

To: DCR Stormwater Section 10 Park Plaza Boston, MA 02116 Date: 6/4/25

Memorandum

Project #: 15722.00

From: Sara Molla Sarah Nalven

Kelly Siry, PE

Re: Charles River and Lake & Pond Phosphorus Control Plan Annual

Performance Review – Permit Year 7

VHB has completed a performance evaluation of DCR's Phosphorus Control Plans for the Charles River Watershed (Charles River PCP) and Lake and Pond Watersheds (Lake & Pond PCPs), as required annually by the 2016 National Pollutant Discharge Elimination System General Permit for Stormwater Discharges from Small Municipal Separate Storm Sewer Systems in Massachusetts (MS4 Permit).

### Introduction

DCR has developed a Charles River PCP and three Lake & Pond PCPs in accordance with the MS4 Permit. DCR submitted these PCPs to the Environmental Protection Agency (EPA) in June 2023 or Permit Year (PY) 5. Requirements for these reports are included in the MS4 Permit's Appendix F, Section A.I, entitled "Charles River Watershed Phosphorus TMDL Requirements" and Appendix F, Section A.II, entitled "Lake and Pond Phosphorus TMDL Requirements." Requirements include planning for and implementing stormwater best management practices (BMPs) to achieve numeric phosphorus reduction requirements. DCR's PCPs can be found at <a href="DCR's Stormwater Management">DCR's Stormwater Management</a> webpage.

Beginning in PY6, the MS4 Permit Appendix F requires permittees to complete an annual performance evaluation of their PCPs. The performance evaluation "shall evaluate the effectiveness of the PCP by tracking the phosphorus reductions achieved through implementation of structural and non-structural BMPs and tracking increases resulting from development." The results of the performance evaluation must be reported in the permittee's annual report.

DCR recently completed requirements of the PCP performance evaluation for PY7, including tracking phosphorus load changes due to development and calculating phosphorus treatment credit from newly mapped BMPs. The following sections provide the results of these efforts and DCR's current progress toward meeting the PCP load reduction requirements for the Charles River and Lake & Pond PCPs.

# **PY7 Baseline Phosphorus Load Update**

In PY6, VHB calculated the change to DCR's baseline phosphorus load since 2005 through identification of updates to impervious cover and land use since 2005. In PY7, VHB identified updates to impervious cover and land use that had occurred since last year's review. This allowed calculation of an updated "load due to development" value and an updated baseline load.

## Methods for Determining Baseline Phosphorus Load Change

In PY6, a manual review of the latest aerial imagery was conducted across all MS4-regulated DCR area within PCP watersheds to identify changes in impervious surfaces and land use. This detailed approach is described in DCR's PY6

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PCP Performance Evaluation memo.<sup>1</sup> Every 3-5 years, this holistic manual review will be repeated, whereas a more focused approach will be taken in interim years. Since PY7 is an interim year, VHB took a focused approach and reviewed areas with known projects to identify changes in impervious cover and/or land use.

#### Lake & Pond PCPs

In Lake & Pond PCP Watersheds, VHB's PY7 review did not identify any changes to impervious cover or land use. Since neither the PY6 nor PY7 review identified changes to impervious cover or land use, none of the Lake & Pond PCP loads have changed due to development since 2005. Table 1 presents current loads and phosphorus reduction requirements for each Lake & Pond PCP Watershed.

Table 1. Lake & Pond PCP Baseline Phosphorus Load and Required Phosphorus Reduction Summary

Watershed	2005 Baseline Load (lb/yr)	Load due to Development since 2005 (lb/yr)	Updated Load (lb/yr)	Percent Reduction Required	Total Required Reduction (lb/yr)	Total Allowable Load (lb/yr)
Auburn Pond / Leesville Pond <sup>2</sup>	4.5	0	4.5	31%	1.4	3.1
Bents Pond / Ramsdall Pond <sup>3</sup>	1.7	0	1.7	52%	0.9	0.8
Lake Quinsigamond & Flint Pond	18.5	0	18.5	49%	9.1	9.4

#### **Charles River PCP**

As in the Lakes & Pond Watersheds, in the Charles River Watershed VHB did not identify changes to impervious cover or land use during the PY7 review. Changes were identified in PY6, however, so the Charles River Watershed's baseline load has been updated since the original calculation. It is also worth noting that VHB's PY7 review identified several ongoing projects that will result in impervious cover change in the future. Table 2 presents current loads and phosphorus reduction requirements for the Charles River Watershed.

