



**DRAFT FOR REVIEW - SUMMER 2019**

# **CAPE COD CANAL TRANSPORTATION STUDY**



Prepared by:







# CONTENTS

<b>5.1 Evaluation Criteria .....</b>	<b>5-2</b>
<b>5.2 Evaluation Methodology .....</b>	<b>5-2</b>
<b>5.3 Multimodal Transportation Improvement</b>	
<b>Recommendations .....</b>	<b>5-5</b>
5.3.1 Bicycle and Pedestrian Improvements .....	5-5
5.3.2 Multimodal Improvements .....	5-6
<b>5.4 Roadway Improvements .....</b>	<b>5-6</b>
5.4.1 Local Intersection Improvements .....	5-7
5.4.2 Gateway Intersection Improvements .....	5-9
<b>5.5 Implementation.....</b>	<b>5-14</b>
5.5.1 MassDOT Project Development and Design	
Process .....	5-14
5.5.2 Project Delivery Methods.....	5-19
5.5.3 Environmental Considerations .....	5-20
5.5.4 Climate Change Considerations .....	5-21
5.5.5 Implementation Summary .....	5-22

# EXHIBITS

Exhibit 5-1	Alternatives Evaluation Matrix – Definition of Benefit and Impact Ratings .....	5-3
Exhibit 5-2	Evaluation Matrix – Comparison of Travel Analysis Model Cases .....	5-4
Exhibit 5-3	Recommended Local Intersection Equipment Improvements.....	5-7
Exhibit 5-4	Alternatives Evaluation Matrix – Definition of Benefit and Impact Ratings .....	5-8
Exhibit 5-5	Components of Case 3A – Recommended Gateway Intersection Improvements .....	5-10

# TABLES

Table 5-1	Components of Case 3A – Recommended Gateway Intersection Improvements .....	5-9
Table 5-2	Recommended Multimodal Transportation Improvements.....	5-13





1  
2  
3  
4  
**5**

# Study Recommendations

The recommendations for the Cape Cod Canal Transportation Study are based on the ability of the potential transportation improvement alternatives to meet the study's goals and objectives. As defined in Chapter 1, the goals and objectives of this study are:

## Goals

- Improve transportation mobility and accessibility in the Cape Cod Canal area and provide reliable year-round connectivity over the Canal and between the Sagamore and Bourne Bridges.

## Objectives

- Improve multimodal connectivity and mobility across the Canal to avoid degrading quality of life on the Cape.
- Ensure that cross-Canal connectivity does not become a barrier to reliable intra community travel within Bourne and Sandwich.
- Create a reliable multimodal connection across the Canal to assure public safety in the event of an emergency

evacuation of portions of the Cape and accommodate first responders trying to reach the Cape.

The alternatives that best met these goals and objectives were determined through a combination of analytical methods and an extensive public participation process.

## **5.1 EVALUATION CRITERIA**

Alternatives were compared to the future no-build transportation conditions on their ability to meet the evaluation criteria established with input from the Working Group at the onset of the study (Chapter 1, Table 1-1). These evaluation criteria were developed with the aim of advancing the study's goals and objectives and consist of various measures of an alternative's impact on the following categories:

- transportation
- safety
- environmental and community resources
- economic development

Review of an alternative's performance compared to the future no-build condition provides an opportunity to gain a complete understanding of an alternative's potential benefits and impacts prior to making study recommendations.

## **5.2 EVALUATION METHODOLOGY**

The recommendations for roadway improvements are based on the effectiveness and potential benefits and/or impacts of the various suite of improvements evaluated under the travel analysis model cases. A matrix was developed to compare each of the travel analysis model cases against the future no-build conditions. This evaluation matrix characterizes the transportation performance or potential environmental or property impact category based on either quantifiable data (using existing data or data produced for this study) or subjective qualitative measures.

The matrix uses different symbols to indicate minor, moderate, or substantial benefits or impact. If no impact or benefit is anticipated (or an environmental resource is not present) a neutral symbol is used. The specific definitions used to

differentiate minor, moderate, or substantial impact to environmental resources are provided in Exhibit 5-1.

The complete Evaluation Matrix is provided in Exhibit 5-2. Ultimately, review of the completed evaluation matrix and consultation with the Working Group and the public, aided MassDOT's decision-making process to identify which Case to recommend for advancement into MassDOT's project development process.

**Exhibit 5-1 Alternatives Evaluation Matrix – Definition of Benefit and Impact Ratings**









Alternatives Evaluation Matrix Legend				
Category	Benefit Levels			
				
Safety (Emergency Vehicle Response Time)	Neutral	Minor or No Impact	Modest Benefit	Substantial Benefit
Bicycle/Pedestrian (facilities or access)				
	Impact Levels			
				
	Neutral (No impact or resource not present)	Minor or No Impact	Modest Impact	Substantial Impact
Wetlands			5,000 SF - 1 acre of wetlands	> 1 acre of wetlands
Rare Species			> 1 acre of work in rare species habitat	Requires a Conservation Management Permit
Area of Critical Environmental Concern (ACEC)			Impacts land within ACEC	Impacts wetlands within ACEC
100-Year Floodplain			Moderate fill within 100-year floodplain	Substantial fill within 100-year floodplain
Water Supply Protection Areas			Impact to land in DEP IWPA or Zone II	Impact to land in DEP Zone I or ORW
Air Quality/Public Health			Modest reductions in idle time/queueing	Substantial reductions in idle time/queueing
Open Space			Acquisition of open space land	Acquisition of open space affecting or active recreational facilities
Historic Resources			Impacts historic parcel or historic district	Adverse Effect on historic property
Land Use/Economic Development			Modest impact to residential, commercial, or utility-owned property	Substantial impact to residential, commercial, or utility-owned property

