

**AUTHORIZATION TO DISCHARGE UNDER THE
RHODE ISLAND POLLUTANT DISCHARGE ELIMINATION SYSTEM**

**GENERAL PERMIT FOR STORMWATER DISCHARGES IN THE
MASHAPAUG WATERSHED**

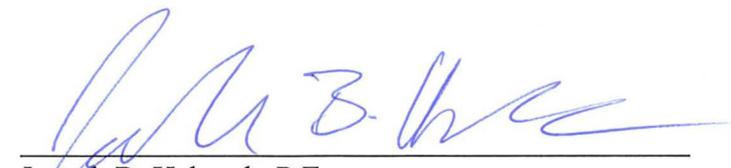
In compliance with the provisions of Chapter 46-12 of the Rhode Island general Laws, as amended, and per §1.32(A)(1)(g) of the Regulations for the Rhode Island Pollutant Discharge Elimination System and 40 CFR Parts 122.26(a)(9)(i)(C) and (D), except as provided in Part I.B.3 of the permit, owners of properties with one or more acres of impervious cover located in the Mashapaug Pond watershed with point source discharges composed entirely of stormwater and allowable non-stormwater discharges, as defined in Part I.B.2 of the permit, are authorized to discharge in accordance with the conditions and requirements set forth herein.

Owners of stormwater and allowable non-stormwater discharges from properties with one or more acres of impervious cover within the Mashapaug Pond watershed, who intend to be authorized by this general permit, must submit a complete Notice of Intent in accordance with Part I.C of the permit. Authorization to discharge shall be granted in accordance with Part I.C.3 of this permit. Owners of properties who fail to submit a Notice of Intent in accordance with Part I.C of this permit are not authorized to discharge stormwater under this permit.

This general permit shall become effective on April 1, 2026.

The general permit and the authorization to discharge expire at midnight, five years from the effective date, or March 31, 2031.

Signed this 13th day of February 2026.



Joseph B. Haberek, P.E.

Administrator of Surface Water Protection

Office of Water Resources

Rhode Island Department of Environmental Management

Providence, Rhode Island

**Rhode Island Pollutant Discharge Elimination System
General Permit for Stormwater Discharges in the
Mashapaug Watershed**

Effective Date:
April 1, 2026



RIR060000

Valid ONLY in accordance with Part I.C.

Expiration Date:
March 31, 2031

**Rhode Island Department of Environmental Management
Office of Water Resources**

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**RHODE ISLAND POLLUTANT DISCHARGE ELIMINATION SYSTEM (RIPDES)
GENERAL PERMIT FOR STORMWATER DISCHARGES IN THE
MASHAPAUG WATERSHED**

I. GENERAL COVERAGE UNDER THIS PERMIT

I.A. Permit Coverage. This general permit applies to point source discharges composed of stormwater and allowable non-stormwater discharges (as identified in Part I.B.2.) within the Mashapaug Watershed from properties with one acre or more (≥ 1) of impervious cover that are not authorized under another RIPDES permit. Contiguous properties under common ownership where the combined land area contains ≥ 1 acre of impervious cover are required to apply for a single general permit authorization for the combined properties.

I.B. Eligibility.

I.B.1. Allowable Stormwater Discharges. This permit may cover sites that have ≥ 1 acre of impervious cover that discharge stormwater to receiving waters in the Mashapaug Watershed via a municipal separate storm sewer system (MS4), a private storm sewer system, or directly to receiving waters, provided that the following conditions are met:

I.B.1.a. The discharge is not covered/authorized by another RIPDES permit;

I.B.1.b. The stormwater is not discharged to a combined sewer system (CSS); and

I.B.1.c. The discharge is not required to obtain an individual permit under the *Regulations for the Rhode Island Pollutant Discharge Elimination System* (RIPDES Regulations), Title 250-RICR-150-10-1 §1.33(C).

I.B.2. Allowable Non-Stormwater Discharges. The following are the only non-stormwater discharges authorized under this permit. All other non-stormwater discharges requiring RIPDES permit coverage except those specifically listed are not authorized by this permit. If non-stormwater discharges requiring RIPDES permit coverage other than those specifically authorized in this permit will be discharged, such non-stormwater discharges must either be eliminated or covered under another RIPDES permit.

- firefighting activities;
- fire hydrant flushings;
- lawn watering;
- irrigation drainage;
- uncontaminated groundwater;
- natural springs;
- potable waterline flushings;
- air conditioning condensate;
- foundation or footing drains where flows are not contaminated with process materials, such as solvents, or contaminated by contact with soils where spills or leaks of toxic or hazardous materials has occurred;
- water sprayed for dust control or at a truck load wet-down station;
- incidental windblown mist from cooling towers that collects on rooftops or adjacent portions of the facility, but not intentional discharges from the cooling tower (e.g., "piped" cooling tower blowdown

or drains);

- uncontaminated utility vault dewatering;
- dechlorinated water line testing water;
- hydrostatic test water that does not contain any treatment chemicals and is not contaminated with process chemicals;
- routine external building washdown / power wash water that does not use detergents or hazardous cleaning products (such as those containing bleach, hydrofluoric acid, muriatic acid, sodium hydroxide, nonylphenols), and for which appropriate control measures are in place to minimize discharges of mobilized solids and other pollutants (e.g., filtration, detention, settlement);
- pavement wash waters, provided that detergents or hazardous cleaning products are not used (e.g., bleach, hydrofluoric acid, muriatic acid, sodium hydroxide, nonylphenols), and the wash waters do not come into contact with oil and grease deposits or any other sources of pollutants, unless residues are first cleaned up using dry clean-up methods (e.g., applying absorbent materials and sweeping, using hydrophobic mops/rags), and for which appropriate control measures are in place to minimize discharges of mobilized solids and other pollutants (e.g., filtration, detention, settlement);
- discharges from washing of vehicles provided that chemicals, soaps, detergents, hazardous cleaning products (such as those containing bleach, hydrofluoric acid, muriatic acid, sodium hydroxide, nonylphenols), steam, or heated water are not used; cleaning is restricted to the outside of the vehicle (e.g., no engines, transmissions, undercarriages, or truck beds); and the washing is not used to remove accumulated industrial materials, paint residues, heavy metals, or any other potentially hazardous materials from surfaces; and for which appropriate control measures are in place to minimize discharges of mobilized solids and other pollutants (e.g., filtration, detention, settlement); and
- discharges from washing of boats provided that chemicals, soaps, detergents, hazardous cleaning products (such as those containing bleach, hydrofluoric acid, muriatic acid, sodium hydroxide, nonylphenols), steam, or heated water are not used; and the washing is not used to remove topside or bottom paint, growth, or other potentially hazardous materials from vessels; and for which appropriate control measures are in place to minimize discharges of mobilized solids and other pollutants (e.g., filtration, detention, settlement).

I.B.3. Limitations on Coverage. The following stormwater discharges are not authorized by this permit:

- I.B.3.a. Stormwater discharges mixed with non-stormwater discharges (except those listed in Part I.B.2. of this permit);
- I.B.3.b. Stormwater discharges from properties with ≥ 1 acre of impervious cover that do not discharge directly to waters of the State, or indirectly through a private or municipal separate storm sewer system (MS4) within the Mashapaug Watershed;
- I.B.3.c. Stormwater discharges associated with construction activity including, but not limited to clearing, grading, excavation, and filling;
- I.B.3.d. Stormwater discharges where a RIPDES permit has been or is in the process of being denied, terminated, or revoked by the Director (other than in a replacement permit issuance process);
- I.B.3.e. Stormwater discharges that may adversely affect a listed, or a proposed to be listed,

endangered or threatened species or its critical habitat; and

I.B.3.f. Discharges prohibited under Title 250 RICR-150-10-1 §1.6.

I.B.3.g. Drainback water. Standing water in a catch basin sump removed during cleaning via vacuum truck or other means shall be discharged to the sanitary sewer with prior approval from the local sewer authority or other facility designed for the treatment and disposal of drainback water.

I.C. Authorization.

I.C.1. How to Obtain Authorization. To be covered under this general permit, owners of property(ies) must:

I.C.1.a. Meet the Eligibility requirements of Part I.B. of this permit;

I.C.1.b. Submit to the Director a standardized Notice of Intent (NOI) form. All NOIs must be submitted to the Director by hard copy unless an electronic application tool becomes available. Upon review of the NOI, the Director may deny coverage under this permit at any time and require submittal of an application for an individual or an alternative general permit; and

I.C.1.c. For properties with seven acres or more (≥ 7 acres) of impervious cover, submit a Stormwater Management Plan (SWMP) according to the requirements of Part V.A. of this permit.

I.C.2. Deadlines for Requesting Authorization.

I.C.2.a. Existing properties consisting of ≥ 1 acre but < 7 acres of impervious cover that intend to obtain coverage under this general permit shall submit a completed NOI no later than six (6) months after the effective date of this permit.

I.C.2.b. Existing properties consisting of ≥ 7 acres of impervious cover that intend to obtain coverage under this general permit shall submit a completed NOI and SWMP no later than twelve (12) months after the effective date of this permit.

I.C.2.c. For properties which become eligible for coverage under this permit after its effective date, a completed NOI must be submitted sixty (60) days prior to the commencement of a discharge. This includes any newly developed site or any site that is not yet permitted under this permit that increases its impervious cover to ≥ 1 acre.

I.C.3. Granting of Authorization.

I.C.3.a. Existing Discharges. Properties that are subject to this permit on its effective date shall be automatically granted authorization to discharge upon the Department's receipt of a complete and accurate NOI unless notified by the Director to the contrary in writing.

I.C.3.b. New Discharges. For properties that become subject to this permit after its effective date (i.e., properties that meet the one or more acre of impervious cover threshold after the permit's effective date), authorization will be granted sixty (60) days after receipt of a complete and accurate NOI, unless otherwise notified by the Director in writing. Regardless of whether the NOI was reviewed by the Department, or it became approved because of the Department's failure to act within sixty (60) days, the permittee is still responsible for complying with all permit conditions and any other applicable state or federal regulations.

I.C.4. Continuation of this Permit. If this permit is not re-issued or replaced prior to the expiration date, it will be administratively continued in accordance with Title 250-RICR-150-10-1 §1.13 and remain fully effective and enforceable. If the stormwater discharges were authorized to discharge under this permit prior to the expiration date, any discharges authorized under this permit will automatically remain

covered by this permit until the earliest of:

- I.C.4.a. The authorization for coverage under a reissued permit or a replacement of this permit following the timely and appropriate submittal of a complete NOI requesting authorization to discharge under the new permit; or
- I.C.4.b. The Department terminates the facility's coverage under this permit; or
- I.C.4.c. A formal permit decision by the Director not to reissue this general permit, at which time the Director will identify a reasonable time period for covered dischargers to seek coverage under an alternative general permit or an individual permit. Coverage under this permit will cease at the end of this time period.

I.D. Termination of Coverage.

I.D.1. To terminate permit coverage, property owners must submit to the Director a complete Notice of Termination (NOT) by hard copy, unless an electronic application tool becomes available. At a minimum, the following information is required in the NOT to terminate coverage under this permit:

- Owner's name, mailing address, and telephone number;
- Name and location of the facility/property;
- RIPDES stormwater permit authorization number; and
- Certification and documentation that stormwater no longer directly discharges to waters of the State in the Mashapaug Watershed or indirectly via a private or municipal separate storm sewer system in the Mashapaug Watershed, or no longer occurs at the property, or the discharges are authorized under another RIPDES permit.

I.D.2. The permittee must submit a NOT within thirty (30) days after one or more of the following conditions have been met:

- A new owner has taken over responsibility for the property(ies); or
- There are no longer any discharges of stormwater from the property to waters of the State in the Mashapaug Watershed; or
- The permittee has obtained coverage under an alternative RIPDES permit, unless the Director has required that the permittee obtains such coverage under authority of Part I.F.1., in which case coverage under this permit will terminate automatically.

I.D.3. The NOT is subject to review and approval by the Department. The Department retains the authority to require permit authorization (and deny a termination request) on a case-by-case basis based on the information provided. Until the Department reviews and decides on the NOT request, the permittee must comply with the terms and conditions of this permit.

I.E. No Discharge Notice of Non-Applicability. Owners of property(ies) that retain or contain discharges of stormwater onsite; or are located in basins or other physical locations so that there will be no discharge of stormwater to waters of the State or into a private or municipal separate storm sewer system in the Mashapaug Watershed; or where stormwater discharges to a Combined Sewer Overflow (CSO) system, should claim "No Discharge" by submitting a RIPDES No Discharge Certification (NDC) form to the Director by hard copy unless an electronic application tool becomes available.

I.F. Alternative Permits.

I.F.1. Requiring Coverage under an Alternative Permit. The Director may require the permittee to apply for and/or obtain authorization to discharge under either an individual RIPDES permit or an alternative

RIPDES general permit in accordance with Title 250 RICR-150-10-1 §§1.33 and 1.55. Any interested person may petition the Department to take action under this paragraph. If the Director requires the permittee to apply for an alternative RIPDES permit, the Department will notify the permittee in writing that a permit application is required. This notification will include a brief statement of the reasons for this decision and will provide application information. In addition, if the permittee is an existing discharger authorized to discharge under this permit, the notice will set a deadline to file the permit application and will include a statement that, on the effective date of the individual RIPDES permit, or the alternative general permit as it applies to the facility, coverage under this general permit will terminate. The Director may grant additional time to submit the application if the permittee requests it. If the permittee is covered under this permit and fails to submit an individual RIPDES permit application as required by the Department, then the applicability of this permit to the permittee is terminated at the end of the day specified by the Department as the deadline for application submittal. The Department may take appropriate enforcement action for any unpermitted discharge.

- I.F.2. **Permittee Requesting Permit Coverage under an Alternative Permit.** The permittee may request to be excluded from coverage under this general permit by applying for an individual permit. In such a case, the permittee must submit an individual permit application in accordance with the requirements of Title 250-RICR-150-10-1 §§1.33(C), with reasons supporting the request, to the Department. The request may be granted by issuance of an individual permit or authorization of coverage under an alternative general permit if the reasons are adequate to support the request.

When an individual RIPDES permit is issued to the permittee or the permittee is authorized to discharge under an alternative RIPDES general permit, the authorization to discharge under this permit is terminated on the effective date of the individual permit or the date of authorization of coverage under the alternative general permit.

- I.G. **Severability.** Invalidation of a portion of this permit does not necessarily render the whole permit invalid. The Department's intent is that the permit is to remain in effect to the extent possible. In the event that any part of this permit is invalidated, the Department will advise the regulated community as to the effect of such invalidation.
- I.H. **Failure to Notify.** Owners of property(ies) with ≥ 1 acre of impervious cover, who fail to notify the Director of their intent to be covered under a general permit and discharge stormwater without a RIPDES permit to waters of the State or to a private or municipal separate storm sewer system in the Mashapaug Watershed, are in violation of Chapter 46-12 of the Rhode Island General Laws and the Clean Water Act and may be subject to legal enforcement action for any unpermitted discharges.

II. WATER QUALITY-BASED LIMITATIONS FOR STORMWATER

- II.A. **Phosphorus Load Reduction Targets.** Permittees shall reduce phosphorus in stormwater discharges from their site by the following percentages¹ based on the specific waterbody/subwatershed into which a site discharges:
- Mashapaug Pond: 65%
 - Spectacle Pond: 68%
 - Tongue Pond: 68%

¹ Pollutant load reduction percentages are based on EPA-approved Total Maximum Daily Load (TMDL) water quality restoration studies for the Mashapaug Pond and Spectacle Pond, i.e., the [Mashapaug Pond TMDL for Dissolved Oxygen and Phosphorus \(2007\)](#), and the [Nine Eutrophic Ponds TMDL for Phosphorus \(2007\)](#). Tongue Pond is currently an unassessed waterbody that discharges to Spectacle Pond and therefore, the pollutant load reduction percentage for Spectacle Pond has been applied to Tongue Pond.

III. PERMIT CONDITIONS APPLICABLE TO ALL PROPERTIES WITH ≥ 1 ACRE OF IMPERVIOUS COVER

III.A. Minimize Exposure. The permittee must minimize the exposure of pollutants to stormwater by doing the following:

- Deter rodents, birds, and other animals from feeding/nesting/roosting at the facility/property;
- Minimize the potential for waste, solid waste, and floatable debris to be discharged by keeping exposed areas free of such materials, or by intercepting them before they are discharged. Solid waste and floatable debris must be stored and disposed of in such way that prevents exposure;
- Install structural source control best management practices (BMPs) to address on-site activities and sources that could cause bacterial/pathogen contamination (e.g., covered dumpsters, compost piles, food waste, and animal products);
- Properly maintain waste areas by keeping all dumpster lids closed when not in use and by performing routine inspections of waste containers for leaks. Locate dumpsters away from drainage infrastructure and waterways. Use dry methods for any needed cleanup. For dumpsters and roll off boxes that do not have lids and could leak, ensure that discharges have a control (e.g., secondary containment, treatment). Consistent with Part I.B.2. above, this permit does not authorize dry weather discharges from dumpsters or roll off boxes;
- Limit fertilizer and pesticide use. Fertilizer use practices should consider fertilizer types, composition, and application practices to apply only the amount plants need. Store fertilizer and other materials to prevent exposure to precipitation;
- Collect and properly dispose of leaf litter and other organic waste and debris from landscaping activities;
- Minimize the use of salt, sand, and deicers on paved surfaces. Store salts, sands, sediments, and other materials inside whenever possible. Salt/sand piles must be enclosed or covered by a storm-resistant shelter to prevent exposure to rain, snow, snowmelt, and/or runoff. The permittee must implement appropriate measures (e.g., good housekeeping, diversions, containment) to minimize exposure resulting from adding to or removing materials from the pile(s);
- Use grading, berming, or curbing to prevent runoff of contaminated flows and divert run-on away from areas with potential sources of chemicals or pollutants;
- Locate materials, equipment, and activities so that leaks are contained in existing containment and diversion systems (confine the storage of leaky or leak-prone vehicles and equipment awaiting maintenance to protected areas);
- Clean up spills and leaks promptly using dry methods (e.g., absorbents) to prevent the discharge of pollutants;
- Store leaky vehicles and equipment indoors or, if stored outdoors, use drip pans and absorbents;
- Use spill/overflow protection equipment on any tanks;
- Drain fluids from equipment and vehicles that will be decommissioned, and, for any equipment and vehicles that will remain unused for extended periods of time, inspect at least monthly for leaks;
- Perform all vehicle and/or equipment cleaning operations indoors, under cover, or in bermed areas that prevent runoff and run-on and also that capture any overspray;
- Ensure that all wash water not authorized under Part I.B.2. drains to a proper collection system (i.e., not the stormwater drainage system); and
- Reduce or eliminate materials containing Per- and Polyfluoroalkyl Substances (PFAS) at the permitted facility that may be exposed to stormwater (e.g., implement product substitution and

replacement; good operating and housekeeping practices). The permittee shall evaluate whether their facility uses or has historically used any products containing PFAS and identify them.

III.B. Good Housekeeping Program. The permittee shall implement good housekeeping measures on their property to ensure that all areas exposed to stormwater are kept in such a condition as to minimize the possibility of discharging pollutants into a stormwater collection system or waters of the State. At a minimum, the permittee must implement:

III.B.1. Catch Basin/Infrastructure Cleaning. All stormwater management structures, catch basins, and outfalls shall be inspected at least twice per year, once between November 15 and December 15 (after leaf fall), and once during the month of April (after snow melt) and at other times as necessary, and cleaned of sediment and debris to prevent the discharge of pollutants from structures or outfalls. The permittee must remove accumulated materials from catch basins (i.e., catch basin cleaning) twice per year, once between November 15 and December 15 (after leaf fall), and once during the month of April (after snow melt) such that a minimum sump storage capacity of 50% is maintained throughout the year. Ensure that grates and covers are clear of debris.

III.B.2. Sweeping. All parking areas, sidewalks, driveways, and other impervious surfaces (except roofs) shall be swept clean of sand, litter, leaf litter, and any other possible pollutants at least twice per year, once between November 15 and December 15 (after leaf fall) and once during the month of April (after snow melt) and at other times as may be necessary. Parking area and driveway sweeping shall be performed with the use of mechanical or vacuum sweepers.

III.B.3. Maintenance. The permittee must regularly inspect, test, maintain, and repair all equipment and systems to prevent leaks, spills, and other releases of pollutants in stormwater discharged to receiving waters. This includes:

- Performing inspections and preventive maintenance of stormwater drainage, source controls, structural treatment systems, and plant equipment and systems that could fail and result in contamination of stormwater;
- Diligently maintaining nonstructural control measures (e.g., keep spill response supplies available, personnel appropriately trained);
- Inspecting and maintaining baghouses at least annually to prevent the escape of dust from the system and immediately removing any accumulated dust at the base of the exterior baghouse; and

If the permittee finds that the control measures or equipment require maintenance, the permittee must conduct the necessary maintenance within 24 hours to minimize pollutant discharges. If the permittee finds that the control measures or equipment need to be repaired or replaced, the permittee must, within 24 hours, take all reasonable steps to prevent or minimize the discharge of pollutants until the final repair or replacement is implemented, including cleaning up any contaminated surfaces so that the material will not be discharged during subsequent storm events. Final repairs/replacement of stormwater controls should be completed as soon as feasible, but no longer than 45 days following identification of the needed maintenance or repair.

III.B.4. Dust Generation and Vehicle Tracking of Materials. The permittee must minimize generation of dust and off-site tracking of raw, final, or waste materials and sediment that can be mixed with stormwater runoff and discharged to waters of the State.

III.C. Minimize Impacts from Major Storm Events. The permittee must identify any areas of the property that are subject to flooding and implement appropriate pollution minimization controls for these areas, such as moving products stored in these areas prior to significant storm events. The permittee must also implement structural improvements, enhanced/resilient pollution prevention measures, and/or other mitigation measures that can help to minimize impacts from stormwater discharges from major storm events, such as

hurricanes, storm surge, extreme/heavy precipitation², and flood events. Control measures that may be considered include, but are not limited to:

- When a delivery of exposed materials, e.g., mulch, salt, or sand, is expected, and a storm is anticipated within 48 hours, delay delivery, if possible, until after the storm or store materials as appropriate;
- Temporarily store materials and waste outside the Flood Zone;
- Temporarily reduce or eliminate outdoor storage;
- Temporarily relocate any mobile vehicles and equipment to higher ground;
- Plan for future site improvements, construction, and/or remodeling projects in a manner that takes into consideration the Flood Zone and appropriate corresponding control measures.

To determine whether your facility is within a Flood Zone for planning and design purposes, see Appendix B “Guidance for Determining Flood Risk for Planning and Design Purposes”.

III.D. Spill Prevention, Control, and Response. The permittee must implement spill prevention, control, and response procedures that include:

- Labeling containers (e.g., “Used Oil,” “Spent Solvents,” “Fertilizers and Pesticides,” etc.) that could be susceptible to spillage or leakage to ensure proper handling and facilitate rapid response if spills or leaks occur;
- Measures to avoid spills in areas exposed to rainfall or from reaching areas exposed to rainfall;
- Identification of areas where potential spills can occur and the location of associated collection and discharge points;
- Procedures for cleaning up spills including:
 - Ensuring that appropriate personnel are trained or otherwise notified of actions to take in the event of a spill; and
 - Ensuring the necessary equipment, such as spill kits, are kept onsite and located near areas where spills may occur or where a rapid response can be made;
- Ensuring that all areas where liquid chemicals are stored are provided with impermeable containment, which will hold at least 110% of the volume of the largest chemical container in the area, without overflow from the containment area and that all chemicals in containers of 100 gallons or less shall be stored under a roof that minimizes stormwater entry to the containment area;
- A requirement that all dumpsters used to store waste or recyclable materials are supplied with attached covers and have drain plugs intact or are in roofed areas that will keep rain out of the dumpster and will not allow dumpster leakage to enter any stormwater drainage system; and
- A requirement to notify appropriate facility personnel, emergency response agencies, and regulatory agencies in the event of a spill. Where a leak, spill, or other release containing a hazardous substance or oil requires the activation of the facility’s response procedures, the permittee must notify the Department and, if applicable, the MS4 operator in accordance with Part VI.C. and take appropriate action to stop or minimize a release of hazardous material posing an imminent hazard and/or any on-going spill of hazardous material at the time of discovery. Local requirements may necessitate reporting spills or discharges to local emergency response, public health, and/or drinking water

² Heavy precipitation refers to instances during which the amount of rain or snow experienced in a location substantially exceeds what is normal. What constitutes a period of heavy precipitation varies according to location and season. Heavy precipitation does not necessarily mean the total amount of precipitation at a location has increased – just that precipitation is occurring in more intense or more frequent events.

supply agencies. Contact information must be in locations that are readily accessible and available. Measures for cleaning up hazardous material spills or leaks must be consistent with applicable RCRA regulations at 40 CFR Part 264 and 40 CFR Part 265.

- III.E. Erosion and Sediment Control.** The permittee must stabilize exposed, erodible areas and contain runoff using structural and/or non-structural control measures to minimize onsite erosion and sedimentation, and the resulting discharge of pollutants. The permittee must place flow velocity dissipation devices at discharge locations and within outfall channels where necessary to minimize channel and streambank erosion and scour in the immediate vicinity of discharge points. The permittee must also use structural and non-structural control measures to minimize the discharge of sediment. The permittee must establish procedures to address erosion or poor vegetative cover when the permittee becomes aware of it.

IV. PERMIT CONDITIONS APPLICABLE ONLY TO PROPERTIES WITH ≥ 1 ACRE BUT < 7 ACRES OF IMPERVIOUS COVER

IV.A. Green Infrastructure and Impervious Cover Reduction Evaluation.

As owners/permittees plan and complete capital projects or other improvements on their property, projects must to the maximum extent feasible:

- Reduce or eliminate impervious (paved and other hard) surfaces and convert them into pervious surfaces (areas with vegetation and soil);
- Improve stormwater infiltration onsite (allowing rain and snowmelt to seep through the surface down to underlying layers of soil and gravel);
- Reestablish aquatic buffers by maintaining existing vegetation, soil health, and resource buffer areas or improving the site by introducing new vegetation, improving soil quality, or restoring buffer areas adjacent to waterways;
- Install green stormwater infrastructure, structural stormwater controls, and/or stormwater retrofit BMPs to manage and/or treat runoff, which, in addition to meeting the [RI Stormwater Management, Design and Installation Rules](#) (Title 250-RICR-150-10-8), the [RI Stormwater Design and Installation Standards Manual](#) (Amended March 2015), and state and local permit requirements, should be implemented above minimum requirements where feasible.

The permittee must describe and list potential opportunities in the Annual Report per Part VI.B. and annually evaluate the site for new opportunities to implement any of the listed projects or make other improvements. Any changes made to the site must be reported in the Annual Report.

V. PERMIT CONDITIONS APPLICABLE ONLY TO PROPERTIES WITH ≥ 7 ACRES OF IMPERVIOUS COVER

V.A. Stormwater Management Plan (SWMP) Requirements.

- V.A.1. The permittee must develop a written SWMP consistent with Part V.B. of this permit and submit it to the RIDEM with the NOI.
- V.A.2. The SWMP shall be signed by the owner in accordance with Part VIII.E. of this permit and retained on-site. Permittees shall make the SWMP available upon request to the Director or, in the case of stormwater that discharges through a MS4, to the MS4 operator.
- V.A.3. If the SWMP is reviewed by the Director, he or she may notify the permittee at any time that the SWMP does not meet one or more of the minimum requirements of this permit. After such notification from the Director, the permittee shall make changes to the SWMP and shall submit to the Director a written certification that the requested changes have been made. Unless otherwise provided by the Director,

the permittee shall have thirty (30) days after such notification to make the necessary changes.

V.A.4. The permittee shall immediately amend the SWMP whenever there is a change in design, construction, operation, or maintenance at the property, which has the potential for the discharge of pollutants to waters of the State; a release of reportable quantities of hazardous substances or oil; or if the SWMP proves to be ineffective in achieving the general objectives of controlling pollutants in stormwater discharges. Changes must be noted and submitted to the Department with the next Annual Report.

V.B. Contents of the SWMP. The SWMP for the site/property must include and address the Permit Conditions Applicable to All Properties With ≥ 1 Acre of Impervious Cover in Part III., in addition to the following requirements:

V.B.1. Pollution Prevention Team. The permittee shall designate a stormwater pollution prevention team consisting of personnel, at least one of whom must be associated with the property, to carry out the provisions of the SWMP and any subsequent amendments. The SWMP must identify the staff individual(s) (by name or title) that comprise the facility's stormwater pollution prevention team as well as their individual responsibilities. The pollution prevention team is responsible for overseeing development of the SWMP, any modifications to it, and for implementing and maintaining control measures and taking corrective actions when required. Each member of the stormwater pollution prevention team must have ready access to either an electronic or paper copy of applicable portions of this permit, the most updated copy of the SWMP, and other relevant documents or information that must be kept with the SWMP.

V.B.2. Site Description.

V.B.2.a. Activities/Land Use. Provide a description of the activities and land uses at the property.

V.B.2.b. Site Level Stormwater Map. Provide a map with enough detail to identify the location of the property and the receiving waters. At a minimum, the site map must include the following:

V.B.2.b.1. boundaries of the property and the size of the property in acres;

V.B.2.b.2. directions of stormwater flow (e.g., use arrows to show which way stormwater flows);

V.B.2.b.3. locations of all surface waterbodies, including wetlands, in the immediate vicinity of the property;

V.B.2.b.4. the location and extent of significant structures and delineation of impervious and pervious surfaces;

V.B.2.b.5. locations of all existing stormwater control measures;

V.B.2.b.6. location of stormwater conveyances including ditches, pipes, and swales;

V.B.2.b.7. locations of stormwater inlets and outfalls/discharge points, with a unique identification code for each outfall (e.g., Outfall 001, 002), and an outline of the subwatershed area draining to each outfall;

V.B.2.b.8. if applicable, locations of all private storm sewer systems and MS4s, where stormwater from the facility discharges to or interconnects with a storm sewer system;

V.B.2.b.9. locations of potential pollutant sources identified under Part V.B.3. and locations

where significant materials are exposed to precipitation;

V.B.2.b.10. locations where major spills or leaks identified under Part V.B.3.d. have occurred;

V.B.2.b.11. location and description of non-stormwater discharges per Part V.B.3.d.;

V.B.2.b.12. location and source of any unidentified connections to the site's stormwater infrastructure per Part V.B.3.d.1.;

V.B.2.b.13. location of any salt, sand, or salt/sand mixture storage areas;

V.B.2.b.14. locations of the following activities where such activities are exposed to precipitation: parking lots; dumpsters; fueling stations; vehicle and equipment maintenance and/or cleaning areas; loading/unloading areas; liquid storage tanks; processing and storage areas; access roads and rail lines used or traveled by carriers of raw materials, manufactured products, waste material, or by-products used or created by the facility; the location of transfer of substances in bulk; and machinery; and

V.B.2.b.15. location and source of runoff from adjacent property containing significant quantities of pollutants of concern to the facility/property. (An evaluation of how the quality of the stormwater running onto the property impacts the stormwater discharges from the property may be included.)

V.B.2.c. Receiving Waters and Wetlands. The name of the nearest receiving water(s), including intermittent streams, the areal extent and description of wetlands that may receive discharges from the property, and the name of the ultimate receiving waterbody (i.e., either Tongue Pond, Spectacle Pond, or Mashapaug Pond).

V.B.3. Summary of Potential Pollutant Sources. The permittee must identify each separate drainage area at the facility where potential pollutant sources (materials or activities) are exposed to stormwater and areas from which allowable non-stormwater discharges are released. Materials or activities include, but are not limited to: parking lots; dumpsters; material handling equipment or activities; machinery; storage, cleaning, fueling, and maintenance of vehicles and equipment storage; and raw materials, intermediate products, by products, final products, or waste products. Material handling activities include the storage, loading and unloading, transportation, or conveyance of any raw material, intermediate product, final product, or waste product. For each separate drainage area identified, the description must include:

V.B.3.a. Activities/Land Use. A list of the activities/land use at the site (e.g., parking areas, waste storage/dumpsters, material storage, loading/unloading, access areas, equipment fueling and cleaning, etc.);

V.B.3.b. Flow Direction and Pollutants. For each drainage area, a prediction of the direction of flow and an estimate of the types of pollutants (e.g., crankcase oil, metals, biochemical oxygen demand (BOD), pH, etc.), which are likely to be carried by or present in the stormwater discharge.

V.B.3.c. Spills and Leaks. The permittee must clearly identify areas where potential spills and leaks, which can contribute pollutants to stormwater discharges, can occur, and their accompanying drainage points. For areas that are exposed to precipitation or that otherwise drain to a stormwater conveyance at the facility, the permittee must provide a list of significant spills and leaks of toxic or hazardous pollutants that occurred during the five (5) year period prior to the date of the submission of a NOI. The list must be updated if significant spills or leaks occur in exposed areas of the facility during the time the permittee is covered by the permit. Significant spills and leaks include, but are not limited to, releases of oil or hazardous

substances in excess of quantities that are reportable under Clean Water Act (CWA) § 311 (see 40 CFR 110.10 and 40 CFR 117.21) or section 102 of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). Significant spills may also include releases of oil or hazardous substances that are not in excess of reporting requirements.

V.B.3.d. Non-Stormwater Discharges. The permittee must evaluate its property for the presence of non-stormwater discharges. Any non-stormwater discharges not explicitly authorized in Part I.B.2. or covered by a separate RIPDES permit must be eliminated. If not covered under a separate RIPDES permit, wastewater, wash water, and any other unauthorized non-stormwater must be discharged to a sanitary sewer if prior approval is granted and in accordance with applicable industrial pretreatment requirements, or otherwise disposed of appropriately.

V.B.3.d.1. Unidentified Connections. The permittee shall investigate and identify the source of any unidentified connection(s) to its stormwater infrastructure discovered during stormwater mapping or at any other time.

V.B.3.d.2. Non-Stormwater Discharges. The permittee must document that the facility has been evaluated for the presence of non-stormwater discharges and that all unauthorized non-stormwater discharges have been eliminated. Documentation of the evaluation must include:

V.B.3.d.2.i. identification of potential non-stormwater at the site;

V.B.3.d.2.ii. the date of any testing and/or evaluation;

V.B.3.d.2.iii. a description of the results of any test and/or evaluation;

V.B.3.d.2.iv. a description of the evaluation criteria or testing method used;

V.B.3.d.2.v. a list of the outfalls or onsite drainage points that were directly observed during the testing; and

V.B.3.d.2.vi. the action(s) taken, such as a list of control measures used to eliminate unauthorized discharge(s) or documentation that a separate RIPDES permit was obtained. For example, a floor drain was sealed, a sink drain was re-routed to a sanitary sewer, or a RIPDES permit was received for an unauthorized cooling water discharge.

V.B.3.d.3. Allowable Non-Stormwater Discharges. Certain sources of non-stormwater are allowable under this permit (see Part I.B.2.). For these discharges to be allowed, the permittee must identify in the SWMP all sources of allowable non-stormwater (except for flows from firefighting activities) that are discharged under the authority of this permit, the location where it is likely to be discharged, and descriptions of appropriate BMPs for each source.

Note: If the permittee includes mist blown from cooling towers amongst the allowable non-stormwater discharges, the permittee must specifically evaluate the potential for the discharges to be contaminated by chemicals used in the cooling tower and determine that the levels of such chemicals in the discharges would not cause or contribute to a violation of an applicable water quality standard after implementation of the BMPs the permittee has selected to control such discharges.

V.C. Stormwater Control Plan (SCP) Requirements.

- V.C.1. The permittee must develop a written SCP consistent with Part V.D. of this permit and submit it to the RIDEM by **February 15, 2028** with the Annual Report for calendar year 2027, or, for sites that become eligible for permit coverage after the permit effective date due to added impervious cover or new development, with the Annual Report for the second year of permit authorization. The SCP may either be a stand-alone document or may be incorporated into the SWMP.
- V.C.2. Once the SCP has been developed, the permittee shall report on its progress toward achieving their site-specific pollutant load reduction targets, the status of the planned stormwater control measures (“SCMs”) (structural and nonstructural), and their implementation progress in their Annual Report submissions to the RIDEM pursuant to Part VI.B. of this permit.
- V.C.3. If the SCP is reviewed by the Director, he or she may notify the permittee at any time that the SCP does not meet one or more of the minimum requirements of this permit. After such notification from the Director, the permittee shall make changes to the SCP and shall submit to the Director a written certification that the requested changes have been made. Unless otherwise provided by the Director, the permittee shall have thirty (30) days after such notification to make the necessary changes.
- V.C.4. The SCP developed by the permittee will outline how Total Phosphorus pollutant loads in stormwater discharges from Mashapaug Watershed sites will be reduced to meet the subwatershed-specific requirements by the percentages defined in Part II.A. This plan must be developed and implemented using appropriate structural and/or nonstructural stormwater management controls. The permittee must complete all requirements outlined in Part V.D. and certify the completion of these requirements in Annual Reports submitted to the RIDEM in accordance with Part VI.B.
- V.C.5. The SCP shall be signed by the owner in accordance with Part VIII.E. of this permit and retained on-site. Permittees shall make the SCP available upon request to the Director or, in the case of stormwater that discharges through a MS4, to the MS4 operator.

V.D. Contents of the SCP. The SCP shall include the following:

- V.D.1. A site plan/map which delineates subdrainage areas, directly connected impervious area, discharge points/outfalls, stormwater flow paths, existing structural SCMs, storm drain networks, receiving waters, applicable MS4 connections, pollutants causing impairments, and TMDL requirements.
- V.D.2. Any non-structural control measures that will be implemented at the site and phosphorus load reduction calculations associated with the non-structural control measures as outlined in Appendix D of this permit.
- V.D.3. Existing SCMs and associated phosphorus load reduction credits as outlined in Appendix D of this permit.
- V.D.4. A plan and implementation schedule to meet 30% of the site-specific phosphorus load reduction responsibility from Part II.A. by the end of the fifth year of the permit by identifying structural and/or nonstructural SCMs that will manage stormwater on the existing developed site or through redevelopment or retrofit. This plan shall address all potential strategies to reduce stormwater-related pollution, including but not limited to:
 - V.D.4.a. Directing runoff to treatment systems or pervious areas, and making use of underutilized parking for stormwater treatment.
 - V.D.4.b. Removing pavement from any oversized or seldom-used parking areas and introducing,

expanding, or improving green spaces and aquatic buffers.

- V.D.4.c. Disconnecting impervious areas by removing curbing or re-routing rooftop drainage to vegetated spaces and maintaining or enhancing those spaces to maximize treatment.
- V.D.4.d. Retrofitting existing parking lot islands to function as SCMs.
- V.D.4.e. Reviewing all existing control measures or SCMs for effectiveness and identifying opportunities for enhancements or retrofits.
- V.D.4.f. Utilizing specific structural SCMs designed to remove pollutants through hydrologic, physical, biological, or chemical processes.
- V.D.4.g. Ensuring all SCMs comply with Title 250-RICR-150-10-8 *RI Stormwater Management, Design, and Installation Rules* § 8.14. Stormwater runoff from land uses with higher potential pollutant loads (LUHPPLs) shall not be infiltrated to groundwater unless adequately treated for the pollutant of concern, as determined by the RIDEM. Also note that infiltration practices are not permitted in areas with unresolved subsurface contamination unless such contamination has been remediated, or where infiltration has otherwise been approved by the RIDEM.
- V.D.5. An inventory and accounting of SCMs and treatment credits as they are implemented using EPA's BMP Accounting and Tracking Tool (BATT) (<https://snepnetwork.org/batt-tutorial/>) or equivalent. Provide a copy of this inventory output annually with the Annual Report.
- V.D.6. An Inspection and Maintenance (I&M) plan for all installed SCMs to ensure long term effectiveness and to maintain pollutant reduction credits. See Appendix E of this permit for I&M requirements necessary to maintain pollutant load reduction credits.
- V.D.7. Site-Specific Pollutant Load Reduction Responsibility. The long term site-specific pollutant load reduction responsibility ("Site-Specific Reduction") is determined by calculating the average annual phosphorus load from the site's total existing impervious and pervious cover prior to obtaining permit coverage and applying the relevant pollution reduction requirements by subwatershed.
 - V.D.7.a. To calculate a Site-Specific Reduction, the permittee must multiply the impervious cover acreage (A_{IC}) and pervious cover acreage (A_{PC}) of their site by the average annual phosphorus pollutant load export rate (PLER) and apply the applicable subwatershed-specific reduction requirements (R_{ws}). If a permittee is responsible for multiple sites, this calculation must be made for each site for which the permittee submitted a NOI. The generic application of this calculation is:
$$\text{Site-Specific Reduction} = [(A_{IC} * \text{PLER lbs/acre-yr}) + (A_{PC} * \text{PLER lbs/acre-yr})] * R_{ws}$$

Where PLER is the Pollutant Load Export Rate for Total Phosphorus in lbs/acre-year (refer to Table 1-1 in Appendix D), and

Where R_{ws} is the subwatershed-specific pollutant load reduction requirement (%) based on EPA-approved TMDLs for both pervious and impervious area:

 - Mashapaug Pond: 65%
 - Spectacle Pond: 68%
 - Tongue Pond: 68%
 - V.D.7.b. To meet Water Quality Standards and total required phosphorus load reduction targets applicable to discharges from the permittee's site as established in Part II.A. of this permit, the permittee shall implement a phased phosphorus load reduction schedule across three consecutive permit terms, as follows:

Permit Term 1: The permittee shall reduce its total phosphorus load to the Mashapaug Watershed by at least 30% of the Site-Specific Reduction.

Permit Term 2: The permittee shall reduce its total phosphorus load to the Mashapaug Watershed by at least an additional 35% of the Site-Specific Reduction, for a cumulative total Site-Specific Reduction of 65%.

Permit Term 3: The permittee shall reduce its total phosphorus load to the Mashapaug Watershed as necessary to achieve a cumulative total phosphorus load reduction of 100% of the Site-Specific Reduction.

Example 1: Calculation to determine the Site-Specific Reduction for a commercial site with 7.0 acres of impervious cover and 1.0 acres of pervious cover [Hydrologic Soil Group (“HSG”)¹ C] that discharges to the Spectacle Pond subwatershed where:

$$Acres_{IC} = 7.0$$

$$Acres_{PC} = 1.0$$

PLER lbs/acre-yr for a Commercial Land Use = 1.78 (from Table 1-1 in Appendix D)

PLER lbs/acre-yr for HSG C Use = 0.21 (from Table 1-1 in Appendix D)

$$R_{Spectacle} = 68\%$$

$$\text{Site-Specific Reduction} = [(7.0 \text{ acres} * 1.78 \text{ lbs/acre-yr}) + (1.0 \text{ acres} * 0.21 \text{ lbs/acre-yr})] * 0.68$$

$$\text{Site-Specific Reduction} = [(12.46 + 0.21)] * 0.68$$

$$\text{Site-Specific Reduction} = \mathbf{8.62 \text{ lbs/yr}}$$

Site-Specific Phased Phosphorus Load Reduction Requirements

*First Permit Term: 30% * 8.62 lbs/yr = 2.59 lbs/yr*

*Second Permit Term: 65% * 8.62 lbs/yr = 5.60 lbs/yr*

*Third Permit Term: 100% * 8.62 lbs/yr = 8.62 lbs/yr*

Note: Appendix C “Methodology for Determining Site-Specific Pollutant Calculations” outlines how the calculation for the site-specific pollutant load reduction requirement under other scenarios should be carried out under this Mashapaug General Permit.

V.D.8. Increased Discharges from New Development and/or Redevelopment on existing Mashapaug Watershed Sites.

V.D.8.a. Properties that meet the impervious cover threshold for eligibility under this permit that add impervious cover after the permit effective date must meet the following requirements:

- Any additional phosphorus load from runoff generated by the newly added impervious cover must be fully treated or offset such that the allowable runoff load generated from this newly added impervious cover does not exceed the load that existed for the previous pervious area.
- The previous pervious load is dependent on the hydrologic soil group (HSG) as referenced in Table 1-1 of Appendix D.
- If the HSG is not known, the permittee may conduct soil testing to determine the HSG or assume conditions to be HSG C for the phosphorus load export rate.
- For existing sites undergoing redevelopment or additions of impervious cover, the existing impervious cover portion of the site must meet pollutant load reduction requirements as outlined in Part V.D.7.

¹ To determine the Hydrologic Soil Group (HSG), navigate to <https://ridemgis.maps.arcgis.com/apps/webappviewer/index.html?id=87e104c8adb449eb9f905e5f18020de5> in a web browser and apply the layers “Geology_and_Soils” and “Soil Hydrologic Group.”

Example 2: Calculation to determine the Site-Specific Reduction for a commercial site with 7.0 acres of impervious cover, 1.0 acres of pervious cover (HSG C) and 0.4 acres of new impervious cover that discharges to the Spectacle Pond subwatershed where:

$$\begin{aligned} \text{Acres}_{IC} &= 7.0 \\ \text{Acres}_{PC} &= 0.6 \quad [1.0_{PC} - 0.4_{\text{NewIC}}] \\ \text{Acres}_{\text{NewIC}} &= 0.4 \end{aligned}$$

$$\text{Site-Specific Reduction} = [(\text{Acres}_{IC} * \text{PLER lbs/acre-yr}) + (\text{Acres}_{PC} * \text{PLER lbs/acre-yr})] * R_{ws} + [(\text{Acres}_{\text{NewIC}} * \text{PLER lbs/acre-yr}) * 100\%]$$

PLER lbs/acre-yr for a Commercial Land Use = 1.78 (from Table 1-1 in Appendix D)
PLER lbs/acre-yr for HSG C Use = 0.21 (from Table 1-1 in Appendix D)

$$R_{\text{Spectacle}} = 68\%$$

$$\text{Site-Specific Reduction} = [(7.0 \text{ acres} * 1.78 \text{ lbs/acre-yr}) + (0.6 \text{ acres} * 0.21 \text{ lbs/acre-yr})] * 0.68 + [(0.4 \text{ acres} * 1.78 \text{ lbs/acre-yr}) * 1]$$

$$\text{Site-Specific Reduction} = [(12.46 + 0.126) * 0.68] + [(0.71) * 1]$$

$$\text{Site-Specific Reduction} = \mathbf{8.56 + 0.71 = 9.27 \text{ lbs/yr}}$$

Site-Specific Phased Phosphorus Load Reduction Requirements

*First Permit Term: 30% * 9.27 lbs/yr = 2.78 lbs/yr*

*Second Permit Term: 65% * 9.27 lbs/yr = 6.03 lbs/yr*

*Third Permit Term: 100% * 9.27 lbs/yr = 9.27 lbs/yr*

V.D.8.b. Any redevelopment that does not change the total net area of impervious cover must meet the established Site-Specific Reduction requirements as outlined in Part V.D.7. This requirement can be met onsite, or offsite, as described in Parts V.D.10. and V.D.11.

V.D.9. Newly Developed Sites after Permit Effective Date.

Any newly developed parcel that was undeveloped prior to the permit Effective Date, that, after development, meets the eligibility requirements of this permit under Part I.B., must meet the following requirements:

V.D.9.a. Obtain authorization to discharge in accordance with Part I.C.1 of the permit (or secure RIPDES coverage under an individual permit); and

V.D.9.b. Fully treat or offset 100% of the phosphorus load from runoff generated by newly added impervious cover.²

- The previous load is dependent on the hydrologic soil group (HSG) and can be referenced in Table 1-1 of Appendix D.
- If the HSG is not known, the permittee may conduct soil testing to determine the HSG or assume conditions to be HSG C for the phosphorus load export rate.
- The pollution load reduction requirement can be met onsite, or offsite, as described in Parts V.D.10. and V.D.11.

V.D.10. Stormwater Control Measures (SCMs).

Permittees must implement structural and nonstructural SCMs to meet the Site-Specific Reduction as outlined in their SCP and track their progress towards meeting the Site-Specific Reduction target. Additionally, implementation of SCMs (structural or nonstructural), must be reported to the RIDEM as part of the Annual Report. Permittees can only take credit for phosphorus load reductions if structural control measures are inspected and maintained as designed, as described in Part V.D.10.d. of this permit.

² Porous or pervious pavement on newly developed sites shall not be included in impervious cover calculations. Additionally, any phosphorus reductions achieved by porous or pervious pavement (compared to traditional impervious pavement) may not be credited towards a newly developed site's phosphorus load reduction requirement originating from other impervious surfaces.

V.D.10.a. New Structural SCMs.

The permittee may install structural SCMs on their site to meet the Site-Specific Reduction target. If the permittee does so, the permittee must submit this information in their Annual Report and the SCP must include information on the pollution reduction achieved by the SCM(s). The permittee shall demonstrate pollution reduction by the following means:

- V.D.10.a.1. SCM pollutant removal percentage calculations must be consistent with EPA Region 1's BMP Accounting and Tracking Tool (BATT) (2016), calculations in Appendix D, or other SCM performance evaluation tool approved by the RIDEM, where available.
- V.D.10.a.2. All stormwater management system designs shall be consistent with, or more stringent than Title 250-RICR-150-10-8 [RI Stormwater Management, Design, and Installation Rules](#) and the [RI Stormwater Design and Installation Standards Manual](#) (Amended March 2015).
- V.D.10.a.3. The permittee must ensure and document adequate Inspection and Maintenance of any installed SCM as outlined in Part V.D.10.d. and Appendix E.
- V.D.10.a.4. If a permittee determines their site may be exposed to, or has previously experienced, major storm and flood events, or contributes to localized flooding, the permittee shall prioritize green infrastructure and/or SCMs that reduce such flooding or enhance evapotranspiration where appropriate.

V.D.10.b. Existing Structural SCMs.

For sites that have existing structural SCMs, permittees may receive credit for achieving phosphorus load reductions. To receive pollutant load reduction credit, the permittee shall:

- V.D.10.b.1. Maintain records demonstrating regular SCM Inspection and Maintenance in accordance with Part V.D.10.d. and Appendix E.
- V.D.10.b.2. Certify to the RIDEM in the Annual Report that existing SCMs have been appropriately inspected and maintained.
- V.D.10.b.3. To calculate pollutant load reduction credit of an existing SCM, the permittee's calculations shall be consistent with:
 - Performance Curves in Appendix D. If original as-built drawings are unavailable, the permittee may estimate the relevant parameters (i.e., the contributing SCM catchment area and the SCM Design Storage Volume (DSV)) to receive credit.
 - EPA Region 1's BMP Accounting and Tracking Tool (BATT) (2016), calculations in Appendix D, or other SCM performance evaluation tool approved by the RIDEM, where available.

If a Performance Curve is not available for the existing SCM the permittee may consider enhancing or retrofitting the existing SCM to function in a manner consistent with an applicable SCM Performance Curve in Appendix D.

V.D.10.c. Nonstructural SCMs.

The permittee may implement enhanced nonstructural SCMs, such as additional sweeping, more frequent catch basin cleaning, and intentional leaf litter collection as outlined in

Appendix D of this permit to provide phosphorus pollutant load reductions. The SCP must outline the following in regard to nonstructural SCMs:

V.D.10.c.1. Pollutant removal percentages achieved through nonstructural controls must be consistent with EPA Region 1's BMP Accounting and Tracking Tool (BATT) (2016), calculations in Appendix D, or other SCM performance evaluation tool approved by the RIDEM, where available.

V.D.10.c.2. The permittee shall maintain records of nonstructural SCM implementation activities and associated pollution reduction credit calculations. In order to qualify for and satisfy the nonstructural SCM requirements outlined in this permit, the permittees must implement nonstructural SCMs in accordance with Appendix D and Appendix E of this permit.

V.D.10.d. Maintaining Stormwater Pollution Reduction Credits.

Permittees must undertake appropriate inspection and maintenance practices for each selected SCM that they install, or for which they are responsible through offsite phosphorus reduction agreements. In order to receive phosphorus load reduction credits, the permittee must document inspections and maintenance of these controls in their SCP and Annual Report. The minimum requirements that the permittee must document are outlined in Appendix E.

V.D.11. Credit for Offsite Stormwater Treatment.

The permittee may meet their Site-Specific Reduction targets by implementing stormwater management controls offsite. Offsite stormwater management controls refer to phosphorus load reduction practices that are implemented at another location that is not the permitted site. Should the permittee opt to use offsite phosphorus reductions to meet their Site-Specific Reduction requirements, the permittee remains responsible for all conditions and requirements of this permit. Offsite phosphorus reduction may be achieved via several methods, including a Regionalized Stormwater Management group, or similar entity, direct Permittee-to-Permittee credit trading, or Co-Funding of Projects. In each of these instances, the permittee must have the following agreements:

V.D.11.a. Regionalized Stormwater Management. Permittees may enter into a legally binding agreement with a local Watershed Management Group or similar entity to fund a regional stormwater control project, or a series of stormwater control projects and the associated inspections and maintenance, that would operate within the subwatershed in which the site is located.

