Cape Cod Canal Transportation Study, 7th Working Group Meeting.

Bourne, Plymouth, Sandwich, Wareham.
Bourne Public Library
January 26, 2017 4:00 PM to 6:00 PM
Agenda.

• Welcome and Introductions.
• Study Process & Framework.
• Study Framework: Goals and Objectives.
• Alternatives Development.
• Schedule/Next Steps.
Welcome and Introductions.

- **MassDOT:**
  - Ethan Britland – Project Manager.

- **US Army Corps of Engineers.**
  - Craig Martin, Project Manager.

- **Study Team:**
  - Bill Reed, P.E., Principal in Charge (Stantec).
  - Mike Paiewonsky, AICP- Team Project Manager (Stantec).
  - Fred Moseley, P.E.–Transportation Engineer (Stantec).
  - Jennifer Siciliano, AICP – Public Engagement (Harriman).
  - Sudhir Murthy, P.E., PTOE–Trans. Modeler (TrafInfo).
  - Frank Mahady – Socio-Economic (FXM Associates).
Study Process and Framework.

- **Step 1:** Goals and Objectives, Evaluation Criteria, and Public Involvement Plan.
- **Step 2:** Existing Conditions, Future Conditions, and Issues Evaluation.
- **Step 3:** Alternatives Development.
- **Step 4:** Alternatives Analysis.
- **Step 5:** Recommendations.
Study Framework Goals (Update).

- **Prior Goal:** To establish an alternative or replacement crossing of the Cape Cod Canal to address the diminishing quality and reliability of year-round connectivity over the Canal due to the aging Sagamore and Bourne Bridges.

- **Updated Goal:** Improve transportation mobility and accessibility in the Cape Cod Canal Area, and to provide reliable year-round connectivity over the canal and between the Sagamore and Bourne Bridges.

- To create/improve multi-modal mobility in the Cape Cod Canal area.
Study Framework: Objectives.

- Create reliable multimodal connectivity and mobility levels such that the quality of life on Cape Cod is not diminished by unreliable connectivity across the Cape Cod Canal.

- Create a reliable multimodal connection across the Cape Cod Canal to maintain/enhance public safety in the event of the need for an emergency evacuation of portions of Cape Cod and to accommodate first responders accessing Cape Cod.

- Ensure that cross canal connectivity does not become a barrier to reliable intra-community connectivity for the Towns of Bourne and Sandwich.
Existing Conditions Supplement: Upper Cape Water Reserve.

Middle Bridge Impacts (acres)

<table>
<thead>
<tr>
<th>Wetlands</th>
<th>Open Space</th>
<th>ACEC</th>
<th>Rare Species Habitat</th>
<th>Zone II</th>
<th>Residential Parcels</th>
<th>JBCC</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.24</td>
<td>37.8</td>
<td>19.2</td>
<td>63.1</td>
<td>19.7</td>
<td>17</td>
<td>19.9</td>
</tr>
</tbody>
</table>
Upper Cape Water Supply Reserve at Joint Base Cape Cod.

- Northern 15,000 Acres of JBCC.
- Owned by MA., through the Division of Fisheries & Wildlife.
- Public Conservation Land (Article 97).
- Managed through by 2015 Memorandum of Agreement (MOA).
- Managed through Environmental Management Commission (EMC) via 19 Environmental Performance Standards.
Upper Cape Water Supply Reserve at Joint Base Cape Cod.
Upper Cape Water Supply Reserve at Joint Base Cape Cod.

- The MOA: an enforceable legal agreement to preserve and protect the Water Supply Reserve.
- The purpose of the Reserve is water supply & wildlife protection & use and training of Mass. military forces.
Camp Edwards – Army National Guard Training Site.

- Largest Military Training Center (MTC) in New England.
- Training within Water Supply Reserve Area.
- > 130,000 training days per year for multiple military agencies.
- Designated as a ‘Collective Training Center’, requiring >9,999 acres of ‘maneuver land’.
- Currently have 10,904 acres.
- Any use of this land for highway uses would reduce ANG’s Maneuver Land, risking their future designation as a training site.
Upper Cape Water Supply Reserve at Joint Base Cape Cod – Property Impacts.

Joint Base Cape Cod – Reduction in “Maneuver Land” (~29 Acres)

Potential Mid-Canal Bridge Alignment
Intelligent Transportation Systems (ITS) on Cape Cod.

- ITS systems include:
  - Variable Message Signs.
  - Real-Time Traffic Monitoring.
  - Traffic Cameras.
Intelligent Transportation Systems (ITS) on Cape Cod.

- ITS systems provides information related to:
  - Real-time traveler information.
  - Incident Management (crashes, spills).
  - Congestion Management.
  - Construction.
  - Weather-related (blizzards, hurricanes).
  - Safety information.
Intelligent Transportation Systems (ITS) on Cape Cod.

Intelligent Transportation Systems (ITS) on Cape Cod.
Alternatives Development and Analysis.
Assumptions for Alternatives Development Process.

- Focus on year-round safety and mobility problem locations.
- Short- and Mid-Term Alternatives assume existing bridges remain and do not preclude new bridge construction.
- New bridges to be built adjacent to (inside of the) existing bridges. Toll-Free.
Design Understanding.