Exhibit 5-2 Evaluation Matrix – Comparison of Travel Analysis Model Cases

Alternatives Evaluation Matrix																	
Category		2040 Future No-Build		Case 1		Case 1A		Case 1B		Case 2		Case 2B		Case 3		Case 3A	
		Rating	Data	Rating	Data / % Change from 2040 No-Build (000's)	Rating	Data / % Change from 2040 No-Build (000's)	Rating	Data / % Change from 2040 No-Build (000's)	Rating	Data / % Change from 2040 No-Build (000's)	Rating	Data / % Change from 2040 No-Build (000's)	Rating	Data / % Change from 2040 No-Build (000's)	Rating	Data / % Change from 2040 No-Build (000's)
Traffic	Vehicle Hours Traveled	◇	16.3 mil	○	530	○	659	◐	860	◐	1,070	◐	1,290	●	1,306	●	1,390
	Average Delay at BC & BR (mins)	◇	6.8	○	6.5	◐	5.4	◐	5.1	◐	4.3	○	6.7	◐	7.9	●	3.7
	Fall PM	◇	3.4	◐	2.5	◐	2.6	●	1.0	●	0.6	●	0.4	●	0.5	●	0.2
Category																	
Safety / Emergency Response Time																	
Bike / Ped (Safety and New Facilities)																	
Environmental	Wetlands (acres)			○	0.0	○	0.0	○	0.0	◐	0.3	◐	0.5	◐	0.3	◐	0.3
	Rare Species (acres)			●	7.2	◇	0.0	◇	0.0	●	7.2	●	7.2	●	11.1	●	11.3
	100-yr Floodplain (acres)			◇	0.0	◇	0.0	◇	0.0	◐	4.7	◐	5.4	◐	4.7	◐	4.7
Community	Water Supply (Zone I/II,WPA) (acres)			◐	5.9	○	0.2	◇	0.0	◐	6.4	◐	6.4	◐	6.4	◐	6.4
	Open Space (acres)			◐	0.6	○	0.2	○	0.2	◐	1.1	◐	1.1	◐	1.1	◐	1.1
Property Impacts	Historic Resources (acres)			◐	0.2	◇	0.0	◇	0.0	◐	0.2	◐	0.2	◐	0.2	◐	0.2
	Residential (acres)			○	0.2	◇	0.0	◇	0.0	○	0.5	○	0.6	○	0.6	○	0.5
	Commercial (acres)			◐	0.9	◇	0.0	◇	0.0	◐	0.9	◐	0.0	◐	0.9	◐	0.9
Economic Impact	Utility (acres)			●	4.7	◐	0.9	◐	0.9	●	4.7	●	4.7	●	4.7	●	4.7
	Economic Impact			◐		◐		◐		●		◐		●		●	
2030 Cost (\$ millions)					60		20		30		100		120		300		370



## 5.3 MULTIMODAL TRANSPORTATION IMPROVEMENT RECOMMENDATIONS

Multimodal transportation improvements were recommended for study area bicycling and pedestrian facilities, multimodal facilities, and roadways. The following sections describe these recommendations.

### 5.3.1 Bicycle and Pedestrian Improvements

**Recommendation:** Improve and expand bicycle and pedestrian facilities in the study area to encourage greater use of non-motorized transportation by residents and visitors.

The specific bicycle and pedestrian improvements recommended include the three categories of improvements listed below. These recommended improvements are described more fully in Section 4.13.1.

1. **New ADA-compliant pedestrian connections to the Cape Cod Canal Bikeway at three locations (Exhibit 4-45):**
  - Bourne Ballfield, Bourne;
  - Pleasant Street, Bourne; and
  - Old Bridge Road, Bourne.
2. **Improve bicycle and pedestrian connections to/from local roadways over the Canal at both the Sagamore and Bourne Bridges (Exhibit 4-46 and 4-47).**
3. **Improve bicycle/pedestrian accommodation along roadways in the study area, especially along bus routes, by providing:**
  - Accessible sidewalks and crosswalks;
  - Pedestrian signal phases at intersections;
  - Shelters at bus stops;
  - Bicycle racks;
  - Wayfinding signage; and
  - Bicycle accommodations in roadway shoulders.

These improvements could be stand-alone improvements or incorporated into a roadway improvement project.

**Benefit:** Improved and expanded bicycle and pedestrian facilities would encourage non-motorized travel and enhance recreational opportunities for residents and visitors. These improvements would advance the study goal of creating and improving multimodal mobility in the Cape Cod Canal area.

### 5.3.2 Multimodal Improvements

**Recommendation:** Develop a new Multimodal Transportation Center (with 100-space park and ride lot) at the Route 6 Exit 2 (Route 130) interchange.

**Benefit:** Additional park and ride facilities will encourage more travelers to use bus service and reduce single-occupant car travel. These improvements would advance the study goal of creating and improving multimodal mobility in the Cape Cod Canal area.

The location of a park and ride lot at the Route 6 Exit 2 (Route 130) interchange is desirable since it is owned by MassDOT and does not contain any regulated environmental resources. Additionally, the western terminus of the planned Service Road shared-use path is at this location.

## 5.4 ROADWAY IMPROVEMENTS

Recommendations for improvements to the study area roadway system were selected based on the travel model analysis and potential impact to environmental and community resources and public and private property. The recommendations are presented in two groups:

- Local intersection improvements, and
- Gateway intersection improvements (larger improvements).

The project development period for these projects will vary based on project complexity. Larger, more complex projects require a longer period to complete the design, environmental review and permitting, and (if required) land acquisition processes. For example, new highway ramps could require extensive coordination with local utility providers to ensure uninterrupted service and safety during the relocation of their equipment (if necessary).

