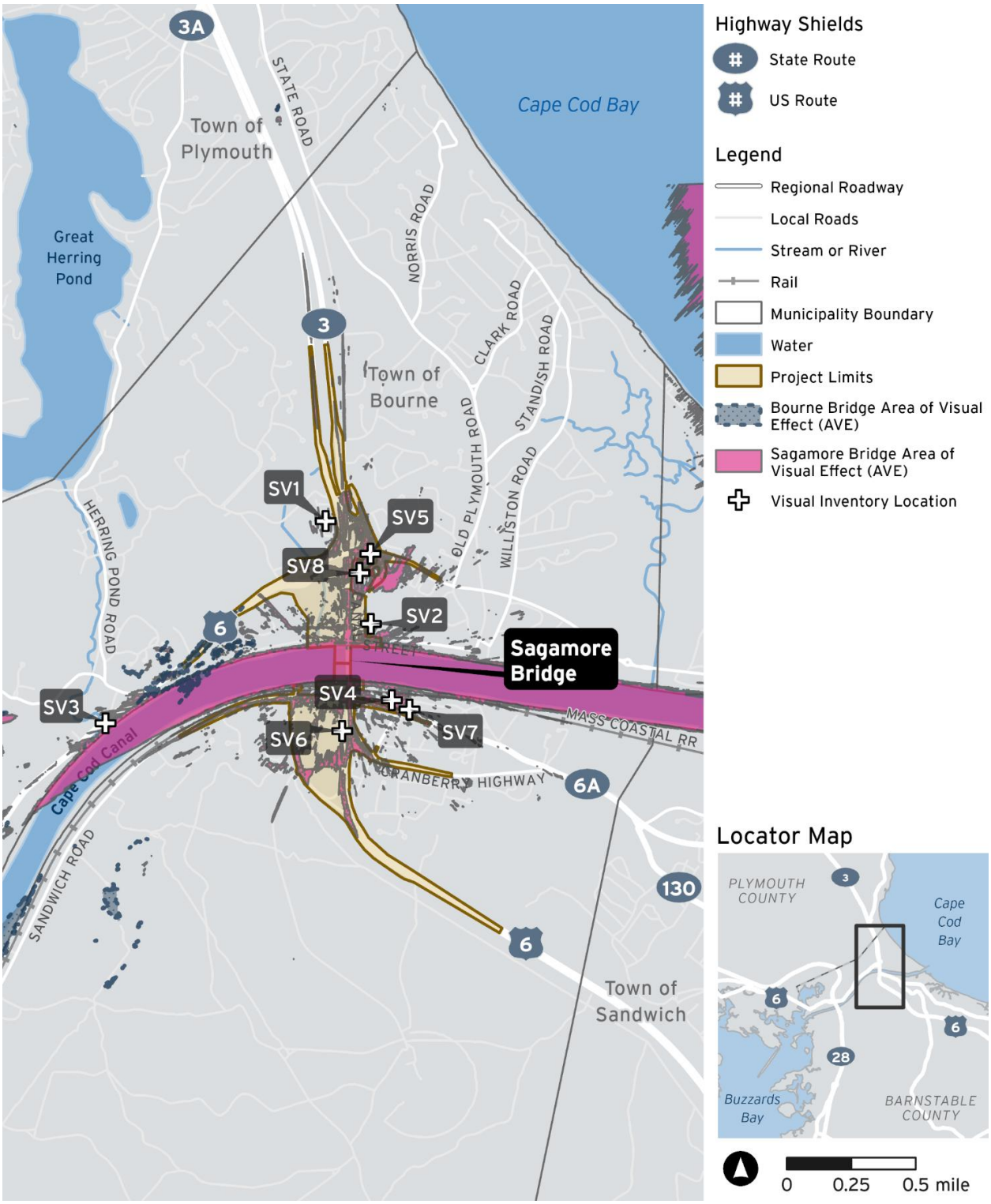
Per the FHWA Guidelines, the Program would affect two distinct viewers, or populations:

- Neighbors, defined as people who view the bridges and/or interchange network
- Travelers, defined as people who use and have views from the bridge and the interchange network

The affected populations in the Sagamore Bridge and Bourne Bridge AVEs include residential, recreational, commercial, and institutional and civic neighbors, as well as travelers on state and local roadways within the Project Limits. Neighbors described in this section may be part of multiple populations. For example, as the operator of the Cape Cod Canal FNP, the USACE is both a recreational neighbor and a civic neighbor; additionally, residential neighbors are travelers.

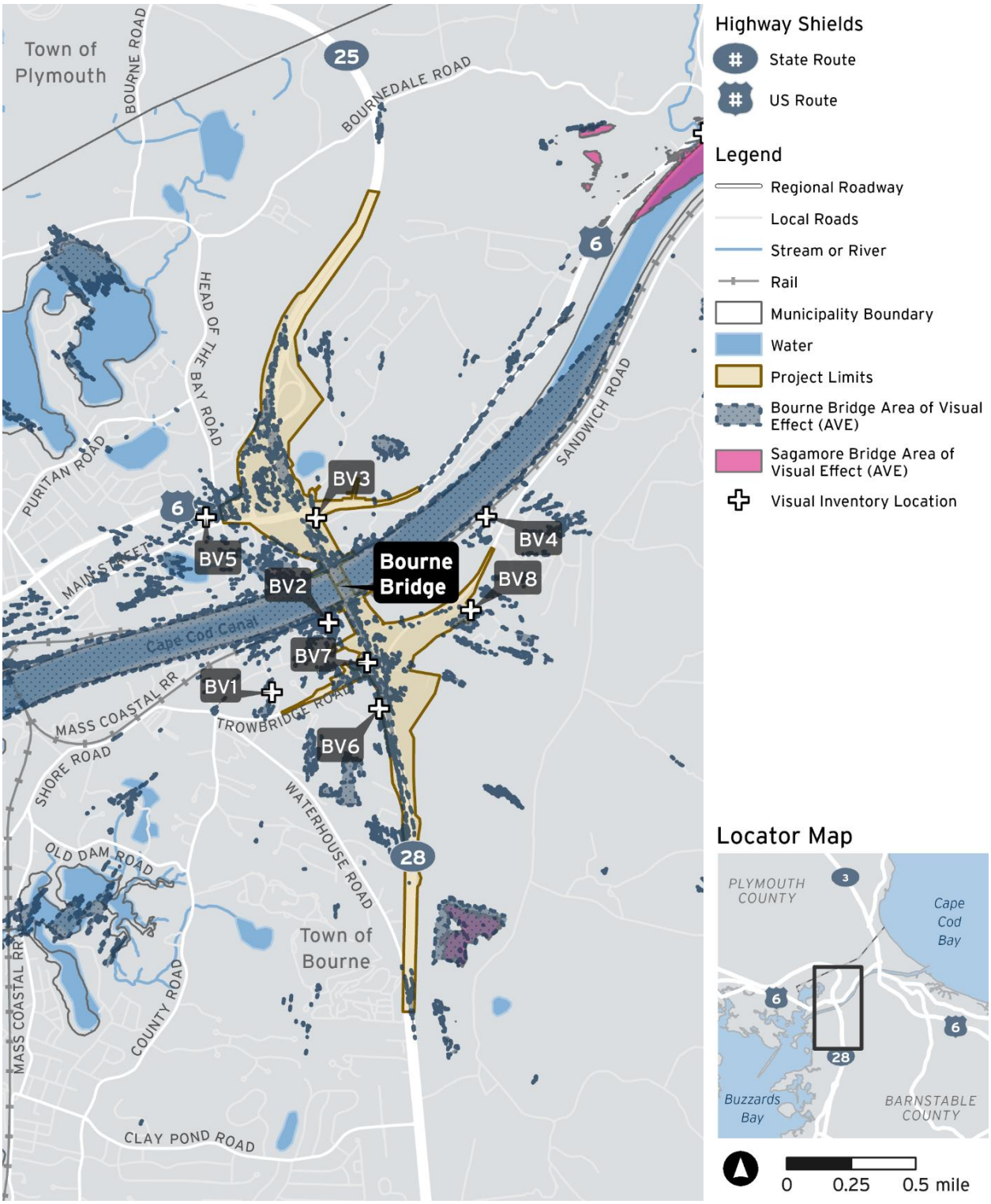
Section 5.3.1 through Section 5.3.5 describe the affected populations and present 15 typical neighbor views of Sagamore and Bourne Bridges in the existing conditions. **Figure 5-2** and **Figure 5-3** identify the neighbor viewer locations in the Sagamore Bridge and Bourne Bridge AVEs, respectively.

Figure 5-2. Neighbor Viewer Locations (Sagamore Bridge Areas of Visual Effect)



Source: Massachusetts Department of Transportation, 2024

Figure 5-3. Neighbor Viewer Locations (Bourne Bridge Areas of Visual Effect)



Source: Massachusetts Department of Transportation, 2024

5.3.1 Residential Neighbors

Residential neighbors within the Sagamore Bridge and Bourne Bridge AVEs include residents with minimal or partial bridge views, as well as residents with prominent views of the bridges. As shown in **Exhibit 5-10** and **Exhibit 5-11**, residents with a distant views of the bridges, such as the partial view of Sagamore Bridge from the Canalside apartment complex on Church Lane (**Figure 5-2**, SV1) or the partial view of Bourne Bridge from the Coady School Residences on Cotuit Street (**Figure 5-3**, BV1), would likely have low sensitivity to the replacement bridge. For these residential neighbors, the bridge represents a small portion of their viewshed.

Exhibit 5-10. View of Sagamore Bridge from Church Lane at Cape Pine Road, facing south

Source: Massachusetts Department of Transportation, 2024

Exhibit 5-11. View of Bourne Bridge from Coady School Residences, facing northeast

Source: Massachusetts Department of Transportation, 2024

In contrast, as shown in **Exhibit 5-12** and **Exhibit 5-13**, residential neighbors who live relatively close to the bridge, such as the Hunters Brook condominiums on Canal Street (**Figure 5-2**, SV2) with prominent views of Sagamore Bridge, or the Winslow Street neighborhood (**Figure 5-3**, BV2) with prominent views of Bourne Bridge, have the potential to be the most sensitive to and most affected by the replacement bridge. For these residential neighbors, the bridge represents a predominant part of their viewshed.

Exhibit 5-12. View of Sagamore Bridge from Hunters Brook Condominiums, facing southwest

Source: Massachusetts Department of Transportation, 2024

Exhibit 5-13. View of Bourne Bridge from Winslow Street, facing northeast

Source: Massachusetts Department of Transportation, 2024

5.3.2 Recreational Neighbors

Recreational neighbors within the Sagamore Bridge and Bourne Bridge AVEs include individuals who view the bridges when participating in the many recreational activities (such as sightseeing, walking, running, bike riding, saltwater fishing, boating, picnicking, and camping) offered by Cape Cod Canal, the Canal Service Roads, and recreation areas and scenic outlooks abutting the canal. Recreational neighbors include residents and tourists. Recreational neighbors also include recreational providers, such as Keith Field on Sandwich Road, and Bourne Scenic Park, at the base of Bourne Bridge north of the canal. **Exhibit 5-14** shows a vista of Sagamore Bridge from Herring Run Recreation Area within the Cape Cod Canal FNP (**Figure 5-2,** SV3). **Exhibit 5-15** shows a view of Sagamore Bridge from Keith Field (**Figure 5-2,** SV4). **Exhibit 5-16** shows view of Bourne Bridge from the entrance to Bourne Scenic Park, off Scenic Highway (**Figure 5-3**, BV3). **Exhibit 5-17** shows a vista of Bourne Bridge from the South Canal Service Road (**Figure 5-3**, BV4).

As demonstrated in these photographs, both bridges have a prominent position in the viewshed of their recreational neighbors, either as vista focal points or due to their proximity to their recreational neighbors. Like residential neighbors, recreational neighbors potentially would be sensitive to and affected by changes in their viewshed, particularly with respect to the historical significance of Sagamore and Bourne Bridges and Cape Cod Canal.

Exhibit 5-14. View of Sagamore Bridge from Herring Run Recreation Area, facing southeast

Source: Massachusetts Department of Transportation, 2024

Exhibit 5-15. View of Sagamore Bridge from Keith Field, facing northwest

Source: Massachusetts Department of Transportation, 2024

Exhibit 5-16. View of Bourne Bridge from Bourne Scenic Park entrance, facing south

Source: Massachusetts Department of Transportation, 2024

Exhibit 5-17. View of Bourne Bridge from South Canal Service Road, facing west

Source: Massachusetts Department of Transportation, 2024

5.3.3 Commercial Neighbors

Commercial neighbors within the Sagamore Bridge and Bourne Bridge AVEs include retailers, employees, and customers who view the bridges and/or the highway interchange networks from their commercial properties. **Exhibit 5-18** and **Exhibit 5-19** show views of the bridges from commercial neighbors within the Sagamore North quadrant, at McDonald's Restaurant on Meetinghouse Lane (**Figure 5-2**, SV5), and Sagamore South quadrant, at the Factory Outlet Road development (**Figure 5-2**, SV6). **Exhibit 5-20** and **Exhibit 5-21** show views of the bridges from commercial neighbors within the Bourne North quadrant, at Ocean State Job Lot on Main Street (**Figure 5-3**, BV5), and Bourne South quadrant, at Nickerson-Bourne Funeral Home on MacArthur Boulevard (**Figure 5-3**, BV6). While many commercial neighbors have views of Sagamore and Bourne Bridges, it is anticipated that the commercial neighbors would be most sensitive to changes in their visibility from abutting roadways, as opposed to their views of the bridges, within the Project Limits.

Exhibit 5-18. View of Sagamore Bridge from McDonald's Restaurant, facing southwest

Source: Massachusetts Department of Transportation, 2024

Exhibit 5-19. View of Sagamore Bridge from Factory Outlet Road development, facing northeast

Source: Massachusetts Department of Transportation, 2024

Exhibit 5-20. View of Bourne Bridge from Ocean State Job Lot, facing south

Source: Massachusetts Department of Transportation, 2024

Exhibit 5-21. View of Bourne Bridge from Nickerson-Bourne Funeral Home, facing north

Source: Massachusetts Department of Transportation, 2024

5.3.4 Institutional and Civic Neighbors

Institutional and civic neighbors within the Sagamore Bridge and Bourne Bridge AVEs include those that provide or receive services from a variety of institutions, such as schools, government organizations, and federal, state, and local agencies. **Exhibit 5-22** and **Exhibit 5-23** show views of Sagamore Bridge from MassDOT's Bourne Park and Ride Lot in Sagamore Circle (**Figure 5-2**, SV7) and Bridgeview Montessori School on Sandwich Road (**Figure 5-2**, SV8). **Exhibit 5-24** and **Exhibit 5-25** show views of Bourne Bridge from the Massachusetts State Police Barracks at the Bourne Rotary (**Figure 5-3**, BV7) and the scenic outlook at Cape Cod Regional Technical High School on Sandwich Road (**Figure 5-3**, BV8). Institutional and civic neighbors that require visibility, such as the State Police Barracks, would be sensitive to changes in their visibility from roadways within the Project Limits.

