Cape Cod Canal Transportation Study, Public Informational Meeting #4.

Bourne, Plymouth, Sandwich, Wareham.

Massachusetts Maritime Academy, Bourne.

February 13th 2019 from 7:00 PM to 9:00 PM.

PIM #4 Agenda.

1. Goals and Objectives
2. Study Assumptions, Travel Patterns, and future (2040) No-Build Traffic Volumes
3. Roadway Improvement Alternatives
4. Summary of Travel Analysis Findings
5. Draft Study Recommendations
6. Cost Estimates Summary
7. Next Steps

Goals and Objectives.

Study Purpose.

- The purpose of MassDOT's conceptual planning study is to evaluate existing and future transportation safety and congestion deficiencies in the Cape Cod Canal Study Area.
- The MassDOT study process has involved significant coordination with the US Army Corps of Engineers on its study of the Bourne and Sagamore Bridges.
- This includes the development and analysis of multimodal transportation alternatives for roadways, transit, and bicycle and pedestrian facilities in order to address identified deficiencies.
- A final report will include the study's analytical findings, a recommended plan of transportation improvements, and preliminary cost estimates for these improvements.

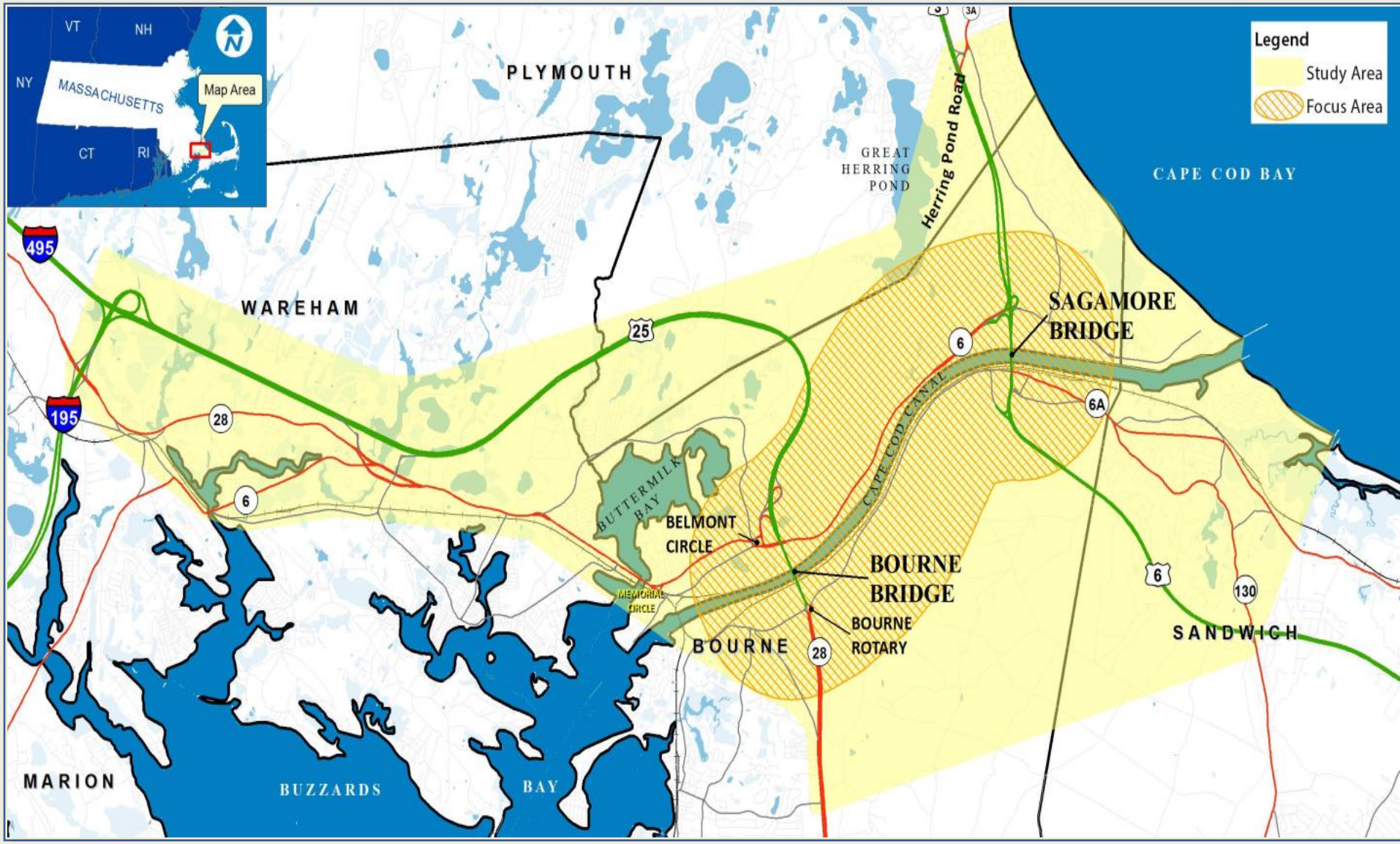
Study Goal.

- 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.

Study Objectives.

- Improve multimodal connectivity and mobility levels 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 to accommodate first responders trying to reach the Cape.

Study Area.


VT
NH
NY
MASSACHUSETTS
Map Area
CT
RI
PLYMOUTH
GREAT HERRING POND
Herring Pond Road
CAPE COD BAY
Legend
Study Area
Focus Area
495
WAREHAM
25
SAGAMORE BRIDGE
6
6A
195
28
6
CAPE COD CANAL
BUTTERMILK BAY
BELMONT CIRCLE
BOURNE BRIDGE
MEMORIAL CIRCLE
BOURNE ROTARY
BOURNE
28
6
130
SANDWICH
MARION
BUZZARDS
BAY

Conceptual Design Assumptions, Travel Patterns, and Future (2040) No-Build Traffic Volumes.

Design Assumptions.

- Focus on year-round safety and mobility problem locations.
- Design for future (2040) fall weekday PM peak period.
- Seek further improvements for summer Saturday peak, as feasible.
- New bridges to be built adjacent to existing bridges.

Access On & Off Cape Cod is a System.

Access System - Two Parts.

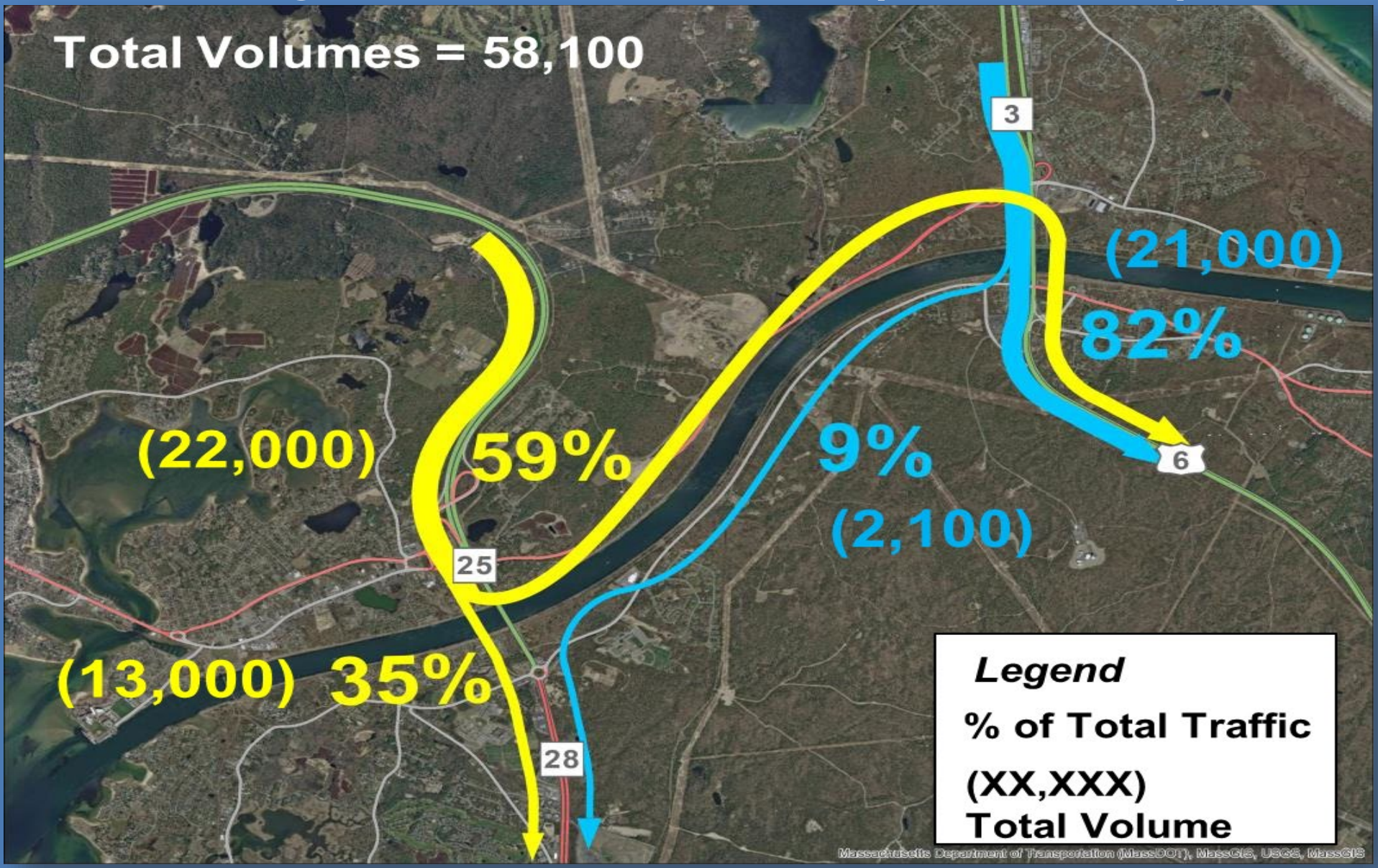
Part 1: Bridges spanning Cape Cod Canal linking to Network (Responsibility of the U.S. Army Corps of Engineers).

- Sagamore Bridge
- Bourne Bridge

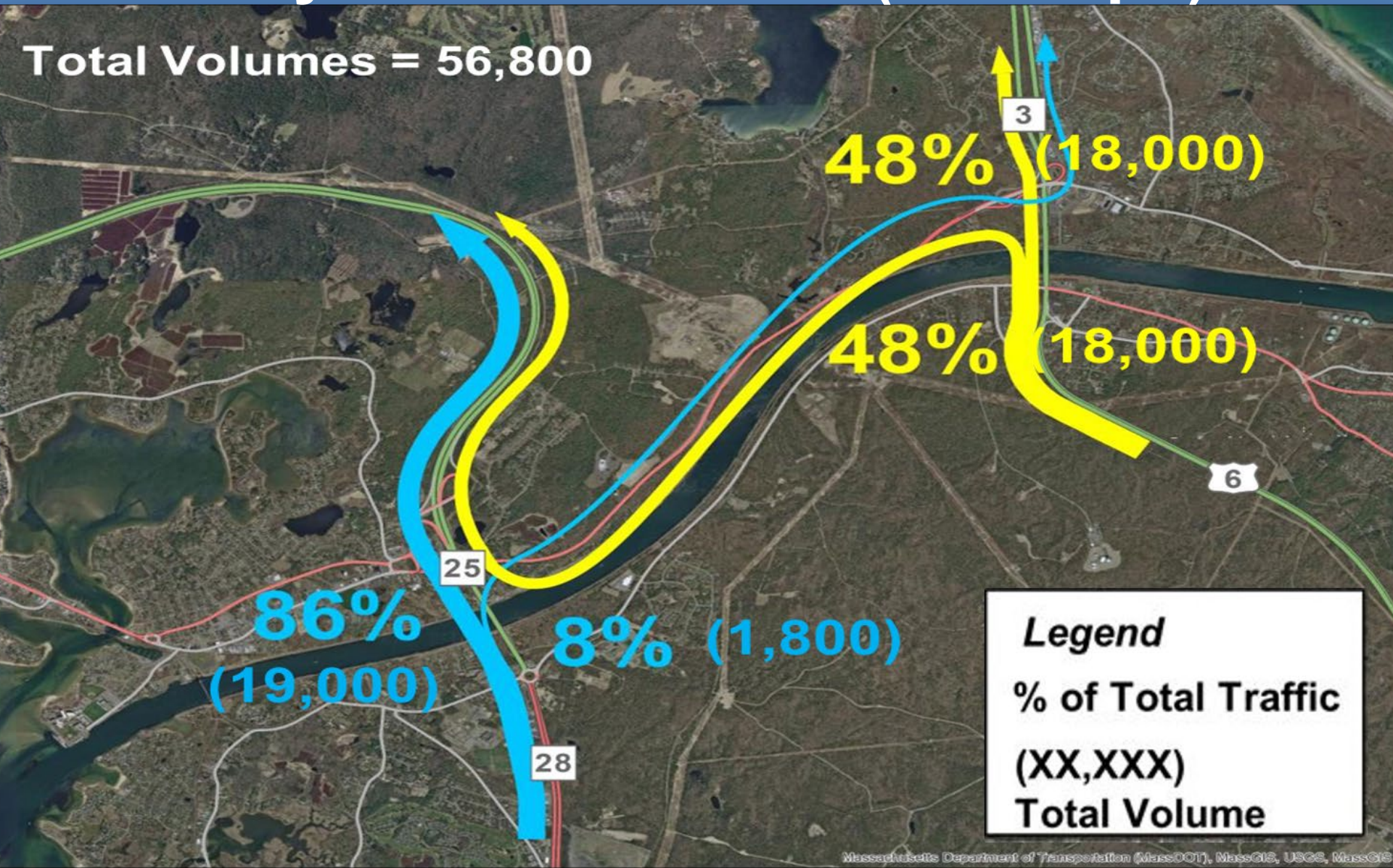
Part 2: "Gateway" roads and intersections linking to bridges (Responsibility of MassDOT).