To enhance multimodal accessibility, MassDOT will evaluate improvements to pedestrian, bicycle and transit facilities at each location. For pedestrians, these improvements may include accessible sidewalks, crosswalks, and signal systems. Bicycle improvements include separated bicycle lanes, marked bicycle lanes on roadway shoulders, and accessible connections to regional bicycle paths. These pedestrian and bicycle facility improvements enhance access to transit facilities.

As appropriate, transportation system design will incorporate Intelligent Transportation System (ITS) improvements to provide real-time traveler information, weather conditions, work-zone management, and emergency management information.

Close coordination between MassDOT and USACE will continue regarding the rehabilitation or replacement of the Canal Bridges and (as necessary) the relocation of the roadway and bridge approaches to these bridges.

#### 5.4.1 Local Intersection Improvements

**Recommendation:** The recommended local intersection improvements include advancing several intersection improvement projects into the project development phase. As described in Section 4.4 and shown on Exhibits 5-3 and 5-4, these intersection improvements include the following potential transportation projects:

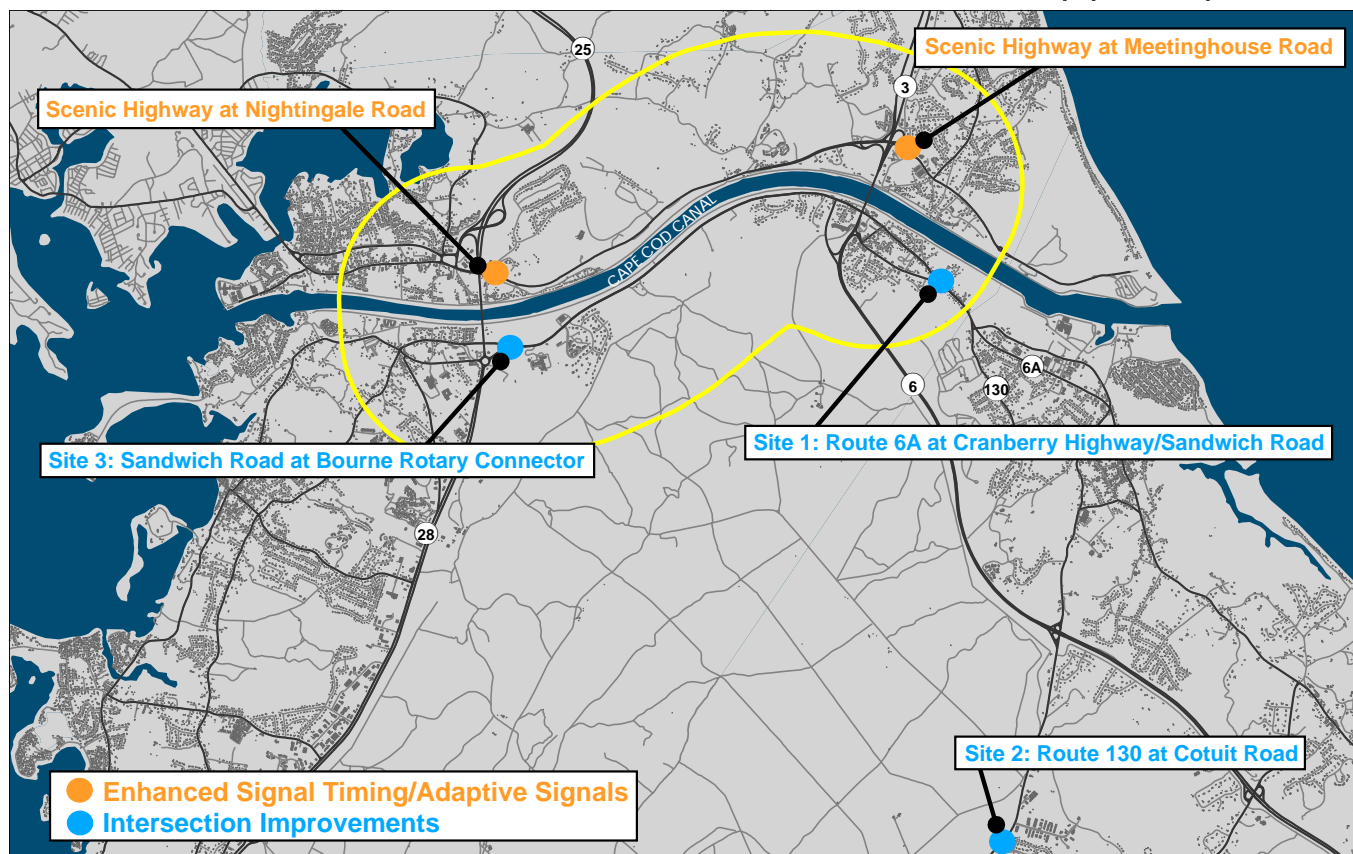
Signal timing improvements at two intersections:

1. Scenic Hwy/Meeting House Lane at State Road/Canal Road;  
and
2. Scenic Highway at Nightingale Road.

Intersection Improvements at three intersections

1. Route 6A (Sandwich Road) at Cranberry Hwy;
2. Route 130 at Cotuit Road; and
3. Sandwich Road at Bourne Rotary Connector.

**Exhibit 5-3 Recommended Local Intersection Equipment Improvements**





**Exhibit 5-4 Recommended Local Intersection Reconstructions**

Site 1

Route 6A (Sandwich Road)  
at Cranberry Highway



Site 2

Route 130 at Cotuit Road



Site 3

Sandwich Road &  
Bourne Rotary Connector



**Benefit:** These intersection roadway improvements represent a lower-cost method to reduce congestion and improve safety at key study area intersections. These improvements would advance the study goal of improving transportation mobility and accessibility in the Cape Cod Canal area.