V.D.11.b. Permittee-to-Permittee Credit Trading. A permittee may enter into a legally binding agreement to fund a new stormwater management control project or purchase pollution reduction credits from an existing stormwater management control project within the subwatershed. The permittee's agreement shall include the associated inspections and maintenance of the stormwater control project.

V.D.11.c. Co-Funding of Projects. Multiple permittees may enter into a legally binding agreement to fund a new stormwater management control project within the subwatershed. The permittees' agreement will include the associated inspections and maintenance of the Stormwater Control Project.

These agreements shall include:

- Description of project(s) funded;
- Description of drainage area contributing to the stormwater control(s), including a drainage map;
- Receiving water;
- Listing of contributing Mashapaug Watershed sites and their RIPDES IDs;
- Total pollution reduction achieved by the project(s);

- Breakdown of pollution reduction credits by each contributing Mashapaug Watershed site;
- Certify inspections and maintenance requirements and responsibilities; and
- Specified timeframe for project completion.

Offsite phosphorus reduction programs must meet the following minimum conditions:

- V.D.11.d. Any permittee engaging in offsite phosphorus reduction remains responsible for complying with pollution reduction requirements as outlined in this Permit and all other permit conditions. Engaging in legally binding agreements with any other permittee or regionalized stormwater management group does not transfer permit responsibilities to that other entity and the permittee remains responsible for compliance with all permit requirements.
- V.D.11.e. Agreements must be made with other Mashapaug Watershed Permittee(s) and be located on other permitted Mashapaug Watershed sites or on properties within the Mashapaug, Spectacle, and Tongue Ponds subwatersheds.
- V.D.11.f. Agreements to fund or purchase credits from such a project or projects must account for inspections and maintenance of stormwater controls.
- V.D.11.g. These projects may be implemented as part of a Watershed Based Plan or other appropriate mechanism.
- V.D.11.h. Projects should consider the impacts that offsite phosphorus reduction will have on localized water quality and where the co-benefits of SCMs will occur. Specific details related to the funded project that involve individual Mashapaug Watershed sites shall be documented in the agreement as specified in this section.
- V.D.11.i. The permittee that provides pollution reduction credits via trading to other permittees are not eligible to receive credits towards their own site-specific pollution reduction responsibility for the pollutant loads that are traded.
- V.D.11.j. Permittees prematurely terminating the agreement or ceasing inspections and maintenance will not receive pollution reduction credit from this project and will need to demonstrate compliance with the permit through other actions.
- V.D.11.k. The permittee must comply with the agreement to receive any phosphorus load reduction credits.

VI. REPORTING AND RECORDKEEPING

VI.A. Reporting Requirements. Information required to be submitted to the Department to comply with this permit shall be submitted by hard copy, unless an electronic reporting tool becomes available, or an electronic submission is approved by the RIDEM.

Information required to be submitted to the Department includes:

- Notice of Intent (NOI) (Part VII.);
- Stormwater Management Plan (SWMP) (Part V.A.);
- Stormwater Control Plan (SCP) (Part V.C.);
- Annual Reports (Part VI.B.);
- Notice of Termination (NOT) (Part I.D.); and/or

- No Discharge Certification (NDC) (Part I.E.)

VI.B. Annual Report. Permittees must submit an Annual Report to the Department for each year of permit coverage summarizing the activities related to permit requirements and describing the steps taken to meet the terms of this permit. Annual Reports must be submitted to the Department by **February 15th** for the previous reporting year (January 1 – December 31). The Annual Report must include the following information:

For all properties with ≥ 1 acre of Impervious Cover:

- Owner name and mailing address;
- Facility name and physical address;
- RIPDES permit authorization number;
- Contact person name, title, email address, and phone number;
- A summary of the strategies implemented in the previous reporting year to minimize exposure of pollutants to stormwater (see Part III.A.);
- A summary of the previous reporting year's facility good housekeeping documentation (i.e., sweeping, stormwater infrastructure and catch basin cleaning, etc.) (see Part III.B.);
- A summary of structural improvements, enhanced/resilient pollution prevention measures, and/or other mitigation measures implemented in the previous reporting year to help minimize impacts from stormwater discharges from major storm events (see Part III.C.);
- A summary of spill prevention, control, and response procedures implemented, including records of employee training. In addition, descriptions and dates of any incidences of significant spills, leaks, or other releases during the previous reporting year that resulted in discharges of pollutants to waters of the State, through stormwater or otherwise; the circumstances leading to the release; actions taken in response to the release; and measures taken to prevent the recurrence of such a release (see Part III.D.);
- A summary of the measures used to minimize soil erosion and the resulting discharge of sediment and pollutants (see Part III.E.);
- A summary of the previous reporting year's changes or improvements made at the site; and
- A description any incidents of noncompliance in the past year, or if none, provide a statement that the permittee is in compliance with the permit.

For Properties with ≥ 1 acre, but < 7 acres of Impervious Cover:

- An updated list of potential pavement reduction projects, stormwater retrofit opportunities, and pending capital projects that have the potential of making improvements to the control or water quality of stormwater discharges (see Part IV.A.).

For Properties with ≥ 7 acres of Impervious Cover:

- Any updates to the SWMP or SCP, including maps to show the locations of new SCMs or retrofits (see Part V.);
- An update on the permittee's progress toward achieving the Site-Specific Reduction targets required by the end of the permit term, including a list of selected SCMs, calculations for crediting associated with structural and nonstructural SCMs, the "inventory output" from EPA's BATT, the status of implementation, dates of SCM installation, and if applicable, any existing SCMs that have been

inspected, maintained, and retrofitted to qualify for phosphorus load reduction credits (see Parts V.C. and V.D.); and

- As applicable, a summary of inspection and maintenance of SCMs conducted during the reporting year (see Part V.D.6.).

VI.C. Additional Reporting. In addition to the reporting requirements stipulated in Part VI, the permittee is also subject to the standard permit reporting provisions.

Where applicable, the permittee must submit the following reports to the Department. If the facility discharges through an MS4, the permittee must also submit these reports to the MS4 operator (identified pursuant to Part VII.A.4.):

- 24-Hour reporting – The permittee shall immediately report any noncompliance which may endanger health or the environment within 24 hours from the time the permittee becomes aware of the circumstances by calling the RIDEM at 401-222-4700, or 401-222-3070 outside of business hours;
- 5-day follow-up reporting to the 24-hour reporting – A written submission must also be provided within five (5) days of the time the permittee becomes aware of the circumstances; and
- Reportable quantity spills – The permittee must provide notification, as required under Part III.D., as soon as the permittee has knowledge of a leak, spill, or other release containing a hazardous substance or oil in an amount equal to or in excess of a reportable quantity.

The written submission shall contain a description of the noncompliance and its cause; the period of noncompliance, including exact dates and times, and if the noncompliance has not been corrected, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance.

The Director may waive the written report on a case-by-case basis if the oral report has been received within 24 hours.

VI.D. Records Retention. The permittee must retain copies of all reports and certifications required by this permit, and records of all data used to complete the NOI to be covered by this permit for a period of at least 5 years from the date of the report or application.

VI.E. How to Submit Reports. Any reports or documentation required by this permit must be submitted to the Director by hard copy, unless an electronic reporting tool becomes available, or an electronic submission is approved by the RIDEM.

VII. NOTICE OF INTENT REQUIREMENTS

VII.A. Contents of the Notice of Intent (NOI).

- VII.A.1. The property owner's name, point of contact name (first name, last name), mailing address, e-mail address, telephone number;
- VII.A.2. Facility/Property's information including: name and location/street address of the facility, the latitude and longitude of the approximate center of the facility to the nearest 15 seconds, for which the NOI is being submitted;
- VII.A.3. A brief description of the site including: the total acreage of the site, total acreage of impervious surface, and a description of existing stormwater management controls;
- VII.A.4. For each discharge point/outfall: outfall ID and description of location; latitude and longitude; name of

the receiving water(s) and if the discharge is through a municipal separate storm sewer system, the name of the operator of the municipal separate storm sewer system; receiving water(s) waterbody ID#; receiving waterbody impairment; identify if receiving waters are subject to an EPA approved TMDL; and pollutants causing the impairment;

VII.A.5. The number of catch basins located on the property; and

VII.A.6. Identification of existing stormwater control measures (non-structural and structural).

VII.B. Deficient NOI. If any portion of the NOI does not meet one or more of the minimum requirements of this part, then the applicant will be notified by the Department. It is the responsibility of the applicant to make all required changes and resubmit the NOI.

VII.C. Stormwater Management Plan. For properties with ≥ 7 acres of impervious cover, a written SWMP must be developed in accordance with Part V.A. of this permit and submitted with the NOI.

VIII. GENERAL REQUIREMENTS

VIII.A. Duty to Comply. The permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of Chapter 46-12 of the Rhode Island General Laws and the CWA and is grounds for enforcement action which may include permit termination, revocation and reissuance, modification, or for the denial of a permit renewal application and the imposition of penalties.

VIII.A.1. The permittee shall comply with effluent standards or prohibitions established under Section 307(a) of the CWA for toxic pollutants within the time provided in the regulations that establish these standards or prohibitions, even if the permit has not yet been modified to incorporate this requirement.

VIII.A.2. Section 309 of the CWA provides significant penalties for any person who violates a permit condition implementing Sections 301, 302, 306, 307, 308, 318 or 405 of the CWA or any permit condition or limitation implementing any such sections in a permit issued under Section 402 of the CWA. Any person who violates any condition of this permit is subject to a civil penalty of up to \$25,000 per day of such violation, as well as any other appropriate sanctions provided by Section 309 of the CWA. Section 309 of the CWA provides that any person who knowingly makes any false material statement, representation, or certification in any record or other document submitted or required to be maintained under this permit, including reports of compliance or noncompliance shall, upon conviction, be punished by a fine of up to \$10,000 or by imprisonment of not more than two (2) years, or by both.

VIII.A.3. Chapter 46-12 of the Rhode Island General Laws provides that any person who violates a permit condition is subject to a civil penalty of not more than \$25,000 per day of such violation. Any person who willfully or negligently violates a permit condition is subject to a criminal penalty of not more than \$25,000 per day of such violation and imprisonment for not more than five (5) years, or both. Any person who knowingly makes any false statement in connection with the permit is subject to a criminal penalty of not more than \$5,000 for each instance of violation or by imprisonment for not more than thirty (30) days, or both.

VIII.B. Need to Halt or Reduce Activity Not a Defense. It shall not be a defense for the permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

VIII.C. Duty to Mitigate. The permittee shall take all reasonable steps to minimize or prevent any discharge in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment.

VIII.D. Duty to Provide Information. The permittee shall furnish to the Department, within a reasonable time, any information which the Director may request to determine whether cause exists for modifying, revoking, and

reissuing, or terminating this permit, or to determine compliance with this permit. The permittee shall furnish to the Director any copies that are required to be kept as part of this permit.

- VIII.E. Signatory Requirements.** All Notices of Intent, Stormwater Management Plans, reports, certifications, or information either submitted to the Director, or that this permit requires to be maintained by the permittee, shall be signed and certified in accordance with Title 250 RICR-150-10-1 §1.12. Rhode Island General Laws, Chapter 46-12 provides that any person who knowingly makes an false statements, representation, or certification in any record or other document submitted or required to be maintained under this permit, including monitoring reports or reports of compliance or noncompliance shall, upon conviction, be punished by a monetary fine, imprisonment, or both.
- VIII.F. Oil and Hazardous Substance Liability.** Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties to which the permittee is or may be subject under Section 311 of the CWA.
- VIII.G. Release in Excess of Reportable Quantities.** If a release in excess of reportable quantities occurs, the permittee must notify the Office of Water Resources immediately. This permit does not relieve the permittee of the reporting requirements of 40 CFR 117 and 40 CFR 302. The discharge of hazardous substances in the stormwater discharge(s) from a facility shall be minimized in accordance with the applicable stormwater management plan for the facility, and in no case, during any 24-hour period, shall the discharge(s) contain a hazardous substance equal to or in excess of reportable quantities.
- VIII.H. Property Rights.** The issuance of this permit does not convey any property rights of any sort, nor any exclusive privileges, nor does it authorize any injury to private property nor any invasion of personal rights, nor any infringement of Federal, State, or local laws or regulations.
- VIII.I. Severability.** The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances and the remainder of this permit shall not be affected thereby.
- VIII.J. Transfers.** This permit is non-transferable. If a permitted property changes ownership, the current permittee must submit a NOT in accordance with the requirements of Part I.D. of this permit, and the new owner must submit a new NOI in accordance with Part I.C. of this permit. The Director may require the owner to apply for and obtain an individual RIPDES permit as stated in Part VIII.O. of this permit.
- VIII.K. State Laws.** Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable State law.
- VIII.L. Proper Operations and Maintenance.** The permittee shall at all times properly operate, inspect, and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with the conditions of this permit and with the requirements of stormwater management plans.
- VIII.M. Inspection and Entry.** The permittee shall allow the Director or an authorized representative of RIDEM, upon presentation of credentials and other documents as may be required by law, to:
- VIII.M.1. Enter upon the permittee's premises where a regulated facility or activity is located or conducted or where records must be kept under the conditions of this permit;
 - VIII.M.2. Have access to and copy at reasonable times; any records that must be kept under the conditions of this permit;
 - VIII.M.3. Inspect at reasonable times any facilities, equipment, or operations regulated or required under this permit; and

VIII.M.4. Sample or monitor any substances or parameters at any location, at reasonable times, for the purposes of assuring permit compliance or as otherwise authorized by the CWA or Rhode Island General Law.

VIII.N. Permit Actions. This permit may be modified, revoked and reissued, or terminated for cause, including but not limited to: violation of any terms or conditions of this permit; obtaining the permit by misrepresentation or failure to disclose all relevant facts; or a change in any condition that requires either a temporary or permanent reduction or elimination of the authorized discharge. The filing of a request by the permittee for a permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance does not stay any permit condition.

VIII.O. Requiring an Individual Permit or an Alternative General Permit

VIII.O.1. The Director of the Rhode Island Department of Environmental Management (RIDEM) may require any owner authorized to discharge stormwater under this permit to apply for and obtain either an individual or an alternative RIPDES general permit. Any interested person may petition the Director to take action under this paragraph. The Director may determine at his or her own discretion that an individual or an alternative general permit is required.

VIII.O.2. Any owner authorized to discharge stormwater by this permit may request to be excluded from coverage of this permit by applying for an individual permit. The request may be granted by issuance of an individual permit or an alternative general permit if the reasons cited by the owner are adequate to support the request. The Director shall notify the permittee within a timely fashion as to whether or not the request has been granted.

VIII.O.3. If a facility requests or is required to obtain coverage under an individual or an alternative general permit, then authorization to discharge stormwater under this permit shall automatically be terminated on the date of issuance of the individual or the alternative general permit. Until such time as an alternative permit is issued, the existing general permit remains fully in force.

VIII.P. Reopener Clause. The Director reserves the right to make appropriate revisions to this permit in order to incorporate any appropriate effluent limitations, schedules of compliance, or other provisions which may be authorized under the CWA or State Law. In accordance with Title 250 RICR-150-10-1 §§1.15 and 1.24, if any effluent standard or prohibition, or water quality standard is promulgated under the CWA or under State Law which is more stringent than any limitation on the pollutants limited in this permit, or controls pollutants not limited in the permit; then the Director may promptly reopen the permit and modify or revoke and reissue the permit to conform to the applicable standard.

VIII.Q. Availability of Reports. Except for data determined to be confidential under Part VIII.R. below, all reports prepared in accordance with the terms of this permit shall be available for public inspection at the RIDEM at 235 Promenade Street, Providence, Rhode Island. As required by the CWA, effluent data shall not be considered confidential. Knowingly making any false statement on any such report may result in the imposition of criminal penalties as provided for in Section 309 of the CWA and under section 46-12-14 of the Rhode Island General Laws.

VIII.R. Confidentiality of Information

VIII.R.1. Any information submitted to the RIDEM pursuant to these regulations may be claimed as confidential by the submitter, consistent with Rhode Island General Law 38-2-2. Any such claim must be asserted at the time of the submission in the manner prescribed on the application form or instructions or, in the case of other submissions, by stamping the words "confidential business information" on each page containing such information. If no claim is made at the time of submission, the RIDEM may make the information available to the public without further notice.

VIII.R.2. Claims of confidentiality for the following information will be denied:

VIII.R.2.a. The name and address of any permit application or permittee;

VIII.R.2.b. Permit applications, permits and any attachments thereto; and

VIII.R.2.c. RIPDES effluent data.

VIII.S. Right to Appeal. Within thirty (30) days of receipt of notice of final authorization, the permittee or any interested person may submit a request to the Director for an adjudicatory hearing to appeal the decision to be covered under the general permit. The request for a hearing must conform to the requirements of Title 250 RICR-150-10-1 §1.50.

Appendix A

Definitions, Abbreviations, and Acronyms

A.1. DEFINITIONS

Aquatic Buffer – a strip of vegetation along a waterbody that serves as a natural boundary between existing development and waterbodies to protect the water from disturbance.

Best Management Practice (BMP) – schedules of activities, practices (and prohibitions of practices), structures, vegetation, maintenance procedures, and other management practices to prevent or reduce the discharge of pollutants to waters of the State. BMPs also include treatment requirements, operating procedures, and practices to control site runoff, water quality, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

Confidential Business Information (CBI) – see 40 CFR Part 2 for relevant definitions of CBI: <https://www.govinfo.gov/content/pkg/CFR-2013-title40-vol1/pdf/CFR-2013-title40-vol1-part2-subpartB.pdf>

Contiguous Parcels or Properties – parcels or properties of land that are adjacent and owned by the same entity. For the purposes of this permit, “adjacent” properties or parcels may include those that are separated by an area such as: an alley, roadway, sidewalk, path, driveway, garden(s), or other structure that interrupts the continuous flow or use of the land and/or an easement, if the land on either side of such an area(s) is owned by the same entity.

Control Measure – refers to any BMP or other method (including effluent limitations) used to prevent or reduce the discharge of pollutants to waters of the State.

Department or RIDEM or DEM – the Rhode Island Department of Environmental Management.

Director – the Director of the Rhode Island Department of Environmental Management or any subordinate or subordinates to whom (s)he delegated the powers and duties vested in her/him by these regulations.

Discharge – when used without qualification, means the "discharge of a pollutant."

Discharge of a Pollutant – any addition of any “pollutant” or combination of pollutants to “waters of the State” from any “point source”. This includes additions of pollutants into waters of the State from: surface runoff which is collected or channeled by man; discharges through pipes, sewers, or other conveyances, leading into privately-owned treatment works.

Discharge Point – for the purposes of this permit, the location where collected and concentrated stormwater flows are discharged from the facility/property such that the first receiving waterbody into which the discharge flows, either directly or through a separate storm sewer system, is a water of the State.

Effluent Limitations – as defined in 40 CFR § 122.2.

Flood Zone – See “Special Flood Hazard Area”.

Green Infrastructure (GI) – the range of measures that use plant or soil systems, permeable pavement or other permeable surfaces or substrates, stormwater harvest and reuse, or landscaping to store, infiltrate, or evapotranspire stormwater and reduce flows to sewer systems or to surface waters.

Heavy Precipitation – refers to instances during which the amount of rain or snow experienced in a location substantially exceeds what is normal. What constitutes a period of heavy precipitation varies according to location and season. Heavy precipitation does not necessarily mean the total amount of precipitation at a location has increased – just that precipitation is occurring in more intense or more frequent events.

Impervious Surface or Impervious Cover – any surface that prevents or significantly impedes the infiltration of water into the underlying soil. This can include but is not limited to: roads, driveways, parking areas and other areas created using non-porous material; buildings, rooftops, structures, artificial turf and compacted gravel or soil.

Municipal Separate Storm Sewer – means a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains):

- (i) Owned or operated by a city or town or the State district association, or other public body (created by or pursuant to State law) having jurisdiction over disposal of sewage, industrial wastes, stormwater, or other wastes, including special districts under State law such as a sewer district, flood control district or drainage district, or similar entity, or an Indian tribe or an authorized Indian tribal organization, or a designated and approved management agency under section 208 of the CWA that discharges to waters of the State;
- (ii) Designed or used for collecting or conveying stormwater;
- (iii) Which is not a combined sewer; and
- (iv) Which is not part of a Publicly Owned Treatment Works (POTW) as defined in Title 250 RICR-150-10-1 § 1.4(A)(87).

Municipal Separate Storm Sewer System (MS4) – all separate storm sewers that are defined as “large” or “medium” or “small” municipal separate storm sewer systems pursuant to Title 250 RICR-150-10-1 §§ 1.4(A)(53), 1.4(A)(59), and 1.4(A)(105). “MS4” may also refer to the permittee/operator with jurisdiction over the sewer system.

Natural Background – For the purposes of this permit natural background pollutants include those substances that are naturally occurring in soils or groundwater. Natural background pollutants do not include legacy pollutants from earlier activity on the site, or pollutants in run-on from neighboring sources which are not naturally occurring.

Owner - the legal name of the person, firm, public (municipal) organization, or any other entity that owns the facility/property seeking authorization under this permit.

Outfall – see “Discharge Point”.

Perfluoroalkyl and Polyfluoroalkyl Substances (PFAS) – PFAS are a diverse group of synthetic chemicals that are resistant to grease, oil, water, and heat. PFAS chemicals are used in a variety of industries that can be exposed to stormwater and contaminate surface waterbodies. These chemicals do not breakdown in the environment, can build up in living things, and can adversely impact human health and the environment.

Permittee – the owner of a site, or one or more contiguous sites, with one (1) acre or more of impervious cover is considered to be the Permittee.

Person – an individual, association, partnership, corporation, municipality, State or Federal agency, or an agent or employee thereof.

Point source – any discernible, confined, and discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, landfill leachate collection system, vessel, or other floating craft from which pollutants are or may be discharged. This term does not include return flows from irrigated agriculture or agricultural stormwater runoff.

Pollutant – dredged spoil, solid waste, incinerator residue, filter backwash, sewage, garbage, sewage sludge, munitions, chemical wastes, biological materials, heat, wrecked or discarded equipment, rock, sand, cellar dirt, and industrial, municipal, and agricultural waste discharged into water.

Reportable Quantity Release – a release of a hazardous substance at or above the established legal threshold that requires emergency notification. Refer to 40 CFR Parts 110, 117, and 302 for complete definitions and reportable quantities for which notification is required.

Retrofit – the addition or modification of stormwater controls on a currently developed site.

Runoff – the water from rain or snowmelt that flows over the land surface and is not absorbed into the ground, instead flowing into surface waters or land depressions.

Significant Materials – includes, but is not limited to: raw materials; fuels; materials such as solvents, detergents, and plastic pellets; finished materials such as metallic products; raw materials used in

food processing or production; hazardous substances designated under section 101(14) of CERCLA; any chemical the facility is required to report pursuant to section 313 of Title III of SARA; fertilizers; pesticides; and waste products such as ashes, slag and sludge that have the potential to be released with stormwater discharges.

Site - For the purposes of this permit, “site” shall include a single property or parcel, or “contiguous” properties or parcels when such properties or parcels are owned by the same entity.

Source Control BMPs - means structures or operations that are intended to prevent pollutants from coming into contact with stormwater through physical separation of areas or careful management of activities that are sources of pollutants. Source controls can be separated into two types: structural source control BMPs (e.g., building of storm-resistant shelters, berms, secondary containment) and operational source control BMPs (e.g., increase or improve sweep technology).

Special Flood Hazard Area (SFHA) - The area that will be inundated by the flood event having a 1-percent chance of being equaled or exceeded in any given year. The 1-percent annual chance flood is also referred to as the base flood or 100-year flood.

Stormwater – stormwater runoff, snow melt runoff, and surface runoff and drainage.

Stormwater Control Measure (SCM) – a technique, measure, or structural control that is used for a given set of conditions to manage the quantity or improve the quality of stormwater runoff in the most cost-effective manner.

Total Maximum Daily Loads (TMDLs) – a TMDL is a calculation of the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards, and an allocation of that amount to the pollutant’s sources. A TMDL includes wasteload allocations (WLAs) for point source discharges, load allocations (LAs) for nonpoint sources and/or natural background, and a margin of safety (MOS).

Waters of the State or Waters – all surface water and groundwater of the State of Rhode Island, including all tidewaters, territorial seas, wetlands, land masses partially or wholly submerged in water, and both inter- and intrastate bodies of water which are, have been or will be used in commerce, by industry, for the harvesting of fish and shellfish, or for recreational purposes.

Water Quality Standards – the physical, chemical, biological, and esthetic characteristics of a waterbody as described by State water quality criteria or the water quality which would result from existing discharges under design conditions, whichever is more stringent as determined by the Department.

A.2. ABBREVIATIONS AND ACRONYMS

BFE – Base Flood Elevation

BMP – Best Management Practice

CBI – Confidential Business Information

CERCLA – Comprehensive Environmental Response, Compensation and Liability Act

CWA – Clean Water Act (or the Federal Water Pollution Control Act, 33 U.S.C. §1251 *et seq*)

EPA – U. S. Environmental Protection Agency

GI – Green Infrastructure

MS4 – Municipal Separate Storm Sewer System

NDC – No Discharge Certification

NOI – Notice of Intent

NOT – Notice of Termination

PFAS – Perfluoroalkyl and Polyfluoroalkyl Substances

RCRA – Resource Conservation and Recovery Act

RDA – Residual Designation Authority

RIDEM – Rhode Island Department of Environmental Management

RIPDES – Rhode Island Pollutant Discharge Elimination System

SARA – Superfund Amendments and Reauthorization Act

SCM – Stormwater Control Measure

SCP – Stormwater Control Plan

SFHA – Special Flood Hazard Area

TMDL – Total Maximum Daily Load

Appendix B

Guidance for Determining Flood Risk for Planning and Design Purposes

To determine whether your facility is within a Flood Zone, the permittee should follow the steps outlined below:

(1) Access the “Climate Change Implications for Wastewater Treatment Facilities” map on RIDEM’s GIS system online, using the following link:

<https://ridemgis.maps.arcgis.com/apps/webappviewer/index.html?id=7fcdb8b98b80416f84674f711dba4378>

(2) On the “Layers List” menu on the right side of the screen, select only the “RI Floodplain Mapping (2022)” layer.

(3) Within the “RI Floodplain Mapping (2022)” layer, select only the “Effective Flood Zones” layer.

(4) Search for facility address in the “Find address of place” field in the top left of the screen.

(5) Observe and consider the position of the facility in relation to the following Flood Zone layers: A, AE, Floodway, AH, AO, and VE zones. Each of these Flood Zones reflect areas that have a 1% chance of flooding in any given year (commonly referred to as a “100-year storm”) as defined by FEMA: <https://www.fema.gov/glossary/flood-zones>.

Appendix C

Methodology for Determining Required Site-Specific Pollutant Load Reductions

The Mashapaug General Permit regulates stormwater discharges from all properties with one (1) acre or more of impervious cover¹ in the Mashapaug Pond Watershed in the cities of Cranston and Providence, RI. The permit requires knowledge of the Mashapaug Watershed property's pollutant load reduction responsibility for several permit requirements, including development of a Stormwater Control Plan (SCP). RIDEM provides the following examples to demonstrate how to calculate site-specific pollutant load reduction responsibility under the Mashapaug General Permit.

1) Example for Generic Site-Specific Pollutant Load Calculation

Specific steps to calculate the site-specific pollutant load of their Mashapaug Watershed site(s) are outlined below:

Step 1: The Permittee must multiply the total impervious and pervious area by the average annual phosphorus load export rate (PLER), as described in Part V.D.7. of the General Permit. Per Table 1-1 in Appendix D, a phosphorus load export rate of 1.78 lbs/acre-year is applicable to commercial and industrial sites and 2.32 lbs/acre-year is applicable to multi-family and high-density residential sites in the Mashapaug Watershed. A phosphorus load for pervious area can be determined based on Table 1-1 in Appendix D. Should one Permittee be responsible for multiple properties, this calculation must be made for each property for which the Permittee submitted a NOI.

Step 2: To determine the final Site-Specific Pollutant Load Reduction Responsibility, the Permittee must multiply the average annual pollutant load from the Mashapaug Watershed site by the subwatershed-specific pollution reduction requirement.

$$\text{Site-Specific Reduction} = [(A_{\text{IC}} * \text{PLER lbs/acre-yr}) + (A_{\text{PC}} * \text{PLER lbs/acre-yr})] * R_{\text{WS}}\%$$

Where the Phosphorus Load Export Rate (PLER) for impervious is a function of Land Use Category and Land Surface Cover²:

¹ Impervious Cover (IC) is defined as “any surface that prevents or significantly impedes the infiltration of water into the underlying soil. This can include but is not limited to: roads, driveways, parking areas, sidewalks, and other areas created using nonporous material, buildings, rooftops, structures, artificial turf and compacted gravel or soil.”

² October 2022 New England Stormwater Retrofit Manual – Appendix D: <https://snepnetwork.org/stormwater-retrofit-manual/>

- 1.78 lb/acre-year is the PLER for Commercial/Industrial Sites with Directly Connected Impervious Cover:
- 2.32 lb/acre-year is the PLER for High-Density Residential/Multi-Family Residential with Directly Connected Impervious Cover

Where the Phosphorus Load Export Rate (PLER) for pervious is function of hydrologic soil group (HSG):

- HSG A – 0.03 lb/acre-year
- HSG B – 0.12 lb/acre-year
- HSG C – 0.21 lb/acre-year
- HSG D– 0.37 lb/acre-year

Where R_{WS} is the subwatershed-specific pollution reduction requirement based on EPA-approved TMDLs for both pervious and impervious area:

- Mashapaug Pond Subwatershed: 65% reduction
- Spectacle Pond Subwatershed: 68% reduction
- Tongue Pond Subwatershed: 68% reduction

Generic Example Calculation: The Site-Specific Reduction for a Mashapaug Watershed site with 7.0 acres of directly connected impervious cover with a Commercial/Industrial land use type and 0.2 acres of pervious cover (HSG C) discharging to Spectacle Pond is described below:

$$Acres_{IC} = 7.0$$

$$Acres_{PC} = 0.2$$

PLER lbs/acre-yr for a Commercial Land Use = 1.78 (from Table 1-1 in Appendix D)

PLER lbs/acre-yr for HSG C Use = 0.21 (from Table 1-1 in Appendix D)

$$R_{Spectacle} = 68\%$$

$$Site\text{-Specific Reduction} = [(7.0 \text{ acres} * 1.78 \text{ lbs/acre-yr}) + (0.2 \text{ acres} * 0.21 \text{ lbs/acre-yr})] * 0.68$$

$$Site\text{-Specific Reduction} = [(12.46 + 0.042)] * 0.68$$

$$Site\text{-Specific Reduction} = \mathbf{8.50 \text{ lbs/yr}}$$

Site-Specific Phased Phosphorus Load Reduction Requirements

$$First \text{ Permit Term: } 30\% * 8.50 \text{ lbs/yr} = \mathbf{2.55 \text{ lbs/yr}}$$

$$Second \text{ Permit Term: } 65\% * 8.50 \text{ lbs/yr} = \mathbf{5.53 \text{ lbs/yr}}$$

$$Third \text{ Permit Term: } 100\% * 8.50 \text{ lbs/yr} = \mathbf{8.50 \text{ lbs/yr}}$$

2) Example for Site-Specific Pollutant Calculation under special circumstances

For pollution tracking and reporting purposes, if a site or site(s) fall(s) into one of the categories below, the Permittee must report the site-specific pollution reduction requirements to DEM in more detail.

a) Sites located in more than one subwatershed

Sites that drain to two different subwatersheds should apply the generic formula below to determine their site-specific reduction.

Generic formula for sites discharging to two watersheds:

Site-Specific Reduction $_{Subwatershed-A\%} = [(Acres_{IC} * PLER) + (Acres_{PC} * PLER)] * R_{WS\%} * D_{Subwatershed-A\%}$

Site-Specific Reduction $_{Subwatershed-B\%} = [(Acres_{IC} * PLER) + (Acres_{PC} * PLER)] * R_{WS\%} * D_{Subwatershed-B\%}$

Where $D_{Subwatershed-A\%}$ and $D_{Subwatershed-B\%}$ represent the percentages of the site that drain to the different subwatersheds.

Example Calculation No. 1: Sites that drain into more than one subwatershed.

An example calculation for a Mashapaug Watershed site with 7.0 acres of directly connected impervious cover and 0.5 acres of pervious cover (HSG C) with a Commercial/Industrial land use type where 10% of the site drains to the Mashapaug Pond Subwatershed and 90% drains to the Spectacle Pond Subwatershed, is outlined below.

Determine Site-Specific Reduction:

Site-Specific Reduction $_{Mashapaug\ Pond\ \%} = [(7.0\ acres * 1.78\ lbs/acre-yr) + (0.2\ acres * 0.21\ lbs/acre-yr)] * 65\% * 10\%$

Site-Specific Reduction $_{Spectacle\ Pond\ \%} = [(7.0\ acres * 1.78\ lbs/acre-yr) + (0.2\ acres * 0.21\ lbs/acre-yr)] * 68\% * 90\%$

Site-Specific Reduction $_{Draining\ to\ Mashapaug} = 0.81\ lbs/yr$

Site-Specific Reduction $_{Draining\ to\ Spectacle} = 7.65\ lbs/yr$

Example Calculation No. 2: Sites that drain into a subwatershed and a combined sewer system.

An example calculation for a Mashapaug Watershed property with 7.4 acres of commercial impervious cover, and 0.1 acres of pervious cover with a 2.4 acre portion of impervious cover that drains to a combined sewer system ($Acres_{CSS}$) in the Mashapaug Watershed is below:

Determine Site Specific Reduction:

Site-Specific Reduction $_{RIPDES\ site} = [((Acres_{IC} - Acres_{CSS}) * PLER) + (Acres_{PC} * PLER)] * R_{ws\%}$

PLER lbs/acre-yr for a Commercial Land Use = 1.78 (from Table 1-1 in Appendix D)

PLER lbs/acre-yr for HSG C Use = 0.21 (from Table 1-1 in Appendix D)

Site-Specific Reduction $_{RIPDES\ site} = [(7.4\ acres - 2.4\ acres) * 1.78\ lbs/acre-yr) + (0.1\ acres * 0.21\ lbs/acre-yr)] * 65\%$

Site-Specific Reduction $_{RIPDES\ site} = 5.80\ lbs/yr$

b) Increased Discharges from New Development and/or Redevelopment

Spectacle Pond and Mashapaug Pond are impaired for phosphorus and other pollutants. To prevent further degradation of these critical natural resources, the Mashapaug General Permit restricts the discharge of new phosphorous loads from Mashapaug Watershed properties, as described below.

Any increased or new impervious cover on an existing Mashapaug Watershed property must meet the following requirements:

- i. No additional phosphorus load may be added from runoff generated by the addition of new impervious cover, it must be completely offset.
- ii. The predevelopment pervious load per acre is dependent on the hydrologic soil group (“HSG”) as referenced in Table 1 below.
- iii. If the HSG is not known, the permittee may conduct soil testing to determine the HSG or assume HSG C conditions for the phosphorus load export rate.
- iv. Existing impervious and pervious cover must meet pollution reduction requirements as outlined in Part II. of the Mashapaug General Permit.
- v. Any redevelopment that does not change the total impervious cover must meet the established site-specific pollutant load reduction requirements as outlined in Part II. of the Mashapaug General Permit.

Table 1. Phosphorus Load Export Rates for pervious soil types by Hydrologic Soil Group. HSG C is bolded as it serves as a proxy in situations where soil types are unknown.

Hydrologic Soil Group (HSG)	Phosphorus Load Export Rate (lb/ac yr)
HSG A	0.03
HSG B	0.12
HSG C	0.21
HSG D	0.37

Example 1. A Mashapaug General Permit property has 7.0 acres of impervious cover at the time of permit issuance and 1.7 acres of pervious area. The Permittee converts 1.2 acres of pervious area to impervious area at the site. To develop the SCP for the site, the Permittee must treat the entirety of the runoff from the newly added portion of the impervious cover or its equivalent, so no additional impervious cover pollutant load is coming off the site, as determined using established Phosphorus Load Export Rates associated with specific Land Use Categories as defined Table 1-1 of Appendix D.

Please note: stormwater treatment may occur on any portion of the site; however, the calculations demonstrated below outline how pollutant load reduction responsibilities must be accounted for when changes in impervious cover occur on a site.

In this scenario, the existing 7.0 acres of Impervious Cover and 0.5 acres (HSG C) of Pervious Cover would require a 65% reduction to meet the required Site-Specific Pollutant Load Reduction. The newly added 1.2 acres of Impervious Cover would require a 100% annual pollutant load reduction. Table 2 below summarizes the allowable load and required reductions that would need to occur for this site.

Table 2. Summary of allowable stormwater loads and stormwater load reduction requirements for Example 1.

	Existing Impervious cover	Existing Pervious cover	New Impervious cover	Total
Acres	7.0 acres	0.5 acres	1.2 acres	8.7 acres
PLER	1.78 lb/ac-yr	0.21 lb/ac-yr	1.78 lb/ac-yr	-----
Load (= Area * PLER)	12.46 lbs/yr	0.11 lbs/yr	2.14 lbs/yr	14.71 lbs/yr
Reduction requirement	65% (Mashapaug Pond Subwatershed)	65% (Mashapaug Pond Subwatershed)	100% (Complete reduction)	-----
Site Specific Reduction	8.10 lbs/yr	0.07 lbs/yr	2.14 lbs/yr	10.31 lbs/yr
Allowable load (= Load - Reduction requirement)	4.36 lbs/yr	0.04 lbs/yr	0.0 lbs/yr	4.40 lbs/yr

All other permit conditions apply to the site.

Example 2. A site in the Mashapaug Pond Subwatershed has 0.75 acres of IC at the time of permit issuance and the owner or operator subsequently adds 0.5 acres of IC. Now that the site exceeds the 1 acre permitting threshold, the site becomes eligible for permit coverage and the site owner must submit an NOI. However, a SCP is not required as the site's IC area does not meet or exceed 7 acres. All other permit requirements applicable to sites with <7 acres of IC would apply.

Appendix D

Phosphorus Reduction Credits for Selected Non-Structural and Structural Stormwater Control Measures (SCMs)

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PART 1. Methods to Calculate Phosphorus Load Reductions for Non-Structural Stormwater Control Measures (SCMs)

1.1. Introduction

The permittee shall use the following methods to calculate phosphorus load reduction credits for the following enhanced non-structural control practices implemented:

- 1) Enhanced Street Sweeping Program;
- 2) Catch Basin Cleaning; and
- 3) Organic Waste and Leaf Litter Collection Program.

The methods include the use of default Phosphorus reduction factors that EPA and RIDEM have determined are acceptable for calculating phosphorus load reduction credits for these practices.

The methods and annual phosphorus load export rates presented in this attachment are for the purpose of counting load reductions for various SCMs treating stormwater runoff from varying site conditions (i.e., impervious or pervious surfaces) and different land uses (e.g., industrial, institutional, residential, and commercial) within the watershed. **Table 1-1** below provides annual phosphorus load export rates by land use category for impervious and pervious areas. The estimates of annual phosphorus load and load reductions resulting from SCM implementation are intended for use by the permittee to measure compliance with its Phosphorus Load Reduction Requirement under the permit.

Examples are provided to illustrate use of the methods. In calculating phosphorus load export rates, the permittee shall select the land use category that most closely represents the actual use for the area in question. For sites with institutional type uses, such as government properties, hospitals, and schools, the permittee shall use the commercial/industrial land use category for the purpose of calculating phosphorus loads.

Table 1-2 provides a crosswalk table of phosphorus load export rate (PLER) land use categories and the corresponding RIGIS¹ land use/land cover codes used in Rhode Island.

To determine a permittee's applicable land use/land cover code, refer to the following RIDEM GIS Land Use/Landcover Lookup, which is available online:
<https://ridemgis.maps.arcgis.com/apps/instant/lookup/index.html?appid=e3b630a879914553a1fb1ed342bb8b03>

For pervious areas, permittees should use the appropriate value for the hydrologic soil group (HSG) if known; otherwise, assume HSG C conditions.

¹ RI Geographic Information System (RIGIS): <https://www.rigis.org/>

Table 1-1. Average annual distinct Phosphorus Load Export Rates (PLERs) for use in estimating Phosphorus load reduction credits in the Mashapaug General Permit.

Phosphorus Source Category by Land Use	Land Surface Cover	Phosphorus Load Export Rate, lbs/acre-year
Commercial (Com) and Industrial (Ind)	Directly connected impervious	1.78
	Pervious	See* DevPERV
Multi-Family (MFR) and High-Density Residential (HDR)	Directly connected impervious	2.32
	Pervious	See* DevPERV
Medium (MDR) and Low Density Residential (LDR)	Directly connected impervious	1.96
	Pervious	See* DevPERV
Highway (HWY)	Directly connected impervious	1.34
	Pervious	See* DevPERV
Forest (For)	Directly connected impervious	1.52
	Pervious	See* DevPERV
Open Land (Open)	Directly connected impervious	1.52
	Pervious	See* DevPERV
Agriculture (Ag)	Directly connected impervious	1.52
	Pervious	See* DevPERV
*Developed Land Pervious (DevPERV) – HSG A	Pervious	0.03
*Developed Land Pervious (DevPERV) – HSG B	Pervious	0.12
*Developed Land Pervious (DevPERV) – HSG C	Pervious	0.21
*Developed Land Pervious (DevPERV) – HSG D	Pervious	0.37
Notes: <ul style="list-style-type: none"> • For pervious areas, if the hydrologic soil group (HSG) is known, use the appropriate value from this table. If the HSG is not known, assume HSG C conditions for the phosphorus load export rate. • Agriculture includes row crops. Actively managed hay fields and pasture lands. Institutional land uses such as government properties, hospitals and schools are to be included in the commercial and industrial land use grouping for the purpose of calculating phosphorus loading. • Impervious surfaces within the forest land use category are typically roadways adjacent to forested pervious areas. 		

Table 1-2. Crosswalk of 2020 RIGIS Land Use/Land Cover Codes and Corresponding PLER Land Use Categories

RIGIS Land Use/Land Cover Codes	Description	PLER Land Use Categories
111	High Density Residential (<1/8 acre lots)	High-Density Residential
112	Medium High Density Residential (1/4 to 1/8 acre lots)	Medium Density Residential
113	Medium Density Residential (1 to 1/4 acre lots)	Medium Density Residential
114	Medium Low Density Residential (1 to 2 acre lots)	Medium Density Residential
115	Low Density Residential (>2 acre lots)	Low Density Residential
120	Commercial (sale of products and services)	Commercial
130	Industrial (manufacturing, design, assembly, etc.)	Industrial
141	Roads (divided highways >200' plus related facilities)	Highway (HWY)
142	Airports (and associated facilities)	Highway (HWY)
143	Railroads (and associated facilities)	Highway (HWY)
144	Water and Sewage Treatment	Industrial
145	Waste Disposal (landfills, junkyards, etc.)	Industrial
146	Power Lines (100' or more width)	Open Land
147	Other Transportation (terminals, docks, etc.)	Highway (HWY)
148	Ground-mounted Solar Energy Systems	Open Land
149	Wind Energy Systems	Open Land
151	Commercial/Residential Mixed	Medium Density Residential
152	Commercial/Industrial Mixed	Industrial
161	Developed Recreation (all recreation)	Open Land
162	Vacant Land	Open Land
163	Cemeteries	Open Land
170	Institutional (schools, hospitals, churches, etc.)	Commercial
210	Pasture (agricultural not suitable for tillage)	Agriculture
220	Cropland (tillable)	Agriculture
230	Orchards, Groves, Nurseries	Forest

240	Confined Feeding Operations	Industrial
250	Idle Agriculture (abandoned fields and orchards)	Agriculture
300	Brushland (shrub and brush areas, reforestation)	Open Land
410	Deciduous Forest (>80% hardwood)	Forest
420	Softwood Forest (>80% softwood)	Forest
430	Mixed Forest	Forest
500	Water	Water
600	Wetland	Forest
710	Beaches	Open Land
720	Sandy Areas (not beaches)	Open Land
730	Rock Outcrops	Open Land
740	Mines, Quarries and Gravel Pits	Industrial
750	Transitional Areas (urban open)	Open Land
760	Mixed Barren Areas	Open Land

1.1.1. Alternative Methods and/or Phosphorus Reduction Factors

A permittee may propose alternative methods and/or phosphorus reduction factors for calculating phosphorus load reduction credits for these non-structural practices subject to RIDEM review and approval.

RIDEM will consider alternative methods and/or phosphorus reduction factors, provided that the permittee submits adequate supporting documentation to RIDEM. At a minimum, supporting documentation shall consist of a description of the proposed method, the technical basis of the method, identification of alternative phosphorus reduction factors, supporting calculations, and identification of references and sources of information that support the use of the alternative method and/or factors in the watershed.

A permittee may not use alternative methods to satisfy the permit requirements without prior approval from RIDEM. The use of alternative methods, including the time required to obtain RIDEM approval, does not waive or extend the deadline to develop and submit the SCP in accordance with the schedules outlined in the permit.

If RIDEM determines that the alternative methods and/or factors are not adequately supported, RIDEM will so notify the permittee, and the permittee may not receive phosphorus reduction credit for such methods. Those permittees may only receive reduction credits following the methods in this attachment for the identified practices.

1.2. Phosphorus Load Reduction Credit Calculations for Non-Structural Stormwater Control Measures (SCMs)

1.2.1. Enhanced Sweeping Program

The permittee may earn a phosphorus reduction credit for conducting an enhanced sweeping program of impervious surfaces.

For the purposes of the Mashapaug General Permit, Permittees shall determine the land use associated with any onsite sweeping area as listed in **Table 1-1**.

Table 1-3 below outlines the default phosphorus removal factors for enhanced sweeping programs. The credit shall be calculated by using the following equation:

$$\text{Credit}_{\text{sweeping}} = \text{IA}_{\text{swept}} * \text{PLER}_{\text{IC-land use}} * \text{PRF}_{\text{sweeping}}$$

Equation 1-1. Enhanced Sweeping Program

Where:

$\text{Credit}_{\text{sweeping}}$ = Amount of phosphorus load removed by enhanced sweeping program (lb/year)

IA_{swept} = Area of impervious surface that is swept under the enhanced sweeping program (acres)

$\text{PLER}_{\text{IC-land use}}$ = Phosphorus Load Export Rate for impervious cover and specified land use (lb/acre-yr) (see **Table 1-1**)

$\text{PRF}_{\text{sweeping}}$ = Phosphorus Reduction Factor for sweeping based on sweeper type and frequency (see **Table 1-3**).

If a permittee includes driveways or other linear features in their street sweeping program, the Permittee can use the equation below to convert the area of the linear features swept to acres.

$$\text{Area Swept [ac]} = \frac{\text{Distance Swept [mi]} * \text{Sweeper Width [8 ft]} * 5280\text{ft} * 1\text{ ac}}{43560\text{ ft}^2 * 1\text{ mi}}$$

Table 1-3. Phosphorus reduction efficiency factors ($PRF_{sweeping}$) for sweeping impervious areas

Level	Frequency	Sweeper Technology	$PRF_{sweeping}$
Minimum Effort	2/year (spring and fall)	Mechanical Broom	0.01
		Vacuum Sweeper	0.02
Medium Effort	Every other week in the fall (September 1 to December 15)	Mechanical Broom or Vacuum Sweeper	0.15
High Effort	Monthly sweeping March through August with weekly sweeping in the Fall (September to December)	Vacuum Sweeper	0.25

As an alternative, the permittee may apply a credible sweeping model of the watershed and perform continuous simulations reflecting build-up and wash-off of phosphorus using long-term local rainfall data.

Example 1-1. Calculation of enhanced sweeping program credit ($Credit_{sweeping}$)

A permittee proposes to implement an enhanced sweeping program and perform monthly sweeping from March through August and weekly sweeping from September 1 to December 15 at their site, using a vacuum assisted sweeper on 20.3 acres of parking lots on a commercial site. For this site, the needed information is:

$IA_{swept} = 20.3$ acres
 $PLER_{IC-land\ use} = 1.78$ lb/acre-yr (from **Table 1-1**)
 $PRF_{sweeping} = 0.25$ (from **Table 1-3**)

Substitution into **Equation 1-1** yields a $Credit_{sweeping}$ of 9.03 pounds of phosphorus removed per year.

$Credit_{sweeping} = IA_{swept} * PLE_{land\ use} * PRF_{sweeping}$
 $= 20.3 \text{ acres} * 1.78 \text{ lbs/acre-yr} * 0.25$
 $= 9.03 \text{ lbs/yr}$

1.2.2. Catch Basin Cleaning

The permittee may earn a phosphorus reduction credit, $Credit_{CB}$, by removing accumulated materials from catch basins (i.e., catch basin cleaning) such that a minimum sump storage capacity of 50% is maintained throughout the year. The credit shall be calculated by using the following equation:

$$Credit_{CB} = IA_{CB} * PLER_{IC-land\ use} * PRF_{CB}$$

Equation 1-2. Catch Basin Cleaning

Where:

- Credit_{CB} = Amount of phosphorus load removed by catch basin cleaning (lb/year)
- IA_{CB} = Impervious drainage area to catch basins (acres)
- PLER_{IC-land use} = Phosphorus Load Export Rate for impervious cover and specified land use (lb/acre-yr) (see **Table 1-1**)
- PRF_{CB} = Phosphorus Reduction Factor for catch basin cleaning (see **Table 1-4**)

Table 1-4. Phosphorus reduction efficiency factor (PRF_{CB}) for semi-annual catch basin cleaning

Frequency	Practice	PRF _{CB}
Semi-annual	Catch Basin Cleaning	0.02

Example 1-2. Calculation for catch basin cleaning credit (Credit_{CB})

A permittee proposes to clean catch basins on their site (i.e., remove accumulated sediments and contaminants captured in the catch basins) that drain runoff from 15.2 acres of commercial impervious area. For this site the needed information is:

- IA_{CB} = 15.2 acre
- PLER_{IC-land use} = 1.78 lbs/acre-yr (from **Table 1-1**)
- PRF_{CB} = 0.02 (from **Table 1-4**)

Substitution into **Equation 1-2** yields a Credit_{CB} of 0.54 pounds of phosphorus removed per year:

$$\begin{aligned}
 \text{Credit}_{CB} &= \text{IA}_{CB} * \text{PLE}_{IC-land use} * \text{PRF}_{CB} \\
 &= 15.2 \text{ acre} * 1.78 \text{ lbs/acre-yr} * 0.02 \\
 &= \mathbf{0.54 \text{ lbs/yr}}
 \end{aligned}$$

1.2.3. Enhanced Organic Waste and Leaf Litter Collection Program

The permittee may earn a phosphorus reduction credit by performing regular gathering, removal and disposal of landscaping wastes, organic debris, and leaf litter from impervious surfaces from which runoff discharges to a receiving water. To earn this credit (Credit_{leaf litter}), the permittee must gather and remove all landscaping wastes, organic debris, and leaf litter from impervious roadways and parking lots at least once per week during the period of September 1 to December 15 of each year. Credit can only be earned for those impervious surfaces that are cleared of organic materials in accordance with the description above. The gathering and removal shall occur immediately following any landscaping activities in the subwatershed and at additional times when necessary to achieve a weekly cleaning frequency. The permittee must ensure that the disposal of these materials will not contribute pollutants to any surface water discharges. The permittee may use an enhanced sweeping program (e.g., weekly frequency) as part of earning this credit provided that the sweeping is effective at removing leaf litter and organic materials. The Credit_{leaf litter} shall be determined by the following equation:

$$\text{Credit}_{\text{leaf litter}} = (\text{Drainage Area}) * (\text{PLER}_{\text{IC-land use}}) * (0.05)$$

Equation 1-3. Enhanced Organic Waste and Leaf Litter Collection Program

Where:

- Credit_{leaf litter} = Amount of phosphorus load reduction credit for organic waste and leaf litter collection program (lb/year)
- Drainage Area = All impervious area (acre) from which runoff discharges to the receiving water or its tributaries
- PLER_{IC-land use} = Phosphorus Load Export Rate for impervious cover and specified land use (lbs/acre-yr) (see **Table 1-1**)
- 0.05 = 5% phosphorus reduction factor for organic waste and leaf litter collection program

Example 1-3. Calculation for organic waste and leaf litter collection program credit (Credit_{leaf litter})

A permittee proposes to implement an organic waste and leaf litter collection program by sweeping the parking lots and access drives at a minimum of once per week using a mechanical broom sweeper for the period of September 1 to December 15 over 12.5 acres of impervious roadways and parking lots on an industrial/commercial site. Also, the permittee will ensure that organic materials are removed from impervious areas immediately following all landscaping activities at the site. For this site, the needed information to calculate the Credit_{leaf litter} is:

- Watershed Area = 12.5 acres; and
 PLER_{IC-commercial} = 1.78 lbs/acre-yr (from **Table 1-1**)

Substitution into **Equation 1-3** yields a Credit_{leaf litter} of 1.11 pounds of phosphorus removed per year:

$$\begin{aligned} \text{Credit}_{\text{leaf litter}} &= (12.5 \text{ acres}) * (1.78 \text{ lbs/acre-yr}) * (0.05) \\ &= \mathbf{1.11 \text{ lbs/yr}} \end{aligned}$$

The permittee also may earn a phosphorus reduction credit for enhanced sweeping of roads and parking lot areas (i.e., $\text{Credit}_{\text{sweeping}}$) for the 3.5 months of use. Using **Equation 1-1**, $\text{Credit}_{\text{sweeping}}$ is:

$$\begin{aligned}\text{Credit}_{\text{sweeping}} &= \text{IA}_{\text{swept}} * \text{PLE}_{\text{IC-land use}} * \text{PRF}_{\text{sweeping}} \\ \text{IA}_{\text{swept}} &= 12.5 \text{ acres} \\ \text{PLER}_{\text{IC-commercial}} &= 1.78 \text{ lbs/acre-yr (from Table 1-1)} \\ \text{PRF}_{\text{sweeping}} &= 0.15 \text{ (from Table 1-3)}\end{aligned}$$

Substitution into **Equation 1-1** yields a $\text{Credit}_{\text{sweeping}}$ of 3.34 pounds of phosphorus removed per year.

$$\begin{aligned}\text{Credit}_{\text{sweeping}} &= \text{IA}_{\text{swept}} * \text{PLER}_{\text{IC-commercial}} * \text{PRF}_{\text{sweeping}} \\ &= 12.5 \text{ acres} * 1.78 \text{ lbs/acre-yr} * 0.15 \\ &= \mathbf{3.34 \text{ lbs/yr}}\end{aligned}$$

PART 2. Methods to Calculate Phosphorus Load Reductions for Structural Stormwater Control Measures (SCMs)

2.1. Introduction

This section of Appendix D provides methods to determine design storage volume capacities and to calculate phosphorus load reductions for the following Stormwater Control Measures (SCMs):

1. Infiltration Trench
2. Surface Infiltration Practices (e.g., basins, rain gardens, bio-retention, etc.)
3. Bio-filtration Practice
4. Gravel Wetland System (i.e., Wet Vegetated Treatment System (WVTS))
5. Enhanced Bio-filtration with Internal Storage Reservoir (ISR)
6. Sand Filter
7. Porous Pavement
8. Wet Pond or Wet Detention Basin
9. Dry Pond or Extended Dry Detention Basin
10. Dry Water Quality Grass Swale with Detention
11. Impervious Area Disconnection through Storage (e.g., rain barrels, cisterns, etc.)
12. Impervious Area Disconnection
13. Conversions of Impervious Area to Permeable Pervious Area
14. Soil Amendments to Enhance Permeability of Pervious Areas

Methods and examples are provided to calculate phosphorus load reductions for SCMs for the four following purposes:

1. To determine the design volume of a SCM to achieve a known phosphorus load reduction target when the contributing drainage area is 100% impervious;
2. To determine the phosphorus load reduction for a SCM with a known design volume capacity when the contributing drainage area is 100% impervious;
3. To determine the design volume of a SCM to achieve a known phosphorus load reduction target when the contributing drainage area has impervious and pervious surfaces; and
4. To determine the phosphorus load reduction for a SCM with a known design volume capacity when the contributing drainage area has impervious and pervious surfaces.