- Design for future (2040) fall weekday PM peak period.
- Seek further improvements for summer Saturday peak, as feasible.
- Not trying to resolve all peak-season traffic problems.
Evaluation of Alternatives - Travel Demand Model.

- Transportation Improvements will be layered upon one another in order to achieve acceptable future traffic conditions.

- Selected improvements at Bourne Rotary, Belmont Circle, Exit 1C will be evaluated with existing bridges and new widened bridges.

- Travel demand model will evaluate whether the ‘transportation system’ works as desired.
Selection of Package of Alternatives.

- Ultimately, selected improvements will be based on a balance of:
  - Effectiveness.
  - Environmental Impact.
  - Community Disruption.
  - Property Impacts.
  - Cost.
Review of Short-Term Alternatives (1-3 Years)

Few environmental or property impacts
<table>
<thead>
<tr>
<th>Location.</th>
<th>Work Proposed.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Scenic Hwy at Canal Road/State Road, Bourne.</td>
<td>Signal Optimization</td>
</tr>
<tr>
<td>2. Route 6A at Cranberry Hwy/Sandwich Road, Bourne.</td>
<td>Left-Turn Lane on Sandwich Road westbound approach.</td>
</tr>
<tr>
<td>3. Route 130 at Cotuit Road, Sandwich.</td>
<td>New Traffic Signals</td>
</tr>
<tr>
<td>4. Sandwich Road at Bourne Rotary Connector, Bourne.</td>
<td>Sandwich Road Through Lane</td>
</tr>
<tr>
<td>5. Sandwich Road at Harbor Lights Road, Bourne.</td>
<td>No short-term work proposed</td>
</tr>
<tr>
<td>6. Scenic Highway at Nightingale Pond Road, Bourne.</td>
<td>Signal Optimization</td>
</tr>
<tr>
<td>7. Belmont Circle, Bourne.</td>
<td>MassDOT Bicycle/Pedestrian Improvements (TIP #600900)</td>
</tr>
</tbody>
</table>
Location 2: Route 6A at Cranberry Highway/Sandwich Road
Future 2040 Peak Periods.

Proposed: Add exclusive left-turn lanes on westbound approach.
Sidewalk on Sandwich Rd. No sidewalk on Cranberry Hwy.
Location 2: Route 6A/Cranberry Hwy - Potential Environmental Impact.
Proposed: Signalized Intersection. Add sidewalks/bike shoulders

Overall Delay: Reduced from 39 to 12 Seconds. (2040 Fall PM)

No Environmental or Property Impact

Location 3: Route 130 at Cotuit Road, Sandwich

Future 2040 Peak Periods.

Signalized Intersection

LOS
Fall PM (4:00 to 6:00) Weekday 2040
No Build → Build
Summer Saturday (10:00 AM to 12:00 PM) 2040 No Build → Build

Proposed: Signalized Intersection. Add sidewalks/bike shoulders

Overall Delay: Reduced from 39 to 12 Seconds. (2040 Fall PM)

No Environmental or Property Impact
Proposed: Signalized Intersection with Direct Access from Bourne Rotary Connector to Sandwich Road (‘Florida T-intersection’).
Will ensure compatibility with Bourne Rotary Improvements.
Add sidewalks and bike shoulders
Location 4: Sandwich Rd/Bourne Rotary Connector - ‘Florida T’ Intersection.
Location 4: Sandwich Rd/Bourne Rotary Connector - Potential Environmental and Property Impact.
Location 2, 3, and 4: Potential Environmental and Property Impact.

<table>
<thead>
<tr>
<th>Resource Areas:</th>
<th>Location 2</th>
<th>Location 3</th>
<th>Location 4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(Rt. 6A/ Cranberry Hwy)</td>
<td>(Route 130 at Cotuit Road)</td>
<td>(Sandwich Rd at Bourne Rotary Connector)</td>
</tr>
<tr>
<td>Rare Species Habitat</td>
<td>0 Acres</td>
<td>0 Acres</td>
<td>0.2 Acres</td>
</tr>
<tr>
<td>Open Space (Town of Bourne)</td>
<td>0 Acres</td>
<td>0 Acres</td>
<td>0.02 Acres</td>
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<tr>
<td>Right of Way:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Residential</td>
<td>0.02 Acres</td>
<td>0 Acres</td>
<td>0 Acres</td>
</tr>
<tr>
<td>Commercial</td>
<td>0.01 Acres</td>
<td>0 Acres</td>
<td>0.01 Acres</td>
</tr>
</tbody>
</table>
Short- and Mid-Term Multimodal Alternatives
Potential New Connections to Canal Bikeway.

• Old Bridge Road – Bourne.

• Pleasant Street – Bourne.

• Bourne Ball Field – Bourne.
Bourne Rail Trail.

Cape Cod Commission feasibility study completed October 2016

Evaluated 2 Options:

- Rail-with-Trail ($14.7M to 25.5M)
- Rail-to-Trail ($9.0M)

Other Potential Alignment
- Parallel to east side of Route 28.
Travel Path - Bike/Ped Access over Sagamore Bridge.

Desire route for ped/bikes from roadways north and south of Sagamore Bridge.

Existing sidewalk.