#### 5.4.2 Gateway Intersection Improvements

For each of the Travel Analysis Model Cases, the study team evaluated the results of the traffic analysis and the potential benefit or impact on the various evaluation criteria categories, as shown on the evaluation matrix (Exhibit 5-2).

In coordination with the Working Group, the components of Case 3A were identified as the transportation improvements that would most effectively satisfy the study's goals and objectives.

As described in Section 4.9 and shown on Exhibit 5-5, Case 3A includes the following improvements:

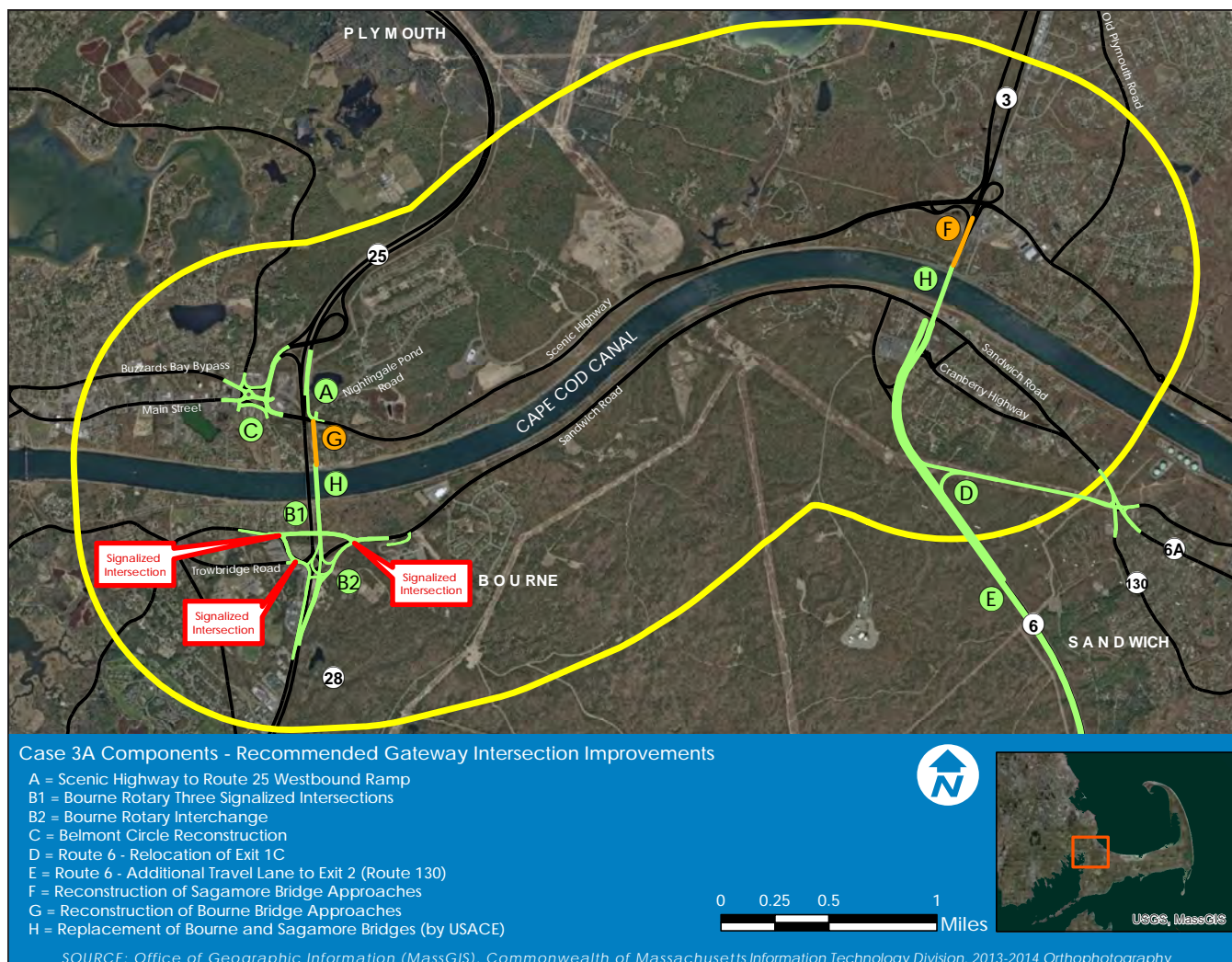
*Table 5-1 Components of Case 3A - Recommended Gateway Intersection Improvements*

LOCATION ON EXHIBIT 5-5	RECOMMENDED GATEWAY INTERSECTION IMPROVEMENT
A	Scenic Highway to Route 25 Westbound Ramp
B	Bourne Rotary Interchange
C	Belmont Circle Reconstruction
D	Route 6 – Relocation of Exit 1C
E	Route 6 – Additional Travel Lane to Exit 2 (Route 130)
F	Reconstruction of Sagamore Bridge Approaches
G	Reconstruction of Bourne Bridge Approaches
H	Replacement of Bourne and Sagamore Bridges (By USACE)

Case 3A was identified as the recommended set of transportation improvements because they would most effectively satisfy the study goals and objectives. Case 3A would:

- Provide the greatest long-term improvement in accessibility and mobility for Cape Cod residents, employers, and visitors;
- Provide a reliable multimodal transportation system to assure public safety in the event of an emergency evacuation of Cape Cod;
- Focus on improving existing infrastructure, thereby minimizing potential property takings and impact to natural and social environmental resources; and
- Accommodate the rehabilitation or replacement of the Canal bridges, envisioned as having two travel lanes and one auxiliary lane in each direction.





