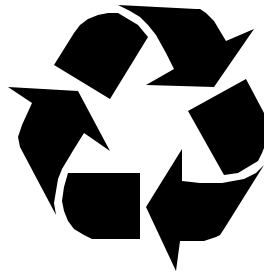


# **MASSACHUSETTS HIGHWAY DEPARTMENT**



## **Recycling & Pollution Prevention Report**

**2000 Update**

(Covers Calendar Year 1999)

**October 2000**

**Matthew J. Amorello**  
**Commissioner**

# TABLE OF CONTENTS

<b>SECTION</b>	<b>PAGE</b>
<b>Executive Summary</b>	<b>1</b>
<b>I. Introduction</b>	<b>2</b>
<b>II. Education &amp; Outreach Efforts</b>	<b>2</b>
<b>III. Environmentally Preferable Purchasing</b>	<b>4</b>
<b>IV. Pollution Prevention Programs</b>	<b>6</b>
<b>V. Recycling Programs</b>	<b>7</b>
<b>VI. Recycled Materials in Construction Activities</b>	<b>10</b>
<b>VII. Research Projects</b>	<b>12</b>
<b>VIII. Conclusion</b>	<b>13</b>
<b>Contact Information</b>	<b>13</b>

## EXECUTIVE SUMMARY

During the calendar year 1999, the Massachusetts Highway Department (MassHighway or MHD), under the direction of the Executive Office of Transportation and Construction (EOTC), continued to expand and promote its recycling, environmentally preferable procurement, and pollution prevention efforts. As the state's natural resource base and available disposal capacity continue to decline, MassHighway is looking for newer and better ways to minimize its impact on the environment by reducing, reusing, and recycling its waste stream.

This report was prepared to meet the requirements of the Commonwealth of Massachusetts' 2000 Transportation Bond Bill (Chapter 235 of the Acts of 2000), which directed MassHighway to submit an annual recycling and pollution prevention report to various legislative committees. The purpose of this report is threefold: to qualitatively and when possible, quantitatively define MassHighway's past accomplishments in terms of recycling, environmentally preferable procurement, and pollution prevention; to discuss and promote ongoing projects; and to establish goals for the coming years.

## HIGHLIGHTS

- ✓ **In 1999, MassHighway attained an overall recycling rate of 69% by recycling over 10,000 tons of its own waste stream.** (See Table 4, page 9) This rate is almost double the State's municipal solid waste recycling rate of approximately 36% - a significant accomplishment. MHD believes this rate to be more accurate than the rates reported last year. Stricter recording measures were taken in 1999 to ensure the accuracy of this data.
- ✓ **In 1999, MassHighway procured more than \$312,000 worth of environmentally preferable products, thereby establishing an environmentally preferable procurement rate of 66%.** (See Table 2, page 5) Again, due to better recording measures, this rate is believed to be more accurate than those reported last year.
- ✓ **In 1999, MassHighway also procured more than \$132,000 worth of recycled plastic lumber products for its Rest Area Rehabilitation Projects.** Due to their inclusion in construction activities (see Table 5, page 11), these purchases are in addition to the environmentally preferable procurements highlighted above.
- ✓ **In 1999, MassHighway incorporated more than 138,000 tons of reclaimed and recycled materials into its construction activities.** (See Table 5, page 11) This includes Reclaimed Asphalt Pavement, Compost, and Recycled Glass Beads (for Pavement Markings).
- ✓ **In 1999, MassHighway hired a Recycling Coordinator who is now responsible for recording, reporting, and increasing MassHighway's recycling, recycled procurement, and pollution prevention efforts.**

## SECTION I. INTRODUCTION

This past year, the Massachusetts Highway Department has continued its progress on the recycling front. Additional steps have been taken by MHD to increase: the use of waste and recycled materials (WRMs) in construction projects and everyday activities; the procurement of recycled-content, remanufactured, and otherwise environmentally preferable goods for offices, stockrooms, facilities, and construction sites; and the recycling of its various waste streams. MassHighway has been motivated to take these actions for reasons of environmental compliance and stewardship, construction and inventory cost savings, and reduced disposal expenses.

