

Massachusetts Department of Transportation
Semi Annual Submittal under MassDOT's Impaired Water Program

Attachment 3: Impaired Waters Assessments, Progress to Final Reports

MA51012 Burncoat Park Pond

MA51-03 Blackstone River

MA71040 Spy Pond

MA71-03 Mystic River

MA84B-02 Beaver Brook

Impaired Waters Assessment for Burncoat Park Pond (MA51012) – Final Report

Introduction

Burncoat Park Pond (MA51012) was previously assessed in a progress report titled, *Impaired Waters Assessment for Burncoat Park Pond (MA51012) – Progress Report*, submitted on 12/8/2010. The progress report included suggestions for additional BMPs and stated that MassDOT would work with designers to implement BMPs in order to meet its target reduction of impervious cover (IC). MassDOT has since initiated the design of BMPs to address its contribution of stormwater to Burncoat Park Pond. This report presents a summary of the findings of the progress report as well as a final assessment which includes the reduction provided by existing BMPs and the final target IC reduction determined during the Designer's comprehensive investigation and the BMPs in design and their estimated resulting IC removals.

Summary of Progress Report

Impaired Water Body

Name: Burncoat Park Pond

Location: Worcester, MA

Water Body ID: MA51012

Impairments

Burncoat Park Pond (MA51012) is listed under Category 5, "Waters Requiring a TMDL", on MassDEP's final *Massachusetts Year 2012 Integrated List of Waters*, (MassDEP 2013). According to MassDEP's *Blackstone River Watershed 2003-2007 Water Quality Assessment Report* (MassDEP, 2010), none of the designated uses have been assessed because there is no recent quality assured data available. This segment is impaired for the following:

- aquatic plants (macrophytes)
- turbidity

Site Description

Burncoat Park Pond (MA51012) is a 6.3 acre pond located in Worcester just north of Interstate 290 (I-290) with a 271-acre contributing watershed. MassDOT owns I-290 and North Service Road, both of which are within the Burncoat Park Pond watershed. North Service Road is adjacent to Burncoat Park Pond on the southern side of the pond. I-290 parallels the North Service Road to the south. I-290 is elevated and its abutment slopes steeply down to the North Service Road.

Based on an automated review of GIS data and MassDOT's Appendix L-1 of Impaired Waterbodies included in BMP 7U (dated July 22, 2010), it was originally determined that MassDOT has one outfall within 500 feet of Burncoat Park Pond. A field investigation on November 3, 2010 found that MassDOT roadways drain to Burncoat Park Pond through four outfalls, two of which are MassDOT outfalls (AECOM ID 14156.4 and 14157.4), while the other two (AECOM ID 14159.4 and 14158.4) are City of Worcester outfalls. Outfall 14156.4 collects storm water runoff from North Service Road between the intersection of

North Parkway and the North Service Road (at the east) and the high point on North Service Road approximately 250 feet to the west. North Service Road is bounded by curbing which directs all storm water to two catch basins that discharge through Outfall 14156.4 directly into the pond. MassDOT's contributing area to this outfall is approximately 0.55 acres of paved roadway.

Outfall 14157.4 collects storm water from the elevated portion of I-290 (0.45 acres of MassDOT roadway) and the vegetated area between I-290 and the North Service Road (1.5 acres vegetated) through a catch basin located within the vegetated area. Runoff from the paved roadway and shoulder drains to a catch basin on I-290 that discharges to a headwall structure within the vegetated area. The headwall structure provides detention control which results in sediment removal. Runoff that reaches the vegetated area via the headwall structure flows overland for a minimum of 100 feet before reaching the catch basin that connects directly to Outfall 14157.4. For this flow path, which drains 0.45 acres of MassDOT property, the vegetated area serves as a filter strip that traps sediment and allows for infiltration.

Outfall 14159.4 is a City of Worcester structure that collects storm water from the ramp between North Parkway and North Service Road. Approximately 0.1 acre of paved Mass DOT roadway drains directly to a Worcester catch basin on Route 70 that discharges through Outfall 14159.4 directly to Burncoat Park Pond.

Outfall 14158.4 is a City of Worcester structure that collects storm water from Worcester's Route 70 and from MassDOT's exit ramp (Exit 20) from I-290 West. Approximately 0.7 acres of MassDOT paved roadway and 1.4 acres of MassDOT vegetated shoulder/median drain to this outfall. The paved exit ramp is bounded by curbing and runoff is discharged directly to a catch basin on the exit ramp, which flows via City of Worcester infrastructure directly to Burncoat Park Pond at Outfall 14158.4.

The vegetated median south of the exit ramp (located between I-290 and the exit ramp) contains vegetated swales and filter strips, however it does not receive much (if any) runoff from paved portions of I-290 or the exit ramp.

Assessment under BMP 7U

For this water body, MassDOT used the IC method to assess the following impairments:

- aquatic plants (macrophytes)
- turbidity

Existing BMPs

The progress report listed one existing BMP which was identified in the Burncoat Park Pond subwatershed as mitigating potential stormwater quality impacts prior to discharge to the pond. A summary of the existing BMP information reported is shown in Table 1.

Table 1. Summary of Existing BMPs

BMP Name	BMP Type	Soil Type	Depth of Runoff Treated (inches)	IC Area Treated (acres)	Reduction of Effective IC* (%)	Reduction of Effective IC (acres)
BMP-1	Filter Strip	C – Silt Loam – 0.27 in/hr	2.0	0.5	94	0.4

*Description of MassDOT's Application of Impervious Cover Method in BMP 7U (MassDOT 2011)

Target Reduction

In the progress report, MassDOT derived the following site parameters and target reduction for DOT's directly contributing watershed draining to the Burncoat Park Pond (MA51012) using the IC Method:

Table 2. Site Parameters and Target IC Reduction

IC in DOT's Directly Contributing Watershed	1.8	acres
Target Percent Reduction in Effective IC	74	%
Target Reduction in Effective IC to meet 9% IC target	1.3	acres
IC Effectively Reduced by Existing BMPs	0.5	acres
IC Remaining to Mitigate with Proposed BMPs	0.9*	acres

*Rounding accounts for differences in summation.

Final Assessment

Designer Investigation of Existing BMPs

After the submittal of the progress report, further investigation of the existing BMP found more precise values of storage volume, IC area treated, and percent reduction of effective IC. The filter strip included as an existing BMP in the progress report was further investigated and it was determined that it does not directly discharge to Burncoat Park Pond. Therefore, there are no existing BMPs to mitigate stormwater discharge to the pond.