Route 6A designated bike route.
Bike/Ped Access over Sagamore Bridge (North of Canal).
Bike/Ped Access over Sagamore Bridge (South of Canal).
Complete Streets Concept at Adams Street.
Travel Path - Bike/Ped Access over Bourne Bridge.
Bike/Ped Access over Bourne Bridge (North of Canal).

- RECONSTRUCT AND WIDEN SIDEWALK
- ADD LANE STRIPING AND SIGNAGE
Bike/Ped Access over Bourne Bridge (South of Canal).

BOURNE ROTARY

NEW SIDEWALK/PIPELINE TO BE CONSTRUCTED

KEY MAP
Park and Ride Lots

15 Park and Ride Lots on the Cape and Just North of the Canal

- 25 Parking Spaces, 36% Full
- 35 Parking Spaces, 71% Full
- 377 Parking Spaces, 90% Full

Potential Park and Ride Lot at Exit 2

Route 6 Exit 6 (Barnstable) 365 Spaces, 100% Full
Park and Ride Lots.

• Reduce single-occupant-vehicle (SOV) travel over bridges.
• Existing Park and Ride lots on Route 6 at 90% to 100% capacity.
• Served by bus lines (P&B/CCRTA).
• Expansion of lot at Exit 6 is possible and would be beneficial.
• Route 130 (Exit 2) would provide a P&R lot between the two existing lots.
Sagamore Park and Ride License Plate Survey.

- October 2016 Mid-Week Survey
- Origin of vehicles to determine viability of Exit 2 Park and Ride Lot.

Findings:
- Lot was 99% Full
- 70% of vehicles are closer to Exit 2.
- Contacting CCRTA to consider adding P&R lot to Sandwich Bus Route.
- Transferring from Sandwich Line to P&B not ideal for commuters
Potential Mid-Term – Multi-Modal Center Route 6 at Route 130 Park & Ride Lot.
Potential Mid-Term – Multi-Modal Center Route 6 at Route 130 Park & Ride Lot.

- Potential Location for a 100-space Park and Ride Lot
- Secure Bike Storage Area
- Connection to future service road bike path and bus route
Potential Improvements To “Gateway” Locations.

Mid- to Long-Term Alternatives (3-8 or 8+ Years)
Access On & Off Cape Cod is a System.
Access System - Two Parts.

Part 1: Bridges Spanning Canal linking to Network (Responsibility of the USACE).

- Sagamore Bridge
- Bourne Bridge

Part 2: “Gateway” Roads and intersections linking to bridges (Responsibility of MassDOT).

- Sagamore Interchange (Reconstructed in 2006)
- Route 6 at Exit 1C
- Belmont Circle
- Bourne Rotary
Access System Limitations.

Total Volumes = 56,800

86% (19,000)

8% (1,800)

48% (18,000)
Access System Limitations.
Route 6 - Exit 1C.
Problems with Existing Exit 1C Westbound Ramp.

- Contributes to Route 6 westbound congestion due to:
  - Very short (<180 foot) acceleration lane immediately before Sagamore Bridge (should be 1,000 ft).
  - Steep grade onto bridge.

- Future Sagamore Bridge would likely flatten bridge grades, requiring the closure or relocation of Exit 1C to the east.
Constraints Related to the Relocation of Exit 1C.

- Need connection to roadway network.
- Joint Base Cape Cod/Upper Cape Water Reserve to the west of Route 6.
- State Forest to the east.
- Residential neighborhoods.
- Old Kings Highway Historic District
Route 6 – Existing Land Uses.

EXISTING EXIT 1C

2 MILES – DESIRED DISTANCE BETWEEN HIGHWAY INTERCHANGES

EXIT 2
Benefits of Relocated Route 6 Exit 1C.

- New Exit 1C at utility corridor (3,400 feet east).
- New Roadway to Route 130 at Route 6A.
- Potentially reduces congestion and improves safety with longer acceleration lanes on Route 6.
- Planned to be compatible with future Sagamore Bridge.
- Potentially no adverse impact on local traffic patterns.
Relocated Route 6 - Exit 1C
Traffic Volumes - 2040 Peak Periods.

X = Fall PM (4:00 to 6:00)
Weekday Volumes

(X) = Summer Saturday (10:00 AM to 12:00 PM) Volumes
Route 6A/Route 130 Intersection
Option 1 – Signalized Intersections
2014 Existing Level of Service.

= 2014 Existing Fall
PM (4:00 to 6:00)
Weekday LOS
Route 6A/Route 130 Intersection Option 1 – Signalized Intersections Future (2040) Peak Periods.

(x) = 2040 Fall PM (4:00 to 6:00) Weekday Delay

(x) = 2040 Summer Saturday (10:00 AM to 12:00 PM) Delay

= LOS

= LOS
Route 6A/Route 130 Intersection
Option 2 – 4 Leg Roundabout.

(x) = 2040 Fall PM
(4:00 to 6:00)
Weekday Delay

(x) = 2040 Summer Saturday (10:00 AM to 12:00 PM) Delay

(x) = LOS

(x) = LOS
Route 6A/Route 130 Intersection
Option 3 – 5 Leg Roundabout.

(x) = 2040 Fall PM
(4:00 to 6:00)
Weekday Delay
X = LOS

(x) = 2040 Summer
Saturday (10:00 AM to 12:00 PM) Delay
X = LOS
Effect of New Exit 1C on Off-Season Travel Times from Area Neighborhoods.