This report represents an effort by MassHighway to describe and quantify its recent efforts in the areas of recycling, recycled procurement, and pollution prevention; to discuss ongoing projects; and to establish future goals in these areas. The core data contained in this report represents activities, purchases, and projects, which took place in the calendar year 1999. Comparisons are also drawn to previously collected data, which was detailed in the 1999 Recycling Report. In addition, activities begun in the current calendar year (2000) are also discussed as ongoing projects.

## SECTION II. EDUCATION & OUTREACH EFFORTS

MassHighway has made many efforts towards becoming a proactive agency when it comes to the environment. The Department has been working hard to educate both its employees and the rest of the Commonwealth about its environmental policies and progress.

### Environmental Education

#### ✓ Facility Environmental Handbook

As part of MassHighway's Environmental Management System (EMS), the Department issued its Facility Environmental Handbook in April of 1999. The Handbook provides facility employees with a visually enhanced reference guide to environmental policies and standard operating procedures (SOPs), including emergency situation responses and employee roles and responsibilities. The four simple tasks encouraged by the handbook are 1) keep it neat, 2) inspect it, 3) label it, and 4) report it.

#### ✓ Facility Training Sessions

In addition to the issuance of the Handbook to all MHD facilities, the Department held mandatory training sessions for all facility employees periodically throughout the year. These sessions involved full explanations and interactive discussions of all the information contained in the Handbook in order to ensure compliance.

## Recycling Coordinator Outreach

Following recommendations contained in the 1995 University of Massachusetts Transportation Center report, "Use of Recycled Materials and Recycled Products in Highway Construction", MHD hired a Recycling Coordinator (see contact info at end of report) in May of 1999 to administer the following tasks:

- Increase the use of recycled materials and products in MassHighway construction projects.
- Increase opportunities for pollution prevention, reuse of waste materials and recycling activities for routine MassHighway maintenance operations.
- Generate and coordinate research opportunities for recycled products and materials.
- Prepare reports on MassHighway recycling efforts.
- Enhance and improve efforts to cooperate and communicate with Department personnel, other agencies, municipalities, organizations and the recycling community with respect to recycling and the reuse of materials at MassHighway.

Beyond the annual reporting requirement, 1999 outreach efforts included:

### ✓ Committee Participation

- *Beneficial Use Determination Subcommittee* – An organized forum for discussion designed to advise the Department of Environmental Protection (DEP) on programmatic efforts to develop policies for the use of solid waste, and to develop improved beneficial use determination (BUD) application requirements and review procedures.
- *Vehicles Procurement Management Team* – As part of the Operational Services Division (OSD), the PMT's mission is to develop and manage "Best Value" statewide contracts to meet the Vehicle & Related Services needs of State, Municipal and Eligible entities including non-profit providers.

### ✓ Conference Participation

- *Wood/Plastic Composites Conference (10/9/99)* – Seminar discussing the industry and markets for wood-thermoplastic composite products.
- *Annual Buy Recycled Vendor Fair & Conference (10/29/99)* – Event sponsored by OSD, DEP and EOEA to encourage greater use of recycled and other environmentally preferable products among state agencies, municipalities and other public entities.
- *Beneficial Use Conference (11/15-11/16/99)* – Technical conference designed to address in detail the issue of by-product use in construction applications in the United States.

In addition to those outreach efforts begun in 1999, 2000 outreach goals include:

### ✓ Newsletter Development

In an effort to reach a greater audience, a recycling newsletter is being planned that will include updates and opportunities related to MHD's continued recycling efforts. The newsletters will be distributed to associations, groups, and organizations representing contractors, designers, government officials and recycling professionals.

✓ Website Development

As part of an effort to communicate and promote MHD's recycling efforts, a recycling website is being developed that will include all relevant information, related publications, and applications. Expected to be up in the second half of 2000, this website will be an extension of MHD's current homepage ([www.magnet.state.ma.us/mhd](http://www.magnet.state.ma.us/mhd)).

### SECTION III. ENVIRONMENTALLY PREFERABLE PURCHASING

#### Summary of EPP Efforts

The State of Massachusetts has become very well known in recent years for its extraordinary efforts to increase statewide procurement of recycled and other environmentally preferable products (EPPs). EPPs are those products that have a lesser or reduced effect on human health and the environment. They may contain recycled content, minimize waste, conserve energy or water, and/or reduce the amount of toxics consumed or disposed. The Operational Services Division deserves the majority of credit for these efforts by working hard to ensure that environmentally preferable products are included on state contracts whenever feasible. MassHighway has taken advantage of many of these contracts for its own procurement, such as the Vehicles Contract 18A, which includes Recycled Antifreeze, Re-refined Oil, and Bio-based Lubricants.