Updated Target Reduction

After the submittal of the progress report, further investigation of MassDOT's directly contributing IC area was performed by the designers. Based on this investigation, the MassDOT Directly Contributing IC Watershed was updated from 1.8 acres to 1.1 acres. Thus, the target reduction of impervious cover, 74% of this IC watershed, was also updated by the designers from 1.3 acres to 0.8 acres based on these more in-depth field evaluations. After taking into account that there is no reduction provided by any existing BMPs, the remaining target reduction of effective IC is 0.8 acres. See Table 3 below.

Table 3. Designer Investigation Site Parameters and Target IC Reduction

IC in DOT's Directly Contributing Watershed	1.1	acres
Target Percent Reduction in Effective IC	74	%
Target Reduction in Effective IC to meet 9% IC target	0.8	acres
IC Effectively Reduced by Existing BMPs	0	acres
IC Remaining to Mitigate with Proposed BMPs	0.8	acres

BMPs in Design

MassDOT has constructed BMPs to address the target IC reduction of 0.8 acres as part of MassDOT's Impaired Waters Retrofit Initiative. MassDOT designed, permitted and constructed 1 infiltration basin and 1 dry detention basin to treat stormwater runoff from 0.96 acres of impervious cover of MassDOT roadways prior to discharge to Burncoat Park Pond. Table 4 below lists the

impervious stormwater catchment area for each BMP as well as the estimated post-construction IC reduction that will be provided by each BMP.

Table 4. Summary of BMPs in Design

BMP Name	BMP Type	IC Area Treated (ac)	Reduction of Effective IC (ac)
BMP-1	Infiltration Basin	0.7	0.7
BMP-2	Dry Detention Basin	0.3	0.1
Total		1.0	0.8

Conclusions

Table 5 summarizes IC reductions within MassDOT's directly contributing watershed under the design BMP conditions.

Table 5. Design BMP Effective IC Reductions

MassDOT Target Reduction in Effective IC to Meet with Design BMPs	0.8 acres
Effective IC Reduction under Design BMPs	0.8 acres
Remaining Target	0 acres

These two stormwater BMPs will achieve an estimated effective impervious cover reduction of 0.8 acres, thus meeting the 9% impervious cover target.

MassDOT will continue to identify opportunities to implement additional structural BMPs to address pollutant loading when road work is conducted under MassDOT's Programmed Projects Initiative. Work on Programmed Projects often includes broader scale road layout changes that may provide additional opportunities for construction of new treatment BMPs. This is consistent with an iterative adaptive management approach to addressing impairments. MassDOT will include an update in annual reports and biannual submittals to EPA regarding progress made towards meeting target IC reductions, plans for construction of proposed BMPs, and finalized assessments including reductions achieved by finalized BMP designs. Furthermore, MassDOT will continue to implement non-structural BMPs that reduce the impacts of stormwater.

References

- Massachusetts Department of Environmental Protection (MassDEP). (2013). Massachusetts Year 2012 Integrated List of Waters - Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Retrieved from: <http://www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf>
- Mass DEP 1998. *Water Quality Assessment Report 1998 Blackstone River Basin*. Commonwealth of Massachusetts Executive Office of Environmental Affairs. Available at: <http://www.mass.gov/eea/agencies/massdep/water/watersheds/blackstone-river-basin-1998.html>
- Mass DEP 2010. *Blackstone River Watershed 2003-2007 Water Quality Assessment Report*. Commonwealth of Massachusetts Executive Office of Environmental Affairs. Available at: <http://www.mass.gov/eea/docs/dep/water/resources/3baapp/51wqar10.pdf>
- Massachusetts Department of Transportation (MassDOT). (2010). MassDOT Quarter 2 Submittal (September 8 – December 7, 2010): NPDES MS4 General Permit Compliance Water Quality Impaired Waters Assessment and Mitigation Plan.
- MassDOT (2011). Description of MassDOT's Application of Impervious Cover Method in BMP 7U (MassDOT Application of IC Method).

Impaired Waters Assessment for Blackstone River (MA51-03) – Final Report

Introduction

Blackstone River (MA51-03) was previously assessed in a progress report titled, *Impaired Waters Assessment for Blackstone River (MA51-03) – Progress Report*, submitted on 12/8/2010. The progress report proposed potential retrofits to existing BMPs as they just fell short of providing the adequate mitigation for stormwater discharge. MassDOT has since initiated the design of BMPs to address its contribution of stormwater to Blackstone River. This report presents a summary of the findings of the progress report as well as a final assessment which includes the reduction provided by existing BMPs and the final target IC reduction determined during the Designer's comprehensive investigation and the BMPs in design and their estimated resulting IC removals.

Summary of Progress Report

Impaired Water Body

Name: Blackstone River

Location: Worcester and Grafton, MA

Water Body ID: MA51-03

Impairments

Blackstone River (MA51-03) is listed under Category 5, "Waters Requiring a TMDL", on MassDEP's final *Massachusetts Year 2008 Integrated List of Waters* (MassDEP, 2008). Blackstone River is impaired due to the following:

- unknown toxicity
- priority organics
- metals
- unionized ammonia
- nutrients
- organic enrichment/low DO
- (flow alteration*)
- (other habitat alterations*)
- pathogens
- suspended solids
- turbidity
- (objectionable deposits*)

Site Description

Blackstone River Segment MA51-03 is a 10.8-mile segment of the Blackstone River that extends from the confluence of the Middle River and Mill Brook (just downstream of the American Steel Dam) in Worcester to the Fisherville Dam in Grafton. The total Blackstone River watershed area

upstream of the Fisherville Dam is 62,650 acres and the portion of this watershed that contributes directly to Segment MA51-03 (the subwatershed) is 6,370 acres.

Within the Segment MA 51-03 watershed, MassDOT owns Highway 146, Route 20 and Interstate I-90. Blackstone River Segment MA51-03 parallels Highway 146 for much of its reach and passes underneath Highway 146, Route 20, and I-90 approximately six times. In this area of Worcester and Millbury, Highway 146 is a divided highway with four lanes of traffic (two northbound lanes and two southbound lanes). MassDOT implemented roadway construction improvements for Highway 146 from 1997 through 2005. As a result, much of the storm water infrastructure for this roadway includes structural storm water best management practices (BMPs) such as grass swales, infiltration basins, and dry ponds. Figure 1 delineates the total Blackstone River watershed upstream of the Fisherville Dam, the Segment MA51-03 subwatershed, and the location of the MassDOT roads.

