

# 12.12.12 GreenDOT Implementation Plan

## **MassDOT**

Massachusetts Department of Transportation

(text version – full graphic version available at : <http://www.massdot.state.ma.us/GreenDOT/GreenDOTImplementationPlan.aspx>)

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MassDOT is committed to having a positive impact on our environment while moving our customers and goods safely, reliably and efficiently. MassDOT projects a large footprint on the Commonwealth, as our people and facilities stretch throughout the state. This reach requires us to be responsible stewards of the Commonwealth's diverse landscape and be conscious of how we consume natural resources.

One example of this stewardship responsibility is water. The Massachusetts Bay Transportation Authority (MBTA) uses enough water to wash its buses annually to fill Fenway Park twenty times. This not only consumes significant amounts of a valuable natural resource, but also requires significant energy and impacts our finances. Another example is that our Highway Division has over 700 buildings that support its operations throughout the Commonwealth. Those buildings all consume energy and produce waste.

MassDOT's GreenDOT Policy makes sustainability an important aspect of the daily work that occurs at MassDOT. Everyday, we are striving to improve our business practices for the benefit of our customers. MassDOT has received recognition for these efforts, as evidenced by our receipt of a "Bicycle Friendly Business Award" from the League of American Bicyclists. We are proud that we are the first department of transportation in the country to receive such recognition, but we are not satisfied. We have a bold goal to triple the share of travel demand by bicycling, transit, and walking.

The GreenDOT Implementation Plan will help move us forward to achieving our sustainability goals by providing us with a framework to measure successful implementation through our performance management system. Like sustainability and livability, the GreenDOT Implementation Plan is not static; it is a 'living document' that will respond to innovations in technology and proven best practices.

I invite you to support MassDOT as we strive to become the most sustainable transportation department in the country while meeting our organizational mission of excellent customer service and safety.

Sincerely,

*(signature)*

Richard A. Davey

Secretary + CEO

# Goals:

## Air

- Reduce greenhouse gas emissions
- Improve statewide air quality

## Energy

- Consume less energy
- Increase reliance on renewable energy

## Land

- Minimize energy + chemicals used in maintenance
- Enhance ecological performance of MassDOT impacted land

## Materials

- Improve life-cycle impacts of investments
- Purchase environmentally preferred products
- Build green facilities for MassDOT

## Policy/Planning

- Design a multi-modal transportation system
- Promote healthy transportation + livable communities
- Triple mode share of bicycling, transit + walking

## Waste

- Achieve zero solid waste disposal
- Reduce all exposure to hazardous waste

## Water

- Use less water
- Improve ecological function of water systems

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# How to Use This Document

**MassDOT Stewardship Goal: Operate the transportation system in a manner that embraces our stewardship of the Commonwealth's natural, cultural, and historic resources.**

This GreenDOT Implementation Plan (The Plan) builds upon the MassDOT stewardship goal above, outlining sustainability initiatives for all MassDOT divisions under the themes of: air quality; energy consumption; material procurement; land management; transportation planning and design; waste management; and water resources.

Under these themes the GreenDOT Implementation Plan establishes 15 broad sustainability goals to decrease resource use, minimize ecological impacts, and improve public health outcomes from MassDOT's operations and planning processes. Each goal is supported by three to five tasks to be implemented over the next eight years. These tasks are then followed by specific indicators, which identify implementation time horizons and divisions responsible for implementation.

The Plan utilizes symbols and charts to help users navigate through the themes, goals, tasks, and indicators. It is written as a usable guide for frequent reference and future adaptation. The Plan will require the implementation of numerous immediate projects along with a thorough inventory of resources, utility expenses, and system operations across all MassDOT facilities. While there are many facilities MassDOT does not own, for example, airports or leased office space, it is anticipated the goals and tasks will provide guidance to those operators and inform the standards applicable to MassDOT's provision of public funding. GreenDOT applies to MassDOT contractors, as well as our state's Metropolitan Planning Organizations (MPOs) and Regional Transportation Authorities (RTAs). Additionally, the Plan should be utilized as a reference guide for our 351 municipalities to bring sustainable transportation to the local level.

GreenDOT will become a key element of MassDOT's performance management and asset management systems. The sustainability goals are written to encourage innovation and responsible investments, however, they do not mean to create unfunded mandates nor conflict; with federal regulations. The sustainability goals should become integrated in division budgets and procurement procedures. We expect that the tasks and indicators will be adjusted as each Division continues to implement the Plan.

## MassDOT Divisions

**Aeronautics** coordinates aviation policy in the Commonwealth and oversees the state’s public use general aviation airports, private use landing areas, and seaplane bases.

**Highway** designs, constructs, operates and maintains the Commonwealth's state roads and bridges including bicycle and pedestrian mobility.

**Rail + Transit** manages the Commonwealth's rail system and oversees the fifteen Regional Transit Authorities (RTAs) and the Massachusetts Bay Transportation Authority (MBTA).

**Registry of Motor Vehicles** licenses vehicle operators and registers vehicles and aircrafts. The Registry oversees commercial and non-commercial vehicle inspection stations.

**Shared Services** are groups within MassDOT that provide essential services to the Divisions and support the operations of MassDOT, including Information Technology, Administration, Finance, Legal, and the Office of Transportation Planning.

*(this text version of this document utilizes a modified format for the indicator matrixes than the graphic version illustrated below)*

Goal ▶ Broad sustainability goal applicable across divisions		Implementing Divisions							
Horizon ▶		2013	2015	2020					
Task ▶ Policy or procedure to implement the goal									
Indicators ▶	Short term action to complete by end of FY 2013	●			●	●	●		
	Mid-term action to complete by end of FY 2015		●			●	●	●	●
	Long term action to complete by end of FY2020				●	●	●		●

# GreenDOT Policy

Our mission is to deliver excellent customer service to the people who travel in the Commonwealth and to provide our nation's safest + most reliable transportation system in a way that strengthens our economy + quality of life.

Above is the Massachusetts Department of Transportation's organizational mission. A critical component of this mission is the GreenDOT initiative, which is MassDOT's internal policy that makes sustainability part of every employee's job. GreenDOT establishes that MassDOT be an innovator in promoting sustainability throughout the transportation sector.

GreenDOT has three primary objectives:

1. Reduce greenhouse gas (GHG) emissions
2. Promote healthy transportation options of walking, bicycling, + public transit
3. Support smart growth development

This Plan will further these objectives, helping us to achieve our goal of being the most sustainable transportation department in the nation. The Plan captures the scope of multiple environmental policies and sustainability initiatives in place within state government, as well as other best practices, and packages them into one plan for long-term stewardship. A key objective of GreenDOT is to embed sustainability into the agency culture and make it easy for MassDOT employees to contribute to better stewardship.

GreenDOT builds off existing policies of the Commonwealth and innovative practices of MassDOT already underway. It also references best practices from other state DOTs and transit agencies as benchmarks to match or exceed. These policies and practices are assembled together within this Plan under 16 broad sustainability goals. Measurable tasks and performance indicators describe practices for immediate implementation by 2013, medium-term application for 2015, and long-range policy targets for 2020. The tasks and indicators for each time horizon will be integrated into MassDOT's performance management efforts.

The Plan focuses upon sustainability practices under the direct control of MassDOT, concentrating on system operations and transportation project development. These strategies may also offer opportunities to address our long term fiscal challenges through energy and maintenance cost savings. At the same time, many of these sustainability goals require investments that may be challenging to make given the current situation related to transportation funding. The Divisions and their partners will implement the sustainable activities identified in this plan with sensitivity to how minority, low-income, and limited-English proficient populations are impacted, both in relation to benefits and burdens.

The transportation facilities maintained by MassDOT touch all corners of the Commonwealth, by providing the infrastructure that allows for the flow of people and goods. Because of this reach, MassDOT has a unique contribution to make as a steward of the environment. This plan outlines a path forward for MassDOT to achieve our organizational goal of being a national leader in 'greening' a state-wide transportation system.

# Goals:

## Air

- Reduce greenhouse gas emissions
- Improve statewide air quality

## Energy

- Consume less energy
- Increase reliance on renewable energy

## Land

- Minimize energy + chemicals used in maintenance
- Enhance ecological performance of MassDOT impacted land

## Materials

- Improve life-cycle impacts of investments
- Purchase environmentally preferred products
- Build green facilities for MassDOT

## Policy/Planning

- Design a multi-modal transportation system
- Promote healthy transportation + livable communities
- Triple mode share of bicycling, transit + walking

## Waste

- Achieve zero solid waste disposal
- Reduce all exposure to hazardous waste

## Water

- Use less water
- Improve ecological function of water systems

# Air

## Goals:

- Improve statewide air quality
- Reduce greenhouse gas emissions

### **MassClean Diesel, Revere**

Partnering with Executive Office of Energy + Environmental Affairs, MassClean Diesel retrofitted more than 2,000 school buses, at no expense to bus owners. These retrofits help keep engine fumes away from children onboard and reduce exhaust emissions to the air. More than 300,000 kids in nearly 300 municipalities now ride to school in lower-polluting buses.

### **Electric Ground Service Vehicles, Mansfield**

60 Global Electric Motorcars (GEM) were given to MassDOT Airports by the Chrysler Corp. Each airport was given two vehicles to help with the day to day operations. These GEM vehicles travel 50 miles per charge and cost approximately \$.02 per mile to run. This vehicle at Mansfield Municipal Airport is used to inspect runways and taxiways.

### **Plug-In Hybrid Vehicles, Lenox**

Highway Districts 1 and 2 have transformed four Toyota Prii into plug-in hybrids. Plug-in hybrid vehicle technology offers many benefits over a conventional hybrid, all-electric, or internal combustion engines that include: lower fuel costs, convenient refueling, less anxiety of vehicle range than pure electric vehicles, reductions in air pollution, and lower greenhouse gas emissions.

### **Electric Vehicle License Plate, Statewide**

The RMV has recently issued new electric vehicle license plates to identify EV, hybrid, or plug-in hybrid vehicles. The plates will provide emergency responders an alert that the automobile contains a different motor and electrical system. They also offer municipalities and businesses a method to identify EV's for incentive programs or reserved parking.

**Goal: Improve Statewide Air Quality**

Massachusetts has been a national leader in implementing polices and programs to reduce vehicle emissions and improve air quality. To be a good steward for statewide air quality, MassDOT will continue to make investments and innovations to reduce emissions with ‘cleaner’ fleets and a streamlining of operations.