**Exhibit 5-5** Components of Case 3A - Recommended Gateway Intersection Improvements

### Potential Case 3A Stages:

The Case 3A improvements could be advanced as a single project or, as described below, through a series of up to four project stages. These potential stages could be combined into fewer stages or completed in different combinations of improvements. However, the benefits to advancing the Case 3A improvements in stages include:

- Lower financial commitment during any single construction period;
- Reduced community disruption;
- Independent benefit will be provided for each project stage;

- Benefits to transportation system increase as each successive stage is implemented;
- Each stage is compatible with other stages, resulting in no wasted transportation dollars;
- If desired, portions of certain stages could be combined.

Below is a description of four potential Case 3A stages.

Stage 1

- 1. Scenic Highway to Route 25 westbound on-ramp  
(Component A on Exhibit 5-5)**
- 2. Bourne Rotary – Three Signalized Intersections (Component B-1 on Exhibit 5-5)**

Benefit of Stage 1: Implementation of the Stage 1 improvements would substantially reduce delays at Both Belmont Circle and Bourne Rotary, especially during the non-summer weekday peak periods.

Challenges of Stage 1: Construction of a new highway on-ramp from Scenic Highway to Route 25 westbound would require the use of land containing natural gas lines, requiring close coordination with the utility provider and potential relocation of the gas lines. At Bourne Rotary, close coordination would be required to accommodate the relocation of the Technical High School driveway and for work adjacent to the state police barracks.

Stage 2

- 1. Belmont Circle – Three-Leg Roundabout with Signalized Intersection (Component C on Exhibit 5 5)**

Benefit of Stage 2: This would further reduce delay at Belmont Circle and Bourne Rotary, especially during non-summer peak periods. Improvements to bicycle and pedestrian accommodations would improve access between the businesses and residential areas west of Belmont Circle in Bourne and Scenic Highway, the Canal bike trail, and the Bourne Scenic Park Campground.

Challenges of Stage 2: The reconstruction of Belmont Circle would impact regulated wetlands and floodplain, requiring the filing of a Notice of Intent with the Bourne Conservation Commission and appropriate wetlands avoidance and mitigation. Maintaining access to local business during construction would also be a priority.

Stage 3

- 1. Relocation of Route 6 Exit 1C (Component D on Exhibit 5-5)**
- 2. Route 6 – Additional Eastbound Travel Lane to Exit 2 (Route 130) (Component E on Exhibit 5-5)**

Unlike Stages 1 and 2, Stage 3 is not interrelated with the other Case 3A improvements and could be built at any time and improve traffic conditions. The full benefit of these improvements would be realized with a replacement Canal bridge in place. It is assumed that the relocation of Exit 1C will be required when the Sagamore Bridge is replaced.

*Benefit of Stage 3:* Would reduce delay on Route 6 westbound during both summer and non-summer peak periods. Delays are substantially reduced on Route 3 southbound when these improvements are combined with the replacement of the Sagamore Bridge.

*Challenges of Stage 3:* The relocation of Exit 1C and the additional eastbound travel lane on Route 6 would result in approximately 7.2 acres and 3.9 acres of disturbance to rare species habitat, respectively. These projects would require close coordination with the Massachusetts Natural Heritage and Endangered Species Program, including the preparation of a Conservation Management Permit with appropriate impact mitigation.

The relocation of Exit 1C would also require close coordination with the electrical utility provider, Eversource, to ensure that the use of 3.8 acres of their land for the roadway project is compatible with their long-term plans.

Stage 4

- 1. Replacement of Bourne and Sagamore Bridges (by USACE) (Component H on Exhibit 5-5)**
- 2. Reconstruction of Bourne and Sagamore Bridge Approaches (by MassDOT) (Components F & G on Exhibit 5-5)**
- 3. Bourne Rotary Interchange (by MassDOT) (Component B-2 on Exhibit 5-5)**

Stage 4, combined with the other three project stages, would complete the implementation of the Case 3A transportation improvements.

*Benefit of Stage 4:* The implementation of the Stage 4 transportation improvements at the Sagamore Bridge area would substantially reduce delay on both Route 6 westbound and Route 3 southbound during both summer and non-summer peak periods.

With the reconstruction of the Bourne Rotary as a highway intersection, the Stage 4 improvements would eliminate nearly all delay at the Bourne Rotary during both the non-summer and summer peak periods. While Belmont Circle still experiences moderate delay during the summer peak period, Case 3A results in the greatest annual vehicle-hour savings than all other cases.

Challenges of Stage 4: The replacement of the Bourne and Sagamore Bridges and related approach work would be a large-scale project requiring state and federal environmental planning studies and other major environmental permits. The environmental planning, permitting, and design phase will require close and sustained coordination between MassDOT, the USACE, and Cape Cod stakeholders.