Storm water from approximately 116 acres of MassDOT roads discharges directly to this segment of the Blackstone River. Approximately 94% of that area flows through storm water structural BMPs prior to discharging to the river. The storm water systems are comprised of a combination of piped collection systems, surface swales, and detention and infiltration systems with well-established vegetation. Several systems include BMPs in series, providing additional treatment of storm water prior to discharge. These BMPs are generally sized to store/treat approximately one inch or more runoff over their contributing impervious watersheds and many have additional storage and outlets designed for flood control. The areas not treated by BMPs include portions of the main travel lanes, the Route 20 bridge over the Blackstone River, and the Highway 146 interchange cloverleaf.

Assessment under BMP 7U

For this water body, MassDOT used the IC method to assess the following impairments:

- unknown toxicity
- priority organics
- metals
- unionized ammonia
- nutrients
- organic enrichment/low DO
- pathogens
- suspended solids
- turbidity

According to the final *Year 2008 Integrated List of Waters*, flow alteration, other habitat alterations, and objectionable deposits are considered non-pollutants and unrelated to stormwater. Therefore, MassDOT has determined that further assessment of these impairments to the water body is not required.

Existing BMPs

The progress report listed twenty-three existing BMPs which were identified in the Blackstone River subwatershed as mitigating potential stormwater quality impacts prior to discharge to the river. A summary of the existing BMP information reported is shown in Table 1.

Table 1. Summary of Existing BMPs

BMP Name	BMP Type	Soil Type	Depth of Runoff Treated (inches)	IC Area Treated (acres)	Reduction of Effective IC* (%)	Reduction of Effective IC (acres)
BMP 1	Infiltration Basin	C - Sandy Clay Loam - 0.17 in/hr	0.3	5.4	34	1.8
BMP 3a	Infiltration Basin	B - Loam 0.52 in/hr	0.4	8.8	60	5.3
BMP3b	Infiltration Basin	B - Loam 0.52 in/hr	0.9		83	2.9
BMP 4	Dry Pond	C - Sandy Clay Loam - 0.17 in/hr	0.9	2.9	38	1.1
BMP 6a	Infiltration Basin	C - Sandy Clay Loam - 0.17 in/hr	0.1	8.0	18	1.4
BMP 6b	Infiltration Basin	C - Sandy Clay Loam - 0.17 in/hr	0.1		19	1.2
BMP 6c	Infiltration Basin	C - Sandy Clay Loam - 0.17 in/hr	2.0		94	5.0
BMP 7a	Dry Pond	C - Sandy Clay Loam - 0.17 in/hr	1.6	6.6	45	3.0
BMP7b	Dry Pond	C - Sandy Clay Loam - 0.17 in/hr	2.0		47	1.7
BMP 8	Infiltration Basin	C - Sandy Clay Loam - 0.17 in/hr	2.0	8.4	94	7.9
BMP 9	Infiltration Basin	D	1.7	5.4	89	4.8
BMP 10	Dry Pond	C - Sandy Clay Loam - 0.17 in/hr	0.4	16.5	21	3.5
BMP 11	Dry Pond	C - Sandy Clay Loam - 0.17 in/hr	0.8	4.3	35	1.5
BMP 12	Grass Swale	C - Sandy Clay Loam - 0.17 in/hr	2.0	0.5	47	0.2
BMP 13	Grass Swale	C - Sandy Clay Loam - 0.17 in/hr	0.3	2.8	16	0.5

BMP 14	Grass Swale	C - Sandy Clay Loam - 0.17 in/hr	2.0	0.2	47	0.1
BMP 15	Grass Swale	C - Sandy Clay Loam - 0.17 in/hr	2.0	0.1	47	0
BMP 19	Dry Pond	C - Sandy Clay Loam - 0.17 in/hr	1.4	2.0	44	0.9
BMP 21	Infiltration Basin	A - Loamy Sand 2.41 in/hr	2.0	4.2	100	4.2
BMP 25	Grass Swale	C - Sandy Clay Loam - 0.17 in/hr	2.0	0.3	47	0.1
BMP 26	Infiltration Basin	C - Sandy Clay Loam - 0.17 in/hr	0.5	8.3	50	4.1
BMP 27	Infiltration Basin	C - Sandy Clay Loam - 0.17 in/hr	0.7	24.1	68	16.3
BMP 33	Grass Swale	B - Loam 0.52 in/hr	2.0	0.9	49	0.4

*Description of MassDOT's Application of Impervious Cover Method in BMP 7U (MassDOT 2011)

Target Reduction

In the progress report, MassDOT derived the following site parameters and target reduction for DOT's directly contributing watershed draining to the Blackstone River (MA51-03) using the IC Method:

Table 3. Site Parameters and Target IC Reduction

IC in DOT's Directly Contributing Watershed	116	acres
Target Percent Reduction in Effective IC	59	%
Target Reduction in Effective IC to meet 9% IC target	69	acres
IC Effectively Reduced by Existing BMPs	68.1	acres
IC Remaining to Mitigate with Proposed BMPs	0.9	acres

Final Assessment

Designer Investigation of Existing BMPs

After the submittal of the progress report, further investigation of the existing BMP found the values of storage volume, IC area treated, and percent reduction of effective IC from the existing BMPs provided in the progress report were accurate. Therefore, the effective IC value did not change.

Updated Target Reduction

After the submittal of the progress report, further investigation of MassDOT's directly contributing IC area was performed by the designers. Based on this investigation, the MassDOT Directly Contributing IC Watershed was confirmed to be 116 acres. Thus, the target reduction of impervious cover, 59% of this IC watershed, remained to be 69 acres based on these more in-depth field evaluations. After taking into account the reduction provided by the existing BMPs determined by the designers, the remaining target reduction of effective IC is 0.9 acres.

BMPs in Design

MassDOT previously constructed 23 existing stormwater BMPs (including detention basins, water quality swales, dry ponds, and infiltration basins) which treat stormwater from MassDOT roadways before reaching the Blackstone River. MassDOT reviewed these existing BMPs and identified potential improvements to the existing BMPs to enhance water quality treatment and address the target IC reduction of 0.9 acres as part of MassDOT's Impaired Waters Retrofit Initiative.