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

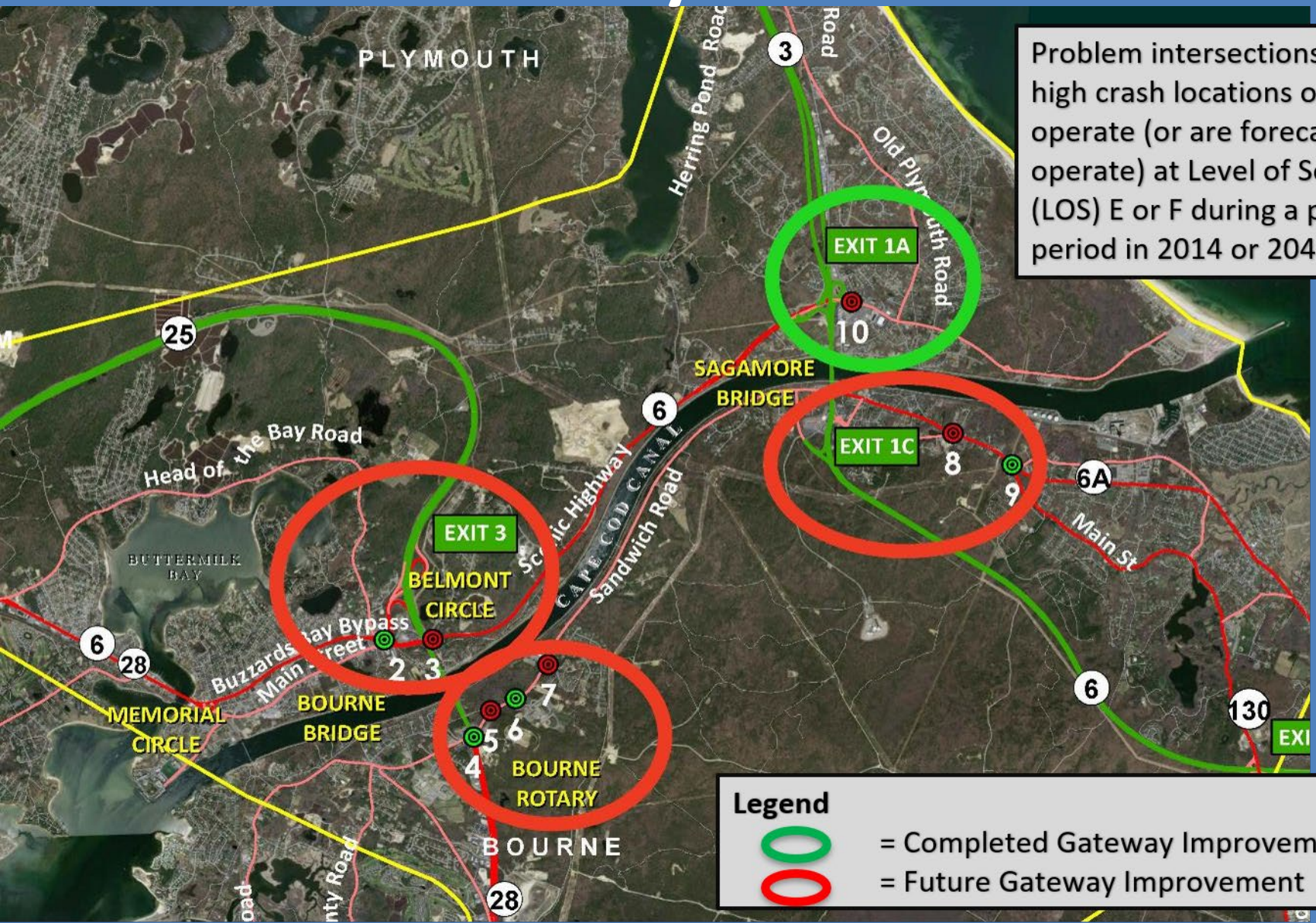
Summer Saturday
Daily Travel Patterns (On-Cape).



Summer Saturday
Daily Travel Patterns (Off-Cape).



Roadway System Limitations at ‘Gateway’ Locations.



Future (2040) No-Build Traffic Conditions.

How We Forecast Future Traffic Volumes – 2014 to 2040.

Future traffic volume based on forecasted growth in:

- Commuter trips (travel to and from work);
- Non-commuter trips (shopping, school, visiting friends/relatives, recreation);
- Visitor Trips

<u>2014 to 2040 Growth in Traffic</u>

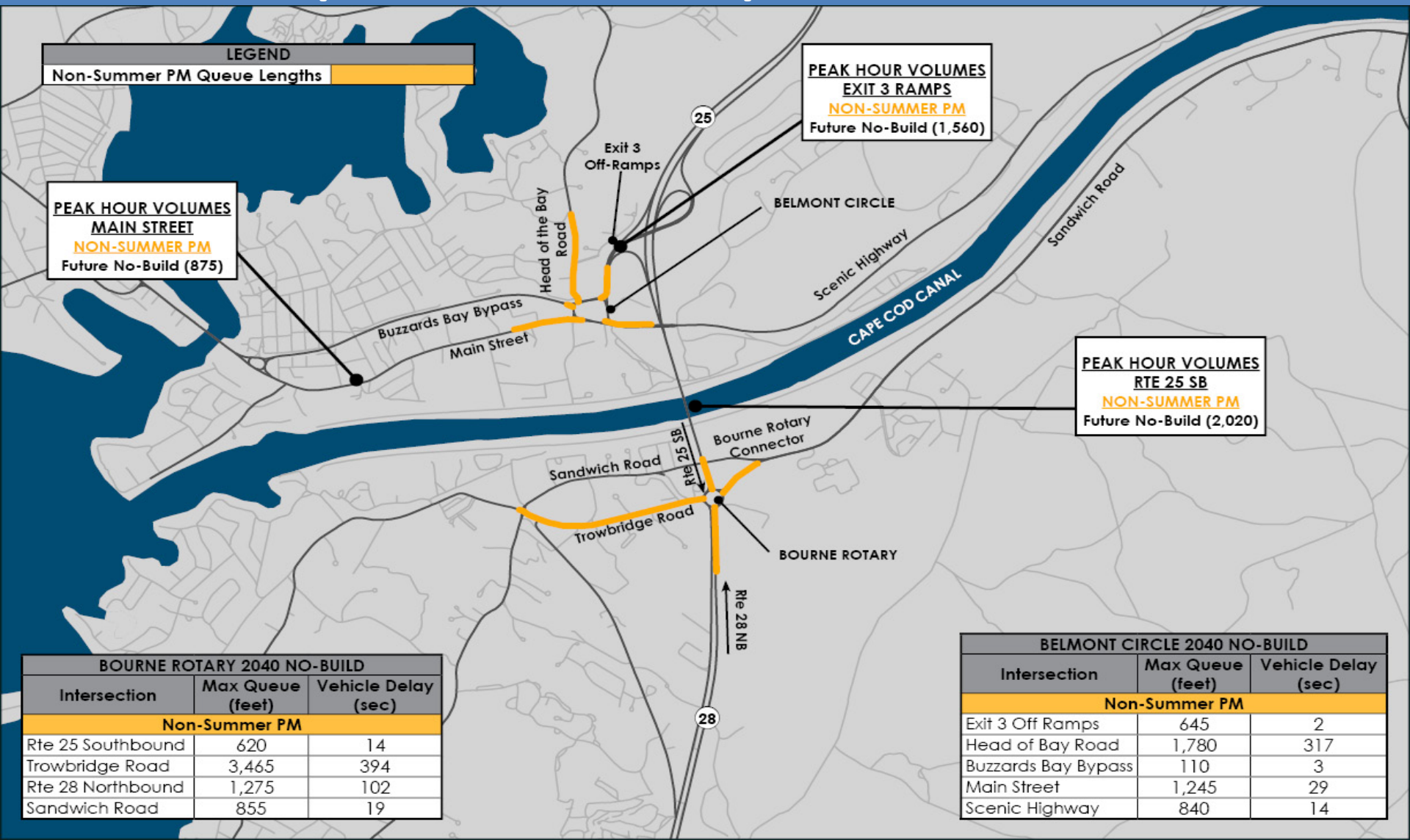
33.4 % Summer

22.5 % Non-Summer

2014 to 2040 Traffic Growth: Example Locations.

ATR Counting Stations	Summer ADT			Non-Summer ADT		
	Existing (2014)	Future (2040)	Projected Growth	Existing (2014)	Future (2040)	Projected Growth
Bourne Bridge	56,500	61,600	9%	38,000	45,200	19%
Sagamore Bridge	65,900	93,300	42%	41,400	59,600	44%
Route 6 (Scenic Highway) East of Nightingale Road	33,600	36,200	8%	21,200	25,400	21%
Sandwich Rd East of Bourne Rotary Connecter	20,800	33,400	8%	22,600	28,100	24%

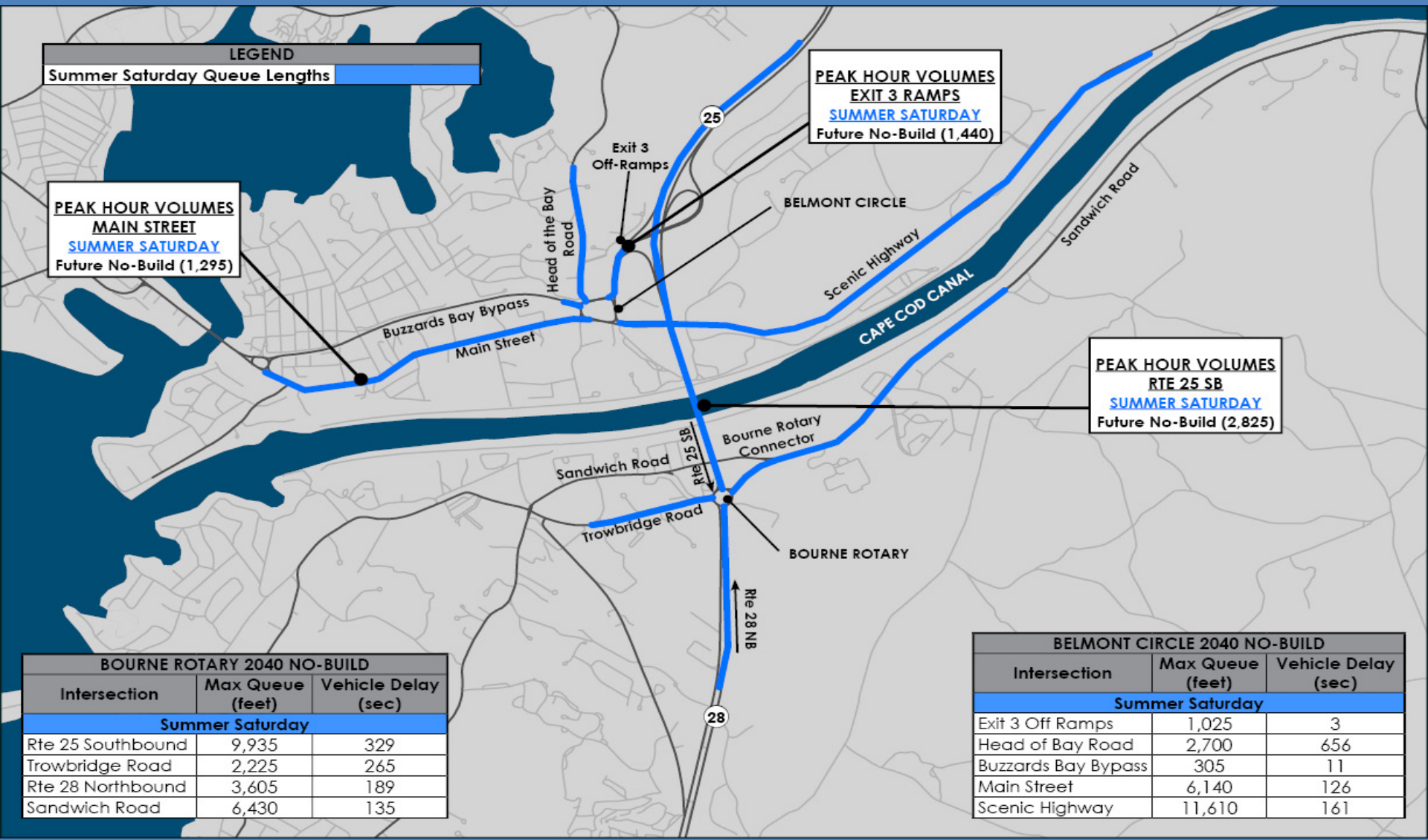
Bourne Bridge – Future (2040) No-Build Analysis Queues and Delay - Non-Summer Weekday PM (4:00 to 6:00 PM) Peak Period.



BOURNE ROTARY 2040 NO-BUILD		
Intersection	Max Queue (feet)	Vehicle Delay (sec)
Non-Summer PM		
Rte 25 Southbound	620	14
Trowbridge Road	3,465	394
Rte 28 Northbound	1,275	102
Sandwich Road	855	19

BELMONT CIRCLE 2040 NO-BUILD		
Intersection	Max Queue (feet)	Vehicle Delay (sec)
Non-Summer PM		
Exit 3 Off Ramps	645	2
Head of Bay Road	1,780	317
Buzzards Bay Bypass	110	3
Main Street	1,245	29
Scenic Highway	840	14

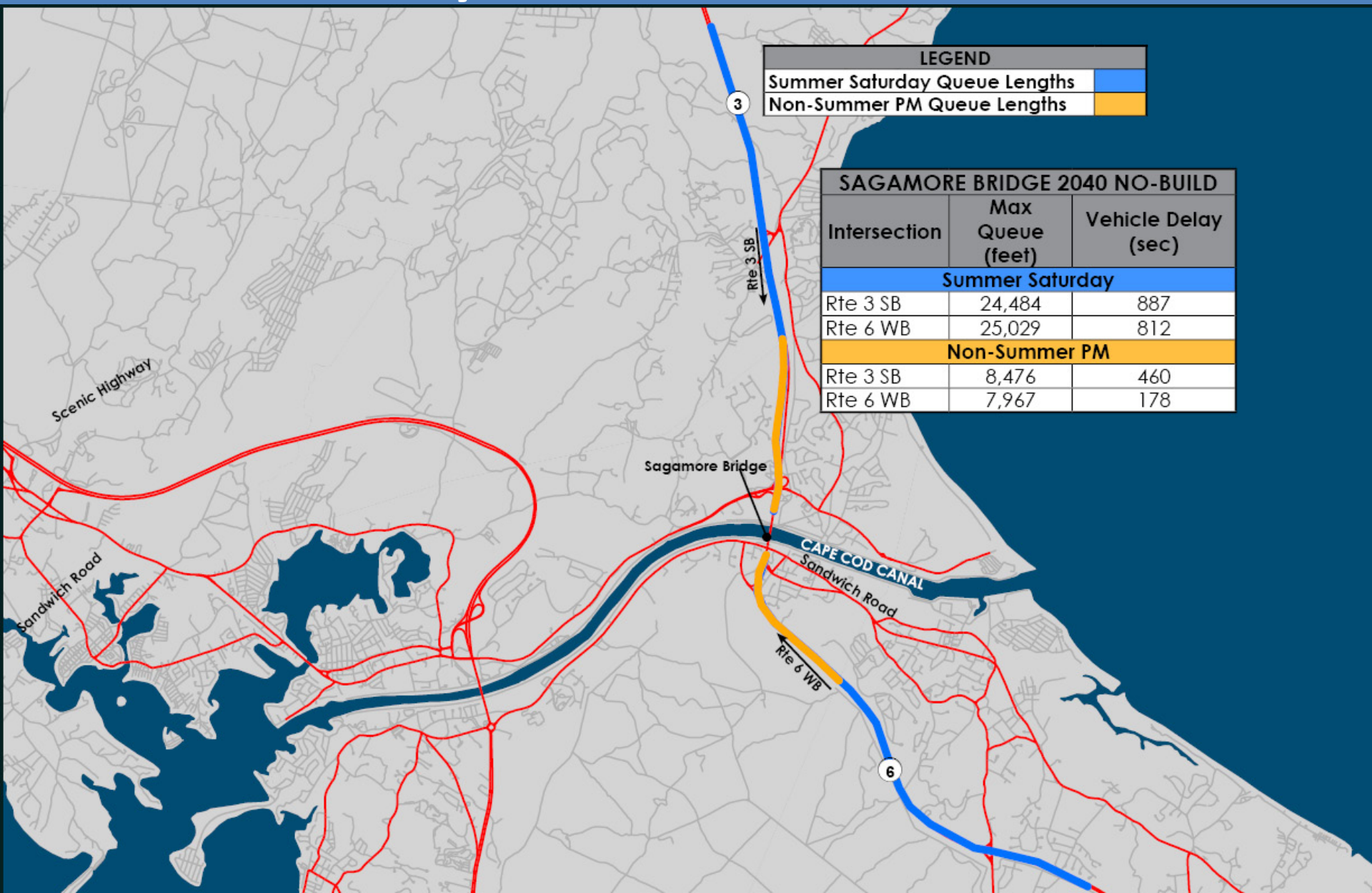
Bourne Bridge – Future (2040) No-Build Analysis Queues and Delay - Summer Saturday (10:00 AM to 12:00 PM) Peak Period.