Table 5-2 Recommended Multimodal Transportation Improvements

TRANSPORTATION MODE	RECOMMENDED IMPROVEMENT	LOCATION	MAJOR STAKEHOLDERS	COST (\$ MILLION)
MULTIMODAL				2017 COST
	New bicycle/pedestrian connections to Canal bike trail	Various locations in Bourne	Town of Bourne / MassDOT / USACE	\$25K - \$50K per location
	Bicycle/Pedestrian Facility Improvements	Sagamore Bridge Approaches / Adams Street	MassDOT / USACE	3.9
	Bicycle/Pedestrian Facility Improvements	Bourne Bridge Approach (north)	MassDOT / USACE	0.8
	Bicycle/Pedestrian accommodation along bus routes: add sidewalks / crosswalks / roadway shoulder / bike racks / bus shelters	Various locations along bus routes in Bourne & Sandwich	Towns of Bourne and Sandwich / MassDOT	Varies by location
	Park and Ride Lot	Route 6 Exit 2 (Route 130)	MassDOT	2.8
LOCAL INTERSECTION ROADWAY IMPROVEMENTS				2017 COST
	Route 6 at Cranberry Highway	Bourne	Town of Bourne / MassDOT	0.6
	Route 130 at Cotuit Road	Sandwich	Town of Sandwich / MassDOT	1.0
	Sandwich Road at Bourne Rotary Connector	Bourne	Town of Bourne / MassDOT	1.9
GATEWAY INTERSECTION ROADWAY IMPROVEMENTS (CASE 3A IMPROVEMENTS <sup>1</sup> )				2030 COST
	Scenic Highway to Route 25 Westbound Ramp		Town of Bourne / MassDOT	11
	Belmont Circle Reconstruction		Town of Bourne / MassDOT	23
	Bourne Rotary Interchange <sup>2</sup>		Town of Bourne / MassDOT	87
	Route 6 Exit 1C Relocation		Town of Bourne / MassDOT	51
	Additional Travel Lane on Route 6 Eastbound to Exit 2		Towns of Bourne and Sandwich / MassDOT	48
	Sagamore Bridge Approaches <sup>3</sup>		Town of Bourne / MassDOT / USACE	64
	Bourne Bridge Approaches <sup>3</sup>		Town of Bourne / MassDOT / USACE	84

<sup>1</sup> Case 3A assumes the prior replacement of the Sagamore and Bourne Bridge by the USACE.

<sup>2</sup> Includes cost of Bourne Rotary Reconstruction (Alternative 2, Three Signalized Intersections).

<sup>3</sup> Includes approach roadway and bridge relocation and retaining walls.



The location and conceptual cost of all recommended transportation improvements are provided in Table 5-2.

## **5.5 IMPLEMENTATION**

This section describes the steps involved in advancing the recommended projects through MassDOT's project development and design process. Although some steps occur simultaneously, they generally occur in the order presented. These steps include project planning, initiation, design, environmental permitting, right-of-way process, programming (funding), procurement, construction, and assessment.

### **5.5.1 MassDOT Project Development and Design Process**

The development of transportation improvements is a complex decision-making process that involves many stakeholders, decision makers, and reviewing agencies. All projects developed by or with the involvement of the MassDOT Highway Division are guided by the eight-step process outlined in Chapter 2 of the MassDOT Highway Division's Project Development and Design Guide. This process guides a proposed transportation improvement from concept through design and construction and is designed to ensure that projects meet their stated goals and objectives.

This project development process is a requirement for all projects involving the MassDOT Highway Division, including projects in which the Highway Division is the project proponent, is responsible for project funding, or controls the infrastructure in question (projects on state highways). In the case of projects involving roadways or other infrastructure and property under the jurisdiction of Cape Cod municipalities, project development and implementation are the municipality's responsibility. Examples of recommendations falling under municipal jurisdiction include local roads and signalization improvements, sidewalk/ADA improvements, and other pedestrian/bicycle infrastructure.

The eight major steps that constitute the MassDOT Project Development and Design Process are outlined below and range from the first steps of identifying a project need toward greater refinement of the project's focus, design details, and ultimately toward implementation. The first two steps, Needs Identification and Planning, are addressed in this study.

#### **Step 1: Needs Identification**

For each of the locations at which an improvement is to be implemented, MassDOT leads an effort to define the problem,



establishes project goals and objectives, and define the scope of the planning needed for implementation. To that end, MassDOT completes a Project Need Form (PNF), which states in general terms the deficiencies or needs related to the transportation facilities or locations. The PNF documents the problems and explains why corrective action is needed. The information defining the need for the project would be drawn primarily from this planning study. At this point in the process, MassDOT also meets with potential project participants to allow for an informal review of the project. For the transportation improvements recommended in this study, potential participants include the Cape Cod Commission, the U.S. Army Corps of Engineers (USACE), local elected officials, community members, and the other stakeholders that have participated in the public engagement process for this study.

The PNF is reviewed by the MassDOT Highway Division office whose jurisdiction includes the location of the proposed project. For the improvements recommended in this study, this is the District 5 office. MassDOT would also send the PNF to the Cape Cod Commission, the regional Metropolitan Planning Organization (MPO), for informational purposes. The outcome of this step determines whether the project requires further planning, whether it is already well supported by prior planning studies, and therefore whether it is ready to move forward into the design phase or whether it should be dismissed from further consideration.

## **Step 2: Planning**

This phase would likely not be required for the implementation of the improvements proposed in the Cape Cod Canal Transportation Study, as this study should constitute the outcome of this step. However, the purpose of this implementation step is for the project proponent to identify issues, impacts, and approvals that may need to be obtained so that the subsequent design and permitting processes are understood.

The level of planning needed varies widely based on the complexity of the project. Typical tasks include the following: define the existing context, confirm the project need, establish goals and objectives, initiate public outreach, define the project, collect data, develop and analyze alternatives, make recommendations, and provide report documentation. Likely outcomes include consensus on the project definition to enable it to move forward into environmental documentation (if needed) and design or a recommendation to delay the project or dismiss it from further consideration.

For this study, continued coordination with the USACE will be critical to properly define future projects and the responsibilities of each agency related to design, permitting, and construction.

