

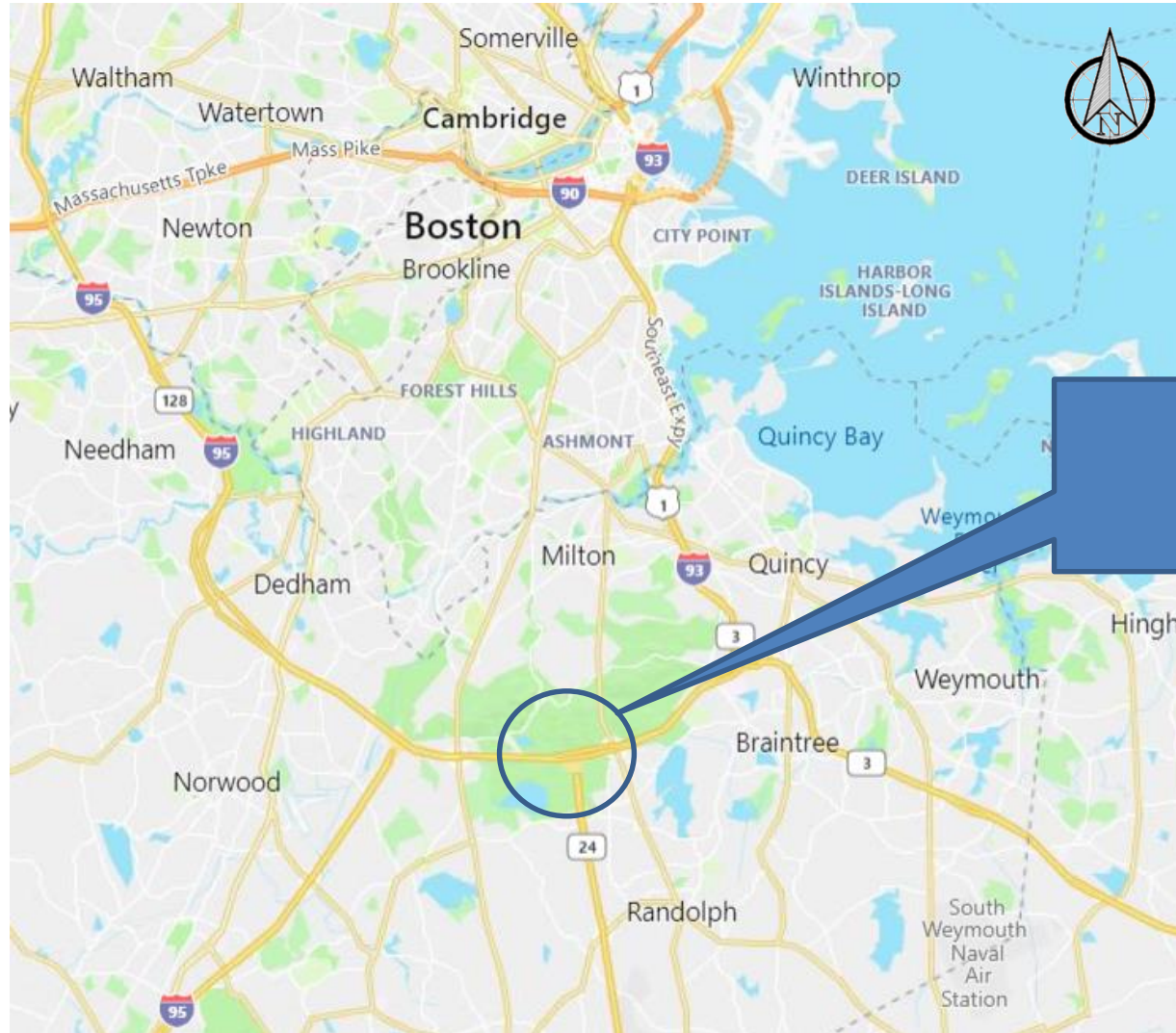
**Randolph-Quincy
Replacement and Rehabilitation of Highway
Lighting System at I-93/Route 24**