MassDOT designed the reconstruction of 1 extended detention basin to increase storage area and increase the effective impervious cover reduction. MassDOT's consultant completed design plans for the enhanced BMP and the work was successfully permitted through the Millbury Conservation Commission. In addition, MassDOT performed maintenance and repair to existing outlet control structures on 4 existing detention basins to improve the function of those BMPs. The BMPs with enhancements will provide a 30-acre reduction in effective impervious cover.

The reconstruction, maintenance and repair of existing BMPs within the Blackstone River subwatershed to provide treatment to meet the target reduction was accomplished and exceeded the target reduction needed to meet the goal.

Conclusions

Table 4 summarizes IC reductions within MassDOT's directly contributing watershed under the design BMP conditions.

Table 4. Design BMP Effective IC Reductions

MassDOT Target Reduction in Effective IC to Meet with Design BMPs	0.9 acres
Effective IC Reduction under Design BMPs	30 acres
Remaining Target	0 acres

The existing BMPs have been designed for retrofits to the maximum extent practicable and will achieve 30 acres of effective IC reduction. Note that the estimated effective IC reduction that will be achieved may change depending on the final designs for the BMPs included in this assessment. The final BMP designs will provide treatment to the maximum extent practicable.

MassDOT will continue to identify opportunities to implement additional structural BMPs to address pollutant loading when road work is conducted under MassDOT's Programmed Projects Initiative. Work on Programmed Projects often includes broader scale road layout changes that may provide

additional opportunities for construction of new treatment BMPs. This is consistent with an iterative adaptive management approach to addressing impairments. MassDOT will include an update in annual reports and biannual submittals to EPA regarding progress made towards meeting target IC reductions, plans for construction of proposed BMPs, and finalized assessments including reductions achieved by finalized BMP designs. Furthermore, MassDOT will continue to implement non-structural BMPs that reduce the impacts of stormwater.

References

- Massachusetts Department of Environmental Protection (MassDEP). (2008). Massachusetts Year 2008 Integrated List of Waters - Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Retrieved from: <http://www.mass.gov/eea/docs/dep/water/resources/07v5/08list2.pdf>
- Mass DEP 1998. *Water Quality Assessment Report 1998 Blackstone River Basin*. Commonwealth of Massachusetts Executive Office of Environmental Affairs. Available at: <http://www.mass.gov/eea/agencies/massdep/water/watersheds/blackstone-river-basin-1998.html>
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- Massachusetts Department of Transportation (MassDOT). (2010). MassDOT Quarter 2 Submittal (September 8 – December 7, 2010): NPDES MS4 General Permit Compliance Water Quality Impaired Waters Assessment and Mitigation Plan.
- MassDOT (2011). Description of MassDOT's Application of Impervious Cover Method in BMP 7U (MassDOT Application of IC Method).

Impaired Waters Assessment for Spy Pond (MA71040) – Final Report

Introduction

Spy Pond (MA71040) was previously assessed in a progress report titled, *Impaired Waters Assessment for Spy Pond (MA71040) – Progress Report*, submitted on 12/8/2011. The progress report stated that MassDOT would work with designers to implement BMPs in order to meet its target reduction of impervious cover (IC). MassDOT has since initiated the design of BMPs to address its contribution of stormwater to Spy Pond. This report presents a summary of the findings of the progress report as well as a final assessment which includes the reduction provided by existing BMPs and the final target IC reduction determined during the Designer's comprehensive investigation and the BMPs in design and their estimated resulting IC removals.

Summary of Progress Report

Impaired Water Body

Name: Spy Pond

Location: Arlington, MA

Water Body ID: MA71040

Impairments

Spy Pond (MA71040) is listed under Category 5, "Waters Requiring a TMDL", on MassDEP's final *Massachusetts Year 2008 Integrated List of Waters* (MassDEP 2008). The water body is impaired for the following:

- pesticides
- nutrients
- organic enrichment/low DO
- noxious aquatic plants
- (exotic species*)

According to MassDEP's *Mystic River Watershed and Coastal Drainage Area 2004-2008 Water Quality Assessment Report* (MassDEP, 2010), Spy Pond is a Class B water body. The report assessed Spy Pond for the Aquatic Life and Fish Consumption designated use classifications. The Aquatic Life Use is reported to be impaired due to the presence of non-native aquatic plants. The Fish Consumption Use is reported to be impaired due to the presence of pesticides (DDT and Chlordane) from an unknown source. Although Spy Pond was not assessed for the Primary Contact, Secondary Contact, or Aesthetics designated use classifications, all three have been placed on "Alert Status" due to evidence of algal blooms.

Site Description

Spy Pond is located in the town of Arlington, Massachusetts. The pond has a surface area of approximately 98.4 acres and is part of the Boston Harbor Watershed and the Mystic River sub-basin. Spy Pond is fed by a combination of groundwater and surface runoff and outlets to Little

Pond in Belmont via a 36-inch concrete culvert, ultimately draining to the Mystic River. The photograph below shows the outlet structure controlling flow into the 36-inch culvert.

Spy Pond has a contributing watershed of approximately 696 acres consisting primarily of urbanized, residential areas in Arlington. The majority of the pond is surrounded by residential properties and recreational areas, including athletic fields and parks. MA Route 2/Concord Turnpike in Belmont and Arlington borders the southwestern portion of the pond, extending approximately 1,760 feet along its shoreline. Refer to Figure 1 for the location of the Spy Pond watershed relative to Route 2.

MassDOT, which owns Route 2, also maintains 13 stormwater outfalls along Spy Pond's shoreline. Approximately 38 acres of MassDOT roadways drain directly to Spy Pond via these 13 outfalls. These roadways include Route 2, its entry/exit ramps, several overpasses, and Frontage Road along the northern edge of Route 2. Refer to Figures 2a-2c for MassDOT's watershed contributing directly to Spy Pond. During a field visit on Monday October 17, 2011, it was confirmed that MassDOT currently has no BMPs in place to mitigate the effects of its IC discharging directly to Spy Pond.

Of MassDOT's 13 outfalls contributing stormwater directly to Spy Pond, 12 are relatively small in diameter (12-inch through 18-inch) and drain two acres or less of roadway each. One outfall is 54 inches in diameter and drains nearly 30 acres of MassDOT roadways. The photograph below shows this 54-inch outfall.