Examples are also provided for estimating phosphorus load reductions associated with impervious area disconnections, conversions of impervious area to permeable pervious area, and soil amendments to enhance permeability of pervious area.

Also, this Appendix provides the methodology for calculating the annual stormwater phosphorus load that will be delivered to SCMs for treatment (“SCM Load”) and to be used for quantifying phosphorus load reduction credits. The methods and annual phosphorus export load rates presented in this Appendix are for calculating load reductions for various SCMs

treating stormwater runoff from varying site conditions (e.g., impervious surfaces) and different land uses (e.g., commercial, industrial, residential, and institutional). The estimates of annual phosphorus load and load reductions resulting from SCM implementation are intended for use by the permittee to demonstrate compliance with its Phosphorus Load Reduction Requirement.

2.2. SCM Performance Credits (SCMs 1-10 above)

For each SCM type identified above (SCMs 1-10), long-term cumulative performance information is provided to calculate phosphorus load reductions or to determine needed design storage volume capacities to achieve a specified reduction target (e.g., 68% phosphorus load reduction). The performance information is expressed as cumulative phosphorus load removed (% removed) depending on the physical storage capacity of the SCM (expressed as inches of runoff from impervious area) and is provided at the end of this Appendix (see **Table 2-3** through **Table 2-24** and performance curves **Figure 2-5** through **Figure 2-26**). Multiple tables and performance curves are provided for the infiltration practices to represent cumulative phosphorus load reduction performance for seven infiltration rates (“IR”), 0.10, 0.17, 0.27, 0.53, 1.02, 2.41, and 8.27 inches/hour. These infiltration rates represent the saturated hydraulic conductivity of the soils. The permittee may use the performance curves provided in this attachment to interpolate phosphorus load removal reductions for field measured infiltration rates that are different than the infiltration rates used to develop the performance curves. Otherwise, the permittee shall use the performance curve for the IR that is nearest, but less than, the field measured rate.

The Design Storage Volume (“DSV”) or physical storage capacity (as referred to on the x-axis of performance curves) equals the total physical storage volume of the control structure to contain water at any instant in time. Typically, this storage capacity is comprised of the surface ponding storage volume prior to overflow and subsurface storage volumes in storage units and pore spaces of coarse filter media. **Table 2-2** provides the formulae to calculate physical storage capacities for the structural control types for using the performance curves.

2.2.1. Impervious area disconnections, conversions of impervious area to permeable pervious area, and soil amendments to enhance permeability of pervious area (SCMs 11-14 above)

For each of these SCMs (SCMs 11-14) identified above, long-term cumulative performance information is provided to calculate phosphorus load reductions or to determine needed design specifications to achieve a desired reduction target (e.g., 65% phosphorus load reduction). The performance information is expressed as cumulative runoff volume reduction (% removed) depending on the design specifics and actual field conditions. Cumulative percent runoff volume reduction is being used as a surrogate to estimate the cumulative phosphorus load reduction credits for these SCMs.

To represent a wide range of potential conditions for implementing these types of SCMs, numerous performance tables and curves have been developed to reflect a wide range of potential conditions and designs such as varying storage volumes (expressed in terms of varying ratios of storage volume to impervious area (0.1 to 2.0 inches)); varying ratios of impervious

source area to receiving pervious area based on hydrologic soil groups (“HSGs”) A, B, C and D (8:1, 6:1, 4:1, 2: 1 and 1:1); and varying discharge time periods for temporary storage (1, 2 or 3 days). The credits are provided at the end of this Attachment (see **Table 2-25** through **Table 2-32** and performance curves **Figure 2-27** through **Figure 2-47**).

RIDEM will consider phosphorus load reductions calculated using the methods provided below to be valid for demonstrating compliance with the terms of this permit for SCMs or SCMs that have not been explicitly modeled, if the desired SCM has functionality that is similar to one of the simulated SCM or SCM types. Regarding functionality, only the surface infiltration, the infiltration trench, impervious area disconnections, conversions of impervious area to permeable pervious area, and soil amendments to enhance permeability of pervious area were simulated to direct stormwater runoff into the ground (i.e., infiltration). All other simulated SCMs represent practices that are not hydraulically connected to the sub-surface soils (i.e., no infiltration) and have either under-drains or impermeable liners. Following are some simple guidelines for selecting the SCM type and/or determining whether the results of any of the SCM types provided are appropriate for another SCM of interest.

2.2.2. Infiltration Trench

An infiltration trench is a practice that provides temporary storage of runoff using the void spaces within the soil/sand/gravel mixture that is used to backfill the trench for subsequent infiltration into the surrounding sub-soils. Performance results for the infiltration trench can be used for all subsurface infiltration practices including systems that include pipes and/or chambers that provide temporary storage. Also, the results for this SCM type can be used for bio-retention systems that rely on infiltration when the majority of the temporary storage capacity is provided in the void spaces of the soil filter media and porous pavements that allow infiltration to occur. General design specifications for infiltration trench systems are provided in Part 8.21 entitled Stormwater Infiltration of the [Stormwater Management, Design and Installation Rules](#) and Part 5.3 in the [Rhode Island Stormwater Design and Installation Standards Manual \(RISDISM\)](#).

2.2.3. Surface Infiltration Practices (e.g., basins, rain gardens, and bio-retention)

Infiltration basins provide temporary surface storage of runoff (e.g., ponding) for subsequent infiltration into the ground. Appropriate practices for use of the performance estimates include infiltration basins, infiltration swales (not conveyance swales), rain gardens, bio-retention systems, and other surface infiltration systems that rely on infiltration and provide the majority of storage capacity through surface-ponding. If an infiltration system includes both surface storage through ponding and a lesser storage volume within the void spaces of a coarse filter media, then the physical storage volume capacity used to determine the long-term cumulative phosphorus removal efficiency from the infiltration basin performance curves would be equal to the sum of the surface storage volume and the void space storage volume. General design specifications for various surface infiltration practices can be found in Part 8.21 in the [Stormwater Management, Design and Installation Rules](#) and Part 5.3 in the [Rhode Island Stormwater Design and Installation Standards Manual \(RISDISM\)](#).

2.2.4. Bio-filtration Practice

Bio-filtration provides temporary storage of runoff for filtering through an engineered soil media. The storage capacity is typically made of void spaces in the filter media and temporary ponding at the surface of the practice. Once the runoff has passed through the filter media, it is collected by an under-drainpipe for discharge. The performance curve for this control practice assumes zero infiltration. If a filtration system has subsurface soils that are suitable for infiltration, then user should use the either performance curves for the infiltration trench or the infiltration basin depending on the predominance of storage volume made up by free standing storage or void space storage. Depending on the design of the filter media manufactured or packaged bio-filter systems such as tree box filters may be suitable for using the bio-filtration performance results. Design specifications for bio-filtration systems are provided in Part 8.23 entitled Filtering Systems of the [Stormwater Management, Design and Installation Rules](#) and Part 5.5 in the [Rhode Island Stormwater Design and Installation Standards Manual \(RISDISM\)](#).

2.2.5. Gravel Wetland System (i.e., Wet Vegetated Treatment System (WVTS))

Gravel Wetland performance statistics should be used for practices that have been designed in accordance or share similar features with the design specifications for Wet Vegetated Treatment Systems (WVTS) provided in Part 8.20 of the [Stormwater Management, Design and Installation Rules](#) and Part 5.2 in the [Rhode Island Stormwater Design and Installation Standards Manual \(RISDISM\)](#).

2.2.6. Enhanced Bio-filtration with Internal Storage Reservoir (ISR)

Enhanced bio-filtration with internal storage reservoir (ISR) provides temporary storage of runoff for filtering through an engineered soil media, augmented for enhanced phosphorus removal, followed by detention and denitrification in a subsurface internal storage reservoir (ISR) comprised of gravel. Runoff flows are routed through filter media and directed to the underlying ISR via an impermeable membrane for temporary storage. An elevated outlet control at the top of the ISR is designed to provide a retention time of at least 24 hours in the system prior to discharge. The design storage capacity for using the cumulative performance curves is comprised of void spaces in the filter media, temporary ponding at the surface of the practice and the void spaces in the gravel ISR. The cumulative phosphorus load reduction curve for this control is intended to be used for systems in which the filter media has been augmented with materials designed and/or known to be effective at capturing phosphorus. If the filter media is not augmented to enhance phosphorus capture, then the phosphorus performance curve for the Bio-Filter should be used for estimating phosphorus load reductions. See the [New England Stormwater Retrofit Manual](#) for additional guidance.

2.2.7. Sand Filter

Sand Filter performance statistics should be used for practices that have been designed in accordance or share similar features with the design specifications for sand filter systems provided in Part 8.23 entitled Filtering Systems of the [Stormwater Management, Design and Installation Rules](#) and Part 5.5 in the [Rhode Island Stormwater Design and Installation Standards Manual \(RISDISM\)](#).

2.2.8. Porous Pavement

Porous Pavement has an impermeable under-liner and an under-drain. If porous pavement systems do not have an impermeable under-liner so that filtered runoff can infiltrate into sub-soils, then the performance results for an infiltration trench may be used for these systems. Design specifications for porous pavement systems are provided in Part 8.22 entitled Permeable Paving of the [Stormwater Management, Design and Installation Rules](#) and Part 5.4 in the [Rhode Island Stormwater Design and Installation Standards Manual \(RISDISM\)](#).

2.2.9. Wet Pond or Wet Detention Basin

Wet Ponds or Wet Detention Basins performance statistics should only be used for practices that have been designed in accordance with the design specifications for Wet Extended Detention Basins provided in Part 8.33 entitled Quantity Control – Stormwater Basins of the [Stormwater Management, Design and Installation Rules](#) and Part 7.2 in the [Rhode Island Stormwater Design and Installation Standards Manual \(RISDISM\)](#).

2.2.10. Dry Pond or Extended Dry Detention Basin

Dry Ponds or Extended Dry Detention Basins performance statistics should only be used for practices that have been designed in accordance with the design specifications for Extended Dry Detention Basins provided in Part 8.33 entitled Quantity Control – Stormwater Basins of the provided in the [Stormwater Management, Design and Installation Rules](#) and Part 7.2 in the [Rhode Island Stormwater Design and Installation Standards Manual \(RISDISM\)](#).

2.2.11. Dry Water Quality Grass Swale with Detention

Water Quality Grass Swale with Detention performance results should only be used for practices that have been designed in accordance with the design specifications for a dry water quality swale with check dams to temporarily store the target storage volume. Refer to Part 8.25 entitled Open Channel Systems in the [Stormwater Management, Design and Installation Rules](#) and Part 5.7 in the [Rhode Island Stormwater Design and Installation Standards Manual \(RISDISM\)](#).

2.2.12. Impervious Area Hydrologic Disconnection using Storage (e.g., rain barrels, cisterns, etc.)

Impervious Area Hydrologic Disconnection using Storage performance results are for collecting runoff volumes from impervious areas such as roof tops, providing temporary storage of runoff volume using rain barrels, cisterns, or other storage containers, and discharging stored volume to adjacent vegetated permeable pervious surfaces over an extended period of time. All impervious area disconnection projects must be designed to ensure that the permeable area to receive runoff from adjacent impervious areas are of sufficient size with adequate soils to receive the runoff without causing negative impacts to adjacent down-gradient properties. Careful consideration must be given to the ratio of impervious area to the pervious area that will receive the discharge. Also, devices such as level spreaders to disperse the discharge and provide sheet flow should be employed whenever needed to increase recharge and avoid flow concentration and short circuiting through the pervious area. Soil testing is needed to classify

the permeability of the receiving pervious area in terms of HSG. See the [New England Stormwater Retrofit Manual](#) for additional guidance.

2.2.13. Impervious Area Hydrologic Disconnection

Impervious Area Hydrologic Disconnection performance results are for diverting runoff volumes from impervious areas such as roadways, parking lots and roof tops, and discharging it to adjacent vegetated permeable surfaces that are of sufficient size with adequate soils to receive the runoff without causing negative impacts to adjacent down-gradient properties. Careful consideration must be given to the ratio of impervious area to the pervious area that will receive the discharge. Also, devices such as level spreaders to disperse the discharge and provide sheet flow should be employed whenever needed to increase recharge and avoid flow concentration and short circuiting through the pervious area. Soil testing is needed to classify the permeability of the receiving pervious area in terms of HSG. Some useful design guidelines and considerations may be found in the [Rhode Island Low Impact Development Site Planning and Design Guidance Manual](#) and the [New England Stormwater Retrofit Manual](#).

2.2.14. Conversion of Impervious Area to Permeable Pervious Area

Conversion of Impervious Area to Permeable Pervious Area phosphorus load reduction credits are for replacing existing impervious surfaces (such as traditional pavements and buildings with roof tops) with permeable surfaces. To be eligible for credit, it is essential that the area previously covered with impervious surface be restored to provide natural or enhanced hydrologic functioning so that the surface is permeable. Sub-soils beneath pavements are typically highly compacted and will require reworking to loosen the soil and the possible addition of soil amendments to restore permeability. Soil testing is needed to classify the permeability (in terms of HSG) of the restored pervious area.

2.2.15. Soil Amendments to Increase Permeability of Pervious Areas

Soil Amendments to Increase Permeability of Pervious Area performance results are for the practice of improving the permeability of pervious areas through incorporation of soil amendments, tilling, and establishing dense vegetation. This practice may be used to compliment other practices such as impervious area disconnection to improve overall performance and increase reduction credits earned. Soil testing is needed to classify the permeability (in terms of HSG) of the restored pervious area.

2.3. Method to Calculate Annual Phosphorus Load Delivered to SCMs (SCM Load)

The SCM Load is the annual phosphorus load from the drainage area to each proposed or existing SCM used by the permittee to claim credit against its stormwater phosphorus load reduction requirement (i.e., Phosphorus Reduction Requirement). The SCM Load is the starting point from which the permittee calculates the reduction in phosphorus load achieved by each existing and proposed SCM.

Examples are provided to illustrate use of the methods. **Table 1-1** provides annual phosphorus load export rates (PLERs) by land use category for impervious areas. The permittee shall select

the land use categories that most closely represents the actual uses of the drainage areas tributary to the SCM. For drainage areas with institutional type uses, such as universities, religious institutions, hospitals, and schools, the permittee shall use the commercial/industrial land use category to calculate phosphorus loads. **Table 1-2** provides a crosswalk table of phosphorus load export rate (PLER) land use categories and the corresponding RIGIS land use/land cover codes used in Rhode Island.

2.3.1. Calculating Annual Stormwater Phosphorus Load Directed to SCM

To estimate the annual phosphorus load reduction for a given stormwater SCM, it is first necessary to estimate the amount of annual stormwater phosphorus load that will be directed to the SCM (SCM Load).

For a given SCM:

1. Determine the total drainage area to the SCM;
2. Distribute the total drainage area into impervious subareas by land use category as defined by **Table 1-1** and **Table 1-2**;
3. Calculate the phosphorus load for each land use-based impervious subarea by multiplying the subarea by the appropriate phosphorus load export rate (PLER) provided in **Table 1-1**; and
4. Determine the total annual phosphorus loads to the SCM by summing the calculated impervious subarea phosphorus loads.

Example 2-1. Determine Phosphorus Loads to a Proposed SCM.

A permittee is proposing a surface stormwater infiltration system that will treat runoff from an industrial site that has a total drainage area of 12.87 acres comprised of 10.13 acres of impervious cover (e.g., roadways, parking areas and rooftops), 1.85 acres of landscaped pervious area and 0.89 acres of wooded area both with HSG C soils. The drainage area information for the proposed SCM is:

SCM Subarea ID	Land Use Category	Cover Type	Area (acres)	PLER (lbs/acre-yr)*
1	Industrial	impervious	10.13	1.78
2	Landscaped (HSG C)	pervious	1.85	0.21
3	Forest (HSG C)	pervious	0.89	0.21

*From **Table 1-1**

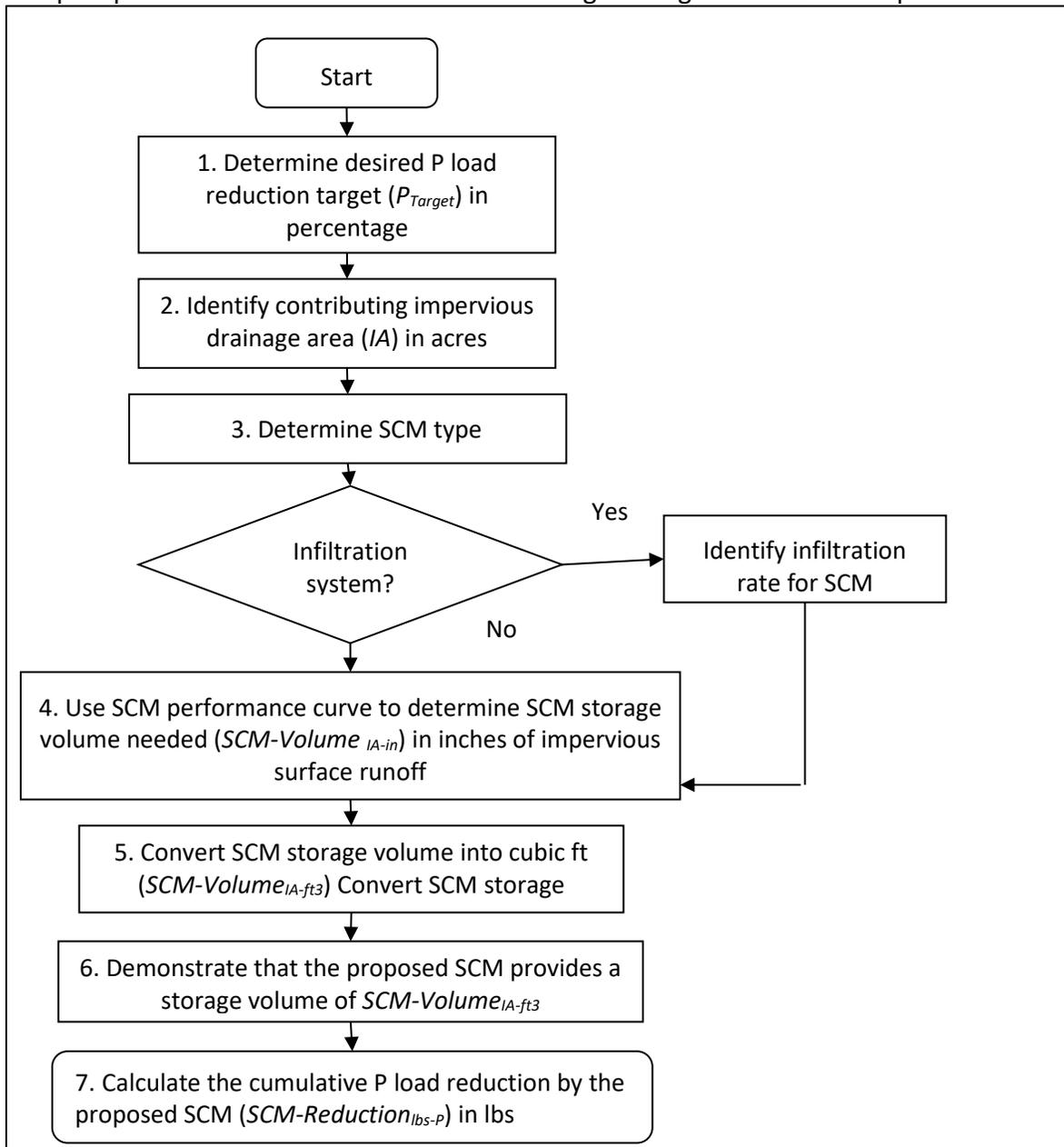
The phosphorus load to the proposed SCM (SCM Load_P) is calculated as:

$$\begin{aligned}
 \text{SCM Load}_P &= (IA_{\text{Ind}} * \text{PLER}_{\text{Ind}}) + (PA_{\text{Land}} * \text{PLER}_{\text{Land}}) + (PA_{\text{For}} * \text{PLER}_{\text{For}}) \\
 &= (10.13 * 1.78) + (1.85 * 0.21) + (0.89 * 0.21) \\
 &= \mathbf{18.61 \text{ lbs P/year}}
 \end{aligned}$$

2.4. Methods to determine the design volume of a SCM or determine a phosphorus (P) load reduction target based on drainage area characteristics.

2.4.1. Method to determine the design volume of a SCM to achieve a known phosphorus (P) load reduction target when the contributing drainage area is 100% impervious.

Figure 2-1. illustrates the steps in the method to determine SCM design volume to achieve a known phosphorus load reduction when contributing drainage area is 100% impervious.



Below are the steps in the method to determine the design volume of a SCM to achieve a known phosphorus (P) load reduction target when the contributing drainage area is 100% impervious:

- 1) Determine the desired cumulative phosphorus load reduction target (P_{Target}) in percentage for the SCM;
- 2) Determine the contributing impervious drainage area (IA) in acres to the SCM;
- 3) Determine the SCM type (e.g., infiltration trench, gravel wetland). For infiltration systems, determine the appropriate infiltration rate for the location of the SCM;
- 4) Using the cumulative phosphorus removal performance curves for the selected SCM (**Figure 2-5 to Figure 2-26**), determine the storage volume for the SCM (SCM-Volume_{IA-in}), in inches of runoff, needed to treat runoff from the contributing IA to achieve the reduction target;
- 5) Calculate the corresponding SCM storage volume in cubic feet (SCM-Volume_{IA-ft³}) using SCM-Volume_{IA-in} determined from step 4 and **Equation 2-1**, below:

$$\text{SCM-Volume}_{\text{IA-ft}^3} = \text{IA (acre)} * \text{SCM-Volume}_{\text{IA-in}} * 3630 \text{ ft}^3/\text{ac-in}$$

Equation 2-1. SCM Design Storage Volume Determination in cubic feet

- 6) Provide supporting calculations using the dimensions and specifications of the proposed SCM showing that the necessary storage volume capacity, SCM-Volume_{IA-ft³}, determined from step 5 will be provided to achieve the P_{Target} ; and
- 7) Calculate the cumulative P load reduction in pounds of P (SCM-Reduction_{lbs-P}) for the SCM using the SCM Load (as demonstrated in **Example 2-1**) and P_{Target} by using **Equation 2-2**:

$$\text{SCM-Reduction}_{\text{lbs-P}} = \text{SCM Load} * (P_{\text{Target}} / 100)$$

Equation 2-2. SCM Reduction

Example 2-2. Determine the design volume of a SCM to achieve a known phosphorus (P) load reduction target when the contributing drainage area is 100% impervious.

A permittee is considering a surface infiltration practice to capture and treat runoff from 2.57 acres of commercial impervious area that will achieve a 70% reduction in average annual phosphorus load. The infiltration practice would be located adjacent to the impervious area. The permittee has measured an infiltration rate (IR) of 0.39 inches per hour (in/hr) in the vicinity of the proposed infiltration practice. Determine the:

- A. Design storage volume needed for a surface infiltration practice to achieve a 70% reduction in annual phosphorus load from the contributing drainage area (SCM-Volume_{IA-ft³}); and
- B. Cumulative phosphorus reduction in pounds that would be accomplished by the SCM (SCM-Reduction_{lbs-P})

Solution:

1. Phosphorus load reduction target (P_{Target}) = 70%
2. Contributing impervious drainage area (IA) = 2.57 acres
3. SCM type is a surface infiltration practice (i.e., basin) with an infiltration rate (IR) of 0.39 in/hr.
4. The performance curve for the infiltration basin (i.e., surface infiltration practice), **Figure 2-14**, IR = 0.27 in/hr is used to determine the design storage volume of the SCM (SCM-Volume_{IA-in}) needed to treat runoff from the contributing IA and achieve a $P_{\text{Target}} = 70\%$. The curve for an infiltration rate of 0.27 in/hr is chosen because 0.27 in/hr is the nearest simulated IR that is less than the field measured IR of 0.39 in/hr. From **Figure 2-14**, the SCM-Volume_{IA-in} for a $P_{\text{Target}} = 70\%$ is 0.36 in.
5. The SCM-Volume_{IA-in} is converted to cubic feet (SCM-Volume_{IA-ft³}) using **Equation 2-1**. SCM Design Storage Volume Determination:

$$\begin{aligned} \text{SCM-Volume}_{\text{IA-ft}^3} &= \text{IA (acre)} * \text{SCM-Volume}_{\text{IA-in}} * 3,630 \text{ ft}^3/\text{acre-in} \\ \text{SCM-Volume}_{\text{IA-ft}^3} &= 2.57 \text{ acre} * 0.36 \text{ in} * 3,630 \text{ ft}^3/\text{acre-in} \\ &= \mathbf{3,359 \text{ ft}^3} \end{aligned}$$
6. A narrow trapezoidal infiltration basin with the following characteristics is proposed to achieve the P_{Target} of 70%. As indicated in **Table 2-2**, the Design Storage Volume (DSV) of a surface infiltration practice is equal to the volume of surface ponding:

$$\text{DSV} = (L * ((W_{\text{bottom}} + W_{\text{top@Dmax}}) / 2) * D)$$

Length (ft)	Design Depth (ft)	Side Slopes	Bottom area (ft ²)	Pond surface area (ft ²)	Design Storage Volume (ft ³)
355	1.25	3:1	1,387	4,059	3,404

The proposed DSV of 3,404 ft³ exceeds the SCM-Volume_{IA-ft³} needed, 3,359 ft³ and therefore is sufficient to achieve the P_{Target} of 70%.

7. The cumulative phosphorus load reduction in pounds of phosphorus for the infiltration practice (SCM-Reduction_{lbs-P}) is calculated using **Equation 2-2**. SCM Reduction. The SCM Load is first determined using the method described above.

$$\begin{aligned}
 \text{SCM Load} &= \text{IA} * \text{impervious cover PLER for commercial use} \\
 &= 2.57 \text{ acres} * 1.78 \text{ lbs/acre-yr} \\
 &= 4.57 \text{ lbs/yr}
 \end{aligned}$$

$$\begin{aligned}
 \text{SCM-Reduction}_{\text{lbs-P}} &= \text{SCM Load} * (\text{P}_{\text{Target}} / 100) \\
 \text{SCM-Reduction}_{\text{lbs-P}} &= 4.57 \text{ lbs/yr} * (70/100) \\
 &= \mathbf{3.20 \text{ lbs/yr}}
 \end{aligned}$$

Alternate Solution: Alternatively, the permittee could determine the design storage volume needed for an IR = 0.39 in/hr by performing interpolation of the results from the surface infiltration performance curves for IR = 0.27 in/hr and IR = 0.52 in/hr as follows (replacing steps 3 and 4 on the previous page):

Using the performance curves for the infiltration basin (i.e., surface infiltration practice), **Figure 2-14**, IR = 0.27 in/hr and **Figure 2-15**, IR = 0.52 in/hr, interpolate between the curves to determine the design storage volume of the SCM (SCM-Volume_{IA-in}) needed to treat runoff from the contributing IA and achieve a P_{Target} = 70%.

First calculate the interpolation adjustment factor (“IAF”) to interpolate between the infiltration basin performance curves for infiltration rates of 0.27 and 0.52 in/hr:

$$\text{IAF} = (0.39 - 0.27) / (0.52 - 0.27) = 0.48$$

From the two performance curves, develop the following table to estimate the general magnitude of the needed storage volume for an infiltration swale with an IR = 0.39 in/hr and a P_{Target} of 70%.

Interpolation Table for determining design storage volume of infiltration basin with IR = 0.39 in/hr and a Phosphorus load reduction target of 70%:

SCM Storage Volume	% Phosphorus Load Reduction IR = 0.27 in/hr (PR _{IR=0.27})	% Phosphorus Load Reduction IR = 0.52 in/hr (PR _{IR=0.52})	Interpolated % Phosphorus Load Reduction IR = 0.39 in/hr (PR _{IR=0.39}) PR_{IR=0.39} = IAF (PR_{IR=0.52} - PR_{IR=0.27}) + PR_{IR=0.27}
0.3	64%	67%	65%
0.4	74%	77%	75%
0.5	79%	82%	80%

As indicated in the table above, the SCM-Volume_{IA-in} for PR_{IR=0.39} of 70% is between 0.3 and 0.4 inches and can be determined by interpolation:

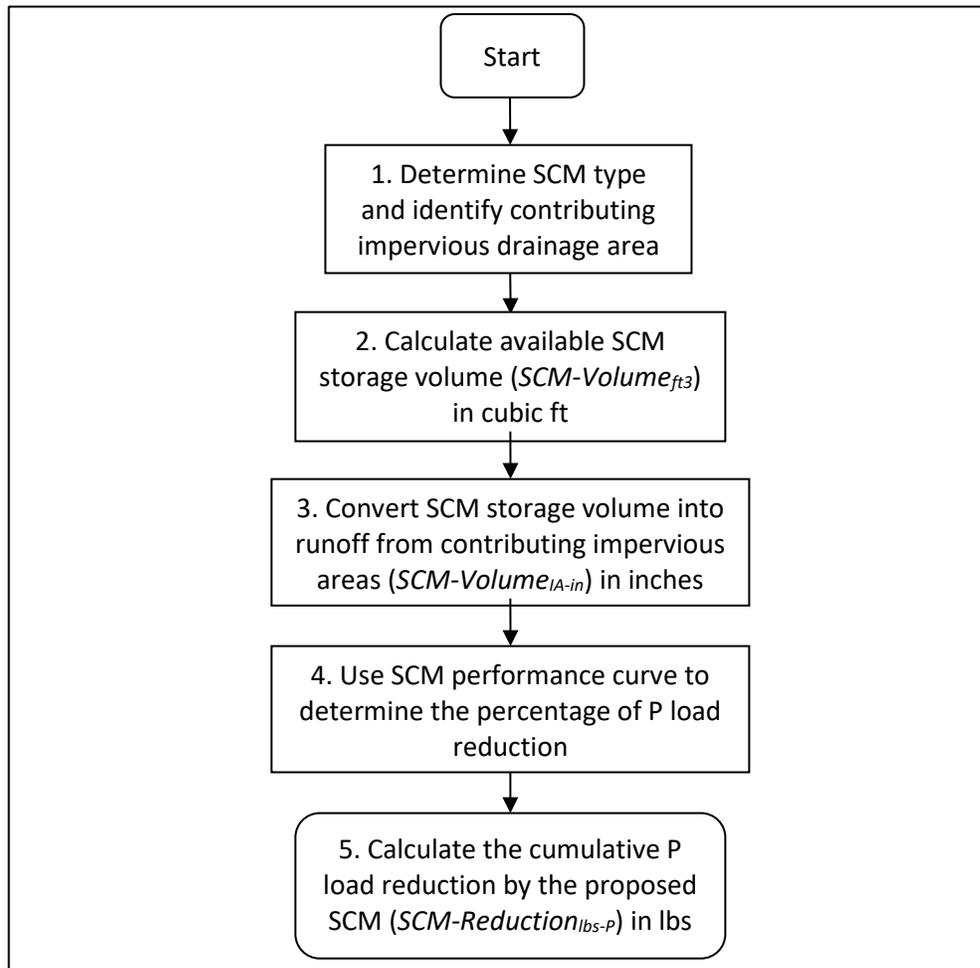
$$\begin{aligned} \text{SCM-Volume}_{\text{IA-in}} &= (70\% - 65\%) / (75\% - 65\%) \times (0.4 \text{ in} - 0.3 \text{ in}) + 0.3 \text{ in} \\ &= 0.35 \text{ inches} \end{aligned}$$

Convert the resulting SCM-Volume_{IA-in} to cubic feet (SCM-Volume_{IA-ft³}) using **Equation 2-1**:

$$\begin{aligned} \text{SCM-Volume}_{\text{IA-ft}^3} &= 2.57 \text{ acre} \times 0.35 \text{ in} \times 3,630 \text{ ft}^3/\text{acre-in} \\ &= \mathbf{3,265 \text{ ft}^3} \end{aligned}$$

2.4.2. Method to determine the Phosphorus load reduction credit for a SCM with a known design storage volume when the contributing drainage area is 100% impervious.

Figure 2-2. illustrates the steps in the method to determine the phosphorus load reduction for a SCM with a known design volume when contributing drainage area is 100% impervious.



Below are the steps in the method to determine the Phosphorus load reduction credit for a SCM with a known design storage volume when the contributing drainage area is 100% impervious.

1. Identify the SCM type and contributing impervious drainage area (IA);
2. Document the available storage volume (ft³) of the SCM (SCM-Volume_{ft³}) using the SCM dimensions and design specifications (e.g., maximum storage depth, filter media porosity);
3. Convert SCM-Volume_{ft³} into inches of runoff from the contributing impervious area (SCM-Volume_{IA-in}) using **Equation 2-3**:

$$\text{SCM-Volume}_{\text{IA-in}} = \text{SCM-Volume}_{\text{ft}^3} / \text{IA (acre)} \times 12 \text{ in/ft} \times 1 \text{ acre}/43,560 \text{ ft}^2$$

Equation 2-3. SCM Design Storage Volume Determination in inches

4. Determine the % P load reduction for the SCM (SCM Reduction_{%-P}) using the appropriate SCM performance curve (**Figure 2-5** through **Figure 2-26**) and the SCM-Volume_{IA-in} calculated in step 3; and
5. Calculate the cumulative P load reduction in pounds for the SCM (SCM Reduction_{lbs-P}) using the SCM Load as calculated from the procedure described above and the percent P load reduction determined in step 4 by using **Equation 2-4**:

$$\text{SCM Reduction}_{\text{lbs-P}} = \text{SCM Load} \times (\text{SCM Reduction}_{\text{\%-P}}/100)$$

Equation 2-4. SCM Reduction

Example 2-3. Determine the Phosphorus load reduction credit for a SCM with a known design storage volume when the contributing drainage area is 100% impervious.

A permittee is considering an Enhanced Bio-filtration w/ISR system to treat runoff from 1.49 acres of commercial impervious area. Site constraints would limit the enhanced bio-filtration system to have a surface area of 1,200 ft² and the system would have to be located next to the impervious drainage area to be treated. The design parameters for the enhanced bio-filtration w/ISR system are presented in the Table below.

Design parameters for bio-filtration system

Components of representation	Parameters	Value
Ponding	Maximum depth	0.5 ft
	Surface area	1,200 ft ²
	Vegetative parameter	85-95%
Soil mix	Depth	2.0 ft
	Porosity	0.35
	Hydraulic conductivity	4 inches/hour
Gravel layer	Depth	2.0 ft
	Porosity	0.45
Orifice #1	Diameter	0.08 ft

^a Refers to the percentage of surface covered with vegetation

Determine the:

- A. Percent phosphorus load reduction (SCM Reduction %_{-P}) for the specified enhanced bio-filtration w/ISR system and contributing impervious Commercial drainage area; and
- B. Cumulative Phosphorus reduction in pounds that would be accomplished by the system (SCM-Reduction _{lbs-P})

Solution:

1. The SCM is an enhanced bio-filtration w/ISR system that will treat runoff from 1.49 acres of Commercial impervious area (IA = 1.49 acre);
2. The available storage volume capacity (ft³) of the enhanced bio-filtration system (SCM-Volume _{SCM-ft³}) is determined using the surface area of the system, depth of ponding, and the porosities of the filter media and subsurface gravel ISR:

$$\begin{aligned}
 \text{SCM-Volume}_{\text{SCM-ft}^3} &= (\text{surface area} * \text{pond maximum depth}) + (\text{surface area} * ((\text{soil mix depth} * \text{soil layer porosity}) + (\text{gravel layer depth} * \text{gravel layer porosity}))) \\
 &= (1,200 \text{ ft}^2 * 0.5 \text{ ft}) + (1,200 \text{ ft}^2 * ((2.0 * 0.35) + (2.0 * 0.45))) \\
 &= 600 + 1920 \\
 &= 2,520 \text{ ft}^3
 \end{aligned}$$

3. The available storage volume capacity of the enhanced bio-filtration system in inches of runoff from the contributing impervious area (SCM-Volume_{IA-in}) is calculated using **Equation 2-3**:

$$\begin{aligned} \text{SCM-Volume}_{\text{IA-in}} &= (\text{SCM-Volume ft}^3 / \text{IA (acre)}) * 12 \text{ in/ft} * 1 \text{ acre} / 43,560 \text{ ft}^2 \\ \text{SCM-Volume}_{\text{IA-in}} &= (2520 \text{ ft}^3 / 1.49 \text{ acre}) * 12 \text{ in/ft} * 1 \text{ acre} / 43,560 \text{ ft}^2 = \mathbf{0.47 \text{ in}} \end{aligned}$$

4. Using the enhanced bio-filtration performance curve shown in **Figure 2-21**, a **61%** Phosphorus load reduction (SCM Reduction %-P) is determined for the system with a design storage capacity of 0.47 inches for treating runoff from 1.49 acres of impervious area; and
5. Calculate the cumulative Phosphorus load reduction in pounds for the enhanced bio-filtration w/ISR system (SCM Reduction_{lbs-P}) using the SCM Load as calculated from the procedure described above and the SCM Reduction %-P determined in step 4 by using **Equation 2-4**. First, the SCM Load is determined as specified above:

$\text{SCM Load}_p = \text{IA} * \text{impervious cover phosphorus export loading rate for Commercial}$

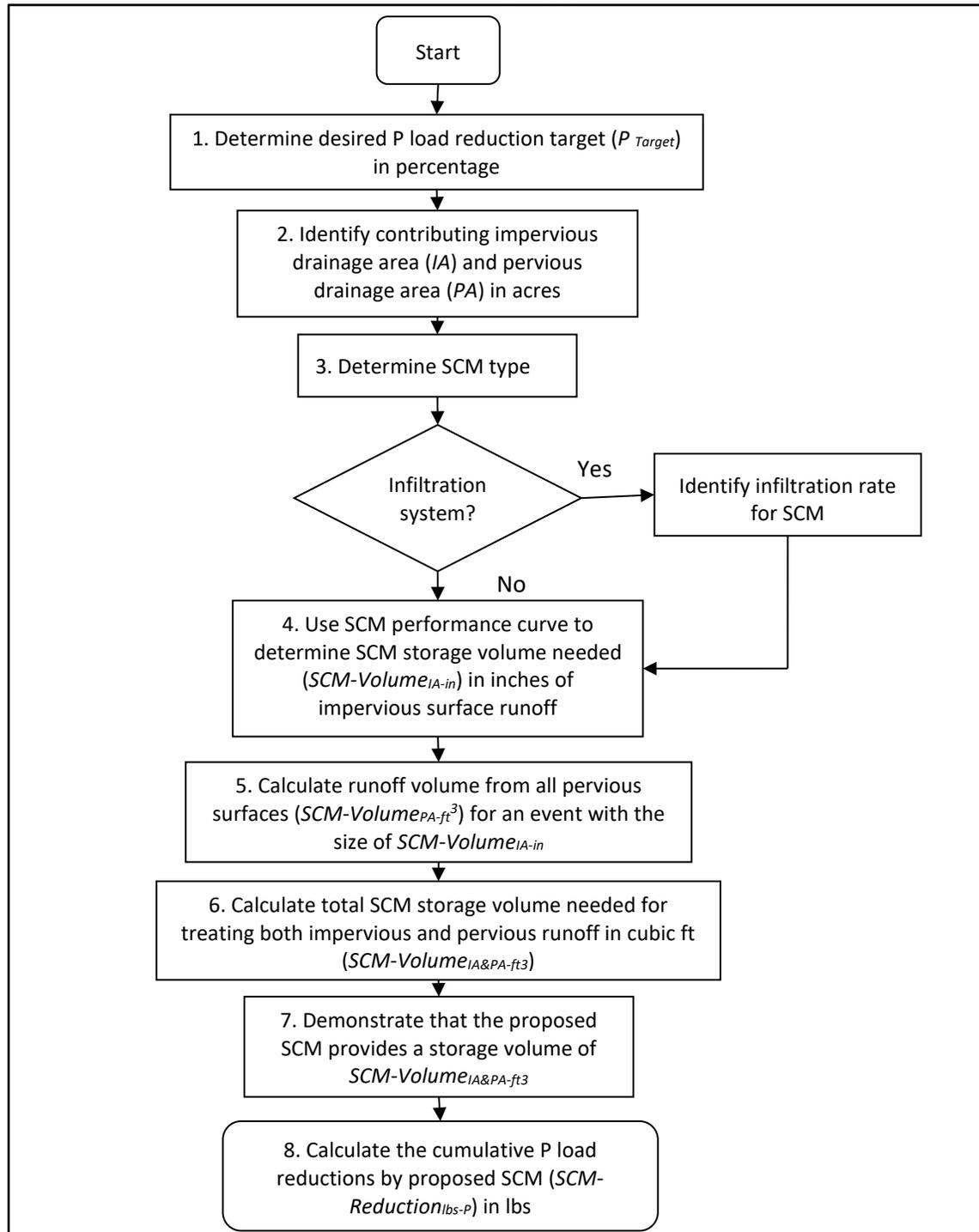
$$\text{SCM Load}_p = 1.49 \text{ acres} * 1.78 \text{ lbs/acre-yr} = 2.65 \text{ lbs/yr}$$

$\text{SCM Reduction}_{\text{lbs-P}} = \text{SCM Load} * (\text{SCM Reduction}_{\text{\%-P}} / 100)$
--

$$\text{SCM Reduction}_{\text{lbs-P}} = 2.65 \text{ lbs/yr} * (61 / 100) = \mathbf{1.62 \text{ lbs/yr}}$$

2.4.3. Method to determine the design storage volume of a SCM to achieve a known phosphorus load reduction target when the contributing drainage area has impervious and pervious surfaces.

Figure 2-3. illustrates the steps to determine the design storage volume of a SCM to achieve a known phosphorus load reduction target when the drainage area has impervious and pervious surfaces.



Below are the steps in the method to determine the design storage volume of a SCM to reach a known P load reduction when both impervious and pervious drainage areas are present.

- 1) Determine the desired cumulative P load reduction target (P_{Target}) in percentage for the SCM;
- 2) Characterize the contributing drainage area to the SCM by identifying the following information for the impervious and pervious surfaces:

Impervious area (IA) - Area (acre) and land use (e.g., commercial)

Pervious area (PA) – Area (acre), land use and hydrologic soil group (HSG)

- 3) Determine the SCM type (e.g., infiltration trench, gravel wetland). For infiltration systems, determine the appropriate infiltration rate for the location of the SCM in the Watershed;
- 4) Using the cumulative P removal performance curve for the selected SCM, determine the storage volume capacity of the SCM in inches needed to treat runoff from the contributing impervious area (SCM-Volume_{IA-in});
- 5) Using **Equation 2-5** below and the pervious area runoff depth information from Table 2-1, below, determine the total volume of runoff from the contributing pervious drainage area in cubic feet (SCM Volume_{PA-ft³}) for a rainfall size equal to the sum of SCM Volume_{IA-in}, determined in step 4. The runoff volume for each distinct pervious area must be determined;

$$\text{SCM-Volume}_{\text{PA-ft}^3} = \sum (\text{PA} * (\text{runoff depth}) * 3,630 \text{ ft}^3/\text{acre-in})_{(\text{PA1}, \text{PA}n)}$$

Equation 2-5. SCM Volume, Sum of pervious areas, cubic feet

- 6) Using **Equation 2-6** below, calculate the SCM storage volume in cubic feet (SCM-Volume_{IA&PA-ft³}) needed to treat the runoff depth from the contributing impervious (IA) and pervious areas (PA);

$$\text{SCM-Volume}_{\text{IA\&PA-ft}^3} = \text{SCM Volume}_{\text{PA-ft}^3} + (\text{SCM Volume}_{\text{IA-in}} \times \text{IA (acre)} \times 3,630 \text{ ft}^3/\text{acre-in})$$

Equation 2-6. SCM Volume pervious and impervious area, cubic feet

- 7) Provide supporting calculations using the dimensions and specifications of the proposed SCM showing that the necessary storage volume determined in step 6, SCM-Volume_{IA&PA-ft³}, will be provided to achieve the P_{Target} ; and
- 8) Calculate the cumulative phosphorus load reduction in pounds of phosphorus (SCM-Reduction_{lbs-P}) for the SCM using the SCM Load (as calculated in example 1) and the P_{target} by using **Equation 2-7**:

$$\text{SCM-Reduction}_{\text{lbs-P}} = \text{SCM Load} * (P_{\text{target}} / 100)$$

Equation 2-7. SCM Reduction

Table 2-1. Developed Land Pervious Area Runoff Depths based on Precipitation depth and Hydrological Soil Groups (HSGs). Soils are assigned to an HSG on the basis of their permeability. HSG A is the most permeable, and HSG D is the least permeable. HSG categories for pervious areas in the drainage area shall be estimated by consulting local soil surveys prepared by the National Resource Conservation Service (NRCS) or by a stormwater professional evaluating soil testing results from the drainage area. If the HSG condition is not known, an HSG C soil condition should be assumed.

Developed Land Pervious Area Runoff Depths based on Precipitation depth and Hydrological Soil Groups				
Rainfall Depth, Inches	Runoff Depth, inches			
	Pervious HSG A	Pervious HSG B	Pervious HSG C	Pervious HSG D
0.10	0.00	0.00	0.00	0.00
0.20	0.00	0.00	0.01	0.02
0.40	0.00	0.00	0.03	0.06
0.50	0.00	0.01	0.05	0.09
0.60	0.01	0.02	0.06	0.11
0.80	0.02	0.03	0.09	0.16
1.00	0.03	0.04	0.12	0.21
1.20	0.04	0.05	0.14	0.39
1.50	0.08	0.11	0.39	0.72
2.00	0.14	0.22	0.69	1.08

Notes: Runoff depths derived from combination of volumetric runoff coefficients from Table 5 of *Small Storm Hydrology and Why it is Important for the Design of Stormwater Control Practices*, (Pitt, 1999), and using the Stormwater Management Model (SWMM) in continuous model mode for hourly precipitation data for Boston, MA, 1998-2002.

Example 2-4. Determine the design storage volume of a SCM to achieve a known phosphorus load reduction target when the contributing drainage area has impervious and pervious surfaces.

A permittee is considering a gravel wetland system to treat runoff from an institutional site. The site is 7.5 acres of which 4.0 acres are impervious surfaces and 3.50 acres are pervious surfaces. The pervious area is made up of 2.5 acres of lawns in good condition and 1.0 acre of stable unmanaged woodland. Soils information indicates that all of the woodland and 0.5 acres of the lawn is hydrologic soil group (HSG) B and the other 2.0 acres of lawn are HSG C. The permittee wants to size the gravel wetland system to achieve a cumulative phosphorus load reduction (P_{Target}) of 55% from the entire 7.5 acres.

Determine the:

- A) Design storage volume needed for a gravel wetland system to achieve a 55% reduction in annual phosphorus load from the contributing drainage area ($SCM-Volume_{IA\&PA-ft^3}$); and
- B) Cumulative phosphorus reduction in pounds that would be accomplished by the SCM ($SCM-Reduction_{lbs-P}$)

Solution:

- 1) The SCM type is gravel wetland system.
- 2) The phosphorus load reduction target (P_{Target}) = 55%.
- 3) Using the cumulative phosphorus removal performance curve for the gravel wetland system shown in **Figure 2-20**, the storage volume capacity in inches needed to treat runoff from the contributing impervious area ($SCM Volume_{IA-in}$) is 0.71 in;

Using **Equation 2-5** and the pervious runoff depth information from **Table 2-1**, the volume of runoff from the contributing pervious drainage area in cubic feet ($SCM Volume_{PA-ft^3}$) for a rainfall size equal to 0.71 in is summarized in the table “Runoff contributions from pervious areas for institutional site” below. As indicated from **Table 2-1**, the runoff depth for a rainfall size equal to 0.71 inches is between 0.6 and 0.8 inches and can be determined by interpolation (example shown for runoff depth of HSG C):

$$Runoff\ depth\ (HSG\ C) = (0.71 - 0.6) / (0.8 - 0.6) * (0.09\ in - 0.06\ in) + 0.06\ in = \underline{0.07\ inches}$$

Runoff contributions from pervious areas for institutional site

ID	Type	Pervious Area (acre)	HSG	Runoff (in)	Runoff = (runoff) x PA (acre-in)	Runoff = Runoff (acre-in) x 3,630 ft ³ /acre-in (ft ³)
PA1	Grass	2.00	C	0.07	0.14	508
PA2	Grass	0.50	B	0.01	0.0	0.0
PA3	Woods	1.00	B	0.01	0.0	0.0
Total	-----	3.50	-----	-----	0.14	508

- 4) Using **Equation 2-6**, determine the SCM storage volume in cubic feet (SCM-Volume_{IA&PA-ft³}) needed to treat 0.71 inches of runoff from the contributing impervious area (IA) and the runoff of 0.14 acre-in from the contributing pervious areas, determined in step 5 is:

$$\text{SCM Volume}_{\text{IA\&PA-ft}^3} = \text{SCM Volume}_{\text{PA ac-in}} + (\text{SCM Volume}_{\text{IA-in}} * \text{IA (acre)}) * 3,630 \text{ ft}^3/\text{acre-in}$$

Equation 2-8. SCM Volume pervious and impervious area, cubic feet

$$\text{SCM Volume}_{\text{IA\&PA-ft}^3} = (508 \text{ ft}^3 + ((0.71 \text{ in} * 4.00 \text{ acre}) * 3,630 \text{ ft}^3/\text{acre-in}) = \underline{10,817 \text{ ft}^3}$$

- 5) The table “Design details for gravel wetland system” provides design details for a potential gravel wetland system.