PROPOSED RELOCATED ROUTE = 4 min. 45 seconds (2.7 miles)

EXISTING ROUTE = 45 seconds (0.4 miles)

Calculated Using
- Speed Limits
- Distances
- Intersections
Relocated Exit 1C
Potential ROW / Environmental Impacts.

Affected Property Areas
Relocated Exit 1C
Potential ROW / Environmental Impacts.
# Relocated Exit 1C
## Potential ROW / Environmental Impacts

<table>
<thead>
<tr>
<th>Resource Areas:</th>
<th>Signalized Alternative</th>
<th>4-Leg Roundabout Alternative</th>
<th>5-Leg Roundabout Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rare Species Habitat</td>
<td>7.4 Acres</td>
<td>7.2 Acres</td>
<td>7.0 Acres</td>
</tr>
<tr>
<td>Open Space (DCR - Shawme-Crowell State Forest)</td>
<td>0.5 Acres</td>
<td>0.6 Acres</td>
<td>0.5 Acres</td>
</tr>
<tr>
<td>Interim Wellhead Protection Area (IWPA)</td>
<td>4.6 Acres</td>
<td>5.7 Acres</td>
<td>5.5 Acres</td>
</tr>
<tr>
<td>Right of Way:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Residential</td>
<td>0.02 Acres</td>
<td>0.15 Acres</td>
<td>0.03 Acres</td>
</tr>
<tr>
<td>Commercial</td>
<td>0.02 Acres</td>
<td>0.9 Acres</td>
<td>0.26 Acres</td>
</tr>
<tr>
<td>Utility</td>
<td>3.5 Acres</td>
<td>3.8 Acres</td>
<td>3.8 Acres</td>
</tr>
</tbody>
</table>
The Study Team suggest advancing:

OPTION 2 – 4 LEG ROUNDABOUT
for Travel Demand Model analysis.

Reason: Simpler design more fitting in with
the community context. Acceptable traffic
operations and limited property and
environmental impact.
Route 6A/Route 130 Intersection
Option 2 – 4 Leg Roundabout.
Belmont Circle.

BUZZARDS BAY BYPASS

HEAD OF THE BAY ROAD

RAMP - RT 25 TO RT 6/28 NB

BOURNE BRIDGE PEDESTRIAN ACCESS

RAMP - RT 6/28 SB TO RT 25

UTILITY CORRIDOR

ROUTE 25

FITTINGALE POND ROAD

SCENIC HIGHWAY

BOURNE BRIDGE

MAIN STREET

BELMONT CIRCLE
Belmont Circle
Belmont Circle
Traffic Weaving & Existing Peak Period LOS.

BELMONT CIRCLE

15% 195 (15%) (255)

25% 215 (8%) (105)

65% 560 (54%) (680)

85% (85%) 1,155 (1,445)

40% 345 (46%) (575)

35% 290 (46%) (570)

X = Fall PM (4:00 to 6:00) Volumes
(x) = Summer Saturday
(10:00 AM to 12:00 PM) Volumes
Belmont Circle
2040 Future No Build Peak Periods
Queue Lengths.

BUZZARDS BAY
BYPASS
BELMONT CIRCLE
SCENIC HIGHWAY

1,208 ft. (8,931 ft.)
1,820 ft. (10,033 ft.)

67 ft. (160 ft.)
94 ft. (1,670 ft.)

(x) = Summer Saturday (10:00 AM to 12:00 PM) 2014
(x) = Fall PM (4:00 to 6:00) Weekday 2014
Belmont Circle Crash History.

How Proposed Alternatives may reduce crash rates:

- Reduced conflicts in rotary because substantial traffic redirected out of rotary.
- Signalized intersection will reduce crash rates.
Belmont Circle – Transportation Improvement Alternatives.

- Prior studies concluded design alternatives within the Circle failed to improve traffic conditions.

- Successful alternative must balance:
  - Reducing traffic volumes entering the Circle.
  - Safely accommodating regional traffic.
  - Maintain access to local business (consider combining driveways).
  - Compatibility with future Bourne Bridge
Scenic Hwy to Route 25 Westbound Ramp.

• Diverts traffic from Belmont Circle. (685 cars in 2040 Fall PM peak period).
• Access from Scenic Hwy westbound only.
• Maintains access to adjacent residential areas.
• Potentially improves traffic operations and safety in Belmont Circle (high crash loc.).
Los Scenic Hwy to Route 25 Westbound Ramp. Traffic Volumes and LOS at 2040 Peak Periods.

- Fall PM (4:00 to 6:00) Weekday Volumes
- Summer Saturday (10:00 AM to 12:00 PM) Volumes

Los
- Fall PM (4:00 to 6:00) Weekday 2014 Existing → 2040 No Build
- Summer Saturday (10:00 AM to 12:00 PM) 2014 Existing → 2040 No Build

Signalized Intersection

685 (of 1,605)
875 (of 2,095)
Scenic Hwy to Route 25 Westbound Ramp.
Queue Lengths at 2040 Peak Periods.