BOURNE ROTARY 2040 NO-BUILD		
Intersection	Max Queue (feet)	Vehicle Delay (sec)
Summer Saturday		
Rte 25 Southbound	9,935	329
Trowbridge Road	2,225	265
Rte 28 Northbound	3,605	189
Sandwich Road	6,430	135

BELMONT CIRCLE 2040 NO-BUILD		
Intersection	Max Queue (feet)	Vehicle Delay (sec)
Summer Saturday		
Exit 3 Off Ramps	1,025	3
Head of Bay Road	2,700	656
Buzzards Bay Bypass	305	11
Main Street	6,140	126
Scenic Highway	11,610	161

Sagamore Bridge – Future (2040) No-Build Analysis Queues and Delay - Summer and Non-Summer Peak.



SAGAMORE BRIDGE 2040 NO-BUILD		
Intersection	Max Queue (feet)	Vehicle Delay (sec)
Summer Saturday		
Rte 3 SB	24,484	887
Rte 6 WB	25,029	812
Non-Summer PM		
Rte 3 SB	8,476	460
Rte 6 WB	7,967	178

Army Corps of Engineers Bridge Study.

US Army Corps of Engineers (USACE) Bridge Study.

- USACE Conducting 'Major Rehabilitation Evaluation Study' to determine rehabilitation or replacement of both Sagamore and Bourne Bridges.

- For the purpose of MassDOT Study's analysis, assuming both bridges will be replaced.

- Assuming replacement bridges will be constructed adjacent to existing canal bridges.

Travel Demand Model.

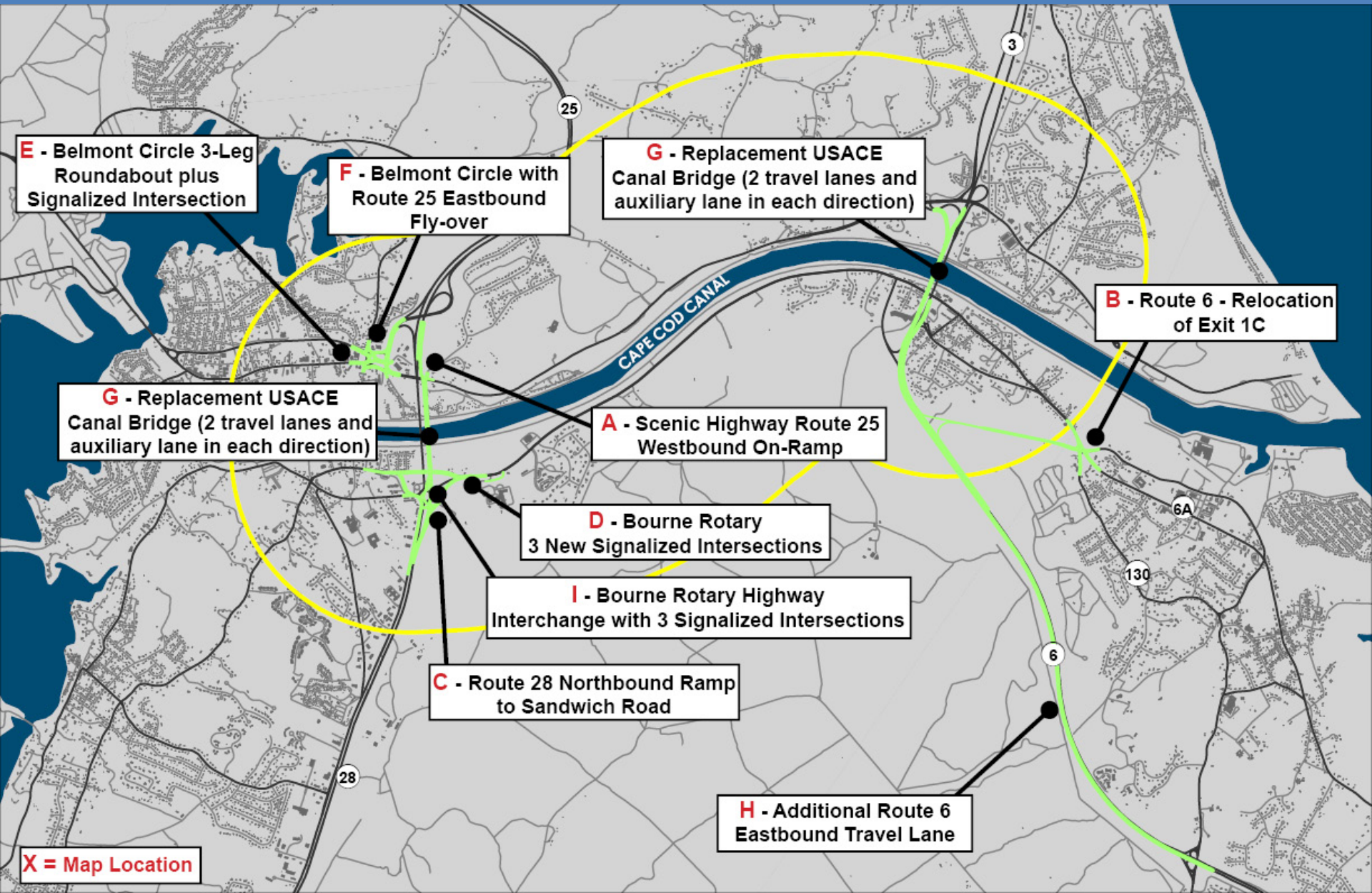
Evaluation of Alternatives - Travel Demand Model.

- Improvements at key locations initially evaluated separately/stand-alone.
- Next, seven combinations of improvements (known as ‘cases’) at key locations evaluated.
- Travel analysis model identified modified travel patterns given the ‘transportation system’ alternatives.

Total of 7 Cases Evaluated.

TRAVEL DEMAND MODEL CASE IMPROVEMENTS								
Map Location	Improvements	Case 1	Case 1A	Case 1B	Case 2	Case 2B	Case 3	Case 3A
A	Scenic Highway to Rte 25 Westbound On-Ramp	●	●	●	●	●	●	●
B	Rte 6 Exit 1C Relocation	●			●	●	●	●
C	Rte 28 Northbound Ramp to Sandwich Road		●	●	●	●	●	
D	Bourne Rotary (Three New Signalized Intersections)			●	●	●	●	
E	Belmont Circle (3 Leg Roundabout plus Signalized Intersection)				●		●	●
F	Belmont Circle with Rte 25 Eastbound Fly-over					●		
G	Replacement Bridges (Bourne and Sagamore) - 2 travel lanes with auxiliary lane in each direction						●	●
H	Additional Rte 6 Eastbound Travel Lane from Exit 1A to Exit 2 (3 total lanes)						●	●
I	Bourne Rotary with Highway Interchange							●

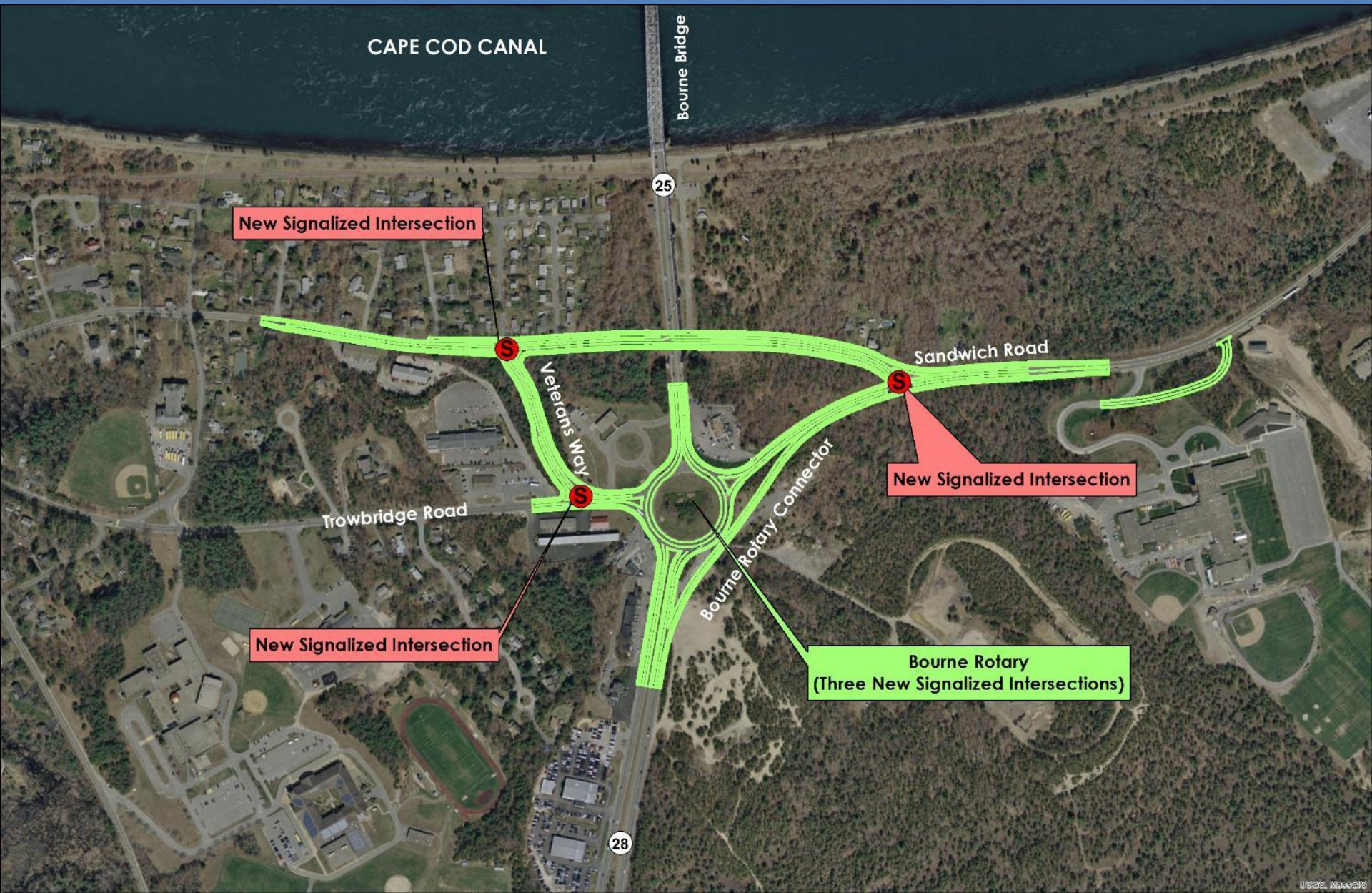
Elements of Cases Analyzed.



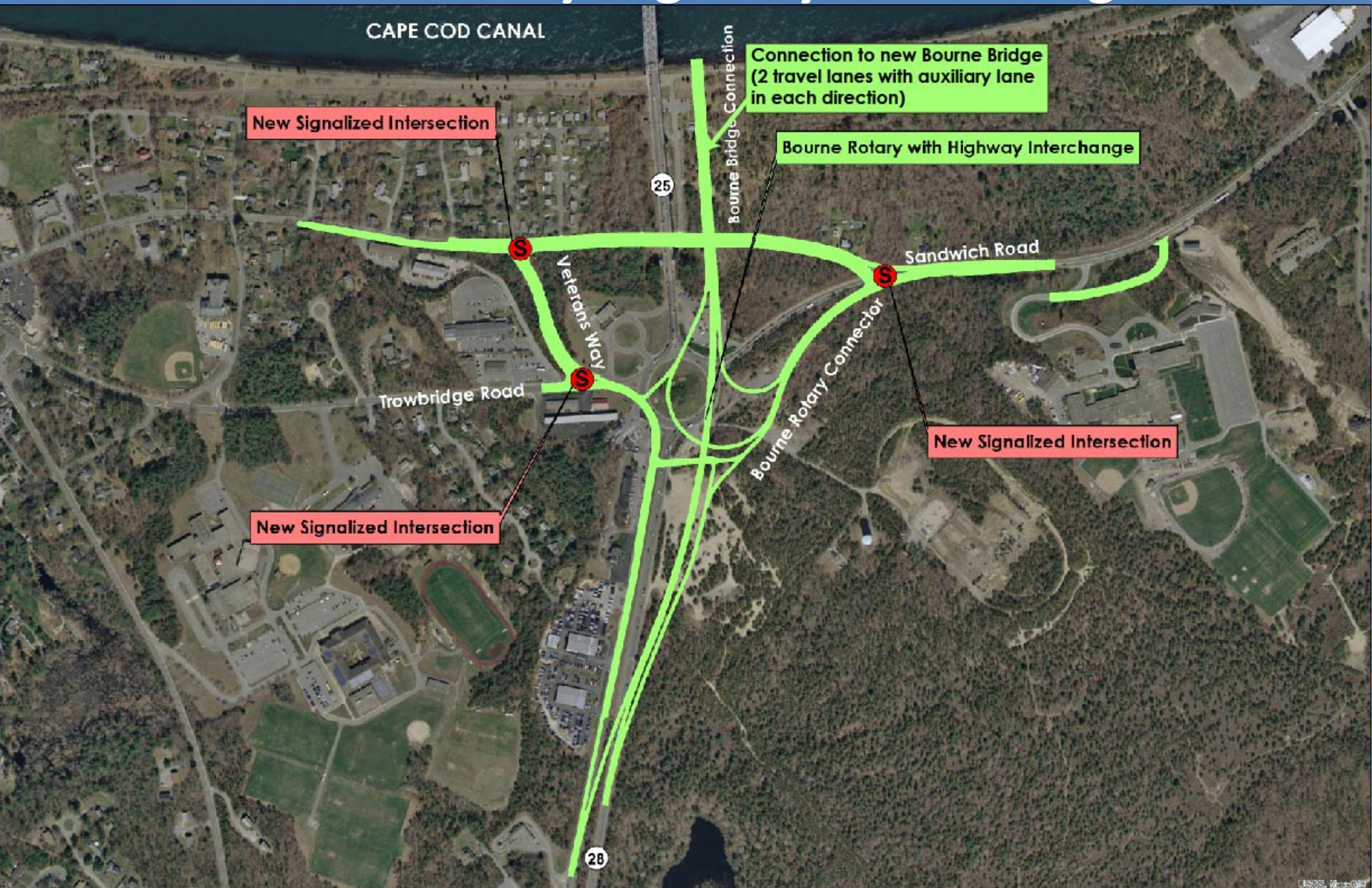
Map Locations A and E: Scenic Highway to Route 25 Westbound On-Ramp, and Belmont Circle Reconstruction (3-Leg Roundabout with Signalized Intersection).