Design details for gravel wetland system:

Gravel Wetland System Components	Design Detail	Depth (ft)	Surface Area (ft ²)	Volume (ft ³)
Sediment Forebay	10% of Treatment Volume			
Pond area		1.33	896	1,192
Wetland Cell #1	----	-----	-----	-----
Pond area	45% of Treatment Volume	2.00	1,914	3,828
Gravel layer		2.00	1,914	1,531
Wetland Cell #2	----	-----	-----	-----
Pond area	porosity = 0.4	2.00	1,914	3,828
Gravel layer	45% of Treatment Volume	2.00	1,914	1,531

	porosity = 0.4			

The total design storage volume for the proposed gravel wetland system is 11,910 ft³. This volume is greater than 11,834 ft³ ((SCM-Volume_{IA&PA-ft³}), calculated in step 4) and is therefore sufficient to achieve a P_{Target} of 55%.

- 6) The cumulative phosphorus load reduction in pounds of phosphorus (SCM-Reduction_{lbs-P}) for the proposed gravel wetland system is calculated by using **Equation 2-9** with the SCM Load and the P_{Target} = 55%.

$$\text{SCM-Reduction}_{\text{lbs-P}} = \text{SCM Load} * (\text{P}_{\text{target}} / 100)$$

Equation 2-9. SCM Reduction

The SCM Load is calculated:

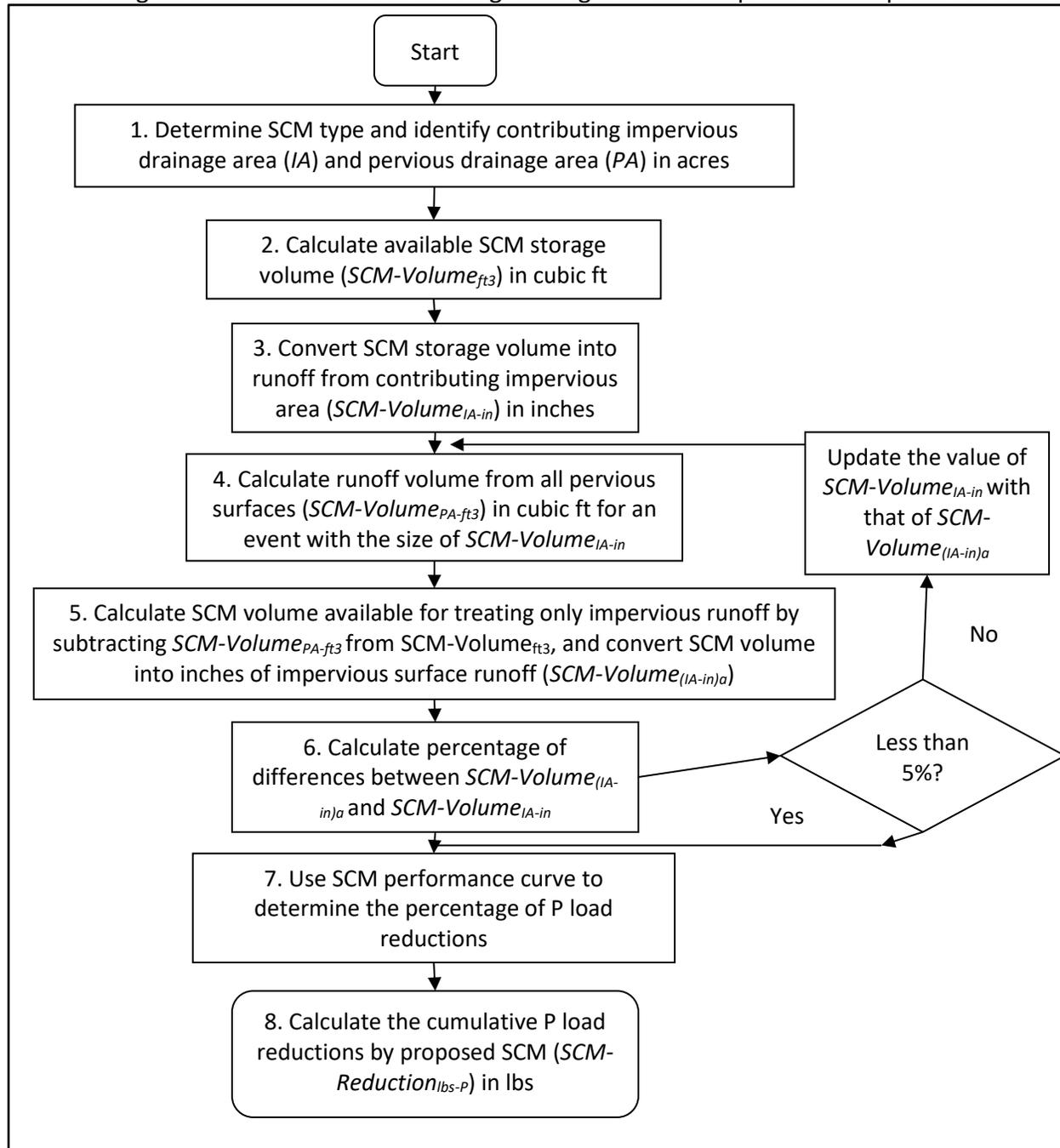
$$\begin{aligned} \text{SCM Load} &= (\text{IA} * \text{PLER}_{\text{IC Ins}}) + (\text{PA lawn}_{\text{HSG B}} * \text{PLER}_{\text{HSG B}}) + (\text{PA lawn}_{\text{HSG C}} * \text{PLER}_{\text{HSG C}}) + (\text{PA forest} * \text{PA PLER}_{\text{For}}) \\ &= (4.00 \text{ acre} * 1.78 \text{ lbs/acre-yr}) + (0.50 \text{ acres} * 0.12 \text{ lbs/acre-yr}) + (2.00 \text{ acre} * 0.21 \text{ lbs/acre-yr}) + (1.00 \text{ acres} * 0.21 \text{ lbs/acre-yr}) = \underline{7.81 \text{ lbs/yr}} \end{aligned}$$

$$\text{SCM-Reduction}_{\text{lbs-P}} = \text{SCM Load} * (\text{P}_{\text{target}} / 100)$$

$$\text{SCM-Reduction}_{\text{lbs-P}} = 7.81 \text{ lbs/yr} * 55/100 = \mathbf{4.30 \text{ lbs/yr}}$$

2.4.4. Method to determine the phosphorus load reduction for a SCM with a known storage volume when the contributing drainage area has impervious and pervious surfaces.

Figure 2-4. illustrates the steps to determine the phosphorus (P) load reduction for a SCM with a known storage volume when the contributing drainage area has impervious and pervious surfaces.



Below are the steps in the method to determine the phosphorus load reduction for a SCM with a known storage volume when the contributing drainage area has impervious and pervious surfaces:

- 1) Identify the type of SCM and characterize the contributing drainage area to the SCM by identifying the following information for the impervious and pervious surfaces:

Impervious area (IA) – Area (acre) and land use (e.g., commercial)

Pervious area (PA) – Area (acre), land use, and hydrologic soil group (HSG)

- 2) Determine the available storage volume (ft^3) of the SCM (SCM-Volume ft^3) using the SCM dimensions and design specifications (e.g., maximum storage depth, filter media porosity);
- 3) To estimate the P load reduction of a SCM with a known storage volume capacity, it is first necessary to determine the portion of available SCM storage capacity (SCM-Volume ft^3) that would treat the runoff volume generated from the contributing impervious area (IA) for a rainfall event with a depth of i inches (in). This will require knowing the corresponding amount of runoff volume that would be generated from the contributing pervious area (PA) for the same rainfall event (depth of i inches). Using **Equation 2-10** below, solve for the SCM capacity that would be available to treat runoff from the contributing impervious area for the unknown rainfall depth of i inches (see **Equation 2-11**):

$$\text{SCM-Volume}_{\text{ft}^3} = \text{SCM-Volume}_{(\text{IA-ft}^3)_i} + \text{SCM-Volume}_{(\text{PA-ft}^3)_i}$$

Equation 2-10. SCM Volume pervious area and impervious area, cubic feet

Where:

SCM-Volume ft^3 = the available storage volume of the SCM;

SCM-Volume $(\text{IA-ft}^3)_i$ = the available storage volume of the SCM that would fully treat runoff generated from the contributing impervious area for a rainfall event of size i inches; and

SCM-Volume $(\text{PA-ft}^3)_i$ = the available storage volume of the SCM that would fully treat runoff generated from the contributing pervious area for a rainfall event of size i inches.

Solving for SCM-Volume $(\text{IA-ft}^3)_i$:

$$\text{SCM-Volume}_{(\text{IA-ft}^3)_i} = \text{SCM-Volume}_{\text{ft}^3} - \text{SCM-Volume}_{(\text{PA-ft}^3)_i}$$

Equation 2-11. SCM Volume pervious area and impervious area, rainfall depth, cubic feet

To determine SCM-Volume $(\text{IA-ft}^3)_i$, requires performing an iterative process of refining estimates of the rainfall depth used to calculate runoff volumes until the rainfall depth used results in the sum of runoff volumes from the contributing IA and PA equaling the available SCM storage capacity (SCM-Volume ft^3). For the purpose of estimating SCM performance, it will be considered adequate when the IA runoff depth (in) is within 5% IA runoff depth used in the previous iteration.

For the first iteration (1), convert the SCM-Volume ft^3 determined in step 2 into inches of runoff from the contributing impervious area (SCM Volume $_{(IA-in)1}$) using **Equation 2-12**.

$$SCM-Volume_{(IA-in)1} = (SCM-Volume_{ft^3} / IA \text{ (acre)}) \times (12 \text{ in/ft} / 43,560 \text{ ft}^2/\text{acre})$$

Equation 2-12. SCM Volume pervious area and impervious area, inches

For iterations 2 through n (2...n), convert the SCM Volume $_{(IA-ft^3)2...n}$, determined in step 6) below, into inches of runoff from the contributing impervious area: (SCM Volume $_{(IA-in)2...n}$) using **Equation 2-13**.

$$SCM-Volume_{(IA-in)2...n} = (SCM-Volume_{(IA-ft^3)2...n} / IA \text{ (acre)}) \times (12 \text{ in/ft} / 43,560 \text{ ft}^2/\text{acre})$$

Equation 2-13. Subsequent SCM Volume pervious area and impervious area, inches

- 4) For 1 to n iterations, use the pervious runoff depth information from **Table 2-1** and **Equation 2-14** to determine the total volume of runoff (ft^3) from the contributing PA (SCM Volume $_{PA-ft^3}$) for a rainfall size equal to the sum of SCM-Volume $_{(IA-in)1}$, determined in step 3. The runoff volume for each distinct pervious area must be determined.

$$SCM \text{ Volume}_{(PA-ft^3)1...n} = \sum ((PA \times (\text{runoff depth})_{(PA1, PA2..PAN)} \times (3,630 \text{ ft}^3/\text{acre-in}))$$

Equation 2-14. SCM Volume from pervious area, rainfall depth, cubic feet.

- 5) For iteration 1, estimate the portion of SCM Volume that is available to treat runoff from only the IA by subtracting SCM-Volume $_{PA-ft^3}$, determined in step 4, from SCM-Volume $_{ft^3}$, determined in step 2, and convert to inches of runoff from IA (see **Equation 2-15** and **Equation 2-16**).

$$SCM-Volume_{(IA-ft^3)2} = ((SCM-Volume_{ft^3} - SCM \text{ Volume}_{(PA-ft^3)1})$$

Equation 2-15. SCM Volume treating IA portion, cubic feet.

$$SCM-Volume_{(IA-in)2} = (SCM-Volume_{(IA-ft^3)2} / IA \text{ (acre)}) \times (12 \text{ in/ft} \times 1 \text{ acre} / 43,560 \text{ ft}^2)$$

Equation 2-16. SCM Volume treating IA portion, inches.

If additional iterations (i.e., 2 through n) are needed, estimate the portion of SCM volume that is available to treat runoff from only the IA (SCM-Volume $_{(IA-in)3..n+1}$) by subtracting SCM Volume $_{(PA-ft^3)2..n}$, determined in step 4, from SCM Volume $_{(IA-ft^3)3..n+1}$, determined in step 5, and by converting to inches of runoff from IA using **Equation 2-16**):

- 6) For iteration a (an iteration between 1 and n+1), compare SCM Volume $_{(IA-in)a}$ to SCM Volume $_{(IA-in)a-1}$ determined from the previous iteration (a-1). If the difference in these values is greater than 5% of SCM Volume $_{(IA-in)a}$ then repeat steps 4 and 5, using SCM Volume $_{(IA-in)a}$ as the new starting value for the next iteration (a+1). If the difference is less than or equal to 5 % of SCM Volume $_{(IA-in)a}$ then the permittee may proceed to step 7;

- 7) Determine the % P load reduction for the SCM (SCM Reduction %_{-P}) using the appropriate SCM performance curve and the SCM-Volume $(IA-in)_n$ calculated in the final iteration of steps 5 and 6; and
- 8) Calculate the cumulative P load reduction in pounds for the SCM (SCM Reduction $lbs-P$) using the SCM Load as calculated Example 3-1 above and the percent P load reduction (SCM Reduction %_{-P}) determined in step 7 by using **Equation 2-17**:

$$SCM\ Reduction\ lbs-P = SCM\ Load \times (SCM\ Reduction\ \%_{-P}/100)$$

Equation 2-17. SCM Reduction.

Example 2-5. Determine the phosphorus load reduction for a SCM with a known design volume when the contributing drainage area has impervious and pervious surfaces.

A permittee is considering an infiltration basin to capture and treat runoff from a portion of the commercial area (COM). The contributing drainage area is 16.55 acres and has 11.75 acres of impervious area and 4.8 acres of pervious area (PA) made up mostly of lawns and landscaped areas that is 80% HSG D and 20% HSG C. An infiltration basin with the following specifications can be placed at the down-gradient end of the contributing drainage area where soil testing results indicates an infiltration rate (IR) of 0.28 in/hr:

Table Example 2-5-A: Infiltration basin characteristics

Structure	Bottom area (acre)	Top surface area (acre)	Maximum pond depth (ft)	Design storage volume (ft ³)	Infiltration Rate (in/hr)
Infiltration basin	0.65	0.69	1.65	48,155	0.28

Determine the:

- A) Percent phosphorus load reduction (SCM Reduction %-P) for the specified infiltration basin and the contributing impervious and pervious drainage area; and
- B) Cumulative phosphorus reduction in pounds that would be accomplished by the SCM (SCM-Reduction lbs-P)

Solution:

- 1) A surface infiltration basin is being considered. Information for the contributing impervious (IA) and pervious (PA) areas are summarized below.

Impervious area characteristics

ID	Land use	Area (acre)
IA1	COM	11.75

Pervious area characteristics

ID	Area (acre)	Hydrologic Soil Group (HSG)
PA1	3.84	D
PA2	0.96	C

- 2) The available storage volume (ft³) of the infiltration basin (SCM-Volume ft³) is determined from the design details and basin dimensions; SCM-Volume ft³= 48,155 ft³.
- 3) To determine what the SCM design storage volume is in terms of runoff depth (in) from IA, an iterative process is undertaken:

Solution Iteration 1:

For the first iteration (1), the SCM-Volume ft^3 is converted into inches of runoff from the contributing impervious area (SCM Volume $_{(\text{IA-in})1}$) using **Equation 2-12**.

$$\text{SCM Volume }_{(\text{IA-in})1} = (48,155 \text{ ft}^2 / 11.75 \text{ acre}) * (12 \text{ in/ft} / 43,560 \text{ ft}^2/\text{acre}) = \underline{1.13 \text{ in}}$$

4-1) The total volume of runoff (ft^3) from the contributing PA (SCM Volume $_{\text{PA-ft}^3}$) for a rainfall size equal to the sum of SCM Volume $_{(\text{IA-in})1}$ determined in step 3 is determined for each distinct pervious area identified in above using the information from **Table 2-1** and **Equation 2-5**. Interpolation was used to determine runoff depths.

$$\text{SCM Volume }_{(\text{PA-ft}^3)1} = ((3.84 \text{ acre} * (0.33 \text{ in}) + (0.96 \text{ acre} * (0.13 \text{ in})) * 3,630 \text{ ft}^3/\text{acre-in} = \underline{5052 \text{ ft}^3}$$

5-1) For iteration 1, the portion of SCM Volume that is available to treat runoff from only the IA is estimated by subtracting the SCM Volume $_{(\text{PA-ft}^3)1}$, determined in step 4-1, from SCM Volume $_{\text{ft}^3}$, determined in step 2, and converted to inches of runoff from IA:

$$\text{SCM Volume }_{(\text{IA-ft}^3)2} = 48,155 \text{ ft}^3 - 5052 \text{ ft}^3 = \underline{43,103 \text{ ft}^3}$$

$$\text{SCM Volume }_{(\text{IA-in})2} = (43,103 \text{ ft}^3 / 11.75 \text{ acre}) * (12 \text{ in/ft} * 1 \text{ acre} / 43,560 \text{ ft}^2) = \underline{1.01 \text{ in}}$$

6-1) The % difference between SCM Volume $_{(\text{IA-in})2}$, 1.01 in, and SCM Volume $_{(\text{IA-in})1}$, 1.13 in is determined and found to be significantly greater than 5%:

$$\begin{aligned} \% \text{ Difference} &= ((1.13 \text{ in} - 1.01 \text{ in}) / 1.01 \text{ in}) * 100 \\ &= 12\% \end{aligned}$$

Therefore, steps 4 through 6 are repeated starting with SCM Volume $_{(\text{IA-in})2} = 1.01 \text{ in}$.

Solution Iteration 2:

$$\begin{aligned} \mathbf{4-2)} \quad \text{SCM-Volume }_{(\text{PA-ft}^3)2} &= ((3.84 \text{ acre} * 0.21 \text{ in}) + (0.96 \text{ acre} * 0.12 \text{ in})) * 3,630 \text{ ft}^3/\text{acre-in} \\ &= 3,345 \text{ ft}^3 \end{aligned}$$

$$\begin{aligned} \mathbf{5-2)} \quad \text{SCM-Volume }_{(\text{IA-ft}^3)3} &= 48,155 \text{ ft}^3 - 3,345 \text{ ft}^3 \\ &= 44,810 \text{ ft}^3 \\ \text{SCM-Volume }_{(\text{IA-in})3} &= (44,810 \text{ ft}^3 / 11.75 \text{ acre}) * (12 \text{ in/ft} * 1 \text{ acre} / 43,560 \text{ ft}^2) \\ &= 1.05 \text{ in} \end{aligned}$$

$$\begin{aligned} \mathbf{6-2)} \quad \% \text{ Difference} &= ((1.05 \text{ in} - 1.01 \text{ in}) / 1.05 \text{ in}) * 100 \\ &= 4\% \end{aligned}$$

The difference of 4% is acceptable.

7) The % phosphorus load reduction for the infiltration basin (SCM Reduction %_{-P}) is determined by using the infiltration basin performance curve for an infiltration rate of 0.27 in/hr and the treatment volume (SCM-Volume_{Net IA-in} = 1.05 in) calculated in step 5-2 and is **SCM Reduction %_{-P} = 93%**.

The performance curve for IR = 0.27 is used rather than interpolating between the performance curves for IR = 0.27 in/hr and 0.52 in/hr to estimate performance for IR = 0.28 in/hr. An evaluation of the performance curves for IR = 0.27 in/hr and IR = 0.52 in/hr for a design storage volume of 1.05 in indicate a small difference in estimated performance (SCM Reduction %_{-P} = 93% for IR = 0.27 in/hr and SCM Reduction %_{-P} = 95% for IR = 0.52 in/hr).

8) The cumulative phosphorus load reduction in pounds of phosphorus (SCM-Reduction_{lbs-P}) for the proposed infiltration basin is calculated by using **Equation 2-18**. SCM Reduction with the SCM Load and the P_{target} of 93%.

$$\text{SCM-Reduction}_{\text{lbs-P}} = \text{SCM Load} \times (\text{P}_{\text{target}} / 100)$$

Equation 2-18. SCM Reduction

Using **Table 1-1**, the SCM load is calculated:

$$\begin{aligned} \text{SCM Load} &= (\text{IA} \times \text{impervious cover phosphorus export loading rate for Commercial}) \\ &+ (\text{PA}_{\text{HSG D}} \times \text{pervious cover phosphorus export loading rate for HSG D}) \\ &+ (\text{PA}_{\text{HSG C}} \times \text{pervious cover phosphorus export loading rate for HSG C}) \end{aligned}$$

$$\begin{aligned} \text{SCM Load} &= (11.75 \text{ acres} \times 1.78 \text{ lbs/acre-yr}) + (3.84 \text{ acres} \times 0.37 \text{ lbs/acre-yr}) \\ &+ (0.96 \text{ acres} \times 0.21 \text{ lbs/acre-yr}) \\ &= 22.54 \text{ lbs/yr} \end{aligned}$$

$$\text{SCM-Reduction}_{\text{lbs-P}} = 22.54 \text{ lbs/yr} \times 93/100 = \mathbf{20.96 \text{ lbs/yr}}$$

Example 2-6. Determine the phosphorus reductions for disconnecting impervious area using storage with delayed release.

A commercial operation has an opportunity to divert runoff from 0.75 acres of impervious roof top to a 5,000-gallon (668.4 ft³) storage tank for temporary storage and subsequent release to 0.09 acres of pervious area (PA) with HSG C soils.

Determine the:

- A) Percent phosphorus load reduction rates (SCM Reduction %_{-P}) for the specified impervious area (IA) disconnection and storage system assuming release times of 1, 2 and 3 days for the stored volumes to discharge to the pervious area; and
- B) Cumulative phosphorus load reductions in pounds that would be accomplished by the system (SCM-Reduction lbs_{-P}) for the three storage release times, 1, 2 and 3 days.

Solution:

- 1) Determine the storage volume in units of inches of runoff depth from contributing impervious area:

$$\text{Storage Volume}_{IA-in} = (668.4 \text{ ft}^3 / (0.75 \text{ acre} * 43.560 \text{ ft}^2/\text{acre})) * 12 \text{ inch/ft}$$

$$= 0.25 \text{ inches}$$

- 2) Determine the ratio of the contributing impervious area to the receiving pervious area:
IA:PA = 0.75 acres/0.09 acres
= 8.3

- 3) Using **Table 2-25** or **Figure 2-29** for a IA:PA ratio of 8:1, determine the phosphorus load reduction rates for a storage volume of 0.25 inches that discharges to HSG C with release rates of 1, 2 and 3 days: Using interpolation, the reduction rates are shown in **Table 2-6-A**:

Table Example 2-6-A: P Reduction Rates

Percent Phosphorus load reduction for IA disconnection with storage to PA HSG C			
Storage Volume <i>IA-in</i>	Storage release rate, days		
	1	2	3
0.25	39%	42%	43%

- 4) The cumulative phosphorus load reductions in pounds of phosphorus for the IA disconnection with storage (SCM-Reduction lbs_{-P}) is calculated using **Equation 2-2**.

Phosphorus:

$$\text{SCM Load}_P = \text{IA (acre)} * \text{PLER}_{IC-Com} \text{ (see Table 3-1)}$$

$$= 0.75 \text{ acres} * 1.78 \text{ lbs/acre-yr}$$

$$= 1.34 \text{ lbs/yr}$$

$$\text{SCM Reduction}_{lbs-P} = \text{SCM Load} * (\text{SCM Reduction \%}_P / 100)$$

$$\text{SCM Reduction}_{lbs-P} = 1.34 \text{ lbs/yr} * (39/100)$$

$$= \mathbf{0.52 \text{ lbs/yr}}$$

The table below presents the SCM Reduction $lbs-P$ for each of the release rates:

P Reduction Loads

Phosphorus load reduction for IA disconnection with storage to PA HSG C, lbs			
Storage Volume $IA-in$	Storage release rate, days		
	1	2	3
0.25	0.52	0.56	0.58

Example 2-7. Determine the phosphorus load reduction for disconnecting impervious area with and without soil augmentation in the receiving pervious area.

The same commercial property as in the above example wants to evaluate disconnecting drainage from the 0.75 acres impervious roof top and discharging it directly to 0.09 acres of pervious area (PA) with HSG C. Also, the property has the opportunity to purchase a small adjoining area (0.06 acres), also HSG C, to increase the size of the receiving PA from 0.09 to 0.15 acres and to allow the property owner to avoid having to install a drainage structure to capture overflow runoff from the PA. The property owner has been informed that the existing PA soil can be tilled and augmented with soil amendments to support denser vegetative growth and improve hydrologic function to approximate HSG B.

Determine the:

- A) Percent phosphorus load reduction rates (SCM Reduction %-P) for the specified impervious area (IA) disconnection to both the 0.09 and 0.15 acres receiving PAs with and without soil augmentation; and
- B) Cumulative phosphorus reductions in pounds that would be accomplished by the IA disconnection for the various scenarios (SCM-Reduction lbs-P).

Solution:

- 1) Determine the ratio of the contributing impervious area to the receiving pervious area:
 $IA:PA = 0.75 \text{ acres}/0.09 \text{ acres}$
 $= 8.3$
 $IA:PA = 0.75 \text{ acres}/0.15 \text{ acres}$
 $= 5.0$
- 2) Using **Table 2-30, Table 2-25** and **Figure 2-47** for a IA:PA ratios of 8:1 and 5:1, respectively, determine the phosphorus load reduction rates for IA disconnections to HSG C and HSG B:

Reduction Rates

Percent Phosphorus load reduction rates for IA disconnection		
Receiving PA	IA:PA	
	8:1	5:1
HSG C	7%	14%
HSG B (soil augmentation)	14%	22%

- 3) The cumulative phosphorus load reduction in pounds of phosphorus for the IA disconnection with storage (SCM-Reduction lbs-P) is calculated using **Equation 2-2**. The SCM Load was calculated in the previous example and is 1.34 lbs/yr.
- 4) $SCM \text{ Reduction }_{lbs-P} = SCM \text{ Load} * (SCM \text{ Reduction }_{\%-P}/100)$
 For PA of 0.09 acres HSG C the SCM Reduction lbs-P is calculated as follows:

$$\text{SCM Reduction}_{\text{lbs-P}(0.09\text{ac-HSG C})} = 1.34 \text{ lbs/yr} * (7/100) = \mathbf{0.09 \text{ lbs/yr}}$$

The table below presents the SCM Reduction $_{\text{lbs-P}}$ for each of the scenarios:

Pounds Phosphorus load reduction for IA disconnection, lbs/yr		
Receiving PA	Area of Receiving PA, acres	
	0.09	0.15
HSG C	0.09	0.19
HSG B (soil augmentation)	0.19	0.29

Example 2-8. Determine the phosphorus load reduction for converting impervious area to permeable/pervious area.

A property owner is planning upcoming road reconstruction work in an industrial (IND) area and has identified an opportunity to convert impervious surfaces to permeable/pervious surfaces by narrowing the road width of 3.7 miles (mi) of roadway from 32 feet (ft) to 28 ft and eliminating 3.2 miles of 4 ft wide paved sidewalk (currently there are sidewalks on both sides of the roadways targeted for restoration). The newly created permeable/pervious area will be tilled and treated with soil amendments to support vegetated growth in order to restore hydrologic function to at least HSG B.

Determine the:

- A) Percent phosphorus load reduction rate (SCM Reduction_{%-P}) for the conversion of impervious area (IA) to permeable/pervious area (PA); and
- B) Cumulative phosphorus reduction in pounds that would be accomplished by the project (SCM-Reduction_{lbs-P}).

Solution:

- 1) Determine the area of IA to be converted to PA:

$$\begin{aligned} \text{New PA} &= (((3.7 \text{ mi} * 4 \text{ ft}) + (3.2 \text{ mi} * 4 \text{ ft})) * 5280 \text{ ft/mi}) / 43,560 \text{ ft}^2/\text{acre} \\ &= 3.35 \text{ acres} \end{aligned}$$

- 2) Using **Table 2-31**, the phosphorus load reduction rate for converting IA to HSG B is 94.1%.
- 3) The SCM Load is first determined using the method described above.

$$\begin{aligned} \text{SCM Load} &= \text{IA} * \text{phosphorus export loading rate for IND IA (see Table 1-1)} \\ &= 3.35 \text{ acres} * 1.78 \text{ lbs/acre-yr} \\ &= 5.96 \text{ lbs/yr} \end{aligned}$$

- 4) The cumulative phosphorus load reduction in pounds of phosphorus for the IA conversion (SCM-Reduction_{lbs-P}) is calculated using **Equation 2-2**.

$$\begin{aligned} \text{SCM Reduction}_{\text{lbs-P}} &= \text{SCM Load} * (\text{SCM Reduction}_{\text{\%-P}}/100) \\ \text{SCM Reduction}_{\text{lbs-P}} &= 5.96 \text{ lbs/yr} * (94.1/100) \\ &= \mathbf{5.61 \text{ lbs/yr}} \end{aligned}$$

Table 2-2. Method for determining stormwater control design volume (DSV) (i.e., capacity) using long-term cumulative performance curves.

Stormwater Control Type	Description	Applicable Stormwater Control Measure Performance Curve	Equation for calculating Design Storage Capacity for Estimating Cumulative Reductions using Performances Curves
Infiltration Trench	Provides temporary storage of runoff using the void spaces within the soil/sand/gravel mixture that is used to backfill the trench for subsequent infiltration into the surrounding sub-soils.	Infiltration Trench (6 infiltration rates: 0.17, 0.27, 0.52, 1.02, 2.41 and 8.27 inches per hour)	DSV = void space volumes of gravel and sand layers $DSV = (L \times W \times D_{stone} \times n_{stone}) + (L \times W \times D_{sand} \times n_{sand})$
Subsurface Infiltration	Provides temporary storage of runoff using the combination of storage structures (e.g., galleys, chambers, pipes, etc.) and void spaces within the soil/sand/gravel mixture that is used to backfill the system for subsequent infiltration into the surrounding sub-soils.	Infiltration Trench (6 infiltration rates: 0.17, 0.27, 0.52, 1.02, 2.41 and 8.27 inches per hour)	DSV = Water storage volume of storage units and void space volumes of backfill materials. Example for subsurface galleys backfilled with washed stone: $DSV = (L \times W \times D)_{galley} + (L \times W \times D_{stone} \times n_{stone})$
Surface Infiltration	Provides temporary storage of runoff through surface ponding storage structures (e.g., basin or swale) for subsequent infiltration into the underlying soils.	Infiltration Basin (6 infiltration rates: 0.17, 0.27, 0.52, 1.02, 2.41 and 8.27 inches per hour)	DSV = Water volume of storage structure before bypass. Example for linear trapezoidal vegetated swale $DSV = (L \times ((W_{bottom} + W_{top@Dmax}) / 2) \times D)$
Rain Garden/Bio-retention (no underdrains)	Provides temporary storage of runoff through surface ponding and possibly void spaces within the soil/sand/gravel mixture that is used to filter runoff prior to infiltration into underlying soils.	Infiltration Basin (6 infiltration rates: 0.17, 0.27, 0.52, 1.02, 2.41 and 8.27 inches per hour)	DSV = Ponding water storage volume and void space volumes of soil filter media. Example for raingarden: $DSV = (A_{pond} \times D_{pond}) + (A_{soil} \times D_{soil} \times n_{soil\ mix})$
Tree Filter (no underdrain)	Provides temporary storage of runoff through surface ponding and void spaces within the soil/sand/gravel mixture that is used to filter runoff prior to infiltration into underlying soils.	Infiltration Trench (6 infiltration rates: 0.17, 0.27, 0.52, 1.02, 2.41 and 8.27 inches per hour)	DSV = Ponding water storage volume and void space volumes of soil filter media. $DSV = (L \times W \times D_{ponding}) + (L \times W \times D_{soil} \times n_{soil\ mix})$

<p>Bio-Filtration (w/underdrain)</p>	<p>Provides temporary storage of runoff for filtering through an engineered soil media. The storage capacity includes void spaces in the filter media and temporary ponding at the surface. After runoff has passed through the filter media it is collected by an underdrain pipe for discharge. Manufactured or packaged bio-filter systems such as tree box filters may be suitable for using the bio-filtration performance results.</p>	<p>Bio-filtration</p>	<p>DSV = Ponding water storage volume and void space volume of soil filter media. Example of a linear biofilter: $DSV = (L \times W \times D_{ponding}) + (L \times W \times D_{soil} \times n_{soil})$</p>
<p>Enhanced Bio-filtration w/ Internal Storage Reservoir (ISR) (no infiltration)</p>	<p>Based on design by the UMA Stormwater Center (UMASC). Provides temporary storage of runoff for filtering through an engineered soil media, augmented for enhanced phosphorus removal, followed by detention and denitrification in a subsurface internal storage reservoir (ISR) comprised of gravel. An elevated outlet control at the top of the ISR is designed to provide a retention time of at least 24 hours in the system to allow for sufficient time for denitrification and nitrogen reduction to occur prior to discharge. The design storage capacity for using the cumulative performance curves is comprised of void spaces in the filter media, temporary ponding at the surface of the practice and the void spaces in the gravel ISR.</p>	<p>Enhanced Bio-filtration w/ISR</p>	<p>DSV = Ponding water storage volume and void space volume of soil filter media and gravel ISR. $DSV = (A_{bed} \times D_{ponding}) + (A_{bed} \times D_{soil} \times n_{soil}) + (A_{ISR} \times D_{gravel} \times n_{gravel})$</p>
<p>Gravel Wetland / Wet Vegetated Treatment System (WVTS)</p>	<p>Provides temporary surface ponding storage of runoff in a vegetated wetland cell that is eventually routed to an underlying saturated gravel internal storage reservoir (ISR) for nitrogen treatment. Outflow is controlled by an elevated orifice that has its invert elevation equal to the top of the ISR layer and provides a retention time of at least 24 hours.</p>	<p>Gravel Wetland</p>	<p>DSV = pretreatment volume + ponding volume + void space volume of gravel ISR. $DSV = (A_{pretreatment} \times D_{preTreatment}) + (A_{wetland} \times D_{ponding}) + (A_{ISR} \times D_{gravel} \times n_{gravel})$</p>
<p>Porous Pavement with subsurface infiltration</p>	<p>Provides filtering of runoff through a filter course and temporary storage of runoff within the void spaces of a subsurface gravel reservoir prior to infiltration into subsoils.</p>	<p>Infiltration Trench (6 infiltration rates: 0.17, 0.27, 0.52, 1.02, 2.41 and 8.27 inches per hour)</p>	<p>DSV = void space volumes of gravel layer $DSV = (L \times W \times D_{stone} \times n_{stone})$</p>

<p>Porous pavement w/ impermeable underliner w/underdrain</p>	<p>Provides filtering of runoff through a filter course and temporary storage of runoff within the void spaces prior to discharge by way of an underdrain.</p>	<p>Porous Pavement</p>	<p>Depth of Filter Course = D_{FC}</p>
<p>Sand Filter w/underdrain</p>	<p>Provides filtering of runoff through a sand filter course and temporary storage of runoff through surface ponding and within void spaces of the sand and washed stone layers prior to discharge by way of an underdrain.</p>	<p>Sand Filter</p>	<p>DSV = pretreatment volume + ponding volume + void space volume of sand and washed stone layers. $DSV = (A_{pretreatment} \times D_{preTreatment}) + (A_{bed} \times D_{ponding}) + (A_{bed} \times D_{sand} \times n_{sand}) + (A_{bed} \times D_{stone} \times n_{stone})$</p>
<p>Wet Pond</p>	<p>Provides treatment of runoff through routing through permanent pool.</p>	<p>Wet Pond</p>	<p>DSV= Permanent pool volume prior to high flow bypass $DSV = A_{pond} \times D_{pond}$ (does not include pretreatment volume)</p>
<p>Extended Dry Detention Basin</p>	<p>Provides temporary detention storage for the design storage volume to drain in 24 hours through multiple outlet controls.</p>	<p>Dry Pond</p>	<p>DSV= Ponding volume prior to high flow bypass $DSV = A_{pond} \times D_{pond}$ (does not include pretreatment volume)</p>
<p>Dry Water Quality Swale/Grass Swale</p>	<p>Based on MA design standards. Provides temporary surface ponding storage of runoff in an open vegetated channel through permeable check dams. Treatment is provided by filtering of runoff by vegetation and check dams and infiltration into subsurface soils.</p>	<p>Water Quality Grass Swale</p>	<p>DSV = Volume of swale at full design depth $DSV = L_{swale} \times W_{swale} \times D_{ponding\ swale}$</p>
<p>Definitions: DSV = Design Storage Volume = physical storage capacity to hold water; VSV = Void Space Volume; L = length, W = width, D = depth at design capacity before bypass, n = porosity fill material, A = average surface area for calculating volume; Infiltration rate = saturated soil hydraulic conductivity</p>			

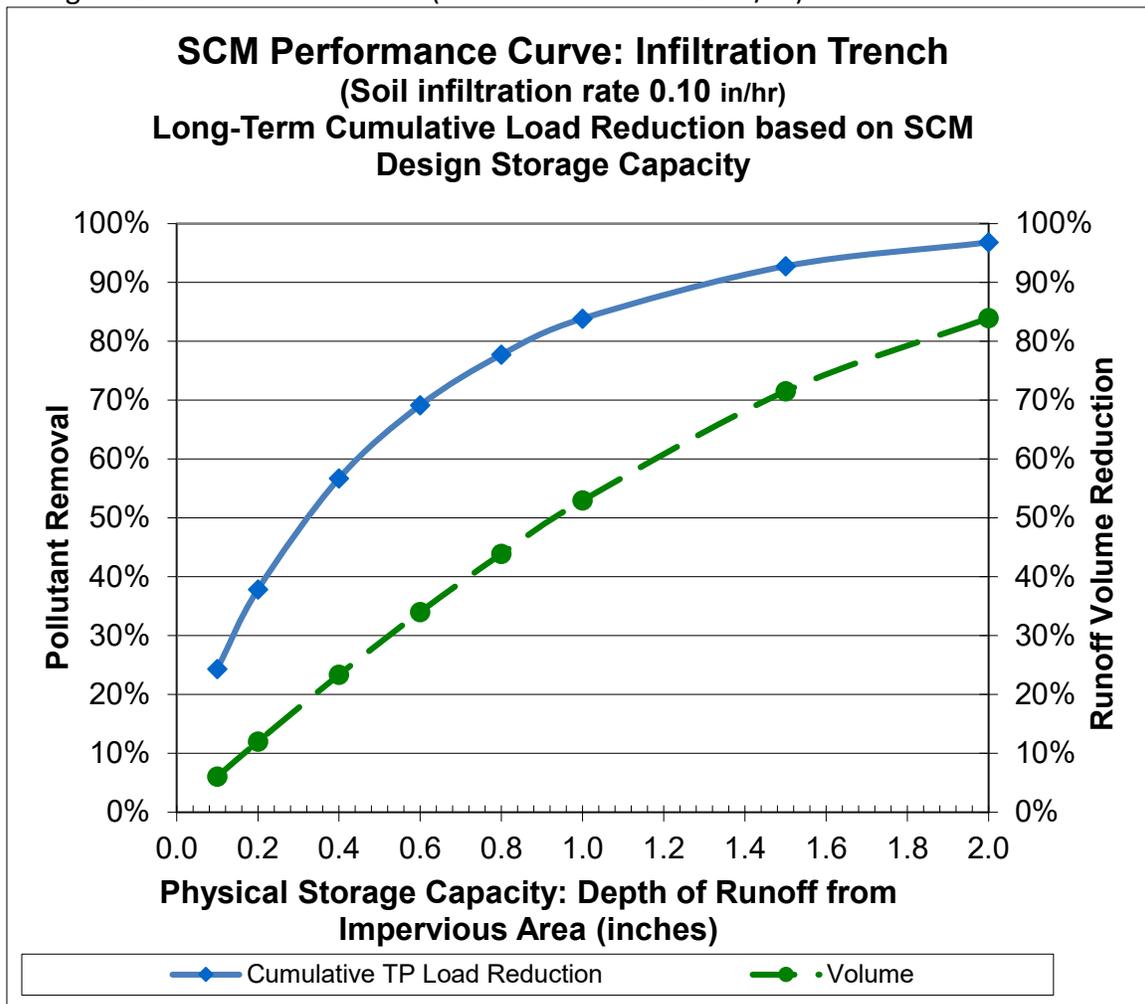
2.5. Phosphorus Load Reduction Credit Calculations for Structural Stormwater Control Measures (SCMs)

2.5.1. Infiltration Trench (IR = 0.10 in/hr) SCM Performance Table and Curve

Table 2-3. Infiltration Trench (IR = 0.10 in/hr) SCM Performance Table

Infiltration Trench (0.10 in/hr) BMP Performance Table: Long-Term Phosphorus Load Reduction								
SCM Capacity: Depth of Runoff from Impervious Area (inches)	0.1	0.2	0.4	0.6	0.8	1.0	1.5	2.0
Runoff Volume Reduction	6%	12%	23%	34%	44%	53%	72%	84%
Cumulative Phosphorus Load Reduction	24%	38%	57%	69%	78%	84%	93%	97%

Figure 2-5. Infiltration Trench (infiltration rate = 0.10 in/hr) SCM Performance Curve

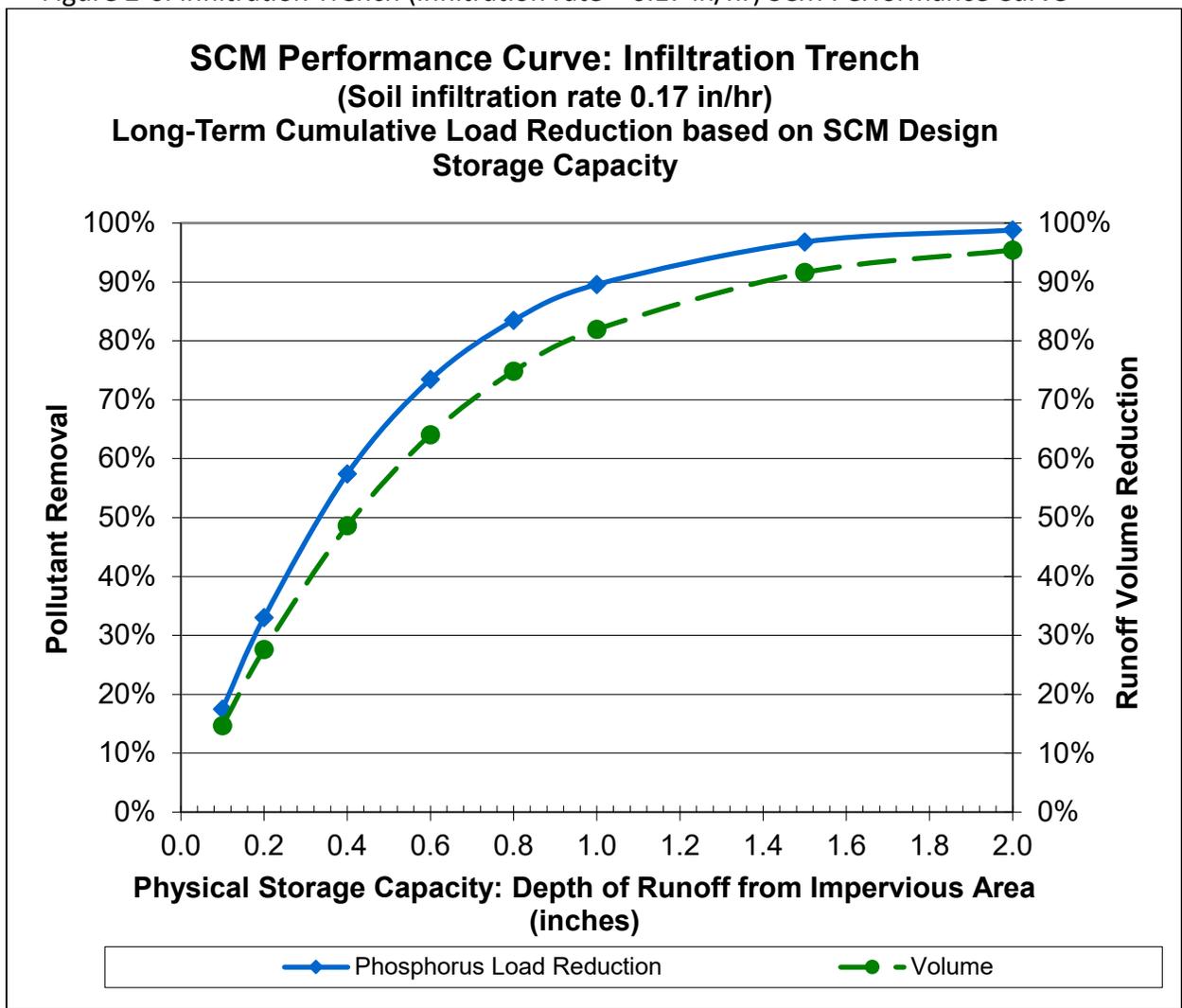


2.5.2. Infiltration Trench (IR = 0.17 in/hr) SCM Performance Table and Curve

Table 2-4. Infiltration Trench (IR = 0.17 in/hr) SCM Performance Table

Infiltration Trench (IR = 0.17 in/hr) SCM Performance Table: Long-Term Phosphorus Load Reduction								
SCM Capacity: Depth of Runoff from Impervious Area (inches)	0.1	0.2	0.4	0.6	0.8	1.0	1.5	2.0
Runoff Volume Reduction	15%	28%	49%	64%	75%	82%	92%	95%
Cumulative Phosphorus Load Reduction	18%	33%	57%	73%	83%	90%	97%	99%

Figure 2-6. Infiltration Trench (infiltration rate = 0.17 in/hr) SCM Performance Curve

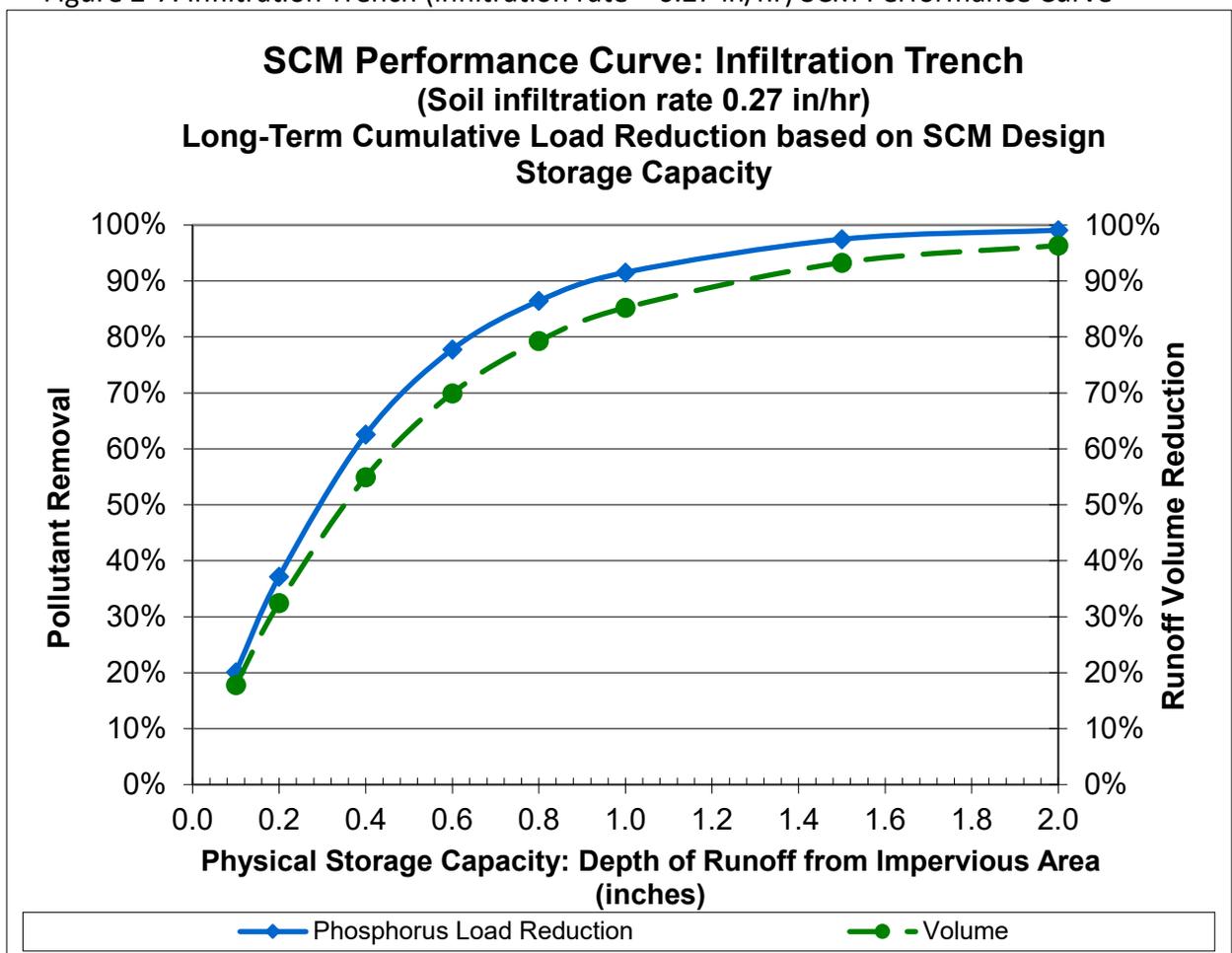


2.5.3. Infiltration Trench (IR = 0.27 in/hr) SCM Performance Table and Curve

Table 2-5. Infiltration Trench (IR = 0.27 in/hr) SCM Performance Table

Infiltration Trench (IR = 0.27 in/hr) SCM Performance Table: Long-Term Phosphorus Load Reduction								
SCM Capacity: Depth of Runoff from Impervious Area (inches)	0.1	0.2	0.4	0.6	0.8	1.0	1.5	2.0
Runoff Volume Reduction	17.8%	32.5%	55.0%	70.0%	79.3%	85.2%	93.3%	96.3%
Cumulative Phosphorus Load Reduction	20%	37%	63%	78%	86%	92%	97%	99%

Figure 2-7. Infiltration Trench (infiltration rate = 0.27 in/hr) SCM Performance Curve