In addition to draining MassDOT roadways, this 54-inch outlet drains several local municipal roadways in the Town of Arlington and the Town of Belmont with stormwater collection systems that tie directly into MassDOT's stormwater collection system. On December 9, 2008, AECOM, working as a consultant for MassDOT, performed an Illicit Discharge Detection review of MassDOT's stormwater system discharging to Spy Pond to address a complaint by Mystic River Watershed Association (MyRWA) regarding high pathogen levels in stormwater discharge samples. AECOM's findings indicate that the following roads in the Town of Arlington have stormwater collection systems tied directly into MassDOT's system:

- Cedar Avenue
- Park Avenue
- Bellington Street
- Hillcrest Street
- Spring Street
- Morton Road
- Jason Street

AECOM's findings also indicate that the following roads in the Town of Belmont have stormwater collection systems tied directly into MassDOT's system:

- Frontage Road to the south of Route 2 (travelling eastbound, its name changes to several times to Bellington Street/Beatrice Circle/Radcliffe Road/Lake Street)
- Clifton Street
- Pleasant Street

These drainage areas are included in the sub-watershed to Spy Pond in the assessment below but are not included in the MassDOT impervious area calculations since they are owned by other entities.

Assessment under BMP 7U

For this water body, MassDOT used the IC method to assess the following impairments:

- pesticides
- nutrients
- organic enrichment/low DO
- noxious aquatic plants

According to MassDEP's final *Massachusetts Year 2012 Integrated List of Waters* (MassDEP 2013), non-native aquatic plants are considered a non-pollutant and unrelated to stormwater. Therefore, MassDOT has determined that further assessment of this impairment to the water body is not required.

Existing BMPs

The progress report identified no existing BMPs in the Spy Pond subwatershed as mitigating potential stormwater quality impacts prior to discharge to the Pond.

Target Reduction

In the progress report, MassDOT derived the following site parameters and target reduction for DOT's directly contributing watershed draining to the Spy Pond (MA71040) using the IC Method:

Table 1. Site Parameters and Target IC Reduction

IC in DOT's Directly Contributing Watershed	38	acres
Target Percent Reduction in Effective IC	73.9	%
Target Reduction in Effective IC to meet 9% IC target	28.1	acres
IC Effectively Reduced by Existing BMPs	0	acres
IC Remaining to Mitigate with Proposed BMPs	28.1	acres

Final Assessment

Designer Investigation of Existing BMPs

After the submittal of the progress report, further investigation of the Spy Pond was conducted for more precise values of storage volume, IC area treated, and percent reduction of effective IC, although in the end the effective IC value did not change. It was confirmed that there are no existing BMPs within the subwatershed.

Updated Target Reduction

After the submittal of the progress report, further investigation of MassDOT's directly contributing IC area was performed by the designers. Based on this investigation, the MassDOT Directly

Contributing IC Watershed and target reduction of impervious cover were unchanged from the progress report.

BMPs in Design

MassDOT has designed BMPs to address the target IC reduction of 28.1 acres as part of MassDOT's Impaired Waters Retrofit Initiative. MassDOT was able to design 7 leaching catch basins, 1 infiltration swale, and 2 infiltration basins. The design plans for these proposed BMPs were completed and successfully permitted with approval by the Town of Arlington Conservation Commission.

MassDOT is constructing the BMPs possible within the existing right of way and site constraints. However, the possibility of additional pollutant reductions will be reviewed during future programmed project work when more significant changes to drainage patterns and expanded right of way are potentially possible.

Table 2. Summary of BMPs in Design

BMP Name	BMP Type	IC Area Treated (ac)	Reduction of Effective IC (ac)
BMP-1	Infiltration Basin	0.2	0.4
BMP-2	Infiltration Basin	0.7	0.9
BMP-3	Infiltration Swale	1.2	0.4
BMP-4	Leaching Catch Basin	0.3	0.02
BMP-5	Leaching Catch Basin	0.3	0.1
BMP-6*	Leaching Catch Basin	0.1	0.1
BMP-7	Leaching Catch Basin	0.8	0.09
BMP-8	Leaching Catch Basin	0.1	0.05
BMP-9	Leaching Catch Basin	0.1	0.03
BMP-10	Leaching Catch Basin	0.6	0.08
Total		4.4	2.1**

*Plans for BMP-2 were eliminated due to State Highway Layout restrictions associated with grading for an infiltration swale, and BMP-6 was eliminated due to high groundwater restrictions based upon test pits data

**Rounding accounts for differences in summation

The installation of additional BMPs within the Spy Pond subwatershed to provide treatment to meet the target reduction was not able to be accomplished due to varying site constraints. During design the consultant determined that limited right-of-way, wetland resources, soil conditions not conducive to infiltration, and inaccessibility of existing infrastructure reduced the area available for construction.

Conclusions

Table 3 summarizes IC reductions within MassDOT's directly contributing watershed under the design BMP conditions.

Table 3. Design BMP Effective IC Reductions

MassDOT Target Reduction in Effective IC to Meet with Design BMPs	28.1 acres
Effective IC Reduction under Design BMPs	2.1 acres
Remaining Target	26 acres

The ten BMPs have been designed to the maximum extent practicable and will achieve 2.1 acres of effective IC reduction. Additional BMPs could not be constructed due to site constraints discussed in Section 'BMPs in Design' and thus the remaining target cannot be met under the Retrofit Initiative.

MassDOT will continue to identify opportunities to implement additional structural BMPs to address pollutant loading when road work is conducted under MassDOT's Programmed Projects Initiative. Work on Programmed Projects often includes broader scale road layout changes that may provide additional opportunities for construction of new treatment BMPs. This is consistent with an iterative adaptive management approach to addressing impairments. MassDOT will include an update in annual reports and biannual submittals to EPA regarding progress made towards meeting target IC reductions, plans for construction of proposed BMPs, and finalized assessments including reductions achieved by finalized BMP designs. Furthermore, MassDOT will continue to implement non-structural BMPs that reduce the impacts of stormwater.