Map Location F: Belmont Circle with Route 25 Eastbound Fly-Over.

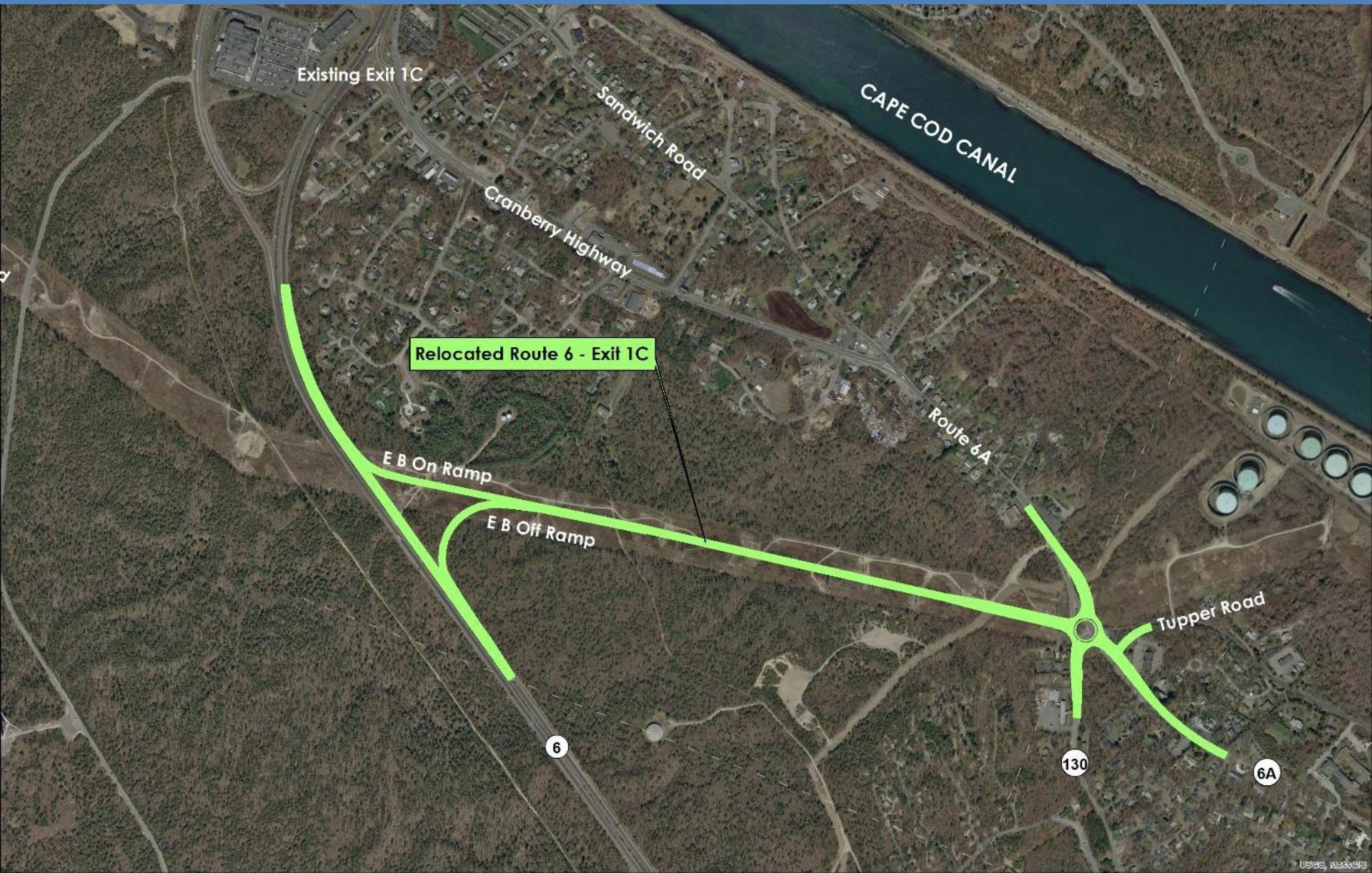
Map Locations C and D: Route 28 Northbound Ramp to Sandwich Road and Bourne Rotary Reconstruction.



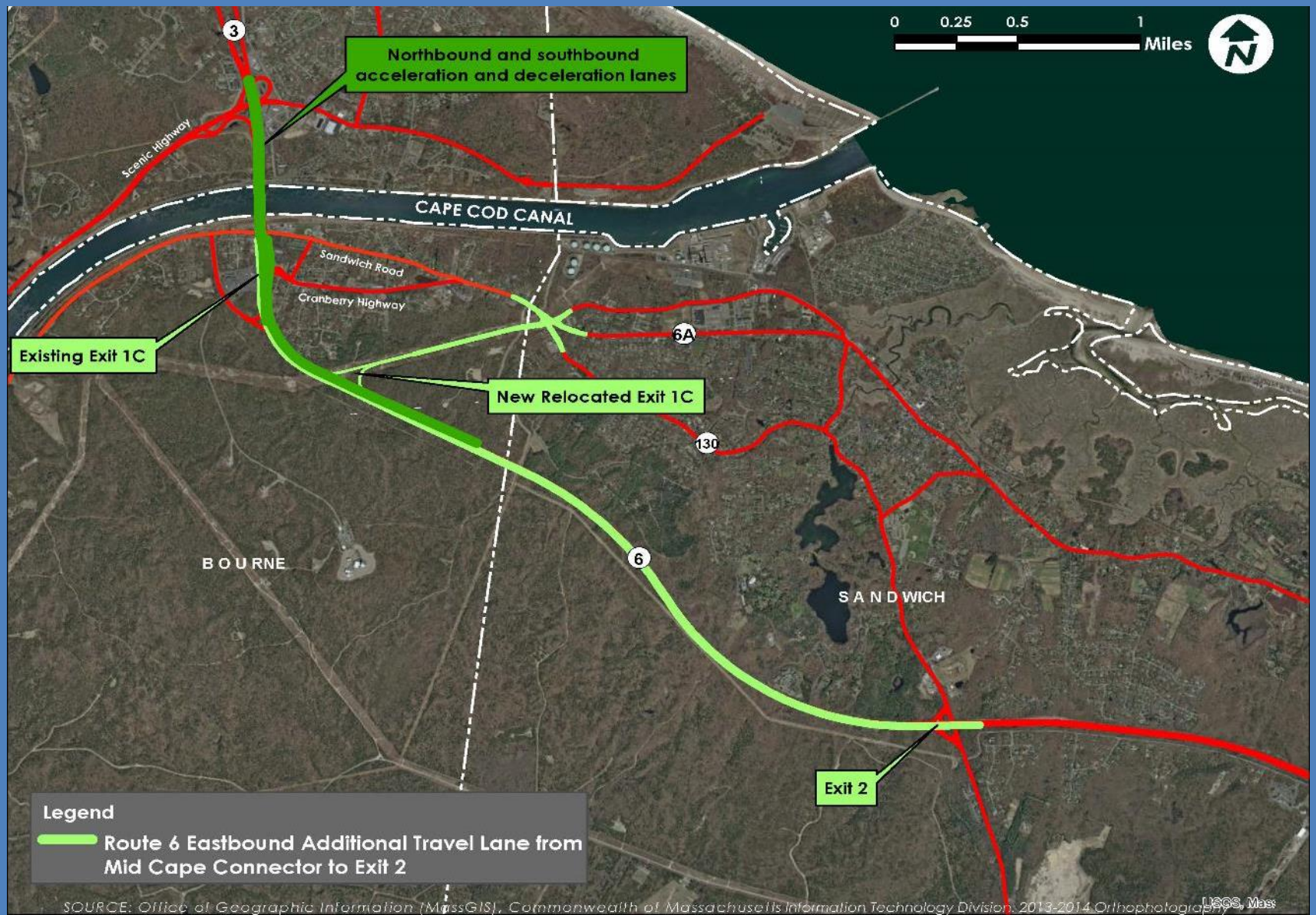
Map Location I:
Bourne Rotary Highway Interchange.



Map Location B:
Route 6 Exit 1C Relocation.



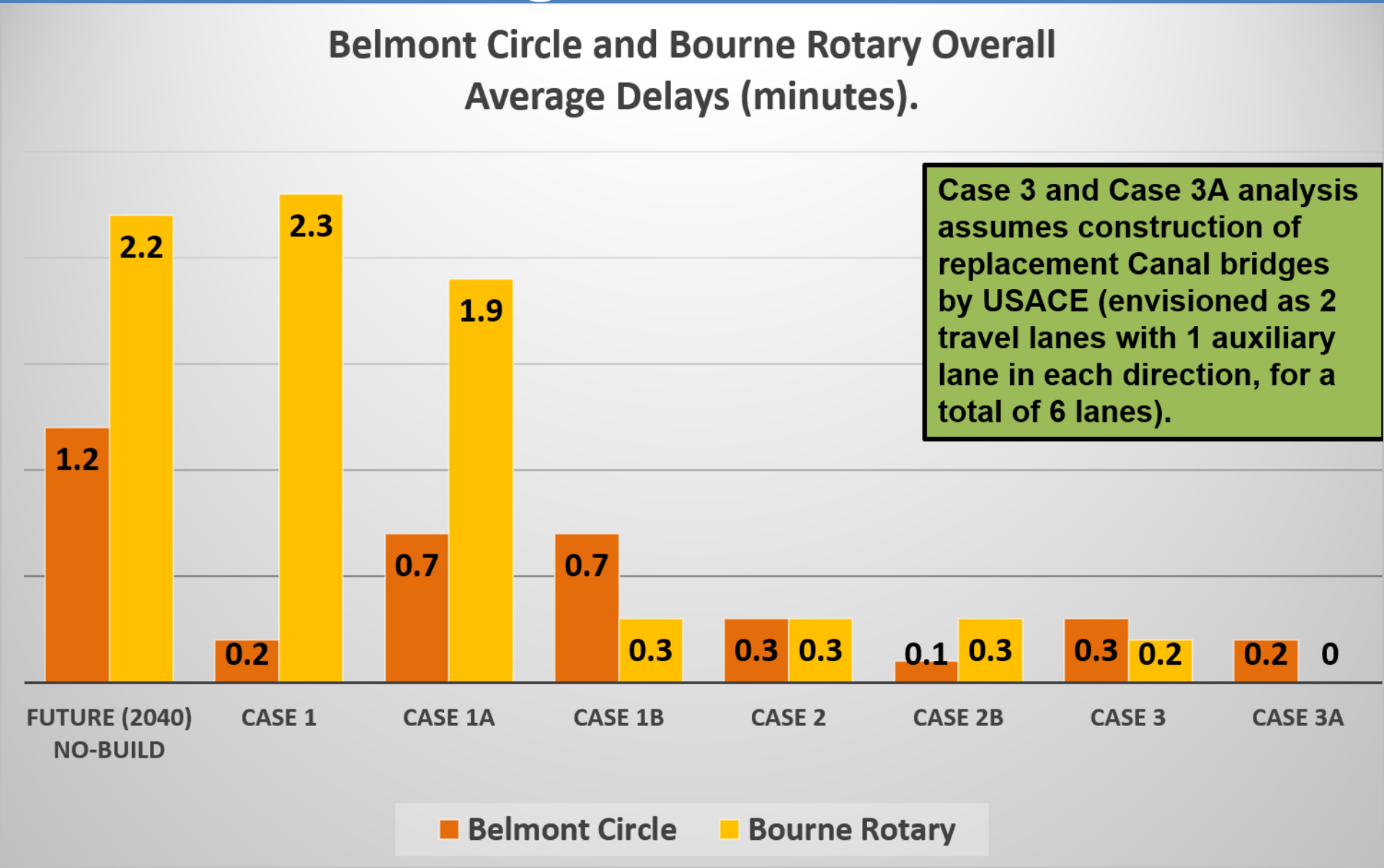
Map Location H:
Route 6 – Additional Eastbound Lane to Exit 2.



Summary of Travel Analysis Findings Non-Summer Peak Period

(Weekday PM: 4:00PM – 6:00PM)

Traffic Analysis Findings
Bourne Bridge Area, Non-Summer.



Traffic Analysis Findings
Bourne Bridge Area, Non-Summer.

Cases 1B, 2, 2B, and 3A would provide progressively greater reductions in delay during the non-summer time periods at Belmont Circle and Bourne Rotary.

New ramps would reduce traffic in rotaries.

- Scenic Highway westbound to Route 25 on-ramp (Element/Map Location A).
- Route 28 north to Sandwich Road eastbound ramp (Element/Map Location C).

New signal and roundabout at Belmont Circle (Element E) would improve traffic flow.

