

# ROAD USER BENEFITS THROUGH ACCELERATED CONSTRUCTION

## MassDOT'S I-93 Fast 14 Project

FHWA Webinar

May 30, 2013





# FAST 14

I-93 Rapid Bridge Replacement Project



## Project Overview



# *Birth of a Project*

- Interstate 93 bridge superstructures in Medford are more than 50 years old and need to be replaced
- An on-going MassDOT repaving project during the spring/summer of 2010 revealed advanced deterioration in northbound bridge decks
- In July 2010 MassDOT initiated a feasibility study to replace the superstructures for several bridges on Intersection 93
- Deck failure in August 2010 on I-93 over Valley Street significantly reduced road capacity during completion of emergency repairs





# Advanced Deck Deterioration

*Isolated failures can result in full span repairs*



*Delaying commencement or completion of replacements may result in unscheduled emergency repairs*



# Bridge Locations



Valley Street

Webster Street

Salem Street WB

Salem Street EB

Riverside Avenue

Mystic River

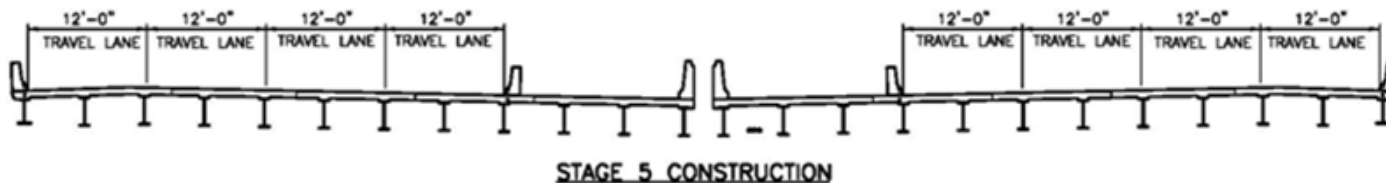
Route 16

These structures carry 200,000 vehicles per day



# Conventional Construction

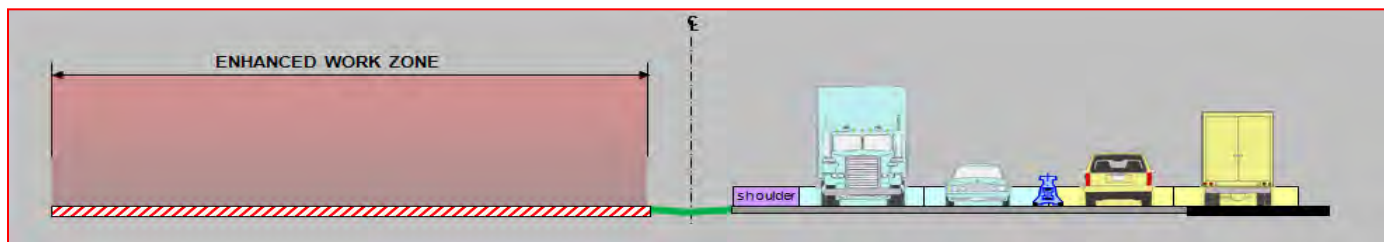
- Requires 5 stages
- Minimum 4 years
- Increased congestion/delays
- Worker safety issues
- Unsafe traffic splits
- Narrow travel lanes
- Loss of accel/decel lanes
- Concern over durability of the existing decks





# Accelerated Construction

- Replace 14 deteriorated bridge superstructures over 10 weekends June - August
- No Work on July 4<sup>th</sup>
- 2-weekends of float for weather/construction issues
- Use crossover on I-93 to provide 2 lanes NB and SB counter-flow in one barrel
- Aggressive traffic management



# Initial Project Goals

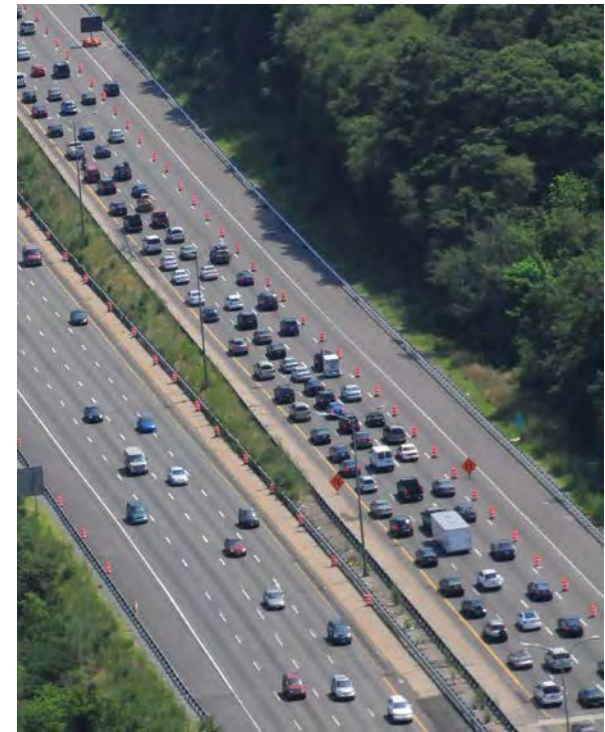
- Use of Accelerated Bridge Construction to reduce the duration of construction
- Make work zone safety is a priority
- Minimize traffic impacts to motorists and local communities
- Stress need to encourage route diversion
- Effectively communicate travel delays and detour routes to the public at large
- Sell the overall benefits of ABC





# Existing Traffic Volumes

- Evaluated historical I-93 summer count data to determine the possible impact for dropping two lanes on a 4-lane interstate highway
- This section of I-93 carries between 169,000 and 181,000 vehicles per day, even weekends
- I-93 weekend volumes for the highest hours of the day are still around 5,500 vph NB and SB
- Route 28, the primary local detour route, carries between 700 to 1,800 vph on the weekend
- The primary detour route has 16 traffic signals under local or other State Agency control and need to be evaluated and re-timed for progression
- Impacts expected on other regional facilities (Route 16, Route 38 & Route 60) which all see significant weekend peak hour traffic volumes