References

- Massachusetts Department of Environmental Protection (MassDEP). (2008). Massachusetts Year 2008 Integrated List of Waters - Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Retrieved from: <http://www.mass.gov/eea/docs/dep/water/resources/07v5/08list2.pdf>
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Impaired Waters Assessment for Mystic River (MA71-03) – Final Report

Introduction

Mystic River (MA71-03) was previously assessed in a progress report titled, *Impaired Waters Assessment for Mystic River (MA71-03) – Progress Report*, submitted on 6/8/2012. The progress report stated that MassDOT would work with designers to implement BMPs in order to meet its target reduction of impervious cover (IC). After further review by the design consultants, it was determined that approximately 15.9 acres of stormwater from MassDOT property discharges directly to the Mystic River. This report presents a summary of the findings of the progress report as well as a final assessment which includes the reduction provided by existing BMPs and the final target IC reduction determined during the Designer's comprehensive investigation.

Summary of Progress Report

Impaired Water Body

Name: Mystic River

Location: Boston, Chelsea, Everett, and Somerville, MA

Water Body ID: MA71-03

Impairments

Mystic River (MA71-03) is listed under Category 5, "Waters Requiring a TMDL" on MassDEP's final *Massachusetts Year 2010 Integrated List of Waters* (MassDEP, 2011). The following impairments for the Mystic River segment (MA71-03) have not been addressed through the development of a TMDL:

- ammonia (Un-ionized)
- fecal coliform
- foam/flocs/scum/oil slicks
- other
- dissolved oxygen
- PCB in fish tissue
- petroleum hydrocarbons
- taste and odor
- sediment screening value (exceedence)

According to MassDEP's *Mystic River Watershed 2004-2008 Water Quality Assessment Report* (MassDEP, 2010), the sources of the impairments to MA71-03 include contaminated sediments and other unknown sources. The following entities have a National Pollutant Discharge Elimination System (NPDES) permit to discharge combined sewer overflows (CSOs) to Segment MA71-03:

- City of Cambridge (MA0101974)
- City of Somerville (MA0101982)
- MWRA (MA0103284)

Site Description

The Mystic River begins at the outlet of the Lower Mystic Lake (MA71027) along the corporate boundary between the City of Medford and the Town of Arlington. From there, the river flows southeast through the Cities of Somerville, Everett, Chelsea, and Boston before its confluence with the Chelsea River (MA71-06) at Inner Boston Harbor (MA70-02). This assessment focuses on Segment MA71-03 of the Mystic River, which includes the 1.8-mile long stretch from the Amelia Earhart Dam in Somerville/Everett to its confluence with the Chelsea River in Boston/Chelsea. Its directly contributing subwatershed is approximately 2,361 acres in size and consists mostly of heavily urbanized areas. The subwatershed has a total impervious cover (IC) area of approximately 71.2 percent. Refer to Figure 1 for the location of Segment MA71-03 and its contributing subwatershed.

MassDOT currently owns and maintains several major roadways within the subwatershed of Segment MA71-03. These roadways include Interstate 93 (I-93) and portions of Route 1/Northeast Expressway (Rt. 1). Runoff from I-93 is collected by traditional piped stormwater systems but appears to flow out of the subwatershed and discharges to a separate water body. The majority of Rt. 1 within the subwatershed of Segment MA71-03 is elevated. Runoff is collected by scuppers and discharged directly to Segment MA71-03 through several stormwater outfalls. Three of these outfalls are very large and appear to also drain interconnected municipal stormwater systems owned by the Cities of Chelsea and Everett.

In addition to the roadways listed above, MassDOT owns and maintains three bridges within the subwatershed of Segment MA71-03. Two of these bridges span railroad lines that run through the subwatershed beneath Route 38/Mystic Avenue and Washington Avenue. Runoff from the two bridges flows into municipal stormwater systems along the adjacent roadways. These municipal systems likely discharge stormwater directly to Segment MA71-03. The third bridge spans a portion of Inner Boston Harbor (MA70-02). Runoff from this bridge likely flows directly to Inner Boston Harbor.

In total, approximately 17 acres of MassDOT's IC within the subwatershed to Segment MA71-03 discharge directly to the water body. Refer to Figure 2 for the locations of MassDOT's directly contributing IC areas within the subwatershed of Segment MA71-03. AECOM conducted two field inspections of MassDOT's stormwater systems within the subwatershed of Segment MA71-03 on behalf of MassDOT on April 3, 2012 and May 22, 2012. AECOM found no Best Management Practices (BMPs) in place to address the direct stormwater runoff from these roadways.

Assessment under BMP 7U

The MassDEP's final *Massachusetts Year 2010 Integrated List of Waters* includes eight impairments for Segment MA71-03 of the Mystic River, none of which have been addressed by a TMDL. Of these impairments, seven are potentially related to highway runoff including ammonia (un-ionized), fecal coliforms, foam/flocs/scum/oil slicks, other, dissolved oxygen, petroleum hydrocarbons, and taste and odor. MassDOT assessed its potential contribution to these impairments using the approach described in BMP 7U of MassDOT's Stormwater Management Plan (*Water Quality Impaired Waters Assessment and Mitigation Plan*), which applies to impairments that have been assigned to a water body prior to completion of a TMDL. MassDOT assessed all eight of the impairments related to stormwater runoff using its Impervious Cover (IC) Method except for fecal coliforms. As described in MassDOT's Application of Impervious Cover Method in BMP 7U (MassDOT, 2011), IC provides a measure of the potential impact of stormwater on many impairments. The impairment of fecal coliforms was assessed separately based on MassDOT's protocol for assessing waters impaired by bacteria as described in the progress report.

The impairment for PCBs in fish tissue is not related to highway runoff and therefore was not considered under MassDOT's assessment as described in the progress report.

Existing BMPs

There are no existing BMPs within MassDOT's directly contributing watershed to Segment MA71-03 of the Mystic River that are mitigating potential stormwater quality impacts. Therefore, no effective IC reduction is currently provided.

Target Reduction

In the progress report, MassDOT derived the following site parameters and target reduction for DOT's directly contributing watershed draining to the Mystic River (MA71-03) using the IC Method:

Table 1. Target IC Reduction – Progress Report

IC in Directly Contributing Watershed	17	acres
Target Percent Reduction in Effective IC	87	%
Target Reduction in Effective IC	15	acres
IC Effectively Reduced by Existing BMPs	0	acres
IC Remaining to Mitigate with Proposed BMPs	15	acres

Final Assessment

Updated Target Reduction

After the submittal of the progress report, further investigation of MassDOT's directly contributing IC area was performed by the designers. Based on this investigation, the MassDOT Directly Contributing IC Watershed was updated from 17 acres to 15.9 acres. Thus, the target reduction of impervious cover, 87% of this IC watershed, was also updated by the designers from 15 acres to 13.9 acres based on these more in-depth field evaluations. See Table 2 below.