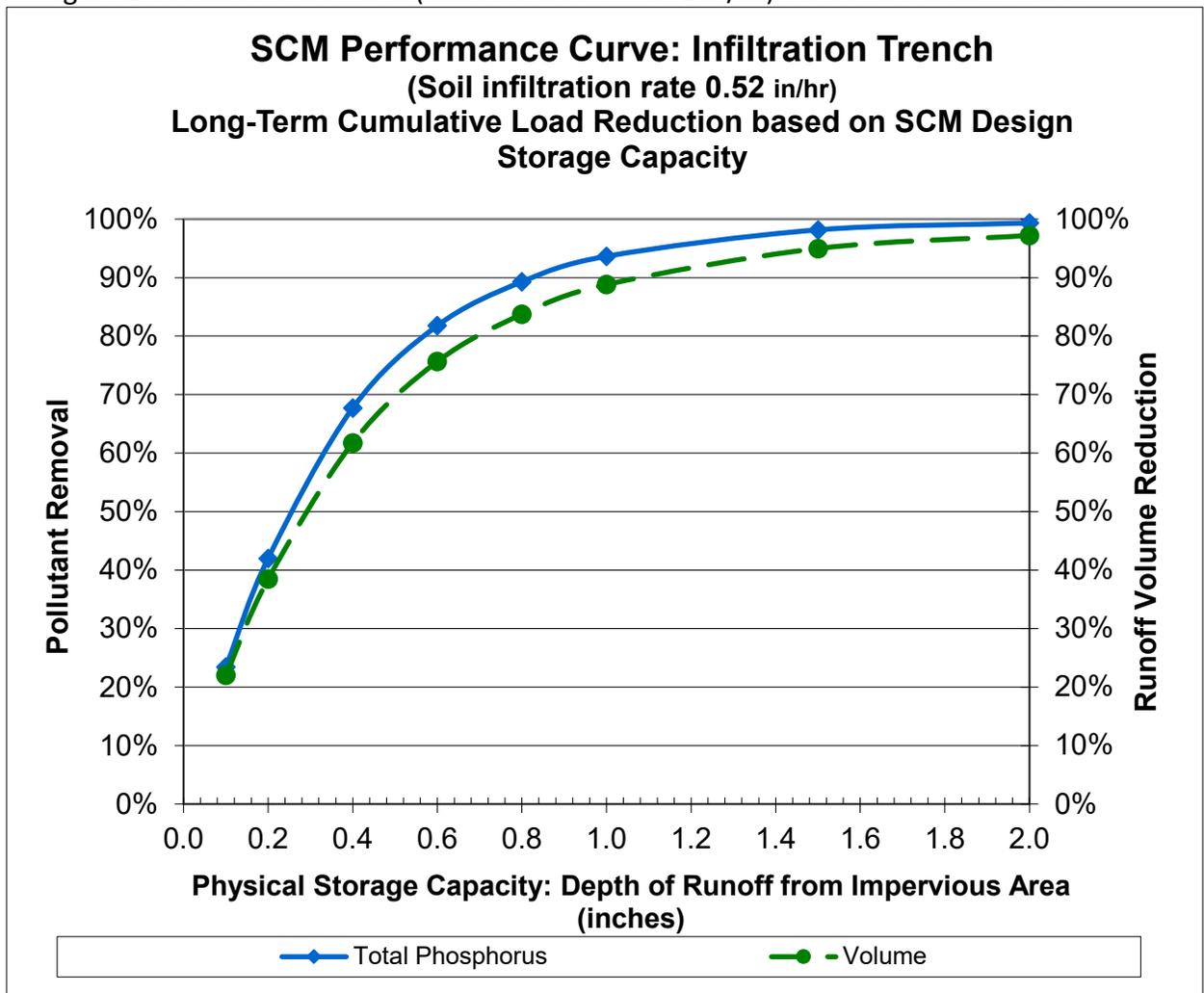


2.5.4. Infiltration Trench (IR = 0.52 in/hr) SCM Performance Table and Curve

Table 2-6. Infiltration Trench (IR = 0.52 in/hr) SCM Performance Table

Infiltration Trench (IR = 0.52 in/hr) SCM Performance Table: Long-Term Phosphorus Load Reduction								
SCM Capacity: Depth of Runoff from Impervious Area (inches)	0.1	0.2	0.4	0.6	0.8	1.0	1.5	2.0
Runoff Volume Reduction	22.0%	38.5%	61.8%	75.7%	83.7%	88.8%	95.0%	97.2%
Cumulative Phosphorus Load Reduction	23%	42%	68%	82%	89%	94%	98%	99%

Figure 2-8. Infiltration Trench (infiltration rate = 0.52 in/hr) SCM Performance Curve

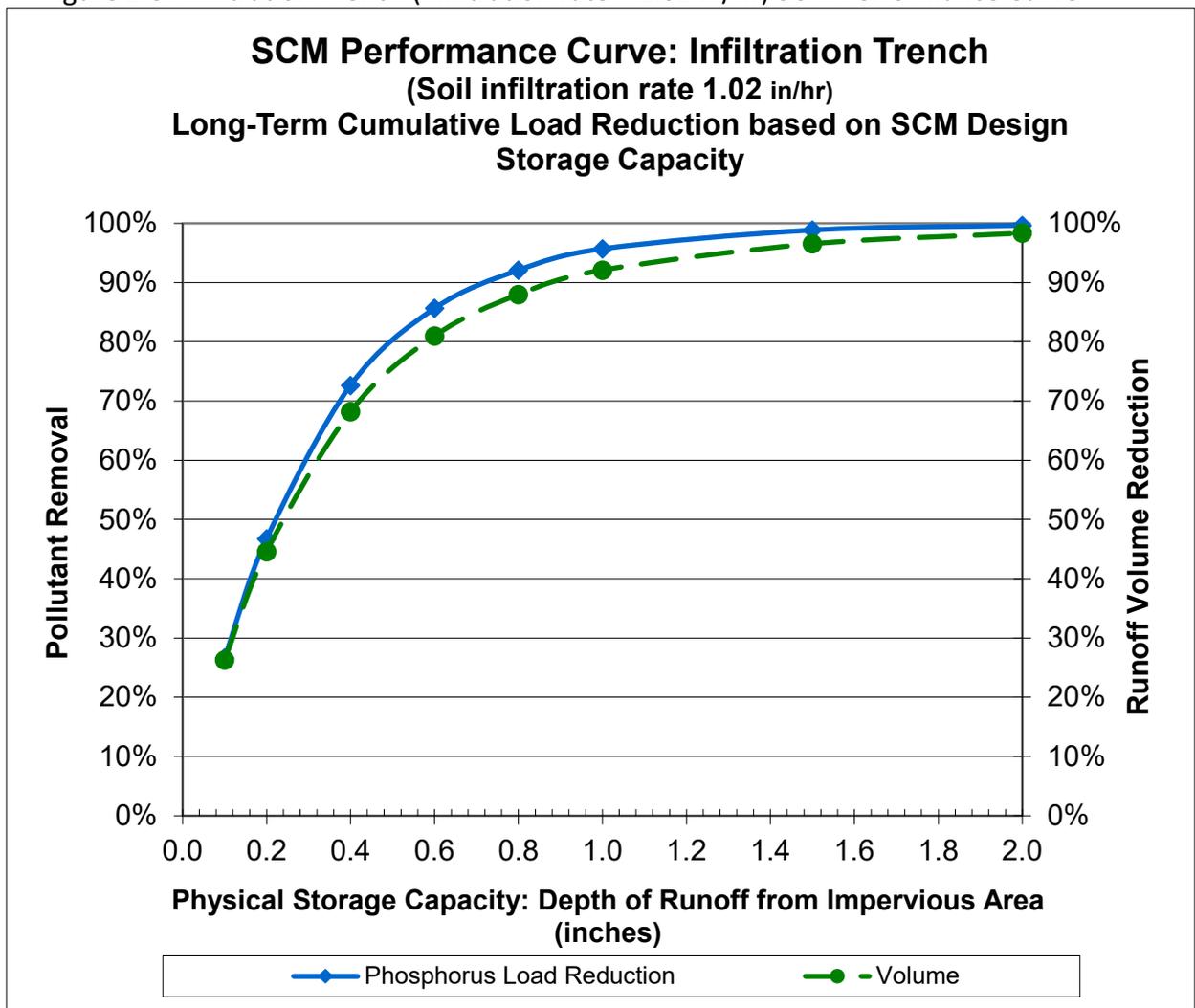


2.5.5. Infiltration Trench (IR = 1.02 in/hr) SCM Performance Table and Curve

Table 2-7. Infiltration Trench (IR = 1.02 in/hr) SCM Performance Table

Infiltration Trench (IR = 1.02 in/hr) SCM Performance Table: Long-Term Phosphorus Load Reduction								
SCM Capacity: Depth of Runoff from Impervious Area (inches)	0.1	0.2	0.4	0.6	0.8	1.0	1.5	2.0
Runoff Volume Reduction	26.3%	44.6%	68.2%	81.0%	88.0%	92.1%	96.5%	98.3%
Cumulative Phosphorus Load Reduction	27%	47%	73%	86%	92%	96%	99%	100%

Figure 2-9. Infiltration Trench (infiltration rate = 1.02 in/hr) SCM Performance Curve

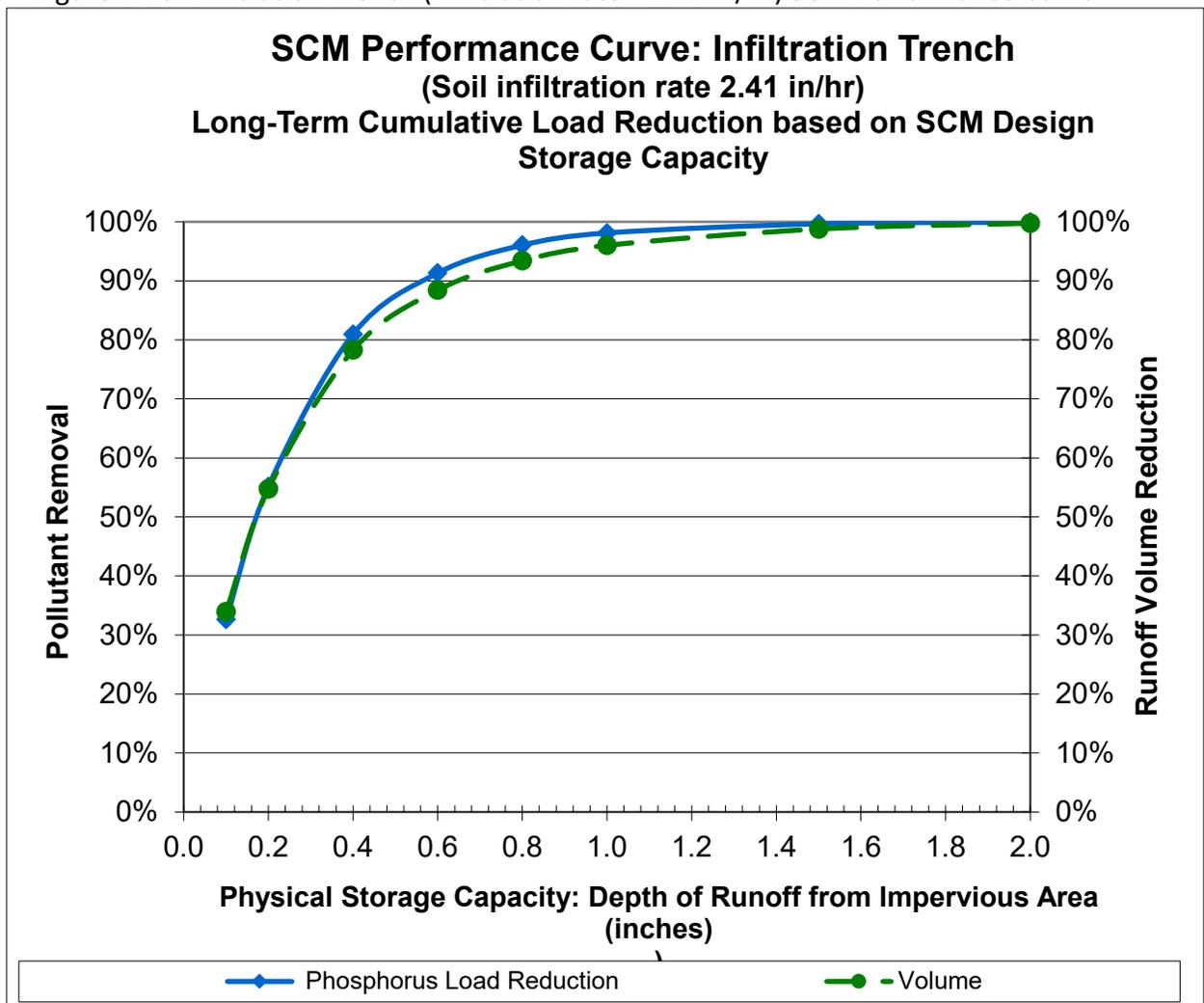


2.5.6. Infiltration Trench (IR = 2.41 in/hr) SCM Performance Table and Curve

Table 2-8. Infiltration Trench (IR = 2.41 in/hr) SCM Performance Table

Infiltration Trench (IR = 2.41 in/hr) SCM Performance Table: Long-Term Phosphorus Load Reduction								
SCM Capacity: Depth of Runoff Treated from Impervious Area (inches)	0.1	0.2	0.4	0.6	0.8	1.0	1.5	2.0
Runoff Volume Reduction	34%	55%	78%	88%	93%	96%	99%	100%
Cumulative Phosphorus Load Reduction	33%	55%	81%	91%	96%	98%	100%	100%

Figure 2-10. Infiltration Trench (infiltration rate = 2.41 in/hr) SCM Performance Curve

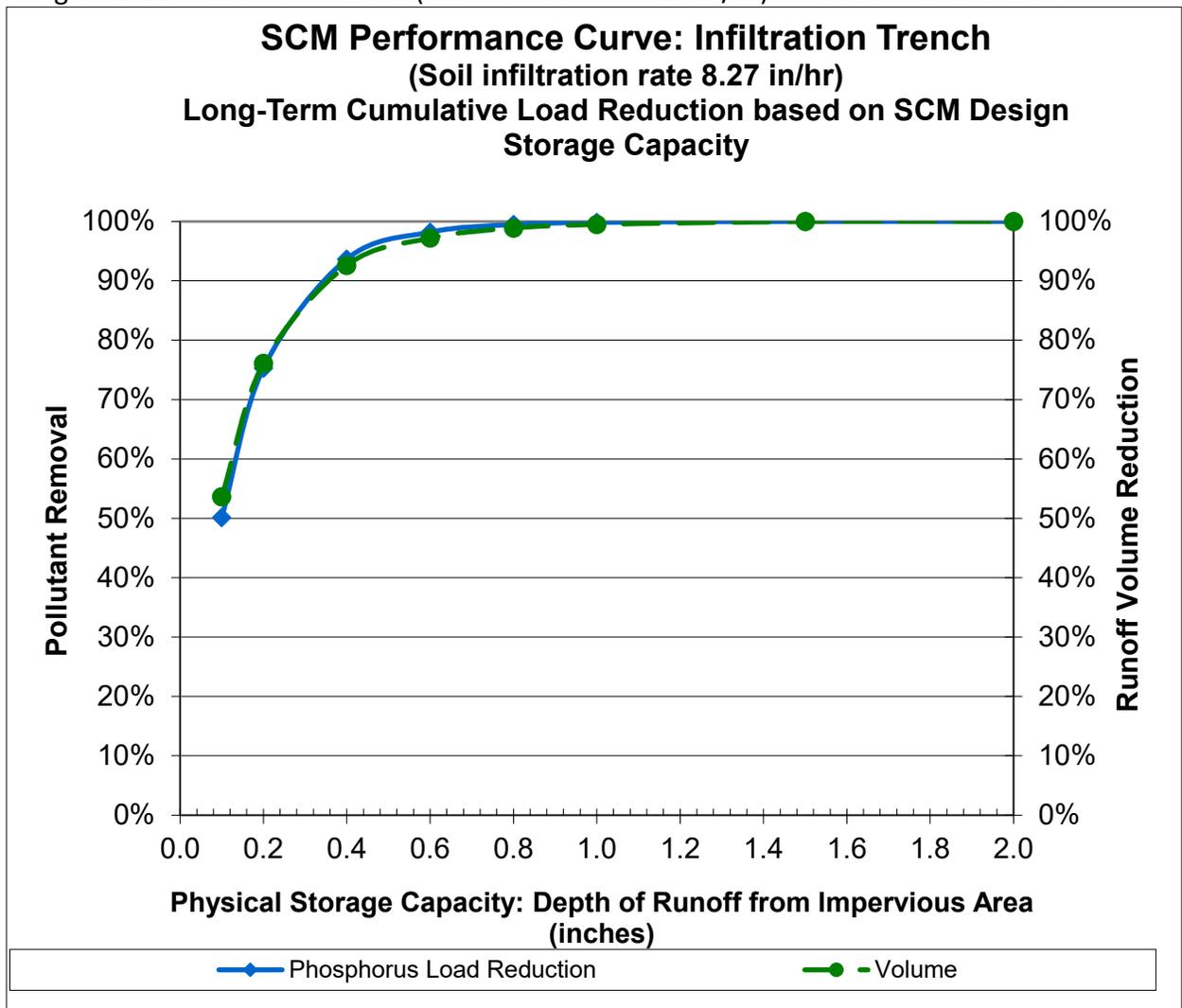


2.5.7. Infiltration Trench (IR = 8.27 in/hr) SCM Performance Table and Curve

Table 2-9. Infiltration Trench (IR = 8.27 in/hr) SCM Performance Table

Infiltration Trench (8.27 in/hr) SCM Performance Table: Long-Term Phosphorus Load Reduction								
SCM Capacity: Depth of Runoff from Impervious Area (inches)	0.1	0.2	0.4	0.6	0.8	1.0	1.5	2.0
Runoff Volume Reduction	53.6%	76.1%	92.6%	97.2%	98.9%	99.5%	100.0%	100.0%
Cumulative Phosphorus Load Reduction	50%	75%	94%	98%	99%	100%	100%	100%

Figure 2-11. Infiltration Trench (infiltration rate = 8.27 in/hr) SCM Performance Curve

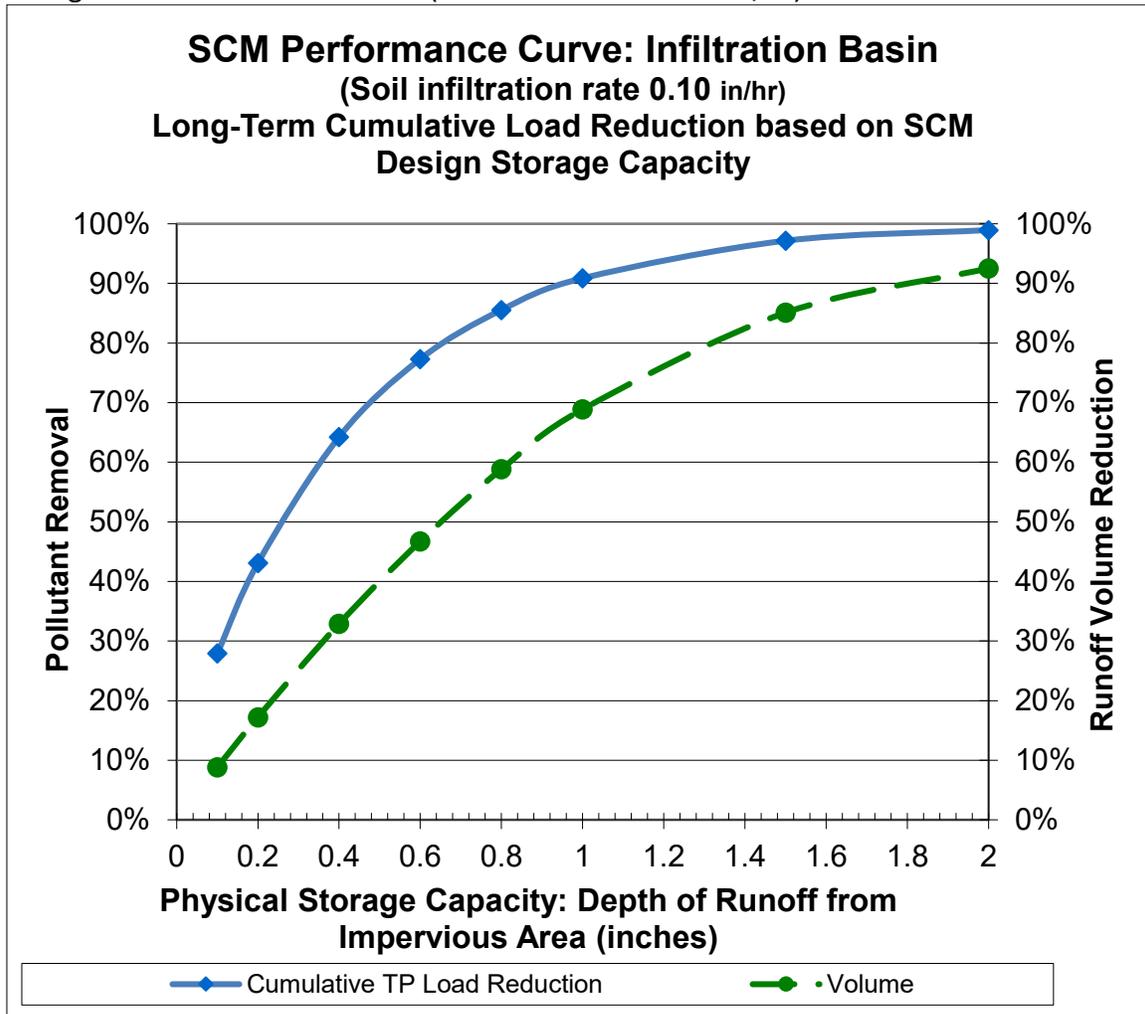


2.5.8. Infiltration Basin (IR = 0.10 in/hr) SCM Performance Curve and Table

Table 2-10. Infiltration Basin (IR = 0.10 in/hr) SCM Performance Table

Surface Infiltration (0.10 in/hr) SCM Performance Table: Long-Term Phosphorus Load Reduction								
SCM Capacity: Depth of Runoff from Impervious Area (inches)	0.1	0.2	0.4	0.6	0.8	1	1.5	2
Runoff Volume Reduction	9%	17%	33%	47%	59%	69%	85%	93%
Cumulative Phosphorus Load Reduction	28%	43%	64%	77%	86%	91%	97%	99%

Figure 2-12. Infiltration Basin (infiltration rate = 0.10 in/hr) SCM Performance Curve

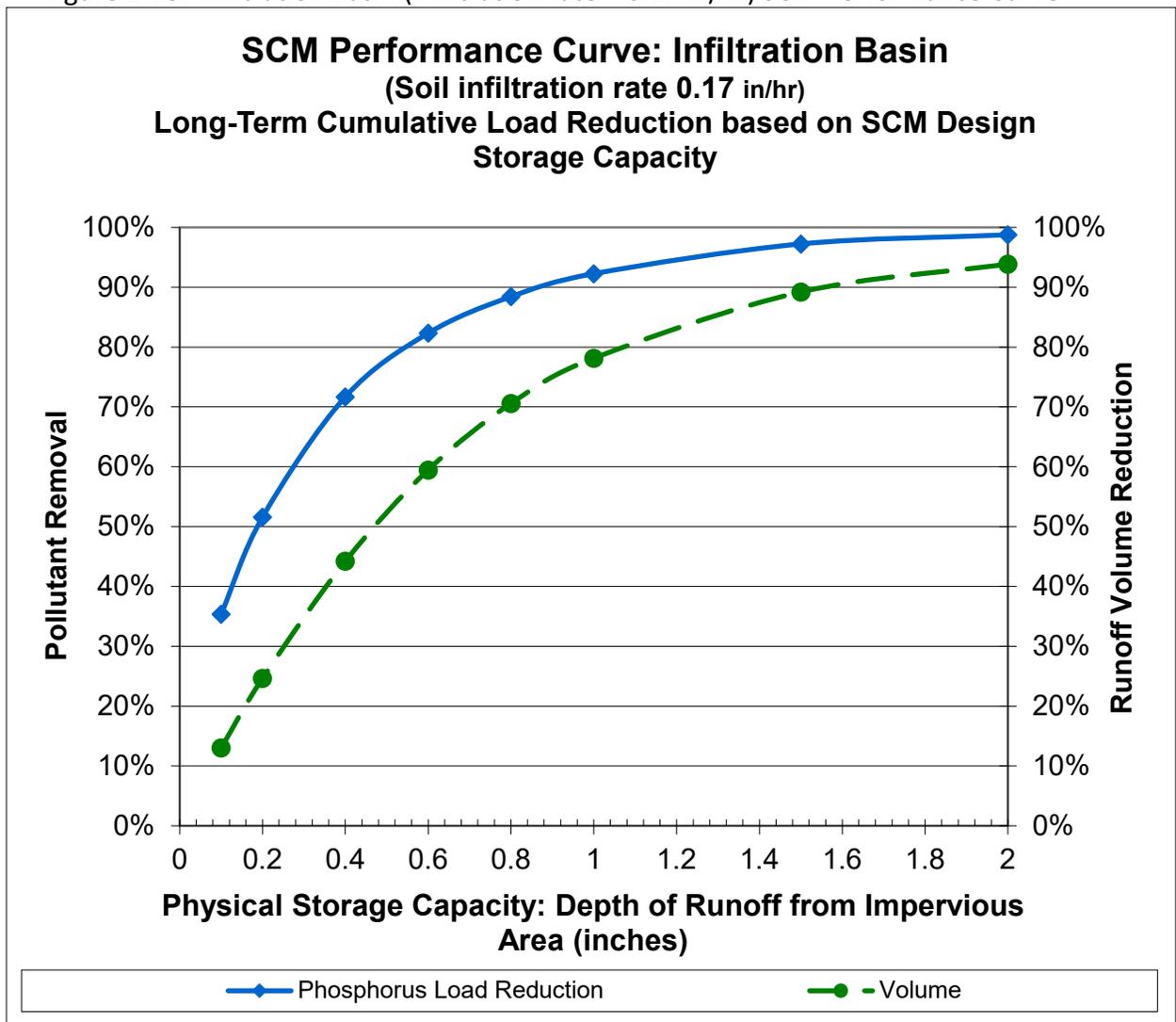


2.5.9. Infiltration Basin (IR = 0.17 in/hr) SCM Performance Curve and Table

Table 2-11. Infiltration Basin (IR = 0.17 in/hr) SCM Performance Table

Infiltration Basin (0.17 in/hr) SCM Performance Table: Long-Term Phosphorus Load Reduction								
SCM Capacity: Depth of Runoff from Impervious Area (inches)	0.1	0.2	0.4	0.6	0.8	1.0	1.5	2.0
Runoff Volume Reduction	13%	25%	44%	59%	71%	78%	89%	94%
Cumulative Phosphorus Load Reduction	35%	52%	72%	82%	88%	92%	97%	99%

Figure 2-13. Infiltration Basin (infiltration rate = 0.17 in/hr) SCM Performance Curve

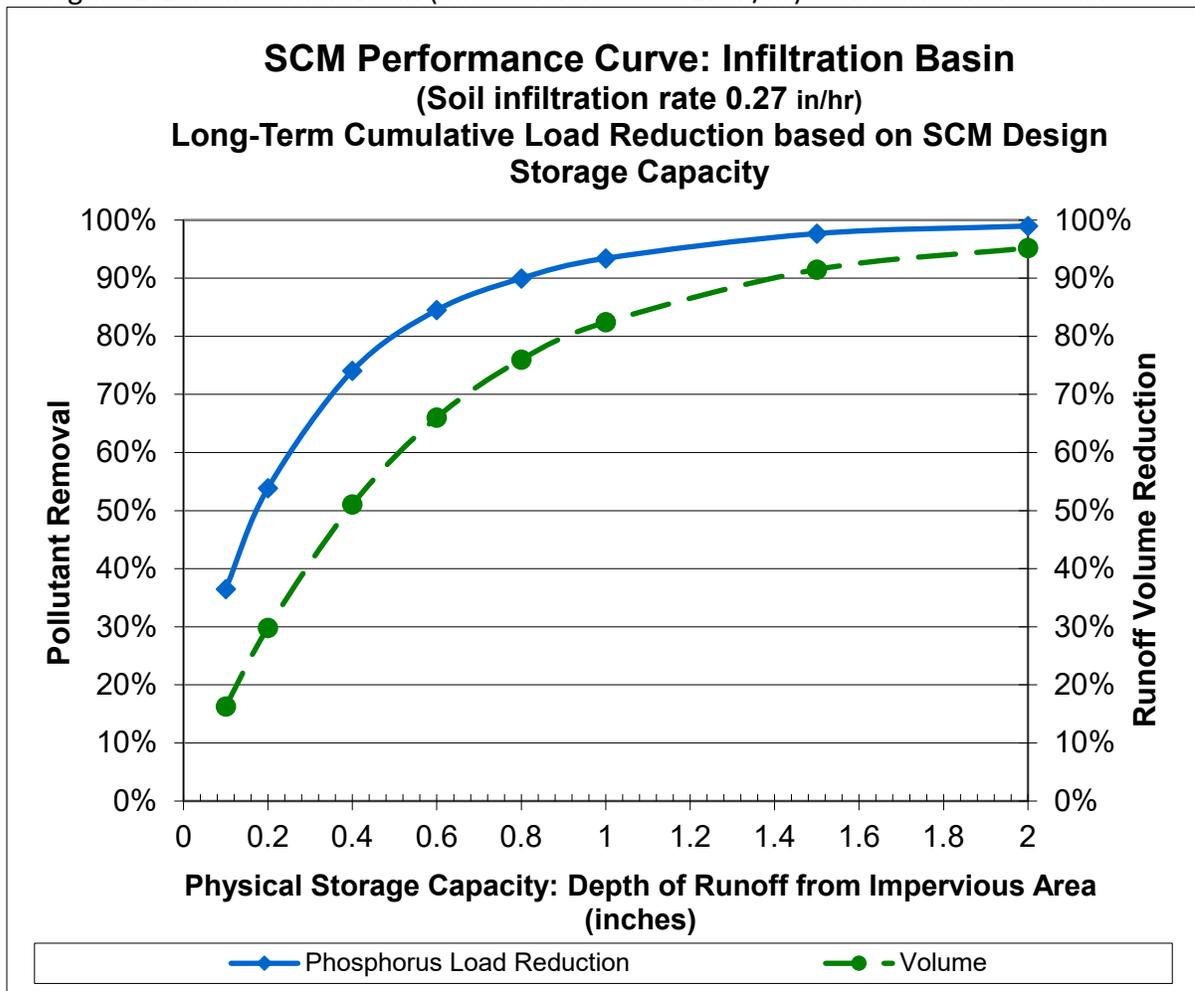


2.5.10. Infiltration Basin (IR = 0.27 in/hr) SCM Performance Table and Curve

Table 2-12. Infiltration Basin (IR = 0.27 in/hr) SCM Performance Table

Infiltration Basin (0.27 in/hr) SCM Performance Table: Long-Term Phosphorus Load Reduction								
SCM Capacity: Depth of Runoff from Impervious Area (inches)	0.1	0.2	0.4	0.6	0.8	1.0	1.5	2.0
Runoff Volume Reduction	16%	30%	51%	66%	76%	82%	91%	95%
Cumulative Phosphorus Load Reduction	37%	54%	74%	85%	90%	93%	98%	99%

Figure 2-14. Infiltration Basin (infiltration rate = 0.27 in/hr) SCM Performance Curve

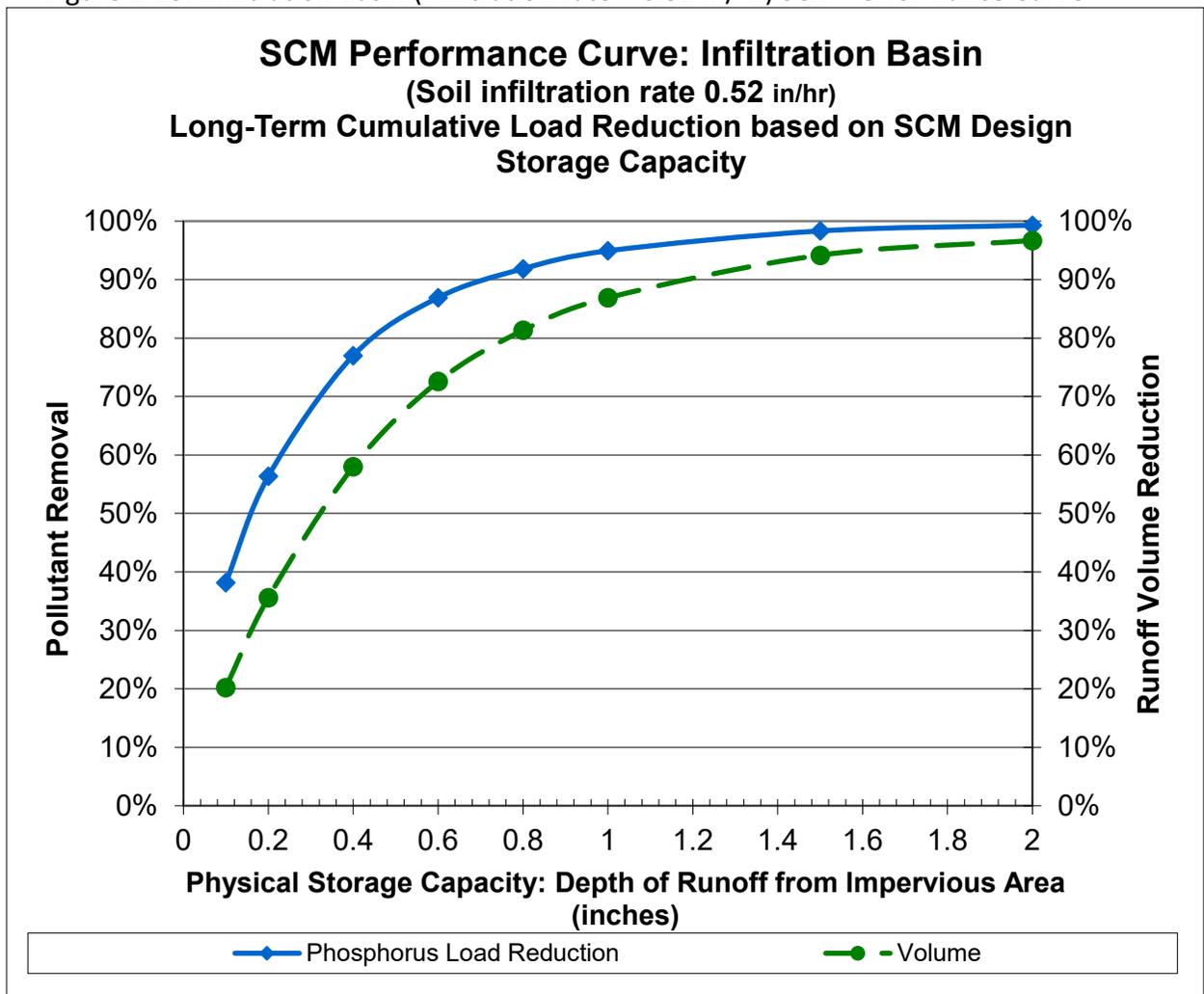


2.5.11. Infiltration Basin (IR = 0.52 in/hr) SCM Performance Table and Curve

Table 2-13. Infiltration Basin (IR = 0.52 in/hr) SCM Performance Table

Infiltration Basin (0.52 in/hr) SCM Performance Table: Long-Term Phosphorus Load Reduction								
SCM Capacity: Depth of Runoff from Impervious Area (inches)	0.1	0.2	0.4	0.6	0.8	1.0	1.5	2.0
Runoff Volume Reduction	20%	36%	58%	73%	81%	87%	94%	97%
Cumulative Phosphorus Load Reduction	38%	56%	77%	87%	92%	95%	98%	99%

Figure 2-15. Infiltration Basin (infiltration rate = 0.52 in/hr) SCM Performance Curve

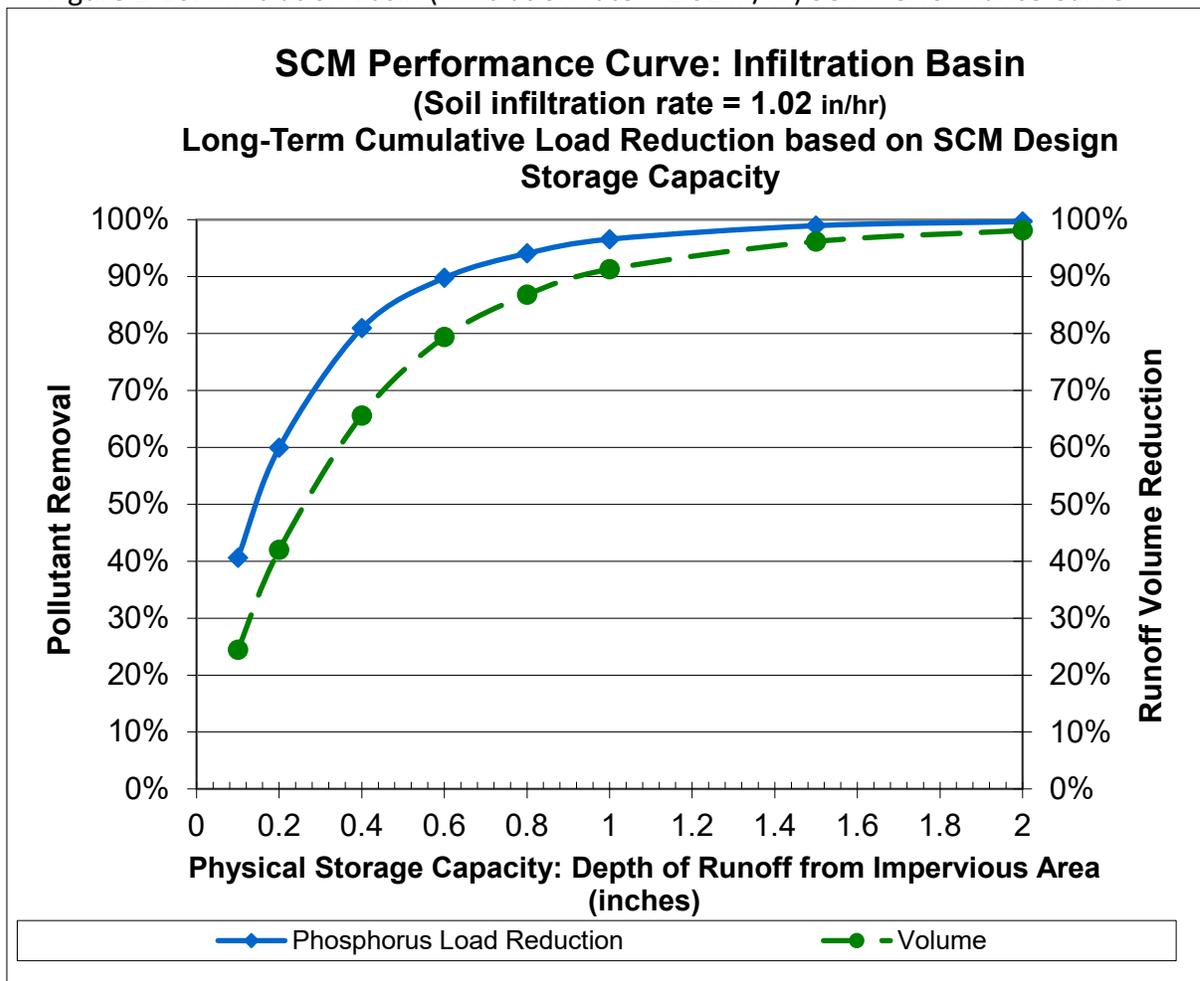


2.5.12. Infiltration Basin (IR = 1.02 in/hr) SCM Performance Table and Curve

Table 2-14. Infiltration Basin (IR = 1.02 in/hr) SCM Performance Table

Infiltration Basin (1.02 in/hr) SCM Performance Table: Long-Term Phosphorus Load Reduction								
SCM Capacity: Depth of Runoff from Impervious Area (inches)	0.1	0.2	0.4	0.6	0.8	1.0	1.5	2.0
Runoff Volume Reduction	24.5%	42.0%	65.6%	79.4%	86.8%	91.3%	96.2%	98.1%
Cumulative Phosphorus Load Reduction	41%	60%	81%	90%	94%	97%	99%	100%

Figure 2-16. Infiltration Basin (infiltration rate = 1.02 in/hr) SCM Performance Curve

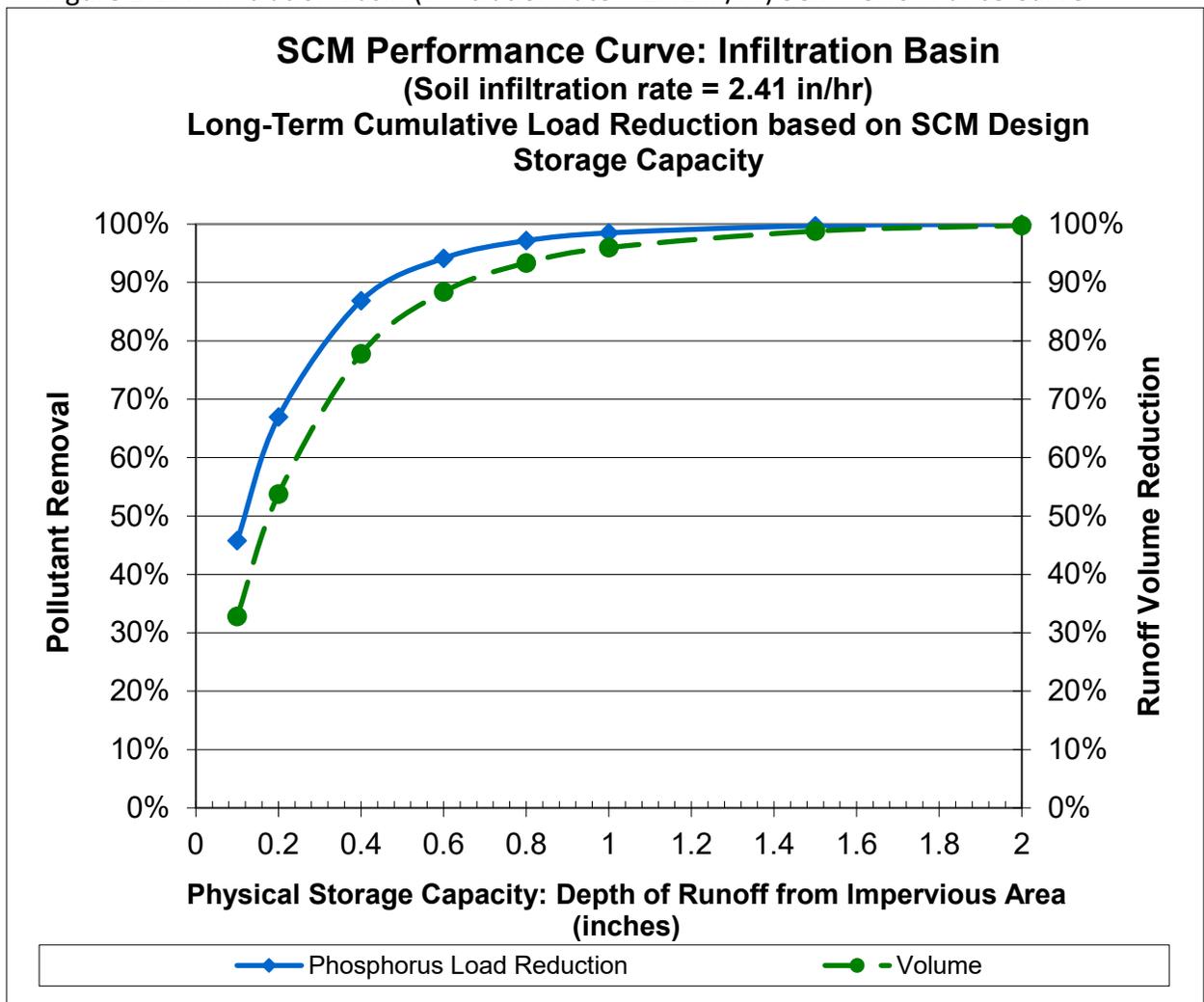


2.5.13. Infiltration Basin (IR = 2.41 in/hr) SCM Performance Table and Curve

Table 2-15. Infiltration Basin (IR = 2.41 in/hr) SCM Performance Table.

Infiltration Basin (2.41 in/hr) SCM Performance Table: Long-Term Phosphorus Load Reduction								
SCM Capacity: Depth of Runoff from Impervious Area (inches)	0.1	0.2	0.4	0.6	0.8	1.0	1.5	2.0
Runoff Volume Reduction	32.8%	53.8%	77.8%	88.4%	93.4%	96.0%	98.8%	99.8%
Cumulative Phosphorus Load Reduction	46%	67%	87%	94%	97%	98%	100%	100%

Figure 2-17. Infiltration Basin (infiltration rate = 2.41 in/hr) SCM Performance Curve

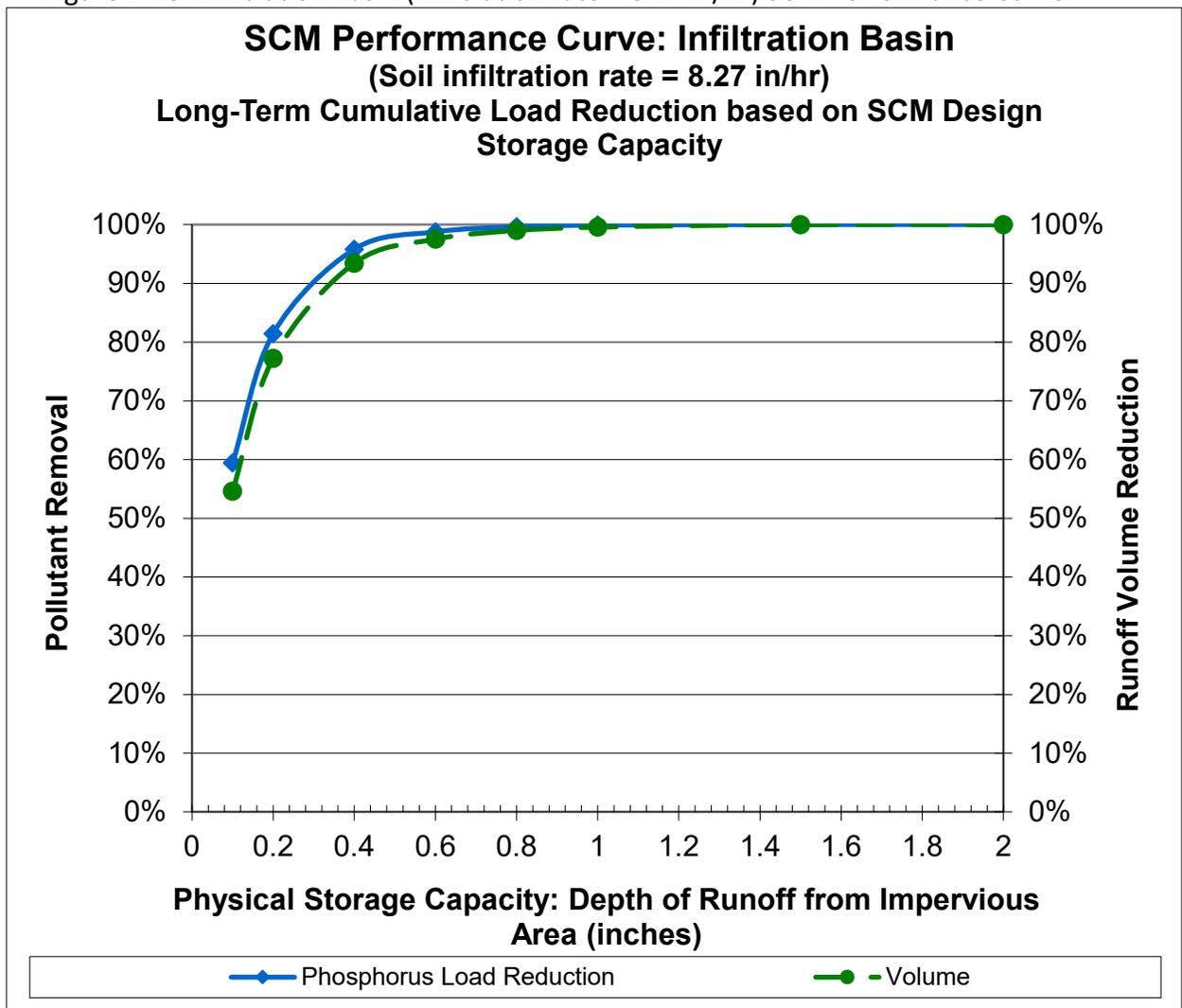


2.5.14. Infiltration Basin (IR = 8.27 in/hr) SCM Performance Table and Curve

Table 2-16. Infiltration Basin (IR = 8.27 in/hr) SCM Performance Table

Infiltration Basin (8.27 in/hr) SCM Performance Table: Long-Term Phosphorus Load Reduction								
SCM Capacity: Depth of Runoff from Impervious Area (inches)	0.1	0.2	0.4	0.6	0.8	1.0	1.5	2.0
Runoff Volume Reduction	54.6%	77.2%	93.4%	97.5%	99.0%	99.6%	100.0%	100.0%
Cumulative Phosphorus Load Reduction	59%	81%	96%	99%	100%	100%	100%	100%

Figure 2-18. Infiltration Basin (infiltration rate = 8.27 in/hr) SCM Performance Curve

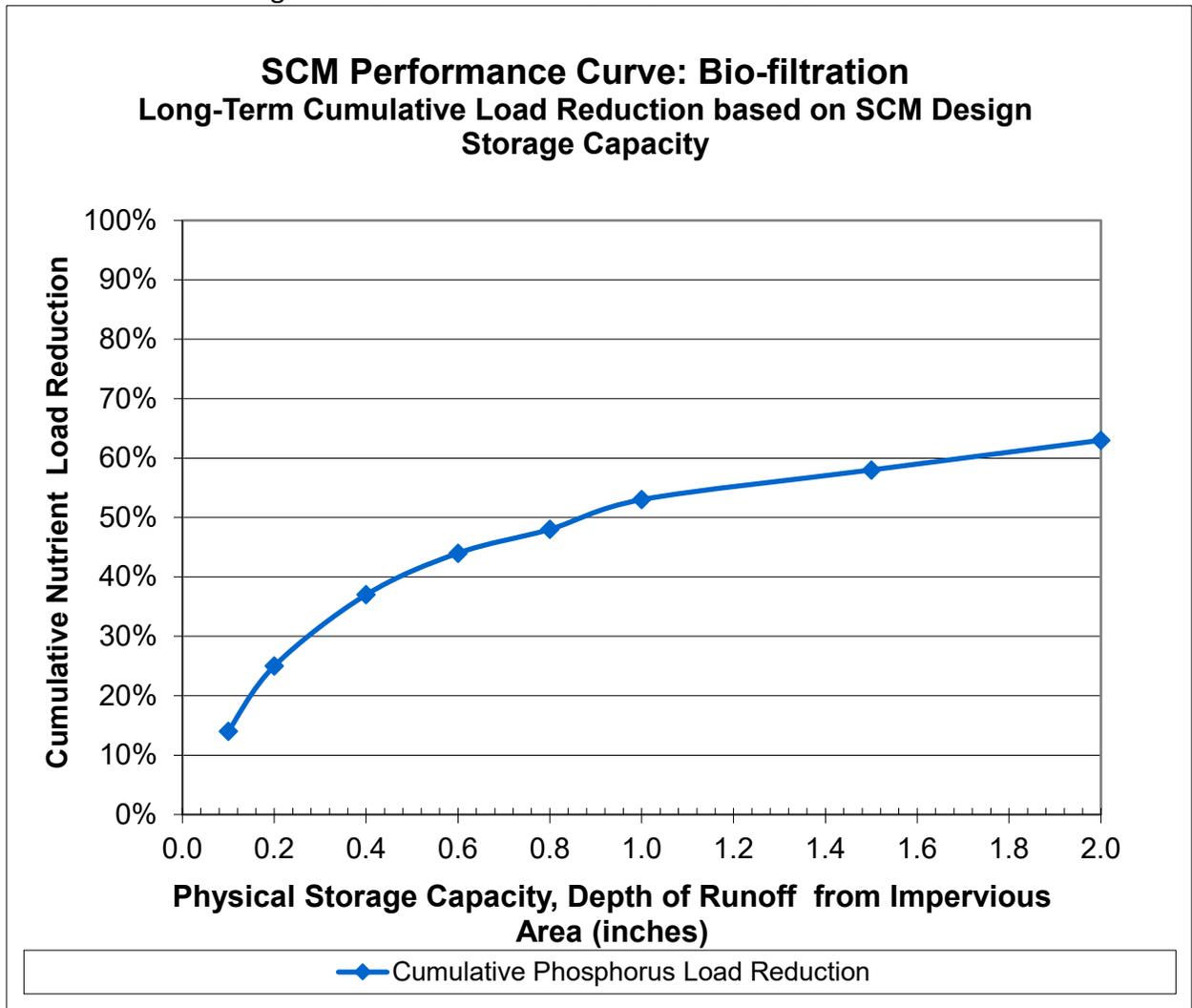


2.5.15. Bio-filtration SCM Performance Table and Curve

Table 2-17. Bio-filtration SCM Performance Table

Bio-filtration SCM Performance Table: Long-Term Phosphorus Load Reduction								
SCM Capacity: Depth of Runoff from Impervious Area (inches)	0.1	0.2	0.4	0.6	0.8	1.0	1.5	2.0
Cumulative Phosphorus Load Reduction	14%	25%	37%	44%	48%	53%	58%	63%