(x) = Summer
Saturday (10:00 AM to 12:00 PM)
2040 Build with Slip Ramp

(x) = Fall PM (4:00 to 6:00) Weekday
2040 Build with Slip Ramp

1,049 ft. (9,346 ft.)
149 ft. (3,562 ft.)
39 ft. (173 ft.)
0 ft. (2,664 ft.)
Scenic Hwy to Route 25 Westbound Ramp.

Environmental Constraints.
Belmont Circle – Alternative 1
3 Leg Roundabout with Signalized Intersection.

- 3 Leg Roundabout replaces Circle.
- Update Signalized Intersection at Scenic Hwy/Nightingale Pond Road to include Route 25 on ramp.
- Maintains access to all local roadways and properties.
- Includes New Ramp from Scenic Highway to Route 25 Westbound.
- Potentially improves traffic operations and safety in Belmont Circle (high crash loc.).
Belmont Circle – Alternative 1
3 Leg Roundabout with Signalized Intersection.
Future (2040) Fall PM Peak.

(x) = 2040 Fall PM
(4:00 to 6:00)
Weekday Delay
X = LOS

(x) = 2040 Summer
Saturday (10:00 AM
to 12:00 PM) Delay
X = LOS

(x) = LOS

Signalized Intersection

(137.7 s)
(21.6 s)
(104.5 s)
(9.6 s)
(31.9 s)
Belmont Circle Alternative 1
Future (2040) Queue Lengths.

x = Fall PM (4:00 to 6:00) Weekday
2040

(x) = Summer Saturday (10:00 AM to 12:00 PM)
2040

- BUZZARDS BAY BYPASS
- MAIN STREET
- BELMONT CIRCLE
- SCENIC HIGHWAY

- 261 ft. (636 ft.)
- 474 ft. (1,749 ft.)
- 135 ft. (240 ft.)
- 290 ft. (870 ft.)
Belmont Circle - Alternative 1A
4 Leg Roundabout with Route 25 Eastbound

- 4 Leg Roundabout replaces Circle.
- Signalized Intersection on Scenic Hwy to Route 25 Ramp.
- Fly-over ramp from Route 25 eastbound to Scenic Hwy.
- Maintains access to all local roadways and properties.
- Includes New Ramp from Scenic Highway to Route 25 Westbound.
Belmont Circle – Alternative 1A
4 Leg Roundabout with Route 25 Eastbound Fly-Over. Future (2040) Fall PM Peak.

(x) = 2040 Fall PM
(4:00 to 6:00)
Weekday Delay

(9.6 s) (31.9 s)

(x) = 2040 Summer Saturday (10:00 AM to 12:00 PM) Delay

(137.7 s)

(17.1 s)

(41.1 s)

Signalized Intersection

Signalized Intersection
Belmont Circle Alternative 1A
Future (2040) Queue Lengths.

<table>
<thead>
<tr>
<th>Season</th>
<th>Time</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall PM</td>
<td>4:00 to 6:00</td>
<td>201 ft. (636 ft.)</td>
</tr>
<tr>
<td>Summer</td>
<td>Saturday</td>
<td>474 ft. (1,749 ft.)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>35 ft. (60 ft.)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>290 ft. (870 ft.)</td>
</tr>
</tbody>
</table>

**Note:**
- “x” = Fall PM (4:00 to 6:00) Weekday
- (x) = Summer Saturday (10:00 AM to 12:00 PM)
Belmont Circle – Alternative 2
4 Leg Roundabout with Main St. to Scenic Hwy

- 4 Leg Roundabout replaces Circle.
- Maintains access to all local roadways and properties.
- Direct Ramp from Main Street to Scenic Hwy.
- Includes New Ramp from Scenic Highway to Route 25 Westbound.
- Potentially improves traffic operations and safety in Belmont Circle (high crash loc.).
Belmont Circle – Alternative 2
4 Leg Roundabout with Main St. to Scenic Hwy Ramp Future (2040) Fall PM Peak.

(\(x\)) = 2040 Fall PM
(4:00 to 6:00) Weekday
Delay
\(x\) = LOS

(\(x\)) = 2040 Summer Saturday (10:00 AM to 12:00 PM) Delay
\(x\) = LOS

Signalized Intersection
Belmont Circle Alternative 2
Future (2040) Queue Lengths.

- **x** = Fall PM (4:00 to 6:00) Weekday 2040
- **(x)** = Summer Saturday (10:00 AM to 12:00 PM) 2040

Queue Lengths:
- 225 ft. (270 ft.)
- 390 ft. (675 ft.)
- 75 ft. (525 ft.)
- 30 ft. (255 ft.)
## Belmont Circle – Alternatives 1, 1A, 2

**Comparison of Fall Weekday PM Queue Lengths.**

<table>
<thead>
<tr>
<th>Approaches</th>
<th>2014 Existing</th>
<th>2040 Future No Build</th>
<th>2040 Future Build with Slip Ramp</th>
<th>Alternative 1</th>
<th>Alternative 1A</th>
<th>Alternative 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scenic Hwy East Bound</td>
<td>1,285 Ft</td>
<td>1,820 Ft</td>
<td>149 Ft</td>
<td>290 Ft</td>
<td>290 Ft</td>
<td>30 Ft</td>
</tr>
<tr>
<td>Main St East Bound</td>
<td>0 Ft</td>
<td>94 Ft</td>
<td>0 Ft</td>
<td>474 Ft</td>
<td>474 Ft</td>
<td>390 Ft</td>
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<tr>
<td>Route 25 East Bound Exit Ramp</td>
<td>1,009 Ft</td>
<td>1,208 Ft</td>
<td>1,049 Ft</td>
<td>135 Ft</td>
<td>35 Ft</td>
<td>75 Ft</td>
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<tr>
<td>Buzzards Bay Bypass West Bound</td>
<td>75 Ft</td>
<td>67 Ft</td>
<td>39 Ft</td>
<td>261 Ft</td>
<td>261 Ft</td>
<td>225 Ft</td>
</tr>
</tbody>
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Belmont Circle – Alternatives 1, 1A, 2
Comparison of Summer Saturday Queue Lengths.