# Traffic Operations Goal



# Traffic Diversion Goal

NORTHBOUND		DIVERSION RATE (Percentages)	QUEUE LENGTH (miles)	AVERAGE DELAY (minutes)
<b>SATURDAY</b>				
		0%	20	172
Need 15%		10%	11	94
		20%	3	29
		30%	0	0
		40%	0	0
		50%	0	0
<b>SUNDAY</b>				
		0%	18	158
Need 15%		10%	9	80
		20%	2	15
		30%	0	0
		40%	0	0
		50%	0	0
SOUTHBOUND		DIVERSION RATE (Percentages)	QUEUE LENGTH (miles)	AVERAGE DELAY (minutes)
<b>SATURDAY</b>				
		0%	43	460
		10%	31	327
		20%	19	206
Need 35%		30%	9	100
		40%	1	15
		50%	0	0
<b>SUNDAY</b>				
		0%	47	512
		10%	29	313
		20%	19	202
Need 35%		30%	9	94
		40%	1	8
		50%	0	0

\*Based on Highest Hour of Traffic Observed

Need Minimum of **15%** traffic diversion Northbound on I-93

Need Minimum of **35%** traffic diversion Southbound on I-93





# Road User Cost Projections

*This represents the cost of one hour of general purpose vehicle driver's travel time based on a 2011 forecast using Consumer Price Index (CPI) History*

<u>TIME OF DAY</u>	<u>VALUE OF VEHICLE OPERATOR'S TIME (\$ / HOUR)</u>	<u>DELAY TIME (HOURS)</u>	<u>VOLUME (VEHICLES / HOUR)</u>	<u>INCREMENTAL ROAD USER COST AT EACH 15 MINUTE INTERVAL</u>	<u>TOTAL ROAD USER COST AT EACH 15 MINUTE INTERVAL</u>
Mon., 5:00:00 AM	\$18.97	0.5000	6,549	\$62,117	<b>\$62,117</b>
Mon., 5:15:00 AM	\$18.97	1.5000	7,000	\$199,185	<b>\$261,302</b>
Mon., 5:30:00 AM	\$18.97	2.5000	8,000	\$379,400	<b>\$640,702</b>
Mon., 5:45:00 AM	\$18.97	3.5000	10,000	\$663,950	<b>\$1,304,652</b>
Mon., 6:00:00 AM	\$18.97	4.5000	11,036	\$942,088	<b>\$2,246,740</b>
Mon., 6:15:00 AM	\$18.97	5.5000	11,150	\$1,163,335	<b>\$3,410,076</b>
Mon., 6:30:00 AM	\$18.97	6.5000	11,400	\$1,405,677	<b>\$4,815,753</b>
Mon., 6:45:00 AM	\$18.97	7.5000	11,600	\$1,650,390	<b>\$6,466,143</b>
Mon., 7:00:00 AM	\$18.97	8.5000	11,847	\$1,910,270	<b>\$8,376,412</b>



# *Incentives & Disincentives*

Operator valued at \$18.97 per person per hour with an average volume of 6,549 veh/hour = Incremental Road User costs at each 15-minute interval starts at \$62,117



*The Road User Costs represent the disincentive values that could be charged against the contractor for being late by each 15-minute increment*