As you will see in the following tables (Tables 1 and 2), MassHighway purchased more than \$312,000 worth of environmentally preferable products in calendar year 1999. This represents

**TABLE 1. 1999 ENVIRONMENTALLY PREFERABLE PRODUCTS SUMMARY**  
(By Procuring Entity)

<b>MASSHIGHWAY'S ENVIRONMENTALLY PREFERABLE PROCUREMENT RECORD</b>								
<b>NON-EPP PURCHASES</b>	<i>District 1</i>	<i>District 2</i>	<i>District 3</i>	<i>District 4</i>	<i>District 5</i>	<i>Boston</i>	<i>Franklin</i>	<b>Total</b>
CY 1998	\$4,441	\$3,534	\$0	\$14,028	\$4,430	\$0	\$52,224	<b>\$78,657</b>
CY 1999	\$5,570	\$4,935	\$0	\$26,205	\$3,818	\$60,108	\$62,399	<b>\$163,035</b>
<b>EPP PURCHASES</b>								
CY 1998	\$5,360	\$4,766	\$0	\$5,546	\$4,020	\$179,000	\$144,505	<b>\$343,197</b>
CY 1999	\$3,366	\$3,810	\$0	\$5,359	\$4,020	\$128,139	\$167,397	<b>\$312,091</b>
<b>EPP PROCUREMENT RATES &amp; GOALS</b>								
CY 1998	55%	57%	N/A	28%	48%	100%	73%	<b>81%</b>
CY 1999	38%	44%	N/A	17%	51%	68%	73%	<b>66%</b>

66% of MHD's purchases of products available in environmentally preferable form via statewide contract or otherwise. However, this also means that there is still significant room for improvement. Table 1 details MassHighway's Environmentally Preferable Procurement Record by Procuring Entity (MHD's five districts and Boston and Franklin stockrooms). Table 2 details these same purchases by Product Type.

**TABLE 2. 1999 ENVIRONMENTALLY PREFERABLE PRODUCTS SUMMARY**  
(By Product Type)

Type of Product	EPP Category	Amount Purchased		% EPP Purchases
		Non-EPP	EPP	
Absorbents		\$0.00	\$1,247.50	100.0%
Alternators	Remanufactured	\$0.00	\$3,046.00	100.0%
Antifreeze		\$0.00	\$1,237.50	100.0%
Batteries		\$285.91	\$524.63	64.7%
Books		\$0.00	\$29,623.90	100.0%
Cardboard Boxes		\$0.00	\$1,534.75	100.0%
Cleaning Products	Less Toxic	\$6,384.18	\$0.00	0.0%
Control Boxes	Remanufactured	\$0.00	\$2,175.00	100.0%
Filters		\$404.31	\$0.00	0.0%
Hydraulic Fluid	Re-refined	\$0.00	\$3,400.00	100.0%
Light Bulbs	Energy Saving	\$10,339.20	\$201.36	1.9%
Motor Oil	Re-refined	\$106.36	\$12,530.00	99.2%
Office Supplies		\$41,118.17	\$19,068.08	31.7%
Paint		\$11,138.70	\$0.00	0.0%
Paper, Envelopes & Forms		\$32,905.56	\$65,800.61	66.7%
Paper Products		\$0.00	\$12,607.68	100.0%
Starters	Remanufactured	\$0.00	\$3,040.00	100.0%
Tires	Retread	\$54,398.20	\$0.00	0.0%
Toner Cartridges	Remanufactured	\$3,783.96	\$29,193.60	88.5%
Traffic Cones		\$0.00	\$23,750.00	100.0%
Transmission Oil	Re-refined	\$0.00	\$745.00	100.0%
Trash Bags		\$190.40	\$99,264.89	99.8%
Wiping Rags		\$1,980.00	\$3,100.00	61.0%
<b>Total</b>		<b>\$163,034.95</b>	<b>\$312,090.50</b>	<b>65.7%</b>

### New Products Purchased

MassHighway is always eager to find environmentally preferable alternatives to virgin products. This past year MassHighway began purchasing several products in recycled form including remanufactured automotive parts and re-refined hydraulic fluid and transmission oil. To date, MHD has had excellent results using these products since they've performed exactly like their virgin or new alternatives.