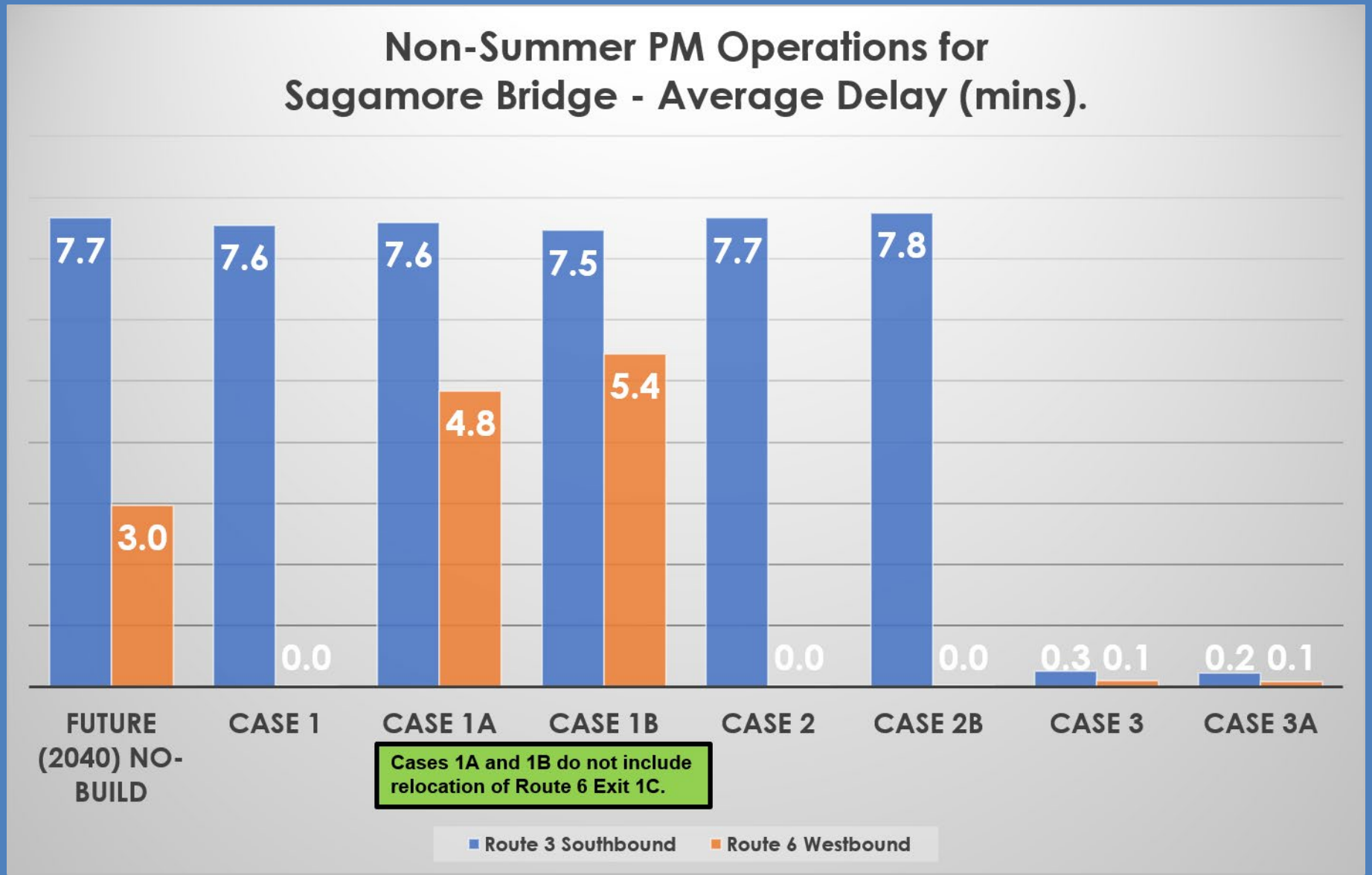
- New traffic signal and roundabout at circle would reduce congestion by controlling traffic flow from Route 25, Main Street, Buzzards Bay Bypass, and Scenic Highway.

Traffic Analysis Findings
Bourne Bridge Area, Non-Summer.

Bourne Rotary Interchange (Element/Map Location I) would reduce vehicular conflict.

- Bourne Rotary Interchange would separate local and regional traffic.
- Regional traffic (with destinations on Route 28 and beyond) would avoid conflict with local Bourne area traffic which would use Sandwich Road for east-west travel.

Traffic Analysis Findings Sagamore Bridge Non-Summer.



Traffic Analysis Findings
Sagamore Bridge Area, Non-Summer.

- Relocation of Route 6 Exit 1C (Element/Map Location B):
  - Would result in substantial delay reduction for Route 6 westbound (off-Cape) from elimination of conflict at south end of Sagamore Bridge.
  - Would provide sufficient acceleration and deceleration distances at relocated Exit 1C on and off-ramps.

- Cases 1A and 1B **do not** include Exit 1C relocation (Element/Map Location B) and would not see Route 6 westbound improvements.

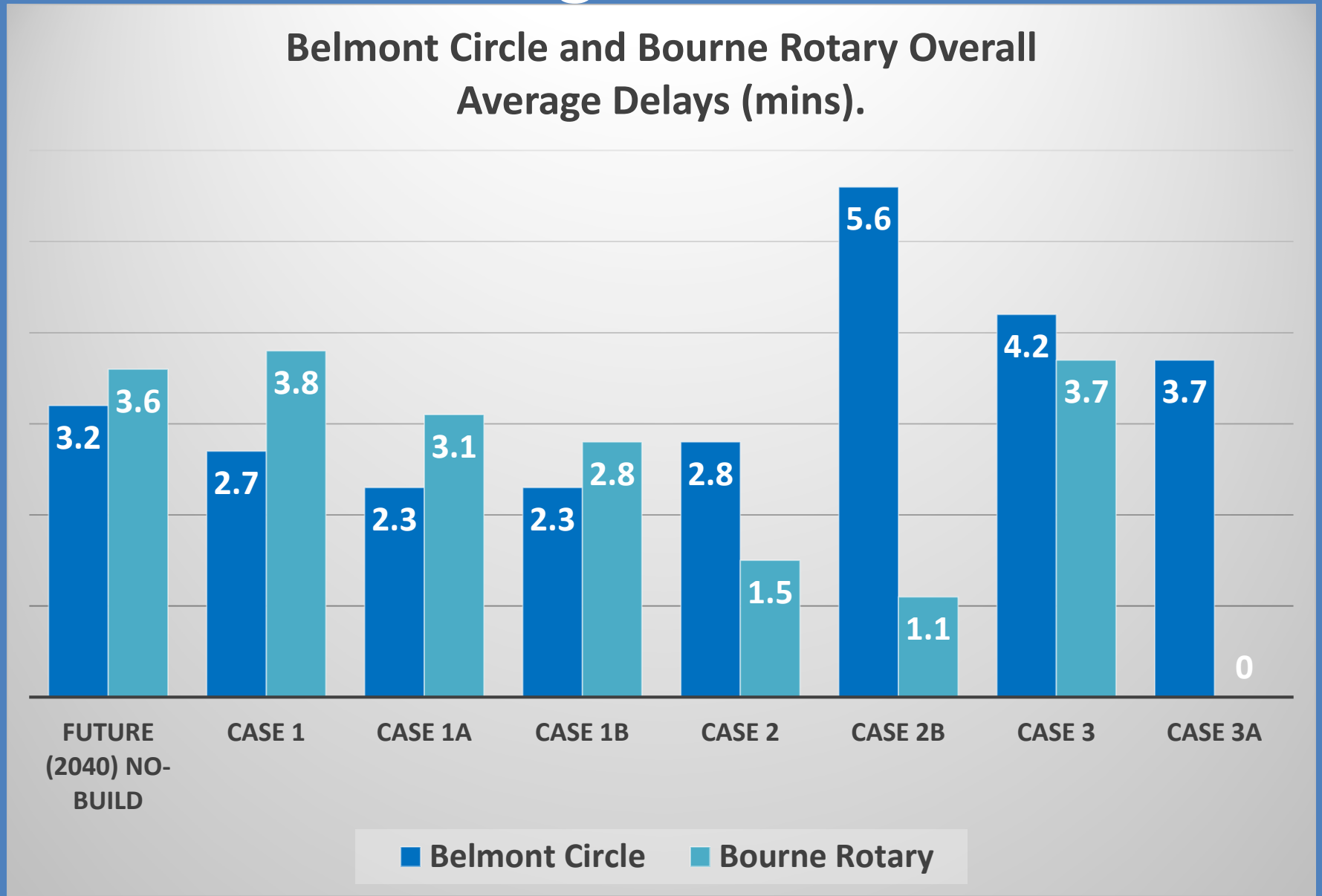
- Case 3A - Delay reduction on Route 3 southbound would occur with replacement of the Sagamore Bridge (Element/Map Location G) and additional Route 6 eastbound travel lane to Exit 2 (Element/Map Location H).

Summary of Traffic Analysis Findings

Summer Peak Period

(Saturday: 10:00AM-12:00PM).

Traffic Analysis Findings
Bourne Bridge Area - Summer.



Traffic Analysis Findings
Bourne Bridge Area - Summer.

Belmont Circle:

- During summer peak period, more modest delay reductions could be achieved at Belmont Circle for Cases 1, 1A, 1B, and 2.

- Under Cases 2B, 3, and 3A, more freely-flowing traffic entering roundabout from Route 25 would result in fewer gaps for vehicles attempting to enter Belmont Circle from Main Street, Scenic Highway, and Head of Bay Road. This would cause additional overall delay under these cases.

Traffic Analysis Findings
Bourne Bridge Area - Summer.

BENEFITS:

- Up to 300 additional vehicles would be processed through Belmont Circle during summer Saturday peak hour (10:00 AM - 12:00 PM) for Cases 1B, 2, 2B, 3, and 3A.

- Regionally, there would be a reduction in travel times.

  Example: Future summer travel time from Route 25 Exit 2 (Glen Charlie Road) to Route 6 Exit 2 (Route 130) would be reduced by 12.1 minutes (via Sandwich Road) under Case 3.

Traffic Analysis Findings
Bourne Rotary - Summer.

Bourne Rotary

- Steadily decreasing delays could be achieved during summer peak period at Bourne Rotary under Cases 1B, 2, 2B, and 3A.

- Case 3 would be less effective because a reconstructed Bourne Rotary (Three New Signalized Intersections – Element/Map Location D) could not effectively process the additional 700 vehicles that would be attracted to a replacement Bourne Bridge (Element/Map Location G), which would be diverted from the Sagamore Bridge.

- Case 3A - Construction of highway interchange (Element I) at Bourne Rotary (with replacement Bourne Bridge - Element/Map Location G) would be necessary to reduce summer delay.

- Case 3A – Auxiliary lanes on replacement Bourne Bridge (Element/Map Location G) would also be effective at reducing delay and conflict by providing acceleration and deceleration lanes.

Traffic Analysis Findings
Changes in Travel Patterns.

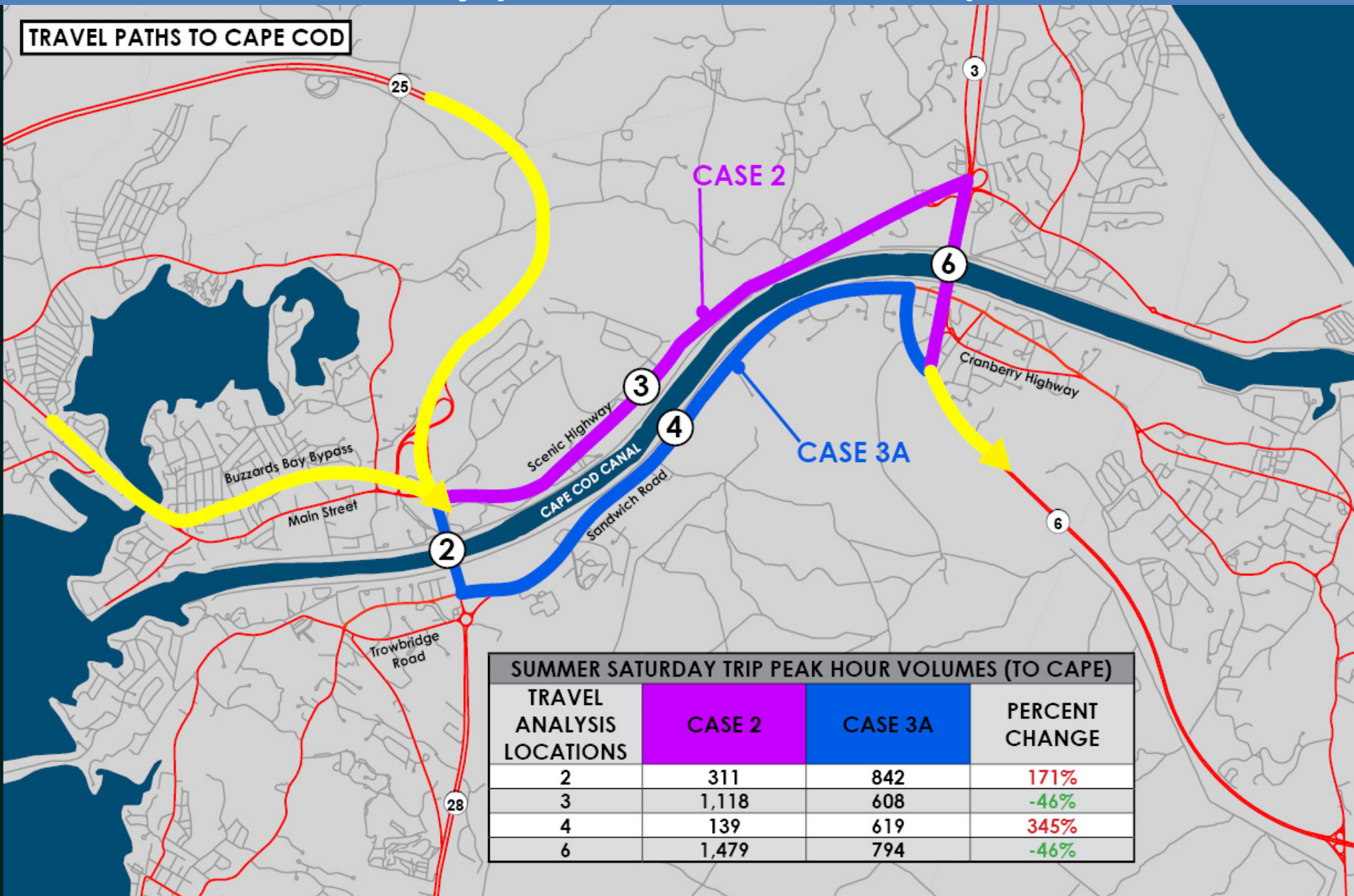
WHY?:

- Currently, congested operations at Bourne Rotary discourage use of Bourne Bridge. Instead, vehicles exit Route 25 at Belmont Circle to travel east on Scenic Hwy and cross the Cape Cod Canal via Sagamore Bridge.