# *So how do we do it?*



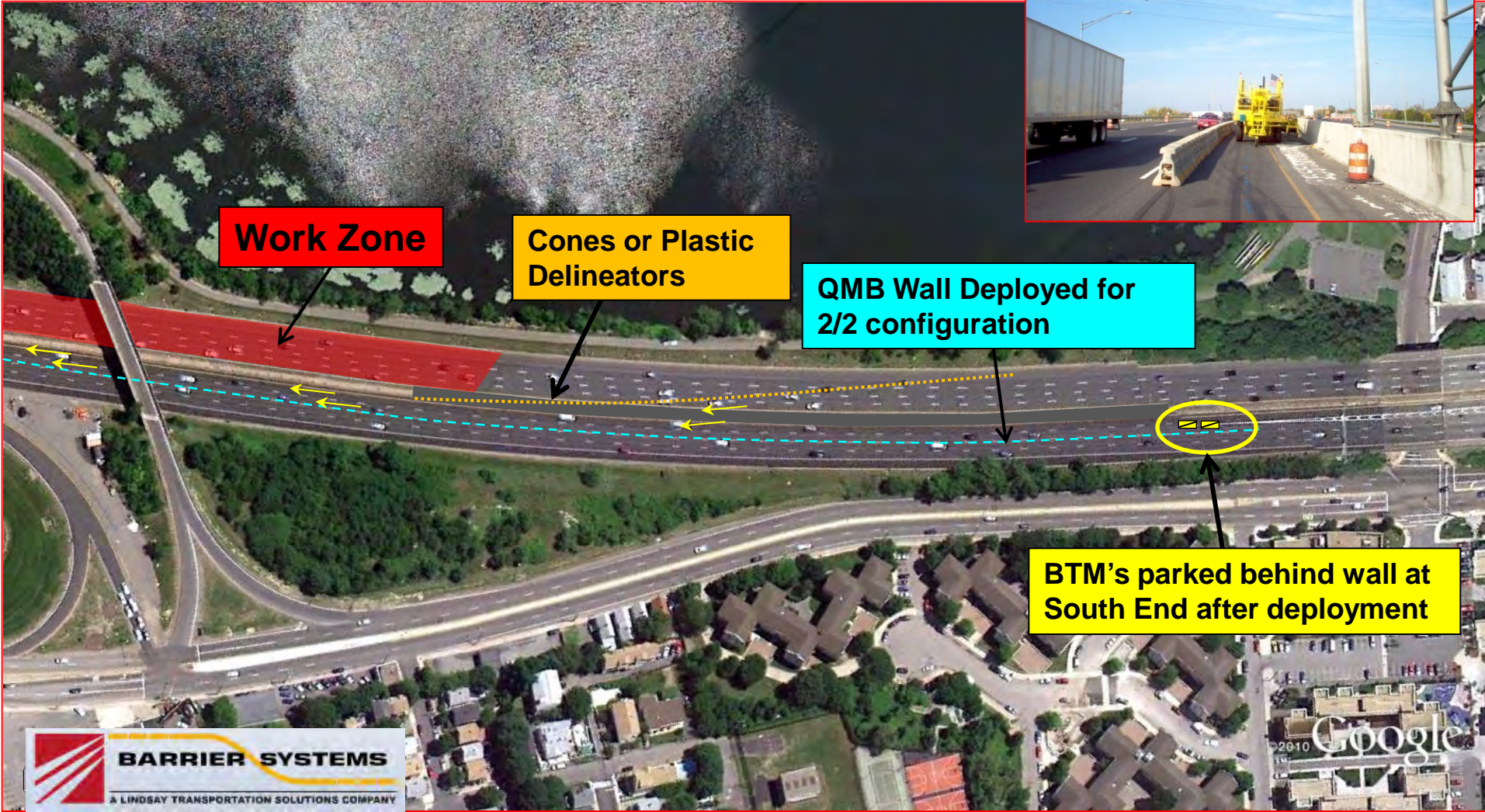


# Traffic Management Details

- Provide full access to one barrel of I-93 and divert traffic from opposite side via a crossover
- Use movable barrier to provide counter-flow operation for 2 lanes each direction
- Divert regional trips away from I-93
- Focus on “safe” means for mobility
- Allow local use of I-93 where feasible to provide access to on/off-ramps
- Use Real-Time Traffic Management system
- Use Police Details to support traffic operations and follow ICS for quick clearance

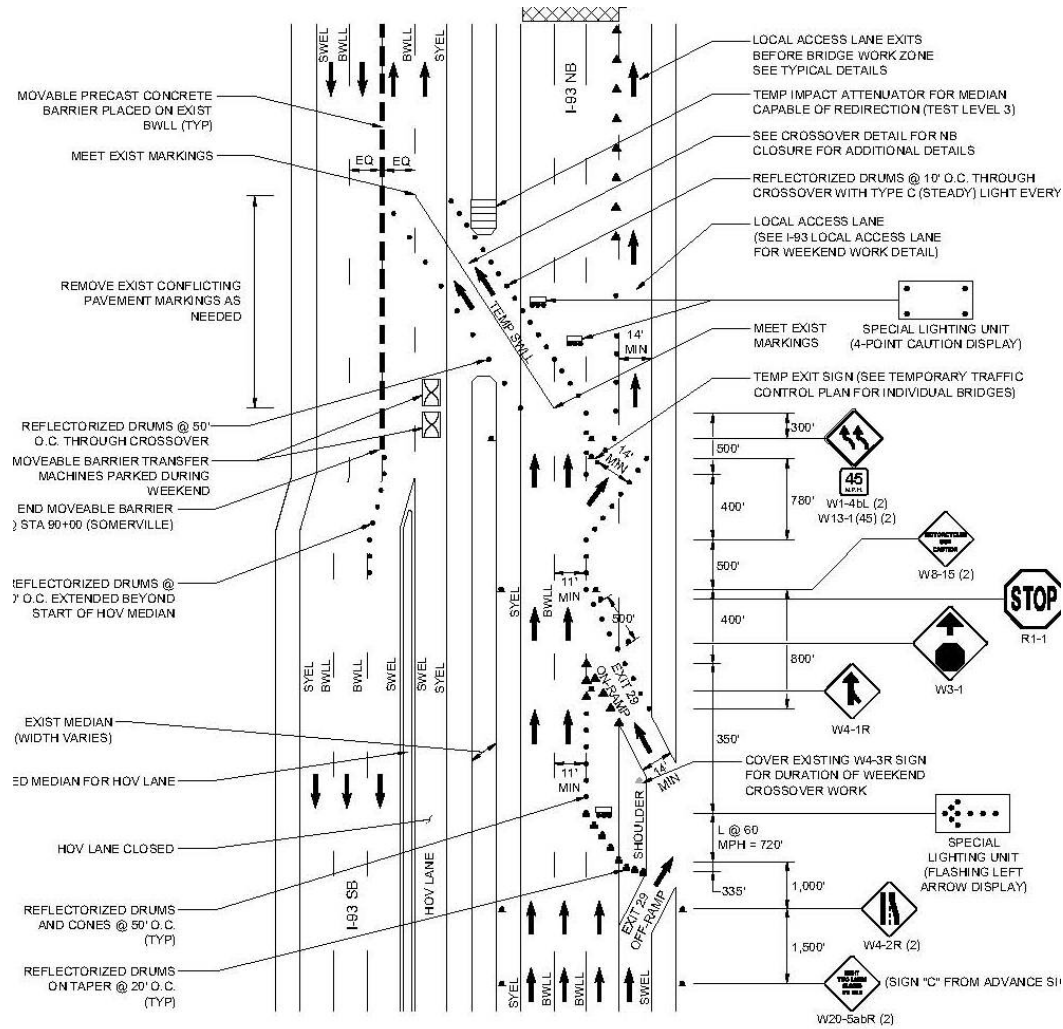


# Use of Movable Barrier





# I-93 Crossover TMP



SEE ADVANCE SIGN PLAN IN TEMPORARY TRAFFIC CONTROL PLAN FOR INDIVIDUAL BRIDGES FOR PCMS LOCATIONS AND MESSAGES.