**Other Themes Addressed:** Energy, Land, Materials, Policy, Planning and Design

**Implementing Divisions:** All

**Task intensity and description:**

Low: Reduce emissions from maintenance + construction equipment

Low: Decrease total engine idling

Moderate: Decrease volatile organic compound discharge from facilities

Moderate: Increase fuel efficiency of operating transit fleets

Complex: Increase efficiency of transportation systems operations

Reduce emissions from maintenance + construction equipment						
Indicators	Horizon	Implementing Divisions				
Retrofit + use of hybrid engine system for each vehicle class piloted	2013	Aeronautics	Highway	Rail + Transit		Shared Services
Diesel retrofit program for on and off-road vehicles expanded	2013		Highway	Rail + Transit		
Hours of non-revenue vehicle operation reduced by 5% through operations streamlining	2015	Aeronautics	Highway	Rail + Transit		
Electric and/or full exhaust cycle motors have replaced 2-stroke equipment	2015	Aeronautics	Highway	Rail + Transit		
All new heavy equipment purchased run hybrid, CNG, or other high efficiency engines	2020	Aeronautics	Highway	Rail + Transit		

## Decrease total engine idling

Indicators	Horizon	Implementing Divisions				
On-board electrification of maintenance equipment for each vehicle type piloted	2013	Aeronautics	Highway	Rail + Transit		
Outreach program established in partnership with EEA to increase customer education of idling laws	2013				Registry	Shared Services
MassDOT compliance with anti-idling laws ensured	2013	Aeronautics	Highway	Rail + Transit	Registry	Shared Services
On + off-road anti-idling policies included in all construction, maintenance + service contracts	2013	Aeronautics	Highway	Rail + Transit	Registry	Shared Services
Anti-idling policies, more restrictive than state law developed to eliminate unnecessary idling	2015	Aeronautics	Highway	Rail + Transit	Registry	Shared Services
Anti-idling technology in transit vehicle + maintenance truck operations utilized	2015	-	Highway	Rail + Transit		
90% of MassDOT over-road maintenance vehicles run hybrid engines or have on-board electrification	2020	-	Highway	Rail + Transit		

## Decrease volatile organic compound discharge from facilities

Indicators	Horizon	Implementing Divisions				
Spray painting restricted to permitted booths + emissions controls installed at spray shops	2015		Highway	Rail + Transit		
All maintenance yard gasoline fueling pumps retrofitted with vapor recovery systems	2015	Aeronautics	Highway	Rail + Transit		
Technologies for diesel + jet fuel vapor recovery explored + implemented where feasible	2020	Aeronautics	Highway	Rail + Transit		
Air emission control training provided to all maintenance employees	2015	Aeronautics	Highway	Rail + Transit		

## Increase fuel efficiency of operating transit fleet

Indicators	Horizon	Implementing Divisions				
100% of transit bus fleet replaced or retrofitted with hybrid systems or best in class fuel efficiency vehicles	2020			Rail + Transit		Shared Services
Statewide diesel transit + school bus retrofit program optimized + balanced with efficient vehicle purchases	2015		Highway	Rail + Transit		Shared Services
20 new high efficiency commuter rail diesel locomotive in service	2015			Rail + Transit		Shared Services
40 new high efficiency commuter rail locomotives purchased	2020			Rail + Transit		Shared Services

## Increase efficiency of transportation systems operations

Indicators	Horizon	Implementing Divisions				
E-ZPass applications dispersed with vehicle registration (RMV)	2013		Highway		Registry	
E-ZPass advertised on turnpike toll tickets	2013		Highway			
Electronic tolling facility of road and parking facilities launched	2020		Highway	Rail + Transit		
Number of E-ZPass transponders increased by 25%	2015		Highway		Registry	
Planned bridges and ROWs designed to increase options for double tracked lines + allow double-stack cars	2020		Highway	Rail + Transit		
Six rail corridors upgraded to increase speed including separated grade crossings or other improvements	2015		Highway	Rail + Transit		
Dwell time of commuter rail trains at stations decreased	2015			Rail + Transit		Shared Services
Program initiated to increase the number of high level commuter rail platforms	2015			Rail + Transit		
Bus route efficiency measures implemented by all transit operators	2015			Rail + Transit		Shared Services
Efficiency of snow + ice operations increased by 50%	2015		Highway			
ITS deployed in critical locations to manage congestion and encourage transit	2015		Highway			Shared Services

## **Goal: Reduce Greenhouse Gas Emissions**

MassDOT and all other State Agencies are mandated by Governor Patrick's Executive Order 484 to achieve a 40% reduction of greenhouse gas (GHG) emissions from daily operations and transportation services by 2020. The GreenDOT policy also directs MassDOT to work toward reducing GHG emissions from the transportation sector, in furtherance of the Commonwealth's innovative Global Warming Solutions Act (GWSA). Many of the energy efficiency efforts we have undertaken over the past decade will help us meet this goal for GHG reduction. Through this plan MassDOT will assemble and promote the best practices across divisions that save energy, resources, and costs.

**Other Themes Addressed:** Energy, Materials, Policy, Planning and Design

**Implementing Divisions:** All

**Task intensity and description:**

Moderate: Increase vehicle electrification facilities

Moderate: Increase use of alternative + renewable fuels

Moderate: Increase fuel efficiency of light duty vehicles

Complex: Increase fuel efficiency of maintenance + construction equipment

Low: Increase telecommuting and meetings by web conference

Low: Track progress toward statewide GHG reduction + other sustainability goals

## Increase vehicle electrification facilities

Indicators	Horizon	Implementing Divisions				
2 truck electrification plug-in facilities piloted at highway service areas	2015		Highway			Shared Services
Truck wayside electrification provided at all service areas with designated long-term truck parking	2020		Highway			Shared Services
Pilot shorepower plug-in facilities provided at two airports serving large jets	2020	Aeronautics				
At least 30 electric vehicle (EV) chargers installed along state highway system + transit parking areas	2013		Highway	Rail + Transit		Shared Services
Installation of EV charging stations at regular intervals along northeast corridor completed	2015		Highway			Shared Services
Optimal Statewide EV plug-in station network planned + implemented	2020		Highway	Rail + Transit		Shared Services
All major park and ride, + transit parking lots (>50 vehicles) have charging stations	2020	Aeronautics		Rail + Transit		Shared Services
Electric Ground Service Equipment (GSE) utilized at airports for grounds crew operations	2015	Aeronautics				
Feasibility analysis of expanding the use of battery + fuel cell powered buses completed	2015			Rail + Transit		Shared Services
The feasibility of electric commuter rail locomotives studied within the Commuter Rail Master Plan	2015			Rail + Transit		Shared Services

## Increase use of alternative + renewable fuels

Indicators	Horizon	Implementing Divisions				
Bio-fuel (such as B10-B20 biodiesel) tested in oil heated buildings	2013	Aeronautics	Highway	Rail + Transit	Registry	Shared Services
20% biodiesel (B20) blend purchased for oil heated buildings	2015	Aeronautics	Highway	Rail + Transit	Registry	Shared Services
Recycled vegetable oil / non-food stock impairing fuel purchased for biodiesel blends	2013	Aeronautics	Highway	Rail + Transit	Registry	Shared Services
Volume purchasing of alternative fuels established across facilities + divisions	2015	Aeronautics	Highway	Rail + Transit	Registry	Shared Services
B10 + B20 biodiesel pilot begun in all diesel vehicle types	2013	Aeronautics	Highway	Rail + Transit		
B10 to B20 biodiesel utilized in all diesel vehicles, depending on availability, vehicle type + season	2015	Aeronautics	Highway	Rail + Transit		
At least 2 alternative fuel options offered at all highway service areas	2015		Highway			
Use of alternative jet fuels tested in coordination with FAA programs	2015	Aeronautics				

## Increase fuel efficiency of light duty vehicles

Indicators	Horizon	Implementing Divisions				
Vehicle fleet inventoried + prioritized for replacement and retrofit based on emissions reduction	2013	Aeronautics	Highway	Rail + Transit	Registry	Shared Services
75 new hybrid, CNG or electric vehicles purchased	2013		Highway			Shared Services
50% of DOT light vehicle fleet replaced or retrofitted with zero or partially zero emission vehicles	2015	Aeronautics	Highway	Rail + Transit	Registry	Shared Services
A portion of light duty fleet in urban areas integrated with car-share programs	2015	–	Highway	Rail + Transit	Registry	Shared Services
Light duty fleet downsized with carpooling, interdepartmental vehicle use, + car-sharing	2020	Aeronautics	Highway	Rail + Transit	Registry	Shared Services
All light duty vehicles replaced or retrofitted with hybrid, electric, CNG or best in class technology	2020	Aeronautics	Highway	Rail + Transit	Registry	Shared Services

## Increase fuel efficiency of maintenance + construction equipment

Indicators	Horizon	Implementing Divisions				
Performance measures added to maintenance + construction contracts for green fleets	2013	Aeronautics	Highway	Rail + Transit		
15% of maintenance fleet replaced with best in class emission ratings	2015	Aeronautics	Highway	Rail + Transit		

## Increase telecommuting + meetings by web conference

Indicators	Horizon	Implementing Divisions				
Teleconference technology capabilities installed at all offices	2013	Aeronautics	Highway	Rail + Transit	Registry	Shared Services
Take home vehicle fleet for office employees eliminated	2013	Aeronautics	Highway	Rail + Transit	Registry	Shared Services
Telecommuting + flex time options expanded for employees	2013	Aeronautics	Highway	Rail + Transit	Registry	Shared Services
Peak hour single occupancy vehicle trips by employees reduced by 20%	2020	Aeronautics	Highway	Rail + Transit	Registry	Shared Services

## Track progress toward statewide GHG reduction + other sustainability goals

Indicators	Horizon	Implementing Divisions				
All resource use + purchases reported for performance monitoring	2013	Aeronautics	Highway	Rail + Transit	Registry	Shared Services
GHG equivalency factors generated for resource consumption + conservation practices	2013					Shared Services
Resource conservation practices prioritized to maximize GHG reduction	2013					Shared Services
Cumulative progress of GHG reductions is projected annually in STIP utilizing best available tools	2013					Shared Services
MassDOT's GHG emissions target of 40% reduction from a 2002 baseline is met	2020	Aeronautics	Highway	Rail + Transit	Registry	Shared Services

# Energy

## Goals:

- Consume less energy
- Increase reliance on renewable energy

### **CCRTA Wind Turbine, South Dennis**

Cape Cod Regional Transit Authority's installed a 100 kW wind turbine at its Operations Center. The turbine generates 181,000 kW hours of electricity annually, which represents about 60% of the electricity the center consumes, saving approximately \$35,000 and offsetting approximately 257 tons of carbon emissions per year.

### **LED Streetlights, Cambridge**

District 6 has install LED energy-efficient fixtures on new ornamental streetlight poles along Route 28, enhancing roadway and pedestrian light levels, and reducing energy use and electricity costs.

### **Blue Line Vehicles, Boston + Revere**

In 2009 the MBTA replaced the Blue line subway fleet with 94 modern energy efficient vehicles. The subway cars are equipped with regenerative braking technology which allows the trains to reuse energy created as the vehicles slow down

### **Energy Star Passenger Terminal, Barnstable**

The new 35,000 square-foot passenger terminal building at Barnstable Municipal Airport is seeking an Energy Star rating based on its multiple energy saving design initiatives including white roofs, high performance windows, high efficient HVAC systems, point of service water heaters, and fluorescent lighting.

## Consume less energy

MassDOT is a major consumer of electricity, from running subway trains and lighting roadways, to fueling buses and road maintenance vehicles. Energy conservation and efficiency efforts can allow us to provide the same services to our customers while also reducing operational costs and the ecological impacts of our activities.