- Remanufactured Automotive Parts – Parts remanufacturing allows users to conserve money and natural resources by recycling their own automotive parts through the remanufacturing process. (Included in statewide contract #VEH11A)
- Re-refined Hydraulic and Transmission Fluids – Re-refined hydraulic and transmission fluids use 100% re-refined base oils, thereby reducing the need to tap limited virgin crude resources and allowing purchasers to “close the loop” by recycling and purchasing re-refined products. (Included in statewide contract #VEH18A)

### Ongoing Product Trials

In addition to the new EPP purchases mentioned above, MassHighway has also been working together with OSD to perform trials of new products, which may or may not already be on contract. By participating in these trials, MassHighway has the opportunity to test products before making large purchases and OSD is provided with reliable, practical feedback from one of the state's largest procuring agencies. Three product trials currently underway or in the works are for Waste Wood Mulch, Safety Vests made from 100% recycled soda bottles, and Retread Tires. The final results of these trials will be reported in the 2001 annual report.

- Recycled Plastic Safety Vests – These vests are manufactured from 100% post-consumer Polyethylene Terephthalate (Plastic #1).
- Retread Tires – These tires cost on average 30 to 50 percent less than comparable new tires and save up to fifteen gallons of oil per retread. (Included in statewide contract #VEH21)
- Waste Wood Mulch – These mulch products, useful for landscaping projects, are made from various wood waste products, including used pallets.

## **SECTION IV. POLLUTION PREVENTION PROGRAMS**

In addition to its recycling and recycled procurement activities, MHD has also undertaken efforts to prevent pollution through conservation and reduction programs. MHD's Pollution Prevention Taskforce, which is made up of the Department's Hazardous Materials Coordinators and other Environmental Personnel, initiates many of these efforts. Pollution prevention efforts are considered preferable to pollution control since control efforts merely manage the distribution/dispersion of pollution rather than eliminate it. The following section is a brief description of MassHighway actions aimed at pollution prevention.

### Air Pollution Prevention

- Fleet inspections to ensure vehicle's emissions compliance;
- Garage location consolidations to reduce overall fume emissions; and,
- Installation of vapor recovery systems for underground storage tanks.

### Energy Conservation

- Installation of more efficient and cost effective lighting systems and products.

### Indoor Pollution Prevention

- Daily fresh air ventilation; and
- Proper maintenance and cleaning of ducts, vents, fans, and a/c units.

### Solid Waste Source Reduction

- Expanded use of recycled and remanufactured products.

### Toxics Use Reduction

- Pollution Prevention Taskforce recommended reduction of the following substances: petroleum-based hydraulic and lubricating oils, automotive parts cleaning solvents and systems, perchloroethylene cleaning solvent, and other automotive lube/cleaning products.
- Began the use of re-refined hydraulic and transmission fluids.

### Water Conservation and Pollution Prevention

- Continued upgrades of floor drainage and septic systems at all depots and administration buildings; and
- Installation of additional vehicle washwater recycling systems at several depots.

## **SECTION V. RECYCLING PROGRAMS**

MassHighway maintains more than 150 facilities including five district offices, the Boston office, the research and materials laboratory, the Franklin stockroom, and more than 140 depots, all of which generate and collect a variety of waste streams. In total, MassHighway recycled 69% of its waste stream in calendar year 1999, more than 10,000 tons. Table 3 illustrates MHD's recycling records by collection location and Table 4 details this same information by waste type.

### Facility Recycling Programs

The majority of MHD's waste stream is composed of materials collected off of the State's highways and stored at its depots. This includes everything from street sweepings, to construction and demolition debris (C&D), to tires. After being transported to MHD's depots these materials are segregated for future disposal or recycling. Segregation actually ensures greater recyclability and less processing of these materials by reducing contamination.