Figure 2-19. Bio-filtration SCM Performance Curve

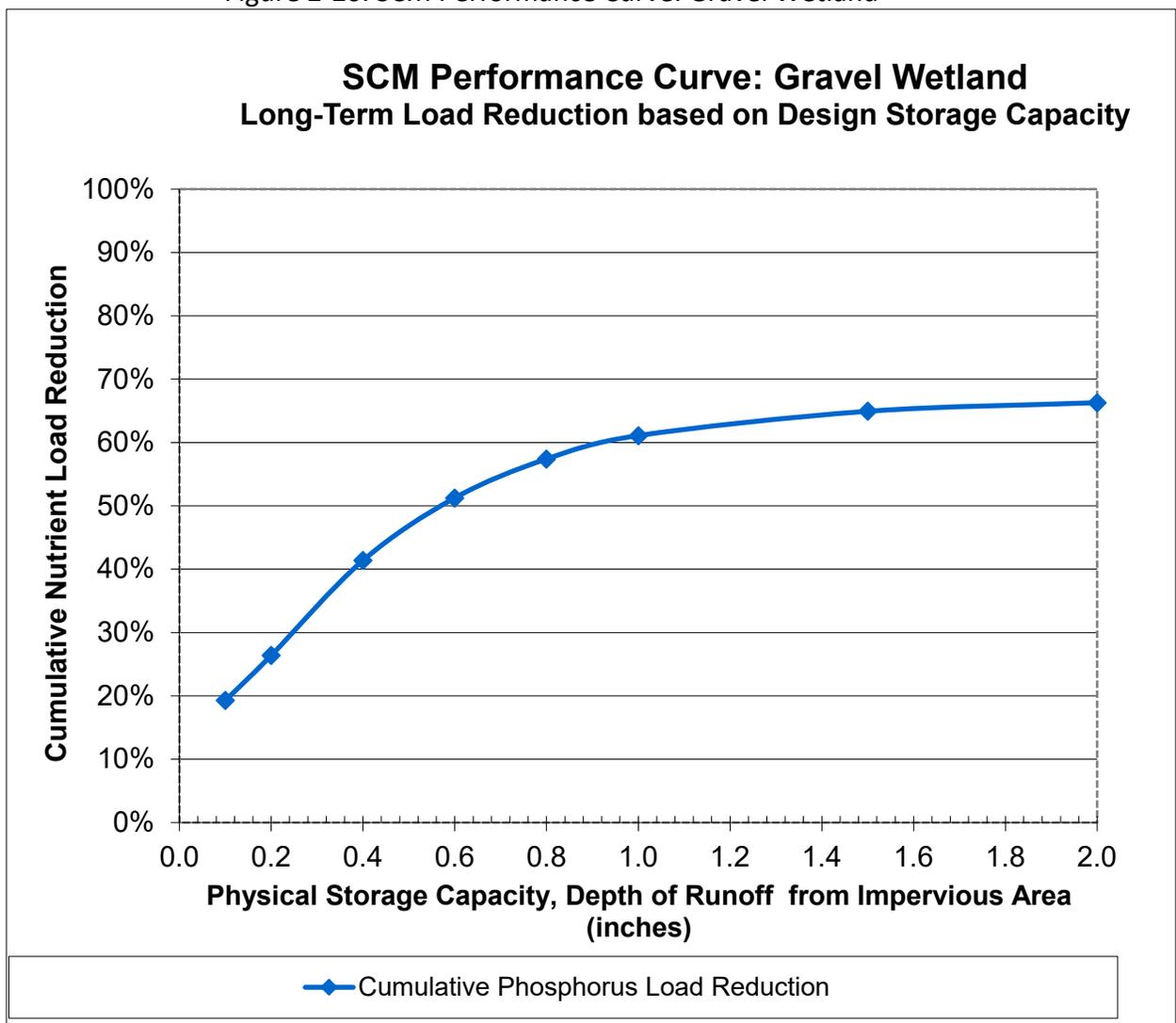


2.5.16. Gravel Wetland SCM Performance Table and Curve

Table 2-18. Gravel Wetland SCM Performance Table

Gravel Wetland SCM Performance Table: Long-Term Phosphorus Load Reduction								
SCM Capacity: Depth of Runoff from Impervious Area (inches)	0.1	0.2	0.4	0.6	0.8	1.0	1.5	2.0
Cumulative Phosphorus Load Reduction	19%	26%	41%	51%	57%	61%	65%	66%

Figure 2-20. SCM Performance Curve: Gravel Wetland



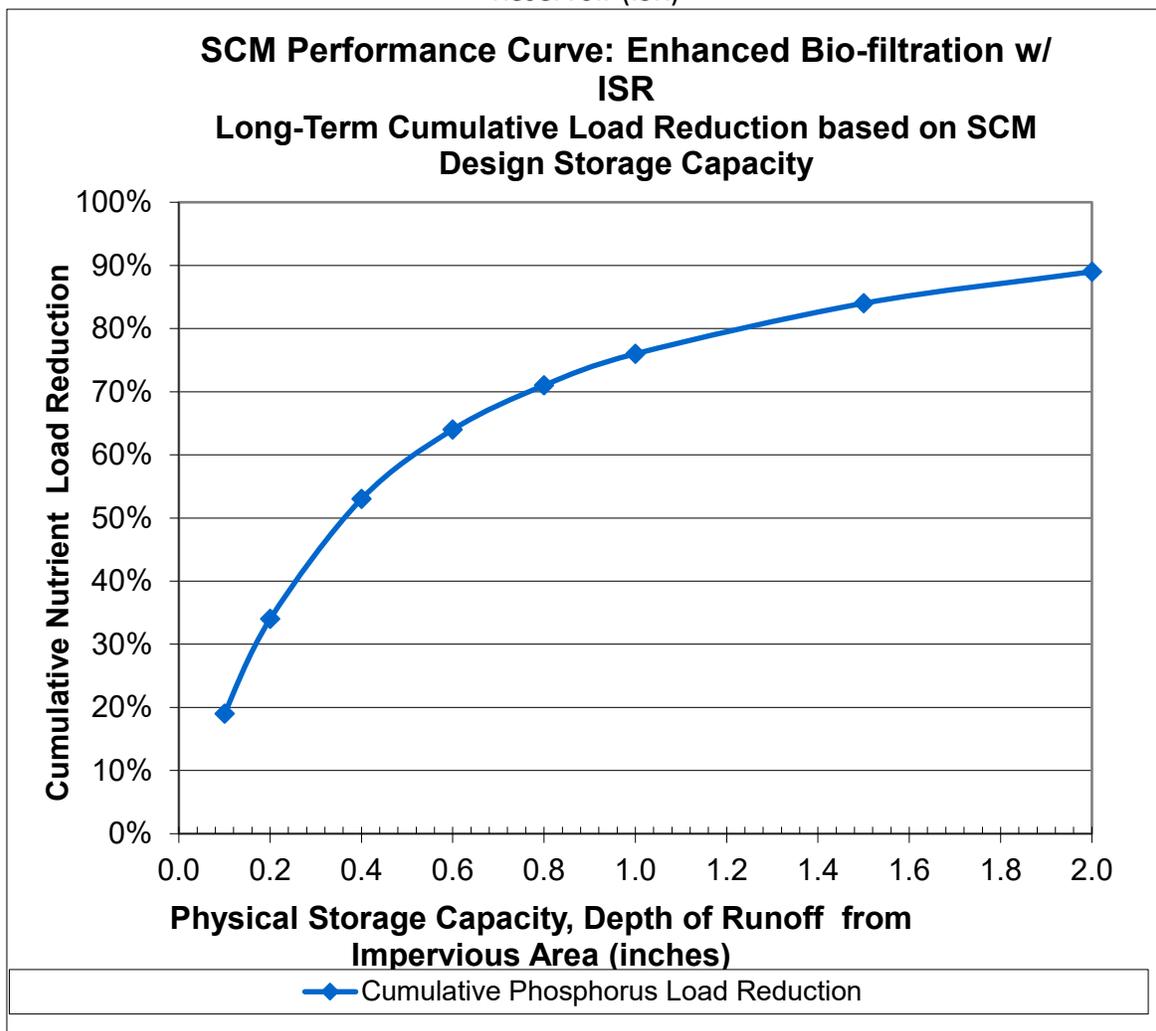
2.5.17. Enhanced Bio-filtration* with Internal Storage Reservoir (ISR) SCM Performance Table and Curve

Table 2-19. Enhanced Bio-filtration* with Internal Storage Reservoir (ISR) SCM Performance Table

Enhanced Bio-filtration* w/ ISR SCM Performance Table: Long-Term Phosphorus Load Reduction								
SCM Capacity: Depth of Runoff from Impervious Area (inches)	0.1	0.2	0.4	0.6	0.8	1.0	1.5	2.0
Cumulative Phosphorus Load Reduction	19%	34%	53%	64%	71%	76%	84%	89%

*Filter media augmented with phosphorus sorbing materials to enhance phosphorus removal.

Figure 2-21. SCM Performance Curve: Enhanced Bio-filtration with Internal Storage Reservoir (ISR)

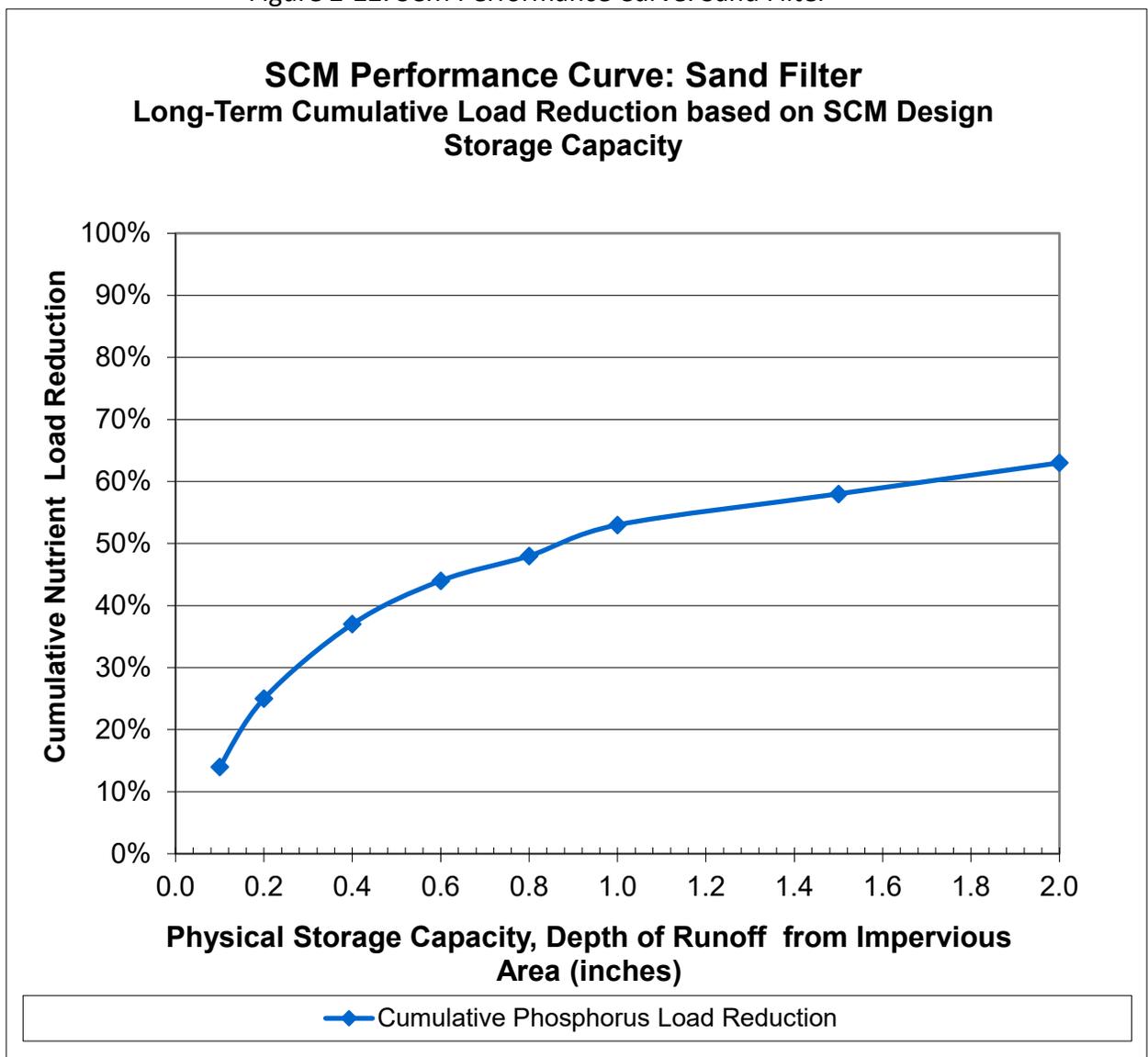


2.5.18. Sand Filter SCM Performance Table and Curve

Table 2-20. Sand Filter SCM Performance Table

Sand Filter SCM Performance Table: Long-Term Phosphorus Load Reduction								
SCM Capacity: Depth of Runoff from Impervious Area (inches)	0.1	0.2	0.4	0.6	0.8	1.0	1.5	2.0
Cumulative Phosphorus Load Reduction	14%	25%	37%	44%	48%	53%	58%	63%

Figure 2-22. SCM Performance Curve: Sand Filter

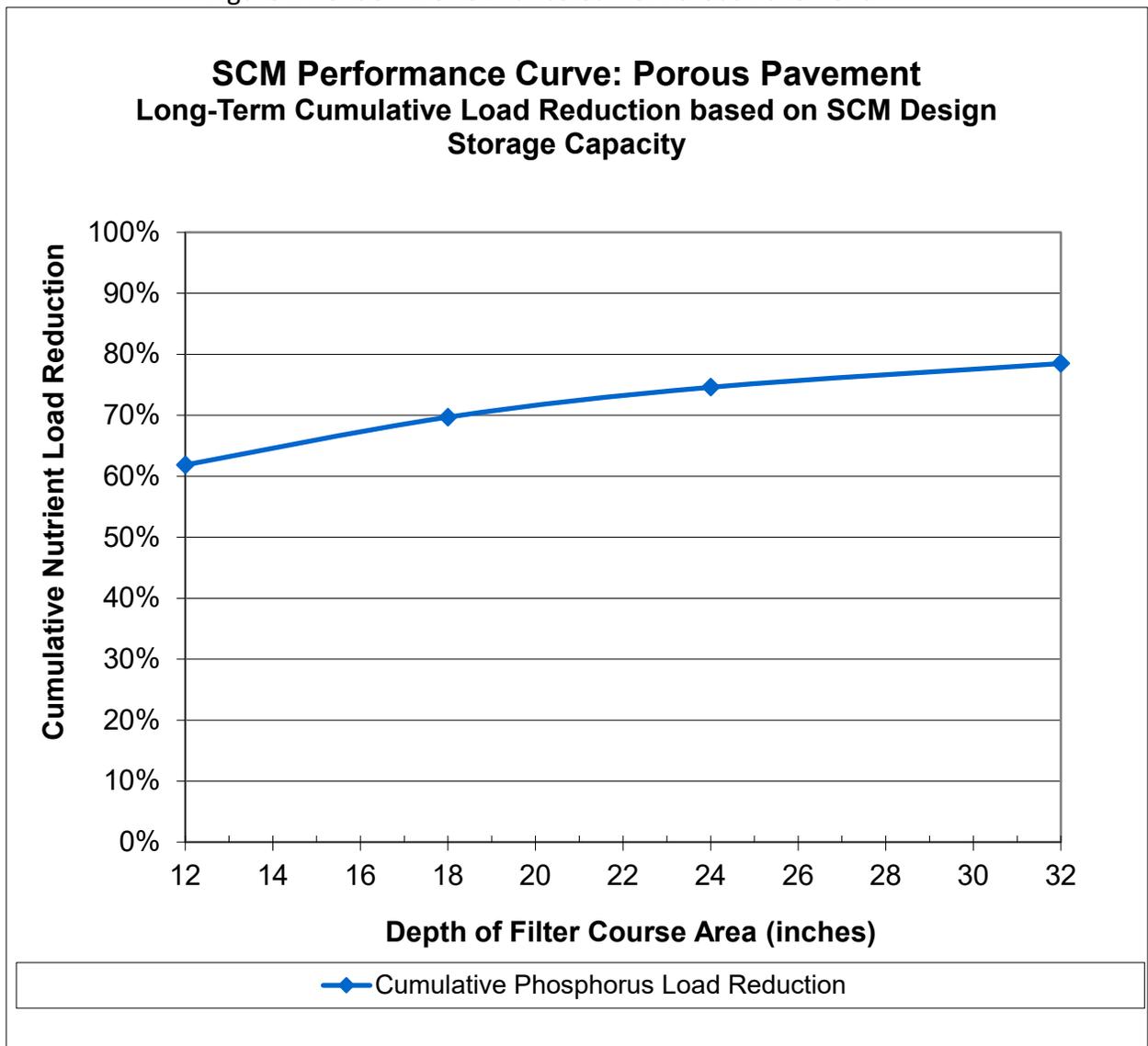


2.5.19. Porous Pavement SCM Performance Table and Curve

Table 2-21. Porous Pavement SCM Performance Table

Porous Pavement SCM Performance Table: Long-Term Phosphorus Load Reduction				
SCM Capacity: Depth of Filter Course Area (inches)	12.0	18.0	24.0	32.0
Cumulative Phosphorus Load Reduction	62%	70%	75%	78%

Figure 2-23. SCM Performance Curve: Porous Pavement

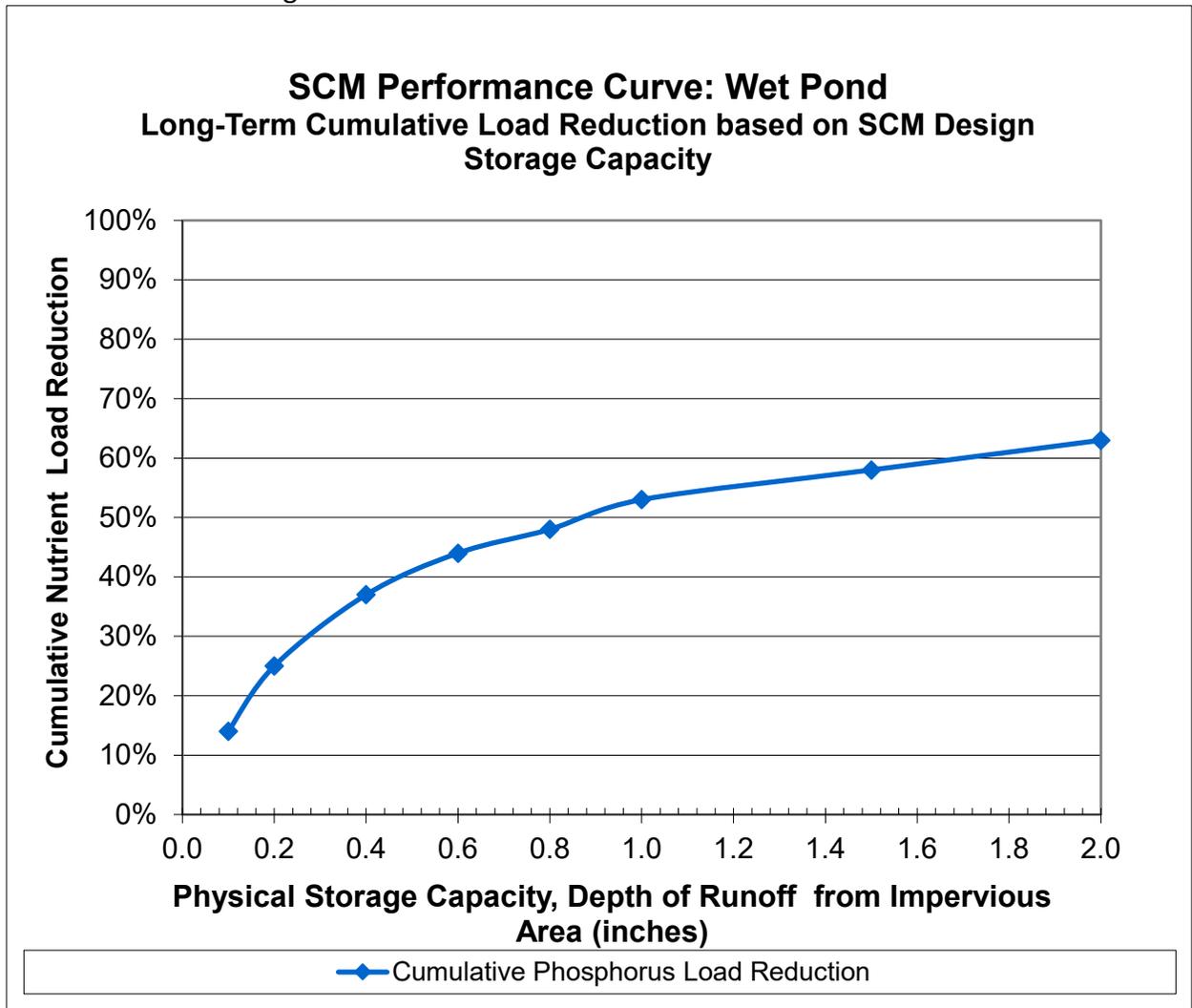


2.5.20. Wet Pond SCM Performance Table and Curve

Table 2-22. Wet Pond SCM Performance Table

Wet Pond SCM Performance Table: Long-Term Phosphorus Load Reduction								
SCM Capacity: Depth of Runoff from Impervious Area (inches)	0.1	0.2	0.4	0.6	0.8	1.0	1.5	2.0
Cumulative Phosphorus Load Reduction	14%	25%	37%	44%	48%	53%	58%	63%

Figure 2-24. SCM Performance Curve: Wet Pond

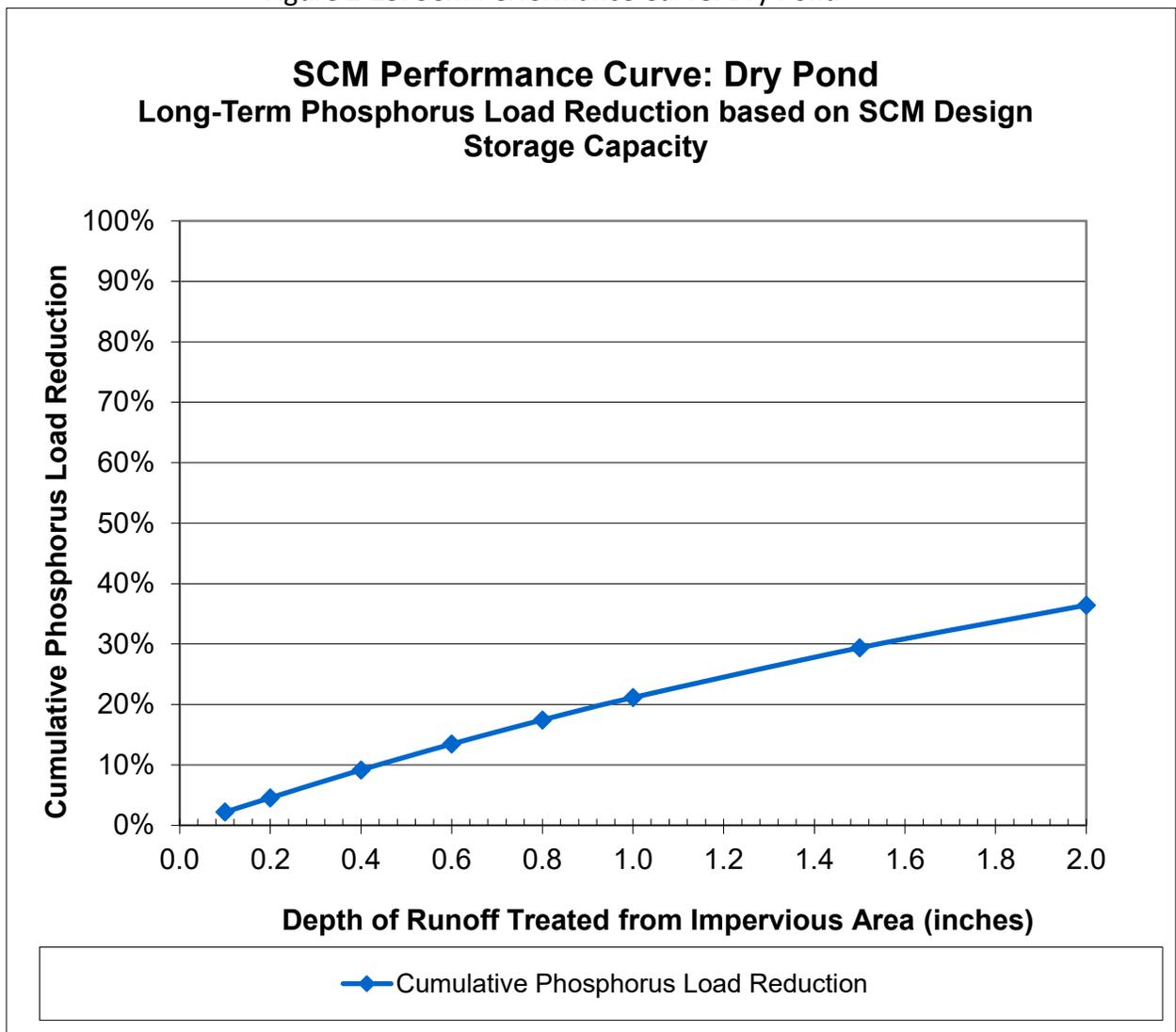


2.5.21. Dry Pond SCM Performance Table and Curve

Table 2-23. Dry Pond SCM Performance Table

Extended Dry Pond SCM Performance Table: Long-Term Phosphorus Load Reduction								
SCM Capacity: Depth of Runoff from Impervious Area (inches)	0.1	0.2	0.4	0.6	0.8	1.0	1.5	2.0
Cumulative Phosphorus Load Reduction	2%	5%	9%	13%	17%	21%	29%	36%

Figure 2-25. SCM Performance Curve: Dry Pond

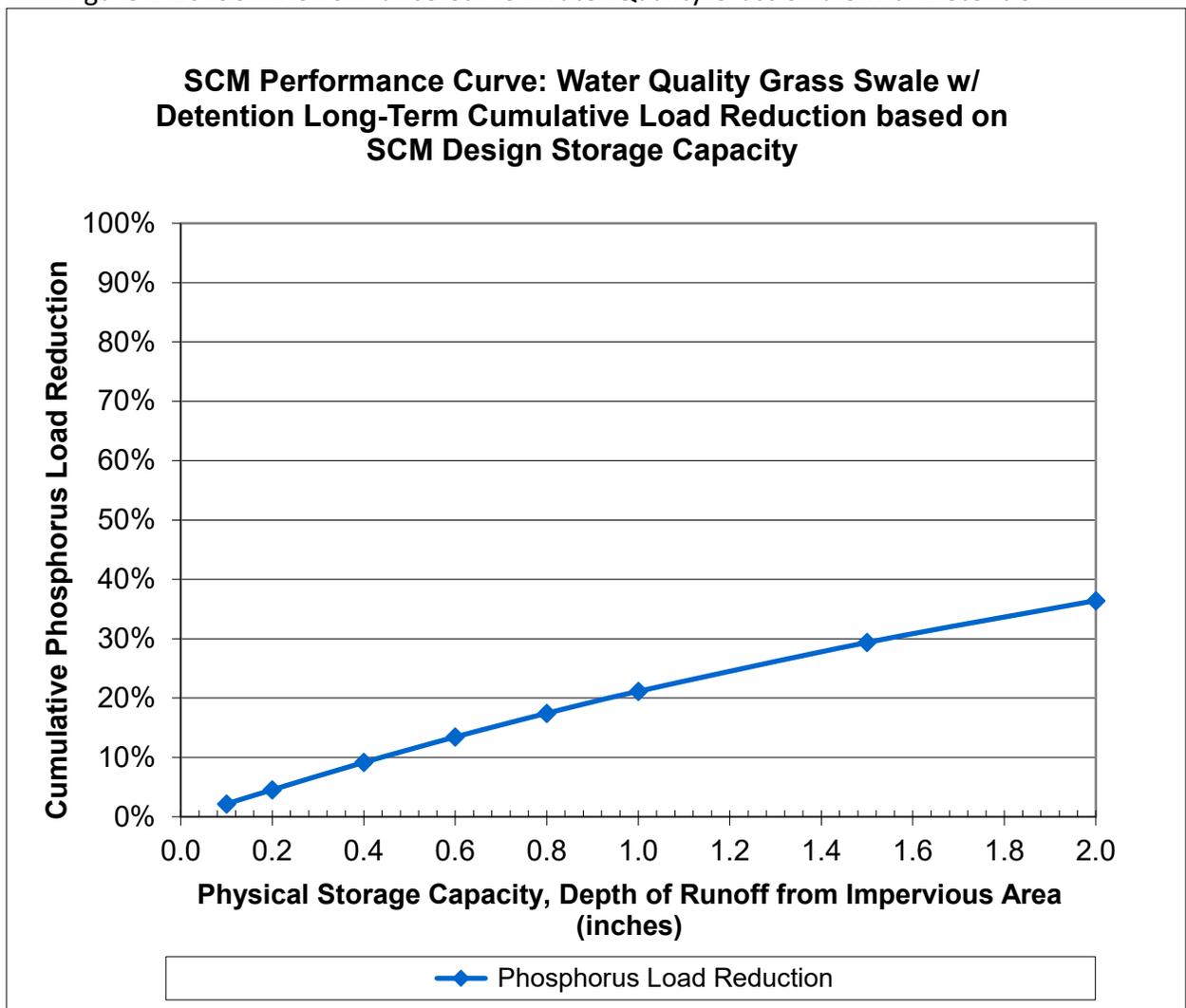


2.5.22. Water Quality Grass Swale with Detention SCM Performance Table and Curve

Table 2-24. Water Quality Grass Swale with Detention SCM Performance Table

Water Quality Grass Swale with Detention Performance Table: Long-Term Phosphorus Load Reduction								
SCM Capacity: Depth of Runoff from Impervious Area (inches)	0.1	0.2	0.4	0.6	0.8	1.0	1.5	2.0
Phosphorus Load Reduction	2%	5%	9%	13%	17%	21%	29%	36%

Figure 2-26. SCM Performance Curve: Water Quality Grass Swale with Detention



2.5.23. Impervious Area Disconnection through Storage: Impervious Area to Pervious Area Ratio = 8:1 Table and Curves

Table 2-25. Impervious Area Disconnection through Storage: Impervious Area to Pervious Area Ratio = 8:1.

Impervious Area Disconnection through Storage: Impervious Area to Pervious Area Ratio = 8:1												
Storage volume to impervious area ratio	Total Runoff Volume (TP) Reduction Percentages											
	HSG A			HSG B			HSG C			HSG D		
	1-day	2-day	3-day	1-day	2-day	3-day	1-day	2-day	3-day	1-day	2-day	3-day
0.1 in	24%	23%	22%	24%	23%	22%	24%	23%	22%	22%	22%	21%
0.2 in	40%	38%	37%	40%	38%	37%	37%	38%	37%	24%	26%	27%
0.3 in	52%	50%	49%	52%	50%	49%	40%	46%	49%	24%	26%	27%
0.4 in	61%	59%	58%	59%	59%	58%	40%	48%	54%	24%	26%	27%
0.5 in	67%	66%	64%	62%	66%	64%	40%	48%	56%	24%	26%	27%
0.6 in	70%	71%	70%	62%	70%	70%	40%	48%	56%	24%	26%	27%
0.8 in	71%	78%	77%	62%	73%	77%	40%	48%	56%	24%	26%	27%
1.0 in	71%	80%	80%	62%	73%	79%	40%	48%	56%	24%	26%	27%
1.5 in	71%	81%	87%	62%	73%	81%	40%	48%	56%	24%	26%	27%
2.0 in	71%	81%	88%	62%	73%	81%	40%	48%	56%	24%	26%	27%

Figure 2-27. Impervious Area Disconnection through Storage: Impervious Area to Pervious Area Ratio = 8:1 for HSG A Soils

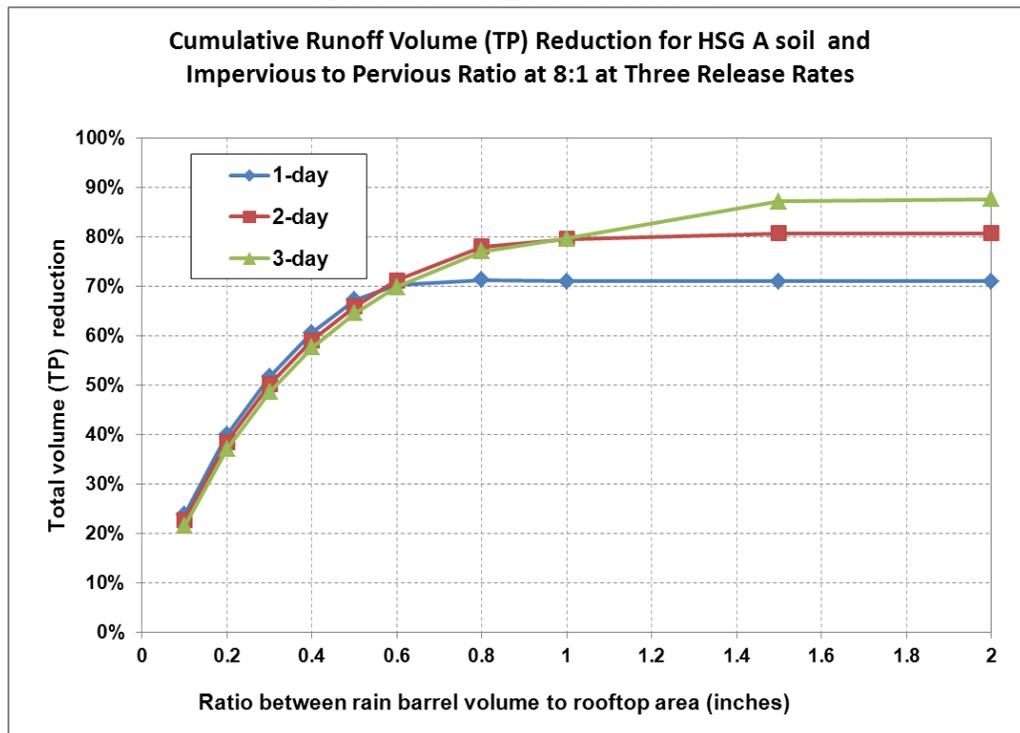


Figure 2-28. Impervious Area Disconnection through Storage: Impervious Area to Pervious Area Ratio = 8:1 for HSG B Soils

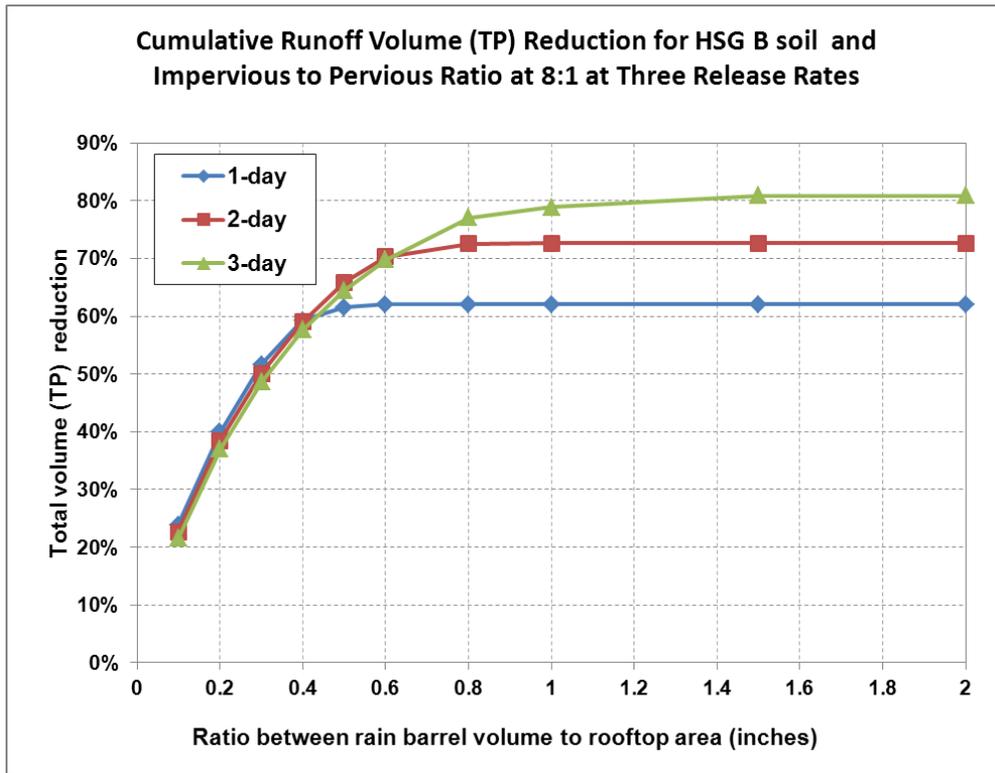


Figure 2-29. Impervious Area Disconnection through Storage: Impervious Area to Pervious Area Ratio = 8:1 for HSG C Soils

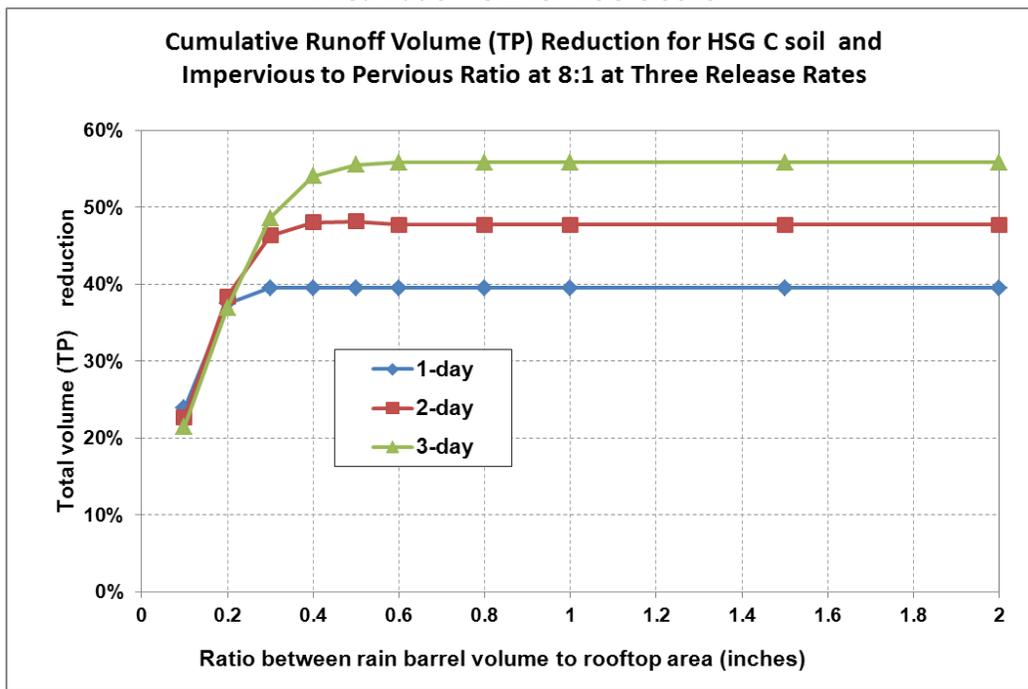
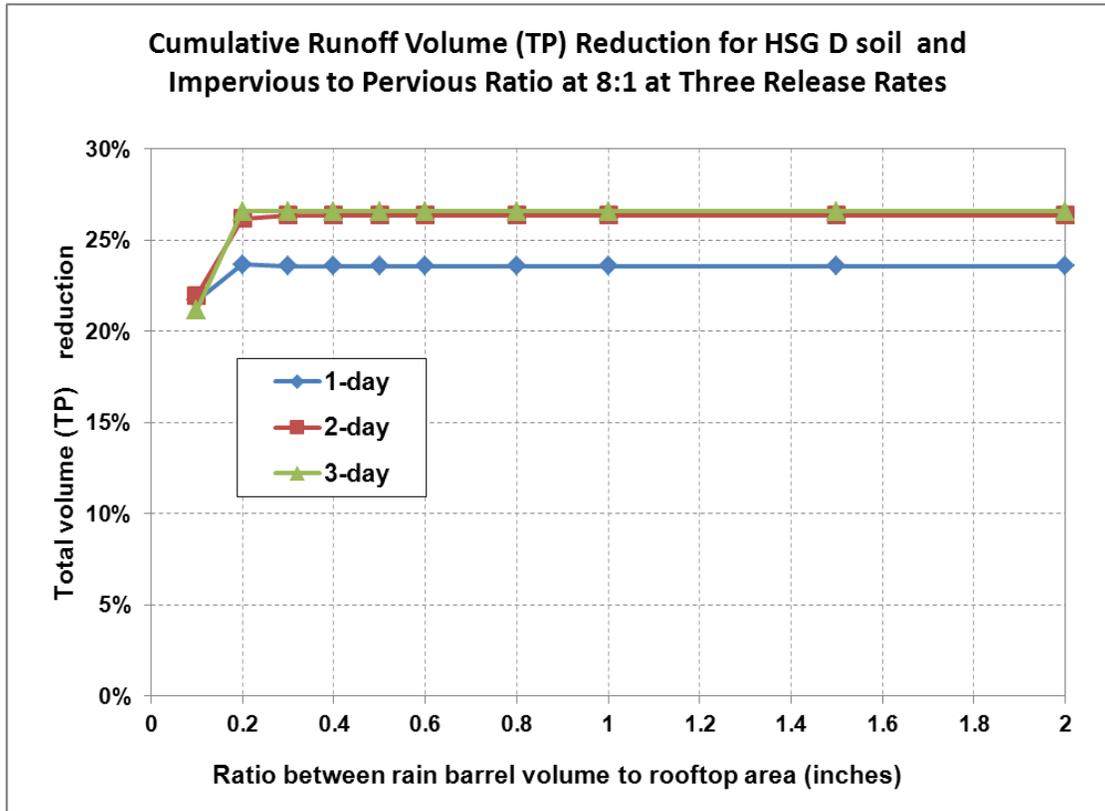


Figure 2-30. Impervious Area Disconnection through Storage: Impervious Area to Pervious Area Ratio = 8:1 for HSG D Soils



2.5.24. Impervious Area Disconnection through Storage: Impervious Area to Pervious Area Ratio = 6:1 Table and Curves

Table 2-26. Impervious Area Disconnection through Storage: Impervious Area to Pervious Area Ratio = 6:1

Impervious Area Disconnection through Storage: Impervious Area to Pervious Area Ratio = 6:1												
Rain barrel volume to impervious area ratio	Total Runoff Volume and Phosphorus Load (TP) Reduction Percentages											
	HSG A			HSG B			HSG C			HSG D		
	1-day	2-day	3-day	1-day	2-day	3-day	1-day	2-day	3-day	1-day	2-day	3-day
0.1 in	24%	23%	22%	24%	23%	22%	24%	23%	22%	23%	23%	22%
0.2 in	40%	38%	37%	40%	38%	37%	40%	38%	37%	28%	30%	33%
0.3 in	52%	50%	49%	52%	50%	49%	47%	50%	49%	29%	31%	34%
0.4 in	61%	59%	58%	61%	59%	58%	48%	55%	58%	29%	31%	34%
0.5 in	67%	66%	64%	67%	66%	64%	48%	57%	63%	29%	31%	34%
0.6 in	73%	71%	70%	70%	71%	70%	48%	57%	65%	29%	31%	34%
0.8 in	78%	78%	77%	71%	78%	77%	48%	57%	66%	29%	31%	34%
1.0 in	79%	81%	80%	71%	79%	80%	48%	57%	66%	29%	31%	34%
1.5 in	79%	87%	88%	71%	80%	87%	48%	57%	66%	29%	31%	34%
2.0 in	79%	87%	91%	71%	80%	87%	48%	57%	66%	29%	31%	34%

Figure 2-31. Impervious Area Disconnection through Storage: Impervious Area to Pervious Area Ratio = 6:1 for HSG A Soils

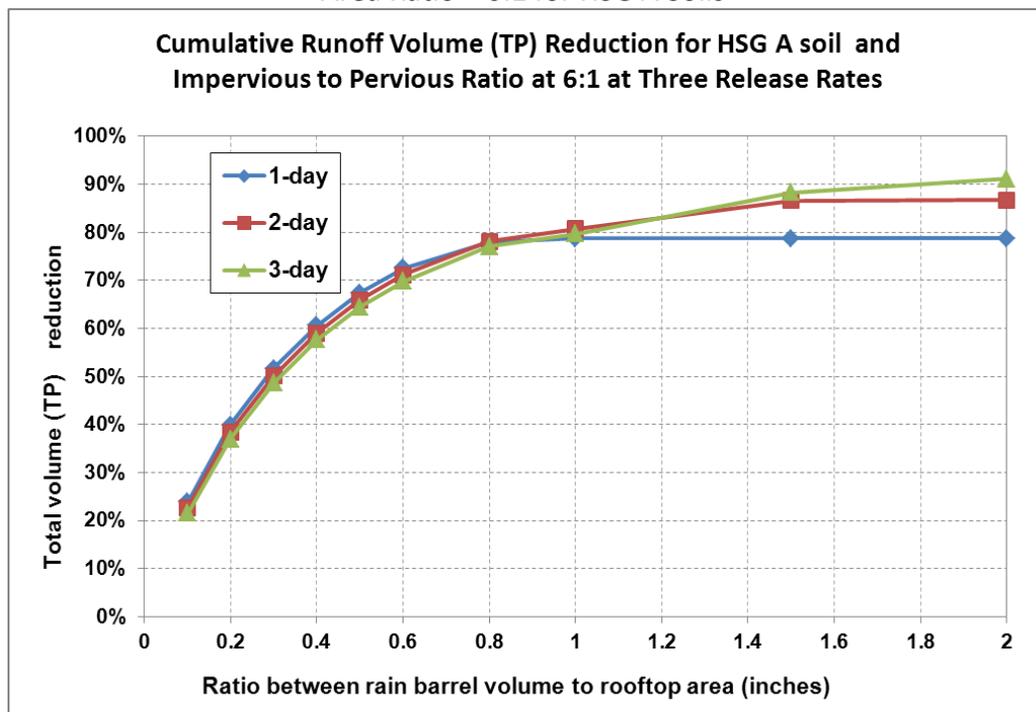


Figure 2-32. Impervious Area Disconnection through Storage: Impervious Area to Pervious Area Ratio = 6:1 for HSG B Soils

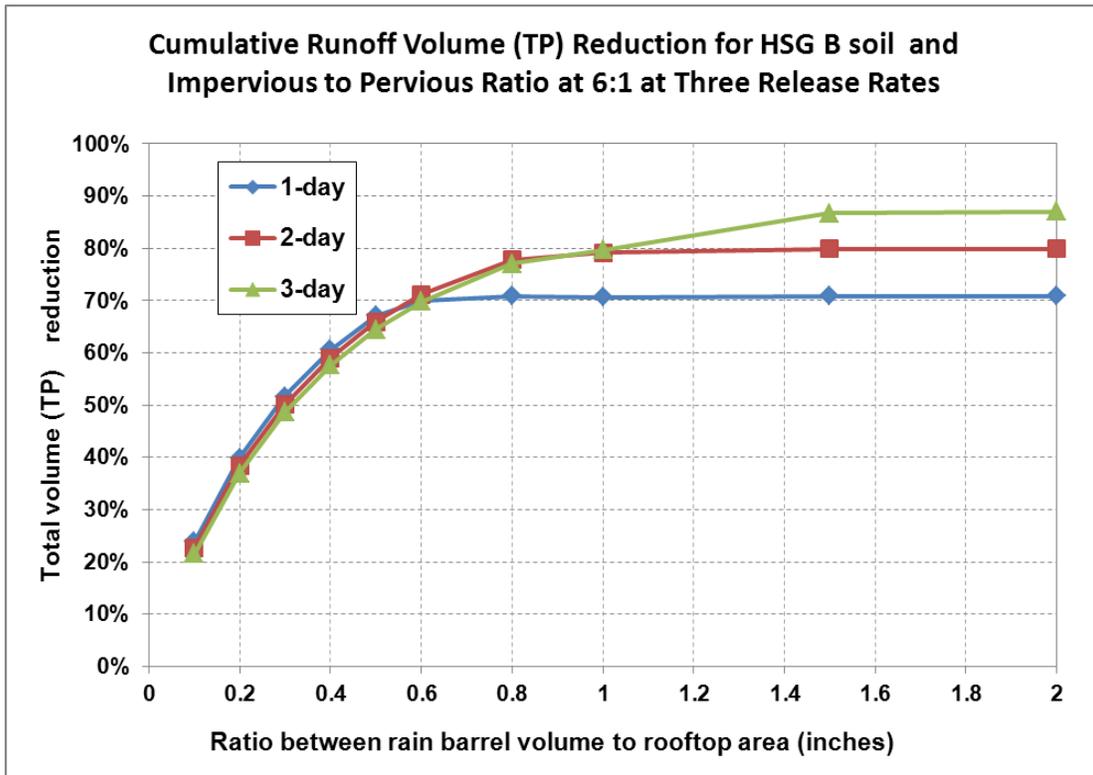


Figure 2-33. Impervious Area Disconnection through Storage: Impervious Area to Pervious Area Ratio = 6:1 for HSG C Soils

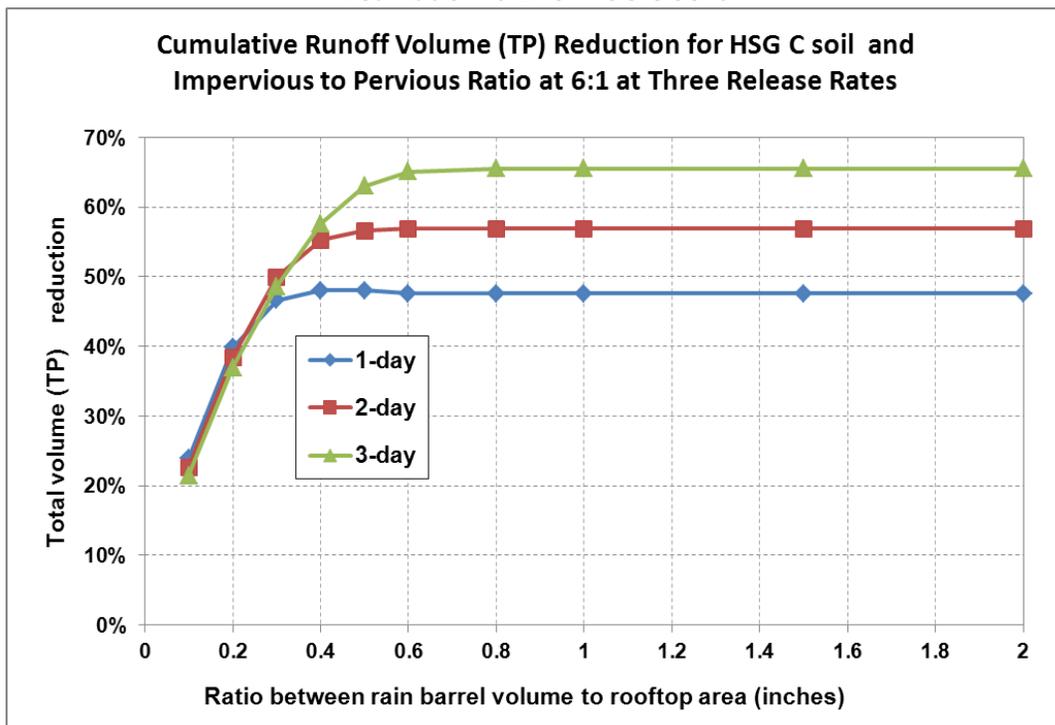
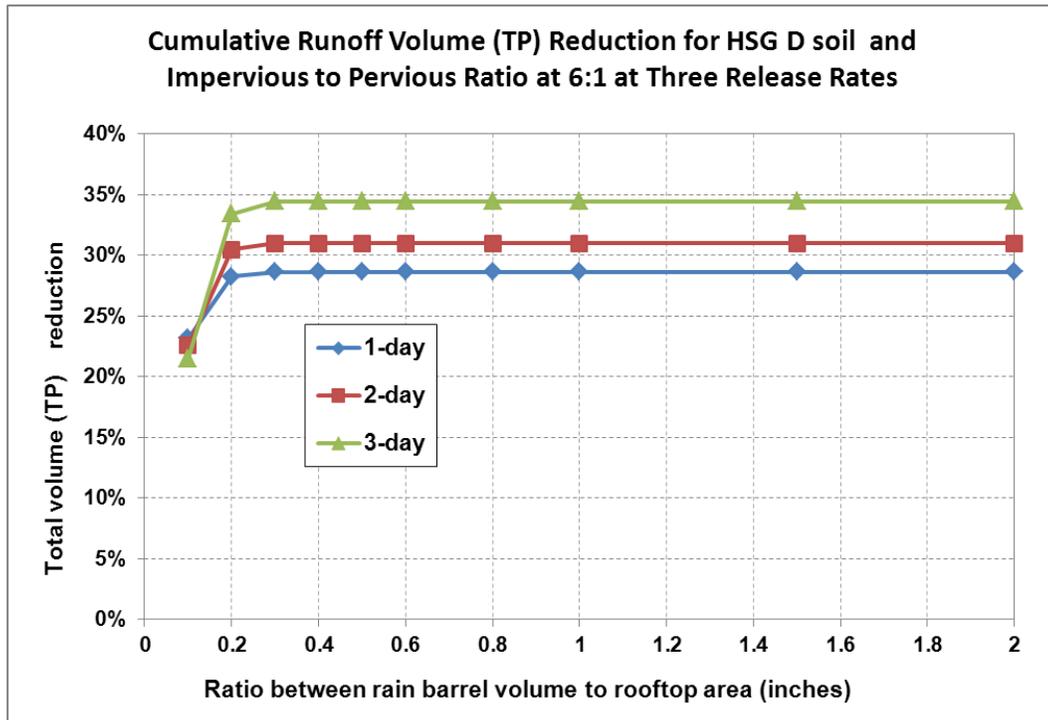