**Other Themes Addressed:** Air, Materials

**Implementing Divisions:** All

**Task intensity and description:**

Low: Reduce building electricity use

Moderate: Reduce electricity use from outdoor lighting

Moderate: Reduce fuel use for heating buildings + water

Complex: Reduce electricity consumption by subways + trolleys

Reduce building electricity use						
Indicators	Horizon	Implementing Divisions				
Electrical + HVAC use of all buildings + facilities audited	2013	Aeronautics	Highway	Rail + Transit	Registry	Shared Services
Office electrical equipment shutdown program implemented	2013	Aeronautics	Highway	Rail + Transit	Registry	Shared Services
Employee education and incentive programs established to encourage energy use reduction	2013	Aeronautics	Highway	Rail + Transit	Registry	Shared Services
All buildings not updated in 10 years renovated / overhauled / consolidated	2015	Aeronautics	Highway	Rail + Transit	Registry	Shared Services
Motion sensor/occupancy lighting installed in all buildings	2015	Aeronautics	Highway	Rail + Transit	Registry	Shared Services
Electricity purchased by MassDOT reduced by 35%	2020	Aeronautics	Highway		Registry	Shared Services
Electricity purchased by the MBTA reduced by 20% per passenger mile	2020			Rail + Transit		

## Reduce electricity use by outdoor lighting

Indicators	Horizon	Implementing Divisions				
Use of incandescent bulbs eliminated	2015	-	Highway	Rail + Transit	Registry	Shared Services
Outdoor lighting assets + technology inventoried	2013	Aeronautics	Highway	Rail + Transit	Registry	
Central Artery Tunnel lighting retrofitted with LED lights	2013		Highway			
50% of all outdoor lighting (ROW, parking lots, tunnels, runways, airfields) retrofitted	2015	Aeronautics	Highway	Rail + Transit	Registry	
100% of all outdoor lighting retrofitted	2020	Aeronautics	Highway	Rail + Transit	Registry	
Electricity consumption for lighting reduced by 50% through retrofits and operations	2020	Aeronautics	Highway	Rail + Transit	Registry	Shared Services
All traffic signals replaced with LED bulbs	2015		Highway	Rail + Transit		

## Reduce fuel use for heating buildings + water

Indicators	Horizon	Implementing Divisions				
Audit of all heating systems + water fixtures conducted + opportunities for retrofit identified	2013	Aeronautics	Highway	Rail + Transit	Registry	Shared Services
Temperatures of all adjustable boilers/heaters reduced	2013	Aeronautics	Highway	Rail + Transit	Registry	Shared Services
Shade tree planting around MassDOT buildings increased to improve building energy performance	2015	Aeronautics	Highway	Rail + Transit	Registry	Shared Services
50% of all inefficient / electric water heaters replaced with high efficiency tanks or tankless systems	2015	Aeronautics	Highway	Rail + Transit	Registry	Shared Services
All inefficient / electric water heaters replaced with high efficiency tanks or tankless systems	2020	Aeronautics	Highway	Rail + Transit	Registry	Shared Services
Oil heating systems converted to natural gas or renewable alternatives where feasible	2015	Aeronautics	Highway	Rail + Transit	Registry	Shared Services
Geothermal + cogeneration heating systems studied for all new buildings	2013	Aeronautics	Highway	Rail + Transit	Registry	Shared Services
Envelops of all buildings are evaluated and prioritized for insulation upgrades	2013	Aeronautics	Highway	Rail + Transit	Registry	Shared Services
Total heating fuel + costs for MassDOT-owned buildings reduced by 20%	2015		Highway	Rail + Transit	Registry	Shared Services
Total heating fuel + costs for MassDOT-owned buildings reduced by 35%	2020		Highway	Rail + Transit	Registry	Shared Services
Insulation of all heated / air conditioned buildings assessed and replaced as needed	2020		Highway	Rail + Transit	Registry	Shared Services
All MassDOT-owned HVAC systems +/- or windows retrofitted or replaced	2020		Highway	Rail + Transit	Registry	Shared Services

## Reduce electricity consumption by subways + trolleys

Indicators	Horizon	Implementing Divisions				
Evaluation of on-board and/or wayside energy recapture conducted for all subway lines	2015			Rail + Transit		
Electrical systems of all subway lines evaluated and retrofitted where cost effective	2020			Rail + Transit		
All outdated transit vehicles replaced with high efficiency cars	2020			Rail + Transit		
New subway car purchases contain regenerative braking technology	2013			Rail + Transit		
RFR issued for wayside station regeneration installation	2020			Rail + Transit		

## Increase reliance on renewable energy

MassDOT and all other State agencies are mandated by Governor Patrick's Executive Order 484 to increase the renewable energy portion of their portfolio and to increase the percentage of their electricity purchased or generated from renewable sources. MassDOT will continue to rely on electricity to deliver transportation options to our customers; however, this electricity can be generated by renewable sources, facilitating investments in the growing renewable energy economy in Massachusetts. To meet this need, MassDOT will continue to pursue both on-site generation capacity + renewable energy procurements, compliant with the Commonwealth's renewable energy portfolio standards.

**Other Themes Addressed:** Air, Materials

**Implementing Divisions:** All

**Task intensity and description:**

Low: Participate in MassDOT Energy Task Initiative

Moderate: Increase energy produced on MassDOT properties

Complex: Purchase renewable energy

Participate in MassDOT Energy Initiative						
Indicators	Horizon	Implementing Divisions				
Create a MassDOT energy management plan	2013	Aeronautics	Highway	Rail + Transit	Registry	Shared Services
Three pilot solar facilities installed + operational along highway ROW	2013		Highway			Shared Services
Site selection completed for large scale photovoltaic solar installation on highway ROW	2015		Highway			Shared Services
All energy consumption (electricity / heating / fleet fuel) tracked + centrally reported	2015	Aeronautics	Highway	Rail + Transit	Registry	Shared Services
Feasibility study completed for additional wind power generation sites on MassDOT properties	2013		Highway	Rail + Transit	Registry	Shared Services

## Increase energy produced at MassDOT facilities

Indicators	Horizon	Implementing Divisions				
Comprehensive feasibility assessment and renewable energy generation plan completed	2013	Aeronautics	Highway	Rail + Transit	Registry	Shared Services
4 RFR's issued by MassDOT for additional renewable generation sites	2013	Aeronautics	Highway	Rail + Transit	Registry	
10 new renewable energy projects installed at MassDOT facilities	2015	Aeronautics	Highway	Rail + Transit	Registry	
At least 5% of electricity demand generated by MassDOT renewable projects	2020	Aeronautics	Highway	Rail + Transit	Registry	

## Purchase more renewable energy

Indicators	Horizon	Implementing Divisions				
Bulk purchasing of green electricity portfolio with other state agencies initiated	2013	Aeronautics	Highway	Rail + Transit	Registry	Shared Services
12% of electricity needs met through production or green energy purchases	2015	Aeronautics	Highway	Rail + Transit	Registry	
25% of electricity needs met through production or green energy purchases	2020	Aeronautics	Highway	Rail + Transit	Registry	

# Land

## Goals:

- Minimize energy + chemical use in maintenance
- Enhance ecological performance of MassDOT impacted land

### **I-91 Slope Stabilization, Greenfield**

A creative solution to stop and prevent serious slope erosion, while maintaining rare Wood Turtle habitat was developed by MassDOT. Three different species of dormant willow cuttings were placed in soil-filled, perforated cardboard tubes. The tubes protected the shrubs while rock was placed around them. Seeded compost was placed on the rock to ensure perennial and grass growth.

### **Reduced Mowing, Sutton**

Maintenance crews in District 3 have allowed natural landscape to return to portions of the right-of-way of Route 146 as part of an experimental vegetation management program. In addition to improved habitats, the reduced mowing area improves stormwater treatment of the median, may help control drifting snow, and reduce maintenance costs.

### **Peregrine Nesting Box, West Springfield**

Crews installed a wooden nest box for peregrine falcons on top of a pier on the I-90 bridge over the Connecticut River. Nesting pairs of falcons are attracted to bridges, which are similar to their normal nesting environment on cliff faces. Peregrine falcons do not build stick nests and the eggs can roll off bridges thus nest boxes increase the productivity of this endangered species.

### **Wildlife Tunnel, Concord**

Underneath Route 2, MassDOT installed a wildlife tunnel which is used by various animals including deer, raccoons, and coyotes. "Critter Crossings" provide a safe passage way for wildlife while increasing roadway safety. (photo courtesy of Lydia Rogers, Concord Wildlife Passage Task Force)

## Minimize energy + chemical use in maintenance

MassDOT's land stewardship includes rights-of-way adjacent to our transportation networks, maintenance facilities and offices. Integrated vegetation and pest management system utilize innovations in landscape practices to reduce chemical and fuel use that can provide cost savings and a healthier environment.

**Other Themes Addressed:** Energy, Policy, Planning + Design, Water

**Implementing Divisions:** All

**Task intensity and description:**

Moderate: Increase acreage of land planted with native / low maintenance vegetation

Moderate: Decrease area + frequency of land mowed

Low: Implement an integrated vegetation management approach for ROWs + facilities

Low: Require intelligent use of herbicides + pesticides in construction and maintenance

Moderate: Protect, preserve and enhance woodland + urban tree coverage

Increase acreage of land planted with native / low maintenance vegetation						
Indicators	Horizon	Implementing Divisions				
New facilities planted with sustainable, minimally managed native landscape	2013	Aeronautics	Highway	Rail + Transit	Registry	
Lawn installations around five facilities replaced with natural (low maintenance) vegetation	2015		Highway	Rail + Transit	Registry	
Native plant restoration or managed fallow habitat restoration increased 25% along ROWs	2015		Highway	Rail + Transit		
Available land surrounding all rural depots and offices planted with native vegetation	2020		Highway	Rail + Transit	Registry	

## Decrease area + frequency of land mowed

Indicators	Horizon	Implementing Divisions				
Inventory of grassed area conducted	2013	Aeronautics	Highway	Rail + Transit		
Turf grass replaced with broad spectrum blend of grasses including warm season + slow growing for low maintenance	2013	Aeronautics	Highway	Rail + Transit		
Mowing frequency reduced by 25%	2013		Highway	Rail + Transit		
Mower blades raised in turtle habitat + areas contiguous with natural areas as standard operating procedure	2013	Aeronautics	Highway	Rail + Transit		
Mowing + brush cutting jobs are scheduled around animal nesting season to the maximum extent possible	2013	Aeronautics	Highway	Rail + Transit		

## Implement an integrated vegetation management approach for ROWs + facilities

Indicators	Horizon	Implementing Divisions				
Landscape areas inventoried by habitat area + maintenance regime	2013	Aeronautics	Highway	Rail + Transit		
Adopted Vegetation Management Plans focus on integrated management approach	2015	Aeronautics	Highway	Rail + Transit		
Grassed areas replaced with natural landscapes beyond sight line + recovery zones	2015	Aeronautics	Highway			
Compost materials used as the preferred soil amendment in all maintenance + construction projects	2013	Aeronautics	Highway	Rail + Transit		
Soil augmentation utilize organic landscape techniques + minimize nutrient loads to water supplies	2015	Aeronautics	Highway	Rail + Transit		

## Require intelligent use herbicides + pesticides in construction + maintenance

Indicators	Horizon	Implementing Divisions				
Mechanical weed control utilized to minimize traditional herbicide use	2013	Aeronautics	Highway	Rail + Transit	Registry	
Herbicides used only in conjunction with integrated + sustainable roadside/railway vegetation management plans	2013	Aeronautics	Highway	Rail + Transit	Registry	
Increase number of employees trained for herbicide application to allow more selective application	2015	Aeronautics	Highway	Rail + Transit		
Integrated pest management (IPM) implemented for all maintenance projects + construction sites	2013	Aeronautics	Highway	Rail + Transit		
Ongoing training for employees + technical assistance for municipalities on organic/IPM practices established	2013	Aeronautics	Highway	Rail + Transit		

## Protect, preserve + enhance woodland + urban tree coverage

Indicators	Horizon	Implementing Divisions				
2 to 1 tree replacement policy implemented where woodland preservation desired	2013		Highway	Rail + Transit		
Mature, healthy tree preservation is maximized in maintenance and project design where feasible	2013		Highway	Rail + Transit		
Trees and naturalized landscaping emphasized in revised Project Development + Design Guide	2013		Highway	Rail + Transit		
Sustainable roadside woodland management plan established for construction and maintenance	2015		Highway	Rail + Transit		
Urban street tree coverage enhanced during improvement projects	2015		Highway	Rail + Transit		
Coordinated tree planting policy established to encourage locally supported urban forestry practices	2015		Highway	Rail + Transit		
100,000 trees planted along roadways as part of MassDOT's Complete Streets practices	2020		Highway	Rail + Transit		

## Enhance ecological performance of MassDOT impacted land

MassDOT's transportation facilities touch all areas of the Commonwealth including significant habitat areas and natural landscapes. Our facilities can coexist with and enhance these key habitats by minimizing impacts on plant and animal habitats, and reducing the "road effect zone" of our rights-of-way. MassDOT's innovative management practices and sensitive construction project designs can enhance the ecological functions of the land we manage.