In 1999, over 15,000 tons of asphalt, brick & concrete (ABC), C&D, scrap metal, street sweepings, wood, and yard wastes & leaves were collected and stored at MHD depots. More than 10,000 tons of these materials were recycled. Additionally, vehicle repair and maintenance also takes place at many depots, creating more than 130 tons of automotive related waste products annually, 115 tons of which were recycled in 1999.

**TABLE 3. 1999 RECYCLING SUMMARY**  
(By Collection Location)

<b>MASSHIGHWAY'S RECYCLING RECORD</b>							
<b>WASTE DISPOSED (TONS)</b>	<i>District 1</i>	<i>District 2</i>	<i>District 3</i>	<i>District 4</i>	<i>District 5</i>	<i>Franklin</i>	<b>Total</b>
CY 1998	12,102	600	312	2,652	700	16	<b>16,382</b>
CY 1999	1,023	823	956	1,210	703	3	<b>4,718</b>
<b>WASTE RECYCLED (TONS)</b>							
CY 1998	14	9,487	3,217	232,180	174	4	<b>245,076</b>
CY 1999	593	3,651	2,223	3,573	300	7	<b>10,347</b>
<b>RECYCLING RATES</b>							
CY 1998	0%	94%	91%	99%	20%	20%	<b>94%</b>
CY 1999	37%	82%	70%	75%	30%	74%	<b>69%</b>

Office Recycling Programs

Office wastes created by MHD's six offices are typical and include paper, paper products, and toner cartridges. Currently, only three of MassHighway's offices maintain office paper recycling programs (Boston and Districts 1 and 3). Recycling services at the Boston office are included in the building lease agreement and as such the amounts recycled are not currently recorded. Therefore, although Table 4 notes a total of 50 plus tons of office waste collected, this is assumed to be much smaller than the actual total. Additionally, those offices not offering recycling services do not calculate the amount of waste paper collected since it is included in the Trash component of Table 4.

Recycling Contracts

Recycling service contracts and provisions are being developed for those offices not currently served.

**TABLE 4. 1999 RECYCLING SUMMARY**  
(By Waste Type)

Type of Recyclable Waste	Tons of Waste Collected	Tons of Waste Disposed	Tons of Waste Recycled	Percentage Recycled
<b>Automotive Wastes</b>				
Antifreeze	3.305	0.200	3.105	93.9%
Batteries	9.414	0.000	9.414	100.0%
Cleaning Solvent	1.805	0.000	1.805	100.0%
Filters	5.305	2.650	2.655	50.0%
Gasoline	1.467	0.000	1.260	100.0%
Oil	23.540	0.000	23.540	100.0%
Petroleum-Contaminated Water	13.400	13.400	0.000	0.0%
Tires	74.930	1.400	73.530	98.1%
<b>Containers</b>				
Aluminum Cans	0.650	0.000	0.650	100.0%
Steel Drums	5.105	0.250	3.975	94.1%
<b>Fixtures</b>				
Ballasts	0.650	0.000	0.625	100.0%
Flourescent Bulbs	5.280	4.750	0.320	6.3%
Surplus Paints	1.500	1.400	0.100	6.7%
Thermostats (Mercury)	0.003	0.000	0.003	100.0%
<b>Office Waste</b>				
Cardboard	3.500	0.250	3.250	92.9%
Magazines & Newspapers	0.500	0.000	0.500	100.0%
Toner Cartridges	0.660	0.000	0.660	100.0%
Paper - Mixed	30.000	30.000	0.000	0.0%
Paper - Other	1.700	0.500	1.200	70.6%
Paper - White	14.100	0.000	14.100	100.0%
<b>Operations Wastes</b>				
Absorbents	2.530	2.130	0.400	15.8%
Asphalt, Brick & Concrete	1249.000	176.000	1073.000	85.9%
Construction & Demolition Debris	3575.210	480.000	3095.210	86.6%
Scrap Metal	479.700	0.000	479.700	100.0%
Street Sweepings	9500.000	0.000	5000.000	100.0%
Wood	581.000	21.000	553.000	96.3%
Yard Wastes & Leaves	5.000	0.000	5.000	100.0%
Other	900.000	0.000	0.000	N/A
<b>Trash</b>	3982.530	3984.030		N/A
<b>Total</b>	<b>20,472</b>	<b>4,718</b>	<b>10,347</b>	<b>68.7%</b>

## SECTION VI. RECYCLED MATERIALS IN CONSTRUCTION ACTIVITIES

Besides purchasing recycled content items for the office and garage, MassHighway also directly incorporates recycled materials and products into its construction activities and contracts. This is accomplished through material and construction specifications that allow recycled content, approved recycled content products, and Beneficial Use Determinations (BUDs) issued by the Department of Environmental Protection. In 1999, almost \$33 million were spent on construction materials and products containing more than 138,000 tons of recycled materials. Table 5 details the amounts and costs of these recycled materials and products.