Figure 2-34. Impervious Area Disconnection through Storage: Impervious Area to Pervious Area Ratio = 6:1 for HSG D Soils



2.5.25. Impervious Area Disconnection through Storage: Impervious Area to Pervious Area Ratio = 4:1 Table and Curves

Table 2-27. Impervious Area Disconnection through Storage: Impervious Area to Pervious Area Ratio = 4:1

Impervious Area Disconnection through Storage: Impervious Area to Pervious Area Ratio = 4:1												
Storage volume to impervious area ratio	Total Runoff Volume and Phosphorus Load (TP) Reduction Percentages											
	HSG A			HSG B			HSG C			HSG D		
	1-day	2-day	3-day	1-day	2-day	3-day	1-day	2-day	3-day	1-day	2-day	3-day
0.1 in	24%	23%	22%	24%	23%	22%	24%	23%	22%	24%	23%	22%
0.2 in	40%	38%	37%	40%	38%	37%	40%	38%	37%	37%	37%	37%
0.3 in	52%	50%	49%	52%	50%	49%	52%	50%	49%	39%	42%	45%
0.4 in	61%	59%	58%	61%	59%	58%	58%	59%	58%	39%	42%	47%
0.5 in	67%	66%	64%	67%	66%	64%	60%	65%	64%	40%	42%	47%
0.6 in	73%	71%	70%	73%	71%	70%	61%	68%	70%	40%	42%	47%
0.8 in	79%	78%	77%	79%	78%	77%	61%	69%	75%	40%	42%	47%
1.0 in	82%	81%	80%	80%	81%	80%	61%	69%	76%	40%	42%	47%
1.5 in	87%	89%	88%	80%	87%	88%	61%	69%	76%	40%	42%	47%
2.0 in	87%	91%	91%	80%	88%	91%	61%	69%	76%	40%	42%	47%

Figure 2-35. Impervious Area Disconnection through Storage: Impervious Area to Pervious Area Ratio = 4:1 for HSG A Soils

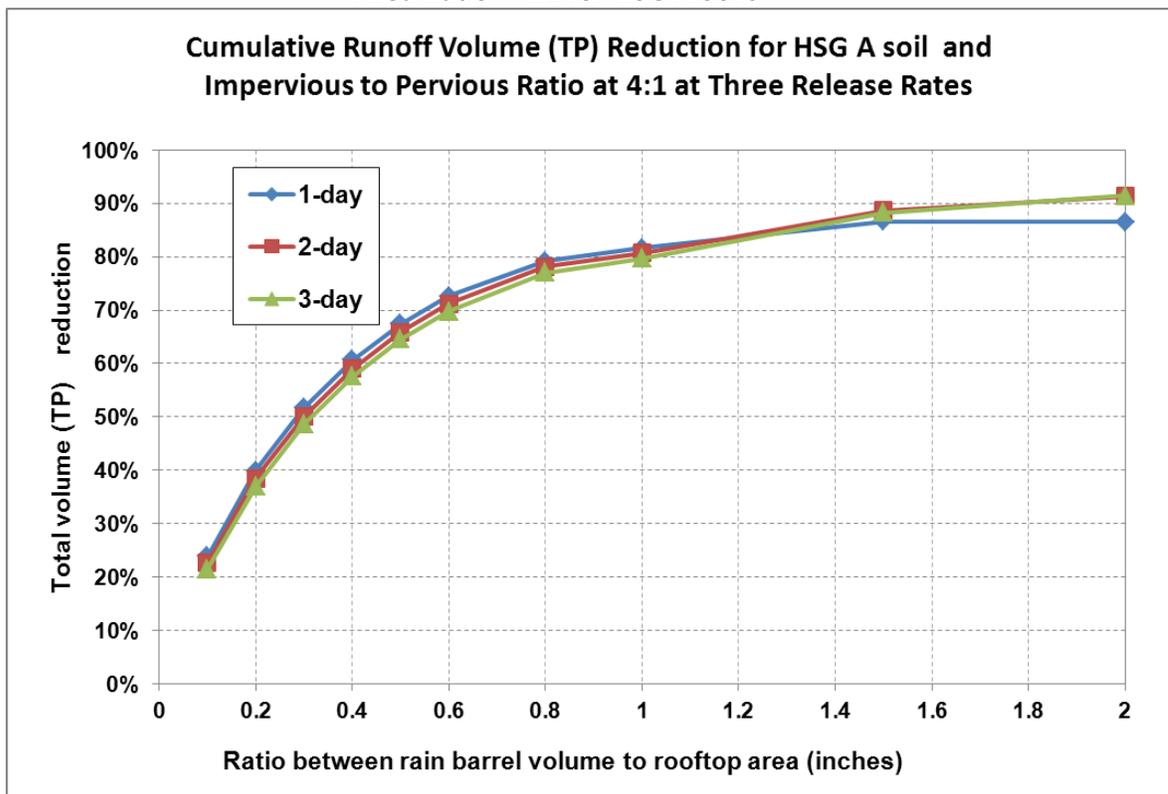


Figure 2-36. Impervious Area Disconnection through Storage: Impervious Area to Pervious Area Ratio = 4:1 for HSG B Soils

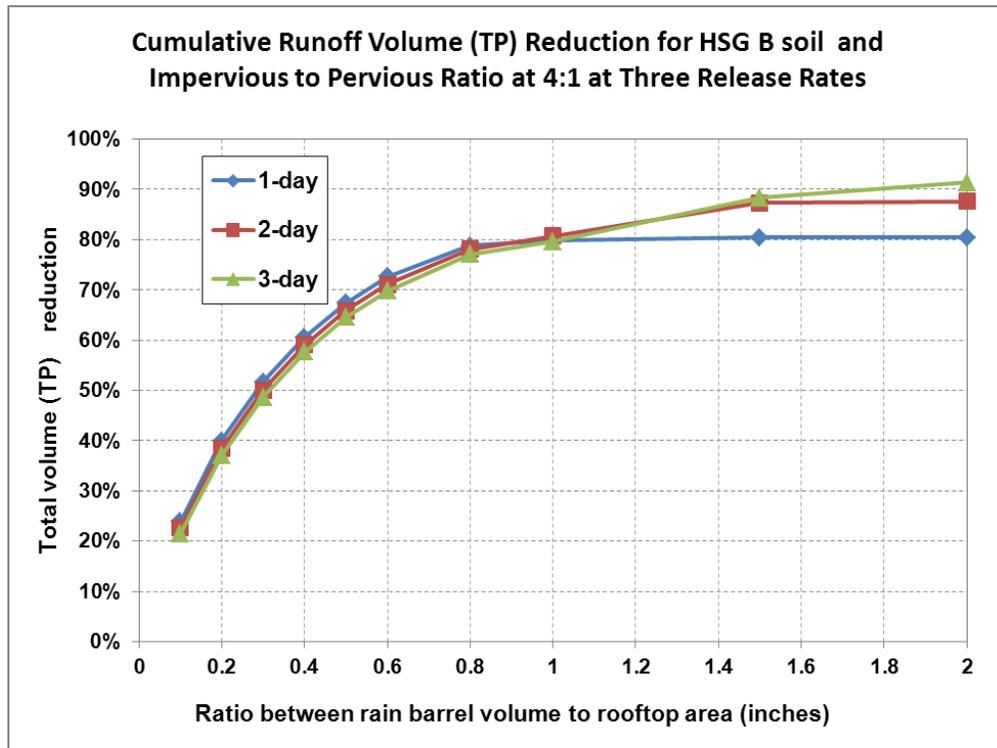


Figure 2-37. Impervious Area Disconnection through Storage: Impervious Area to Pervious Area Ratio = 4:1 for HSG C Soils

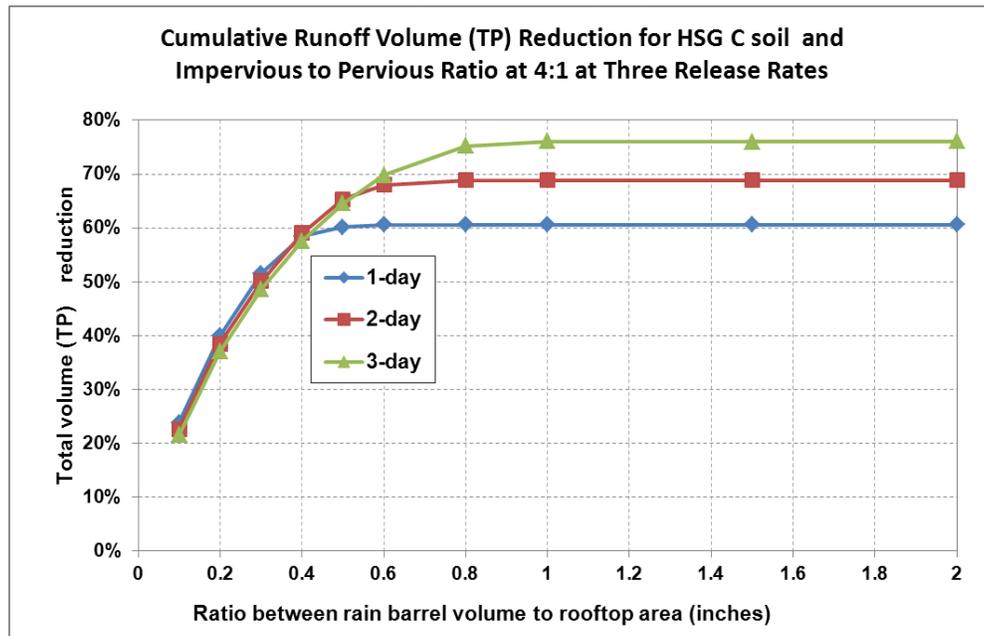
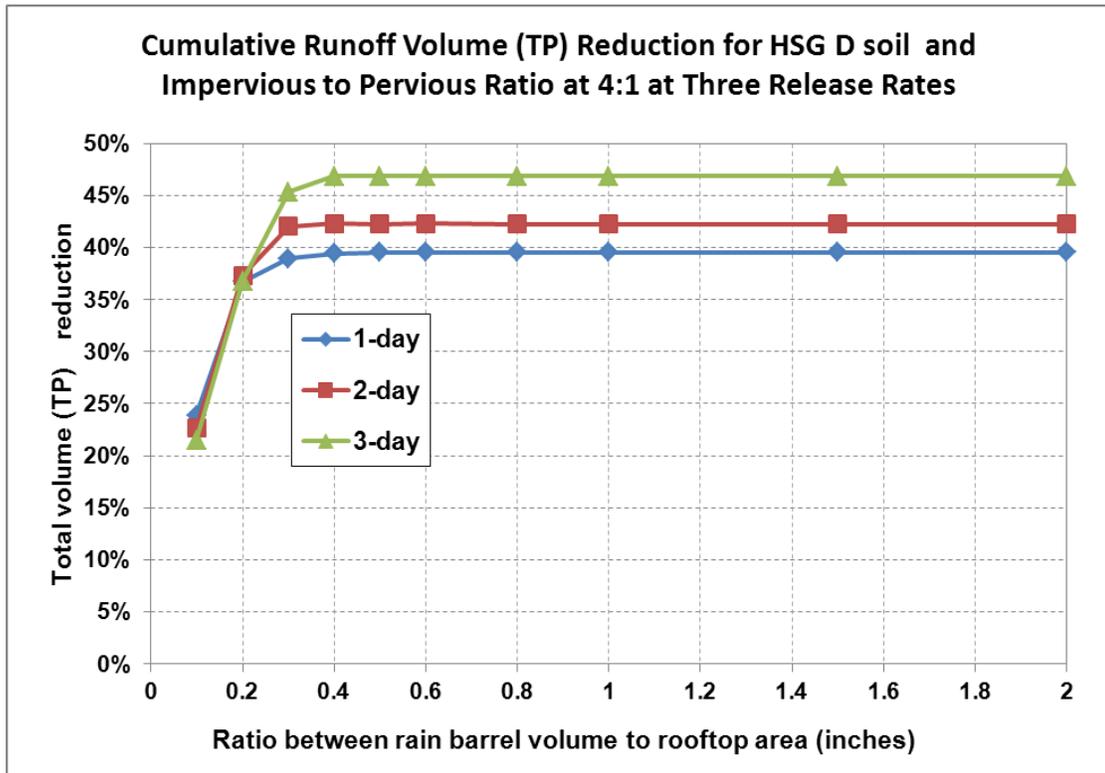


Figure 2-38. Impervious Area Disconnection through Storage: Impervious Area to Pervious Area Ratio = 4:1 for HSG D Soils



2.5.26. Impervious Area Disconnection through Storage: Impervious Area to Pervious Area Ratio = 2:1 Table and Curves

Table 2-28. Impervious Area Disconnection through Storage: Impervious Area to Pervious Area Ratio = 2:1

Impervious Area Disconnection through Storage: Impervious Area to Pervious Area Ratio = 2:1												
Storage volume to impervious area ratio	Total Runoff Volume and Phosphorus Load (TP) Reduction Percentages											
	HSG A			HSG B			HSG C			HSG D		
	1-day	2-day	3-day	1-day	2-day	3-day	1-day	2-day	3-day	1-day	2-day	3-day
0.1 in	24%	23%	22%	24%	23%	22%	24%	23%	22%	24%	23%	22%
0.2 in	40%	38%	37%	40%	38%	37%	40%	38%	37%	40%	38%	37%
0.3 in	52%	50%	49%	52%	50%	49%	52%	50%	49%	51%	50%	49%
0.4 in	61%	59%	58%	61%	59%	58%	61%	59%	58%	57%	58%	57%
0.5 in	67%	66%	64%	67%	66%	64%	67%	66%	64%	59%	62%	63%
0.6 in	73%	71%	70%	73%	71%	70%	72%	71%	70%	59%	62%	67%
0.8 in	79%	78%	77%	79%	78%	77%	77%	78%	77%	59%	62%	67%
1.0 in	82%	81%	80%	82%	81%	80%	78%	81%	80%	59%	62%	67%
1.5 in	89%	89%	88%	89%	89%	88%	78%	84%	88%	59%	62%	67%
2.0 in	92%	92%	91%	91%	92%	91%	78%	84%	89%	59%	62%	67%

Figure 2-39. Impervious Area Disconnection through Storage: Impervious Area to Pervious Area Ratio= 2:1 for HSG A Soils

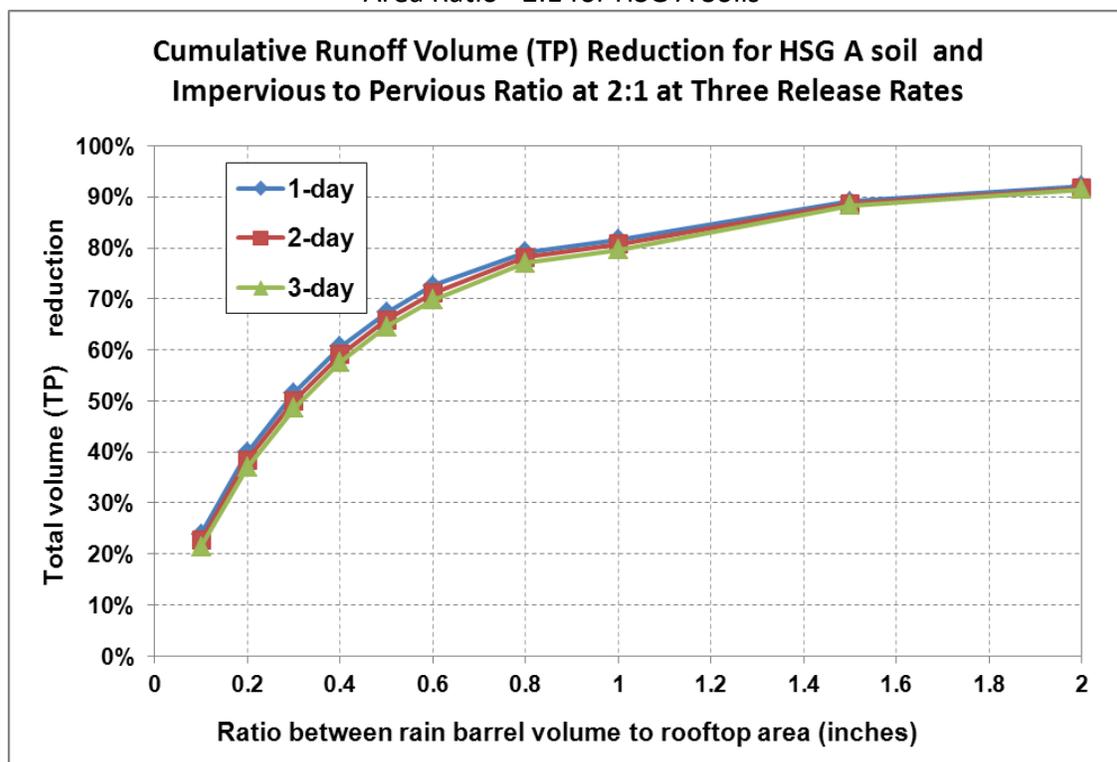


Figure 2-40. Impervious Area Disconnection through Storage: Impervious Area to Pervious Area Ratio= 2:1 for HSG B Soils

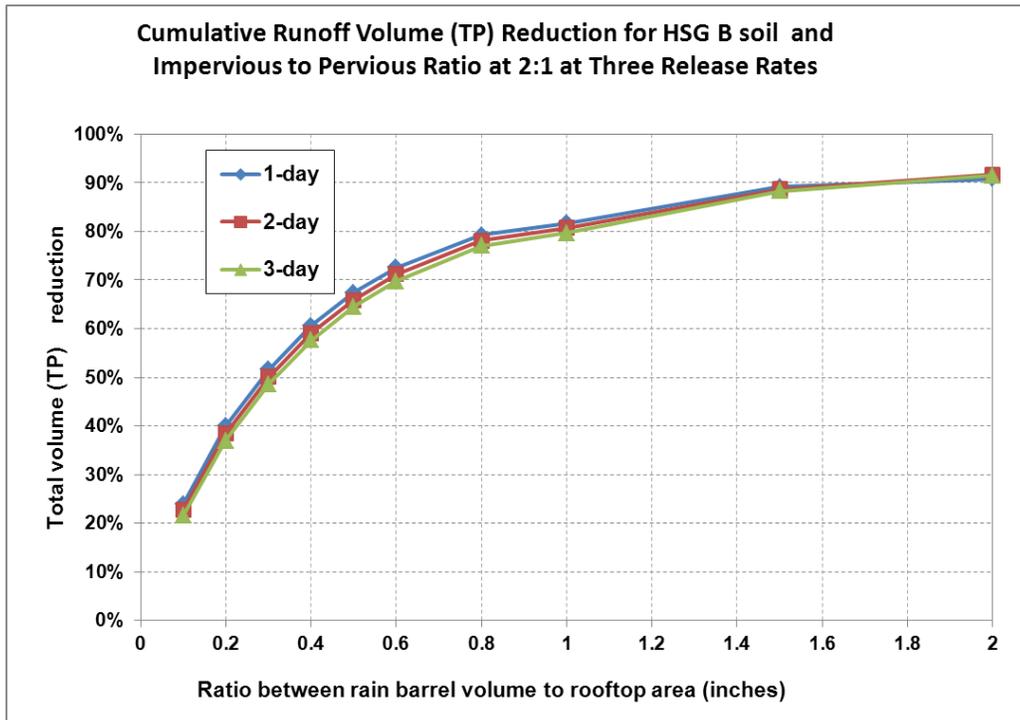


Figure 2-41. Impervious Area Disconnection through Storage: Impervious Area to Pervious Area Ratio= 2:1 for HSG C Soils

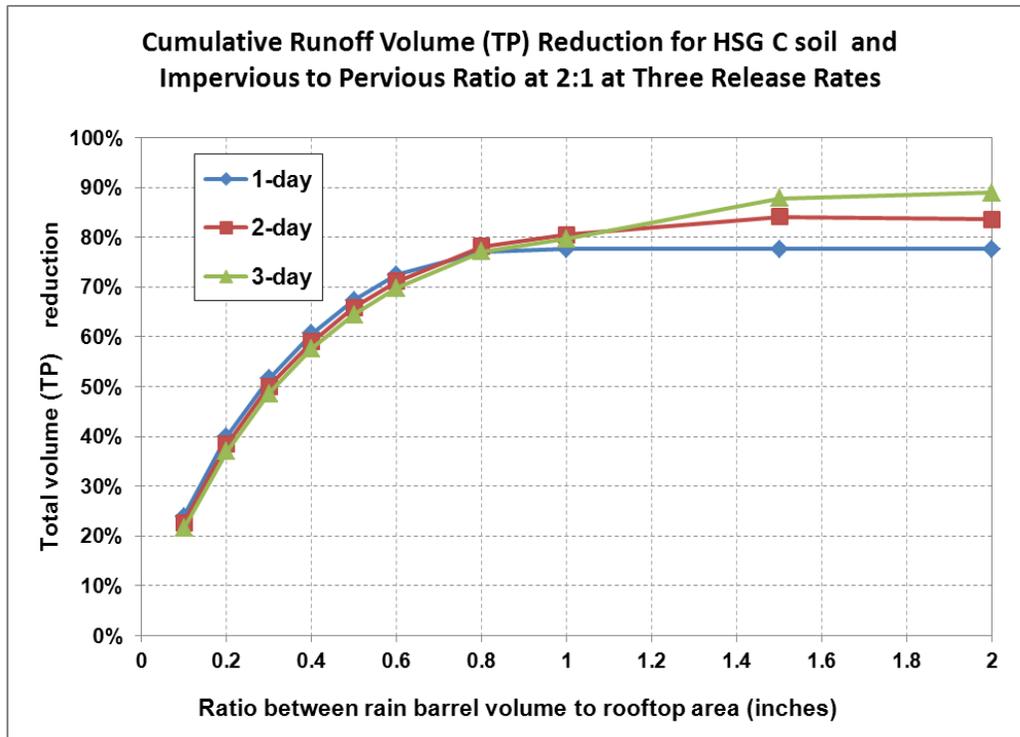
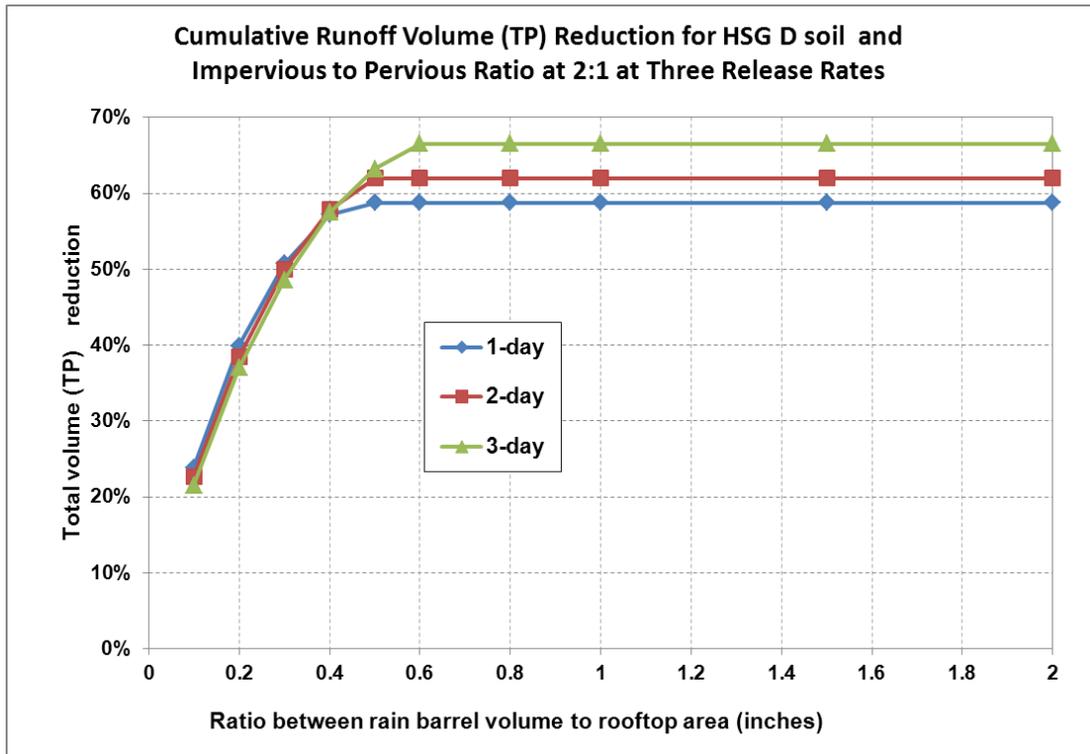


Figure 2-42. Impervious Area Disconnection through Storage: Impervious Area to Pervious Area Ratio= 2:1 for HSG D Soils



2.5.27. Impervious Area Disconnection through Storage: Impervious Area to Pervious Area Ratio = 1:1 Table and Curves

Table 2-29. Impervious Area Disconnection through Storage: Impervious Area to Pervious Area Ratio = 2:1

Impervious Area Disconnection through Storage: Impervious Area to Pervious Area Ratio = 1:1												
Storage volume to impervious area ratio	Total Runoff Volume and Phosphorus Load (TP) Reduction Percentages											
	HSG A			HSG B			HSG C			HSG D		
	1-day	2-day	3-day	1-day	2-day	3-day	1-day	2-day	3-day	1-day	2-day	3-day
0.1 in	24%	23%	22%	24%	23%	22%	24%	23%	22%	24%	23%	22%
0.2 in	40%	38%	37%	40%	38%	37%	40%	38%	37%	40%	38%	37%
0.3 in	52%	50%	49%	52%	50%	49%	52%	50%	49%	52%	50%	49%
0.4 in	61%	59%	58%	61%	59%	58%	61%	59%	58%	61%	59%	58%
0.5 in	67%	66%	64%	67%	66%	64%	67%	66%	64%	67%	66%	64%
0.6 in	73%	71%	70%	73%	71%	70%	73%	71%	70%	72%	71%	70%
0.8 in	79%	78%	77%	79%	78%	77%	79%	78%	77%	78%	78%	77%
1.0 in	82%	81%	80%	82%	81%	80%	82%	81%	80%	79%	80%	80%
1.5 in	89%	89%	88%	89%	89%	88%	89%	89%	88%	80%	82%	86%
2.0 in	92%	92%	91%	92%	92%	91%	91%	92%	91%	80%	82%	86%

Figure 2-43. Impervious Area Disconnection through Storage: Impervious Area to Pervious Area Ratio = 1:1 for HSG A Soils

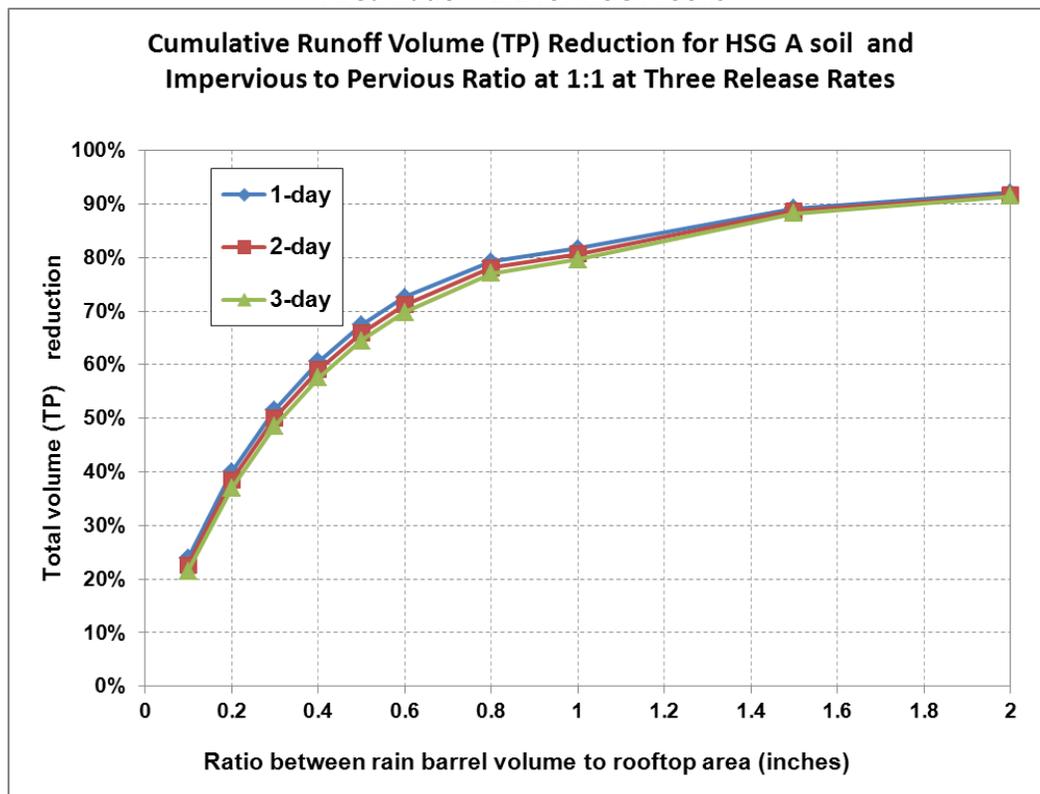


Figure 2-44. Impervious Area Disconnection through Storage: Impervious Area to Pervious Area Ratio = 1:1 for HSG B Soils

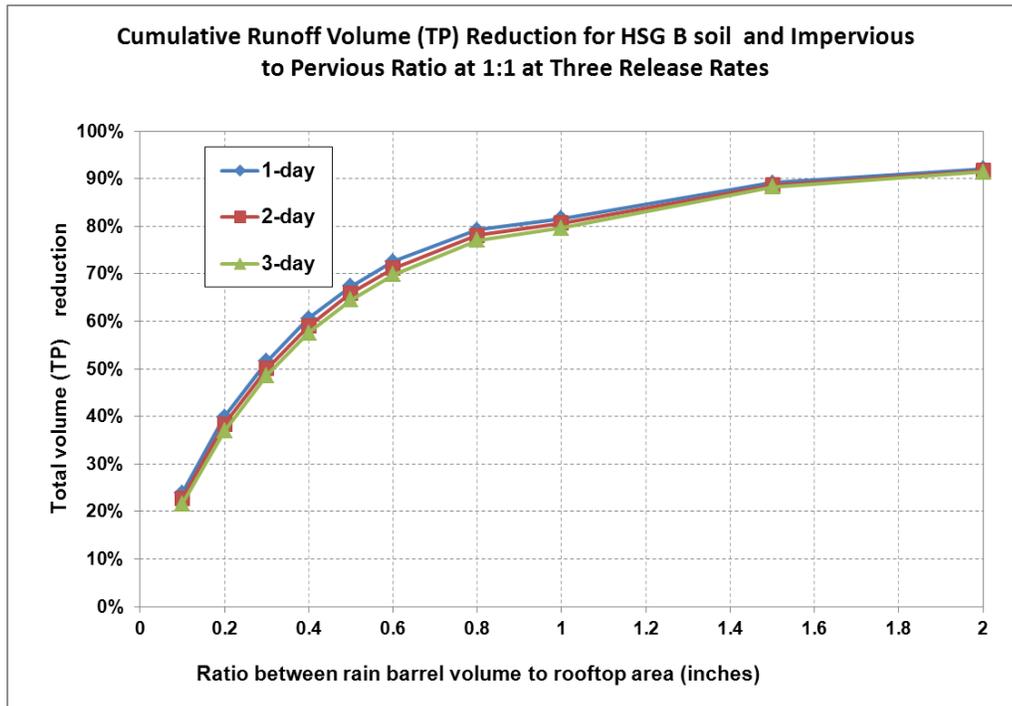


Figure 2-45. Impervious Area Disconnection through Storage: Impervious Area to Pervious Area Ratio = 1:1 for HSG C Soils

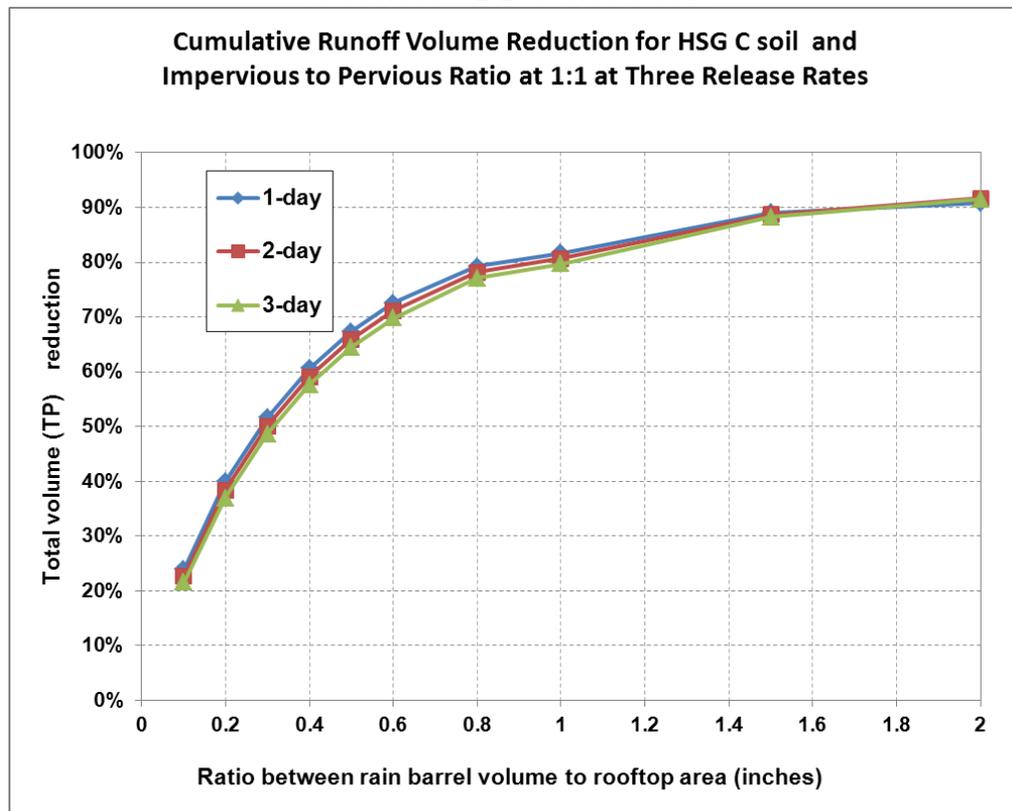
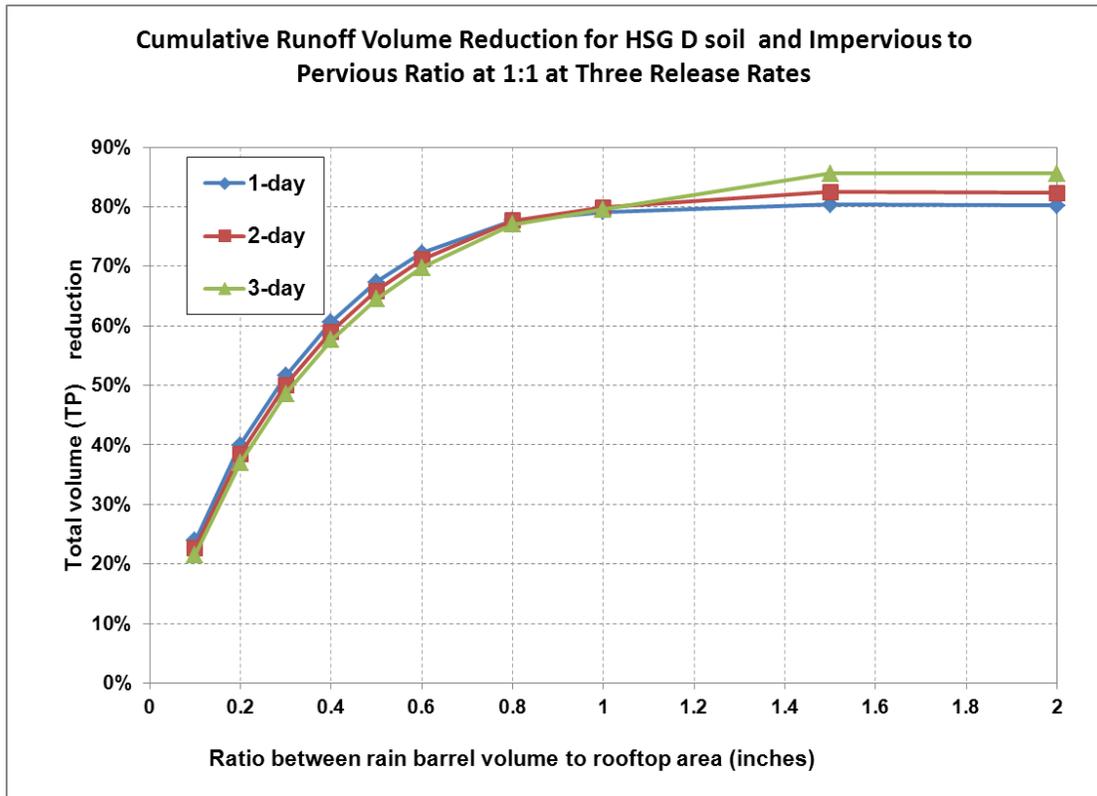


Figure 2-46. Impervious Area Disconnection through Storage: Impervious Area to Pervious Area Ratio = 1:1 for HSG D Soils

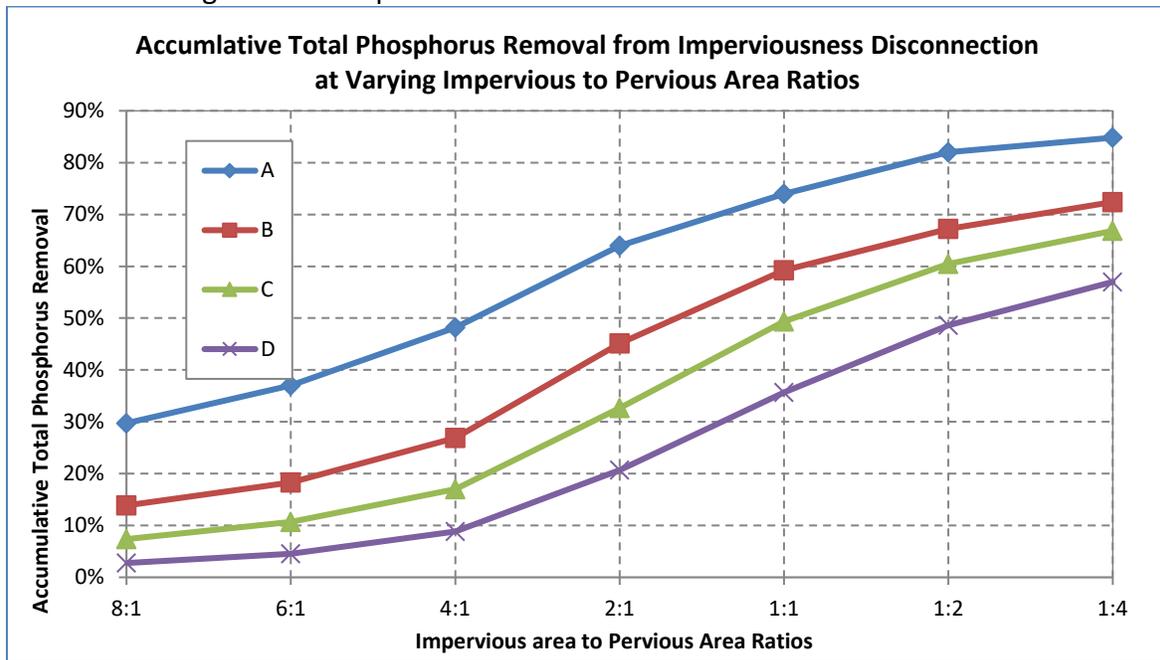


2.5.28. Impervious Area Disconnection Performance Table and Curve

Table 2-30. Impervious Area Disconnection Performance Table

Impervious area to pervious area ratio	Soil type of Receiving Pervious Area			
	HSG A	HSG B	HSG C	HSG D
8:1	30%	14%	7%	3%
6:1	37%	18%	11%	5%
4:1	48%	27%	17%	9%
2:1	64%	45%	33%	21%
1:1	74%	59%	49%	36%
1:2	82%	67%	60%	49%
1:4	85%	72%	67%	57%

Figure 2-47. Impervious Area Disconnection Performance Curves



2.5.29. Conversion of Impervious Areas to Pervious Area based on Hydrological Soil Groups Performance Table

Table 2-31. Conversion of Impervious Areas to Pervious Area based on Hydrological Soil Groups Performance Table

Land-Use Group	Cumulative Reduction in Annual Stormwater Phosphorus Load			
	Conversion of impervious area to pervious area-HSG A	Conversion of impervious area to pervious area-HSG B	Conversion of impervious area to pervious area-HSG C	Conversion of impervious area to pervious area-HSG D
Commercial (Com) and Industrial (Ind)	98.33%	93.89%	88.33%	79.44%
Multi-Family (MFR) and High-Density Residential (HDR)	98.74%	95.38%	91.18%	84.45%
Medium -Density Residential (MDR)	98.48%	94.42%	89.34%	81.22%
Low Density Residential (LDR) - "Rural"	98.48%	94.42%	89.34%	81.22%
Highway (HWY)	97.85%	92.11%	84.94%	73.46%
Forest (For)	98.00%	92.68%	86.02%	75.37%
Open Land (Open)	98.00%	92.68%	86.02%	75.37%
Agriculture (Ag)	98.00%	92.68%	86.02%	75.37%

2.5.30. Conversion of Low Permeable Pervious Area to High Permeable Pervious Area based on Hydrological Soil Group Performance Table

Table 2-32. Conversion of Low Permeable Pervious Area to High Permeable Pervious Area based on Hydrological Soil Group Performance Table

Land Cover	Cumulative Reduction in Annual SW Phosphorus Load from Pervious Area				
	Conversion of pervious area HSG D to pervious area-HSG A	Conversion of pervious area HSG D to pervious area-HSG B	Conversion of pervious area HSG D to pervious area-HSG C	Conversion of pervious area HSG C to pervious area-HSG A	Conversion of pervious area HSG C to pervious area-HSG B
Developed Pervious Land	91.89%	70.27%	43.24%	85.71%	47.62%

2.6. Alternative Methods:

A permittee may propose alternative long-term cumulative performance information or alternative methods to calculate phosphorus load reductions for the SCMs identified above or for other SCMs not identified in this Appendix subject to RIDEM review and approval.

RIDEM will consider alternative long-term cumulative performance information and alternative methods to calculate phosphorus load reductions for SCMs provided that the permittee provides RIDEM with adequate supporting documentation. At a minimum, the supporting documentation shall include:

1. Results of continuous SCM model simulations representing the SCM, using a verified SCM model and representative long-term (i.e., 10 years) climatic data including hourly rainfall data;
2. Supporting calculations and model documentation that justify use of the model, model input parameters, and the resulting cumulative phosphorus load reduction estimates;
3. If pollutant removal performance data are available for the specific SCM, model calibration results should be provided; and
4. Identification of references and sources of information that support the use of the alternative information and method.

A permittee may not use alternative methods to satisfy the permit requirements without prior approval from RIDEM. The use of alternative methods including the time required to obtain RIDEM approval does not waive or extend the deadline to develop and submit the SCP in accordance with the schedules outlined in the permit.

If RIDEM determines that the long-term cumulative phosphorus load reductions developed based on alternative information are not adequately supported, RIDEM will notify the permittee in writing, and the permittee may receive no phosphorus reduction credit other than a reduction credit calculated by the permittee using the default phosphorus reduction factors provided in this Appendix for the identified practices. The permittee is required to submit to RIDEM valid phosphorus load reductions for SCMs in accordance with the submission schedule requirements specified in the permit and this Appendix.

Appendix E

Inspection and Maintenance (I&M) Requirements

Parts V.D.6. and V.D.10.d. of the draft Mashapaug General Permit requires the documentation of proper inspection and maintenance of structural and nonstructural controls. The sections below provide detail on what information, at a minimum, the Permittee shall include in this documentation within their SCP.

Section 1 The SCP shall address inspection and maintenance procedures for structural stormwater control measures (SCMs) to ensure that all SCMs function as designed.

1.1. The Mashapaug General Permit lays out the following minimum attributes for maintaining records and inventories of structural SCMs in the I&M plan:

- 1.1.1. The plan shall include an inventory of all existing and new SCMs. The inventory shall include, at a minimum, basic information about the SCMs including:
 - 1.1.1.A. Location (street address or GPS location with accuracy of +/- 30 feet);
 - 1.1.1.B. Age or date of installation or retrofit, if known.
 - 1.1.1.C. Condition, if applicable.
 - 1.1.1.D. Ownership and party responsible for maintenance.
 - 1.1.1.E. Type of SCM with the naming convention found (if applicable).
 - 1.1.1.F. Drainage area in acres.
 - 1.1.1.G. Impervious area, described in terms of acres draining to the SCM.
 - 1.1.1.H. Design Storage Volume (DSV)¹ of the SCM (if applicable).
 - 1.1.1.I. The estimated pollutant reduction achieved by the SCMs based on the methodology described in Appendix D of this Permit, if applicable.
 - 1.1.1.J. Date of last maintenance activity for the treatment device.
 - 1.1.1.K. Whether the physical extent of the SCM intersects with a FEMA Flood Zone Layer (i.e. A, AE, Floodway, AH, AO, and VE zones). Each of these Flood Zones reflect areas that have a 1% chance of flooding in any given year (commonly referred to as a “100-year storm”) as defined by FEMA.² See Appendix B of this permit for guidance on determining the position of an SCM in relation to a FEMA Flood Zone.

¹ The October 2022 New England Stormwater Retrofit Manual <https://snepnetwork.org/stormwater-retrofit-manual/> defines Design Storage Volume (DSV) as the total volume of stormwater that a SCM is designed to be able to effectively hold. It includes permanent system treatment volume and does not include volumes associated with peak rate or flood control (i.e., volume above the primary outlet control). Each SCM will have a different method of calculating this volume, as presented in Appendix C of the New England Stormwater Retrofit Manual.

² <https://www.fema.gov/glossary/flood-zones>.

- 1.1.2. A maintenance schedule for all treatment system components and related appurtenances; and
- 1.1.3. On-site records of the completion of regular structural SCM maintenance activities shall be maintained in accordance with the records retention requirements in Part VI.D. of this permit.

Section 2 The SCP shall address inspection and maintenance procedures for nonstructural SCMs (e.g., sweeping, catch basin cleaning, and organic waste and leaf litter collection) and site infrastructure. This shall include an inventory of the nonstructural controls that are implemented at the site and site infrastructure that is being maintained.

2.1. The Mashapaug General Permit lays out the following minimum requirements for maintaining records and inventories of nonstructural SCMs in the I&M plan:

- 2.1.1. Documented procedures and protocols for good housekeeping practices and/or control measures that maintain areas that are potential sources of pollutants. This includes maintaining:
 - 2.1.1.A. parking lots, driveways, sidewalks, maintenance and storage yards, fleet or maintenance shops with outdoor storage areas, salt/sand storage locations and snow disposal areas operated by the Permittee, and waste storage locations; and
 - 2.1.1.B. procedures for properly disposing of waste removed from the separate storm sewers and areas listed above (such as accumulated sediments, floatables, and other debris).
- 2.1.2. Documented procedures for inspection and maintenance of catch basins:
 - 2.1.2.A. Prioritize inspection and maintenance for catch basins located near construction activities. Clean catch basins in such areas more frequently if inspection and maintenance activities indicate excessive sediment or debris loadings.
 - 2.1.2.B. Prioritize inspection and maintenance for catch basins that may be prone to flooding in major storm and flood events.
- 2.1.3. Establish and update as necessary a schedule with a goal that the frequency of routine cleaning will ensure that no catch basin at any time will be more than 50 percent full.
 - 2.1.3.A. If a catch basin sump is more than 50 percent full during two consecutive routine inspections/cleaning events, the Permittee shall document that finding, investigate the contributing drainage area for

sources of excessive sediment loading, and to the extent practicable, abate contributing sources.

- 2.1.3.B. For the purposes of this part, an excessive sediment or debris loading is a catch basin sump more than 50 percent full. A catch basin sump is more than 50 percent full if the contents within the sump exceed one half the distance between the bottom interior of the catch basin to the invert of the deepest outlet of the catch basin.
- 2.1.4. Drainback water resulting from catch basin cleaning shall be discharged to the sanitary sewer after seeking approval from the local sewer authority or other facility designed for the treatment and disposal of catch basin drainback water. No catch basin cleaning drainback water shall be discharged to the drainage system (i.e., MS4, private storm sewer system, or to the receiving water).
- 2.1.5. The Permittee shall keep a log of catch basins cleaned or inspected as part of the plan. At a minimum, this log shall include the sump depth, last cleaning or maintenance event, and estimated volume of sediment removed at last cleaning, and whether the catch basin is located within a flood zone as defined by FEMA (see section 1.1.1.K. of this Appendix).
- 2.1.6. On-site records of the completion of regular non-structural SCM maintenance activities shall be maintained in accordance with the records retention requirements in Part VI.D. of this permit.

FACT SHEET
RHODE ISLAND POLLUTANT DISCHARGE ELIMINATION SYSTEM
GENERAL PERMIT FOR STORMWATER DISCHARGES IN THE
MASHAPAUG WATERSHED
(Revised February 11, 2026)

1. BACKGROUND

1.1 Residual Designation Authority Petition

On November 19, 2018 and January 31, 2024, the Conservation Law Foundation (CLF) and the Rhode Island Office of the Attorney General (RIAG), respectively, formally petitioned the Rhode Island Department of Environmental Management (RIDEM) pursuant to 40 C.F.R. § 122.26(f)(2), to permit certain discharges of stormwater from unregulated sources in the Mashapaug Watershed that contribute to violations of water quality standards in Mashapaug and Spectacle Ponds (the “Ponds”). The petitions noted that the Ponds have been impaired for their designated uses for decades, contributing to public health hazards in these Environmental Justice Focus Areas identified by RIDEM. The petitions also indicated that efforts to control stormwater and its environmental impacts through municipal separate storm sewer systems (MS4s) and other established permitting schemes have been inadequate to meet water quality standards in the Ponds. The petitions further highlighted RIDEM’s authority pursuant to its designation by the United States Environmental Protection Agency (EPA) to establish a permitting system applicable to surrounding impervious surface owners under 40 C.F.R. §122.26(a)(9)(i)(D) and (f)(2) and to thereby regulate stormwater discharges in addition to those regulated under the Rhode Island Pollutant Discharge Elimination System (RIPDES) Municipal Separate Storm Sewer System (MS4) General Permit. It was noted that the use of RIDEM’s discretionary authority to issue RIPDES permits would open the door to protection of waterways as has been initiated in similar Environmental Justice neighborhoods in Massachusetts.¹

To date, pollutants in stormwater runoff within the watershed have resulted in elevated levels of phosphorus, fecal coliform, and low dissolved oxygen contributing to harmful algal blooms (cyanobacteria) and frequent recreational health advisories. As a result, the public recreational use of the Ponds has been impacted. Since 2011, there have been 20 public health advisories related to cyanobacteria blooms in the Ponds, often stretching many months at a time. The area surrounding the Mashapaug

¹ EPA, Clean Water Act Residual Designation Determination for Certain Stormwater Discharges in the Charles, Mystic, and Neponset River Watersheds, in Massachusetts, (Sept. 14, 2022) <https://www.epa.gov/npdes-permits/residual-designation-charles-river-watershed-mystic-river-watershed-and-neponset>

Watershed is located in a heavily-paved urban corridor and is designated by the RIDEM as an [Environmental Justice Focus Area](#).²

The Ponds are predominantly surrounded by impermeable surfaces, which have led to significant stormwater runoff and its associated impacts. Mashapaug Pond is currently listed by RIDEM as impaired by chlorophyll A (formerly excess algal growth), total phosphorus, low dissolved oxygen levels, polychlorinated biphenyls (PCBs) in fish tissue, and fecal coliform. Spectacle Pond is currently impaired for total phosphorus, low dissolved oxygen, and chlorophyll A. Since at least 2002, Mashapaug and Spectacle Ponds have been listed on [Rhode Island's 303\(d\) List of Impaired Waters](#).³

1.2 RIDEM's Residual Designation Authority Under the Clean Water Act

The Clean Water Act (CWA) and related regulations define the specific stormwater sources that must be authorized by a RIPDES permit. The CWA also recognizes that other sources may need to be regulated on a case-by-case or category-by-category basis based on additional information or localized conditions. The authority to regulate other sources based on the localized adverse impact of stormwater on water quality through RIPDES permits is commonly referred to as the "Residual Designation" authority.⁴

RIDEM may use its "residual designation" authority under 40 CFR 122.26(a)(9)(i)(C) and (D)⁵ to require RIPDES permits for other stormwater discharges or category of discharges on a case-by-case basis when it determines that:

- the discharges contribute to a violation of water quality standards,
- are a significant contributor of pollutants to federally protected surface waters, or
- controls are needed for the discharge based on wasteload allocations that are part of "total maximum daily loads" (TMDLs) that address the pollutant(s) of concern.