**Other Themes Addressed:** Policy, Planning + Design, Water

**Implementing Divisions:** All

**Task intensity and description:**

Low: Increase habitat preservation + enhancements

Moderate: Decrease outdoor light pollution

Moderate: Increase wildlife accommodations along ROWs + facilities

Complex: Decrease quantity of invasive + noxious species

Increase habitat preservation + enhancements						
Indicators	Horizon	Implementing Divisions				
Proactively coordinate project development with MA Department of Fish + Game	2013	Aeronautics	Highway	Rail + Transit		Shared Services
Restored + maintained areas increased for non-urban construction projects	2015	Aeronautics	Highway	Rail + Transit		
Contiguous areas of land greater than one acre suitable for natural grassland or shrubland habitat identified	2015	Aeronautics	Highway			Shared Services
A landscape/habitat restoration + enhancement policy developed + implemented	2015	Aeronautics	Highway			Shared Services
25 nest boxes installed at appropriate locations	2015	-	Highway	Rail + Transit		
Surplus land with high natural resource value evaluated for transfer to appropriate state agencies	2015		Highway	Rail + Transit	Registry	Shared Services
Grassland and/or Woodland Management Plans in place for all appropriate facilities	2015	Aeronautics	Highway	Rail + Transit		
Wildlife + endangered species training program provided for applicable employees	2015	Aeronautics	Highway	Rail + Transit		
Ten rare species habitat management/ enhancement projects initiated within right-of-way	2015	Aeronautics	Highway	Rail + Transit		

## Decrease outdoor light pollution

Indicators	Horizon	Implementing Divisions				
New lighting designed to conserve energy + avoid light pollution	2013	Aeronautics	Highway	Rail + Transit		
Light shields installed in coordination with roadway + parking lot lighting fixture retrofits	2015	Aeronautics	Highway	Rail + Transit		

## Increase wildlife accommodation along ROWs + facilities

Indicators	Horizon	Implementing Divisions				
Wildlife mortality databases updated to establish a wildlife mortality reporting Standard Operation Procedure	2013		Highway			Shared Services
Feasibility of wildlife crossings studied in every project within rare species habitats or wildlife mortality areas	2013		Highway			Shared Services
Feasibility of wildlife crossings studied in every project within rare species habitats or wildlife mortality areas	2013		Highway			Shared Services
Wildlife hazard mitigation plan(s) implemented for all facilities	2015	Aeronautics	Highway	Rail + Transit		Shared Services
Reptile + amphibian + fish passage structures incorporated into maintenance activities	2013		Highway	Rail + Transit		Shared Services
Project forms revised to include wildlife accommodations measures early in design review	2013		Highway	Rail + Transit		Shared Services
Wildlife fencing along ROWs/properties within all critical habitat areas evaluated + installed	2020	Aeronautics	Highway	Rail + Transit		Shared Services

## Decrease quantity of invasive + noxious species

Indicators	Horizon	Implementing Divisions				
Planting of all listed noxious or invasive species prohibited	2013	Aeronautics	Highway	Rail + Transit		
All stockpiled materials screened for noxious or invasive species	2013	Aeronautics	Highway	Rail + Transit		
Transportation of cut wood materials limited to avoid beetle + other pest transportation	2013	Aeronautics	Highway	Rail + Transit		
Information on invasive species distributed with all truck and boat operating licenses	2013				Registry	
Active invasive species management programs in place within priority habitat areas	2015	Aeronautics	Highway	Rail + Transit		Shared Services
Aggressive species early detection + rapid response program in place	2015	Aeronautics	Highway	Rail + Transit		Shared Services
Invasive species control on sites are managed with minimal adverse impact on other species	2013	Aeronautics	Highway	Rail + Transit		
All maintenance crews trained on invasive species detection	2015	Aeronautics	Highway	Rail + Transit		

# Materials:

## Goals:

- Purchase environmentally preferred products
- Improve life-cycle impacts of investments
- Build green facilities for MassDOT

### **John W. Olver Transit Center, Greenfield**

The super-energy efficient building, is the home to the Franklin Regional Transit Authority and the Franklin Regional Council of Governments. It currently serves as a bus terminal and will eventually serve as a passenger train station. Energy-saving systems are built into the building's design, and 7,300 square feet of photovoltaic panels along with 22 geothermal wells result in a zero-net-energy building.

### **Cold in Place Asphalt, Warwick**

Cold in-place recycling projects require minimal truck trips for removing and replacing materials. In addition to reducing truck traffic, the process reduces energy inputs into the manufacturing process and eliminates the need for mining and production of virgin materials. The technique not only is better for the environment, but also is faster and less expensive.

### **Scott Reservoir Outlet Bridge, Fitchburg**

This bridge highlights the use of an innovative construction method called a "Bridge-in-a-Backpack". The composite tubes used to build the structural spine of the bridge are light and portable, and were transported to the construction site in large bags. The only heavy vehicles needed to construct the superstructure are concrete trucks to fill the tubes and install the concrete deck.

### **Farmer's Market – Charlton Travel Plaza**

Local farmers are invited to take advantage of free vending space at the MassDOT's eighteen highway travel plazas to sell their locally-grown produce and made-in-Massachusetts products. These activities help support the Commonwealth's economic vitality.

## Purchase environmentally preferred products

MassDOT is a major purchaser of supplies and equipment from paper to leaf blowers that support our facilities that serve our customers. These products have life cycle costs from their embodied energy use to future disposal costs. Along with other agencies of the Commonwealth, MassDOT has made great efforts to increase procurement of recycled materials and other environmentally preferable products. This Plan will expand upon this success and result in more products that are safe for both people and the environment.

**Other Themes Addressed:** All

**Implementing Divisions:** All

**Task intensity and description:**

Low: Implement an environmentally preferred materials purchasing program

Moderate: Purchase energy efficient equipment

Low: Use environmentally friendly cleaning products + procedures

Moderate: Reduce hazardous chemical use in operations + maintenance

Moderate: Increase opportunities for local vendors + locally sourced products at facilities

Implement an environmentally preferred materials purchasing program						
Indicators	Horizon	Implementing Divisions				
Environmentally preferred materials purchasing programs implemented in collaboration with OSD	2013	Aeronautics	Highway	Rail + Transit	Registry	Shared Services
Low or no volatile organic compound furniture + flooring purchased	2013	Aeronautics	Highway	Rail + Transit	Registry	Shared Services
100% recycled content paper products purchased	2013	Aeronautics	Highway	Rail + Transit	Registry	Shared Services
Reclaimed + recycled materials utilized for landscaping + earthwork	2013	Aeronautics	Highway	Rail + Transit	Registry	
Only refrigerators with low Global Warming Potential (GWP) refrigerants and insulation purchased	2013	Aeronautics	Highway	Rail + Transit		Shared Services
Sustainable Forestry Certified wood for permanent or temporary construction utilized	2013	Aeronautics	Highway	Rail + Transit	Registry	
Standards for recycled content of traffic control/safety devices developed	2015		Highway	Rail + Transit		Shared Services
Sustainability practices integrated into all construction and service contract evaluation criteria	2013	Aeronautics	Highway	Rail + Transit	Registry	Shared Services

## Purchase energy efficient equipment

Indicators	Horizon	Implementing Divisions				
Only Energy Star or Electronic Product Environmental Assessment Tool certified electronic products purchased	2013	Aeronautics	Highway	Rail + Transit	Registry	Shared Services
Total electronic appliances within office locations reduced	2015	Aeronautics	Highway	Rail + Transit	Registry	Shared Services
Energy efficient criteria utilized for shop equipment + machinery purchases	2020	Aeronautics	Highway	Rail + Transit		

## Use environmentally friendly cleaning products + procedures

Indicators	Horizon	Implementing Divisions				
Maintenance products + procedures utilized that pose least harm to humans + the environment	2013	Aeronautics	Highway	Rail + Transit	Registry	Shared Services
Protocols for disposal of all cleaning product waste established	2013	Aeronautics	Highway	Rail + Transit	Registry	Shared Services
Environmentally friendly cleaning products purchased when available	2015	Aeronautics	Highway	Rail + Transit	Registry	Shared Services
Environmental friendly cleaning products required to be used within vendor service contracts	2013	Aeronautics	Highway	Rail + Transit	Registry	Shared Services

## Reduce hazardous chemical use in operations + maintenance

Indicators	Horizon	Implementing Divisions				
Hazardous materials substitution program developed	2013	Aeronautics	Highway	Rail + Transit		
Hazardous materials spill prevention control and countermeasures plan created	2013	Aeronautics	Highway	Rail + Transit		
Lead free wheels purchased and steel weighted wheels phased in to replace older wheels	2013	Aeronautics	Highway	Rail + Transit		
Natural or organic fertilizers, pesticides, + landscaping materials purchased	2013	Aeronautics	Highway	Rail + Transit		
Low or no volatile organic compound paints applied on indoor facilities	2013	Aeronautics	Highway	Rail + Transit		
Purchasing lists + disposal protocols for engine service + maintenance standardized	2013	Aeronautics	Highway	Rail + Transit		
Technology implemented reducing the quantity of salt applied to roadways proportional to weather conditions	2015	Aeronautics	Highway	Rail + Transit		

## Increase opportunities for local vendors or locally sourced products sold at facilities

Indicators	Horizon	Implementing Divisions				
Vendor solicitation for MassDOT facilities written to encourage local ownership / sourced products	2013		Highway	Rail + Transit		
Lease language for MassDOT facilities written to encourage locally sourced products	2013		Highway	Rail + Transit		
Local vendors + locally sourced products sold at MassDOT facilities doubled	2020		Highway	Rail + Transit		

## Improve life-cycle impacts of investments

MassDOT's mission states that we will deliver excellent customer service to the people who travel in the Commonwealth and to provide our nation's safest and most reliable transportation system in a way that strengthens our economy and quality of life. Many of the traditional materials that go into new construction projects and system maintenance efforts leave significant environmental footprints. MassDOT can incorporate new research and innovations in material and construction techniques to reduce raw material use and energy inputs. Many of these new materials and practices may be able to: decrease construction times; reduce project costs; eliminate hazardous materials; and increase facility durability.