- Under Cases 3 and 3A, traffic operations would improve with replacement of the canal bridges (Element/Map Location G) , Exit 1C Relocation (Element/Map Location B) , Route 6 eastbound travel lane (Element/Map Location H) , reconstruction of Belmont Circle (Element/Map Location E), and a Bourne Rotary Interchange (Element/Map Location I).

- As a result, some Route 6-bound traffic would shift to more direct route to Bourne Bridge (via Sandwich Road) rather than Sagamore Bridge (via Scenic Hwy).

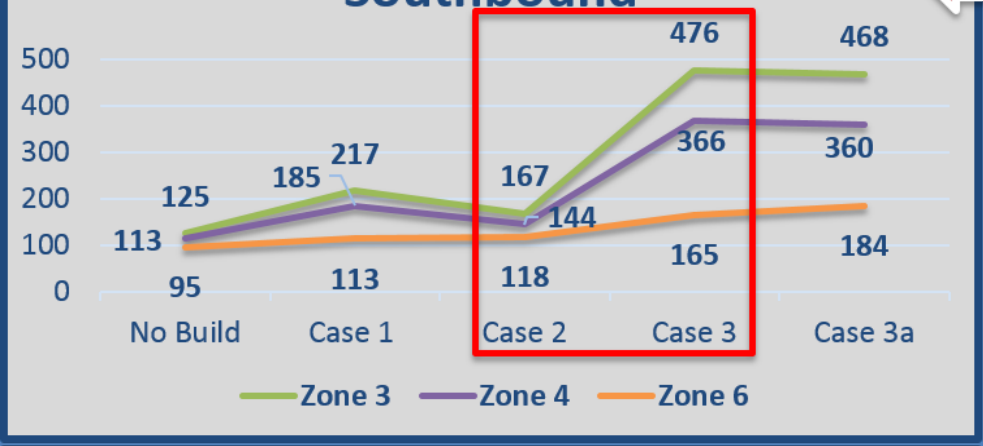
Travel Patterns for Trips to Cape Cod – Summer Saturday (10:00AM – 12:00 PM) Peak Period.



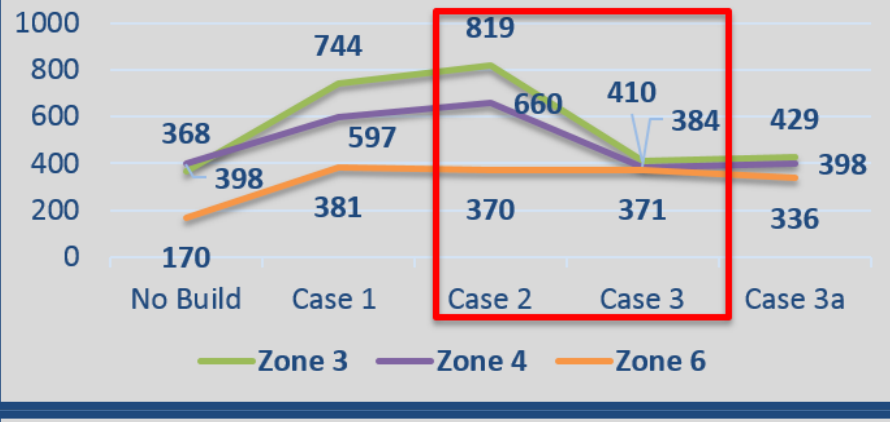
SUMMER SATURDAY TRIP PEAK HOUR VOLUMES (TO CAPE)			
TRAVEL ANALYSIS LOCATIONS	CASE 2	CASE 3A	PERCENT CHANGE
2	311	842	171%
3	1,118	608	-46%
4	139	619	345%
6	1,479	794	-46%

Travel Patterns for Trips to Cape Cod – Summer Peak Period.

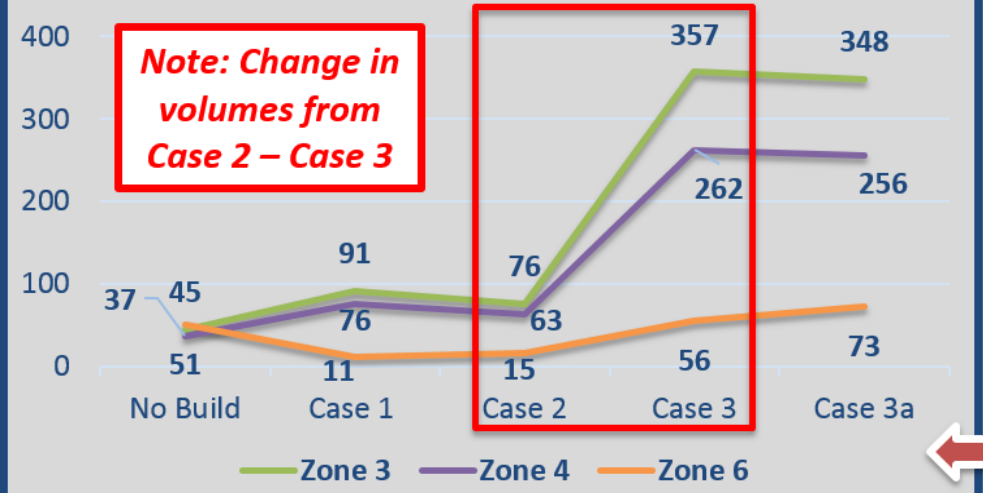
Using Bourne Bridge Southbound



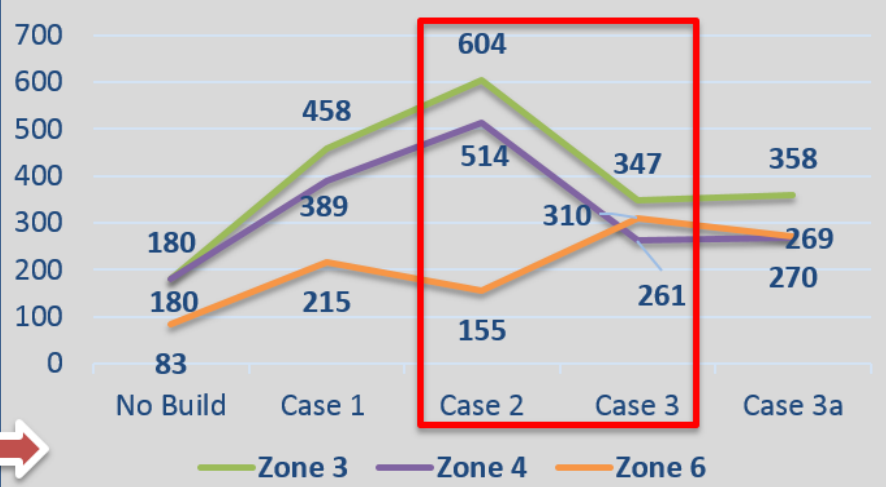
Using Sagamore Bridge Southbound



Using Sandwich Rd Eastbound



Using Scenic Hwy EB



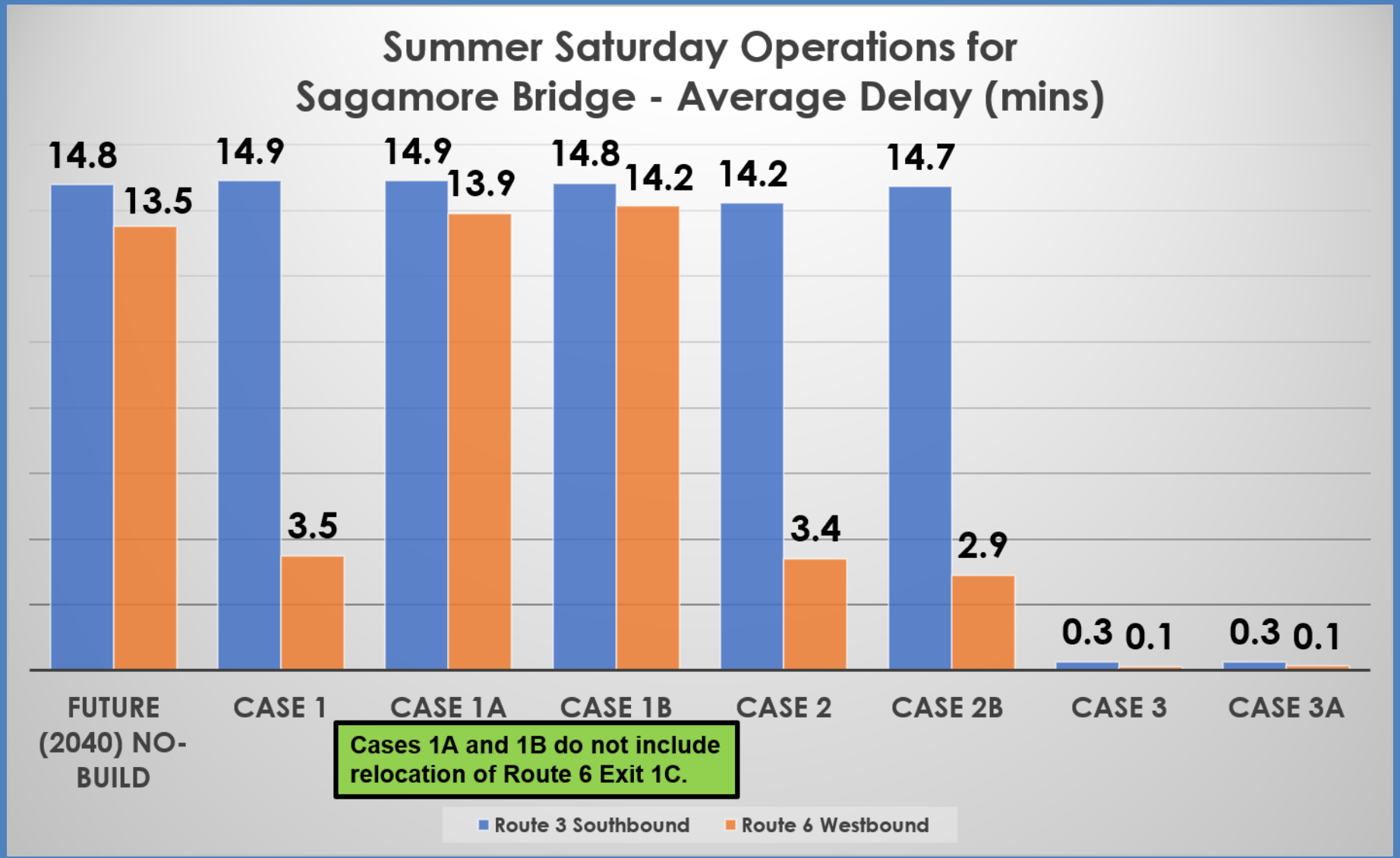
Traffic Analysis Findings
Belmont Circle - Summer.

RESULT:

- Case 3A would result in a better balanced split of traffic using replacement Sagamore and Bourne Bridges (Element/Map Location G).

PEAK HOUR TRAFFIC			
TRAVEL ANALYSIS LOCATIONS	NO BUILD	CASE 2	CASE 3A
Sagamore Bridge SB	3,975	4,000	3,350
Bourne Bridge SB	2,825	2,840	3,550

Travel Analysis Findings
Sagamore Bridge - Summer.



Traffic Analysis Findings
Sagamore Bridge Area, Summer.

- Relocation of Route 6 Exit 1C (Element/Map Location B) would result in substantial delay reduction for Route 6 westbound (off-cape) for Cases 1, 2, 2B, 3, & 3A.

- Delay reduction on Route 3 southbound would occur under Cases 3 and 3A, with construction of replacement Sagamore Bridge (including two travel lanes and one auxiliary lane in each direction), and additional Route 6 eastbound lane.

Draft Study Recommendations.

Range of Draft Recommended Transportation Improvements.

- Multimodal:
  - Bicycle/Pedestrian.
  - Park & Ride Facilities.
- Roadway Improvements:
  - Local Intersections.
  - “Gateway” Locations.

Draft Study Recommendations – Multimodal.

Bicycle/Pedestrian Improvements include the following:

- Accessible sidewalks & trails, crosswalks, pedestrian phases at intersections, bicycle accommodation in roadway shoulder.

Draft Study Recommendations – Multimodal.

Bicycle/Pedestrian Improvements -

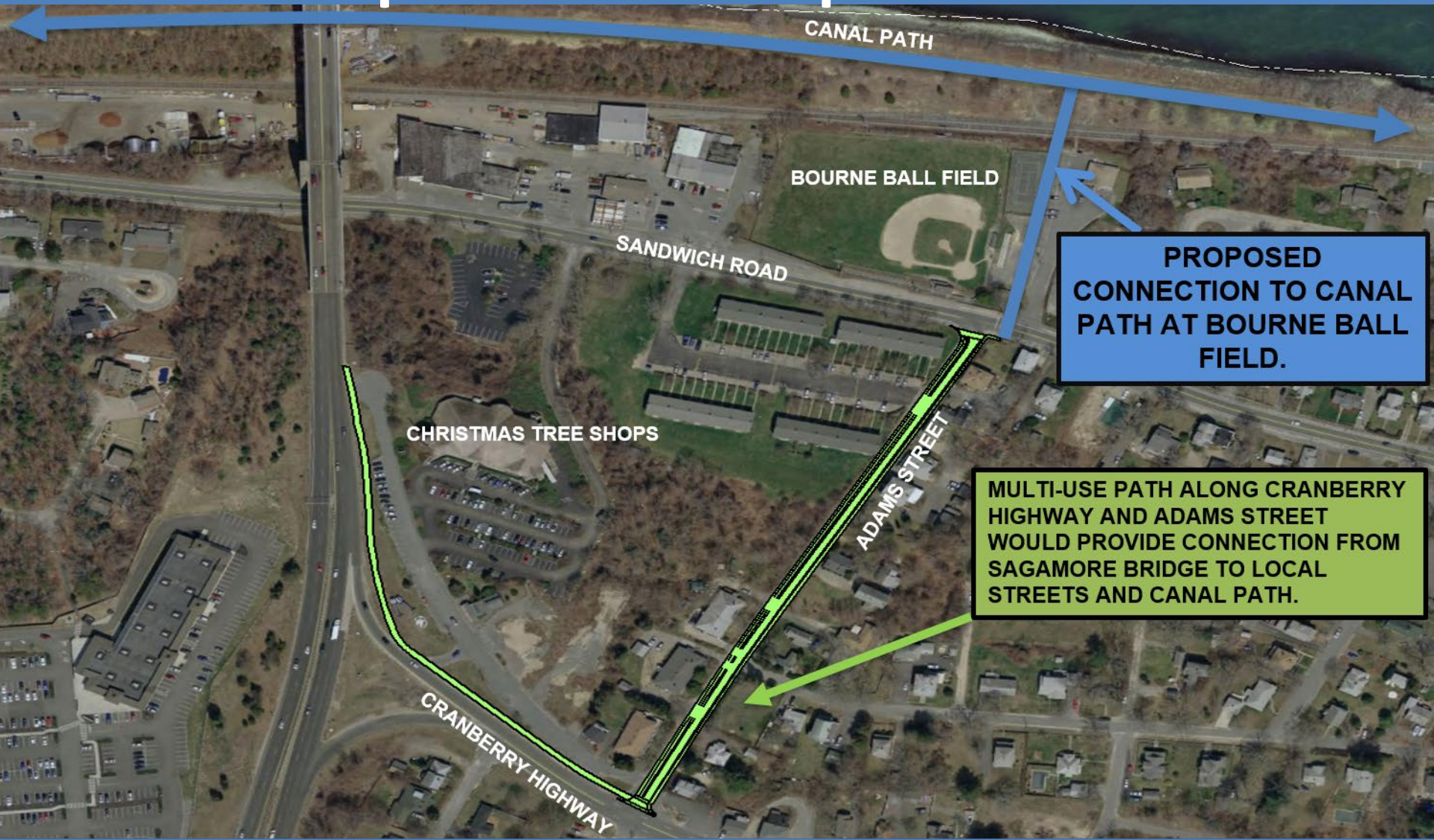
- Provide three new additional accessible connections to Cape Cod Canal Bikeway.
- Improve bicycle/pedestrian facilities along Cape Cod Regional Transit Authority (CCRTA) bus routes.
- Provide accessible connections along roadway approaches to Sagamore and Bourne Bridges (including 'Complete Street' design of Adams Street)

WHY? – More accessible connections provide more multimodal options for residents and visitors.