Table 2. Charles River PCP Baseline Phosphorus Load and Required Phosphorus Reduction Summary

Watershed	2005 Baseline Load (lb/yr)	Load due to Development since 2005 (lb/yr)	Updated Load (lb/yr)	Percent Reduction Required	Total Required Reduction (lb/yr)	Total Allowable Load (lb/yr)
Charles River	873	3.1	876	22%	193	683

<sup>&</sup>lt;sup>1</sup> VHB Memorandum to DCR. "Charles River and Lake & Pond Phosphorus Control Plan Annual Performance Review – Permit Year 6." June 26, 2024. (https://www.mass.gov/doc/pcp-performance-evaluation-memo/download)

The Leesville Pond Watershed's phosphorus reduction requirement is included in this table and used for calculations because it is higher than Auburn Pond's and therefore used as the governing target.

The Bents Pond Watershed's phosphorus reduction requirement is included in this table and used for calculations because it is higher than Ramsdall Pond's and therefore used as the governing target.

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# **PY6 Phosphorus Load Reduction Update**

As required by the MS4 Permit, VHB reviewed DCR's properties within the Charles River and Lake & Pond PCP Watersheds and calculated phosphorus load reduction from newly constructed or newly mapped BMPs. DCR began fulfilling this requirement in PY5 as part of the PCPs and will continue to do so annually.

## Methods for Determining Additional Load Reduction

During PY7, VHB reviewed and credited BMPs that had been mapped in DCR's GIS database since the PY6 performance evaluation. These BMPs were mapped between February 1, 2024 and March 31, 2025. The credit from the new BMPs was added to previous totals to provide updated pollutant load reduction values for each PCP watershed.

BMPs have been mapped since the PY6 performance evaluation either because they were recently constructed or recently identified through field visits, design plan set review, or a VHB desktop exercise that identified existing impervious cover disconnection. This latter desktop exercise was performed in summer 2024 and involved reviewing discharging, untreated catchments in the Charles River Watershed (using data such as aerial imagery, impervious cover, land use, drainage infrastructure, topography, and Google Streetview) and delineating "Impervious Area Disconnection" BMPs in DCR's Surface BMP layer when data suggested disconnection.

The methodology used for crediting is described in Chapter 4 of the document, Methods for PCP & NSIR Development, which was submitted to EPA as part of the PCP submission. Two changes were made to the described crediting methodology beginning in PY6. These changes are described in DCR's PY6 PCP Performance Evaluation memo in detail. In summary, the changes include 1) assuming soil type of Hydrologic Soil Group (HSG) C rather than B when there are gaps in National Resource Conservation Service (NRCS) HSG data and 2) calculating BMP catchment load by summing the load from each combination of HSG and land use in the BMP's catchment area instead of taking the predominant HSG and land use.<sup>4</sup> In addition to using this updated crediting methodology for the PY7 round of BMP crediting, VHB also recalculated credits for BMPs that were originally credited in PY5 so that crediting methodology is now consistent for all credited BMPs.

Note that by crediting each BMP, DCR assumes the BMP is functioning as designed. If BMPs are not properly maintained, their effectiveness in reducing phosphorus load decreases. VHB is working to support improvement of DCR's BMP inspection and maintenance procedures to ensure that each BMP functions as designed and that calculated treatment is accurate.

## **Updated Phosphorus Load Reduction Credit**

### Lake & Pond PCPs

In Lake & Pond PCP Watersheds, VHB identified four newly mapped, creditable BMPs during the PY7 review, three of which were designed and constructed at the Daniel S. Horgan Memorial Skating Rink specifically to meet phosphorus load reduction targets for the Auburn Pond/ Leesville Pond PCP. Table 3 provides BMP type and phosphorus load reduction information for these four credited BMPs.

VHB Memorandum to DCR. "Charles River and Lake & Pond Phosphorus Control Plan Annual Performance Review – Permit Year 6." June 26, 2024. (https://www.mass.gov/doc/pcp-performance-evaluation-memo/download)

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Table 3. Phosphorus Reduction from BMPs Credited in PY7 BMPs in Lake & Ponds Watersheds\*

ВМР Туре	Count	Total P Reduction	Average P Reduction	Average P Reduction	
		(lb/yr)	(lb/yr)	(%)	
Auburn Pond / Leesville Pond					
Leaching Basin	2	2.0	1.0	77	
Infiltration Basin/Swale	1	0.5	0.5	91	
Lake Quinsigamond & Flint Pond					
Impervious Area Disconnection	1	0.4	0.4	67	

<sup>\*</sup>There were no new BMPs mapped in the Bents Pond/ Ramsdall Pond Watershed in PY7.

With PY7 crediting complete, DCR meets the final PCP target for the Auburn Pond/ Leesville Pond watershed and has met interim deadlines through PY10 for the other two Lakes & Ponds PCP Watersheds (Table 4). DCR will continue to maintain the BMPs that allow DCR to meet these targets to ensure that load reduction tallies continue to be accurate.