**Other Themes Addressed:** Energy, Policy, Planning + Design, Waste

**Implementing Divisions:** All

**Task intensity and description:**

Low: Reduce energy inputs into paving operations

Low: Increase % of recycled materials in paving + concrete installations

Moderate: Increases total volume of materials sourced within 200 miles of construction sites

Moderate: Increase albedo factor in hardscapes, rooftops + paving

Moderate: Design for deconstruction + reuse

Reduce energy inputs into paving operations						
Indicators	Horizon	Implementing Divisions				
Warm asphalt mix chosen as the standard state specification and hot mix asphalt eliminated	2013	Aeronautics	Highway	Rail + Transit		
Two pilots of cold in-place paving completed	2013	Aeronautics	Highway	Rail + Transit		
Standard specifications + guidelines for expansion of cold in-place paving established	2015	Aeronautics	Highway	Rail + Transit		
Two pilots of full depth reclamation advertised	2013		Highway	Rail + Transit		
Standard specifications + guidelines for expansion of full depth reclamation projects established	2015		Highway	Rail + Transit		
Research to increase the recycled content, reduce energy inputs, and improve vehicle efficiency of paving completed	2015		Highway	Rail + Transit		Shared Services

## Increase % of recycled materials in paving + concrete installations

Indicators	Horizon	Implementing Divisions				
20% of recycled paving material content used in road resurfacing projects	2015		Highway	Rail + Transit		
25% recycled paving material content used in road reconstruction projects	2015		Highway	Rail + Transit		
Innovative paving techniques at airports incorporated according to FAA standards	2013	Aeronautics				
The highest recycled content paving and base material available utilized for shared-use paths	2013	Aeronautics	Highway	Rail + Transit		Shared Services
Use of recycled rubberized asphalt + rubberized asphalt sealer increased	2015		Highway	Rail + Transit		
Minimum 25% fly ash, slag concrete, or silica flume utilized	2013	Aeronautics	Highway	Rail + Transit		
Innovative sustainable concrete construction techniques encouraged in contracts	2015	Aeronautics	Highway	Rail + Transit		
20% recycled course aggregate concrete used in all suitable applications	2013	Aeronautics	Highway	Rail + Transit		

## Increase total volume of materials sourced within 200 miles of construction site

Indicators	Horizon	Implementing Divisions				
Total weight/volume/cost of material purchased locally (within 200 miles) measured in all projects	2013	Aeronautics	Highway	Rail + Transit		
Product source information added to bidding requirements	2013	Aeronautics	Highway	Rail + Transit	Registry	
Cost share of locally sourced materials increased 20% on state funded projects	2015	Aeronautics	Highway	Rail + Transit	Registry	

## Increase albedo factor in hardscapes, rooftops + paving

Indicators	Horizon	Implementing Divisions				
Solar Reflectivity Index minimum of 78 instituted for all roofing projects	2013	Aeronautics	Highway	Rail + Transit		
Two innovative roofing (green, vegetation or blue water) projects piloted	2015	Aeronautics	Highway	Rail + Transit	Registry	Shared Services
All new roofing installations utilize high measured albedo factor materials	2015	Aeronautics	Highway	Rail + Transit	Registry	
Albedo factor increased in paving surfaces + hardscape materials	2013	Aeronautics	Highway	Rail + Transit		
Urban roadways + parking lots designed to maximize shade coverage of asphalt + concrete surfaces	2013	Aeronautics	Highway	Rail + Transit	Registry	Shared Services
Solar Reflectivity Index of at least 30 required for paving projects	2015	Aeronautics	Highway	Rail + Transit		

## Design for deconstruction + reuse

Indicators	Horizon	Implementing Divisions				
Road rehabilitation standards developed for reuse of existing installations	2013	Aeronautics	Highway	Rail + Transit		
Expertise in designing for deconstruction specified in all RFRs for design contracts	2013	Aeronautics	Highway	Rail + Transit		
Procurement criteria include incentives to contractor bids utilizing higher recycled content materials	2015	Aeronautics	Highway	Rail + Transit		
Lifecycle analysis in design, project alternative + material selection included	2015	Aeronautics	Highway	Rail + Transit		
Readily reusable + renewable materials encouraged in design specifications	2015	Aeronautics	Highway	Rail + Transit		

## Build green facilities for MassDOT

MassDOT seeks to be the 'greenest' DOT in the nation and to 'Lead by Example' with our own facilities. Green building is a rapidly evolving field of design to reduce the impact of construction on the environment and public health. By integrating building design, operations, and maintenance protocols we can improve our energy use, waste management, and the indoor climate control of our facilities. Demonstrated operational savings and improved customer satisfaction with minimal construction cost increases has mainstreamed 'Greener' building practices and these are being integrated into our existing facilities and employed in new construction.

**Other Themes Addressed:** All

**Implementing Divisions:** All

**Task intensity and description:**

Low: Design all new facilities to green building standards

Moderate: Retrofit existing facilities to meet environmental design criteria

Complex: Relocate office + encourage healthy transportation options

Complex: Consolidate office + maintenance facilities where feasible

Design all new facilities to green building standards						
Indicators	Horizon	Implementing Divisions				
New facilities funded or built by MassDOT over 20,000 sq. ft. designed to MA LEED Plus	2013	Aeronautics	Highway	Rail + Transit	Registry	
New facilities funded by MassDOT designed to LEED Gold or Net Zero Energy Building standard	2015	Aeronautics	Highway	Rail + Transit	Registry	
Nation's first Net Zero airport terminal designed and constructed	2015	Aeronautics				

## Retrofit existing facilities to meet environmental design criteria

Indicators	Horizon	Implementing Divisions				
All window AC units removed from office buildings or replaced with Energy Star units	2015	Aeronautics	Highway	Rail + Transit	Registry	Shared Services
Three building retrofits to LEED Existing Buildings Operations + Maintenance (EBO+M) initiated	2015	Aeronautics	Highway	Rail + Transit	Registry	Shared Services
Air circulation/filtration of MassDOT owned indoor facilities improved	2015	Aeronautics	Highway	Rail + Transit	Registry	Shared Services

## Relocate offices + encourage healthy transportation options

Indicators	Horizon	Implementing Divisions				
Offices in town or city centers relocated to be served by transit, walking + bicycling	2015	Aeronautics	Highway	Rail + Transit	Registry	
Provide transit pass exchange for employees with subsidized parking benefits	2013	Aeronautics	Highway	Rail + Transit	Registry	Shared Services
Free parking + take home vehicles for MassDOT urban office employees eliminated	2015	Aeronautics	Highway	Rail + Transit	Registry	Shared Services

## Consolidate office + maintenance facilities where feasible

Indicators	Horizon	Implementing Divisions				
MassDOT office + maintenance facility consolidation opportunity study completed	2013	Aeronautics	Highway	Rail + Transit	Registry	Shared Services
One office consolidation site piloted	2015	Aeronautics	Highway	Rail + Transit	Registry	Shared Services
Three pilot consolidation and/or cross utilization maintenance sites piloted	2020	Aeronautics	Highway	Rail + Transit	Registry	Shared Services

# Planning, Policy + Design

## Goals:

- Design a multi-modal transportation system
- Promote healthy transportation + livable communities
- Triple bicycling, transit + walking mode share

## Arborpoint, Newton

The MBTA provided a 70 year lease for a mixed income rental housing project on the park + ride lot at the Woodland Green Line Station. The development includes 180 units of multifamily housing and townhomes along with 548 structured replacement parking spaces.

## Hubway Bike Sharing, Boston

The Hubway is the Boston area's bike sharing system, launched in July of 2011 with 60 stations, 600 bicycles. MassDOT is working with the City of Boston, the Metropolitan Area Planning Council, and the Federal Transit Administration to expand the system into more Boston neighborhoods as well as Cambridge, Brookline and Somerville.

## South Coast Rail Plan, Freetown

The South Coast Rail Economic Development and Corridor Land Use Plan, brought together multiple communities to think regionally to advance infrastructure and transportation investment. The plan provides a framework for growth, and preservation, targeting state investment to enhance the sustainable economic development of communities.

## Bay State Greenway, Pioneer Valley

The 2008 Massachusetts Bicycle Transportation Plan established a seven-corridor, 788-mile statewide system of bicycling routes, known as the Bay State Greenway. A pilot sign program in the Pioneer Valley is underway linking a number of off-road paths and on-road routes in Massachusetts and connecting to systems in Connecticut to Vermont.

## Design a multi-modal transportation system

Most of Massachusetts' cities and town have a historic foundation of multi-modal travel with walkable neighborhoods and commercial centers. MassDOT was an early leader in adopting statewide guidelines for Complete Streets. MassDOT is committed to increased investment in and access to a multi-modal transportation system to provide our customers with more and healthier travel options, in an equitable manner available to all communities in the Commonwealth.

**Other Themes Addressed:** Air, Energy, Land, Water

**Implementing Divisions:** Aeronautics, Highway, Rail + Transit, Shared Services

**Task intensity and description:**

Low: Increase delivery of Complete Street projects

Moderate: Increase bicycle parking + access to transit

Moderate: Increase total miles and connectivity of bicycle + pedestrian facilities

Moderate: Improve traffic controls to reduce vehicle emissions + to support walking + bicycling

Complex: Increase transit system performance statewide

Increase delivery of Complete Streets projects						
Indicators	Horizon	Implementing Divisions				
Bicycle + pedestrian facilities featured + prioritized in designs, rather than simply accommodated	2013		Highway	Rail + Transit		Shared Services
Project forms + databases revised to track Complete Streets + sustainability measures	2013		Highway	Rail + Transit		Shared Services
Update of Project Development + Design Guide underway to reflect evolution of Complete Streets	2013		Highway			Shared Services
Opportunities to improve bicycle + pedestrian access across active railroads studied	2013		Highway	Rail + Transit		Shared Services
Surfaces and facilities of at-grade rail crossings improved for pedestrian + bicycle travel	2020		Highway	Rail + Transit		Shared Services
Techniques for reducing operating speeds on arterials, connectors and local roads researched	2015					Shared Services
All 'driveway' approaches to MassDOT airports, rail stations + MassDOT provide bicycle + pedestrian access	2015	Aeronautics	Highway	Rail + Transit		Shared Services

## Increase bicycle parking + access to transit

Indicators	Horizon	Implementing Divisions				
Number of bicycle racks doubled in municipalities participating in bike rack programs	2015					Shared Services
Transit stations with significant customer car parking (>50 spaces) have covered +/- or secure bicycle parking	2015			Rail + Transit		Shared Services
Bike stations at North, South, and Back Bay stations established with showers + locker facilities	2020			Rail + Transit		Shared Services
High capacity bicycle coaches operated on all commuter rail lines + peak-hour access restrictions lifted	2020			Rail + Transit		Shared Services
All MBTA + RTA buses equipped with bicycle racks	2015			Rail + Transit		
Bicycle access to heavy rail lines expanded to all hours except two 1-hour peak periods	2015			Rail + Transit		
Study + pilot programs completed evaluating options for eliminating peak hour restrictions of bikes on transit	2015			Rail + Transit		Shared Services

## Increase total miles + connectivity of bicycle + pedestrian facilities

Indicators	Horizon	Implementing Divisions				
Statewide inventory of bicycle facilities completed	2013		Highway			Shared Services
Bike sharing programs expanded within + beyond Boston inner core	2015					Shared Services
Statewide inventory of sidewalk + pedestrian facilities completed	2013		Highway			Shared Services
Critical pedestrian + bicycle network gaps are prioritized for project funding	2013		Highway			Shared Services
Bicycle + pedestrian facilities upgraded across all bridge projects	2015		Highway			Shared Services
Funding available for design, construction + maintenance of shared use paths expanded	2015		Highway			Shared Services
Contemporary bicycle facilities such as cycle tracks, painted lanes, and bike signals considered in Complete Street designs	2013		Highway			Shared Services
Bicycle + pedestrian planning + design assistance to municipalities provided	2015		Highway			Shared Services
Mileage of dedicated on-road bicycle facilities doubled across the Commonwealth	2015		Highway			Shared Services
At least 45 miles of shared use path on Bay State Greenway corridors under construction	2015		Highway			Shared Services
Bay State Greenway Priority 100 completed	2020		Highway			Shared Services