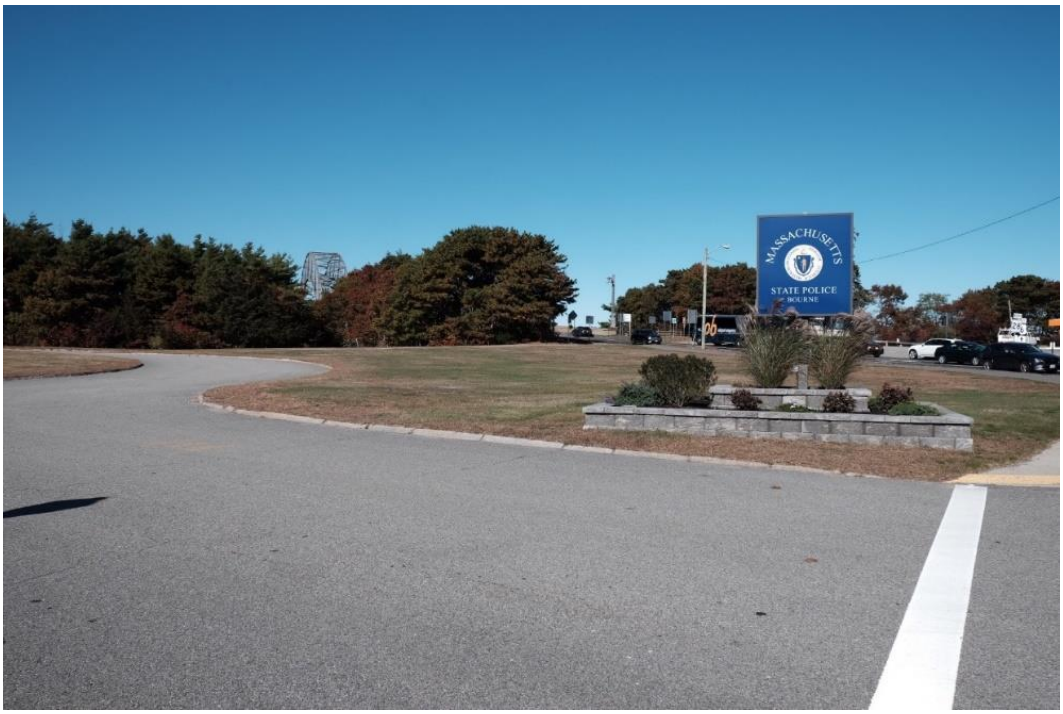
Exhibit 5-22. View of Sagamore Bridge from Bourne Park and Ride Lot, facing southwest

Source: Massachusetts Department of Transportation, 2024

Exhibit 5-23. View of Sagamore Bridge from Bridgeview Montessori School, facing west

Source: Massachusetts Department of Transportation, 2024

Exhibit 5-24. View of Bourne Bridge from State Police Barracks, facing northeast



Source: Massachusetts Department of Transportation, 2024

Exhibit 5-25. View of Bourne Bridge from Upper Cape Cod Regional Technical School Scenic Outlook, facing northwest

Source: Massachusetts Department of Transportation, 2024

5.3.5 Travelers

Travelers are a broad range of users of the Program bridges and highway interchange networks, including SUPs, within the Sagamore Bridge and Bourne Bridge Project Limits (**Figure 5-2** and **Figure 5-3**). The definition of travelers, which includes motorists, pedestrians, and bicyclists, consists of the following:

- Commuting travelers comprise regular travelers of the same route, including commuters living in the immediate vicinity of the Program (residents) and commuters traveling through the Project Limits to regional destinations (on- or off-Cape).
- Touring travelers comprise visitors traveling to the town of Bourne and farther destinations on Cape Cod.
- Shipping travelers comprise commercial and/or freight travelers using the bridges and highways to move goods.

5.4 Visual Quality of the Environment

Per the FHWA Guidelines, visual quality, identifying what people like and dislike about the visual character of the AVEs, serves as the baseline for determining the degree of visual impacts (assessed as beneficial, neutral, or adverse changes, as defined in **Section 3.5**). Additionally, the visual quality of the AVEs provides a design goal for determining the need to mitigate for adverse effects. **Section 5.4.1 through Section 5.4.3** describe visual preferences as identified by local and regional policy and planning documents and the Programmatic Agreement between the USACE and the MA SHPO regarding the Cape Cod Canal Highway Bridges Project, and as identified by MassDOT during the Program's public meetings.

5.4.1 Visual Preferences Identified by Local and Regional Policy and Planning Documents

In its 2019 revision, the Town of Bourne Local Comprehensive Plan[12] (Comprehensive Plan) cites the vision for the town of Bourne that was established in its first (2009) Local Comprehensive Plan:

> "a vision of a town of village centers serving the daily needs of surrounding neighborhoods, with an active downtown in Buzzards Bay that would be a center for government, marine research, and education. Regional commercial and industrial uses would be located on MacArthur Boulevard and other areas with good highway access. Village centers would be connected by pedestrian and bicycle paths, as well as local roads that were off the path of regional traffic."

[12] https://www.townofbourne.com/sites/g/files/vyhlif12841/f/uploads/2019_final_revision_comprehensive_version_2.14.20.pdf

The Comprehensive Plan notes that over the 10 years since the initial comprehensive planning effort, substantial progress has been made toward achieving the town's vision.

The Town of Bourne Open Space and Recreation Plan[13] (Recreation Plan) identifies the town as a medium-sized rural community that is unique due to its community of villages, its abundance of cultural and natural resources, its home to Cape Cod Canal, and its reputation as the "Gateway to Cape Cod."

As integral elements of Cape Cod Canal and as contributing resources to the Cape Cod Canal Historic District, Sagamore and Bourne Bridges occupy prominent roles in the AVEs, including protections through community and regional goals and zoning.

The Recreation Plan provides context for defining the visual quality of the AVEs, as well as the visual preferences within the town. According to the Recreation Plan, the most distinctive landform and physically impressive element of the town of Bourne's landscape is Cape Cod Canal. Nearly all of Cape Cod Canal is within the town. The Recreation Plan notes that the canal's "scenic and recreational value is an indisputable asset to the community." The Recreation Plan also identifies two scenic landscapes and viewsheds within the Sagamore Bridge and Bourne Bridge AVEs as "being important to its heritage:"

- The view down Cape Cod Canal from the Upper Cape Regional Technical High School dining rooms (which includes views of both bridges)
- The view of large/tall ships passing through the canal (**Exhibit 5-26)**

Exhibit 5-26. View of Large Ship Passing through Cape Cod Canal

Source: Massachusetts Department of Transportation, 2024

[13] https://www.townofbourne.com/sites/g/files/vyhlif12841/f/uploads/open_space_plan_fina_2018.pdf

The Recreation Plan includes the following "community character" goal focused on natural and cultural resources, developed with input from the public:

> "Protect existing cultural and landscape assets. Such features are critical to Bourne's self-understanding and sense of community. They provide linkages between the history and the present and help shape the Town's unique character."[14]

The Town of Bourne Zoning Bylaw (amended October 2022) and Zoning Map (October 25, 2011) has designated areas between the two bridges and abutting Scenic Highway to the south and an area abutting Sandwich Road to the west as Scenic Development Districts. The Zoning Bylaw states that one of the purposes of these districts is to preserve and enhance highway views of Cape Cod Canal and landscaping and tree cover; further, the Scenic Development District should be located to provide views of the canal.[15]

Local and regional documents cite the importance of Cape Cod Canal and Bourne and Sagamore Bridges as cultural visual resources. The Town of Bourne Local Comprehensive Plan acknowledges the need for the bridges to be replaced and cites the importance of constructing replacement bridges that "respect the iconic natures of these bridges to the Cape's image," noting that the bridges are integral to the local heritage of Cape Cod.[16] The Cape Cod Commission's Cape Cod Regional Policy Plan[17] (Policy Plan) includes two policy goals applicable to the existing bridges and their replacements:

- Community Design, to "protect and enhance the unique character of the region's built and natural environment based on the local context."
- Cultural Heritage, to "protect and preserve the significant cultural, historic, and archaeological values and resources of Cape Cod."

Further, the Policy Plan's vision for historic areas, including local and/or NRHP districts, is to protect historic resources and to support development that respects the form, scale, and character of existing historic areas.[18]

[14] https://www.townofbourne.com/sites/g/files/vyhlif12841/f/uploads/open_space_plan_fina_2018.pdf
[15] https://www.townofbourne.com/sites/g/files/vyhlif12841/f/uploads/zoning_bylaw_2022_for_website_1.pdf
[16] https://www.townofbourne.com/sites/g/files/vyhlif12841/f/uploads/2019_final_revision_comprehensive_version_2.14.20.pdf
[17] https://www.capecodcommission.org/resource-library/file/?url=/dept/commission/team/Website_Resources/RPP/2018_Cape_Cod_Regional_Policy_Plan_for_web.pdf
[18] https://www.capecodcommission.org/resource-library/file/?url=/dept/commission/team/Website_Resources/RPP/2018_Cape_Cod_Regional_Policy_Plan_for_web.pdf

5.4.2 Visual Preferences Identified in the Programmatic Agreement

The Programmatic Agreement between the USACE and the MA SHPO for the Cape Cod Canal Highway Bridges Project[19] (i.e., the Program) addresses the importance of viewsheds of and from the NRHP-eligible Cape Cod Canal Historic District. The Programmatic Agreement states that viewshed analyses of the existing and proposed bridges shall be prepared to determine if historic properties within the Historic District and outside the Cape Cod Canal FNP have views that could be affected by the construction of the proposed bridges. Further, the Programmatic Agreement states that the USACE and MassDOT shall "make a good faith effort to design, position, and construct new bridges that will avoid adverse effects" to the Cape Cod Canal Historic District and any NRHP-eligible properties within the viewshed of the proposed undertaking.[20]

5.4.3 Visual Preferences Identified through Public Involvement

As part of its series of public meetings to identify recommendations for Program elements, in November 2022, MassDOT conducted two virtual public meetings to review preliminary recommendations of the feasible bridge types, obtain public sentiment on the bridge types, and confirm the bridge type to be advanced for further design. MassDOT conducted a poll to determine the community's visual preferences relative to the existing bridges and preferences for the replacement bridges via two questions:

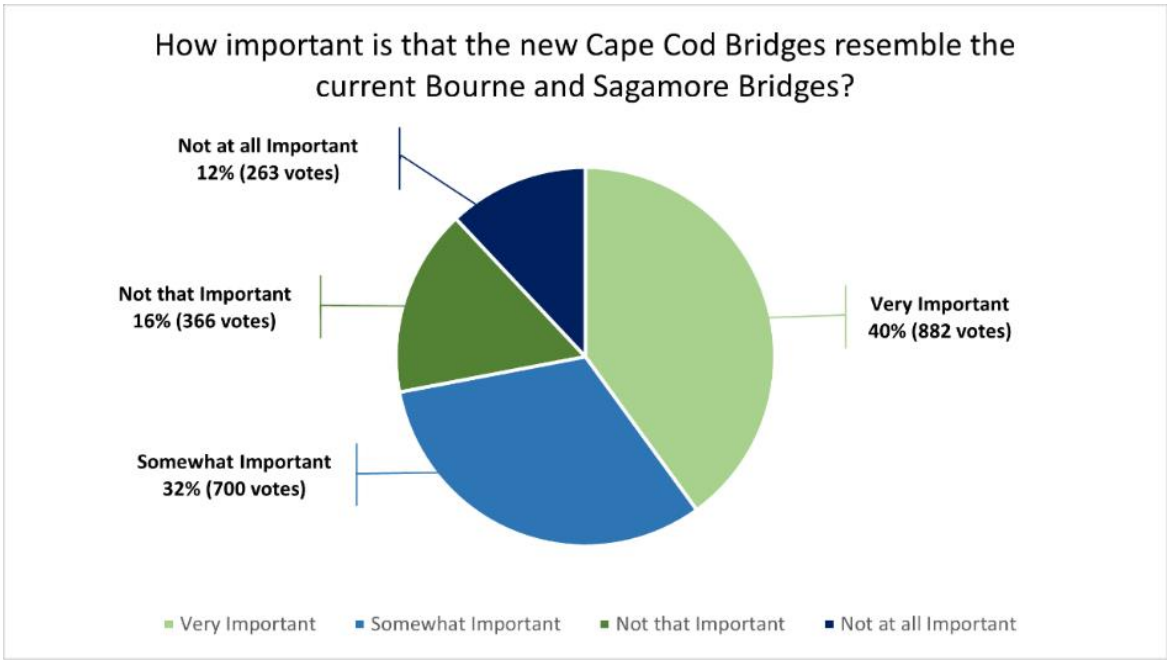
- How important is it that the new Cape Cod Bridges resemble the current Bourne and Sagamore Bridges?
- How important is it to replace the Cape Cod Bridges with landmark structures?

MassDOT received over 2,200 responses during and following the two public meetings. As indicated in **Figure 5-4** and **Figure 5-5**, the majority of respondents indicated that it is somewhat to very important that the replacement bridges resemble the existing Sagamore and Bourne Bridges, indicating a high level of viewer sensitivity to the bridges.