<table>
<thead>
<tr>
<th>Approaches</th>
<th>2014 Existing</th>
<th>2040 Future No Build</th>
<th>2040 Build with Slip Ramp</th>
<th>Alternative 1</th>
<th>Alternative 1A</th>
<th>Alternative 2</th>
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<tr>
<td>Scenic Hwy East Bound</td>
<td></td>
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<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td>10,015 Ft</td>
<td>10,033 Ft</td>
<td>3,562 Ft</td>
<td>870 Ft</td>
<td>870 Ft</td>
<td>255 Ft</td>
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<tr>
<td>Main St East Bound</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1,374 Ft</td>
<td>1,670 Ft</td>
<td>2,664 Ft</td>
<td>1,749 Ft</td>
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<td>675 Ft</td>
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<td>8,931 Ft</td>
<td>9,346 Ft</td>
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<td>Buzzards Bay Bypass West Bound</td>
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<td>93 Ft</td>
<td>160 Ft</td>
<td>173 Ft</td>
<td>s36 Ft</td>
<td>636 Ft</td>
<td>270 Ft</td>
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Belmont Circle
Potential Property / Environmental Impacts.

ALTERNATIVE 1 SHOWN

Legend
- Federal Open Space (2)
- Municipal Open Space (4)
- Private Open Space (1)
- 100-year Flood Zone
- 500-year Flood Zone
- Wetlands
- DEP Approved Zone I
- NHPAs
- National Historic Preservation Act
- NHESP Estimated Habitats of Rare Wildlife
- NHESP Priority Habitats of Rare Species

Nightingale Pond Conservation Area
BELMONT CIRCLE
Buzzards Bay Water District
SCENIC HIGHWAY
Cape Cod Canal Access
Bourne Scenic Park
<table>
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<th>Resource Areas:</th>
<th>Scenic Hwy to Route 25 WB Ramp</th>
<th>Alternative 1</th>
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<td>Rare Species Habitat</td>
<td>1.1 Acres</td>
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<td>Open Space (By Owner)</td>
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<td>Army Corps of Engineering</td>
<td>0 Acres</td>
<td>0.1 Acres</td>
<td>0.1 Acres</td>
<td>0.1 Acres</td>
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<tr>
<td>DEP Wetlands</td>
<td>0 Acres</td>
<td>0.3 Acres</td>
<td>0.5 Acres</td>
<td>0.03 Acres</td>
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<tr>
<td>100-year Floodplain</td>
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<td>4.7 Acres</td>
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<td>IWPA (Interim Wellhead Protection Area)</td>
<td>0.2 Acres</td>
<td>0.5 Acres</td>
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<td>0.4 Acres</td>
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<td>Right of Way:</td>
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<td>0.02 Acres</td>
<td>0.02 Acres</td>
<td>0.02 Acres</td>
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<tr>
<td>Residential</td>
<td>0 Acres</td>
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<td>0.02 Acres</td>
<td>0.02 Acres</td>
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<td>Utility</td>
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Belmont Circle
Potential ROW / Environmental Impacts.
Belmont Circle
Study Team Suggestion.

• The Study Team suggests advancing

ALTERNATIVE 1 – 3 LEG ROUNDABOUT WITH SIGNALIZED INTERSECTION

for Travel Demand Model analysis.

• Reason: Improved traffic operations with simpler, less costly design. Less environmental or property impact.
Belmont Circle – Alternative 1
3 Leg Roundabout with Signalized Intersection.
Bourne Rotary.

UPPER CAPE REGIONAL TECHNICAL HIGH SCHOOL
Bourne Rotary Fall PM Peak Existing (2014) and Future No Build (2040) Queue Lengths.

**EXISTING**
- 5,425 ft.
- 16,713 ft.
- 615 ft.
- 526 ft.
- 1,385 ft.
- 3,662 ft.
- 3,170 ft.
- 1,027 ft.

**FUTURE**
- (10,030 ft.)
- (27,714 ft.)
- (2,385 ft.)
- (4,489 ft.)
- (8,758 ft.)
- (4,865 ft.)
- (4,194 ft.)
Bourne Rotary Crash History

How proposed improvements may reduce crash rates

- Conflicts reduced because traffic redirected to ramps outside of rotary.
- Signalized intersections reduce conflicts.
Alternatives 1, 1A, and 2 conceived to be compatible with existing Bourne Bridge.

May be compatible with future Bourne Bridge with consideration of:
- Proximity of bridge to rotary
- Horizontal and vertical alignment of new bridge.