Project File No. 608611

Presentation to Boston MPO

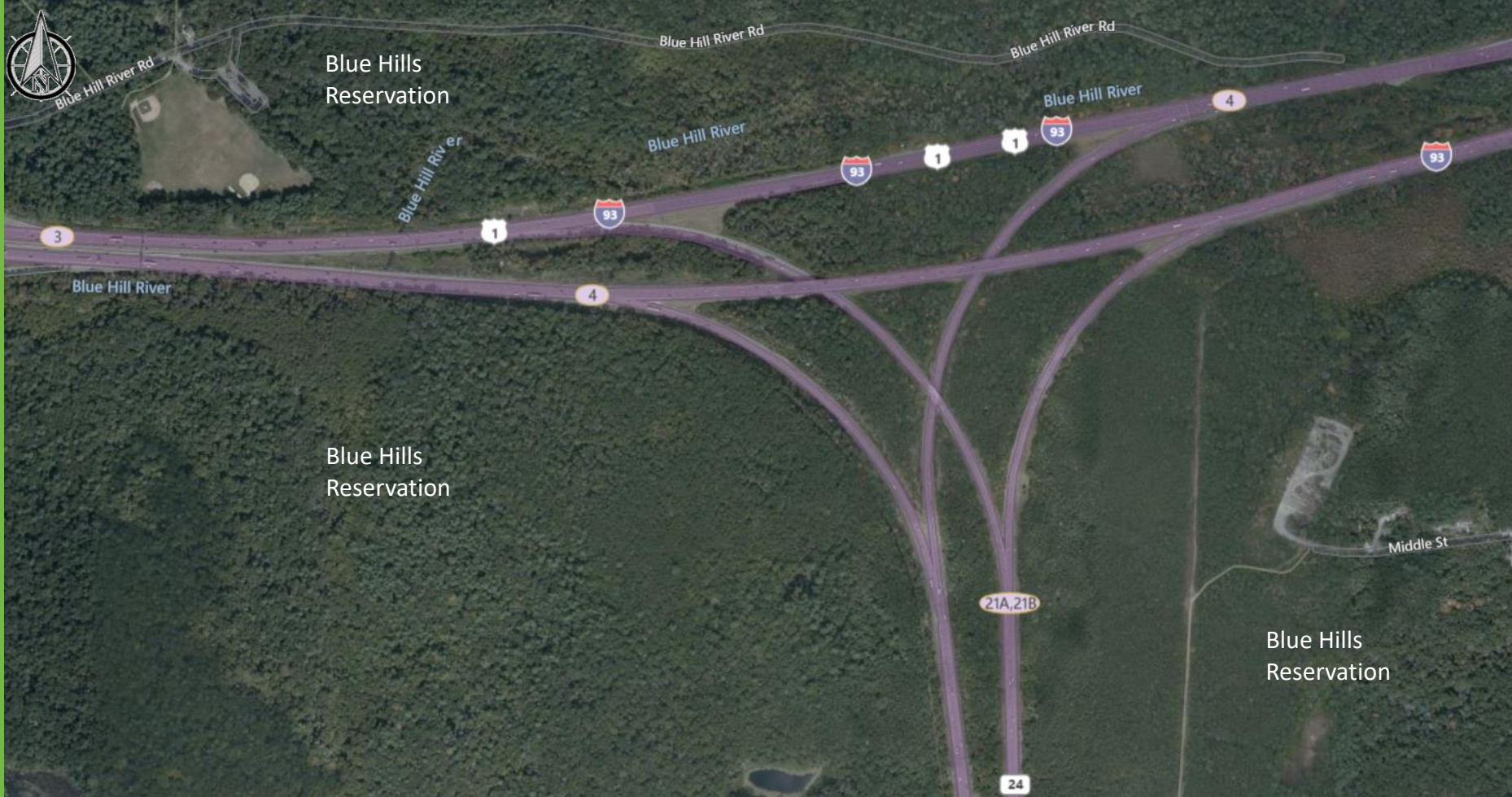
July 16, 2020

Locus Map



Exit 4

Aerial View of Project Area



Project Goals

- **Improve Roadway Lighting Conditions**
- **Increase Driver and Maintenance Worker Safety**
- **Improve System Reliability and Reduce Maintenance Costs**

Existing Conditions

- **High crash location:**
 - Over 500 crashes in 5 years
 - One fatality
 - 155 crashes occurred during low traffic volume under dark conditions
 - Another 48 crashes occurred at dawn or dusk
 - Of 203 crashes during low lighting conditions 56 crashes involved personal injuries and one fatality
 - Multiple crashes striking light poles
- **Loss of light poles due to vehicle hits worsens lighting conditions and requires increased maintenance**
- **Due to loss of poles illumination levels are below minimum**
- **Lack of light uniformity (bright areas and dark areas)**
- **Replacing light poles requires lane closures further reducing safety of motorists and putting maintenance crews at risk**

Existing Conditions

Light pole
knocked down on
May 11, 2020 on
Route 24 NB
Entrance to
I-93 NB



As-Built Photometrics*

Roadway Illuminance Statistics					
Description	Avg	Max	Min	Max/Min	Avg/Min
I-93 SB	1.4 fc	5.7 fc	0.2 fc	27.5:1	7.5:1
I-93 NB	1.4 fc	5.8 fc	0.2 fc	30.0:1	8.0:1
I-93 NB TO RT 24 SB RAMP	1.9 fc	5.7 fc	0.1 fc	57.0:1	19.0:1
I-93 SB TO RT 24 SB RAMP	1.4 fc	5.7 fc	0.3 fc	17.0:1	4.6:1
RT 24 NB TO I-93 SB RAMP	1.8 fc	5.7 fc	0.1 fc	57.0:1	18.0:1
RT 24 NB TO I-93 NB RAMP	2.2 fc	80.4 fc	0.2 fc	402.0:1	11.0:1

* Based on all initially installed light fixtures operational

Lack of light uniformity: recommended Avg/Min ratio: 3.0 (*Source: ANSI/IES; MassDOT agreed to increase Avg/Min ratio to 5.0*)