[19] https://www.nae.usace.army.mil/Portals/74/docs/Topics/Cape%20Cod%20Canal%20Bridges/Agreements/USACE-MassDOTCapeCodCanalBridgesApproachesCollaborativeMemorandumofUnderstanding.pdf

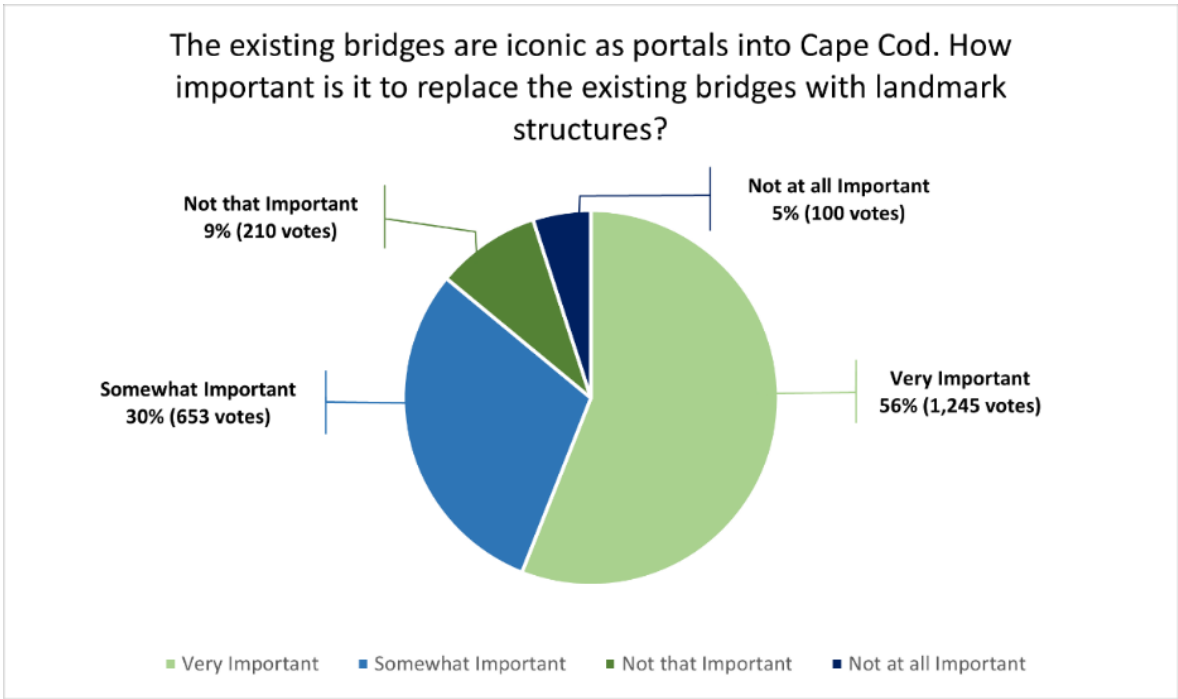
[20] https://www.nae.usace.army.mil/Portals/74/docs/Topics/Cape%20Cod%20Canal%20Bridges/Agreements/USACE-MassDOTCapeCodCanalBridgesApproachesCollaborativeMemorandumofUnderstanding.pdf

Figure 5-4. Assessment of Community Visual Preferences, Public Polling Question No.1



Source: Massachusetts Department of Transportation, 2024

Figure 5-5. Assessment of Community Visual Preferences, Public Polling Question No.2



Source: Massachusetts Department of Transportation, 2024

5.5 Visual Inventory Locations

MassDOT identified 17 visual inventory locations in the Sagamore Bridge and Bourne Bridge AVEs as the basis for assessing visual impacts of the Program. They show different visual character and represent different viewers and landscape units throughout the AVEs. **Section 5.5.1 through Section 5.5.5** present the visual inventory locations for Sagamore and Bourne Bridges and the interchange networks in the four Program quadrants, along with tables describing the viewsheds, viewer types, and viewer sensitivity. MassDOT determined viewer sensitivity based on FHWA's VIA definitions of viewer sensitivity, discussed in **Section 3.5.2**.

5.5.1 Sagamore and Bourne Bridges

Table 5-1 lists two visual inventory locations for Sagamore and Bourne Bridges. These locations apply to both bridges.

Table 5-1. Description of Visual Inventory Locations (Sagamore and Bourne Bridges)

Visual Inventory Location*	Viewshed	Description	Viewer Types	Viewer Sensitivity
B1	View from Motorist on Sagamore or Bourne Bridges	Viewshed of a portal entry onto the bridge, with prominent historic plaque at the portal entrance, reinforced by tall safety/visual fences on both sides of the highway and heavily trafficked narrow traffic lanes.	Travelers	High
B2	View of Sagamore and Bourne Bridges from Cape Cod Canal Service Road	Viewshed includes the expanse of the waterway and the extensive length of the parallel service road, with the curve of the waterway in the distant view.	Recreational Neighbors	High

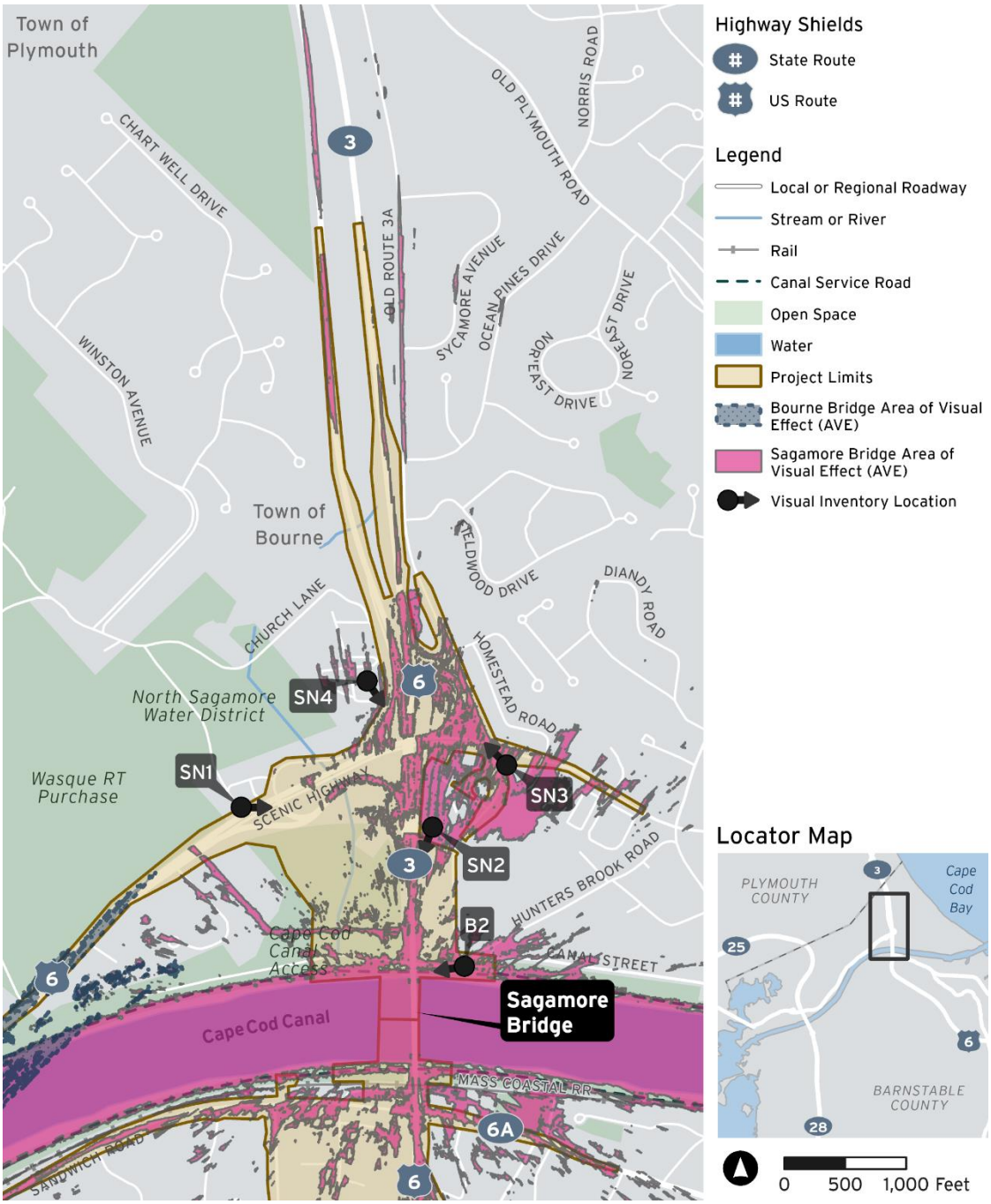
Source: Massachusetts Department of Transportation, 2024

* Visual Inventory Location B1 is shown on **Figure 5-9** and Visual Inventory Location B2 is shown on **Figure 5-6**; however, the bridge visual inventory locations are applicable to all figures.

5.5.2 Sagamore North Quadrant Interchange Approach Network

Figure 5-6 and **Table 5-2** identify four visual inventory locations in the Sagamore North quadrant highway interchange approach network.

Figure 5-6. Visual Inventory Locations (Sagamore North Quadrant Interchange Approach Network)



Source: Massachusetts Department of Transportation, 2024

Table 5-2. Description of Visual Inventory Locations (Sagamore North Quadrant Interchange Approach Network)

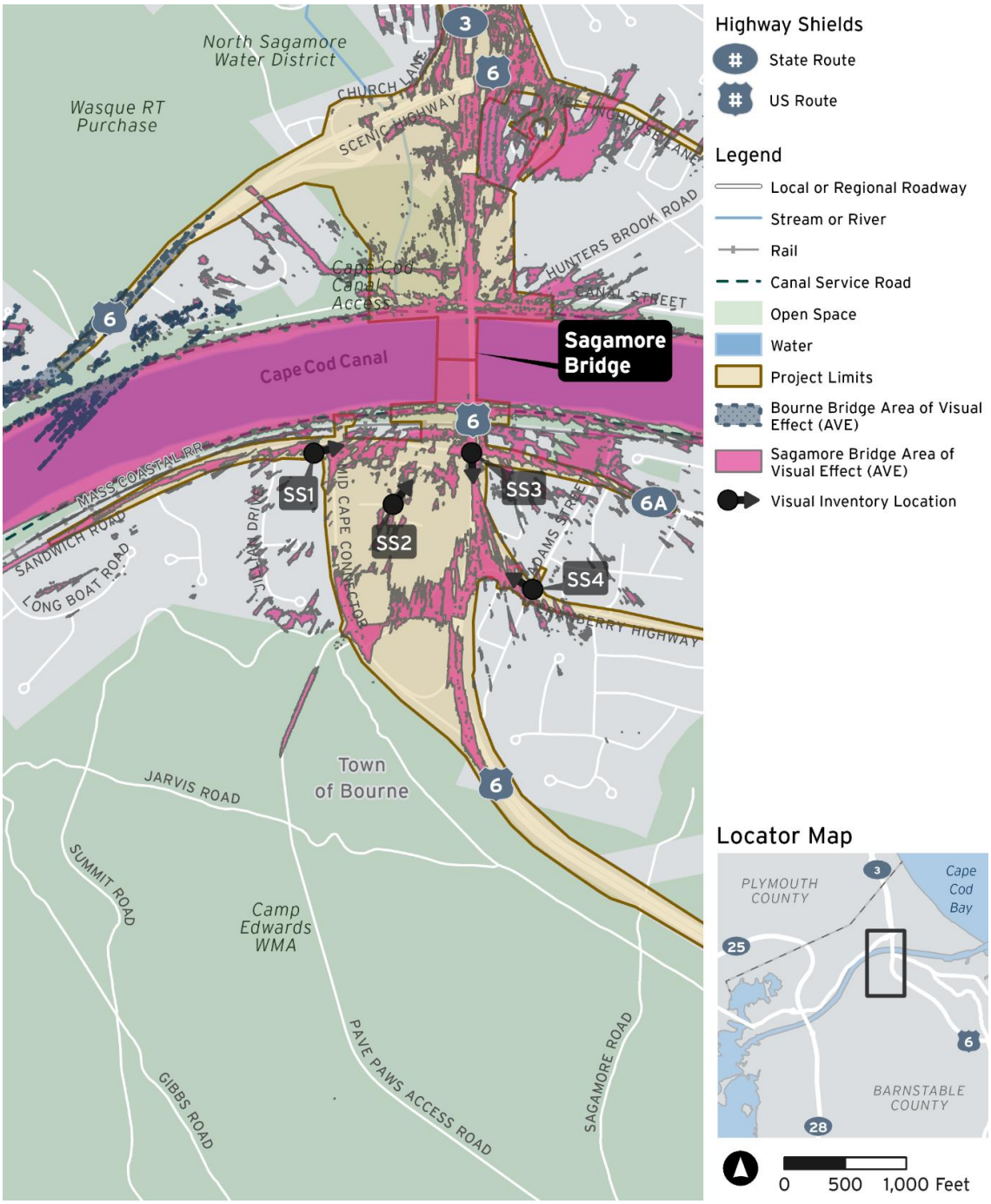
Visual Inventory Location Quadrant	Viewshed	Description	Viewer Types	Viewer Sensitivity
SN1 (Figure 5-6)	View from Scenic Highway at Church Lane, facing east	Viewshed includes a string of overhead signals across 4-lane divided Scenic Highway (with a State Route 3 turning lane) and the State Route 3 South on-ramp from Scenic Highway, directional signage, and forested areas bordering both sides of Scenic Highway.	Residential Neighbors, Travelers	Moderate
SN2 (Figure 5-6)	View from Bourne Park and Ride Lot, facing south	Viewshed includes parked vehicles, dense vegetation, sidewalk to Canal Street, commercial building (Starbucks) and signs, and Sagamore Bridge arch to the west.	Travelers	Low
SN3 (Figure 5-6)	View from Meetinghouse Lane at State Road, facing northwest	Viewshed includes high abutment wall and State Route 3 to the west, overhead and side traffic signals, utility poles and overhead wiring, directional signage, divided 4-lane Scenic Highway directly west.	Residential and Commercial Neighbors, Travelers	Moderate
SN4 (Figure 5-6)	View from Church Lane at Cape Pine Road, facing south	Viewshed includes the Sagamore Bridge arch in the distance.	Residential Neighbors	Low

Source: Massachusetts Department of Transportation, 2024

5.5.3 Sagamore South Quadrant Interchange Approach Network

Figure 5-7 and **Table 5-3** identify four visual inventory locations in the Sagamore South quadrant highway interchange approach network.