### **Step 3: Project Initiation**

At this point in the process, the proponent, MassDOT Highway Division, completes a Project Initiation Form (PIF) for each improvement, which is reviewed by the MassDOT Project Review Committee (PRC) and the MPO, in this case the Cape Cod Commission. The MassDOT PRC is composed of MassDOT staff members including the Chief Engineer, each District Highway Director, representatives of the Project Management, Environmental, Planning, Right-of-Way, Traffic, and Bridge Departments, and the Federal-Aid Program Office (FAPRO).

The PIF documents the project type and description, summarizes the project planning process, identifies likely funding and project management responsibility, and defines a plan for interagency and public participation. First, the PRC reviews and evaluates the proposed project based on the MassDOT's statewide priorities and criteria. If the result is positive, MassDOT Highway Division moves the project forward to the design phase and to programming review by the MPO. The PRC may provide a Project Management Plan to define roles and responsibilities for subsequent steps. The MPO review includes project evaluation based on the MPO's regional priorities and criteria. The MPO may assign a project evaluation criteria score, a Transportation Improvement Program (TIP) year, a tentative project category, and a tentative funding category.

Given transportation funding constraints, prioritization of the recommendations for implementation will need to be established regionally by the Cape Cod Commission, member communities, and MassDOT, in particular for the gateway intersection improvements recommended in Section 5.4.2.

#### USACE Coordination

MassDOT will continue to coordinate with the USACE related to the development and permitting of the transportation improvements in the Canal area and their efforts to secure federal funding for the assumed replacement of the Bourne and Sagamore Bridges.

### **Step 4: Public Outreach, Environmental Permitting, Design, and Right-of-Way Process**

This step has four distinct but closely integrated elements: Public Outreach, Environmental Documentation and Permitting, Design,

and Right-of-Way Acquisition. The outcome of this step is a fully designed and permitted project ready for construction.

The sections below provide more detailed information on the four elements of this step of the project development process.

**Public Outreach:** Continued public outreach in the design and environmental process is essential to maintain public support for the project and to seek meaningful input on the design elements. The public outreach is often in the form of required public hearings (conducted at the 25% design milestones) but can also include less formal dialogue with those interested in and affected by a proposed project.

Given the size and complexity of the transportation improvements recommended in this study, on-going public outreach meetings are anticipated with the public, the study Working Group, local elected officials, and other stakeholders.

**Environmental Planning and Permitting:** The MassDOT Highway Division will be responsible for identifying and complying with all applicable federal, state, and local environmental laws and requirements. This includes determining the appropriate project category for both the Massachusetts Environmental Protection Act (MEPA) and the National Environmental Protection Act (NEPA).

As the Canal bridges are owned by the USACE, they have responsibility for the environmental documentation and permitting of the assumed replacement of the Canal bridges. However, in certain circumstances, projects involving multiple federal agencies (in this case, the USACE and the Federal Highway Administration [FHWA]), a lead federal agency is identified to manage the environmental planning and permitting process.

Environmental documentation and permitting are typically completed in conjunction with the Preliminary Design phase described below.

**Design:** The MassDOT project development process involves three major phases of design. The first is Preliminary Design, also referred to as the 25% submission. The major components of this phase include a full survey of the project area, preparation of base plans, development of basic geometric layout, development of preliminary cost estimates, and submission of a functional design report. Preliminary Design is often completed in conjunction with Environmental Planning and Permitting. The next phase is Final Design, which is also referred to as the 75% and 100% submissions. The major components of these phases include preparation of a subsurface exploratory plan (if required),

coordination of utility relocations, development of temporary traffic control plans through construction zones, development of final cost estimates, and refinement and finalization of the construction plans. Once Final Design is complete, a full set of Plans, Specifications, and Estimates (PS&E) is developed for the project.

**Right-of-Way Acquisition:** A separate set of Right-of-Way plans is required for any project that requires land acquisition or easements. These plans are developed concurrent with the 25% and 75% highways design plans and must identify the existing and proposed layout lines, easements, property lines, names of property owners, and the dimensions and areas of estimated takings and easements.

#### **Step 5: Programming (Identification of Funding)**

Programming, which typically begins during the design phase, can occur at any time during the process, from planning to design. In this step, which is distinct from project initiation, the project proponent requests that the MPO include a project from the Regional Transportation Plan in the region's annual Transportation Improvement Plan (TIP) development process. The proponent requesting the project's listing on the TIP can be the community or one of the MPO member agencies (the Regional Planning Agency, MassDOT, or the Regional Transit Authority). The MPO considers the project in terms of state and regional needs, funding availability, project readiness, evaluation criteria, and compliance with the Regional Transportation Plan. If the MPO decides to include the project in the TIP, it is first included in the Draft TIP for public review and then in the Final TIP. A project does not have to be fully designed for the MPO to program it in the TIP, but generally a project has reached 75 percent design to be programmed in the year-one element of the four-year TIP.

While securing funding through the MPO's TIP process is important, the cost of some of the larger the improvements recommended in this study are well beyond the level of funding the MPO typically has to allocate to projects in this region. Additional funding sources must be identified to advance these projects. As noted, the USACE would be responsible for securing federal funding for the assumed replacement of the Bourne and Sagamore Bridges.

#### **Step 6: Procurement**

Following project design and programming of a highway project, the MassDOT Highway Division publishes a request for

proposals, which is also often referred to as being “advertised” for construction. MassDOT then reviews the bids and awards the contract(s) to the qualified bidder with the lowest bid.

#### **Step 7: Construction**

After a construction contract is awarded, MassDOT Highway Division and the contractor develop a public participation plan and a temporary traffic control plan for the construction process.

#### **Step 8: Project Assessment**

The purpose of this step is to receive constituents’ comments on the project development process and the project’s design elements. MassDOT Highway Division can apply what is learned in this process to future projects. The Project Development and Design Process steps detailed above, along with their effect on the project schedule and typical durations associated with each step.