Draft Study Recommendations – Canal Trail Connections.

Draft Study Recommendations – Bike-Ped Facilities along Bus Routes.

Bicycle/Pedestrian Access: Sagamore Bridge Approaches & Adams Street Complete Street Improvements.



Bicycle/Pedestrian Access: Bourne Bridge (North of Canal).

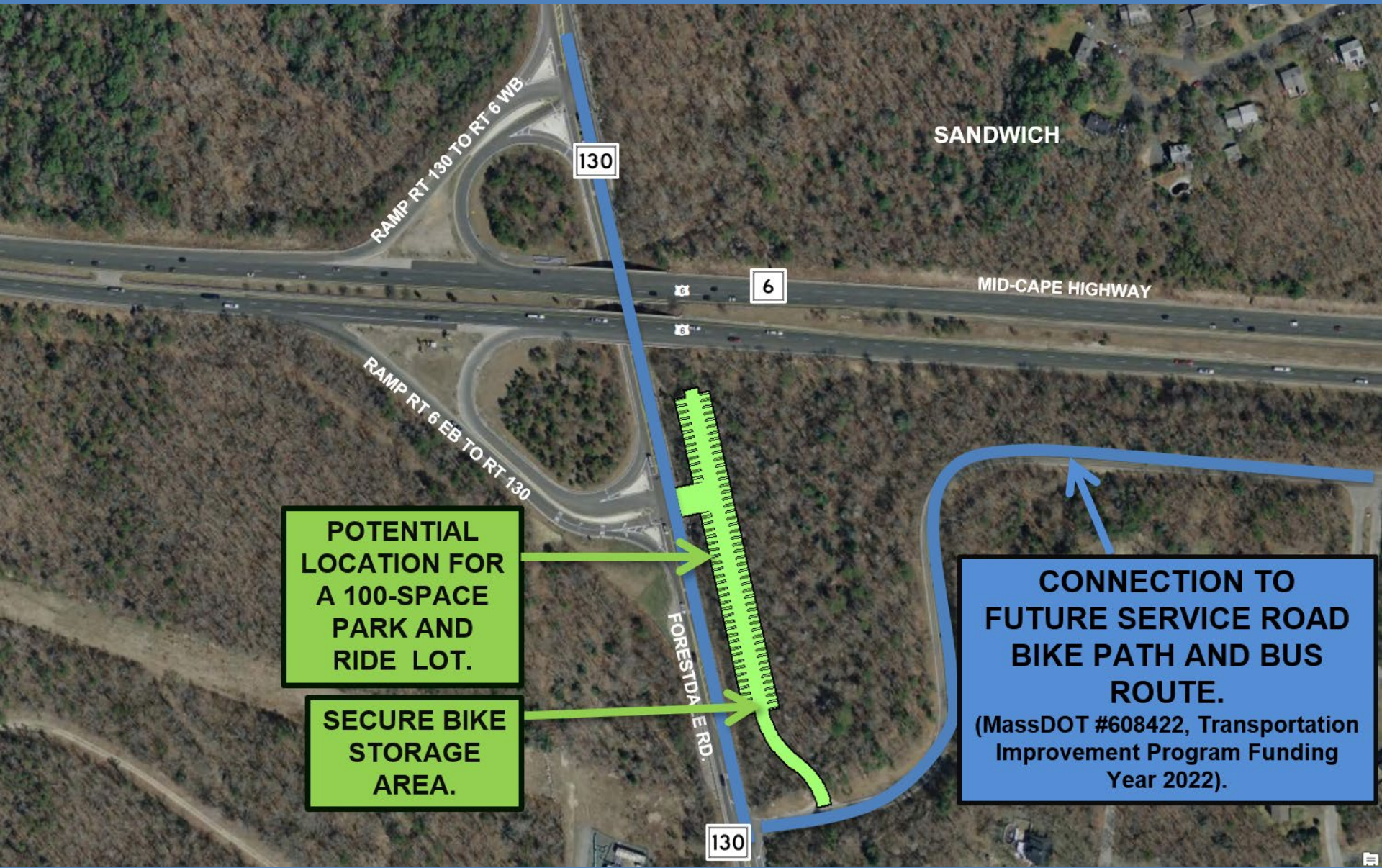
Draft Study Recommendations – Multimodal.

Park & Ride Facilities:

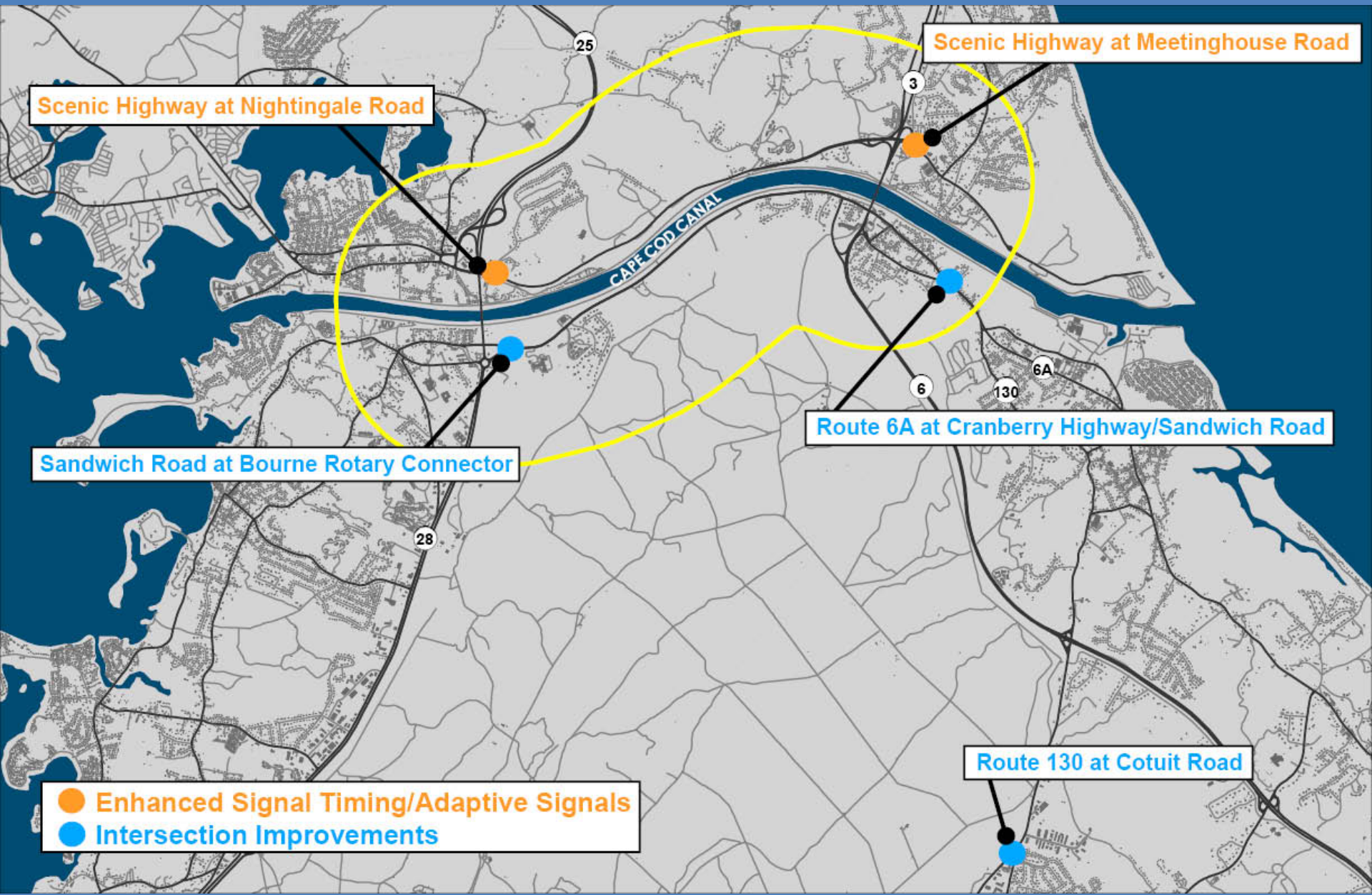
- Construct new Park & Ride lot at Route 6 Exit 2.
- Potential new Plymouth & Brockton commuter bus stop.
- Provide connection to new Service Road bike path.
- Provide bicycle storage facilities.

WHY? – Encourages use of alternate modes of transportation.

Park & Ride Facility/Lot
Route 6 at Route 130.



Local Intersections.



Draft Study Recommendations – Local Intersections.

Intersection/Signal Improvements –

- Signal Timing / Adaptive Signal Improvements:
  - Scenic Highway at Meetinghouse Road.
  - Scenic Highway at Nightingale Road.
- Route 6A at Cranberry Highway/Sandwich Road:
  - New turning lane.
- Route 130 at Cotuit Road:
  - Install traffic signal.
- Sandwich Road at Bourne Rotary Connector:
  - New traffic signal and through lane.

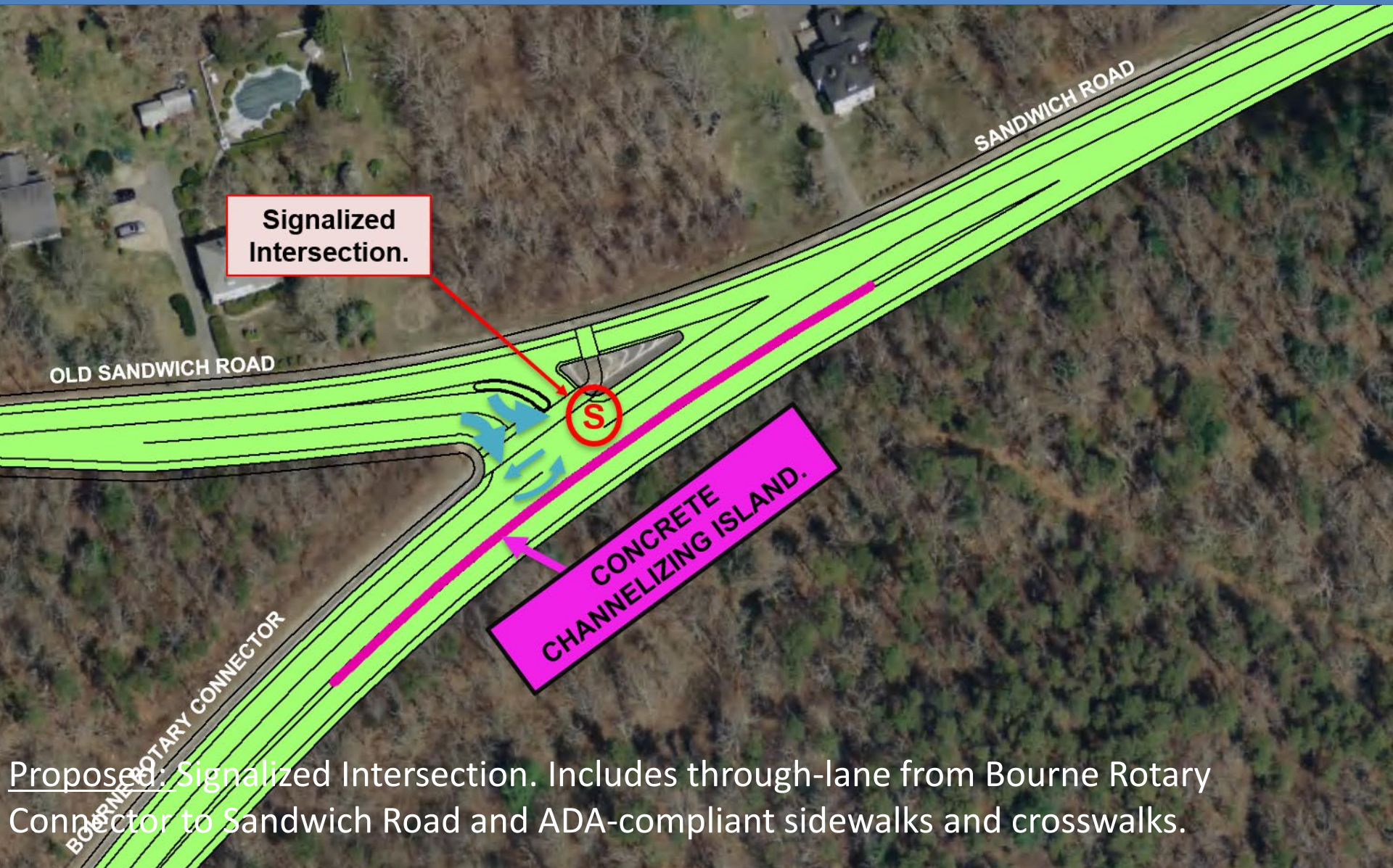
Route 6A at Cranberry Highway/ Sandwich Road, Bourne.

Proposed: Add exclusive left-turn lanes on westbound approach.
ADA-compliant sidewalks and crosswalk on all approaches.

Route 130 at Cotuit Road, Sandwich.

Proposed: Signalized Intersection.
ADA-compliant sidewalks and crosswalk on all approaches.

Sandwich Rd/Bourne Rotary Connector, Bourne ‘Florida T’ Intersection.



Proposed: Signalized Intersection. Includes through-lane from Bourne Rotary Connector to Sandwich Road and ADA-compliant sidewalks and crosswalks.