Figure 5-7. Visual Inventory Locations (Sagamore South Quadrant Interchange Approach Network)



Source: Massachusetts Department of Transportation, 2024

Table 5-3. Description of Visual Inventory Locations (Sagamore South Quadrant Interchange Approach Network)

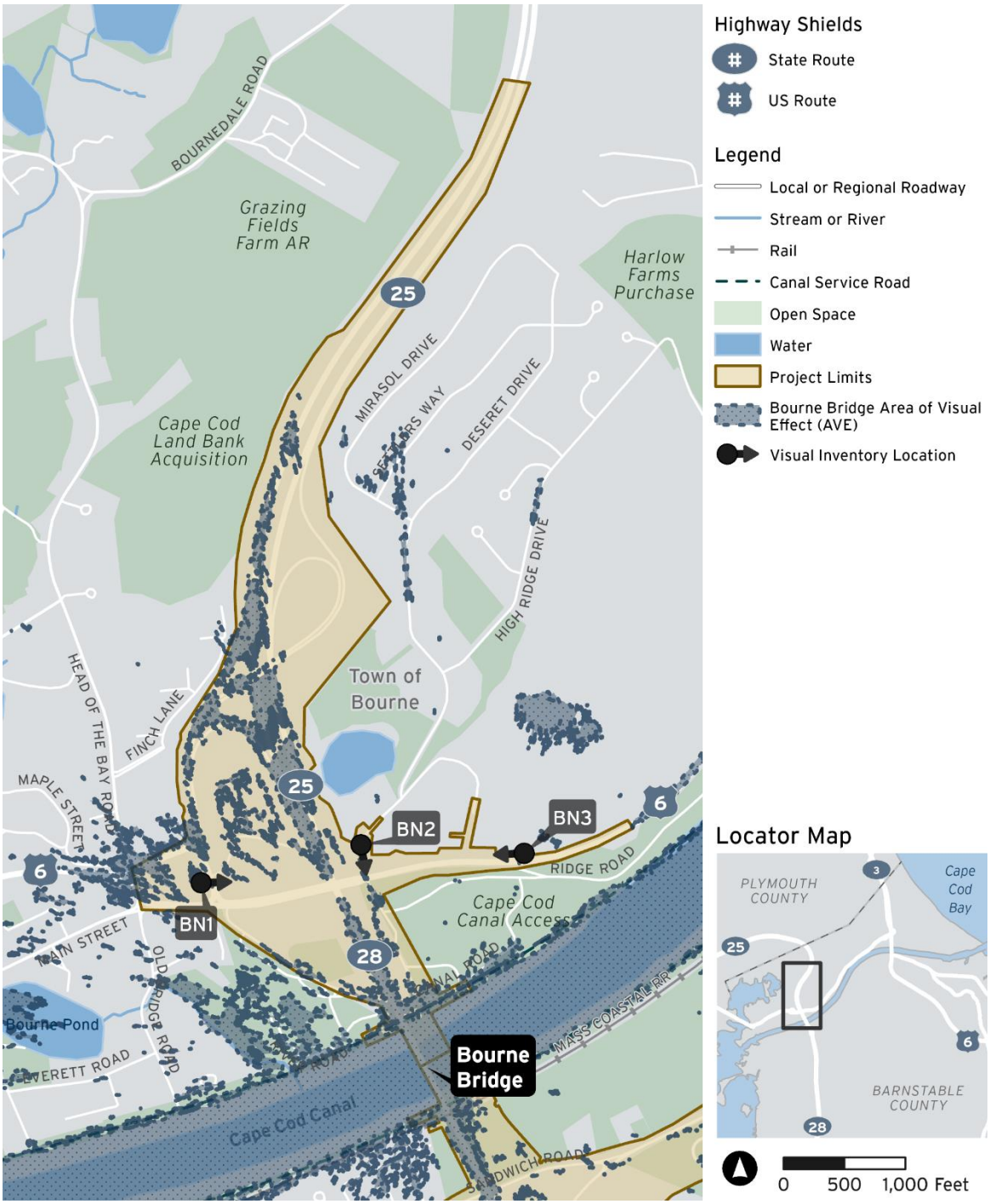
Visual Inventory Location	Viewshed	Description	Viewer Types	Viewer Sensitivity
SS1 (Figure 5-7)	View from Sandwich Road at Mid-Cape Connector, facing east	Viewshed includes median island, a crossarm with three overhead signals, two ground-level signals lights, utility pole and overhead wiring, directional signage, Sagamore Bridge arch and span, and residential and commercial uses on both sides of Sandwich Road.	Residential and Commercial Neighbors, Travelers	Moderate
SS2 (Figure 5-7)	View from Eleanor Avenue, facing northeast	Viewshed includes the intersection with John's Lane, single-family residential houses on the east side of Eleanor Avenue, trees lining the roadway, dense canopy cover at rear of houses, and Sagamore Bridge arch in the background.	Residential Neighbors	High
SS3 (Figure 5-7)	View from Sandwich Road at Sagamore Bridge South Abutment, facing south	Viewshed includes concrete abutment of Sagamore Bridge against steep embankment, overhead wires, and sidewalk in front of abutment. The vertical under-clearance of the bridge over Sandwich Road is 21 feet.	Travelers	Low
SS4 (Figure 5-7)	View from Cranberry Highway at Adams Street, facing west	Viewshed includes two-lane striped roadway separated from frontage road by narrow, grassed median strip with utility poles and overhead electrical wiring; scattered individual residential and commercial buildings; distant view of facades of shopping development; and minimal landscaping.	Residential and Commercial Neighbors, Travelers	Moderate

Source: Massachusetts Department of Transportation, 2024

5.5.4 Bourne North Quadrant Interchange Approach Network

Figure 5-8 and **Table 5-4** identify three visual inventory locations in the Bourne North quadrant highway interchange approach network.

Figure 5-8. Visual Inventory Locations (Bourne North Quadrant Interchange Approach Network)



Source: Massachusetts Department of Transportation, 2024

Table 5-4. Description of Visual Inventory Locations (Bourne North Quadrant Interchange Approach Network)

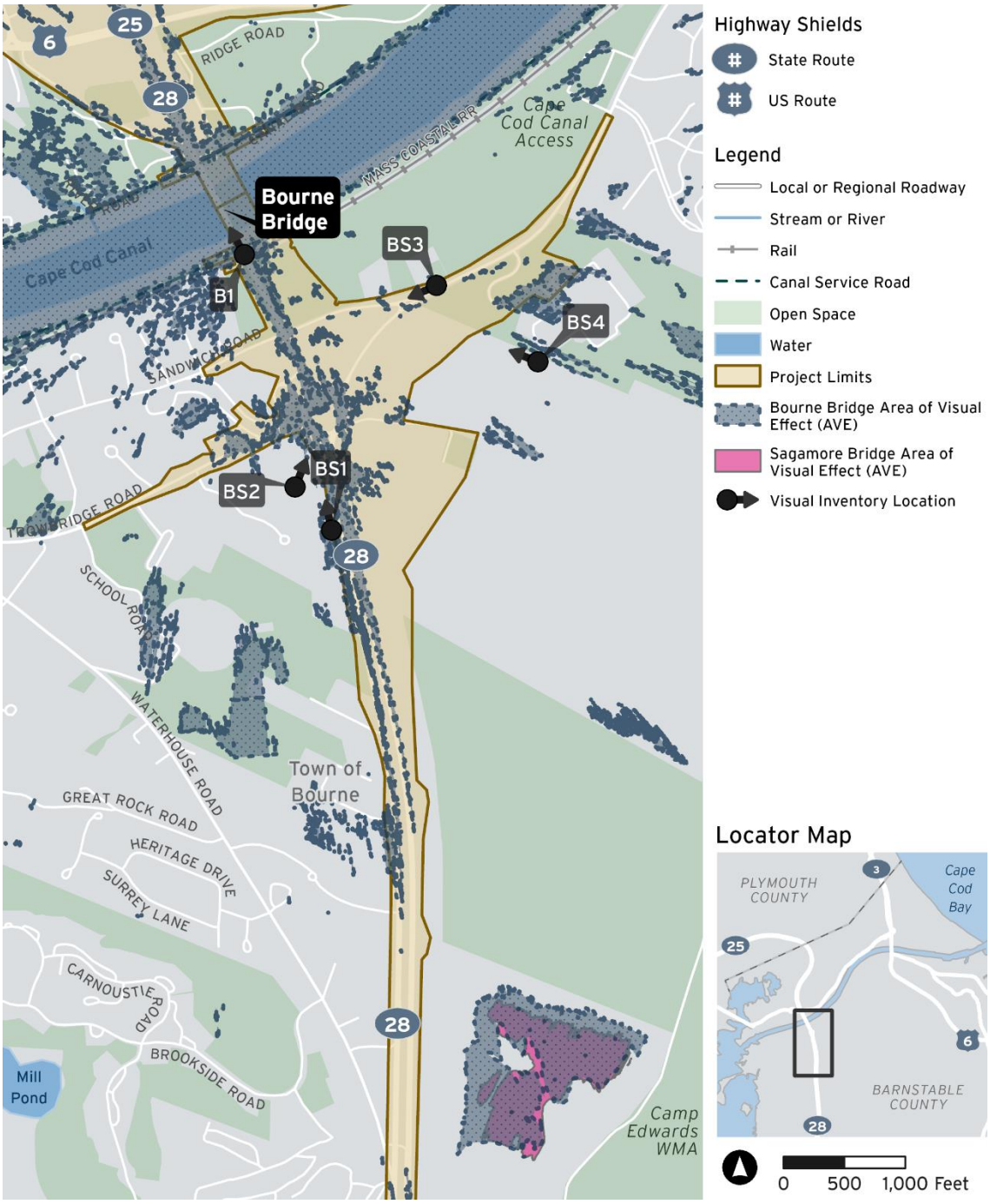
Visual Inventory Location	Viewshed	Description	Viewer Types	Viewer Sensitivity
BN1 (Figure 5-8)	View from Belmont Circle, facing east	Viewshed includes circular rotary, sidewalk in front of shopping development plaza with parking and storefronts; overhead traffic lights and directional signage.	Commercial Neighbors, Travelers	Low
BN2 (Figure 5-8)	View from Nightingale Road at Scenic Highway, facing south	Viewshed includes roadway with left and right turning lanes, overhead traffic signals, directional signage, and entrance to Bourne Scenic Park, with Bourne Bridge arch in background.	Residential Neighbors	Moderate
BN3 (Figure 5-8)	View from Scenic Highway, facing west	View from Scenic Highway, facing west. Viewshed includes striped divided highway with two lanes in each direction approaching signalized Nightingale Road intersection with Route 25 overpass highway in background; densely forested landscape paralleling Scenic Highway.	Travelers	Low

Source: Massachusetts Department of Transportation, 2024

5.5.5 Bourne South Quadrant Interchange Approach Network

Figure 5-9 and **Table 5-5** identify four visual inventory locations in the Bourne South quadrant highway interchange approach network.

Figure 5-9. Visual Inventory Locations (Bourne South Quadrant Interchange Approach Network)



Source: Massachusetts Department of Transportation, 2024

Table 5-5. Description of Visual Inventory Locations (Bourne South Quadrant Interchange Approach Network)

Visual Inventory Location Quadrant	Viewshed	Description	Viewer Types	Viewer Sensitivity
BS1 (Figure 5-9)	View from Nickerson-Bourne Funeral Home, facing north	Viewshed includes entrance driveway from State Route 28 to fenced and signed commercial property; utility poles and overhead wiring; divided State Route 28, separated by guardrail and median strip; and dense vegetation bordering State Route 28 northbound; and the Bourne Bridge arch in the distance on the west.	Commercial Neighbors	High
BS2 (Figure 5-9)	View from Cumberland Farms, facing northeast	Viewshed includes commercial signage, off-ramp to State Route 28 south, directional signage, circular drive around rotary with irregular landscaping and vegetation in the center, utility poles with overhead wiring.	Commercial Neighbors, Travelers	Moderate
BS3 (Figure 5-9)	View from Sandwich Road, facing west	Viewshed includes Sandwich Road at a fork: proceeding southwest on 2-lane upper Sandwich Road to State Route 28 or northwest on 2-lane lane lower Sandwich Road to Bourne Recreation Area/Bourne Village, one directional sign, and densely forested/brush bordering both sides of Sandwich Road.	Travelers	Low
BS4 (Figure 5-9)	View from Upper Cape Cod Regional Technical School Scenic Overlook, facing northwest	Viewshed of landscaped and paved scenic overlook with aesthetic visual elements includes Bourne Bridge in the distance as the single focal point.	Institutional Neighbors, Recreational Neighbors	High

Source: Massachusetts Department of Transportation, 2024

6 Impacts Analysis

6.1 Purpose

This section consists of the Analysis Phase of the VIA: it assesses the potential changes to the visual quality of the Sagamore Bridge and Bourne Bridge AVEs due to the No Build Alternative and the Build Alternative.

6.2 Visual Impacts of the No Build Alternative

The No Build Alternative would not alter the visual quality of Sagamore and Bourne Bridges or affect the visual landscape of the interchange highway networks because they would retain their current configurations. It is not anticipated that the USACE's program of continued inspections and maintenance and repair of both existing bridges as needed ("Fix as Fails") in the No Build Alternative would substantially alter the viewsheds of the motorist crossing the bridges or the views of the bridges from the Canal Service Roads.

The No Build Alternative would include proposed transportation improvement projects in and near the Project Limits within the interchange improvements network (**Table 3-2**), consisting primarily of traffic safety improvements at Belmont Circle, Bourne Rotary, Scenic Highway, and State Route 28. It is not anticipated that these improvements, such as restriping, additional lanes, signage, flashing beacons, raised medians, and deck replacement, would alter the existing visual landscape.

The No Build Alternative would include changes to the viewsheds of travelers on the regional and local roadways networks due to proposed development, such as the proposed Cumberland Farms retail development on MacArthur Boulevard, the proposed storage unit facility at Bourne Rotary, and the proposed mixed-use development on Canal Street.[21] However, travelers are expected to have low viewer sensitivity due to their generally narrow viewshed and the short amount of time that drivers would be exposed to the new views. As a result, it is anticipated that the degree of impact from new development abutting the highway networks would likely be neutral.

6.3 Visual Impacts of the Build Alternative

Using the visual inventory locations to identify potential visual changes due to the Build Alternative, this section presents a description of visual changes, a comparison of existing and simulated viewsheds, and an assessment of impacts to viewsheds based on the FHWA Guidelines. This visual assessment was conducted based on MassDOT's preliminary recommendations for intersection control, as presented in **Chapter 3, Section 3.4.3, Intersection Control Preliminary Recommendations** of the Draft Environmental Impact Statement.

[21] Town of Bourne Planning Department, August 14, 2024; updated November 26, 2024.