### Specifications

Currently, MassHighway maintains specifications for all of the following recycled materials:

- *Blast Furnace Slag* – for use in Cement Concrete;
- *Compost* – for use in Amended Loam;
- *Fly Ash* – for use in Cement Concrete and Controlled Density Fill;
- *Pavement Millings* – for use in Mulch under guardrail;
- *Processed Glass Aggregate* – for use in Bituminous Concrete, Borrow, and Sub-base Course;
- *Reclaimed Asphalt Pavement* – for use in Bituminous Concrete;
- *Reclaimed Pavement Borrow Material* – for use in Base and Sub-base Courses;
- *Recycled Plastic Offset Blocks* – for use in guardrail construction.
- *Rubberized Asphalt* – for use in Hot Poured Joint Sealers and Stress Absorbing Membrane Interlayers (SAMIs);
- *Silica Fume* – for use in Cement Concrete.

### Approved Products

As well as its standard specifications, MassHighway also produces an “approved products list”, which contains specific manufactured items allowed for use on MHD projects. The following approved products include recycled content alternatives:

- *Recycled Plastic Flexible Delineators*;
- *Rubberized Asphalt Sealers*.

### Other Materials/Products

In addition to the specified materials and approved products listed above, several other recycled content materials and products have been incorporated into MassHighway and other construction projects through the Department of Environmental Protection’s (DEP) Beneficial Use Determination (BUD) Program and the Operational Services Division’s (OSD) Environmentally Preferable Product (EPP) Purchasing Program. The following items have all been purchased and utilized in construction projects with the help of these programs:

- *Recycled Glass Beads* – for use in Reflectorized Pavement Markings;
- *Recycled Plastic Picnic Tables, Park Benches and Trash Receptacles* – for use at Rest Areas;
- *Recycled Plastic Traffic Cones* – for use at Maintenance and Construction Sites;
- *Street Sweepings* – for use as Landfill Cover and Fill Material.

TABLE 5. RECYCLED CONTENT CONSTRUCTION MATERIALS

<b>CONSTRUCTION MATERIALS CONTAINING RECYCLED CONTENT</b>		
<i>Material Description</i>	<i>Amount</i>	<i>Cost</i>
<b>Concrete with Additives</b>	<b>70,601 CY</b>	<b>\$19,564,949</b>
Fly Ash Content	30,876 Tons	
Microsilica Content	14,096 Tons	
Slag/NEWCEM Content	12,244 Tons	
<b>Controlled Density Fill with Fly Ash</b>	<b>2,215 CY</b>	<b>\$120,777</b>
Fly Ash Content	318 Tons	
<b>Modified Loam Borrow with 30% Compost</b>	<b>2,202 CY</b>	<b>\$52,848</b>
Compost Content	1,322 Tons	
<b>Pavement Millings Mulch</b>	<b>4,031 Tons</b>	<b>\$129,839</b>
<b>Pavement with RAP</b>	<b>323,118 Tons</b>	<b>\$12,225,254</b>
Reclaimed Asphalt Pavement Content	55,278 Tons	
<b>Reclaimed Pavement for Base &amp; Subbase</b>	<b>19,890 Tons</b>	<b>\$282,655</b>
<b>Rubberized Asphalt Sealer</b>	<b>717,556 LF</b>	<b>\$187,126</b>
Rubber Content	27 Tons	
<b>Rubberized Stress Absorbing Membrane Interlayer</b>	<b>37,000 SY</b>	<b>\$107,300</b>
Rubber Content	23 Tons	
<b>Recycled Plastic Park Benches</b>	<b>57</b>	<b>\$50,540</b>
<b>Recycled Plastic Picnic Tables</b>	<b>40</b>	<b>\$55,230</b>
<b>Recycled Plastic Trash Receptacles</b>	<b>39</b>	<b>\$26,300</b>
<b>Recycled Glass Beads for Pavement Markings</b>	<b>286 Tons</b>	<b>\$95,524</b>
	<b>Total Recycled Material Content</b>	<b>138,391 Tons</b>
	<b>Total Material Costs</b>	<b>\$32,898,342</b>

## SECTION VII. RESEARCH PROJECTS

Annually, MassHighway participates in and funds several research studies. Currently, MassHighway is involved in several projects, which are investigating the implications of the use of recycled materials in highway construction. The following section is a brief description of each of these projects.