## Improve traffic controls to reduce vehicle emissions, + to support walking + biking

Indicators	Horizon	Implementing Divisions				
Inventory of traffic signals + grade crossing signal conducted	2015		Highway	Rail + Transit		Shared Services
All signalized corridors evaluated for optimal operations for all users, including bike-specific signs, signals and detectors	2020		Highway			Shared Services
Pedestrian countdowns installed at 50% of MassDOT traffic intersections with crosswalks	2015		Highway			
Pedestrian countdowns installed at all MassDOT signals with crosswalks	2020		Highway			
All signals evaluated and adjusted for optimal operations for all users	2020		Highway	Rail + Transit		Shared Services

## Improve transit system performance statewide

Indicators	Horizon	Implementing Divisions				
Bus stop consolidation on key routes assessed	2015			Rail + Transit		Shared Services
Payment + boarding system for MBTA light rail + vehicles + buses improved	2015			Rail + Transit		
All RTA's have conducted comprehensive service analysis to improve system connectivity + efficiency	2015			Rail + Transit		Shared Services
Green Line extension + South Coast Rail service completed	2020			Rail + Transit		
Opportunities for express bus lanes + regional bus services analyzed	2015		Highway	Rail + Transit		Shared Services
Transit operation efficiency improved while maintaining/increasing ridership	2015		Highway	Rail + Transit		Shared Services
Preliminary design of South Station expansion completed + meets high green building standards	2015			Rail + Transit		Shared Services
Transit Signal Priority for all new traffic signals implemented	2015			Rail + Transit		Shared Services
At least one new Bus Rapid Transit line meeting ITDP's BRT standard operational within a major city	2020		Highway			Shared Services

## Promote healthy transportation + livable communities

A strong commitment to improving networks and connectivity for pedestrians and bicyclists in all communities is central to MassDOT's transportation vision, as embedded in GreenDOT and the Healthy Transportation Compact. Our traveler options program provides customers with services that increase transportation choices, reduce congestion and improve air quality.

**Other Themes Addressed:** Air, Energy, Land

**Implementing Divisions:** All

**Task intensity and description:**

Low: Expand commuter option programs

Low: Encourage walking, bicycling, and transit as active transportation

Low: Promote eco-driving and programs to reduce reliance on single occupancy vehicles

Complex: Utilize surplus land, surface parking, and air rights for transit-oriented developments

Encourage walking, biking, + transit as active transportation						
Indicators	Horizon	Implementing Divisions				
MassDOT Bay State Bike Week facilitated + promoted annually in partnership with MassBike	2013		Highway	Rail + Transit		Shared Services
All office locations have visible bicycle parking locations for visitors near entrances	2013	Aeronautics	Highway	Rail + Transit	Registry	Shared Services
Selection of public meeting venues prioritizes locations with transit, pedestrian + bicycle access	2013	Aeronautics	Highway	Rail + Transit	Registry	Shared Services
Information on transit, bicycle + pedestrian travel provided on public meeting announcements	2013	Aeronautics	Highway	Rail + Transit	Registry	Shared Services
MassDOT sidewalks + bicycle facilities are cleared of snow + ice simultaneously with vehicle lanes	2015		Highway	Rail + Transit		
40% of elementary + middle schools reached through Safe Routes to Schools program	2020			Rail + Transit		Shared Services
Navigational signage to transit stations expanded along local roads and highways	2015		Highway	Rail + Transit		Shared Services
Employees + contractors required to use transit, walk, bike or carpool to meetings whenever location + service schedules allow	2013	Aeronautics	Highway	Rail + Transit	Registry	Shared Services

## Promote eco-driving + programs to reduce reliance on single occupancy vehicles

Indicators	Horizon	Implementing Divisions				
Eco-driving promoted through digital display boards + customer facilities	2013		Highway	Rail + Transit	Registry	Shared Services
Pay-As-You-Drive car insurance program implemented	2015				Registry	Shared Services
Information + free air for proper vehicle tire inflation provided at all rest stops	2015		Highway			Shared Services

## Expand commuter options programs

Indicators	Horizon	Implementing Divisions				
Commuter options programs through digital displays promoted statewide	2013		Highway	Rail + Transit	Registry	Shared Services
Parking spots at major transit stations with parking reserved for car sharing	2013			Rail + Transit		Shared Services
Covered +/- or secure bicycle parking installed at major park + ride facilities	2015	Aeronautics	Highway	Rail + Transit	Registry	Shared Services
Urban high capacity roadway segments analyzed for HOV + express bus lanes	2015		Highway			Shared Services
Secure indoor bicycle parking + shower facilities provided at all major MassDOT employment centers	2015	Aeronautics	Highway	Rail + Transit	Registry	Shared Services

## Utilize surplus land, parking lots + air rights for transit-oriented developments

Indicators	Horizon	Implementing Divisions				
Four new RFP's issued for land development	2013	-	Highway	Rail + Transit		Shared Services
Large parking lots at transit stations analyzed for TOD redevelopment in the Commuter Rail Master Plan	2013	-	Highway	Rail + Transit		Shared Services
All properties, including air-rights, studied for development feasibility	2015		Highway	Rail + Transit		Shared Services
At least two mixed use developments on MBTA properties initiated	2015			Rail + Transit		Shared Services

### **Triple bicycling, transit + walking mode share**

MassDOT's statewide mode shift goal is to triple the current mode share of bicycling, public transit, + walking, each by 2030. This goal is built around the idea of providing more access to these modes for our customers, having these modes absorb as much future travel demand as possible and thus leveling off growth of automobile usage. MassDOT is looking to anticipate major demographic changes and to capitalize on recent trends that show the amount our customers are bicycling, riding public transit, and walking is increasing. MassDOT wants to not only encourage that trend but also accelerate it. MassDOT, in partnership with our Metropolitan Planning Organizations (MPOs), must find ways to reduce GHGs from the transportation sector while keeping people and goods moving. Mode shift can be an important element to our strategy to meet the Commonwealth's commitments under the Global Warming Solutions Act.

**Other Themes Addressed:** Air, Energy, Land

**Implementing Divisions:** All

**Task intensity and description:**

Complex: Connect land use planning with transportation planning + investments

Complex: Stabilize travel demand growth on roadways from single occupancy vehicles

Low: Collect data regarding factors influencing mode choices + utilize better planning tools

Low: Increase training opportunities on GreenDOT and Mode Shift

## Connect land use planning with transportation planning + investments

Indicators	Horizon	Implementing Divisions				
			Highway	Rail + Transit		Shared Services
GreenDOT Implementation Plan activities incorporated into MPO's Unified Planning Work Programs	2013		Highway	Rail + Transit		Shared Services
Project evaluation criteria that prioritize mode shift, GreenDOT + GHG reduction adopted by MPOs	2013		Highway	Rail + Transit		Shared Services
Transit authorities participate in all MassDOT and MPO corridor studies	2013		Highway	Rail + Transit		Shared Services
RTA's participate in MassDOT MEPA review and mitigation formation	2013			Rail + Transit		Shared Services
All MassDOT owned roads 'master planned' for Complete Street improvements during future repaving or reconstruction	2015		Highway			Shared Services
Complete Commuter Rail Master Plan to evaluate options to expand capacity + increase ridership along each line	2015			Rail + Transit		Shared Services
Priority Development Areas (PDAs) + Priority Protection Areas (PPAs) approved by HED established in all MPOs	2015		Highway	Rail + Transit		Shared Services
Strategic regional visions for 'zero' SOV growth + GHG reduction adopted by MPOs	2015		Highway	Rail + Transit		Shared Services
Land use + transportation planning strategies to support mode shift incorporated into 2016 RTPs	2015		Highway	Rail + Transit		Shared Services
State-of-the-practice metric for measuring bicycle and pedestrian quality of roadways utilized in corridor planning + design	2015		Highway	Rail + Transit		Shared Services

## Stabilize travel demand growth on roadways from single occupancy vehicles

Indicators	Horizon	Implementing Divisions				
MEPA mitigations focus on multi-modal efforts to reduce Automobile Trips Generated (ATG)	2013		Highway			Shared Services
Standard operating procedure (SOP) memo to promote the delivery of high quality bicycle + pedestrian facilities issued	2013		Highway			Shared Services
Establish guidelines for when multi-modal enhancements or land use imperatives outweigh benefits from LOS improvement	2013		Highway			Shared Services
Project Design Guide revised to define lanes greater than 11 ft on urban roadways as design exceptions	2015		Highway			Shared Services
Transportation Demand Management programs expanded 20%	2015					Shared Services
All rail stations are accessed by Complete Streets	2020			Rail + Transit		Shared Services

## Collect data regarding factors influencing mode choices + utilize better planning tools

Indicators	Horizon	Implementing Divisions				
Person Miles Travelled (PMT) for all modes measured and/or estimated annually at state and regional levels	2013		Highway	Rail + Transit		Shared Services
Traffic forecasting GHG impact analysis tools updated to reflect induced travel demand by SOVs	2015		Highway			Shared Services
VMT and automobile ownership rates are tracked and published by region	2013				Registry	Shared Services
Public health impacts of major transportation projects considered in project selection criteria	2015	Aeronautics	Highway	Rail + Transit		Shared Services
New methods for collecting travel data for bicycles and pedestrians piloted	2013		Highway	Rail + Transit		Shared Services
Scenario planning methods utilized by MassDOT and MPOs instead of traditional growth trend forecasts	2015		Highway	Rail + Transit		Shared Services
Traffic model assumptions for road design revised to assume limited traffic growth rather than historic VMT growth trends	2013		Highway	Rail + Transit		Shared Services
MassDOT conducts travel demand forecasts with an activity based model	2015		Highway	Rail + Transit		Shared Services

## Increase training opportunities on GreenDOT and Mode Shift

Indicators	Horizon	Implementing Divisions				
Bay State Roads technical assistance offers materials on sustainability, mode shift, Complete Streets, and parking policies	2013		Highway	Rail + Transit		Shared Services
Programs for healthy transportation education and travel training for young + elderly travelers developed statewide	2015		Highway	Rail + Transit		Shared Services
Outreach materials on Mode Shift delivered to all MassDOT employees	2013					Shared Services
Coordinated information gateway for shuttles and inter-city bus travel implemented	2015			Rail + Transit		Shared Services
MassDOT Staff and Bay State Road Program develop continuous Complete Street training program	2013		Highway			Shared Services

# Waste

## Goals:

- Achieve zero solid waste disposal
- Reduce all exposure to hazardous waste

## **Readville Yard Clean Up, Dedham**

The MBTA recently completed soil remediation of the 42-acre Readville 5 Yard facility removing approximately 17,840 tons of contaminated soil. The MBTA is working to install a solar facility to turn the brownfield into a 2.5 megawatt 'brightfield' by the end of 2012.

## **EVR, Statewide**

Electronic Vehicle Registration lets MassDOT customers process registration transactions and title applications through an electronic link to the RMV. This system provides enhanced service to drivers, dealers, and insurance agents, while reducing paper usage and minimizing customer trips to RMV branches.

## **MBTA Oil Room, Boston**

The Orient Heights Oil Room at the Blue Line maintenance facilities utilizes well labeled storage facilities for all oil containers. Waste oil from the subway vehicles is deposited in the drum and sold for other uses.

## **Litter Collection Crew, Sheffield**

The rest stop on Route 7 next to the Housatonic River has been adopted by Berkshire Meadows, a special education residential school that helps children and young adults with severe developmental disabilities. Volunteers throughout the Commonwealth participate in Adopt-a-Highway programs, keeping our rights-of-way and waterways clear of litter and debris.