## I-93 NB BRIDGE CLOSURE SOUTH OF SOUTHERN CROSSOVER





# Work Zone Speed Limit



# Work Area Protection



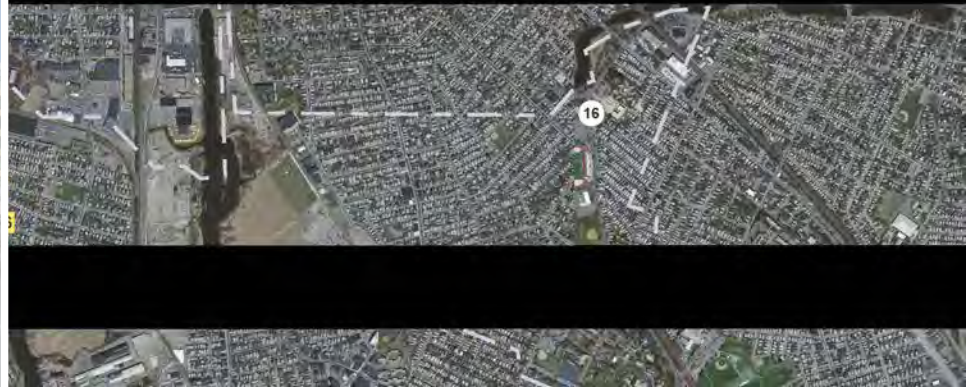
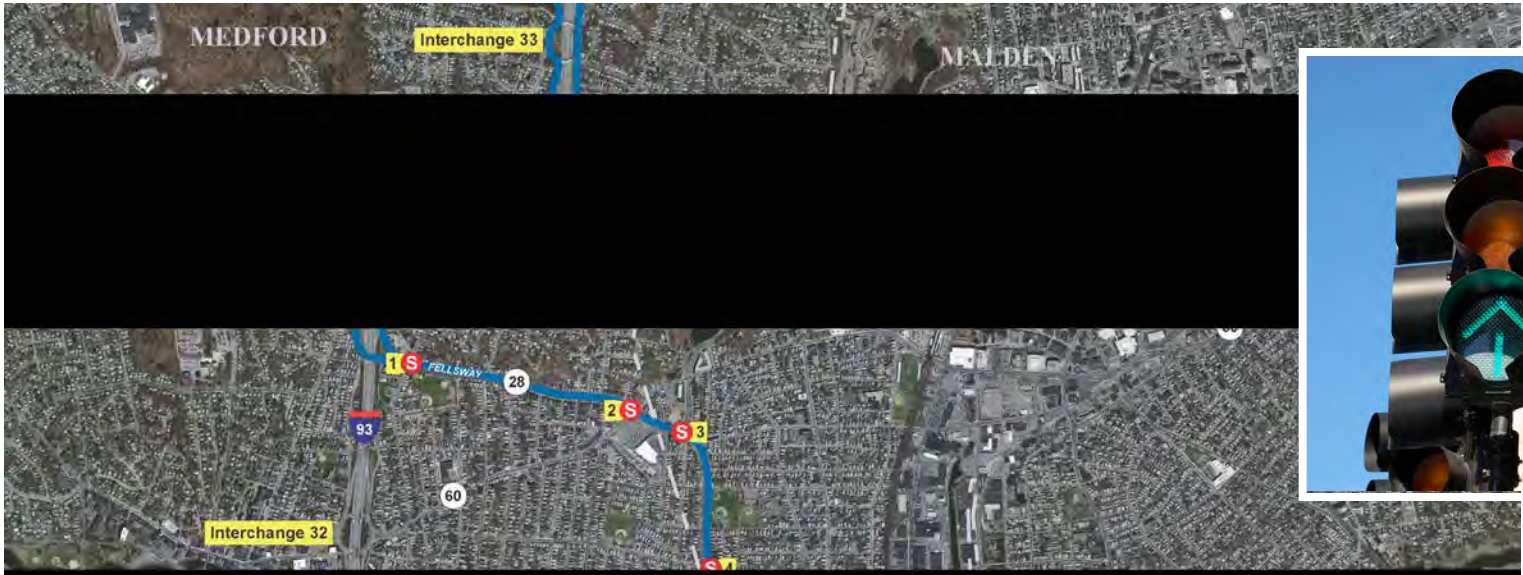