Current Photometrics*

Roadway Illuminance Statistics					
Description	Avg	Max	Min	Max/Min	Avg/Min
I-93 SB	0.6 fc	1.5 fc	0.0 fc	N/A	N/A
I-93 NB	0.5 fc	1.9 fc	0.0 fc	N/A	N/A
I-93 NB TO RT 24 SB RAMP	0.6 fc	1.3 fc	0.0 fc	N/A	N/A
I-93 SB TO RT 24 SB RAMP	0.7 fc	2.2 fc	0.0 fc	N/A	N/A
RT 24 NB TO I-93 SB RAMP	0.9 fc	2.1 fc	0.1 fc	21.0:1	9.0:1
RT 24 NB TO I-93 NB RAMP	0.6 fc	1.2 fc	0.0 fc	N/A	N/A

* Based on light fixtures present at the time of survey

- **Low levels of illumination do not meet standards:** recommended average roadway illuminance for major interchange: 1.8 fc (*Source: IES; MassDOT agreed to lower illuminance level to 1.0 fc*)
- **Lack of light uniformity:** recommended Avg/Min ratio: 3.0 (*Source: ENSI/IES; MassDOT agreed to increase Avg/Min ratio to 5.0*)

Proposed Improvements

- **Replace 133 existing cobra-style light poles with 11 high mast towers located outside the clear zone or behind guardrail**
- **Install all new conduit and wiring**
- **Replace two existing Lighting Load Centers (LLCs) and Transformer**
- **Upgrade building housing LLCs and transformer**
- **Provide level of illumination consistent with current design standards**

Benefits of High Mast Lighting

From 2018 Illuminating Engineering Society Manual:

- **Benefits derived from application of a high-mast lighting system:**
 - light system is designed to provide illumination of the roadway as well as the areas immediately beyond the roadway
- **High mast lighting tends to illuminate the entire traveled corridor within the road allowance,**
 - Provides greater visual comfort to the traveling motorist by improving peripheral vision and by better illuminating:
 - roadside obstacles
 - fixed structures,
 - and other similar objects in the field of view of a driver.

Benefits of High Mast Lighting

Additional Benefits:

- High mast towers are located outside of clear zone or behind guardrail minimizing potential for driver's collision
- Reduced maintenance costs
- Reduced power consumption

Proposed Improvements

Initial Design Highlights

- Eleven 150-foot tall high mast light towers
- Ten–fixture ring assembly on each high mast
- To minimize light trespass average roadway illuminance level reduced from 1.8 FC recommended by IES for major/major interchange to 1.0 FC
- Cut-off shields on fixtures facing environmentally sensitive areas
- Light color temperature – 4000 K

Comments Received

Concerns regarding High Mast Impacts

- **Impacts to Nocturnal Wildlife, specifically:**
 - Light trespass into Priority Habitat area (Lighting Zone 0)
 - Exceeding recommendation of 0.05 fc for Zone 0
 - Light Color Temperature of 4000K
- **General light pollution, including visibility of starry night sky**

Proposed Improvements

Subsequent Design Revisions

- Reduced height of six high mast towers to 135 feet
- Reduced light color temperature to 2700 K
- Introduced “dummy” fixtures facing environmentally sensitive areas
- Updated Categorical Exclusion Checklist

Photometric Analysis

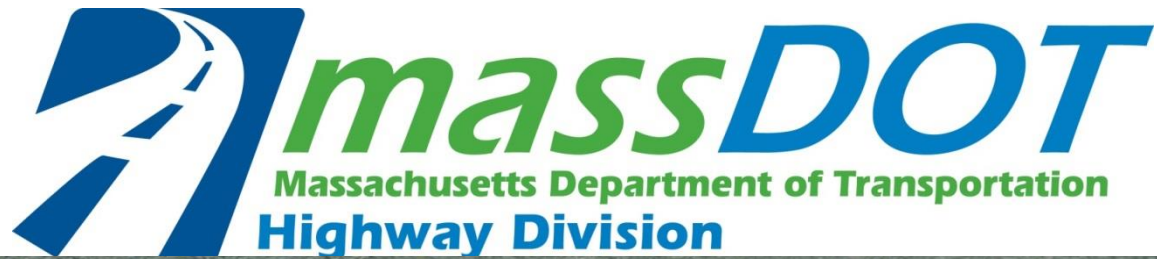
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I-93 NB	1.0 fc	2.5 fc	0.3 fc	8.3:1	4.0:1
I-93 NB TO RT 24 SB RAMP	1.0 fc	2.5 fc	0.2 fc	12.5:1	5.0:1
I-93 SB TO RT 24 SB RAMP	1.1 fc	2.1 fc	0.2 fc	10.5:1	5.5:1
RT 24 NB TO I-93 SB RAMP	1.1 fc	2.8 fc	0.3 fc	9.3:1	3.7:1
RT 24 NB TO I-93 NB RAMP	1.1 fc	2.2 fc	0.3 fc	7.3:1	3.7:1

Recommended average roadway illuminance for major interchange: 1.8 FC (*Source: IES; MassDOT agreed to lower illuminance level to 1.0 FC*)

Recommended illuminance for Lighting Zone 0 (environmentally sensitive area): 0.05 FC

Proposed Illuminance Heat Map





**Thank You
Q&A**

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