Table 2. Target IC Reduction – Designer Investigation

IC in Directly Contributing Watershed	15.9	acres
Target Percent Reduction in Effective IC	87	%
Target Reduction in Effective IC	13.9	acres
IC Effectively Reduced by Existing BMPs	0	acres
IC Remaining to Mitigate with Proposed BMPs	13.9	acres

Existing and Proposed BMPs

The designers investigation confirmed that there are no existing BMPs for Mystic River (MA71-03). Also, further investigation of MassDOT's property determined that due to site constraints and the limitations of the retrofit initiative, the construction of a BMP for the treatment of directly contributing impervious cover is not feasible for this segment.

Conclusions

MassDOT owned roadways within the Mystic River segment MA71-03 were investigated and approximately 15.9 acres of MassDOT impervious cover contributes stormwater directly to the Mystic River. There are currently no existing BMPs associated with direct discharges from MassDOT property into the Mystic River. MassDOT reviewed their property and determined that, due to the lack of available space within right of way, the placement of a BMP for the treatment of directly contributing impervious cover is not feasible under the Retrofit Initiative.

MassDOT will continue to identify opportunities to implement additional structural BMPs to address pollutant loading when road work is conducted under MassDOT's Programmed Projects Initiative. Work on Programmed Projects often includes broader scale road layout changes that may provide additional opportunities for construction of new treatment BMPs. This is consistent with an iterative adaptive management approach to addressing impairments. MassDOT will include an update in annual reports and biannual submittals to EPA regarding progress made towards meeting target IC reductions, plans for construction of proposed BMPs, and finalized assessments including reductions achieved by finalized BMP designs. Furthermore, MassDOT will continue to implement non-structural BMPs that reduce the impacts of stormwater.

References

- Massachusetts Department of Environmental Protection (MassDEP). (2010). Mystic River Watershed and Coastal Drainage Area 2004-2008 Water Quality Assessment Report. March 2010. Available at: <http://www.mass.gov/dep/water/resources/71wqar09.pdf>
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- Massachusetts Department of Transportation (MassDOT). (2012). MassDOT Semi Annual Submittal under MassDOT's Impaired Waters Program.
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Impaired Waters Assessment for Beaver Brook (MA84B-02) – Final Report

Introduction

Beaver Brook (MA84B-02) was previously assessed in a progress report titled, *Impaired Waters Assessment for Beaver Brook (MA84B-02)*, submitted on 6/8/2011. The progress report included suggestions to implement BMPs in order to meet its target reduction of impervious cover (IC). MassDOT has since initiated the design of BMPs to address its contribution of stormwater to Aberjona River. This report presents a summary of the findings of the progress report as well as a final assessment which includes the reduction provided by existing BMPs and the final target IC reduction determined during the Designer's comprehensive investigation and the BMPs in design and their estimated resulting IC removals.

Summary of Progress Report

Impaired Water Body

Name: Beaver Brook (MA84B-02)

Location: Littleton and Westford, MA

Water Body ID: MA84B-02

Impairments

Beaver Brook (MA84B-02) is listed under Category 5, "Waters Requiring a TMDL", on MassDEP's final *Massachusetts Year 2008 Integrated List of Waters* (MassDEP 2008). Beaver Brook is impaired for the following:

- nutrients
- pH
- organic enrichment/low DO
- pathogens
- suspended solids

According to MassDEP's Merrimack River *Watershed 2004 Water Quality Assessment Report*, Beaver Brook was not assessed for any of the uses due to insufficient data (MassDEP, 2010).

Site Description

Beaver Brook segment MA84B-02 is an approximately 4.8 mile stream that is located in the Towns of Littleton and Westford, MA between the outlet of Mill Pond (MA84038) in Littleton and the inlet to Forge Pond in Westford. Beaver Brook passes beneath Interstate 495 (I-495) and flows north along the eastern side of the I-495 and Route 2A/110 (King Street) interchange. The main Beaver Brook channel flows north and again passes beneath I-495 approximately 1,500 feet north of this interchange. The eastern branch of Beaver Brook flows south at the culvert on King Street, and north through the I-495 and Great Road interchange. The main channel passes under Great Road to the west of this interchange where it drains through an extensive wetland complex.

The Beaver Brook total contributing watershed is approximately 8,414 acres and includes the Mill

Ponds (MA84038 and MA84081) and extensive wetland areas. The subwatershed that contributes directly to the impaired segment of Beaver Brook, and not to upstream tributaries, is approximately 1,878 acres (Figure 1). Within this subwatershed, Mass DOT property includes approximately 124 acres, of which approximately 50 acres of impervious surface drain to Beaver Brook through systems of piping, swales, and overland flow.

MassDOT's Interstate 495 (I-495), Route 119 and Route 2A in Littleton discharge stormwater to Beaver Brook.

Assessment under BMP 7U

For this water body, MassDOT used the IC method to assess the following impairments:

- nutrients
- pH
- organic enrichment/low DO
- suspended solids

The impairment for pathogens was also assessed separately in the progress report because a pathogen impairment was included on the 2008 impairment list which was the current version at the time of the report was prepared. This impairment was removed on the 2010 impairment list.

Existing BMPs

The progress report listed eight existing BMP which were identified in the Beaver Brook subwatershed as mitigating potential stormwater quality impacts prior to discharge to the river. A summary of the existing BMP information reported is shown in Table 1.