### Boiler Aggregate Leachability Study – University of Massachusetts at Lowell

Researchers at the University of Massachusetts at Lowell's Center for Environmental Engineering, Science and Technology (CEEST) are currently conducting research for MassHighway to determine specific environmental impacts of Boiler Aggregate™ (BA) modified hot mix asphalt concrete. BA™ is an aggregate substitute made from municipal solid waste combusted bottom ash. Laboratory experiments and computer models are being used to determine the effect of BA™ content on the leachability of specific heavy metals from stockpiles of reclaimed asphalt pavement (RAP). Based on leachability study results and structural performance specifications, technically defensible maximum acceptable substitution rates of BA™ in hot mix asphalt concrete will be determined.

This two-year study is scheduled for completion in 2001.

### Offset Blocks Life Cycle Assessment – Sustainable Solutions

The Chelsea Center for Recycling and Economic Development (also part of UMass Lowell) has contracted with Sustainable Solutions to develop a Life Cycle Assessment of three types of offset blocks for use by MassHighway in guardrail systems. The purpose of the project is to provide MHD with basic information and analyses needed to make environmental and cost comparisons between recycled plastic, recycled steel, and pressure treated wood offset blocks over the course of their life spans from manufacture through disposal.

This short study is scheduled for completion in 2000.

### Tire Shred Embankment – Town of Tewksbury

The Town of Tewksbury has agreed to participate in a research study funded by the Federal Highway Administration (FHWA) and MassHighway to investigate the use of tire shreds as mitigation for secondary compression of organic soils beneath a roadway embankment.

Research services on this project will be provided to the Town and MassHighway by Stephens Associates Consulting Engineers. Research objectives include tire shred performance testing and the development of standard specifications and design details for MHD for the use of tire shreds as lightweight fill.

This two-year study is scheduled for completion in 2002.

## SECTION VIII. CONCLUSION

Over the past few years there has been an increasing awareness and interest in the use of recycled materials and recycling as it relates to highway and roadway construction. Federal and state construction bodies across the country have begun to account for and find ways to increase their use of recycled materials. Many states have mandated the use of recycled materials in public construction projects. Although this is not the case in the Commonwealth, MassHighway has voluntarily done its part to account for and reduce its waste stream and to reincorporate waste and recycled materials into its construction and operations activities.

Recycling and environmentally preferable procurement are becoming part of the routine way of doing business at MassHighway. Although highway performance, safety, and cost are of primary importance to MassHighway, as long as recycled and environmentally preferable materials and products can fit this bill, they will be considered comparable, if not superior to virgin alternatives.

### *1999 MassHighway Accomplishments*

- More than 10,000 tons of waste were recycled.
- More than 138,000 tons of recycled materials were used in construction projects.
- Overall, more than \$33,000,000 was spent on recycled-content and environmentally preferable materials and products.

### *Future Goals*

Much still remains to be done. In the upcoming years, MassHighway will continue to evaluate its many procurements and specifications to remove unnecessary barriers and identify new opportunities for recycled and environmentally preferable purchases. MassHighway will also continue to examine its construction and maintenance operations to identify areas of potential waste reduction. Finally, MassHighway hopes to continue to work in coordination with local, state, and national environmental and public works entities to share its experiences and to learn more about the use of recycled and environmentally preferable materials in highway and roadway construction.

## CONTACT INFORMATION

Contact	Jessica LeBlanc, Recycling Coordinator
Address	10 Park Plaza, Room 3531, Boston, MA 02116
Telephone Number	617-973-7820
Fax Number	617-973-8032
Email Address	<a href="mailto:jessica.leblanc@state.ma.us">jessica.leblanc@state.ma.us</a>