## **Achieve zero solid waste disposal**

Improving the recycling rates of our facilities including offices, train stations, airports, maintenance yards, and rest areas offer opportunities for cost savings and improved customer service. MassDOT offices will work to reduce waste volumes through paperless procedures, and MassDOT construction sites will seek to minimize waste generation with integrated project design and site management. Thoughtful waste management and a commitment to recycling will be emphasized at all of our facilities.

**Other Themes Addressed:** Air, Land, Materials

**Implementing Divisions:** All

**Task intensity and description:**

Low: Increase diversion rate of office waste

Low: Eliminate litter accumulation in ROWs + stations

Moderate: Provide full recycling opportunities at all customer facilities

Moderate: Decrease amount of waste generation during construction + maintenance

Moderate: Decrease paper use

## Increase the diversion rate of office waste

Indicators	Horizon	Implementing Divisions				
		Aeronautics	Highway	Rail + Transit	Registry	Shared Services
Zero waste plan developed for MassDOT	2013	Aeronautics	Highway	Rail + Transit	Registry	Shared Services
Full "single stream" recycling provided at all buildings	2013	Aeronautics	Highway	Rail + Transit	Registry	Shared Services
All electronics, cartridges, batteries, + accessories recycled	2013	Aeronautics	Highway	Rail + Transit	Registry	Shared Services
Employee education program on recycling + waste reduction underway	2013	Aeronautics	Highway	Rail + Transit	Registry	Shared Services
15% reduction in solid waste from offices achieved	2015	Aeronautics	Highway	Rail + Transit	Registry	Shared Services
30% reduction in solid waste disposal achieved	2020	Aeronautics	Highway	Rail + Transit	Registry	Shared Services
A food scrap pilot project initiated	2013		Highway			
Office building composting or biomass heating piloted at two facilities	2015	Aeronautics	Highway	Rail + Transit	Registry	Shared Services
Waste reduction / recycling program emphasized in all janitorial service contracts	2013	Aeronautics	Highway	Rail + Transit	Registry	Shared Services

## Eliminate litter accumulation in ROWs + stations

Indicators	Horizon	Implementing Divisions				
		Aeronautics	Highway	Rail + Transit		
Litter control programs initiated in all corridors	2013	Aeronautics	Highway	Rail + Transit		
Litter prevention information provided at all rest areas + stations	2015		Highway	Rail + Transit		

### Provide "full-stream" recycling opportunities at all customer facilities

Indicators	Horizon	Implementing Divisions				
Container + paper recycling installed at all rest area, airports, transit stations + RMV branches	2013	Aeronautics	Highway	Rail + Transit	Registry	
Mobile electronics + license plate recycling drop off provided at key locations	2015	Aeronautics	Highway	Rail + Transit	Registry	

### Decrease amount of waste generation during construction + maintenance

Indicators	Horizon	Implementing Divisions				
Waste management plans developed for all construction projects	2013	Aeronautics	Highway	Rail + Transit		
At least 65% of construction debris is reused or recycled	2015	Aeronautics	Highway	Rail + Transit		
At least 80% of construction debris is reused or recycled	2020	Aeronautics	Highway	Rail + Transit		
At least 90% of landscaping waste material is reused or composted	2015	Aeronautics	Highway	Rail + Transit		

### Decrease paper use

Indicators	Horizon	Implementing Divisions				
Paperless office procedures and equipment piloted in all offices	2013	Aeronautics	Highway	Rail + Transit	Registry	Shared Services
Paper use is cut in half	2015	Aeronautics	Highway	Rail + Transit	Registry	Shared Services
A paper-free office program adopted + implemented	2020	Aeronautics	Highway	Rail + Transit	Registry	Shared Services
Other paper products consumption (paper towels, napkins, etc.) reduced in all facilities	2015	Aeronautics	Highway	Rail + Transit	Registry	Shared Services

## Reduce all exposure to hazardous waste

MassDOT's transportation system requires the use of fuels, solvents, and other chemicals that can have significant environmental and public health risks. MassDOT is responsible for handling these materials carefully and disposing of them in a legal and environmentally sensitive manner. Land impacted by historic transportation and industrial operations provide opportunities for redeveloping land into more productive uses.

**Other Themes Addressed:** Land, Water

**Implementing Divisions:** All

**Task intensity and description:**

Low: Implement Environmental Management System

Moderate: Comply with waste ban + eliminate on site storage of waste

Moderate: Increase recycling rate of hazardous waste

Complex: Evaluate + remediate brownfield sites

Implement Environmental Management System						
Indicators	Horizon	Implementing Divisions				
EMS systems adopted + implemented for all divisions	2013	Aeronautics	Highway	Rail + Transit		
All waste is managed in compliance with a hazardous waste management plan	2013	Aeronautics	Highway	Rail + Transit		
Metrics of recycling + disposals reported from all sites	2013	Aeronautics	Highway	Rail + Transit	Registry	Shared Services
EMS data from all Divisions compiled annually into a central performance management system	2013	Aeronautics	Highway	Rail + Transit	Registry	Shared Services
Best management practices for salt and sand storage in place at all depot facilities	2013	Aeronautics	Highway	Rail + Transit		

### Comply with waste ban + eliminate on-site storage

Indicators	Horizon	Implementing Divisions				
100% compliance with state waste bans met at office + maintenance facilities	2013	Aeronautics	Highway	Rail + Transit	Registry	Shared Services
Long-term storage of hazardous waste minimized	2015	Aeronautics	Highway	Rail + Transit		

### Increase recycling rate of hazardous materials

Indicators	Horizon	Implementing Divisions				
Refrigerants with high global warming potential from HVAC + refrigerators recycled	2013	Aeronautics	Highway	Rail + Transit	Registry	Shared Services
80% of all hazardous waste generated is recycled where possible	2015	Aeronautics	Highway	Rail + Transit		
100% of hazardous waste with recycling potential is diverted	2020	Aeronautics	Highway	Rail + Transit		

### Evaluate + remediate brownfield sites

Indicators	Horizon	Implementing Divisions				
An assessment of all brownfield properties is completed	2013	Aeronautics	Highway	Rail + Transit		Shared Services
Remediation / redevelopment of at least four properties underway	2015	-	-	Rail + Transit		
Remediation / redevelopment at all known brownfield sites initiated	2020	-	-	Rail + Transit		

# Water

## Goals:

- Use less water
- Improve ecological function of water systems

### **PVTA Bus Wash, Springfield**

The Pioneer Valley Transit Authority operates a recycled water bus wash facility that utilizes two 2000 gallon recycled water tanks to wash 70 – 80 buses a night. A drain collects wash water which settles in the tanks before being pumped to the main tank. All the water used for cleaning buses is recycled water, except the final rinse.

### **McNerney Road Bridge, Becket**

The McNerney Road Bridge over Shaker Mill Brook, a Wild and Scenic River, was replaced as part of the Accelerated Bridge Program. The bridge opening was expanded to provide for full bank flow width and MassDOT worked with the National Park Service to develop a stream restoration plan. Partial rock dams and plunge pools were installed to allow for fish passage upstream through the new bridge.

### **Porous Pavement Parking Lot, Whately**

MassDOT constructed portions of this park & ride lot using Porous Asphalt Pavement. The special design of this porous surface allows rain to penetrate the surface and enter the underlying soils. Warm Mix Asphalt was also used, requiring less energy to produce than conventional asphalt, and results in lower emissions of greenhouse gases.

### **North River Marsh Restoration, Scituate**

The MBTA built a salt marsh restoration site adjacent to the North River, to compensate for the impacts of the Greenbush Project. The project included 4.74 acres of salt marsh improvements. Now in its fourth year of monitoring this mitigation area has been a huge success in creating a beautiful, functional saltwater marsh.

## Use less water

Many of MassDOT's facilities can make simple modifications to reduce water consumption. Although seemingly plentiful, fresh water is a limited resource and every gallon of tap water represents energy, chemicals, and expenses in its collection, treatment, distribution, and discharge. Additionally most water use represents a downstream sewage treatment burden. Much of MassDOT's water use, such as vehicle cleaning, does not require clean drinking water and recycled or reclaimed water can meet our maintenance needs while saving resources. Our water conservation efforts can result in savings of money, energy, and resources.

**Other Themes Addressed:** Energy, Materials, Waste

**Implementing Divisions:** All

**Task intensity and description:**

Low: Decrease potable water use in buildings

Low: Decrease water use for irrigation

Moderate: Increase utilization of recycled water + rainwater

Complex: Install innovative dual plumbing water systems in facilities

### Decrease potable water use in buildings

Indicators	Horizon	Implementing Divisions				
The efficiency of all water fixtures in buildings evaluated	2013	Aeronautics	Highway	Rail + Transit	Registry	Shared Services
Fixtures retrofitted to gain a 10% reduction in water use	2015	Aeronautics	Highway	Rail + Transit	Registry	Shared Services
Plumbing system retrofitted to gain 20% reduction in water use	2020	Aeronautics	Highway	Rail + Transit	Registry	Shared Services

### Decrease water use for irrigation

Indicators	Horizon	Implementing Divisions				
Water conservation integrated into vegetation management plans	2013	Aeronautics	Highway	Rail + Transit		
Potable water use for irrigation reduced by 25%	2015	Aeronautics	Highway	Rail + Transit	Registry	

## Increase utilization of recycled water + rainwater

Indicators	Horizon	Implementing Divisions				
Water conservation practices at bus, vehicle, or airplane washing facilities required	2013	Aeronautics	Highway	Rail + Transit		
All new vehicle/bus/rail vehicle washing facilities designed and built with recycled water technologies	2013		Highway	Rail + Transit		
All existing vehicle washing facilities evaluated for recycled or recaptured rain water alternatives	2015		Highway	Rail + Transit		
Study of rooftop rainwater use for toilets / HVAC of largest office facilities completed	2013	Aeronautics	Highway	Rail + Transit	Registry	Shared Services
Rain barrels or other means to reuse rainwater + disconnect drain spouts from sewage systems installed	2015	Aeronautics	Highway	Rail + Transit	Registry	Shared Services

## Install innovative dual plumbing water systems in facilities

Indicators	Horizon	Implementing Divisions				
Water use innovations required in all new building proposals	2013	Aeronautics	Highway	Rail + Transit	Registry	Shared Services
Three new pilot structures or building retrofits utilizing dual plumbing completed	2020		Highway	Rail + Transit	Registry	Shared Services

## Improve ecological function of water systems

MassDOT's roads and railroads traverse rivers, streams, and wetlands, changing their hydrology and discharging sediment and pollutants into the watershed. Protecting waterway and wetlands from impacts of transportation facilities is important. Stormwater now represents the single largest source responsible for water quality impairments in our rivers, lakes, ponds, and marine waters. MassDOT seeks to implement wetland protection and stormwater treatment systems in conjunction with habitat restoration efforts to provide incremental opportunities to improve aquatic habitats throughout the Commonwealth.