Table 1. Summary of Existing BMPs

Existing BMPs						
BMP Name	BMP Type	Soil Type	Storage Volume (in.)	IC Area Treated (acres)	Percent Reduction of Effective IC*	Reduction of Effective IC (acres)
Ex-BMP-1	Infiltration Basin	C - Silt Loam - 0.27 in/hr	1.9	0.3	94%	0.2
Ex-BMP-2	Infiltration Basin	B - Loam 0.52 in/hr	1.3	0.5	91%	0.5
Ex-BMP-3	Infiltration Basin	B - Loam 0.52 in/hr	1.9	0.3	97%	0.3
Ex-BMP-4	Infiltration Basin	A - Loamy Sand 2.41 in/hr	2.0	0.7	100%	0.7
Ex-BMP-5	Vegetated Filter Strip	C - Silt Loam - 0.27 in/hr	2.0	1.4	95%	1.3
Ex-BMP-6	Vegetated Filter Strip	C - Silt Loam - 0.27 in/hr	2.0	1.5	95%	1.4
Ex-BMP-7	Vegetated Filter Strip	A - Loamy Sand 2.41 in/hr	1.8	0.7	100%	0.7
Ex-BMP-8	Infiltration Swale	B - Loam 0.52 in/hr	1.6	0.2	95%	0.2
Total				5.5**		5.3

*Description of MassDOT's Application of Impervious Cover Method in BMP 7U (MassDOT 2011)

**Rounding accounts for differences in summation.

Target Reduction

In the progress report, MassDOT derived the following site parameters and target reduction for DOT's directly contributing watershed draining to the Beaver Brook (MA84B-02) using the IC Method:

Table 2. Site Parameters and Target IC Reduction

IC in DOT's Directly Contributing Watershed	49.4	acres
Target Percent Reduction in Effective IC	31	%
Target Reduction in Effective IC to meet 9% IC target	15.5	acres
IC Effectively Reduced by Existing BMPs	5.3	acres
IC Remaining to Mitigate with Proposed BMPs	10.2	acres

Final Assessment

Designer Investigation of Existing BMPs

After the submittal of the progress report, further investigation of the existing BMP found more precise values of storage volume, IC area treated, and percent reduction of effective IC, although in the end the effective IC value did not change. Table 3 below summarizes the updated existing BMP information.

Table 3. Summary of Designer Investigation of Existing BMPs

BMP Name	BMP Type	NRCS Hydrologic Soil Group	Storage Volume (in)	IC Area Treated (ac)	Percent Reduction of Effective IC*	Reduction of Effective IC (ac)
Ex-BMP-1	Vegetated Filter Strip	-	-	0.7	100%	0.7
Ex-BMP-2	Vegetated Filter Strip	-	-	0.4	100%	0.4
Ex-BMP-3	Vegetated Filter Strip	-	-	0.6	98%	0.5
Ex-BMP-4	Vegetated Filter Strip	-	-	0.8	100%	0.8
Ex-BMP-5	Vegetated Filter Strip	-	-	0.6	66%	0.4
Ex-BMP-6	Vegetated Filter Strip	-	-	1.5	66%	1.0
Ex-BMP-7	Vegetated Filter Strip	-	-	2.5	36%	0.9
Ex-BMP-8	Infiltration Basin	-	-	0.5	93%	0.5
Ex-BMP-9	Infiltration Basin	-	-	0.3	97%	0.3
Ex-BMP-10	Infiltration Basin	-	-	0.65	100%	0.7

*Description of MassDOT's Application of Impervious Cover Method in BMP 7U (MassDOT Application of IC Method, MassDOT 2011b).

Updated Target Reduction

After the submittal of the progress report, further investigation of MassDOT's directly contributing IC area was performed by the designers. Based on this investigation, the MassDOT Directly Contributing IC Watershed was confirmed to be 49.4 acres and the target reduction of impervious cover, 31% of this IC watershed, was also confirmed to be 15.5 acres. After taking into account the reduction provided by the existing BMPs determined by the designers, the remaining target reduction of effective IC is 9.3 acres. See Table 4 below.

Table 4. Designer Investigation Site Parameters and Target IC Reduction

IC in DOT's Directly Contributing Watershed	49.4	acres
Target Percent Reduction in Effective IC	31	%
Target Reduction in Effective IC to meet 9% IC target	15.5	acres
IC Effectively Reduced by Existing BMPs	6.2	acres
IC Remaining to Mitigate with Proposed BMPs	9.3	acres

BMPs in Design

MassDOT has initiated the design and construction of additional BMPs to address the target IC reduction of 9.3 acres as part of MassDOT's Impaired Waters Retrofit Initiative. Design plans for nine infiltration swales were completed and successfully permitted with approval from the Littleton Conservation Commission. These BMPs will provide a 7.2-acre reduction in effective impervious cover. Table 5 below lists the impervious stormwater catchment area for each BMP as well as the estimated post-construction IC reduction that will be provided by each BMP.

Table 5. Summary of BMPs in Design

BMP Name	BMP Type	IC Area Treated (ac)	Reduction of Effective IC (ac)
BMP-1	Infiltration Swale	0.8	0.7
BMP-2	Infiltration Swale	0.9	0.8
BMP-3	Infiltration Swale	0.8	0.7
BMP-4	Infiltration Swale	1.3	1.2
BMP-5	Infiltration Swale	0.8	0.8
BMP-6	Infiltration Swale	0.3	0.3
BMP-7	Infiltration Swale	0.5	0.5
BMP-8	Infiltration Swale	1.0	0.8
BMP-9	Infiltration Swale	0.7	0.2
Total		7.1	6.0

The installation of additional BMPs within the Beaver Brook subwatershed to provide treatment to meet the target reduction was not able to be accomplished due to varying site constraints including the limited right-of-way and wetland resources.

Conclusions

Table 6 summarizes IC reductions within MassDOT's directly contributing watershed under the design BMP conditions.

Table 6. Design BMP Effective IC Reductions

MassDOT Target Reduction in Effective IC to Meet with Design BMPs	9.3 acres
Effective IC Reduction under Design BMPs	6.0 acres
Remaining Target	3.3 acres

The nine BMPs have been designed to the maximum extent practicable and will achieve 6.0 acres of effective IC reduction. Additional BMPs could not be constructed due to site constraints discussed in Section BMPs in Design and thus the remaining target cannot be met under the Retrofit Initiative.

MassDOT will continue to identify opportunities to implement additional structural BMPs to address pollutant loading when road work is conducted under MassDOT's Programmed Projects Initiative. Work on Programmed Projects often includes broader scale road layout changes that may provide additional opportunities for construction of new treatment BMPs. This is consistent with an iterative adaptive management approach to addressing impairments. MassDOT will include an update in annual reports and biannual submittals to EPA regarding progress made towards meeting target IC reductions, plans for construction of proposed BMPs, and finalized assessments including reductions achieved by finalized BMP designs. Furthermore, MassDOT will continue to implement non-structural BMPs that reduce the impacts of stormwater.

References

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