# Emergency Access Points

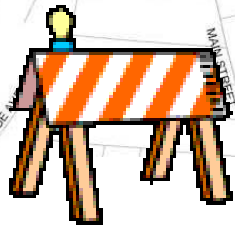
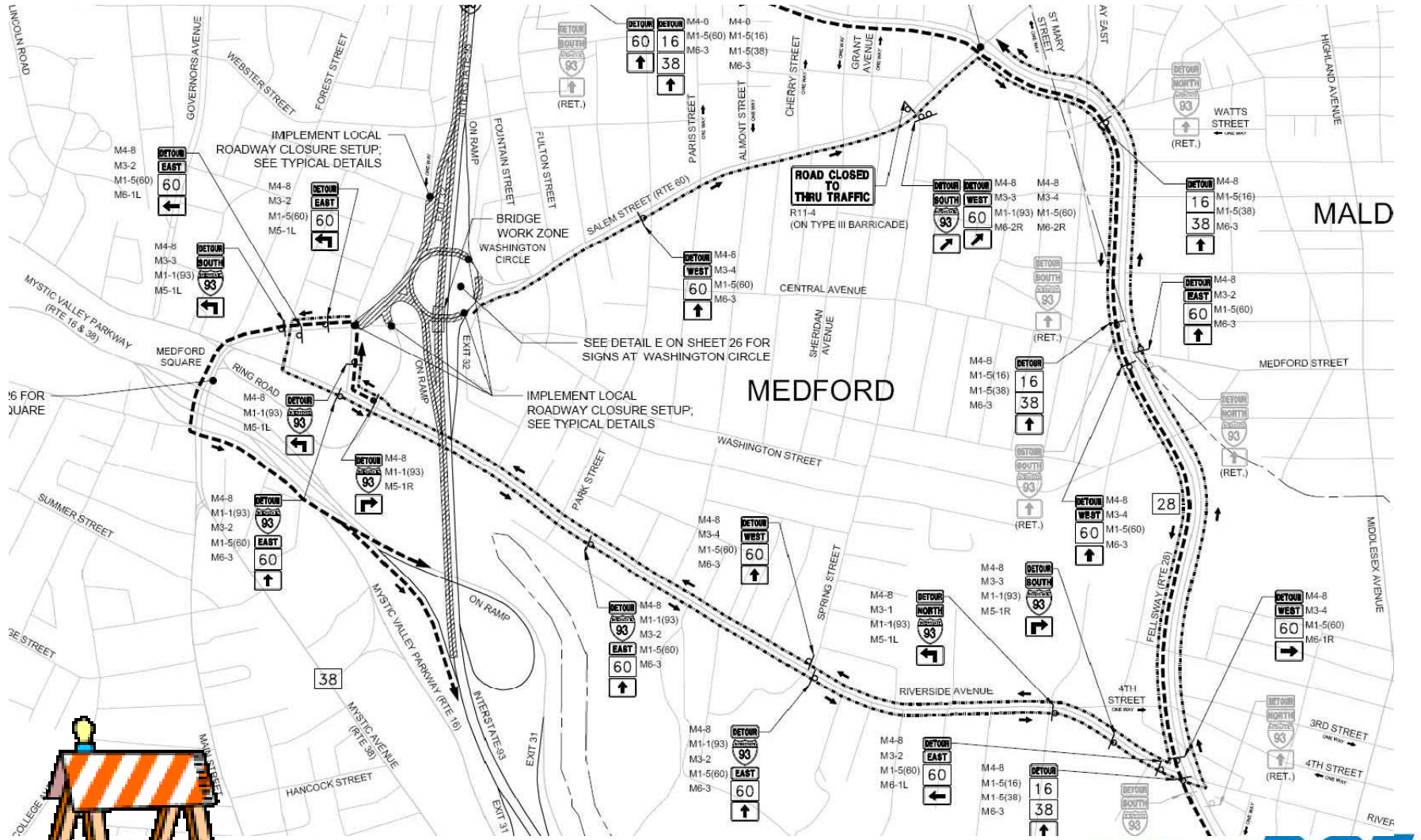




# Route 28 Traffic Plan



# Local Detour Routes

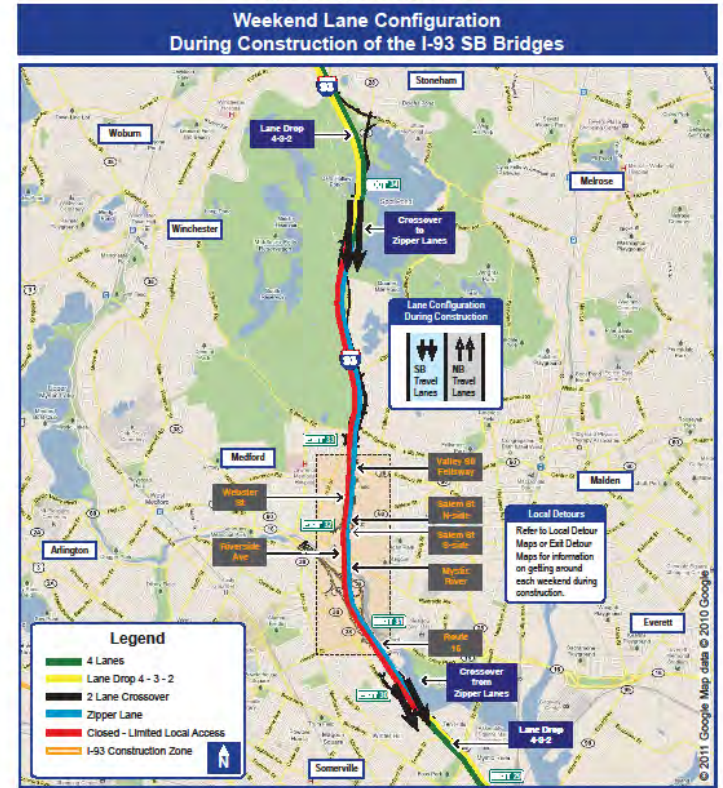
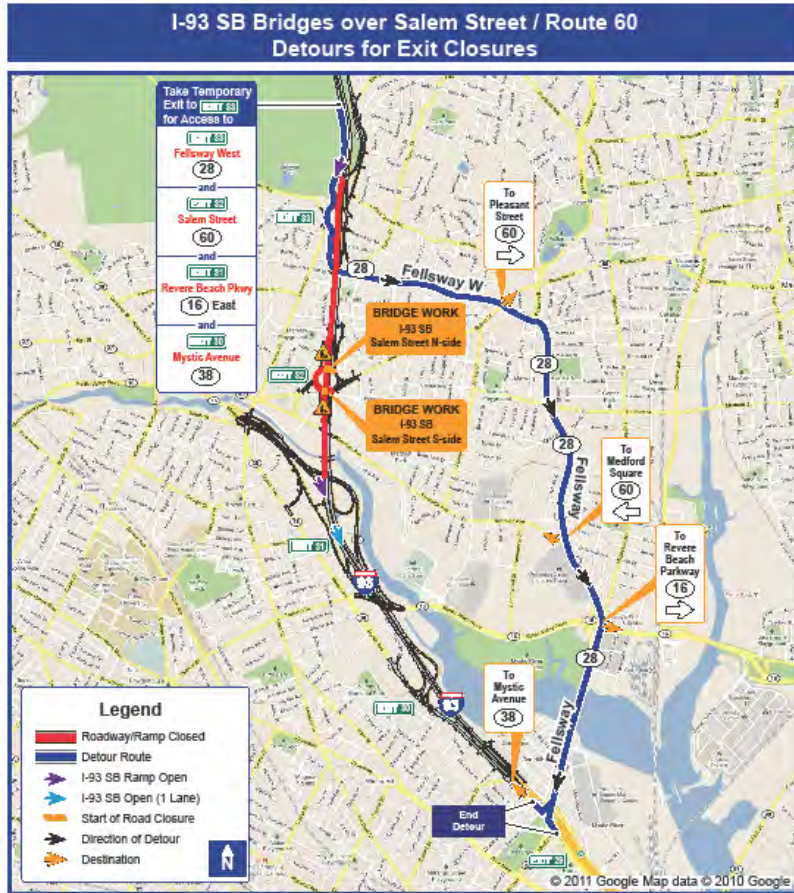