Alternative 3 and 3A conceived to be compatible with new bridge (with alignment inside of existing bridge).
Bourne Rotary Alternative 1.

- Direct ramp from Route 28 northbound to Bourne Rotary Connector.
- Signalized intersection at Old Sandwich Road at Sandwich Road/Bourne Rotary Connector.
- Direct access ramp from Bourne Rotary Connector to Sandwich Road (‘Florida T’).
- Relocation of High School driveway entrance (350 feet east).
Bourne Rotary Alternative 1 – Route 28 Northbound Ramp.
Bourne Rotary Alternative 1
Future (2040) LOS.
Bourne Rotary Alternative 1 – Future (2040) Queue Lengths.

**TROWBRIDGE RD**

9,340 ft. (27,564 ft.)

875 ft. (877 ft.)

635 ft. (309 ft.) 4,895 ft. (3,052 ft.)

(x) = Summer Saturday (10:00 AM to 12:00 PM) 2040

x = Fall PM (4:00 to 6:00) Weekday 2040

875 ft. (877 ft.)

635 ft. (309 ft.)

4,895 ft. (3,052 ft.)
Bourne Rotary – Alternative 1A

- Direct Ramp from Route 28 southbound to Old Sandwich Road (via Veteran’s Way).
- Old Sandwich Road over/underpass to Sandwich Road.
- Direct ramp from Route 28 northbound to Bourne Rotary Connector.
- Potentially improves traffic operations and safety in Bourne Rotary (high crash location).
Bourne Rotary Alternative 1A – Route 28 North and Southbound Ramps.

- Route 28 NB At-Grade Ramp
- Route 28 SB At-Grade Ramp to Sandwich Road
- Old Sandwich Road Underpass
- Relocated High School Driveway
Bourne Rotary Alternative 1A
Future (2040) LOS.

Fall PM (4:00 to 6:00)
Weekday LOS

Summer
Saturday (10:00 AM to 12:00 PM LOS)
Bourne Rotary – Alternative 1A
Future (2040) Queue Lengths.

- 2,955 ft. (17,029 ft.)
- 1,760 ft. (1,684 ft.)
- 875 ft. (874 ft.)
- 175 ft. (214 ft.)

(x) = Summer Saturday (10:00 AM to 12:00 PM) 2040
x = Fall PM (4:00 to 6:00) Weekday 2040
Bourne Rotary – Alternative 2.

• Direct ramp from Route 28 northbound to Bourne Rotary Connector.

• 3 new Signalized Intersections.
  • Veteran’s Way at Trowbridge Road.
  • Veteran’s Way at Old Sandwich Road.
  • Old Sandwich Road at Sandwich Road.

• No access around ‘top’ of Rotary
Bourne Rotary Alternative 2
3 Signalized Intersections

= New Signalized Intersection
Bourne Rotary Alternative 2
Future (2040) LOS.

New Signalized Intersection

- Summer Saturday (10:00 AM to 12:00 PM) LOS
- Fall PM (4:00 to 6:00) Weekday LOS
Bourne Rotary – Alternative 2
Future (2040) Queue Lengths.

TROWBRIDGE RD

5,620 ft. (13,685 ft.)

50 ft. (50 ft.)

210 ft. (371 ft.)

7,445 ft. (7,443 ft.)

(x) = Summer Saturday (10:00 AM to 12:00 PM)
2040

x = Fall PM (4:00 to 6:00) Weekday
2040
Comparison of Fall Weekday PM Queue Lengths.

<table>
<thead>
<tr>
<th>Approaches</th>
<th>2014 Existing</th>
<th>2040 Future No Build</th>
<th>2040 Alternative 1</th>
<th>2040 Alternative 1A</th>
<th>2040 Alternative 2</th>
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<tbody>
<tr>
<td>Route 28 North Bound</td>
<td>3,170 Feet</td>
<td>4,865 Feet</td>
<td>635 Feet</td>
<td>175 Feet</td>
<td>210 Feet</td>
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<tr>
<td>Route 28 South Bound</td>
<td>5,425 Feet</td>
<td>10,030 Feet</td>
<td>9,340 Feet</td>
<td>2,955 Feet</td>
<td>5,620 Feet</td>
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<tr>
<td>Bourne Rotary Connector</td>
<td>615 Feet</td>
<td>875 Feet</td>
<td>875 Feet</td>
<td>875 Feet</td>
<td>50 Feet</td>
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<tr>
<td>Trowbridge Road</td>
<td>1,385 Feet</td>
<td>2,385 Feet</td>
<td>4,895 Feet</td>
<td>1,760 Feet</td>
<td>7,445 Feet</td>
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**NOTE: FALL PM WEEKDAY QUEUE LENGTHS SHOWN**
### Bourne Rotary – Alternatives 1, 1A, 2

Comparison of Summer Saturday Queue Lengths.