In the next eight years, DCR will be required to meet final targets for the two incomplete Lakes & Ponds Watersheds. Within six years (by PY13 or June 2031), DCR will have to reduce phosphorus load by at least 0.6 lb/yr in the Bents Pond/ Ramsdall Pond Watershed and by at least 6.4 lb/yr in the Lake Quinsigamond & Flint Pond Watershed (Table 4).

Table 4. Existing versus Required Phosphorus Load Reduction in Lake & Ponds Watersheds

	Existing P Load Reduction (lb/yr)			Required P Load Reduction (lb/yr)				Remaining Required P Load	
	Structural BMPs <sup>1</sup>	Sweeping <sup>2</sup>	Total	PY8	PY10	PY13	PY15 (Final)	Reduction (lb/yr)	
Auburn Pond / Leesville Pond	2.5 (3)	0.01	2.5	0.3	0.6	1.0	1.4	0.0	
Bents Pond / Ramsdall Pond	0.5 (1)	0.00	0.5	0.2	0.4	0.6	0.9	0.4	
Lake Quinsigamond & Flint Pond	4.9 (3)	0.03	4.9	1.8	3.6	6.4	9.1	4.2	

<sup>&</sup>lt;sup>1</sup> Number of BMPs is shown in parentheses.

Green cells indicate permit milestones have been met

Red cells indicate permit milestones have yet to be met

#### **Charles River PCP**

In the Charles River Watershed, VHB identified 14 newly mapped BMPs to credit in PY7, for which phosphorus reduction credit totaled 11.4 lb/yr (Table 5). Nine of these BMPs (providing 8.3 lb/yr of phosphorus reduction) were

<sup>&</sup>lt;sup>2</sup> Street sweeping phosphorus load reduction values are rounded to the nearest hundredth rather than tenth due to their small magnitude.

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Impervious Area Disconnection BMPs that had been delineated during a PY7 desktop review intended to identify areas where impervious area disconnection already existed but had not yet been inventoried as a BMP (Table 5).

Table 5. Phosphorus Reduction from BMPs Credited in PY7 in the Charles River Watershed

BMP Type	Count	Total P Reduction	Average P Reduction	Average P Reduction	
		(lb/yr)	(lb/yr)	(%)	
Surface BMPs					
Bioretention Infiltration Basin/Swale	1	1.5	1.5	77	
Bioretention with Underdrain Basin/Swale	1	0.2	0.2	41	
Extended Dry Detention Basin/Swale	1	0.4	0.4	11	
Impervious Area Disconnection	9	8.3	0.9	68	
Porous Pavement with Underdrain	1	0.1	0.1	62	
Subsurface BMPs					
Leaching Chamber	1	0.8	0.8	65	
Total	14	11.4	0.8	62	

With PY7 BMP crediting complete, and with adjustments made to BMPs credited in PY5 to ensure consistent crediting methodology, DCR is now accounting for 78.6 lb/yr of phosphorus load reduction. This is 41% of DCR's final PY20 reduction target. DCR has met interim PCP deadlines up to PY13, which requires a 35% reduction (Table 6). In the next 13 years, DCR will have to remove 114.4 lb/yr of phosphorus from its stormwater load.

Table 6. Existing and Remaining Phosphorus Load Reduction in the Charles River Watershed

Sweeping P Reduction (lb/yr)	Structural P Reduction (lb/yr)	Structural BMP Count (#)	Total P Reduction (lb/yr)	Required PY13 P Reduction (lb/yr)	Required PY20 (Final) P Reduction (lb/yr)	Remaining Required P Reduction (lb/yr)	Progress to PY20 P Reduction	
31.0	47.6	111	78.6	68	193	114.4	41%	

# **Summary**

In accordance with the MS4 Permit, DCR has completed a PY7 performance evaluation of implementation for the Charles River and Lake & Pond PCPs. As part of this evaluation, VHB reviewed DCR properties for changes to impervious cover and land use to determine if DCR phosphorus load has changed since last year's review. VHB determined that in the last year there has been no change to DCR's load as a result of development in any of the PCP watersheds. Additionally, VHB estimated the phosphorus reduction provided by BMPs that have been mapped in the last year. With this crediting complete, DCR has now met the PCP load reduction requirement for the Auburn Pond/

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Leesville Pond PCP and continues to progress toward meeting requirements in the Lake Quinsigamond and Charles River Watersheds. No progress was made towards meeting requirements in the Bents Pond/ Ramsdall Pond Watershed in PY7, but total required load reduction is small for this watershed and can likely be accomplished with the installation of just one BMP. Across PCP watersheds, DCR has 119 lb/yr of load to remove to meet reduction targets. DCR will continue to work diligently to reduce impervious cover and increase treatment in the next 13 years or until PCP requirements have been met.