6.3.1 Sagamore and Bourne Bridges

6.3.1.1 Summary of Visual Changes

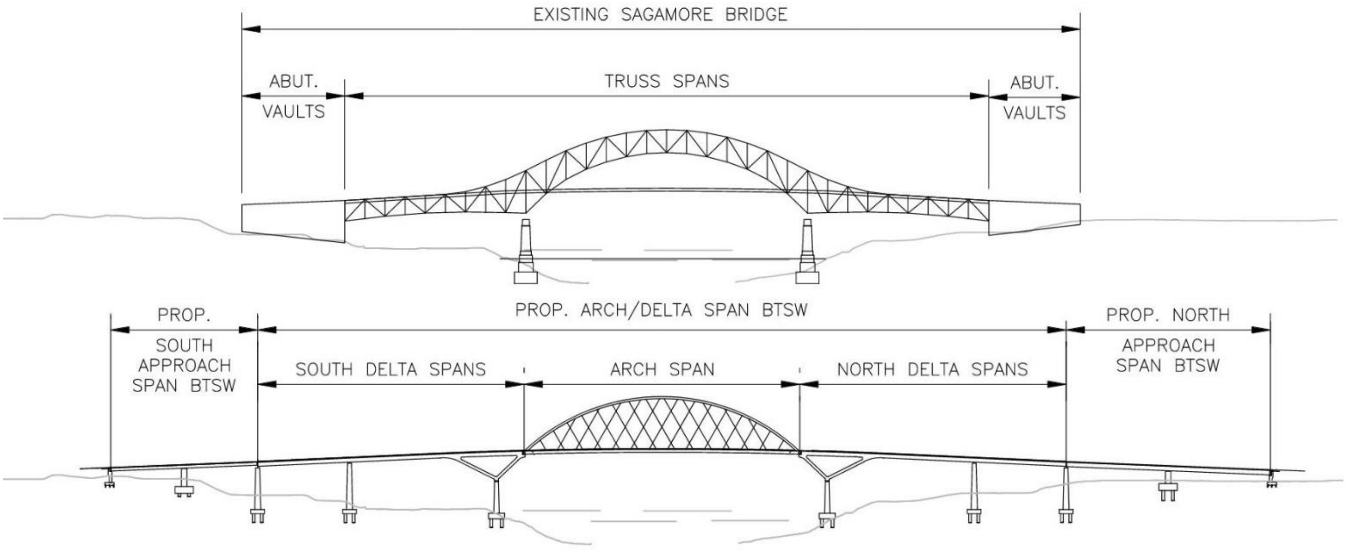
Like the existing bridges, the replacement Sagamore and Bourne Bridges would be nearly identical. The replacement bridges would be steel twin tied-arch bridges with delta frames supporting an approximate 700-foot mainline span of concrete. The 616-foot steel network tied arch of the replacement bridge would be approximately 115 feet above the deck, resulting in an overall bridge rise (top of arch) of 253 feet above mean high water, which would be approximately 10 feet lower than existing conditions. At each crossing, the two main spans would have an overall width of approximately 167 feet, which would be more than triple the width of the existing bridge's single main span width.

The proposed 720-foot distance between the centerlines of the canal side piers would be substantially wider than the existing 616-foot main span. As a result, the two new concrete bridge piers would be located outside the waterway and into the riprap portion of the canal cut, closer to the edges of the canal than in existing conditions. Due to the depth requirements of the proposed bridge delta frame, the top of the new bridge piers would be approximately 10 feet lower than the existing piers.

At Sagamore Bridge, the main span would be flanked to the north by two delta spans (measuring 320 feet and 200 feet), an expansion joint, and 445 feet of approach bridge structure. The main span would be flanked to the south by two delta spans (measuring 320 feet and 200 feet), an expansion joint, and 320 feet of approach bridge structure. At Bourne Bridge, the main span would be flanked to the north by two delta spans (measuring 320 feet and 200 feet), an expansion joint, and 1,620 feet of approach bridge structure. The main span would be flanked to the south by two delta spans (measuring 320 feet and 200 feet), an expansion joint, and 1,080 feet of approach bridge structure.

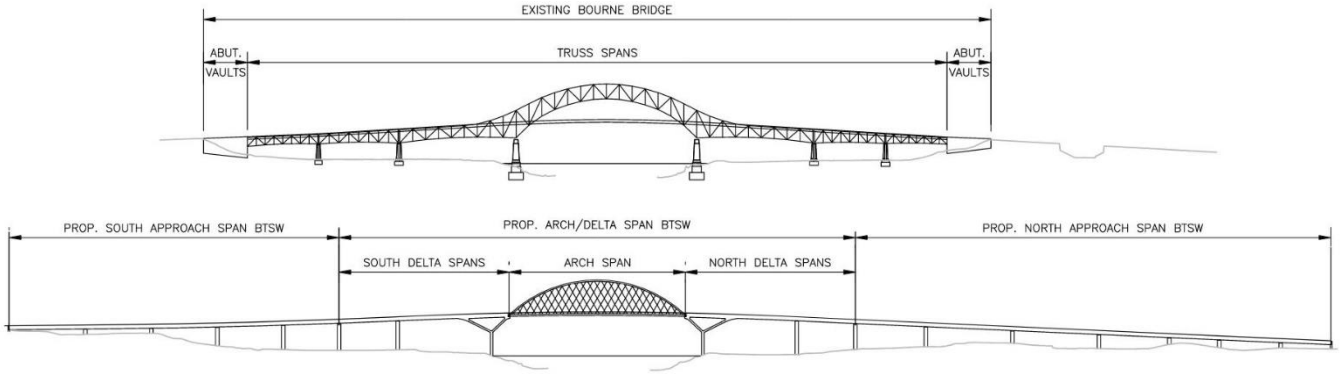
Figure 6-1 and **Figure 6-2** present comparison images of the proposed and existing Sagamore Bridge and Bourne Bridge. As demonstrated in these figures, the form of the proposed bridges closely adheres to the design of the existing bridges.

Figure 6-1. Comparison of Existing and Proposed Sagamore Bridge



Source: Massachusetts Department of Transportation, 2024

Figure 6-2. Comparison of Existing and Proposed Bourne Bridge



Source: Massachusetts Department of Transportation, 2024

6.3.1.2 Comparison of Existing and Simulated Viewsheds

The two existing and simulated viewsheds are applicable to both bridge crossings.

B1. View From Motorist on Highway Bridge

Exhibit 6-1a and **Exhibit 6-1b** present existing and simulated viewsheds of motorists on the bridges (**Figure 5-9**, B1). The overall shape of the delta-frame-supported arches would replicate the rounded arches of the existing steel truss bridges and would be compatible with the existing steel truss bridge in scale and form. It would successfully mimic the portal "gateway" entrance of the existing bridges. The proposed use of steel and concrete, with grey as the finish color, would provide a traditional look consistent with the appearance of the existing bridge. In the proposed view, the separation of opposing traffic and the additional width of the travel lanes would provide travelers with a sense of visual separation and orderliness that is not present in the existing conditions. Lighting would be provided on the roadway and selected bridge elements.

Exhibit 6-1a. Existing View from Motorist (Sagamore and Bourne Bridges)

Source: Massachusetts Department of Transportation, 2024

Exhibit 6-1b. Simulated View from Motorist (Sagamore and Bourne Bridges)

Source: Massachusetts Department of Transportation, 2024

B2. View of Sagamore and Bourne Bridges from Cape Cod Canal Service Road

Exhibit 6-2a and **Exhibit 6-2b** present existing and simulated views of the bridges from the Cape Cod Canal Service Road (**Figure 5-6**, B2). The views of the replacement bridges from the Canal Service Roads would be consistent with the existing views of the bridges. From the viewpoint of the recreational neighbor, the increased height of the bridge deck and the lower height of the top of the arch would not be obvious. The placement of the new piers into the riprap portion of the canal would open views of the waterway from the Canal Service Roads, enhancing the natural vista. The piers would be physically closer to the Canal Service Roads and due to the depth of the delta frame, would be approximately 10 feet lower in height than the existing piers; however, the visual differences would be negligible.

Exhibit 6-2a. Existing View of Sagamore or Bourne Bridges from Cape Cod Canal Service Road

Source: Massachusetts Department of Transportation, 2024

Exhibit 6-2b. Simulated View of Sagamore or Bourne Bridges from Cape Cod Canal Service Road

Source: Massachusetts Department of Transportation, 2024

6.3.1.3 Viewshed Impact Assessment: Replacement Bridges

Table 6-1 presents a summary of anticipated impacts to the viewsheds of the replacement bridges.

Table 6-1. Anticipated Impacts to Viewsheds (Replacement Bridges)

Visual Inventory Location	Exhibit No.	Viewshed	Impact Compatibility	Viewer Sensitivity	Degree of Impact
B1 (**Figure 5-9**)	**6-1a, 6-1b**	View from Motorist on Sagamore or Bourne Bridges.	Compatible	High	Neutral
B2 (**Figure 5-6**)	**6-2a, 6-2b**	View of Sagamore or Bourne Bridges from Cape Cod Canal Service Road	Compatible	High	Neutral

Source: Massachusetts Department of Transportation, 2024

6.3.2 Sagamore North Quadrant Interchange Approach Network

6.3.2.1 Summary of Visual Changes

The Sagamore North quadrant interchange approach network would provide a single exit point from a relocated U.S. Route 6/State Route 3. It would remove the Sagamore Bridge northbound off-ramp connection to Scenic Highway/Meetinghouse Lane eastbound and instead would connect to State Road, north of Scenic Highway /Meetinghouse Lane. The remaining ramp connections would remain similar to existing conditions. Signalized intersections along Scenic Highway and Meetinghouse Lane would be modified with two roundabouts to accommodate through-travel and turning movements. The intersection of State Road at State Route 3 northbound would be modified to accommodate the addition of the new State Route 3 northbound off-ramp with installation of a traffic signal. The network improvements would be approximately 1 to 2 feet higher than the existing elevations; however, this change in elevation would be a negligible difference that would be difficult for travelers to discern.

The Sagamore North quadrant interchange approach network would provide a SUP on the U.S. Route 6 eastbound main span; the SUP would connect to SUPs on the south side of Scenic Highway, Canal Street, and North Canal Service Road. Additionally, a SUP would be provided along the southern side of Scenic Highway and Meetinghouse Lane and along the eastern side of State Road to Homestead Avenue.

6.3.2.2 Comparison of Existing and Simulated Viewsheds

SN1. View From Scenic Highway at Church Lane

Exhibit 6-3a and **Exhibit 6-3b** present existing and simulated views from Scenic Highway, facing east, at its intersection with Church Lane (**Figure 5-6**, SN1). The proposed view would be generally consistent with the existing view. Scenic Highway travelers and residential neighbors from the Church Lane area would have views of the SUP on the south side of Scenic Highway and partial views of Sagamore Bridge. The elimination of overhead utilities would present a more harmonious and coherent view to travelers.

Exhibit 6-3a. Existing View from Scenic Highway at Church Lane, facing east

Source: Massachusetts Department of Transportation, 2024

Exhibit 6-3b. Simulated View from Scenic Highway at Church Lane, facing east

Source: Massachusetts Department of Transportation, 2025

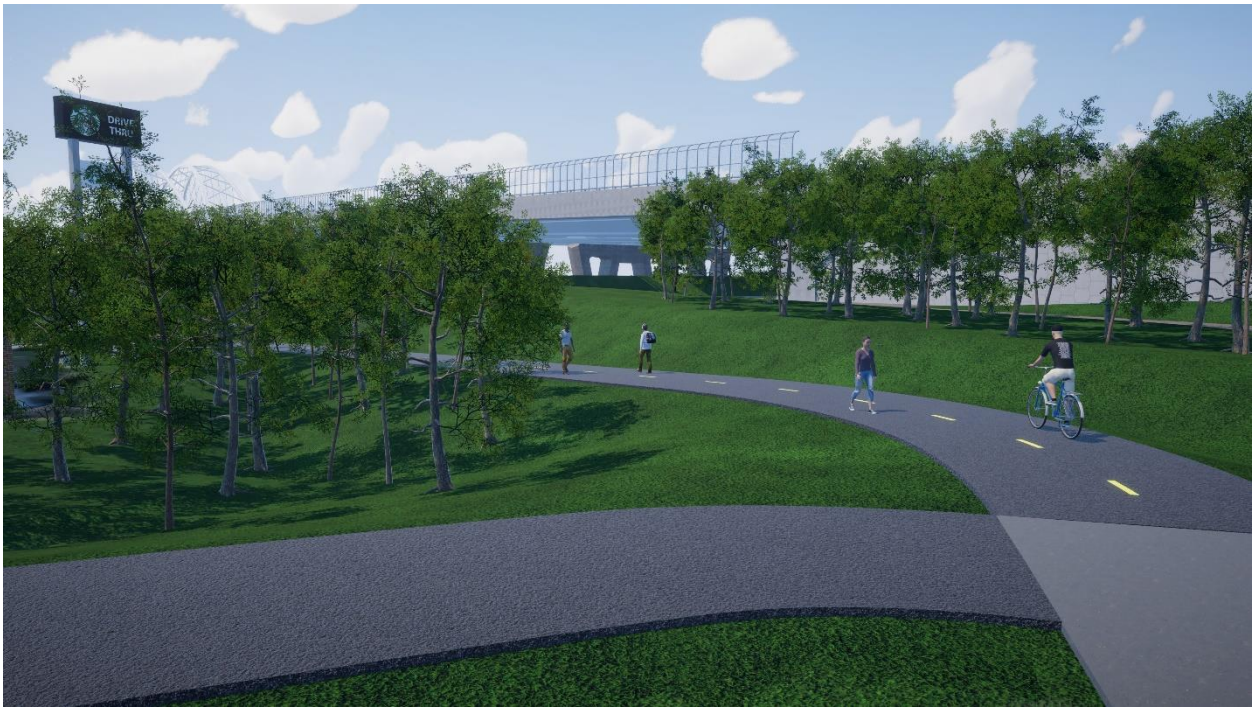
SN2. View from Bourne Park and Ride Lot

Exhibit 6-4a and **Exhibit 6-4b** present existing and simulated views from Bourne Park and Ride Lot facing south toward Sagamore Bridge (**Figure 5-6**, SN2). In the proposed view, Sagamore Bridge would be less prominent because the bridge location would shift to the west. However, State Route 3 would be more prominent to viewers than in existing conditions. In the proposed condition, the State Route 3 mainline would be approximately 15 feet higher than the existing roadway on average, ranging from approximately 7 feet, closer to Scenic Highway, to a maximum 20-foot difference at the abutment of the replacement bridge, which would align with the existing Starbucks parking lot. The hardness of the concrete mainline would be softened by extensive landscaping. The natural environmental features of the setting and views of the new SUP that would start at the Bourne Park and Ride Lot would be visually appealing, introducing a harmonious view that would provide both visual interest and visual relief.

Exhibit 6-4a. Existing View from Bourne Park and Ride Lot, facing south

Source: Massachusetts Department of Transportation, 2024

Exhibit 6-4b. Simulated View from Bourne Park and Ride Lot, facing south



Source: Massachusetts Department of Transportation, 2025

SN3. View From Meetinghouse Lane at State Road

Exhibit 6-5a and **Exhibit 6-5b** present existing and simulated views from Meetinghouse Lane at State Road facing northwest (**Figure 5-6**, View SN3). In the proposed view, the removal of the utility poles, overhead signals, and wiring would eliminate visual clutter and present a more harmonious and coherent view. The introduction of a roundabout would be more visually appealing than the existing signalized intersection; it would reduce the amount of paved area and the landscape treatment in the center island would provide a natural feature and visual relief. The channelized entry of the roundabout would provide travelers with a sense of orderliness that is not present in the existing condition.