<table>
<thead>
<tr>
<th>Approaches</th>
<th>2014 Existing</th>
<th>2040 Future No Build</th>
<th>2040 Alternative 1</th>
<th>2040 Alternative 1A</th>
<th>2040 Alternative 2</th>
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</thead>
<tbody>
<tr>
<td>Route 28 North Bound</td>
<td>1,027 Feet</td>
<td>4,194 Feet</td>
<td>309 Feet</td>
<td>214 Feet</td>
<td>371 Feet</td>
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<td>Route 28 South Bound</td>
<td>16,713 Feet</td>
<td>27,714 Feet</td>
<td>27,564 Feet</td>
<td>17,029 Feet</td>
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<td>Bourne Rotary Connector</td>
<td>525 Feet</td>
<td>870 Feet</td>
<td>877 Feet</td>
<td>874 Feet</td>
<td>50 Feet</td>
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<tr>
<td>Trowbridge Road</td>
<td>3,662 Feet</td>
<td>4,489 Feet</td>
<td>3,052 Feet</td>
<td>1,684 Feet</td>
<td>7,443 Feet</td>
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### NOTE: SUMMER SATURDAY QUEUE LENGTHS SHOWN
Bourne Rotary
Potential ROW / Environmental Impacts.

ALTERNATIVE 1A SHOWN
### Bourne Rotary

**Potential ROW / Environmental Impacts.**

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<tr>
<th>Resource Areas:</th>
<th>Alternative 1</th>
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<th>Alternative 2</th>
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<tbody>
<tr>
<td>Rare Species Habitat</td>
<td>1.3 AC</td>
<td>3.3 AC</td>
<td>2.0 AC</td>
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<tr>
<td>Army Corps of Engineering</td>
<td>0.1 AC</td>
<td>0.2 AC</td>
<td>0.4 AC</td>
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<tr>
<td>Town of Bourne</td>
<td>0.0 AC</td>
<td>1.0 AC</td>
<td>0.0 AC</td>
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<td>Right of Way:</td>
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<td>Residential</td>
<td>0.02 AC</td>
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<td>State Police Barracks</td>
<td>0 AC</td>
<td>0.17 AC</td>
<td>0.14 AC</td>
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Bourne Rotary
Study Team Suggestion.

The Study Team suggests advancing

ALTERNATIVE 2 – 3 SIGNALIZED INTERSECTIONS

for Travel Demand Model analysis.

Reason: Improved traffic operations. Potentially more compatible with new Bourne Bridge. Less impact to State Police barracks
Bourne Rotary Alternative 2.

- New Signalized Intersection

- Summer Saturday (10:00 AM to 12:00 PM)
- Fall PM (4:00 to 6:00)
- Weekday LOS

Legend:
- "S" = New Signalized Intersection

MAP LEGEND:
- Fall PM: 4:00 to 6:00
- Weekday LOS
- Summer Saturday: 10:00 AM to 12:00 PM
- LOS
Bourne Rotary – Alternative 3 and 3A
Long-Term Interchange Alternative

- Potential Alternative built concurrently with new bridge.
- Replacement of rotary with highway interchange.
- Grade-separated through traffic on Route 28
- Maintains all local access.
- Relocated high school driveway.
- Compatible with new, relocated Bourne Bridge.
Bourne Rotary - Alternative 3.

Potential Connection to new Bourne Bridge

Relocated High School Driveway
Bourne Rotary - Alternative 3A.

Potential Connection to new Bourne Bridge

Relocated High School Driveway

Route 28 Underpass with local roads at grade
Route 6 Eastbound Additional Travel Lane.

- Eastbound lane from Mid-Cape Connector to Exit 2 (Route130).
- Long Term Project - Potential component of Sagamore Bridge Replacement.
- Potentially reduces congestion and improves safety on Route 6 by allowing smoother merging of traffic entering or exiting Mid Cape Connector.
- Limited environmental impact.
Route 6 Eastbound Additional Travel Lane.

Route 6 Eastbound Additional Travel Lane from Mid Cape Connector to Exit 2.
Route 6 Eastbound
Additional Travel Lane –
Existing Conditions vs Future Conditions.

LOS
Fall PM (4:00 to 6:00) Weekday 2014
Existing→2040 No Build
Summer Saturday (10:00 AM to 12:00 PM) 2014 Existing→2040 No Build

1,100 (1,020)
1,100 (1,195)
1,400 (2,130)
2,300 (3,355)
2,500 (3,150)
3,400 (4,550)

x = Fall PM
(4:00 to 6:00)
2014
(x) = 2040

x = Summer Saturday
(10:00 AM to 12:00 PM) 2014
(x) = 2040
Route 6 Add-A-Lane (Southern End)
2014/2040 Peak Period Traffic Volumes.

LOS
Fall PM (4:00 to 6:00) Weekday 2014 Existing → 2040 No Build
Summer Saturday (10:00 AM to 12:00 PM) 2014 Existing → 2040 No Build
Route 6 Add-A-Lane
Potential Environmental Impact.

3.9 Acres of Rare Species Habitat Impact.
Questions?

Comments and feedback can be emailed to:
Ethan Britland- ethan.britland@state.ma.us.
Schedule and Next Steps.
Next Steps.

• Evaluation of identified alternatives using Regional Travel Demand Model.

• Evaluation Matrix: Selected Improvements will also be evaluated based on:
  • Effectiveness.
  • Environmental Impact.
  • Community Disruption.
  • Property Impacts.
  • Cost.
## Study Schedule

<table>
<thead>
<tr>
<th>TASK 3 Alternatives Development</th>
<th>2016</th>
<th>2017</th>
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<td>Aug</td>
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Questions?

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Ethan Britland- ethan.britland@state.ma.us.
End of Presentation.