### **5.5.2 Project Delivery Methods**

The following sections describe three common project delivery methods for highway projects. MassDOT and the USACE would be responsible for selecting the project delivery method that best balances cost, risk, construction schedule, and inconvenience to the residents and visitors to Cape Cod.

#### ***Design-Bid-Build (D-B-B)***

The project development process described previously is based on a conventional project delivery method, commonly referred to as “Design-Bid-Build” (D-B-B). The essence of the D-B-B process is that the project is designed to the PS&E level and then advertised for construction, i.e. the design and construction are carried out sequentially. Under this scenario, the engineer of record (designer) and the construction contractor are two separate contracting entities.

#### ***Design-Build (D-B)***

The design-build project delivery process is a method to deliver a project in which the design and construction services are contracted by a single team. This process occurs after the completion of the environmental planning and 25% design phase. This type of project delivery process often takes less time than a traditional design-bid-build process because design and construction process happen at the same time.



### *Public-Private Partnership (P3)*

An infrastructure P3 is generally a method of project delivery in which a private entity designs, constructs, finances, and manages a facility in exchange for a portion of the funds generated or through availability payments. In the case of a highway P3 project, the funds generated by the project are generally the tolls charged to users of the facility. A benefit of this type of project delivery process is that the project owner (in this case, MassDOT) does not have to fund the design or construction of the project.

### **5.5.3 Environmental Considerations**

This section provides a summary of the environmental documentation, review, and permitting that would need to be conducted for any alternative to be implemented. Any project will need to follow the project development design process (Step 4), which includes identifying and complying with all applicable federal, state, and local environmental laws and requirements. This includes determining the appropriate project category for MEPA and NEPA. Expected environmental policy acts and permitting application and reviews are discussed below but may vary depending upon actual project design and impacts.

#### *Environmental Policy Acts*

Both the Massachusetts and National Environmental Policy Acts (MEPA and NEPA) require an evaluation of a range of alternatives to identify the alternative that meets the project's purpose and need with the least impact to social and natural environmental resources. Mitigation for all environmental impacts must be identified. Based on the scope of the anticipated highway improvements, it is anticipated that MEPA review will at least consist of an Environmental Notification Form (ENF) and a Draft and Final Environmental Impact Report (EIR). Similar thresholds apply to NEPA where a full Environmental Assessment (EA) or Environmental Impact Statement could be warranted for this project.

#### *Environmental Reviews/Permits*

Local, state, and federal agency regulatory agencies will review proposed activities with respect to applicable environmental laws and regulations. The following state and federal regulatory agency reviews and permits would likely be required for the recommended projects:

##### State Agency Review/Approval

- Massachusetts Environmental Policy Act

- Massachusetts Wetlands Protection Act (WPA) – Wetlands Notice of Intent (NOI)
- Massachusetts Division of Fisheries, Natural Heritage and Endangered Species Program review
- Massachusetts General Law Chapter 21E and the Massachusetts Contingency Plan (MCP) (hazardous materials review)

Federal Agency Review/Approval

- National Environmental Policy Act
- Section 404 Permit – U.S. Army Corps of Engineers (USACE) General Permit
- Section 401 of the Federal Clean Water Act – 401 Water Quality Certification
- Section 106 National Historic Preservation Act (managed by the Massachusetts Historical Commission (MHC))
- Endangered Species Act – Section 7 review
- Environmental Protection Agency (EPA) Construction Stormwater General Permit

#### **5.5.4 Climate Change Considerations**

MassDOT has a goal of reducing transportation vulnerabilities and adapting infrastructure for current and future climate change impacts. MassDOT has completed several studies and has a number of active projects underway that will help to better assess the potential impacts of climate change and severe weather to the Commonwealth's transportation infrastructure. A summary of MassDOT's Climate Change Resiliency pilot projects and statewide mapping products can be found on their website using this link: <https://www.mass.gov/info-details/climate-change-resiliency#additional-resiliency-projects-underway->.

In addition, MassDOT, through the Executive Office of Energy and Environmental Affairs, (EEA) and the Massachusetts State Hazard Mitigation and Climate Adaptation Plan, is also working with other state and federal agencies to develop statewide policies and best management practices to adapt to climate change hazards and improve resiliency.

MassDOT is also reviewing its internal policies and procedures to integrate resiliency into the planning and project development processes. While those policies and procedures are being developed, projects are being reviewed on a case-by-case basis.

A high-level vulnerability assessment of the study area focused on flood risk, revealed that several roadways near the western end of the Canal and Buttermilk Bay are within the 100-year

flood zones and will increasingly be vulnerable to flooding with forecast sea level rise and increasing storm intensity. These roadways include portions of Main Street, Buzzards Bay Bypass, and Belmont Circle in Bourne and Cranberry Highway and Head of the Bay Road in Wareham. At the eastern side of the Canal, portions of Scusset Beach Road and Route 6A are within the 100-year flood zone. MassDOT will incorporate increased flood risk while designing transportation improvements in these areas.

#### **5.5.5 Implementation Summary**

As part of this study, several multimodal transportation improvement projects have been outlined. It is recommended that all of these improvements should be considered for project development. It is imperative that municipal leadership from Bourne and Sandwich, as well as the Cape Cod Commission, area Chambers of Commerce, members of the broader community, the USACE, and MassDOT continue to coordinate and further define the most appropriate and urgent projects. In addition, continued support from local and regional stakeholders in advancing high-priority projects is critical to successfully implementing this agenda. These local priorities should inform time lines and programming for each improvement to proceed to project development.