Exhibit 6-5a. Existing View of State Road from Meetinghouse Lane, facing northwest

Source: Massachusetts Department of Transportation, 2024

Exhibit 6-5b. Simulated View of State Road at Meetinghouse Lane, facing north

Source: Massachusetts Department of Transportation, 2025

SN4. View from Church Lane at Cape Pine Road

Exhibit 6-6a and **Exhibit 6-6b** present existing and simulated views from Church Lane at Cape Pine Road, facing south (**Figure 5-6**, SN4). The proposed view would be consistent with existing conditions, where the residential neighbor would have only a distant view of Sagamore Bridge. The change in bridge alignment would not be readily apparent from this distant view.

Exhibit 6-6a. Existing View from Church Lane at Cape Pine Road, facing south

Source: Massachusetts Department of Transportation, 2024

Exhibit 6-6b. Simulated View from Church Lane at Cape Pine Road, facing south

Source: Massachusetts Department of Transportation, 2025

6.3.2.3 Viewshed Impact Assessment: Sagamore North Quadrant Interchange Approach Network

Table 6-2 presents a summary of anticipated impacts to viewsheds within the Sagamore North quadrant highway interchange approach network.

Table 6-2. Anticipated Impacts to Viewsheds (Sagamore North Quadrant Interchange Approach Network)

Visual Inventory Location	Exhibit No.	Viewshed	Impact Compatibility	Viewer Sensitivity	Degree of Impact
SN1 (**Figure 5-6**)	**6-3a, 6-3b**	View from Scenic Highway at Church Lane, facing east	Compatible	Moderate	Neutral
SN2 (**Figure 5-6**)	**6-4a, 6-4b**	View from Bourne Park and Ride Lot, facing south	Compatible	Low	Beneficial
SN3 (**Figure 5-6**)	**6-5a, 6-5b**	View from State Road at Meetinghouse Lane, facing northwest	Compatible	Moderate	Beneficial
SN4 (**Figure 5-6**)	**6-6a, 6-6b**	View from Church Lane at Cape Pine Road, facing south	Compatible	Low	Neutral

6.3.3 Sagamore South Quadrant Interchange Approach Network

6.3.3.1 Summary of Visual Changes

The Sagamore South quadrant interchange approach network would involve the most substantial visual changes of the Program. In the Sagamore South quadrant, two new roadways—Cranberry Highway Extension and Sandwich Road Connector—would be constructed. The majority of the right-of-way impacts, including demolition of commercial and residential units and conversion to state highway layout, would occur in Sagamore South.

The Sagamore South quadrant would include a new Cranberry Highway Extension and would relocate the westbound on-ramp, so that it would share the same entrance point as the eastbound on-ramp off Mid-Cape Connector. It would remove Cranberry Highway to the Sagamore Bridge westbound ramp, and it would provide a new westbound on-ramp connection from Mid-Cape Connector to Sagamore Bridge westbound. Modifications to lane arrangements at the intersections of Mid-Cape Connector with Sandwich Road and Cranberry Highway Extension would accommodate the revised traffic patterns resulting from the extension of Cranberry Highway and relocation of access to U.S. Route 6 eastbound, including modifications to the existing traffic signals. There would be a new connection from Sandwich Road to Cranberry Highway Extension east of the new mainline bridge structure (Sandwich Road Connection), within the footprint of the existing Sagamore Bridge mainline. A single lane roundabout would be the intersection control at this location. Additionally, west of the new mainline bridge, a single lane roundabout would be provided at the eastern-bound entrance of the existing Market Basket parking lot. There would be modified access to Market Basket (Factory Outlet Road) and an access driveway to the former Christmas Tree Shops area. A new SUP would be provided on the U.S. Route 6 eastbound main span; it would connect to SUPs along Factory Outlet Road, Sandwich Road, and the South Canal Service Road. Bicycle and pedestrian improvements on Cranberry Highway would consist of buffered bicycle lanes with concrete sidewalks east of Sandwich Road Connection to Vermont Street. A new SUP connection would be added through Cranberry Highway Extension to Mid-Cape Connector.

6.3.3.2 Comparison of Existing and Simulated Viewsheds

SS1. View From Sandwich Road at Mid-Cape Connector

Exhibit 6-7a and **Exhibit 6-7b** present existing and simulated views from Sandwich Road at its intersection with Mid-Cape Connector, facing east (**Figure 5-7**, SS1). In the proposed view, the signalized intersection would remain. The elimination of the overhead wiring and utility poles would provide a more coherent and harmonious view. Travelers and commercial and residential neighbors would have views of a new SUP on the south side of Sandwich Road, which would provide visual interest. Views of the existing residences and commercial uses along Sandwich Road would not change. The relocated Sagamore Bridge would be a more prominent feature in the viewshed; however, the differences in height between the existing and proposed arches would be difficult to discern.

Exhibit 6-7a. Existing View from Sandwich Road at Mid-Cape Connector, facing east

Source: Massachusetts Department of Transportation, 2024

Exhibit 6-7b. Simulated View from Sandwich Road at Mid-Cape Connector, facing east

Source: Massachusetts Department of Transportation, 2025

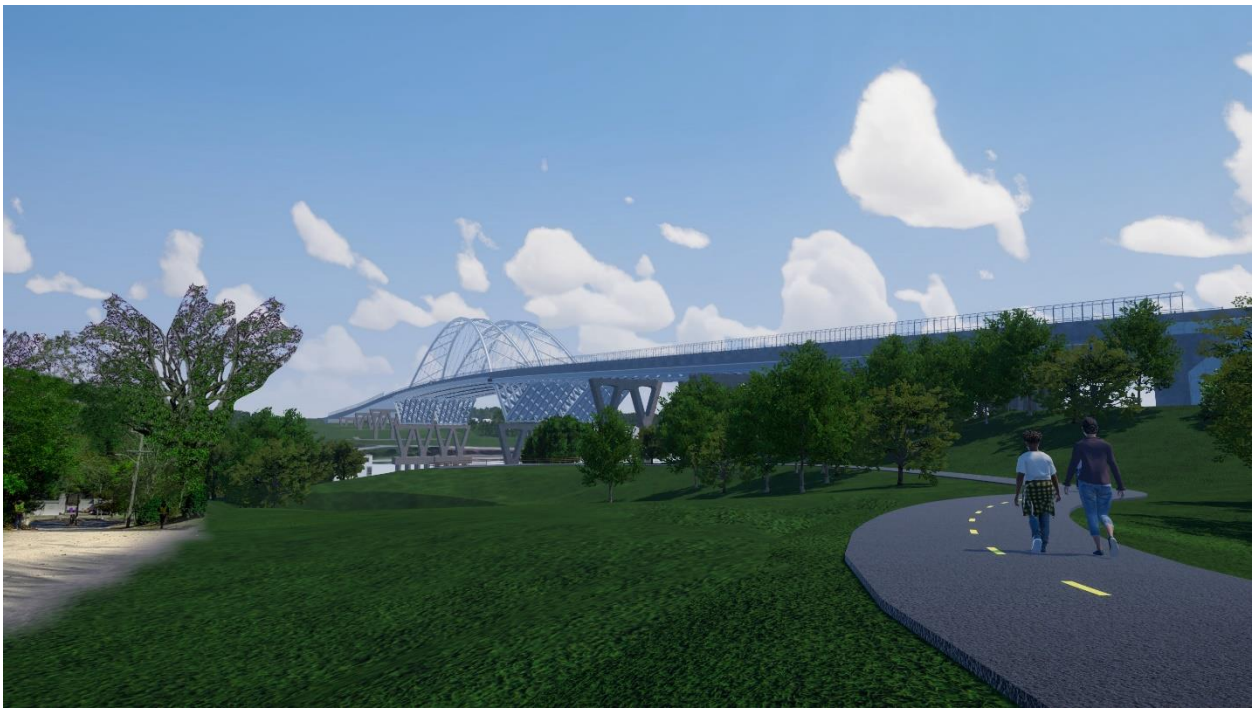
SS2. View From Eleanor Avenue

Exhibit 6-8a and **Exhibit 6-8b** present existing and simulated views from Eleanor Avenue, facing northeast (**Figure 5-7**, SS2). In the proposed view, MassDOT proposes to acquire and demolish the residences along the east side of Eleanor Avenue because this area would be needed to construct the new bridge and demolish the existing bridge. The replacement Sagamore Bridge and reconfigured U.S. Route 6 mainline would be closer to the neighborhood on the west side of Eleanor Avenue and would be more prominent features in viewsheds. At the southern end of Eleanor Avenue, the mainline would be approximately 37 feet higher than in existing conditions, increasing to a 103-foot height difference at the northern end of Eleanor Avenue. The dense tree canopy along the embankment of the existing U.S. Route 6 would be removed and replaced with a buffer area. While the buffer area would separate the Round Hill neighborhood on the west side of Eleanor Avenue from the elevated U.S. Route 6 mainline, the loss of residential units and the existing dense tree canopy, and the resulting view of the more prominent transportation elements, would substantially alter the neighborhood's existing visual character and would adversely affect the sensitivity of the residential viewers. **Section 7** describes the proposed mitigation measures, such as extensive landscaping and the addition of park features, to address this adverse effect.

Exhibit 6-8a. Existing View from Eleanor Avenue, facing northeast

Source: Massachusetts Department of Transportation, 2024

Exhibit 6-8b. Simulated View from Eleanor Avenue, facing northeast



Source: Massachusetts Department of Transportation, 2025

SS3. View from Sandwich Road at Sagamore Bridge Abutment

Exhibit 6-9a presents an existing view from Sandwich Road at the Sagamore Bridge south abutment, facing south; **Exhibit 6-9b** presents a simulated view from Sandwich Road at the new Sandwich Connector, facing south (**Figure 5-7**, SS3). In the proposed view, the existing Sagamore Bridge would be eliminated; the existing bridge and U.S. Route 6 mainline footprint would be replaced with a new road connecting Sandwich Road with the new Cranberry Highway Extension via a new roundabout. The new Sandwich Road Connector would parallel the relocated U.S. Route 6 mainline. Located approximately 100 feet west of the connector, the view of the elevated concrete roadway would be a prominent feature within the traveler's viewshed. Sidewalks would be provided on both sides of Sandwich Road Connector.

The Sandwich Road Connector would provide a new view to travelers in this area of the town of Bourne. With its distinct and straight lines, the new connector would introduce a sense of orderliness and a vista of the roundabout in the distance. The viewshed would include the windmill of the former Christmas Tree Shops development, giving viewers a sense of familiarity and placemaking within the new vista. Due to the rolling terrain at this location, construction of Sandwich Road Connector would require substantial excavation of up to 58 feet; the areas bordering the road would be landscaped. The landscaping and sidewalks would provide visual interest to travelers. As design advances, MassDOT is refining the grading of the roadway side slopes. **Section 7** further describes proposed mitigation.

The connector road would introduce a new appealing view to an area from Sandwich Road with an existing void. While the new view would substantially differ from the current view of the bridge abutment, it would be generally consistent with the character of the transportation network in this section of Sandwich Road. Further, travelers typically would have low sensitivity to this travel corridor because the purpose of the Sandwich Road Connector would be to bypass local traffic with destinations to Market Basket and Mid-Cape Connector. MassDOT determined that due to the viewers' low sensitivity and the general compatibility between existing and proposed transportation elements, the degree of impact would be neutral.

Exhibit 6-9a. Existing View from Sandwich Road at Sagamore Bridge South Abutment, facing south

Source: Massachusetts Department of Transportation, 2024

Exhibit 6-9b. Simulated View of Sandwich Road Connector at Sandwich Road, facing south

Source: Massachusetts Department of Transportation, 2025

SS4. View from Cranberry Highway at Adams Street

Exhibit 6-10a presents an existing view of Cranberry Highway at its intersection with Adams Street, facing west, and **Exhibit 6-10b** presents a simulated view of the new Cranberry Highway Connector from Cranberry Highway at its intersection with Adams Street, facing west (**Figure 5-6**, SS4). In the proposed view, the removal of the utility poles and overhead wiring would eliminate visual clutter and present a more harmonious and coherent view. The roundabout would be more visually appealing than the existing diverging roadways that lack visual directional cues; it would reduce the paved area and incorporate a landscaped treatment in the center island, providing visual relief. The channelized entry of the roundabout would provide travelers with a sense of orderliness that is not present in the existing condition and would be a visual entry for travelers to the Market Basket commercial area. Travelers and residential and commercial neighbors would have prominent views of the elevated U.S. Route 6 mainline beyond the roundabout. While the elevated structure would be a new viewshed element, it would be consistent with the character of the transportation corridor.

Exhibit 6-10a.Existing View from Cranberry Highway at Adams Street, facing west

Source: Massachusetts Department of Transportation, 2024

Exhibit 6-10b.Simulated View from Cranberry Highway at Adams Street, facing west

Source: Massachusetts Department of Transportation, 2025

6.3.3.3 Viewshed Impact Assessment: Sagamore South Quadrant Interchange Approach Network

Table 6-3 presents a summary of anticipated impacts to viewsheds within the Sagamore South quadrant highway interchange approach network.

Table 6-3. Anticipated Impacts to Viewsheds (Sagamore South Quadrant Interchange Approach Network)

Visual Inventory Location*	Exhibit No.	Viewshed	Impact Compatibility	Viewer Sensitivity	Degree of Impact
SS1 (**Figure 5-7**)	**6-7a, 6-7b**	View from Sandwich Road at Mid-Cape Connector, facing east	Compatible	Moderate	Neutral
SS2 (**Figure 5-7**)	**6-8a, 6-8b**	View from Eleanor Avenue, facing northeast	Incompatible	High	Adverse
SS3 (**Figure 5-7**)	**6-9a, 6-9b**	View from Sandwich Road, facing south	Compatible	Low	Neutral
SS4 (**Figure 5-7**)	**6-10a, 6-10b**	View from Cranberry Highway at Adams Street, facing west	Compatible	Moderate	Beneficial

6.3.4 Bourne North Quadrant Interchange Approach Network

6.3.4.1 Summary of Visual Changes

The Bourne North quadrant interchange approach network would provide a combination of direct connection ramps between State Route 25 and U.S. Route 6. The ramp connecting State Route 25 eastbound to Scenic Highway would be a direct connect ramp, allowing access to Scenic Highway eastbound only. The new flyover ramp, with an 18-foot clearance, would connect Scenic Highway to State Route 25 and would allow vehicles to bypass Belmont Circle without an additional traffic signal. This ramp would utilize one of the travel lanes on Scenic Highway and would be a free-flowing movement to reduce congestion. The existing State Route 28 over the State Route 25 bridge would be relocated to widen the bridge to allow for this new southbound to eastbound ramp movement. The existing southbound off-ramp would be revised to be an option lane, improving the geometry and decision sight distance for drivers. The intersection control at U.S. Route 6/Nightingale Road/Andy Oliva Drive would be either a single-lane roundabout or a signalized intersection.