# Maps for Local Detour Routes



DRAFT  
5-13-2011  
v. 1



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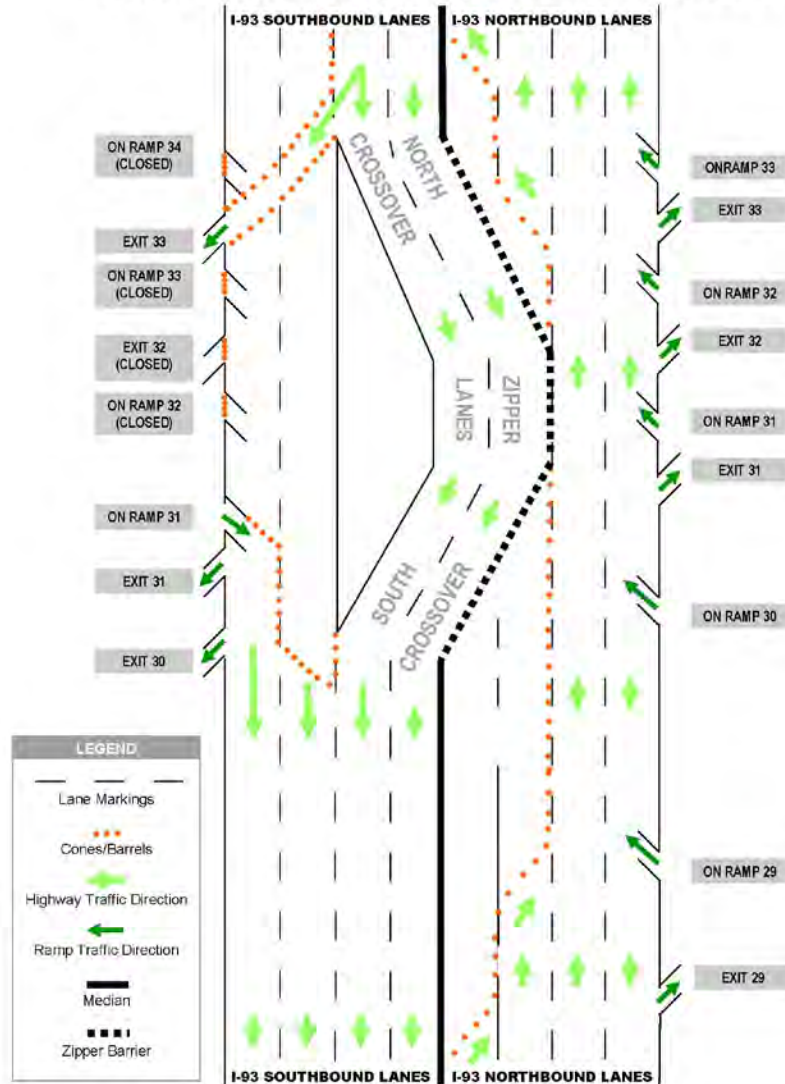
# Incident Command Center

- From early on in the process the decision was made to plan the Fast 14 traffic management operations as if the weekend schedule is an “incident” and utilize the Incident Command Structure according to the National Incident Management System (NIMS)
- The Massachusetts State Police have a mobile “command center” that will serve as the focal point of communications between work zone traffic details, intersection control, construction operations, local police/fire and of incidents and regional EMS