**Other Themes Addressed:** Energy, Materials, Waste

**Implementing Divisions:** All

**Task intensity and description:**

Low: Minimize impacts + enhance wetlands + impaired waters

Complex: Adapt facilities for climate change resilience

Moderate: Minimize impacts of ROWs + bridges on fluvial processes

Moderate: Reduce stormwater volumes + increase permeable surface areas

Complex: Decrease non-point source pollutant discharge

Minimize impacts + enhance wetlands + impaired waters						
Indicators	Horizon	Implementing Divisions				
Preservation + enhancement of wetlands is adopted in design instead of replacement	2013	Aeronautics	Highway	Rail + Transit		
Environmental benefits of impact mitigation through watershed planning improved	2015	Aeronautics	Highway	Rail + Transit		Shared Services
Natural buffers between wetland resources + transportation infrastructure increased whenever possible	2015	Aeronautics	Highway	Rail + Transit		Shared Services
Alternative deicer agents utilized in areas with wetlands, coldwater fisheries, and water supplies	2015	Aeronautics	Highway	Rail + Transit		Shared Services
New rail lines designed to enhance wetland habitats	2015			Rail + Transit		
Five wetland restoration projects not considered mitigation completed	2015	Aeronautics	Highway	Rail + Transit		

## Adapt facilities for climate change resilience

Indicators	Horizon	Implementing Divisions				
Climate change adaptation strategies initiated between local and federal parties	2013		Highway	Rail + Transit		Shared Services
Revised extreme precipitation data utilized for rainfall, flood flow + stormwater calculations	2013		Highway	Rail + Transit		Shared Services
Climate Adaptation Plan applicable to all MassDOT facilities adopted	2015	Aeronautics	Highway	Rail + Transit		Shared Services
Statewide climate change vulnerability assessment for MassDOT facilities completed	2015	Aeronautics	Highway	Rail + Transit		Shared Services
Critical roadway or rail segments targeted for culvert replacement + rearming for scour protection	2015		Highway	Rail + Transit		
Fish passage structures which meet state crossing standards included in maintenance activities	2013		Highway	Rail + Transit		
All reconstruction projects crossing tidal habitats include measures to eliminate tidal flow restrictions	2013		Highway	Rail + Transit		

## Minimize impacts of ROWs + bridges on fluvial processes

Indicators	Horizon	Implementing Divisions				
New roadways + bridges designed to maximize natural fluvial processes including tidal flushing	2013		Highway	Rail + Transit		
At minimum 12 bridge replacement projects improving water flow under construction or completed	2015		Highway	Rail + Transit		
All new + replacement structures designed to state stream crossing standards	2013		Highway			
The standards within MA Stream Crossing Handbook utilized in all project development processes	2013		Highway	Rail + Transit		
The feasibility of retrofitting culverts to stream crossing standards evaluated as element of all reconstruction projects	2013		Highway			
All projects crossing tidal habitats evaluated for restriction of tidal flow	2013		Highway	Rail + Transit		
A minimum of five culverts redesigned + rebuilt for improved fish migration	2015		Highway	Rail + Transit		
All railroad bed reconstruction projects retrofitted with enhanced stream crossing standards	2020			Rail + Transit		

## Reduce stormwater volumes + increase permeable surface areas

Indicators	Horizon	Implementing Divisions				
Environmentally sensitive site design in new construction projects utilized	2013	Aeronautics	Highway	Rail + Transit	Registry	
Post peak discharge rates held to less than pre-project discharge rates to the maximum extent possible	2013	Aeronautics	Highway	Rail + Transit	Registry	
All projects designed to remove solids + pollutants to the maximum extent possible	2013	Aeronautics	Highway	Rail + Transit	Registry	
All projects designed to include measures to increase infiltration + reduce stormwater volumes	2015	Aeronautics	Highway	Rail + Transit	Registry	
Permeable paving or other infiltration installations included in parking lot resurfacing projects	2020	Aeronautics	Highway	Rail + Transit	Registry	
Design charette conducted for creating "green roof" bus shelters for the MBTA and/or major RTA	2013			Rail + Transit		Shared Services
Green roof installed on at least one large bus or rail maintenance garage	2020			Rail + Transit		Shared Services

## Decrease non-point source pollutant discharges

Indicators	Horizon	Implementing Divisions				
All structural best management practices inspected annually + cleaned as necessary	2013	Aeronautics	Highway	Rail + Transit		
Illicit discharges from MassDOT structures eliminated upon detection	2015	Aeronautics	Highway	Rail + Transit		
Long-term pollution prevention programs implemented at all maintenance sites	2013	Aeronautics	Highway	Rail + Transit		
Environmentally sensitive design / Low Impact Design (LID) utilized in all construction projects	2013	Aeronautics	Highway	Rail + Transit		
Highway runoff assessments of 680 impaired waters for impacts completed	2015		Highway			
Commuter ferries follow best practices for fuel handling, bilge water, sanitary waste + trash disposal	2013			Rail + Transit		
New best management practices installed at all facilities identified by Impaired Waters Program	2020	Aeronautics	Highway	Rail + Transit		
Phytotechnology as part of stormwater evaluation + constructed stormwater controls utilized	2015	Aeronautics	Highway	Rail + Transit		
Assessment protocol developed to evaluate water quality functions of roadside vegetation	2015	Aeronautics	Highway	Rail + Transit		
Stormwater 'Low Impact Design' integrated into revised Project Development + Design Guide	2013		Highway	Rail + Transit		Shared Services

## Next Steps

MassDOT will rely on the new culture of innovation and accountability thriving in our Divisions to lead the way. The Plan designs a framework to measure implementation success under a performance management system.

The MassDOT Divisions worked closely with the Office of Transportation Planning (OTP) to determine the feasibility of tasks, indicators and implementation horizons. The next steps for this Plan are for MassDOT's Divisions and shared services offices to get underway on the tasks specifically identified to accomplish the goals outlined within each theme.

Each Division Administrator will develop a work plan outlining specific measures to be taken to accomplish the goals and tasks in the Plan. Investment needs will be incorporated into each Division's Capital Improvement Plan. The Divisions will conduct analysis of implementation strategies and prioritization decisions to further the GreenDOT goals. The Division leadership will meet regularly to track implementation successes.

OTP has also worked closely with the Office of Performance Management and Innovation (OPMI) to embed the GreenDOT Implementation Plan performance measures into individual MassDOT Division scorecards that the Secretary of Transportation uses to evaluate the performance of the Divisions. The performance management framework will measure success starting with indicators that have been noted for implementation by the end of state fiscal year 2013. Progress toward meeting the sustainability goals will be also be measured and reported regularly in cross-divisional GreenDOT reports.

Meeting certain indicators may prove to be infeasible due to financial or logistical barriers in the near-term, and their implementation horizons may be revised. The Divisions may also find in their efforts towards implementing this Plan that the goals may be better achieved with other tasks or indicators. MassDOT's path towards becoming the most sustainable department of transportation in the nation is not fixed, and this Plan provides flexibility for the Divisions to use their spirit of innovation and accountability to achieve the goals in this Plan. This Plan will be revisited on a regular basis as new ideas come forward, tasks and indicators are met, implementation horizons come to pass and/or new goals are established. The Plan will also inform our Bay State Roads technology transfer program to disseminate sustainability transportation strategies to municipalities.

Outlined on the following page is a sample of what a GreenDOT Implementation Plan performance scorecard could look like:

Goal ► Broad Sustainability Goal Across Divisions

Implementing  
Divisions

Implementation  
Performance Notes

Horizon ►

2013

Task ► Policy or Procedure to Implement the Goal

Indicators ►	Short term action to complete by end of FY 2013	●		●		⊗		RMV did not have any new facilities
	Mid-term action to complete by end of FY 2015			⊕	⊕	◐		Implementation horizon for indicator is 2015 or 2020
	Long term action to complete by end of FY2020			⊕	⊕			Implementation horizon for indicator is 2015 or 2020

Task ► Policy or Procedure to Implement the Goal

	Short term action to complete by end of FY 2013	●	◐		●		○	Aeronautics has limited influence on airport facilities
	Mid-term action to complete by end of FY 2015		⊕	⊕	⊕			Implementation horizon for indicator is 2015 or 2020
	Long term action to complete by end of FY2020		⊕	⊕			◐	Implementation horizon for indicator is 2015 or 2020

Performance Indicators	⊕	Division responsible for implementation by 2015 or 2020
	○	Division has not achieved implementation of this indicator
	◐	Division has partially achieved implementation of this indicator
	●	Division has achieved implementation of this indicator
	⊗	Division no longer responsible for implementation

## **Appendix:** State Initiatives to Promote Sustainability

### **Global Warming Solutions Act**

The Global Warming Solutions Act, signed by Governor Patrick in 2008, requires an economy-wide greenhouse gas (GHG) emissions reduction mandate of 80 percent by 2050. This plan contains a portfolio of established and new policies to contribute to this requirement. These actions also reduce energy use, save money, and stimulate the adoption of clean energy technologies, thereby creating jobs at the same time that they reduce GHG emissions.

[www.mass.gov/dep/air/climate/gwsa.htm](http://www.mass.gov/dep/air/climate/gwsa.htm)

### **EO 484 – Leading by Example Clean Energy + Efficient Buildings**

Issued on April 18, 2007, Executive Order 484, declared that agencies shall prioritize practices and programs that address resource use at state facilities, including a reduction in emissions and energy consumption derived from fossil fuels. Executive Order 484 specifically sets energy targets for the Commonwealth's buildings.

[www.mass.gov/governor/legislativeexecorder/executiveorder/executive-order-no-484.html](http://www.mass.gov/governor/legislativeexecorder/executiveorder/executive-order-no-484.html)

### **EO 515 – Establishing an Environmental Purchasing Policy**

Executive Order 515 declares that the Commonwealth shall reduce its impact on the environment and enhance public health by procuring 'Environmentally Preferable Products and Services' (EPPs). It requires that agencies shall consider full Life Cycle costs, including all costs associated with the production, purchase, transportation, use, operation, and disposal of such products or services.

[www.mass.gov/governor/legislativeexecorder/executiveorder/executive-order-no-515.html](http://www.mass.gov/governor/legislativeexecorder/executiveorder/executive-order-no-515.html)

### **Green Communities Act**

On July 2, 2008 the Green Communities Act was signed with the goal of enhancing the development of renewable energy and energy efficiency in Massachusetts. The Green Communities Act requires all electric and gas distribution companies and municipalities to develop energy efficiency plans that make efficiency and conservation efforts competitive with supply side energy generation.

[www.malegislature.gov/Laws/SessionLaws/Acts/2008/Chapter169](http://www.malegislature.gov/Laws/SessionLaws/Acts/2008/Chapter169)

### **Healthy Transportation Compact**

The Healthy Transportation Compact (HTC) is a key requirement of the landmark transportation reform legislation signed into law in June 2009. The HTC is an innovative, inter-agency collaboration of MassDOT, the Office of Energy and Environmental Affairs, and the Office of Health and Human Services. The HTC facilitates transportation decisions that balance the needs of all transportation users, expands mobility, improves public health, supports a cleaner environment and creates stronger communities.

[www.massdot.state.ma.us/GreenDOT/HealthyTransportationCompact.aspx](http://www.massdot.state.ma.us/GreenDOT/HealthyTransportationCompact.aspx)

### Complete Streets

The MassDOT Highway Project Development + Design Guide established Massachusetts as a national leader in Complete Streets. The Design Guide ensures that transportation planners and engineers consistently design the entire roadway with all users in mind - including bicyclists, public transit riders, and pedestrians.

[www.mhd.state.ma.us/default.asp?pgid=content/signGuide&sid=about](http://www.mhd.state.ma.us/default.asp?pgid=content/signGuide&sid=about)

## Compilation Map of Green DOT Examples

Examples of the Green DOT goals in action throughout the Commonwealth are highlighted in the document. Their locations are mapped here and within the Plan.

Cover Photos:

**Front** - Limited mowing along I-190 in Leominster, Sediment control during bridge construction in Bardwell, and a new commuter rail locomotive crossing the Mystic River on the Dana Bridge into Everett.

**Back** - Airplanes at Mansfield Municipal Airport, bicyclists on the Minuteman Commuter Bikeway in Lexington, and the Red Line crossing the Charles River in Cambridge.