The Bourne North quadrant interchange approach network would provide a SUP and a grade-separated crossing for pedestrians and bicyclists via the new flyover ramp over Scenic Highway. The U.S. Route 6 lane configuration would be reduced from four lanes to three lanes, which would provide additional space for multimodal accommodations. It would provide one continuous 12-foot-wide SUP along the south side of U.S. Route 6 connecting to Belmont Circle and a 6-foot-wide sidewalk along the north side of U.S. Route 6.

6.3.4.2 Comparison of Existing and Simulated Viewsheds

BN1. View From Belmont Circle

Exhibit 6-11a and **Exhibit 6-11b** present existing and simulated views from Belmont Circle, facing east (**Figure 5-8**, BN1). In the proposed view, the viewshed of the new 18-foot-high flyover ramp connecting Scenic Highway to State Route 25 would add a higher structural element than in existing conditions; however, the new flyover ramp would be consistent with the visual character of the existing transportation environment. Further, commercial neighbors and travelers would not be sensitive to these visual changes; as in the current view, the altered transportation elements in the background would not occupy a prominent position in their viewshed. The visibility of and access to existing commercial uses in Belmont Circle would not be affected.

Exhibit 6-11a.Existing View from Belmont Circle, facing east

Source: Massachusetts Department of Transportation, 2024

Exhibit 6-11b.Simulated View from Belmont Circle, facing east

Source: Massachusetts Department of Transportation, 2025

BN2. View From Nightingale Road at Scenic Highway

Exhibit 6-12a and **Exhibit 6-12b** present existing and simulated views from Nightingale Road at its intersection with Scenic Highway, facing south (**Figure 5-8**, BN2). In the proposed view, the relocated Bourne Bridge would be diminished by the approximate 80-foot relocated State Route 25 mainline and the approximate 30-foot-high new elevated flyover ramp connecting State Route 25 eastbound to Scenic Highway eastbound, which would be the dominant visual structural elements in the viewshed. The removal of the utility poles, overhead signals, and wiring would eliminate visual clutter and present a more harmonious and coherent view. The roundabout would be more visually appealing than the existing signalized intersection; it would reduce the amount of paved area and the landscape treatment in the center island would provide a natural feature and visual interest. The SUP would provide a new element of visual interest to the viewshed. The viewshed of neighbors exiting the Nightingale Pond neighborhood onto Scenic Highway would substantially change from existing conditions, however, conveying an urban form with hard lines of the highways in contrast to their current view of the natural, park setting of the Bourne Scenic Park entrance. **Section 7** describes the proposed mitigation measures, such as landscaping and abutment wall treatments, to address this adverse effect.

Exhibit 6-12a.Existing View from Nightingale Road at Scenic Highway, facing south

Source: Massachusetts Department of Transportation, 2024

Exhibit 6-12b.Simulated View from Nightingale Road at Scenic Highway, facing south

Source: Massachusetts Department of Transportation, 2025

BN3. View from Scenic Highway

Exhibit 6-13a and **Exhibit 6-13b** present existing and simulated views from Scenic Highway, facing west (**Figure 5-8**, BN3). Travelers would have views of the elevated State Route 25 mainline, the elevated flyover ramp connecting State Route 25 eastbound to Scenic Highway eastbound, and the new State Route 28 northbound on-ramp. In the proposed view, the existing dense canopy of trees on both sides of Scenic Highway would be replaced with an extensive roadway network, creating a more developed, urban character to this portion of Scenic Highway. The reconfigured State Route 25, approximately 28 feet higher than existing conditions, and the new ramps would be dominant structures within the viewshed. The single-lane roundabout would be a traffic calming measure; it would provide travelers with a sense of orderliness and serve as a visual entry to the Belmont Circle commercial area. The landscaped treatment in the center of the roundabout and the sidewalks on the south side of Scenic Highway would add visual interest.

While the more physically dominating presence of the transportation network would constitute a substantial change from existing conditions, travelers along this portion of Scenic Highway typically would have low sensitivity to this travel corridor. Further, the inclusion of the roundabout, sidewalks, and landscaping would provide visually appealing features to the viewshed. As a result, MassDOT determined that the degree of impact would be neutral.

Exhibit 6-13a.Existing View from Scenic Highway, facing west

Source: Massachusetts Department of Transportation, 2024

Exhibit 6-13b.Simulated View from Scenic Highway, facing west

Source: Massachusetts Department of Transportation, 2025

6.3.4.3 Viewshed Impact Assessment: Bourne North Quadrant Interchange Approach Network

Table 6-4 presents a summary of anticipated impacts to viewsheds within the Bourne North interchange network.

Table 6-4. Anticipated Impacts to Viewsheds (Bourne North Quadrant Interchange Approach Network)

Visual Inventory Location*	Exhibit No.	Viewshed	Impact Compatibility	Viewer Sensitivity	Degree of Impact
BN1 (**Figure 5-8**)	**6-11a, 6-11b**	View from Belmont Circle, facing east.	Compatible	Low	Neutral
BN2 (**Figure 5-8**)	**6-12a, 6-12b**	View from Nightingale Road at its intersection with Scenic Highway, facing south.	Incompatible	Moderate	Adverse
BN3 (**Figure 5-8**)	**6-13a, 6-13b**	View from Scenic Highway, facing west.	Incompatible	Low	Neutral

6.3.5 Bourne South Quadrant Interchange Approach Network

6.3.5.1 Summary of Visual Changes

The Bourne South quadrant highway interchange network would eliminate Bourne Rotary and replace it with a grade-separated diamond interchange, allowing through movements on State Route 28 to bypass the intersections with the non-mainline roadways. Preliminary design recommendations include a single-lane dogbone-shaped roundabout. Changes to the Trowbridge Road and Sandwich Road underpass would consist of a multi-lane roundabout at a relocated Upper Cape Cod Regional Technical High School Driveway entrance. SUP connections would be provided to Trowbridge Road, the South Canal Service Road, and the Bourne Recreation Area.

A new service frontage road of approximately 0.5 mile would be constructed from Trowbridge Road parallel to State Route 28 southbound; it would provide abutting businesses with direct access from the frontage road.

6.3.5.2 Comparison of Existing and Simulated Viewsheds

BS1. View from Nickerson-Bourne Funeral Home Parcel

Exhibit 6-14a and **Exhibit 6-14b** present existing and simulated views from Nickerson-Bourne Funeral Home on State Route 28, facing north (**Figure 5-9**, BS1). The new frontage road, implemented for safety and access management, would provide visibility of and access to commercial neighbors, similar to existing conditions where commercial businesses and their patrons have access and visibility to and from State Route 28. The new SUP along the frontage road would provide visual interest. The forested area along existing State Route 28 would be removed; the highway would be relocated approximately 35 feet to the east, elevated by approximately 5 feet, and separated from the frontage road by a landscaped area. Views of Bourne Bridge would be more prominent with the change in realignment, but the difference in the arch height would not be discernible from this distance. Views of the project impacts along this heavily trafficked corridor would be consistent with the visual character of the existing transportation elements. The frontage road would meet the needs of commercial neighbors who would be sensitive to their visibility and accessibility.

Exhibit 6-14a. Existing View from Nickerson-Bourne Funeral Home, facing north

Source: Massachusetts Department of Transportation, 2024

Exhibit 6-14b. Simulated View from Nickerson-Bourne Funeral Home, facing north

Source: Massachusetts Department of Transportation, 2025

BS2. View from Cumberland Farms Parcel

Exhibit 6-15a and **Exhibit 6-15b** present existing and simulated views from the Cumberland Farms Parcel at the Bourne Rotary, facing northeast (**Figure 5-9**, BS2). In the proposed view, removal of the utility poles and overhead wiring would eliminate visual clutter and present a more harmonious and coherent view. Replacement of the two-lane Bourne Rotary with a single-lane, double (dog-bone) roundabout, would serve as a traffic calming measure and the channelized entry would allow for visual traffic separation, providing travelers with a sense of orderliness that is not present with the existing rotary that allows for higher speeds. The dog-bone roundabout would improve visibility and access to commercial neighbors. The two center islands of the dog-bone roundabout would provide opportunities for landscaping to add natural elements and visual interest.

As the "entry" into Cape Cod from Bourne Bridge, there would be an opportunity for the roundabout to incorporate elements to welcome visitors to Cape Cod, such as the way the existing Cape Cod hedge welcomes visitors to Cape Cod. **Section 7** provides more information about design mitigation measures.

Exhibit 6-15a.Existing View from Cumberland Farms Parcel, facing northeast

Source: Massachusetts Department of Transportation, 2024

Exhibit 6-15b.Simulated View from Cumberland Farms Parcel, facing northeast

Source: Massachusetts Department of Transportation, 2025

BS3. View from Sandwich Road

Exhibit 6-16a and **Exhibit 6-16b** present existing and simulated views from Sandwich Road, facing west (**Figure 5-9**, BS3). In the proposed view, the existing fork separating upper and lower Sandwich Road would be removed, and the existing dense forested canopy bordering Sandwich Road would be removed and replaced with landscaped sloped areas and relocated State Route 28 as prominent features. Upper Sandwich Road would be barely visible from lower Sandwich Road. While the more prominent elevated roadway and the loss of the existing tree canopy would alter the existing rural character along this portion of Sandwich Road, travelers generally would be less sensitive to viewshed changes. Further, the newly landscaped area, and the SUP on the north side of lower Sandwich Road would create a harmonious, visually appealing viewshed. Additionally, the substantially improved sight lines for travelers on Sandwich Road would enhance traveler safety and promote a sense of orderliness.

Exhibit 6-16a.Existing View from Sandwich Road, facing west

Source: Massachusetts Department of Transportation, 2024

Exhibit 6-16b.Simulated View from Sandwich Road, facing west

Source: Massachusetts Department of Transportation, 2025

BS4. View from Upper Cape Regional Technical High School Scenic Overlook

Exhibit 6-17a and **Exhibit 6-17b** present existing and simulated views from the scenic overlook at Upper Cape Regional Technical High School, facing northwest (**Figure 5-9**, BS4). Institutional and recreational neighbors would be sensitive to project impacts affecting their views of Bourne Bridge from the scenic overlook. The view of the replacement bridge from the scenic overlook would be consistent with the existing view of Bourne Bridge. Due to the distance from this focal point, the lower height of the top of the arch would not be discernible to the viewer.

Exhibit 6-17a. Existing View from Upper Cape Regional Technical High School Scenic Overlook, facing northwest

Source: Massachusetts Department of Transportation, 2024

Exhibit 6-17b. Simulated View from Upper Cape Regional Technical High School Scenic Overlook, facing northwest

Source: Massachusetts Department of Transportation, 2025

6.3.5.3 Viewshed Impact Assessment: Bourne South Quadrant Interchange Approach Network

Table 6-5 presents a summary of anticipated impacts to viewsheds within the Bourne South quadrant interchange approach network.

Table 6-5. Anticipated Impacts to Viewsheds: Bourne South Quadrant Interchange Approach Network

Visual Inventory Location	Exhibit No.	Viewshed	Impact Compatibility	Viewer Sensitivity	Degree of Impact
BS1 (**Figure 5-9**)	**6-14a, 6-14b**	View from Nickerson-Bourne Funeral Home, facing north	Compatible	High	Neutral
BS2 (**Figure 5-9**)	**6-15a, 6-15b**	View from Cumberland Farms, facing northeast	Compatible	Moderate	Beneficial
BS3 (**Figure 5-9**)	**6-16a, 6-16b**	View from Sandwich Road, facing west	Incompatible	Low	Neutral
BS4 (**Figure 5-9**)	**6-17a, 6-17b**	View from Upper Cape Cod Regional Technical School Scenic Overlook, facing northwest	Compatible	High	Neutral

6.3.6 Summary of Visual Impacts

This section summarizes the findings of the visual impact assessments. As indicated in **Section 5.5**, MassDOT selected 17 visual inventory locations in the Sagamore Bridge and Bourne Bridge AVEs that consisted of key views of and from the bridges and the highway interchange networks, including views that could be affected by the Program, such as where project horizontal or vertical elements could affect the visual character of the viewshed, including changes to the scale and character of the neighborhood.

6.3.6.1 Beneficial Changes to the Visual Quality of the Areas of Visual Effect

MassDOT determined that the degree of visual impact would be beneficial for the following four visual inventory locations in the interchange approach networks:

- View from Bourne Park and Ride Lot (SN2)
- View from Meetinghouse Lane at State Road (SN3)
- View from Cranberry Highway at Adams Street (SS4)
- View from Cumberland Farms Parcel (BS2)

MassDOT determined that **beneficial changes** to the visual quality of the Sagamore Bridge and Bourne Bridge AVEs would result from the following:

- Removing utility poles and overhead signals and wiring at roadway intersections, thereby presenting more harmonious and coherent views to travelers and neighbors
- Replacing existing intersections or rotaries with roundabouts, resulting in reduced paved areas, increased landscaping, and a sense of orderliness that is not present in the existing condition.
- Incorporating landscaping and SUPs or pedestrian walkways into the transportation network, thereby providing visual interest and relief from the concrete environment.

6.3.6.2 Neutral Changes to the Visual Quality of the Areas of Visual Effect

For nine visual inventory locations in the interchange approach networks, MassDOT determined that **neutral changes** to the visual quality of the Sagamore Bridge and Bourne Bridge AVEs would result from project impacts. This total number included the following locations where shifts in the bridge or roadway location and elevation would not be discernible by the viewer:

- View from Church Lane at Cape Pine Road (SN4)
- View from Upper Cape Cod Regional Technical High School Scenic Overlook (BS4)

The neutral changes ratings included the following locations with low to moderate viewer sensitivity where proposed impacts, including new and/or expanded infrastructure, generally would be consistent with the visual character of the existing transportation environment:

- View from Scenic Highway at Church Lane (SN1)
- View from Sandwich Road at Mid-Cape Connector (SS1)

- View from Sandwich Road facing south (SS3)
- View from Belmont Circle (BN1)

A neutral rating was given to the following one location where the new transportation infrastructure would provide a continuity of access and visibility to commercial neighbors who would be sensitive to project changes:

- View from Nickerson-Bourne Funeral Home (BS1)

Neutral ratings also included two locations where the more dominant and physically imposing transportation elements would transform the roadway's rural visual character with a more urban appearance, introducing incompatible elements into the existing viewshed. However, at these locations with low viewer sensitivity, the visual changes would be neutralized through the introduction of landscaping and pedestrian/bicycle paths to soften the hardscape and provide visual interest, as well as other improvements (such as increased safety) that would enhance the traveler's driving experience:

- View from Scenic Highway (BN3)
- View from Sandwich Road facing west (BS3)

For the two visual inventory locations at the bridge sites, MassDOT determined that with the minimization measures incorporated into the Program, the degree of visual impact would be **neutral**:

- View From Motorist on Highway Bridge (B1)
- View of Sagamore and Bourne Bridges from Cape Cod Canal Service Road (B2)

While the demolition of Sagamore and Bourne Bridges would be an adverse effect on those NRHP-eligible structures, MassDOT selected a replacement bridge design that would closely resemble the existing structures and complement their setting within Cape Cod Canal, to avoid and/or minimize impacts to the NRHP-eligible Cape Cod Canal Historic District. **Section 7** further describes measures that MassDOT's will incorporate into the Program to compensate for the loss of the historic structures.