# I-93 Traffic Route Diagram

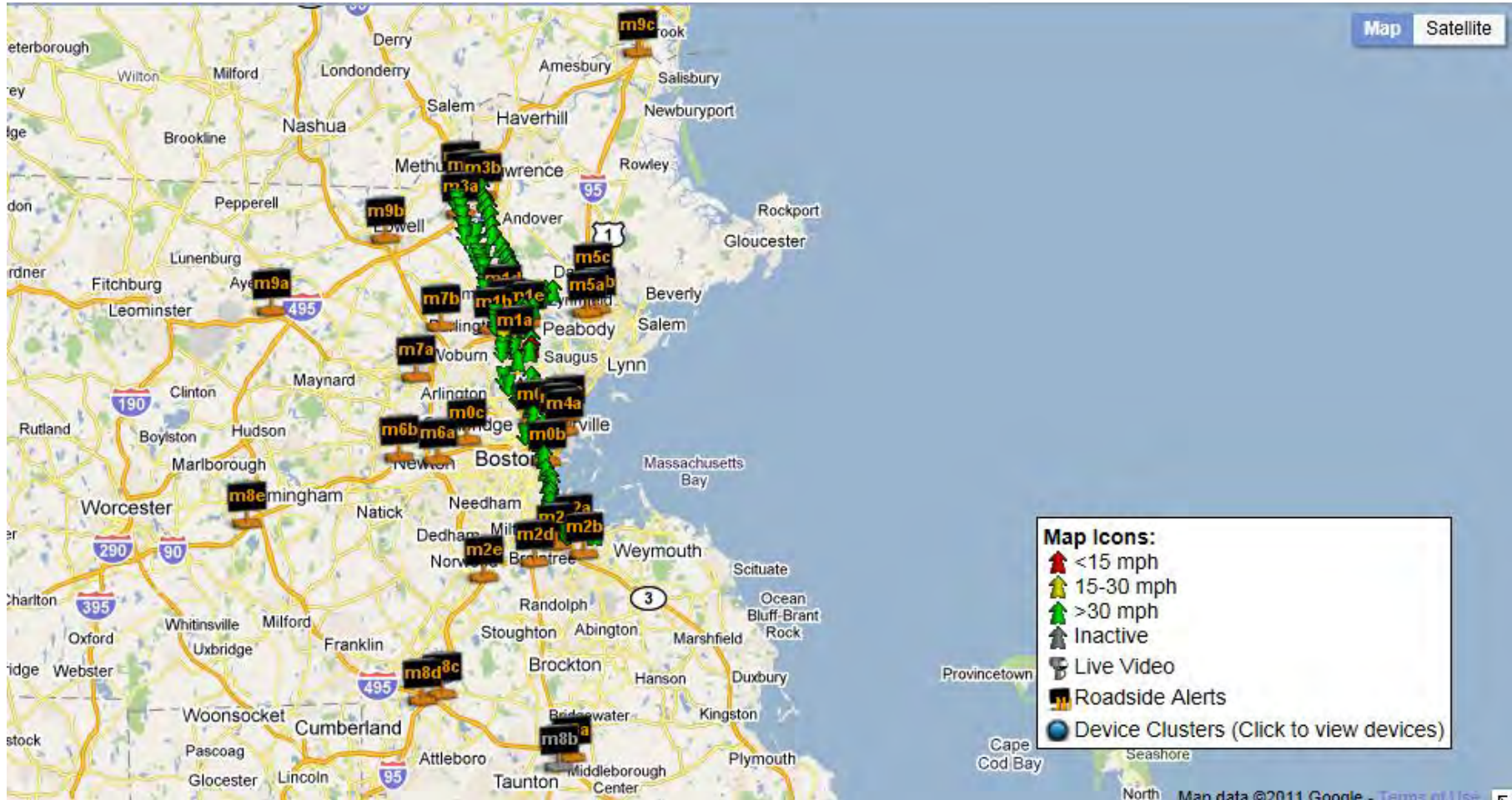
Fast14 Southbound Bridges Simplified Traffic Configuration



Diagrams created to assist State Police with simple layout of the traffic management plan displaying the lane/ramp status for use in fixed post assignment and quick emergency response



# Real-Time Traffic Management





# RTTM Equipment

- 35 Portable Changeable Message Signs (PCMS)



- 4 Portable Camera Trailers

- 67 Traffic Sensor Trailers

- 3 Bluetooth Sensors

- 2 Speed Radar Trailers

- ASTI's "CHIPS"

Program (Operating System)



# RTTM System

The screenshot displays the RTTM System web interface. At the top, there is a browser window with the URL <http://208.11.154.237/tcm/Default.aspx>. The page features the Mass.gov logo, the FAST 14 logo, and the massDOT logo (Massachusetts Department of Transportation).

The main content area is divided into several sections:

- Camera Feed (C01 - Camera):** Shows a live video feed of a highway with a traffic jam. The text above the video reads "North Camera, Facing South 07/12/2011 08:26:01 PM". Below the video are "Preset Views" and "Device Information" tabs.
- Map:** A Google Map showing the location of the camera and sensor. The map is centered on Stoneham, MA, near I-93. Green arrows on the map indicate sensor locations. A legend titled "Map Icons:" lists:
  - Red arrow: <15 mph
  - Yellow arrow: 15-30 mph
  - Green arrow: >30 mph
  - Grey arrow: Inactive
  - Camera icon: Live Video
  - Warning icon: Roadside Alerts
  - Blue circle: Device Clusters (Click to view devices)
- Sensor Data Panel (Q28 - RealTimeMeasurementSensor):** Contains "Sensor Data" and "Device Information" tabs. Under "Current Sensor Data":
  - Speed:**
    - S Lanes Average Speed: 11.00390625
    - Lane # 3 12
    - Lane # 4 9
    - N Lanes Average Speed: 72.52734375
    - Lane # 5 76
    - Lane # 6 68
  - Volume:** (Green bar)
  - Density:** (Red bar)
  - Get Historic Data:** (Link)
- Summary Panel (Bottom Left):** A black box with orange text that reads:
  - 93 NORTH TO EX 34 STONEHAM
  - 8 MINS
  - 5 MILES

The bottom of the screen shows a Windows taskbar with the time 8:28 PM and date 07/12/2011.