Draft Study Recommendations – "Gateway" Locations.

Case 3A Elements/Improvements Satisfy the Study Goals and Objectives:

- Improvements analyzed under Case 3A would provide the greatest long-term benefits in accessibility and mobility for Cape Cod residents, employers, and visitors.
- Public Safety: Case 3A would provide a reliable multimodal transportation system in the event of an emergency evacuation of Cape Cod.
- Case 3A improvements focused on improving existing infrastructure, thereby minimizing anticipated impacts.

Draft Study Recommendations – MassDOT "Gateway" Locations.

Elements/Map Locations of Case 3A Include:

A. Scenic Highway westbound to Route 25 westbound on-ramp.

B. Route 6 – Relocation of Exit 1C on Route 6 westbound.

E. Belmont Circle reconstruction as a 3-leg roundabout with signalized intersection.

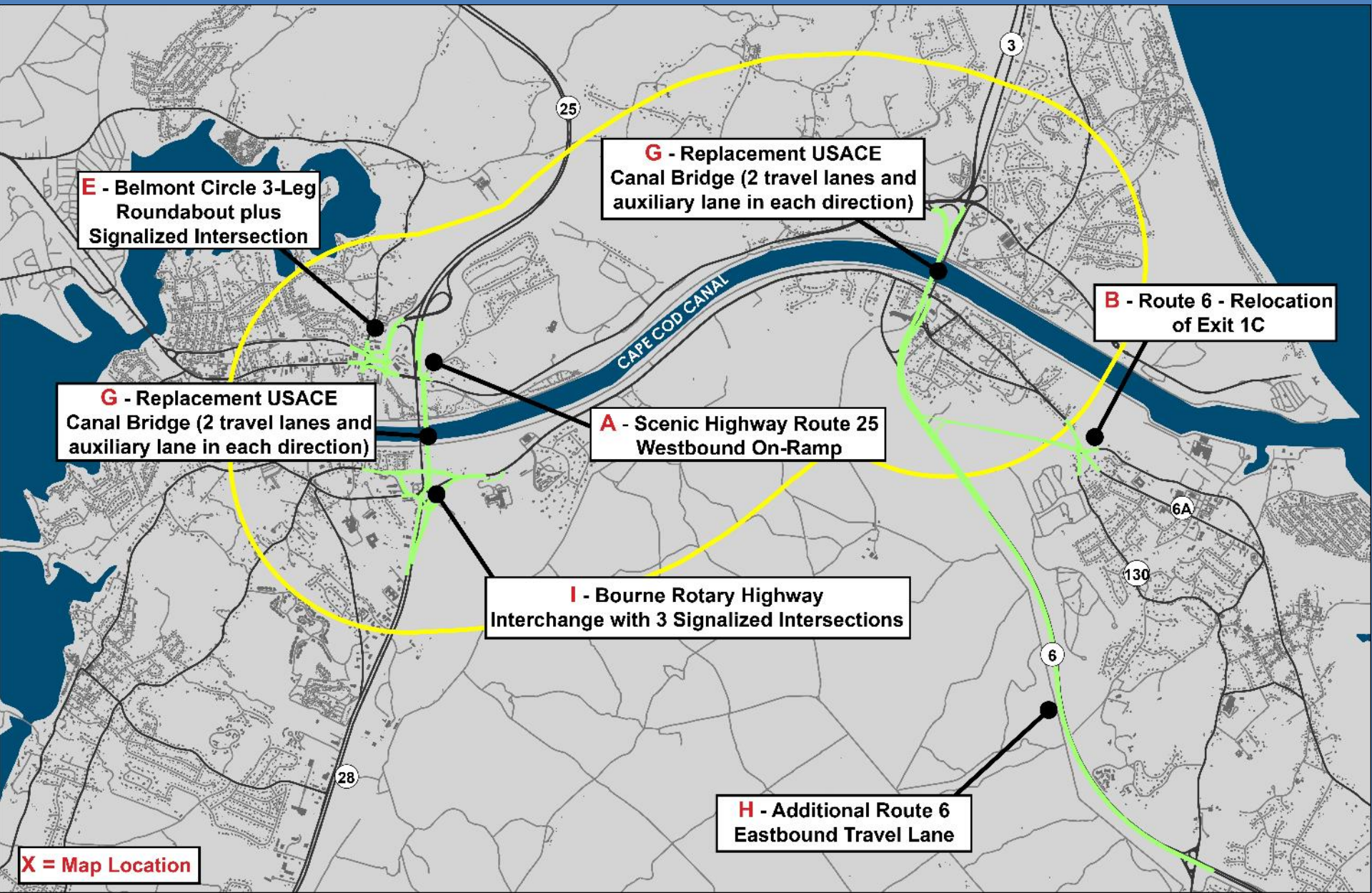
H. Construct Route 6 eastbound travel lane to Exit 2.

I. Reconstruct Bourne Rotary as an interchange.

Draft Study Recommendations – "Gateway" Locations.

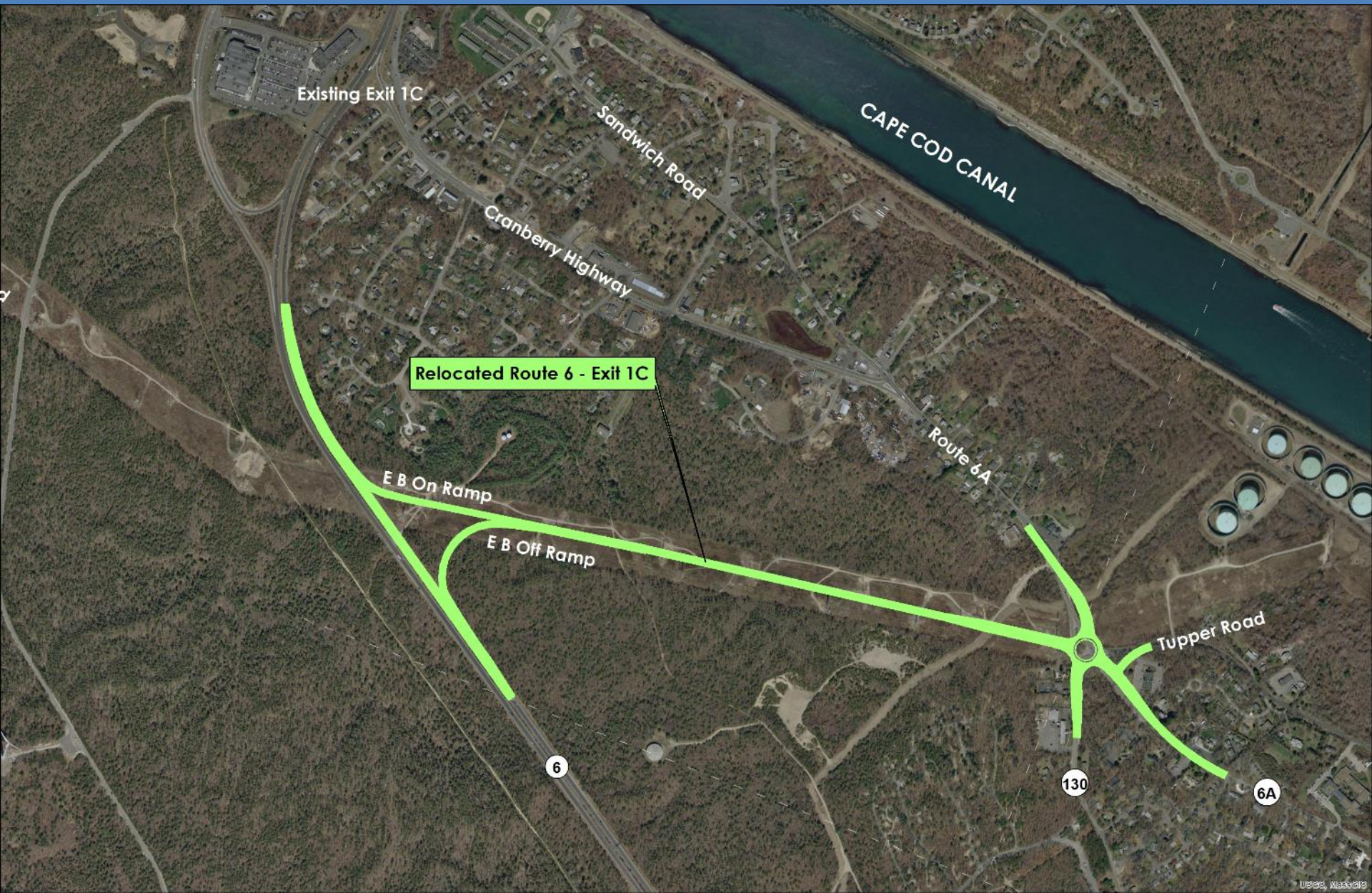
- The US Army Corps of Engineers (USACE) is currently conducting a study to determine the long-term disposition (Major Rehabilitation or Replacement) of the Bourne and Sagamore Bridges.
- MassDOT's Draft Study Recommendations of improvements included in Case 3A assumes that USACE will be recommending replacement of both the Bourne and Sagamore Bridges (with 2 travel lanes and 1 auxiliary lane in each direction).

Travel Model Case 3A.

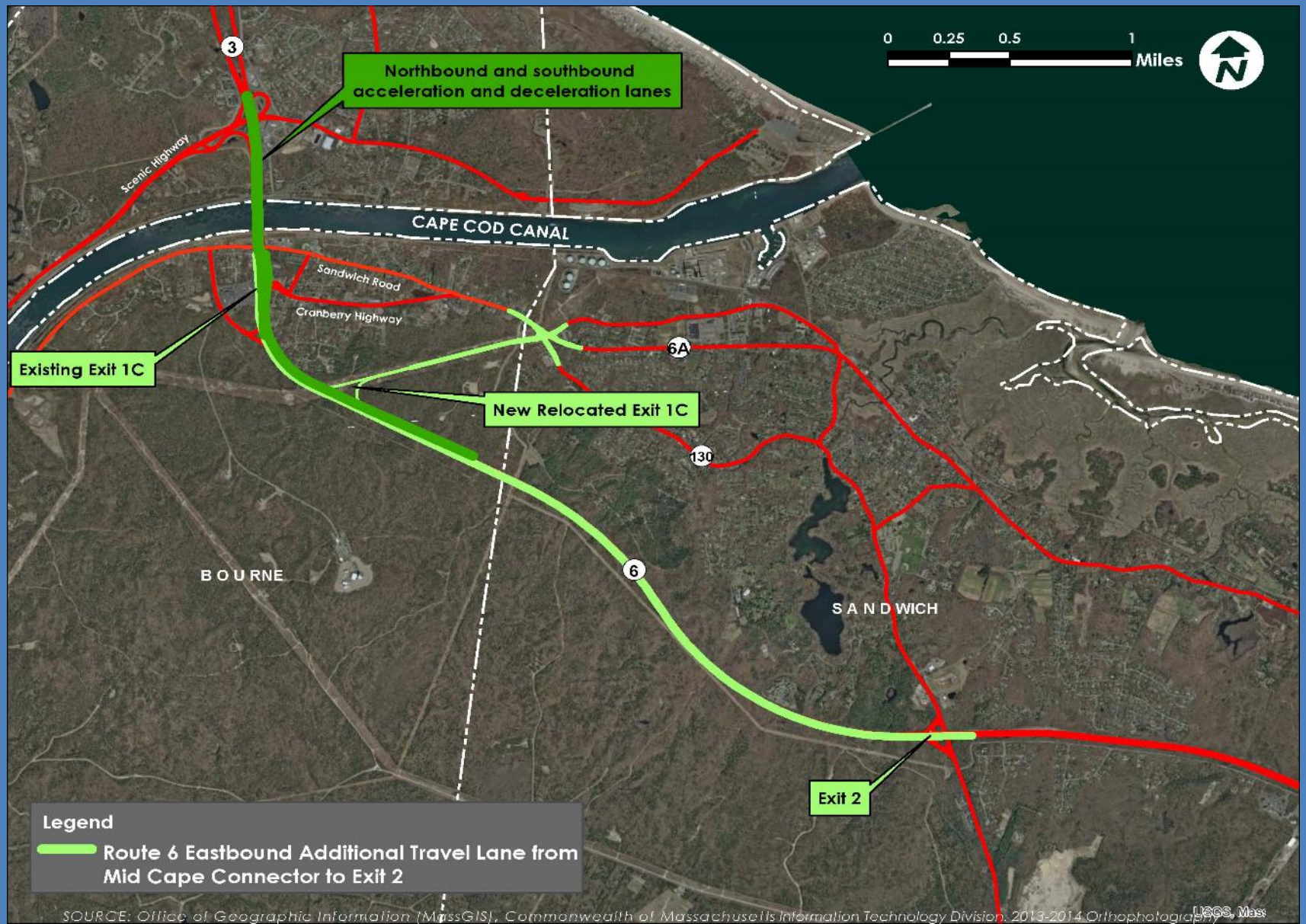


Map Locations A and E: Scenic Highway to Route 25 Westbound On-Ramp, and Belmont Circle Reconstruction (3-Leg Roundabout with Signalized Intersection).

Map Location B: Route 6 Exit 1C Relocation.



Map Location H:
Route 6 – Additional Eastbound Lane to Exit 2.



Map Location I:
Bourne Rotary Highway Interchange.

Summary of Conceptual Cost Estimates by Case.

Cost Estimates by Case ($ in millions)		
Cases	2030	2040
Case 1	$60	$90
Case 1A	$20	$30
Case 1B	$30	$40
Case 2	$100	$150
Case 2B	$120	$180
Case 3*	$300	$440
Case 3A*	$370	$540

**Includes cost of Sagamore and Bourne Bridge approaches.*

Conceptual Cost Estimates by Location for Case 3A.

Cost Estimates ($ in millions)		
Location	2030	2040
Scenic Highway to Route 25 WB Ramp	$11	$16
Route 6 Exit 1C Relocation	$51	$75
Belmont Circle Reconstruction	$23	$33
Route 6 EB Travel Lane	$48	$71
Bourne Rotary Interchange (including 3 signalized intersections at Bourne Rotary)	$87	$127
Sagamore Bridge Approach	$64	$95
Bourne Bridge Approach	$84	$125

Next Steps.

- The Draft Study Report will be released soon and will include a 30-day public comment period. When the report is available, it will be posted to https://www.mass.gov/cape-cod-canal-transportation-study.

- MassDOT will continue to coordinate with the USACE on its study of the Bourne and Sagamore Bridges.

- Once the USACE has decided on its long-term plan for the bridges, MassDOT will initiate and prioritize the project development process for the capital projects recommended in the Cape Cod Canal Transportation Study's Final Report.