6.3.6.3 Adverse Changes to the Visual Quality of the Areas of Visual Effect

For two visual inventory locations in the interchange approach networks, MassDOT determined that **adverse changes** to the visual quality of the Sagamore Bridge and Bourne Bridge AVEs would result from project impacts:

- View from Eleanor Avenue (SS2)
- View from Nightingale Road (BN2)

For the View from Eleanor Avenue (SS2), MassDOT determined that the project impacts—potentially acquiring residences for the construction of the new bridge, demolition of the existing bridge, and incorporation of stormwater control measures—would adversely affect the sensitivity of the Round Hill residential viewers on the west side of Eleanor Avenue. For the View from Nightingale Road at its intersection with Scenic Highway (BN2), MassDOT determined that the elevated relocated State

Route 25 mainline and flyover ramp would introduce incompatible elements to the existing views of residential neighbors, who would be sensitive to their altered views of the landscaped Bourne Scenic Park entrance. To address these adverse visual impacts, MassDOT is proposing minimization and mitigation measures, which are described in **Section 7**.

7 Mitigation

7.1 Purpose

The purpose of this phase of the VIA is to describe mitigation used throughout the Program to address the visual character of the Sagamore Bridge and Bourne Bridge AVEs. The FHWA Guidelines note that the goal of the VIA is to maintain or enhance visual quality by providing mitigation for the natural, cultural, or project environments, such as either rehabilitating the degraded resource or adding complementary visual features to the resource, by providing mitigation for the visual experience of viewers. Mitigation will include the following:

- Avoiding the impact by not taking certain actions or portions of actions.
- Minimizing impacts by limiting the degree or magnitude of the action.
- Rectifying the impact by repairing, rehabilitating, or restoring the affected environment.
- Reducing or eliminating impacts over time by preserving or maintaining operations during the life of the action.
- Compensating for impacts by replacing or providing substitute resources or environments.

7.2 Mitigation Approach

MassDOT conducted a detailed alternatives analysis process to determine the Preferred Alternative, which included multiple evaluations of the bridge design parameters and the options for the highway interchange approach network components. MassDOT determined that the No Build Alternative, which would avoid project impacts, would not meet the Program's Purpose and Need. MassDOT's recommended Preferred Alternative would minimize adverse project impacts to the maximize extent practicable.

The following sections describe MassDOT's proposed design-related and construction-related mitigation measures, encompassing minimization, restoration, maintenance, and compensation, for visual impacts that cannot be avoided, including the adverse visual impacts to the Round Hill neighborhood on the west side of Eleanor Avenue and the Nightingale Road neighborhood viewers resulting from new and realigned transportation infrastructure.

In coordination with the MA SHPO, the FHWA and MassDOT will identify mitigation measures to compensate for the loss of the NRHP-eligible Sagamore and Bourne Bridges; these measures will be memorialized as stipulations in the Section 106 Programmatic Agreement for the Program. As design

advances, MassDOT will continue to refine the proposed mitigation measures, as well as identify additional mitigation measures, in coordination with stakeholders and the public.

7.3 Design-Related Mitigation

A guiding principle of MassDOT's Project Development and Design Guide is "context-sensitive design," which is defined as follows:

> Context-sensitive design is a collaborative, interdisciplinary approach that involves all constituents to develop a transportation facility that fits its physical setting and preserves scenic, aesthetic, historic, and environmental resources while maintaining safety and mobility for all users.

MassDOT has incorporated the principle of context-sensitive design throughout the Program's planning and design.

7.3.1 Bridge Design

Because of the historic significance of Sagamore and Bourne Bridges and Cape Cod Canal, and the high sensitivity of neighbors and travelers to the loss of the NRHP-eligible structures, MassDOT has selected a design for the replacement bridges that would resemble the overall shape of the historic bridge arches, while also incorporating modern elements into the design and maximizing constructability. For example, the 115-foot rise of the bridge arch was selected to echo the appearance of the existing bridges; the height would also be the upper bound limits that would meet clearance requirements for the anticipated construction method of floating in the completed arch on barges. The number of delta frames in the superstructure has been minimized to create clean lines. Additionally, the series of connected Y-shapes of the proposed piers would introduce a more contemporary version of the straight, vertical pier stems of the existing bridges.

7.3.2 Aesthetic Bridge Lighting

Existing bridge lighting is limited to minimal roadway lighting. MassDOT proposes to provide standard roadway and pedestrian-scale lighting along the replacement bridges, the approach highway networks, and SUPs. In keeping with the historic nature of Cape Cod Canal, MassDOT is considering aesthetic bridge lighting concepts that propose understated, low-level lighting of the bridge arch and different bridge components, such as the bridge cables, inner piers, outer piers, and inner delta frames. As design advances, MassDOT will continue to evaluate incorporating aesthetic lighting for the new bridges.

7.3.3 Incorporation of Recreational Amenities as Visual Enhancements

At each bridge crossing, MassDOT is proposing to create a walkway/fishing platform at the top of the delta pier footing, at the same elevation as Canal Service Road. Additionally, at each bridge crossing, MassDOT proposes to incorporate a scenic overlook at the top of the bridge arch. The overlook would be constructed by widening the proposed pedestrian/bicycle SUP.

Both recreational amenities would provide visual enhancements of the Cape Cod Canal Historic District by providing new vistas of Cape Cod Canal as a visual natural resource and cultural resource.

Exhibit 7-1 provides a conceptual plan of the pier walkway/fish platform, and **Exhibit 7-2** provides a conceptual plan of the scenic overlook at the bridge arch.

Exhibit 7-1. Conceptual Plan of Pier Walkway/Fishing Platform

Source: Massachusetts Department of Transportation, 2024

Exhibit 7-2. Conceptual Plan of Bridge Scenic Overlook

Source: Massachusetts Department of Transportation, 2024

7.3.4 Landscaping

To compensate for the disturbance and clearing required for the Program, including bridge replacements and connections to the local roadway networks on the mainland and on Cape Cod, MassDOT proposes to implement a substantial landscaping plan to repair, restore, and enhance the landscape flanking the mainline highways, bridges, and local roads and connections. MassDOT's goals for the landscaping plan correlate with the goal of the VIA to maintain and enhance visual quality:

- Revegetate all areas disturbed by construction around the new Sagamore and Bourne Bridges, adjacent highways, local roadways, SUPs, stormwater and utility infrastructure, and construction staging areas.
- Develop landscape zones that restore and/or enhance existing habitats and reinforce the unique landscape character of the region.
- Screen undesirable views for both users of the Project Limits as well as abutters.
- Improve sight lines and views while mitigating the appearance of undesirable areas within and beyond the bridge sites.
- Soften the visual appearance of new and expanded infrastructure to maintain the character of the region.
- Utilize landscape to create gateways as visitors approach Cape Cod, including placemaking opportunities as visitors enter and exit Cape Cod.
- Enhance pedestrian zones with planting at trailheads, in medians, and in roundabouts in lieu of impervious surfaces.
- Integrate stormwater basins with the surrounding restored landscapes so they appear natural and contribute to the creation of habitat as much as possible.
- Maintain site visibility for safety along highways and roadways and around pedestrian zones and off-road areas for site security.

MassDOT's landscape plan consists of developing several landscape types to restore the disturbed site and to integrate the new infrastructure into the landscape. These landscape types include landscape restoration, reforestation, street tree planting, limited areas for lawn, stormwater basins and rain gardens, buffer planting, roundabout planting, and special plantings. **Figures 6-4b, 6-8b, 6-12b,** and **6-16b** present examples of landscape treatments that are incorporated into the Program's infrastructure to restore, maintain, and enhance visual quality.

7.3.5 Coordinated Shared Use Path Site Elements

In recognition of the community's goals to protect its existing cultural and landscape assets, MassDOT is designing features and amenities of the Program's pedestrian and bicycle zones and SUPs to provide a coherent and coordinated appearance and complement the town's unique character. Examples include designating trailheads, overlooks, and waysides through special pavements or

stamped/colored concrete; using natural and color-coordinated site furnishings along the SUPs, such as bench seating, trash receptacles, and railings; and providing themed interpretive and wayfinding signage.

7.3.6 Aesthetic Wall Treatments

MassDOT is investigating the visual/aesthetic treatment of bridge abutment walls and retaining walls required throughout the Sagamore Bridge and Bourne Bridge AVEs. Based on their visibility to travelers and neighbors, different finish materials, including materials echoing the rural character of Cape Cod, may be utilized. MassDOT has categorized walls in the AVEs by priority:

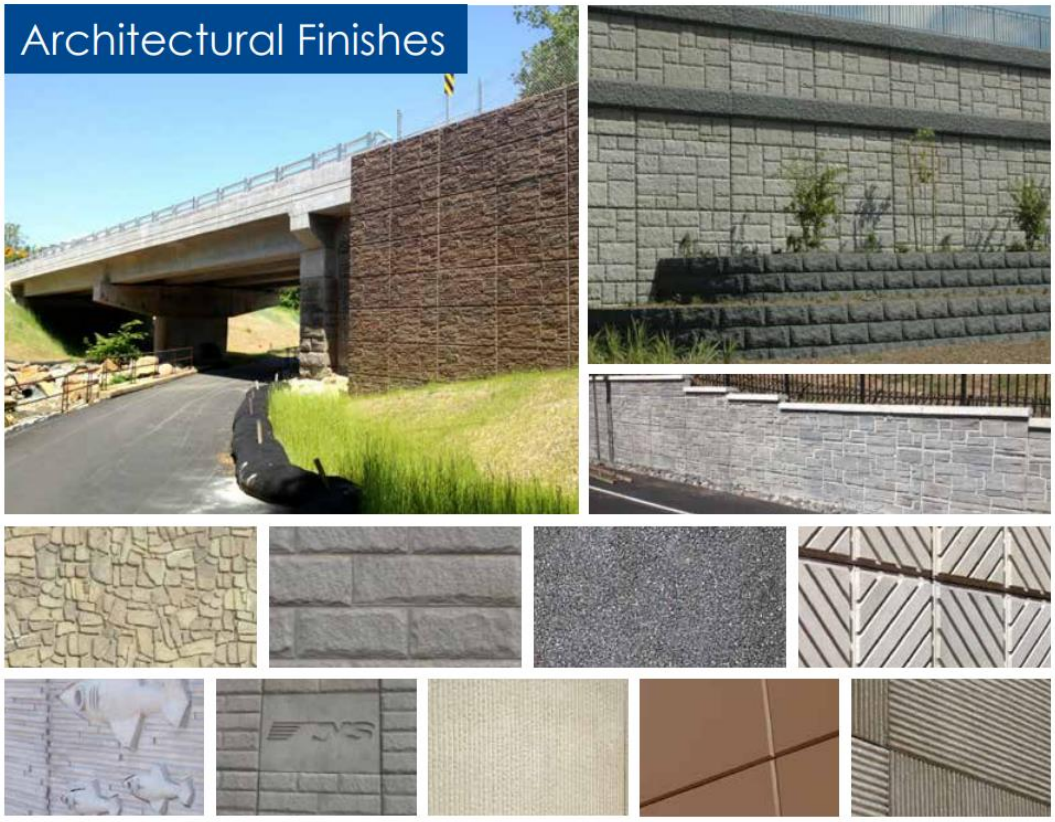
- **High Priority Walls** would be very visible to the public, including where the Cape Cod character would be important to highlight. An example of a high-priority wall would be the retaining wall supporting the SUP at the Bourne South quadrant, where the State Route 28 south off-ramp connects to Trowbridge Road. In this location, a cast-in-place retaining wall with New England fieldstone veneer would be aesthetically pleasing and appropriate for the site character. Interpretive features could also be incorporated into the wall. Other high-priority walls would include smaller retaining walls along SUPs that would be visible to recreation neighbors.
- **Medium Priority Walls** would include most bridge abutments and wingwalls that are near and visible from local roadways and SUPs, and walls that retain local roadways that would be visible to residential and commercial neighbors. An example treatment for the cast-in-place concrete walls would be a formliner to create a pattern on the wall face.[22] Plant material could also be used to screen portions of these walls.
- **Low Priority Walls** would include retaining walls that support highways and ramps facing naturalized areas, interiors to off- and on-ramps, and walls that are distant from local roads and residential neighbors. Example treatments could include concrete block gravity walls.

As design advances, and as appropriate for the wall location, MassDOT is investigating the use of different types of walls and wall treatments to minimize effects to visual quality.

The many wall types being evaluated include stone masonry walls; mechanically stabilized earth (MSE) walls or prefabricated walls with stamped, textured, and/or colored designs; pre-fabricated modular walls; and cast-in-place concrete walls, which can include precast concrete veneers with a variety of textures and finishes. **Exhibit 7-3** presents an example of architectural wall finishes.

[22] A wall formliner consists of a plastic or rubber liner that is used to create a texture or pattern onto a concrete surface.

Exhibit 7-3. Examples of Aesthetic Wall Treatments



7.4 Construction-Related Mitigation

To minimize visual impacts in the Sagamore Bridge and Bourne Bridge AVEs, MassDOT would incorporate construction-related mitigation into the Program through permits, special provisions and guidance documents, and its Standard Specifications for Highways and Bridges.

The Program's Construction Stormwater General Permit would contain multiple measures to reduce adverse effects from construction, including, among other control measures, the requirement to stabilize disturbed areas immediately when construction has ceased and will not resume for more than 14 days.

MassDOT has issued extensive guidance for tree preservation, including plant protection fencing for public places and staging or other construction activity near desirable vegetation. As applicable, MassDOT will use plant protection fencing to minimize impacts to visual natural resources.

MassDOT's manual of Standard Specifications for Highways and Bridges (2024 Edition, Division II) contains standard specifications to mitigate for temporary construction-related impacts, including potential effects to visual quality. Construction-related mitigation to be incorporated into the Program would include minimizing fugitive light from portable sources, directing light sources away from residential areas, and restoring all disturbed areas at the completion of construction.