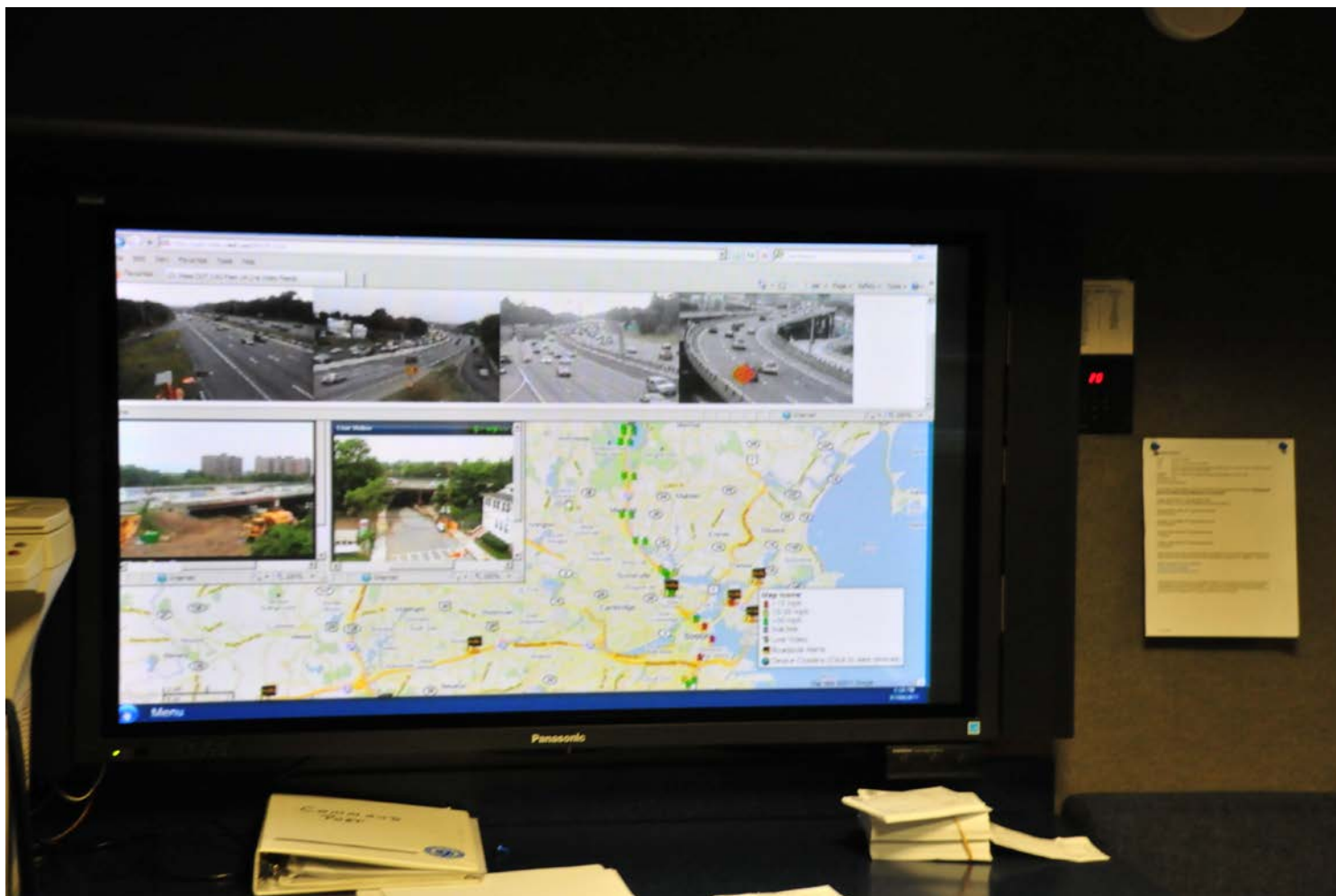


# *Field Office Operations Center*





# Video Wall at Command Post



# Highway Advisory Radio

- MassDOT deployed six HAR units approaching key alternate routes
- Message sets were drafted for eight different traffic scenarios based on varying delay thresholds



# 511 Construction Updates

- Entering the final weekend (#10), there were **825 users** of the dedicated I-93 Fast 14 Construction Alerts



- Saturday, July 30<sup>th</sup> – General Message

*“MassDOT- Medford I93 reduced to 2 lanes each dir – NB Ramps open, SB to Ex 33 only. Local access via Rt 28. Expect traffic delays/plan extra time/use alt rte”*

- Voice Over – In addition to the traditional text messages that we sent Sendza, we also prepared a voice over message to cover the roadway detour plans





# State Police Emergency Response Teams

## CVES



## CARS





# On-Site Tow Services



# Motorist Assistance Vans

In order to keep the “alternate routes” a viable option for motorists to consider diverting to, MassDOT scheduled the traditional weekday rush hour Motorist Assistance Vans to keep the road free from breakdowns and traffic incidents

**747 stops with 394 motorists assisted**





# Public Transportation



Anderson RTC -  
People were  
encouraged to  
take advantage of  
the free parking

MassDOT will replace 14 Medford bridges on I-93 north of Boston this summer, requiring significant lane restrictions during weekends. Plan ahead, expect delays and seek alternate routes, especially during weekends. Use caution in work zones.

**93 FAST 14**  
I-93 Rapid Bridge Replacement Project

**AVOID THE CONGESTION - TAKE THE MBTA**  
Free Parking at Anderson RTC  
Friday Night at 5 PM/All Day Saturday/All Day Sunday

Get project information, travel alerts,  
real-time traffic updates and more:  
[www.mass.gov/massdot/93fast14](http://www.mass.gov/massdot/93fast14)

Sign up to receive project information via email  
or send questions to the project team:  
[93fast14.info@state.ma.us](mailto:93fast14.info@state.ma.us)

Real-Time Traffic Updates & Travel Alerts

**massDOT**  
Massachusetts Department of Transportation

**ACCELERATED BRIDGE PROGRAM**


# Bus Route Changes

**T Service Advisory**  
Effective Friday 07/8/11 6 PM until Monday 07/11/11 5 AM

**Route 710 detour due to Webster Street Bridge Closure**

For the weekend of July 8th starting at 6:00PM the Route 710 will be detoured due to the closure of the Webster Street Bridge.

The route will omit service along Fulton Street, Webster Street and Forest Street between Fellsway West and Lawrence Road.




**T** Massachusetts Bay Transportation Authority  
For schedule information, call 617-222-3200, TTY 617-222-5146, or visit [www.mbta.com](http://www.mbta.com)

**T Service Advisory**  
Effective Friday 06/24/11 6 PM until Monday 06/27/11 5 AM

**Route 100 detour due to Valley Street and Fellsway Bridge Closure**

For the weekend of June 24th starting at 6:00PM the Route 100 will be detoured due to the closure of the Valley Street and Fellsway Bridge.

The bus stop at Valley and Fulton Streets will be relocated temporarily on the far side of the intersection. No other stops will be missed.



**T** Massachusetts Bay Transportation Authority  
For schedule information, call 617-222-3200, TTY 617-222-5146, or visit [www.mbta.com](http://www.mbta.com)



# ***Achievement of Project Goals***

- Managed interstate traffic without long queues/excessive delays
- Kept local detour routes moving with acceptable levels of delay
- Protected workers from hazards of the work zone zone/highway
- Avoided serious crashes within the limits of the TTCP







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