² The Rhode Island Department of Environmental Management, Environmental Justice Policy Version 1.4 – September 28, 2023. https://dem.ri.gov/sites/g/files/xkgbur861/files/2023-09/ridem-environmental-justice-policy_0.pdf

³ Rhode Island Section 303(d) - Lists of Impaired Waters: <https://dem.ri.gov/programs/water/publications/303d.php>

⁴ See EPA's Residual Designation Authority: <https://www.epa.gov/npdes/epas-residual-designation-authority>

⁵ 40 CFR 122.26(a)(9)(i)(C) and (D): <https://www.govinfo.gov/content/pkg/CFR-2015-title40-vol22/pdf/CFR-2015-title40-vol22-sec122-26.pdf>

The requirement to permit stormwater discharges that satisfy the above conditions is also included in § 1.32(A)(1) of the Regulations for the Rhode Island Pollutant Discharge Elimination System (RIPDES Regulations).⁶

In addition, designation can be requested by petition.

1.3 RIDEM Response to Residual Designation Authority Petitions

On April 30, 2024, the RIDEM announced that it would move forward with the issuance of a RIPDES general permit to regulate previously unpermitted stormwater discharges into the Ponds in the Cities of Cranston and Providence, RI. The announcement to issue a general permit was in direct response to the petitions filed by the RIAG and CLF. The general permit will address the key components of the petitions by including compliance options using an adaptive management approach to prevent and reduce stormwater pollution, require site owners to reduce pollutant loads to the watershed, and implement green infrastructure to reduce the impacts of climate change.

The Department hosted two informational workshops (held on July 30 and 31, 2025) to support the development of the Mashapaug General Permit. Following the informational workshops, the Department made a draft general permit available for review and initiated a formal public comment period. The original public comment period was scheduled from October 10, 2025, to November 21, 2025. Based on numerous requests from the public, the Department extended the public comment period to Monday, December 22, 2025, at 4:00 PM. In response to multiple requests and significant public interest, the Department also held a public hearing on November 20, 2025 at the RIDEM Headquarters located at 235 Promenade Street in Providence, Rhode Island. During the public hearing and public comment period, the RIDEM received numerous verbal and written public comments. The final Mashapaug General Permit and this Fact Sheet include minor modifications to clarify permit conditions in response to public comments received.

2. THE MASHAPAUG WATERSHED

2.1 Tongue, Spectacle, and Mashapaug Pond “The Ponds”

5.4-acre Tongue Pond (RI Water Body ID RI0006017L-10) (shown in Figure 1) and 38.8-acre Spectacle Pond (RI Water Body ID RI0006017L-07) (shown in Figure 2) are located within the Pawtuxet River watershed in a highly urbanized area in northern Cranston, near the Providence border. Spectacle Pond is bounded to the north and west by Cranston Street, to the east by Route 10, and to the south by Park Avenue (Route 12). The watershed is sewered. Approximately 53% of the watershed of Spectacle Pond consists of high-density residential development. Commercial and industrial land use

⁶ Regulations for the Rhode Island Pollutant Discharge Elimination System (RIPDES) Title 250-RICR-150-10-1: <https://rules.sos.ri.gov/regulations/part/250-150-10-1>

make up 17% and 10% of the watershed, respectively. Forest, wetland, open water, and mixed/other urban land uses comprise approximately 9% and 6% of the watershed, respectively. The northern and eastern shores of the pond are bounded by commercial and/or industrial uses. Residential areas characterize the western and southern shores. Steep terrain along the western and eastern shores and small wetlands at the northern and southern ends of the pond provide a vegetated buffer along most of the shoreline.

A manmade ditch connects Tongue Pond, located approximately 330 meters north of Spectacle Pond, to Spectacle Pond at its northern end (see Figure 1). There are three small wetland replication areas immediately adjacent to the stream. None of these wetland replication areas are hydrologically connected to either the stream or to Spectacle Pond. Spectacle Pond's outlet is a 48-inch highway culvert under Route 10, located in the northeast portion of the pond. The culvert leads to Mashapaug Brook, which discharges into 76.8-acre Mashapaug Pond (RI Water Body ID RI0006017L-06) (see Figure 3) via an underground conduit.

Mashapaug Pond is in the southern section of the City of Providence. It is the largest freshwater lake in the City of Providence and is located within an area locally known as Reservoir Triangle. The pond is bordered by the City of Cranston to the west, Narragansett Avenue to the east, and Sinclair Avenue to the south. As stated above, Mashapaug Pond receives freshwater inflow from Spectacle Pond, groundwater, and stormwater. Figure 3 shows Mashapaug Pond relative to Tongue Pond and Spectacle Pond to the west.

Mashapaug Pond flows to the Roger Williams Park Pond system, located southeast of the pond through culverted flow at the western edge of Roosevelt Lake. The Roger Williams Park Ponds then discharge to the Pawtuxet River, which drains into the Providence River, and ultimately into Narragansett Bay.⁷ Figure 4 provides an overview of how Mashapaug Pond connects to the Roger Williams Park Ponds and the Pawtuxet River.

The Mashapaug Watershed covers 1.8 square miles. The pond has a long history of development along its banks, dating back to the early 1600s. Developed areas (including residential, commercial, and transportation uses) occupy a large portion (83%) of the watershed. Non-developed uses cover approximately 5%, wetlands and other surface waters occupy 10% and other land uses combine to occupy 2%. Impervious surfaces cover a total of 61%.

Impervious cover is defined as land surface areas, such as roofs and roads, that force water to run off land surfaces, rather than infiltrating into the soil. Impervious cover

⁷ Total Maximum Daily Loads for Phosphorus to Address 9 Eutrophic Ponds in Rhode Island – September 2007:

https://dem.ri.gov/sites/g/files/xkgbur861/files/programs/benviron/water/quality/rest/pdfs/eutr_opnd.pdf

provides a useful metric for the potential for adverse stormwater impacts. As discussed in the RI Statewide Bacteria TMDL⁸ and other applicable TMDLs in this watershed, and as a general rule, impaired streams with watersheds having higher than 10% impervious cover are assumed to be adversely affected by stormwater runoff.

⁸ RI Statewide Bacteria TMDL – September 2011: <https://dem.ri.gov/environmental-protection-bureau/water-resources/research-monitoring/rhode-island-statewide-bacteria-tmdl>

Figure 1 – Tongue Pond and surroundings.



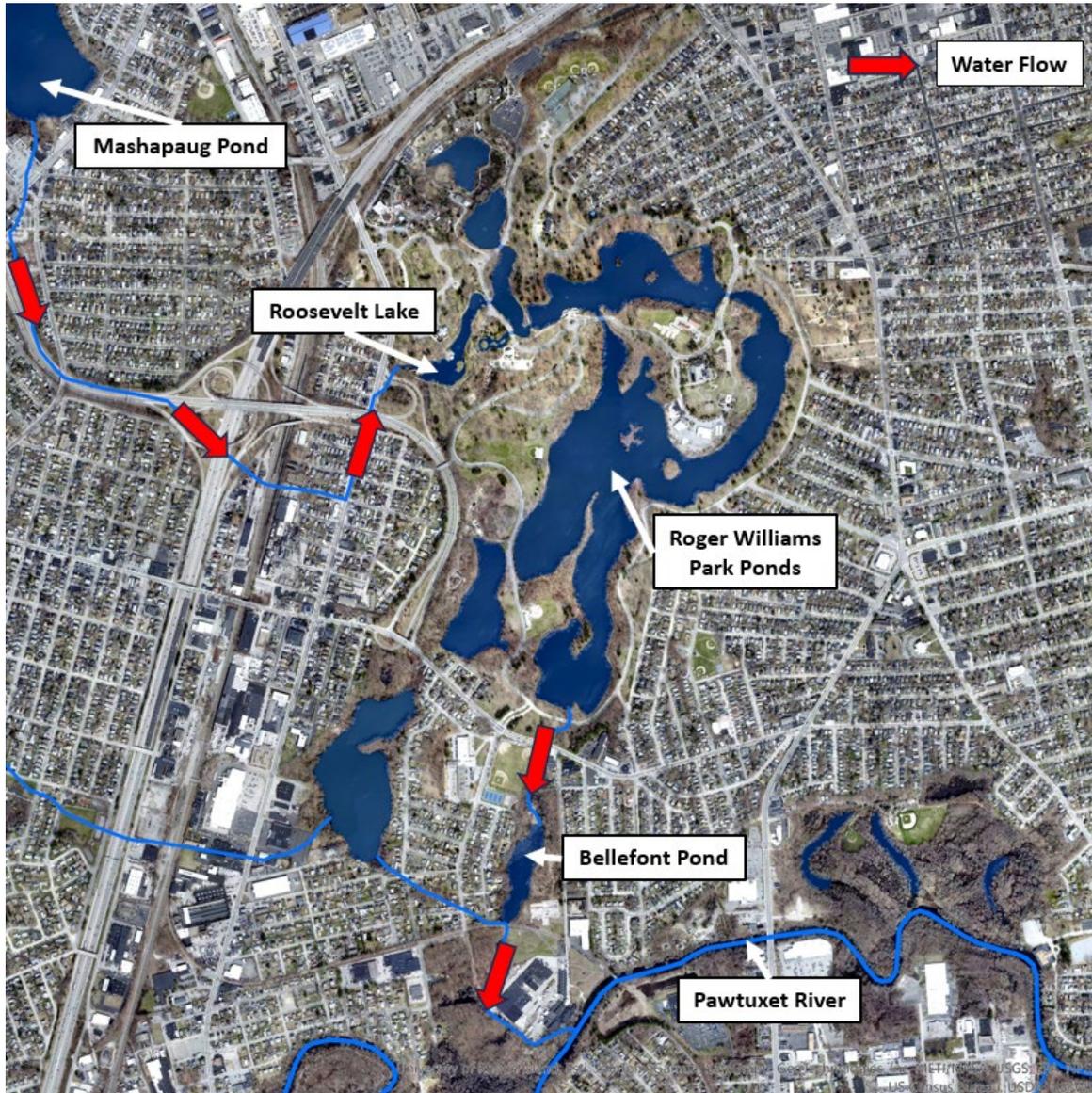
Figure 2 – Spectacle Pond and surroundings.



Figure 3 – Mashapaug Pond and surroundings (with Tongue Pond and Spectacle Pond to the west).



Figure 4 – Connectivity between Mashapaug Pond, Roger Williams Park Ponds, and the Pawtuxet River.



2.2 Designated Uses and Current Water Quality Impairments

Mashapaug Pond, Spectacle Pond, and Tongue Pond are all designated as Class B freshwater bodies.⁹ Class B waters are designated for fish and wildlife habitat and primary and secondary contact recreational activities. They shall be suitable for compatible industrial processes and cooling, hydropower, aquacultural uses,

⁹ Rhode Island Water Quality Regulations (250-RICR-150-05-1):
<https://rules.sos.ri.gov/regulations/part/250-150-05-1>

navigation, and irrigation and other agricultural uses. These waters shall have excellent aesthetic value.

Mashapaug Pond and Spectacle Pond are impaired for the following uses according the RIDEM Office of Water Resources 2024 Integrated Water Quality Monitoring and Assessment Report.¹⁰

Use Description	Use Attainment Status	Cause/Impairment	Waterbody
Fish and Wildlife Habitat	Not Supporting	Chlorophyll-A (Excess Algal Growth)	Mashapaug Pond Spectacle Pond
Fish and Wildlife Habitat	Not Supporting	Dissolved Oxygen	Mashapaug Pond Spectacle Pond
Fish and Wildlife Habitat	Not Supporting	Phosphorus, Total	Mashapaug Pond Spectacle Pond
Fish Consumption	Not Supporting	PCBs in Fish Tissue	Mashapaug Pond
Primary Contact Recreation	Not Supporting	Fecal Coliform	Mashapaug Pond
Secondary Contact Recreation	Not Supporting	Fecal Coliform	Mashapaug Pond

It should be noted that Tongue Pond is also designated as a Class B waterbody, but currently remains unassessed.

2.3 Water Quality Restoration Studies in the Mashapaug Watershed

The RIDEM's Office of Water Resources develops water quality restoration studies with public input to restore and maintain water quality for impaired/polluted waters. Waters are impaired if they do not meet state water quality criteria. These studies, required by the federal Clean Water Act, are called Total Maximum Daily Loads (TMDLs). TMDLs determine the total pollutant load that a waterbody can assimilate and still meet water quality standards. Rhode Island's TMDL studies identify water quality goals, necessary pollutant reductions to achieve these goals, the sources of pollution found contributing to the pollution problems, and the necessary pollution control actions to achieve the required reductions and restore water quality.

¹⁰ 2024 Rhode Island Integrated Water Quality Monitoring and Assessment Report: <https://dem.ri.gov/environmental-protection-bureau/water-resources/research-monitoring/water-quality-resources/integrated-reports>

A TMDL for Mashapaug Pond¹¹ intended to address dissolved oxygen and chlorophyll A impairments, and phosphorus pollution was approved in September of 2007. A second TMDL completed for Nine Eutrophic Ponds¹² in September 2007, which included Spectacle Pond and the Roger Williams Park Ponds, focused on phosphorus pollution and chlorophyll A and applicable dissolved oxygen impairments. A third Statewide Bacteria TMDL¹³ was approved in September of 2011, which focused on bacteria impaired waters including Mashapaug Pond and the Roger Williams Park Ponds.

2.4 Recommended Pollution Control Actions

The TMDLs referenced in Section 2.3 above identified several pollution sources in the Mashapaug Watershed and recommended the following actions: abatement of direct runoff into Mashapaug Pond along the Mashapaug Pond shoreline by reestablishing aquatic buffers; reductions in stormwater volumes discharging in the watershed by increasing infiltration opportunities and reducing impervious surfaces; discouraging waterfowl and wildlife, which contribute to nutrient pollution, from congregating in community baseball fields and surrounding parks; and treating direct discharges from stormwater collection systems in the Mashapaug Watershed by providing filtration systems, infiltration basins, infiltration trenches, and other best management practices (BMPs). The TMDL recommendations also identified responsible parties, including the City of Providence, the City of Cranston, the RI Department of Transportation, and private property owners.

2.5 Pollution Control Implementation through Adaptive Management

Currently, the Clean Water Act's National Pollutant Discharge Elimination System (NPDES) stormwater program, adopted by Rhode Island through its federally approved RIPDES program, directly regulates stormwater discharges from three main sources: MS4s, construction activities, and industrial activities. These sources of stormwater account for only a portion of the total pollutant load entering waterbodies and may not include all large impervious surfaces, such as parking lots or strip malls. As a result, the mechanisms for meeting water quality standards for Mashapaug Pond are limited to the MS4s owned and operated by the City of Cranston, the City of Providence, and the RI Department of Transportation. In addition to regulating stormwater via the RIPDES MS4 General Permit, certain industrial sites are required to obtain coverage under the RIPDES Multi-Sector General Permit (MSGP) for Industrial Stormwater. Lastly, construction projects which disturb greater than one

¹¹ Mashapaug Pond TMDL For Dissolved Oxygen and Phosphorus, September 2007: <https://dem.ri.gov/sites/g/files/xkgbur861/files/programs/benviron/water/quality/rest/pdfs/mashapaug.pdf>

¹² Nine Eutrophic Ponds TMDL for Phosphorus, September 2007: <https://dem.ri.gov/sites/g/files/xkgbur861/files/programs/benviron/water/quality/rest/pdfs/eutropnd.pdf>

¹³ Statewide Bacteria TMDL, September 2011: <https://dem.ri.gov/environmental-protection-bureau/water-resources/research-monitoring/rhode-island-statewide-bacteria-tmdl>

acre of land are also required to obtain coverage under the RIPDES Construction General Permit. These sources of stormwater only account for a portion of the pollutant load in the Mashapaug Watershed and are already regulated as point sources via the RIPDES Program and its associated permitting mechanisms. As indicated in the January 30, 2024 petition referenced above, despite a degree of regulation, many sources of urban stormwater in the Mashapaug Watershed are left unregulated as they are not required to obtain one of the three above-mentioned permits.

As a result, the RIDEM RIPDES Program is issuing a general permit to regulate activities within the Mashapaug Watershed that are not currently being addressed via existing RIPDES permitting mechanisms. The goal of issuing a new general permit will serve to address a gap in current stormwater pollution mitigation efforts by requiring incremental improvements in stormwater quality using an adaptive management approach. Implementation of a phased approach is consistent with the EPA publication entitled, "Guidance for Water Quality Based Decisions: The TMDL Process," which states: "For certain non-traditional problems, if there are not adequate data and predictive tools to characterize and analyze the pollution problem, a phased approach may be necessary." To implement a phased or adaptive management approach to improving water quality in the Mashapaug Watershed, the permit requires a suite of solutions to be implemented in the watershed. The suite of solutions that will be implemented in this permit focus on pollution prevention and pollutant load reductions. The permit requires permittees to identify opportunities to minimize exposure of pollutants to stormwater, reduce impervious cover, restore aquatic buffers, perform regular parking lot sweeping and catch basin cleaning and regular infrastructure maintenance, take measures to mitigate flooding and the effects of major storm events, and implement soil erosion and sediment control measures. Lastly, the permit requires the submittal of an Annual Report to document actions taken to minimize pollutant discharges in stormwater. Parcels located in the watershed have been divided into tiers based on the total impervious cover present.¹⁴ Pollutant load reduction efforts will be required of all properties, however, those properties that have the most impervious cover within the watershed will be required to make the most significant reductions as they have been deemed the most significant contributors of stormwater pollution.

Permits issued under the Rhode Island Pollutant Discharge Elimination System (RIPDES) program are limited by regulation to a maximum term of five (5) years. Title 250 RICR-150-10-1 §1.20 provides that RIPDES permits may not exceed the duration specified in 40 C.F.R. § 122.46, which establishes a maximum permit term of five years. However, it is the Department's intention to require properties with between 1 acre and 6.9 acres of impervious cover to reduce phosphorus loading in future permit cycles. Table 2 outlines the anticipated timeframes for all properties to address their phosphorus load reductions in future permit cycles consistent with the adaptive

¹⁴ Based on the URI Environmental Data Center and RIGIS – Rhode Island Impervious Surfaces Layer (2020): <https://www.rigis.org/maps/ce2cb6f8f7b045fe800cdd4e281dfb64/about>

management approach. Note that the percent reductions noted in Table 2 below refer to each parcel’s pollutant load reduction responsibility.

Permit Term (5-yr cycle)	7+ Acres Impervious Cover	3–7 Acres Impervious Cover	1–3 Acres Impervious Cover
Permit Term 1	<ul style="list-style-type: none"> • SWMP Development → Sweeping and catch basin cleaning → Pollution Prevention & Good Housekeeping → O&M and reporting • SCP Development • SCM Installation to achieve 30% phosphorus reduction 	<ul style="list-style-type: none"> • Green Infrastructure and Impervious Cover Reduction Evaluation • Sweeping and catch basin cleaning • Pollution Prevention & Good Housekeeping • O&M and reporting • No numeric load reduction 	<ul style="list-style-type: none"> • Green Infrastructure and Impervious Cover Reduction Evaluation • Sweeping and catch basin cleaning • Pollution Prevention & Good Housekeeping • O&M and reporting • No numeric load reduction
Permit Term 2	<ul style="list-style-type: none"> • SCM Installation to achieve 65% phosphorus reduction • Continued SWMP/SCP implementation 	<ul style="list-style-type: none"> • SWMP Development → Sweeping and catch basin cleaning → Pollution Prevention & Good Housekeeping → O&M and reporting • SCP Development • SCM Installation to achieve 30% phosphorus reduction 	<ul style="list-style-type: none"> • Green Infrastructure and Impervious Cover Reduction Evaluation • Sweeping and catch basin cleaning • Pollution Prevention & Good Housekeeping • O&M and reporting • No numeric load reduction
Permit Term 3	<ul style="list-style-type: none"> • SCM Installation to achieve 100% phosphorus reduction • Continued SWMP/SCP implementation 	<ul style="list-style-type: none"> • SCM Installation to achieve 65% phosphorus reduction • Continued SWMP/SCP implementation 	<ul style="list-style-type: none"> • SWMP Development → Sweeping and catch basin cleaning → Pollution Prevention & Good Housekeeping → O&M and reporting • SCP Development • SCM Installation to achieve 30% phosphorus reduction
Permit Term 4	<ul style="list-style-type: none"> • Continued SWMP/SCP implementation 	<ul style="list-style-type: none"> • SCM Installation to achieve 100% phosphorus reduction • Continued SWMP/SCP implementation 	<ul style="list-style-type: none"> • SCM Installation to achieve 65% phosphorus reduction • Continued SWMP/SCP implementation
Permit Term 5	<ul style="list-style-type: none"> • Continued SWMP/SCP implementation 	<ul style="list-style-type: none"> • Continued SWMP/SCP implementation 	<ul style="list-style-type: none"> • SCM Installation to achieve 100% phosphorus reduction • Continued SWMP/SCP implementation

This phased approach allows property owners with less than 7 acres of impervious cover additional time to pursue voluntary stormwater improvements, access available funding opportunities, and obtain guidance from environmental groups.

RIDEM is issuing a stormwater general permit in the Mashapaug Watershed, which will be referred to as the “Mashapaug General Permit.” Properties that are subject to the permit are described in Section 4 of this Fact Sheet entitled: Eligibility. A map showing the properties in the Mashapaug Watershed subject to the permit is shown in Figure 5, and can be further explored on the [Mashapaug General Permit Interactive Map](#).¹⁵ A corresponding list of properties, owners, and corresponding total impervious cover in acres are provided in Attachment 1 of this Fact Sheet.

3. PERMIT COVERAGE

This permit is enacted using the RIDEM’s “residual designation” authority under 40 CFR 122.26(a)(9)(i)(C) and (D)¹⁶ and § 1.32(a)(1) of the RIPDES Regulations. This Mashapaug General Permit applies to sites or contiguous sites that have one acre or more (≥ 1) of impervious cover and have stormwater discharges to an MS4, a private storm sewer system, or directly to Mashapaug Pond, Spectacle Pond, Tongue Pond, or associated wetlands or tributaries (herein referred to as “Mashapaug Watershed”). A “site” is defined as the land or water area where any “facility or activity” is physically located or conducted, including adjacent land used in connection with the facility or activity (40 CFR § 122.2). For purposes of this permit, “site” shall include “contiguous” properties or parcels when such properties or parcels are owned by the same entity. “Contiguous” parcels or properties are parcels or properties of land that are adjacent and owned by the same entity. For the purposes of this permit, “adjacent” properties or parcels may include those that are separated by an area, such as: an alley, roadway, sidewalk, path, driveway, garden(s), or other structure that interrupts the continuous flow or use of the land and/or easement, if the land on either side of such an area(s) is owned by the same entity.

To identify eligible sites or contiguous sites, all parcels intersecting the Mashapaug Watershed were first identified. The Mashapaug Watershed was delineated using the RI Department of Transportation (RIDOT) Stormwater Control Plan (SCP) developed for *Spectacle, Mashapaug, and Roger Williams Park Ponds – Mashapaug Pond (Providence, RI)* dated December 30, 2017.¹⁷ Individual parcels located in the Mashapaug Watershed were then identified using parcel information provided by the Cities of Cranston¹⁸ and Providence.¹⁹ Next, properties were merged based on

¹⁵ Mashapaug General Permit Interactive Map:

<https://ridemgis.maps.arcgis.com/apps/mapviewer/index.html?webmap=6b2f46b170004f09a7fa883bf751e601>

¹⁶ 40 CFR 122.26(a)(9)(i)(C) and (D): <https://www.govinfo.gov/content/pkg/CFR-2015-title40-vol22/pdf/CFR-2015-title40-vol22-sec122-26.pdf>

¹⁷ RIDOT Stormwater Control Plan (SCP) for Spectacle, Mashapaug, and Roger Williams Park Ponds – Mashapaug Pond (Providence, RI) dated December 30, 2017:

https://gisstage.dot.ri.gov/editing/rest/services/SCP/SCP_Watersheds_unfiltered_Public/MapServer/0/266/attachments/27

¹⁸ [Cranston RI Geo Hub – Cranston RI GIS – Parcels Layer](#)

¹⁹ [Providence GIS Hub – Providence Parcel Boundaries Layer](#)

common ownership and adjacency so that the true size of the property area associated with each entity could be determined. After merging, the amount of impervious cover (IC) associated with each property was calculated and all properties with one or more acres of impervious cover were identified.

See Figure 5 for an overview of the parcels within the Mashapaug Watershed subject to the permit requirements. Examples of the types of properties affected include businesses, shopping centers, employee parking lots, office buildings, residential apartment buildings, schools, etc. Contiguous properties with the same owner where the combined land area contains one acre or more of impervious cover are required to apply for a single general permit authorization. Any discharges authorized under the RIPDES MSGP are exempt from this permit, since stormwater discharges from these sites are already authorized by the MSGP.

4. ELIGIBILITY

As indicated above, the Mashapaug General Permit applies to sites or contiguous sites that have one acre or more (≥ 1) of impervious cover that discharge stormwater to an MS4, a private storm sewer system, or directly to water(s) of the State in the Mashapaug Watershed and are not authorized to discharge under another RIPDES permit.

Certain non-stormwater discharges are allowed under the permit, but are limited to:

- firefighting activities;
- fire hydrant flushings;
- lawn watering;
- irrigation drainage;
- uncontaminated groundwater;
- natural springs;
- potable waterline flushings;
- air conditioning condensate;
- foundation or footing drains where flows are not contaminated with process materials, such as solvents, or contaminated by contact with soils where spills or leaks of toxic or hazardous materials has occurred;
- water sprayed for dust control or at a truck load wet-down station;
- incidental windblown mist from cooling towers that collects on rooftops or adjacent portions of the facility, but not intentional discharges from the cooling tower (e.g., "piped" cooling tower blowdown or drains);
- uncontaminated utility vault dewatering;
- dechlorinated water line testing water;
- hydrostatic test water that does not contain any treatment chemicals and is not contaminated with process chemicals;
- routine external building washdown / power wash water that does not use detergents or hazardous cleaning products (such as those containing bleach, hydrofluoric acid, muriatic acid, sodium hydroxide, nonylphenols), and for which appropriate control measures are in place to minimize discharges of mobilized solids and other pollutants (e.g., filtration, detention, settlement);

- pavement wash waters, provided that detergents or hazardous cleaning products are not used (e.g., bleach, hydrofluoric acid, muriatic acid, sodium hydroxide, nonylphenols), and the wash waters do not come into contact with oil and grease deposits or any other sources of pollutants, unless residues are first cleaned up using dry clean-up methods (e.g., applying absorbent materials and sweeping, using hydrophobic mops/rags), and for which appropriate control measures are in place to minimize discharges of mobilized solids and other pollutants (e.g., filtration, detention, settlement);
- discharges from washing of vehicles provided that chemicals, soaps, detergents, hazardous cleaning products (such as those containing bleach, hydrofluoric acid, muriatic acid, sodium hydroxide, nonylphenols), steam, or heated water are not used; cleaning is restricted to the outside of the vehicle (e.g., no engines, transmissions, undercarriages, or truck beds); and the washing is not used to remove accumulated industrial materials, paint residues, heavy metals, or any other potentially hazardous materials from surfaces; and for which appropriate control measures are in place to minimize discharges of mobilized solids and other pollutants (e.g., filtration, detention, settlement); and
- discharges from washing of boats provided that chemicals, soaps, detergents, hazardous cleaning products (such as those containing bleach, hydrofluoric acid, muriatic acid, sodium hydroxide, nonylphenols), steam, or heated water are not used; and the washing is not used to remove topside or bottom paint, growth, or other potentially hazardous materials from vessels; and for which appropriate control measures are in place to minimize discharges of mobilized solids and other pollutants (e.g., filtration, detention, settlement).

These allowable non-stormwater discharges are eligible for coverage under this permit because pollutants present in them are similar to stormwater and BMPs used to control these pollutants are similar to those used for stormwater.

5. WATER QUALITY-BASED LIMITATIONS FOR STORMWATER

5.1 Stormwater Pollutant Loading Rates

EPA, states, and the scientific community have effective tools for characterizing the mass load of nutrients in stormwater. Nutrient loading to waterbodies is often characterized through export coefficients (i.e., Pollutant Load Export Rates (PLERs)) from land uses with similar characteristics in areas with similar rainfall patterns, which represents the total amount (expressed in pounds) of either nitrogen or phosphorus delivered annually to a system from a defined area (expressed in acres). Annual export coefficients for nutrients are particularly useful at characterizing stormwater because of the cumulative effects nutrients have on receiving waterbodies, including effects on downstream receiving waters. Receiving waters respond to the overall annual load of nutrients they receive, not just a snapshot in time of the stormwater nutrient concentration. The results of this can be seen in the impairments in each watershed, with downstream reaches exhibiting the higher levels of degradation due

to excess nutrients which accumulate in the tributaries in each watershed. EPA Region 1 has developed stormwater runoff PLERs for pervious and impervious areas that are annual pollutant mass per unit area load or volume per area load estimates. The PLERs have been developed for multiple parameters (i.e., Total Phosphorus, Total Nitrogen, TSS, Metals, Bacteria, and Runoff) and include unique values for pervious and impervious area for the following land use categories: Commercial/Industrial, Residential (low [rural], medium, and high/multi-family density), Highway, Forest, Agriculture, Open land, and Developed land pervious (based on hydrologic soil group).²⁰

5.2 Phosphorus Indicator Parameter

Due to the nature of stormwater and the pollutants it commonly contains, RIDEM determined that it would be both impractical and unnecessary to attempt to evaluate and limit every possible individual pollutant among the common stormwater pollutants. As a result, RIDEM determined that limiting “indicator parameters” in accordance with 40 CFR § 122.44(d)(1)(vi)(C) is reasonable and sufficiently stringent to carry out the provisions of the CWA and ensure compliance with applicable Water Quality Standards (WQSs) as required by CWA § 401(a)(2) and 40 CFR § 122.4(d).

Accordingly, the Mashapaug General Permit identifies phosphorus as an indicator parameter and identifies phosphorus and fecal coliform as the pollutants which are intended to be controlled using the phosphorus indicator parameter effluent limitations. This Fact Sheet sets forth the basis for phosphorus effluent limitations and finds that compliance with the phosphorus effluent limitations will result in controls on the other pollutants of concern, which are sufficient to attain and maintain applicable WQSs. RIDEM has determined that no effluent and ambient monitoring is necessary to evaluate whether the limitations on the indicator parameter meet applicable WQSs, because EPA has carried out extensive modeling on the cumulative performance of Stormwater Control Measures (SCMs) in Appendix D of this general permit. Appendix D contains SCMs and performance curves that were developed by EPA Region 1, including associated phosphorus load reduction crediting methodologies associated with each SCM.

5.3 Phosphorus Load Reduction Requirements

The following pollutant load reduction percentages are based on EPA-approved TMDL water quality restoration studies for the Mashapaug Pond and Spectacle Pond, i.e., the *Mashapaug Pond TMDL for Dissolved Oxygen and Phosphorus* (2007), and the *Nine Eutrophic Ponds TMDL for Phosphorus* (2007). Tongue Pond is currently an unassessed waterbody that discharges to Spectacle Pond and therefore, the pollutant load reduction percentage for Spectacle Pond has been applied to Tongue Pond.

²⁰ New England Stormwater Retrofit Manual (October 2022): https://snepnetwork.org/wp-content/uploads/2022/10/SNEP_Stormwater-Retrofit-Manual_Oct-2022-508c.pdf

Permittees shall reduce phosphorus in stormwater discharges from their site by the following percentages based on the specific waterbody/subwatershed into which a site discharges:

- Mashapaug Pond: 65%
- Spectacle Pond: 68%
- Tongue Pond: 68%

The Mashapaug General Permit contains requirements to bring stormwater discharges authorized under this permit into compliance with applicable WQSs using an adaptive management approach. Properties with one acre or more (≥ 1) but less than seven (< 7) acres of impervious cover will begin to make progress toward pollutant load reduction targets in this first permit term by implementing the Permit Conditions Applicable to All Properties and the Permit Conditions Applicable to Properties with < 7 Acres of Impervious Cover. Properties with seven or more (≥ 7) acres of impervious cover will make progress toward pollutant load reduction targets in this first permit term by implementing the Permit Conditions Applicable to All Properties and the Permit Conditions Applicable to Properties with ≥ 7 Acres of Impervious Cover. This approach prioritizes properties with the greatest amount of impervious cover, and therefore the highest estimated annual phosphorus loads, to begin making immediate progress toward pollutant load reduction targets. (See Section 2.5 and Table 2 of this Fact Sheet for a discussion on the long term phased approach of requiring all regulated parcels to reduce phosphorus loading in future permit cycles.)

Future assessments of the impaired waterbodies or other information may indicate further reductions are needed in future permit terms, but given the information presently known, RIDEM believes these provisions are appropriate and protective of water quality.

6. PERMIT CONDITIONS APPLICABLE TO ALL PROPERTIES WITH ONE OR MORE (≥ 1) ACRE OF IMPERVIOUS COVER

Stormwater discharges can be highly intermittent, are usually characterized by very high flows occurring over relatively short time intervals, and carry a variety of pollutants whose source, nature, and extent varies. RIDEM includes non-numeric effluent limits in RIPDES permits like the Mashapaug General Permit, such as requirements mandating that facilities minimize various types of pollutant discharges, or implement control measures unless infeasible. For the purposes of this permit, the term "minimize" is defined as: to reduce and/or eliminate to the extent achievable using control measures that are technologically available and economically practicable and achievable in light of best industry practices. Similarly, "feasible" means technologically possible and economically practicable and achievable in light of best industry practices. Pollution prevention continues to be the cornerstone of the RIPDES stormwater program.

All permittees shall consider certain factors when assessing pollution prevention strategies and how best to manage stormwater at their site, including:

- Preventing stormwater from coming into contact with polluting materials is generally more effective and less costly than trying to remove pollutants from stormwater;
- Using combinations of control measures is more effective than using control measures in isolation for minimizing pollutants;
- Assessing the type and quantity of pollutants, including their potential to impact receiving water quality, is critical to determining which control measures will be most effective in preventing pollution;
- Minimizing impervious areas at the facility and infiltrating runoff onsite (via bioretention cells, green roofs, pervious pavement, etc.) can reduce runoff volume and improve groundwater recharge and stream base flows in local streams (although care must be taken to avoid groundwater contamination);
- Attenuating flow using open vegetated swales and natural depressions can reduce in-stream impacts of erosive flows;
- Conserving and/or restoring riparian buffers will help protect waterbodies from stormwater runoff and improve water quality; and
- Using treatment interceptors (e.g., swirl separators, oil-water separators, sand filters) may be appropriate in some instances to minimize the discharge of pollutants.

The Mashapaug General Permit includes water quality-based effluent limits (WQBELs) to ensure that authorized stormwater discharges will be controlled as necessary to meet applicable water quality standards. The WQBELs included in the Mashapaug General Permit are non-numeric. The RIDEM relies on a narrative limit to ensure discharges are controlled as necessary to meet applicable water quality standards, and to ensure that additional measures are employed where necessary to meet the narrative WQBELs, or to be consistent with the assumptions and requirements of an applicable TMDL. The following is a list of the WQBELs required by the Mashapaug General Permit to address water quality impairments that exist in Mashapaug Watershed (i.e., excess algal growth, low dissolved oxygen levels, polychlorinated biphenyls (PCBs) in fish tissue, total phosphorus, and fecal coliform):

6.1 Minimize Exposure

Permittees must implement the following list of control measures/strategies to minimize exposure of pollutants to stormwater:

- Deter rodents, birds, and other animals from feeding/nesting/roosting at the facility/property;

- Minimize the potential for waste, solid waste, and floatable debris to be discharged by keeping exposed areas free of such materials, or by intercepting them before they are discharged. Solid waste and floatable debris must be stored and disposed of in such way that prevents exposure;
- Install structural source control best management practices (BMPs) to address on-site activities and sources that could cause bacterial/pathogen contamination (e.g., covered dumpsters, compost piles, food waste, and animal products);
- Properly maintain waste areas by keeping all dumpster lids closed when not in use and performing routine inspections of waste containers for leaks. Locate dumpsters away from drainage infrastructure and waterways. Use dry methods for any needed cleanup. For dumpsters and roll off boxes that do not have lids and could leak, ensure that discharges have a control (e.g., secondary containment, treatment). This permit does not authorize dry weather discharges from dumpsters or roll off boxes;
- Limit fertilizer or pesticide use. Fertilizer use practices should consider fertilizer types, composition, and application practices to apply only the amount plants need. Store fertilizer and other materials to prevent exposure to precipitation;
- Collect and properly dispose of leaf litter and other organic waste and debris from landscaping activities;
- Minimize the use of salt, sand, and deicers on paved surfaces. Store salts, sands, sediments, and other materials inside whenever possible. Salt/sand piles must be enclosed or covered by a storm-resistant shelter to prevent exposure to rain, snow, snowmelt, and/or runoff. The permittee must implement appropriate measures (e.g., good housekeeping, diversions, containment) to minimize exposure resulting from adding to or removing materials from the pile(s);
- Use grading, berming, or curbing to prevent runoff of contaminated flows and divert run-on away from areas with potential sources of chemicals or pollutants;
- Locate materials, equipment, and activities so that leaks are contained in existing containment and diversion systems (confine the storage of leaky or leak-prone vehicles and equipment awaiting maintenance to protected areas);
- Clean up spills and leaks promptly using dry methods (e.g., absorbents) to prevent the discharge of pollutants;
- Store leaky vehicles and equipment indoors or, if stored outdoors, use drip pans and absorbents;

- Use spill/overflow protection equipment;
- Drain fluids from equipment and vehicles that will be decommissioned, and, for any equipment and vehicles that will remain unused for extended periods of time, inspect at least monthly for leaks;
- Perform all vehicle and/or equipment cleaning operations indoors, under cover, or in bermed areas that prevent runoff and run-on and also that capture any overspray;
- Ensure that all wash water not authorized as an Allowable Non-Stormwater Discharge (per Part I.B.2. of the permit) drains to a proper collection system (i.e., not the stormwater drainage system); and
- Reduce or eliminate materials containing Per- and Polyfluoroalkyl Substances (PFAS) at the permitted facility that may be exposed to stormwater (e.g., implement product substitution and replacement; good operating and housekeeping practices). The permittee shall evaluate whether their facility uses or has historically used any products containing PFAS and identify them.

6.2 Good Housekeeping Program

Permittees must develop and implement the following as part of their good housekeeping program:

- Catch Basin/Infrastructure Cleaning.* The Mashapaug General Permit requires the permittee to inspect and clean sediment and debris from stormwater management structures, catch basins, and outfalls at least twice per year between November 15 and December 15 (after leaf fall) and during the month of April (after snow melt), or more frequently when needed. Catch basin cleaning must be conducted such that a minimum sump storage capacity of 50% is maintained throughout the year.
- Sweeping.* Leaf litter can contribute significant phosphorus loads to receiving waterbodies and winter operations can contribute salt and sediment. To reduce these pollutant loads, the Mashapaug General Permit requires the permittee to sweep all parking areas, sidewalks, driveways, and other impervious surfaces (except roofs) twice per year between November 15 and December 15 (after leaf fall), once during the month of April (after snow melt), and at other times as may be necessary, and implement the removal of sand, litter, leaf litter, and any other possible pollutants.
- Maintenance.* The permittee must regularly inspect, test, maintain, and repair all equipment and systems to avoid situations that may result in leaks, spills, and other releases of pollutants in stormwater discharged to receiving waters.

- d. Dust Generation and Vehicle Tracking of Materials.* The permittee must minimize generation of dust and off-site tracking of raw, final, or waste materials and sediment that can be mixed with stormwater runoff and discharged to waters of the State.

6.3 Minimize Impacts from Major Storm Events

The permittee must identify any areas of the property that are subject to flooding and implement appropriate pollution minimization controls, structural improvements, enhanced/resilient pollution prevention measures, and other mitigation measures to help minimize impacts from stormwater discharges from major storm events, such as hurricanes, storm surges, extreme/heavy precipitation, and flood events. When these types of major storm events are predicted, control measures that may be considered include, but are not limited to: temporarily storing materials and waste outside the Flood Zone, temporarily reducing or eliminating outdoor storage, temporarily relocating vehicles and equipment to higher ground, delaying the delivery of exposed materials if possible until after the storm, and planning future site improvements or construction projects to consider the Flood Zone and associated control measures.

6.4 Spill Prevention, Control, and Response

Permittees must develop and implement procedures to prevent and control spills, including best management practices and good housekeeping measures to prevent spills from occurring, control any that do occur so that pollution is not released into waters of the State, and the response tools, training, and procedures needed for staff to quickly address and handle situations if they do occur. Permittees must have procedures to notify appropriate facility personnel, emergency response agencies, and regulatory agencies in the event of a spill, including the RIDEM and, if applicable, the operator of a MS4. Local requirements may necessitate reporting spills or discharges to local emergency response, public health, and/or drinking water supply agencies.

6.5 Erosion and Sediment Control

Permittees must stabilize areas of exposed or disturbed soil and contain stormwater runoff using structural and/or non-structural control measures to minimize onsite erosion and sedimentation and the resulting discharge of pollutants.

7. PERMIT CONDITIONS APPLICABLE ONLY TO PROPERTIES WITH ONE OR MORE (≥1) BUT LESS THAN SEVEN (<7) ACRES OF IMPERVIOUS COVER

7.1 Green Infrastructure and Impervious Cover Reduction Evaluation

Permittees must evaluate their site for opportunities to reduce or eliminate impervious (paved and other hard) surfaces, improve stormwater infiltration (where

feasible²¹), reestablish aquatic buffers, and/or install green stormwater infrastructure, structural stormwater controls, and/or stormwater retrofits to manage and treat runoff from the property. Examples of green stormwater infrastructure solutions include installing bioswales, vegetated swales, and bioretention basins. Examples of other best management practices (BMPs) to consider include installing filtration systems, infiltration basins, or infiltration trenches, using porous materials for otherwise impervious surfaces (e.g., porous asphalt, interlocking pavers, etc.), reducing parking lot sizes or driveway widths, installing rain gardens, capturing and reusing rain in rain barrels, planting trees, enhancing existing vegetation and soil health, introducing new vegetation, improving soil quality, or restoring buffer areas adjacent to waterways, disconnecting impervious cover, eliminating curbing, utilizing sunken parking lot islands, directing roof runoff to pervious surfaces where feasible, etc.

The permittee must describe and list potential opportunities in the Annual Report and annually evaluate the site for new opportunities to implement any of the listed projects. As property owners/permittees plan and complete capital projects or make other improvements at their site, projects shall to the maximum extent feasible: reduce or eliminate impervious cover, improve infiltration onsite, reestablish aquatic buffers, and install green stormwater infrastructure, structural stormwater controls, and/or stormwater retrofit BMPs. Any changes made to the site must be reported in the Annual Report.

8. PERMIT CONDITIONS APPLICABLE ONLY TO PROPERTIES WITH SEVEN OR MORE (≥ 7) ACRES OF IMPERVIOUS COVER

8.1 Stormwater Management Plan (SWMP) Requirements

The Mashapaug General Permit requires the development and implementation of a site-specific SWMP for properties with seven or more (≥ 7) acres of impervious cover. The goal of the SWMP is to help parcels with larger amounts of impervious cover identify the sources of pollutants in stormwater discharges and document the specific control measures that will be used to meet the permit conditions as well as to document compliance with other permit requirements (e.g., inspections, recordkeeping, reporting, etc.). This SWMP describes how the property owner will manage operations and includes measures to reduce or eliminate the potential for the discharge of stormwater pollutants to the watershed.

The SWMP must be a written document submitted with the NOI for permit coverage. The SWMP helps to ensure that permittees have (1) taken steps to identify all sources of pollutant discharges in stormwater; and (2) implemented appropriate measures to control these discharges in advance of authorization to discharge under the new permit.

²¹ Infiltration is not encouraged in contaminated soils. (See Title 250-RICR-150-10-8 RI Stormwater Management, Design, and Installation Rules § 8.14.)

The permit contains the required elements to be documented in the SWMP, which include: 1) the establishment of a stormwater pollution prevention team; 2) a description of the site, including a site level stormwater map and receiving waters; 3) a summary of potential pollutant sources; 4) a description of control measures; 5) schedules and procedures including inspection schedules, infrastructure maintenance, sweeping, and annual reporting; and 6) signature requirements.

8.2 Contents of the SWMP

The Mashapaug General Permit requires the SWMP to address the Permit Conditions Applicable to All Properties with One or More (≥ 1) Acre of Impervious Cover (Part III. of the permit), in addition to the following requirements:

- a. *Designation of a Pollution Prevention Team.* A qualified individual or team responsible for developing, implementing, and revising the facility's SWMP must be identified. These persons, at least one of whom must be associated with the property, are responsible for ensuring that all permit conditions are satisfied and that needed updates to the SWMP are assessed and implemented annually or when significant changes occur. Personnel should be chosen for their expertise in the relevant departments at the property to ensure that all aspects of site operations are considered in developing and implementing the SWMP. The SWMP must clearly describe the responsibilities of each team member to ensure that each aspect of the plan is covered.
- b. *Site Description.* The SWMP must describe the property, its physical features, activities and land use, how stormwater moves through the property, the receiving waters, and the activities that may contribute pollutants in stormwater runoff.
- c. *Site Level Stormwater Map.* The SWMP must contain a map of the site that shows where the property is in relation to receiving waters and other geographical features, existing stormwater infrastructure and directions of stormwater flow, location and extent of pervious and impervious surfaces, and contain information on the site characteristics or activities that affect stormwater runoff quality and quantity.
- d. *Summary of Potential Pollutant Sources.* The Mashapaug General Permit requires permittees to identify the potential sources of pollutants from site activities that could result in the contribution of pollutants in stormwater discharges, unauthorized non-stormwater discharges, and potential sources of allowable non-stormwater discharges. Sources of stormwater pollution discharging from the site may include, but are not limited to: parking areas, waste storage/dumpsters, material storage, loading/unloading, access areas, equipment fueling and cleaning, areas where potential spills and leaks can occur, etc. Illicit discharges are a likely contributor of pollutants to receiving waters. By receiving the authorization to discharge under this permit, the

permittee must comply with the requirement to remove any illicit connections into their storm sewer system upon discovery of the connection.

8.3 Stormwater Control Plan (SCP) Requirements

Permittees with properties that contain seven or more (≥ 7) acres of impervious cover shall develop, implement, and maintain a site-specific SCP designed to reduce the amount of phosphorus in stormwater discharges from their site to waters of the State in the Mashapaug Watershed. The SCP may either be a stand-alone document or may be incorporated into the SWMP.

To meet Water Quality Standards and total required phosphorus load reduction targets applicable to discharges from the permittee's site as listed in section 5.3, permittees with properties containing ≥ 7 acres of impervious cover shall meet the following pollutant reduction targets:

Permit Term 1: The permittee shall reduce its total phosphorus load to the Mashapaug Watershed by at least 30% of the site-specific pollutant load reduction responsibility (as discussed in section 8.4.1).

Permit Term 2: The permittee shall reduce its total phosphorus load to the Mashapaug Watershed by at least an additional 35%, for a cumulative total phosphorus load reduction of 65% of the site-specific pollutant load reduction responsibility.

Permit Term 3: The permittee shall reduce its total phosphorus load to the Mashapaug Watershed as necessary to achieve a cumulative total phosphorus load reduction of 100% of the site-specific pollutant load reduction responsibility.

The SCP shall be developed and submitted to the RIDEM by February 15, 2028 with the Annual Report for calendar year 2027, or, for sites that become eligible for permit coverage after the permit effective date due to added impervious cover or new development, within 2 years of permit authorization. The SCP must document the selection, design, installation, and implementation of control measures used to meet the above-mentioned phosphorus reduction targets.

The SCP must be updated whenever there is change in site conditions or approach to stormwater treatment which could result in an increase in the discharge of pollutants to the receiving water(s). Permittees must maintain an up-to-date SCP (hardcopy or electronic) on-site and/or with the permittee to be made available upon inspection and/or request by RIDEM, the State, and/or the municipality in which the discharge occurs.

8.4 Contents of the SCP

The SCP must document a plan and implementation schedule to meet 30% of the site-specific phosphorus load reduction responsibility by the end of the fifth year of the permit by identifying structural and/or nonstructural SCMs that will manage stormwater on the existing developed site or through redevelopment or retrofit.

8.4.1 Site-Specific Pollutant Load Reduction Responsibility

To determine the site-specific pollutant load reduction requirements, the permittee may follow the generic examples provided below. More examples for special circumstances are included in Appendix C of the permit. Specific steps to calculate the site-specific pollutant load reduction of a generic site are as follows:

Step 1: The permittee must multiply the site's impervious area by the average annual phosphorus load export rate in lbs/acre-yr based on Land Use Type as listed in Appendix D, Table 1-1. This average annual phosphorus load export rate (PLER) is applicable to all sites in the watershed. Should one permittee be responsible for multiple sites, this calculation must be made for each site for which the permittee submitted a NOI.

Step 2: The permittee must multiply the site's pervious area by the average annual phosphorus load export rate (PLER) in lbs/acre-yr depending on the associated Hydrologic Soil Group (HSG) listed in Appendix D, Table 1-1. This average annual phosphorus load export rate is applicable to all sites in the watershed. Should one permittee be responsible for multiple sites, this calculation must be made for each site for which the permittee submitted a NOI.

Step 3: The permittee must add the annual phosphorus load for impervious and pervious area together to get the total average annual pollutant load in lbs/yr specific to the site.

Step 4: To determine the final Site-Specific Pollutant Load Reduction Responsibility in lbs/yr, the permittee must multiply the average annual pollutant load from the site by the waterbody-specific pollution reduction requirement as outlined in section 5.3.

$$\text{Site-Specific Reduction} = \frac{[(\text{Acres}_{\text{IC}} * \text{PLER lbs/acre-yr}) + (\text{Acres}_{\text{PC}} * \text{PLER lbs/acre-yr})] * R_{\text{ws}}}{R_{\text{ws}}}$$

Where: Acres_{IC} = Impervious Area
 Acres_{PC} = Pervious Area
 PLER = Pollutant Load Export Rate (for phosphorus)

Where R_{ws} = the subwatershed-specific pollution reduction requirement (%):

- Mashapaug Pond: 65%
- Spectacle Pond: 68%
- Tongue Pond: 68%

Example Calculation 1: Determine the Site-Specific Reduction for a Commercial/Industrial site with 7.0 acres of impervious cover and 1.0 acre of pervious cover (HSG C) in the Spectacle Pond watershed.

$$\text{Site-Specific Reduction} = [(7.0 \text{ acres} * 1.78 \text{ lbs/acre-yr}) + (1.0 \text{ acres} * 0.21 \text{ lbs/acre-yr})] * 68\%$$

$$\text{Site-Specific Reduction} = [(12.46 + 0.21)] * 68\%$$

$$\text{Site-Specific Reduction} = [(12.67)] * 68\%$$

$$\text{Site-Specific Reduction} = 8.62 \text{ lbs/yr}$$

In accordance with Part V.D.7.b. of the Mashapaug General Permit, the Phased Site-Specific Phosphorus Load Reduction Requirements would be as follows:

$$\text{First Permit Term: } 30\% * 8.62 \text{ lbs/yr} = 2.59 \text{ lbs/yr}$$

$$\text{Second Permit Term: } 65\% * 8.62 \text{ lbs/yr} = 5.60 \text{ lbs/yr}$$

$$\text{Third Permit Term: } 100\% * 8.62 \text{ lbs/yr} = 8.62 \text{ lbs/yr}$$

Step 5: If a site proposes adding new impervious area, the permittee will calculate a new Site-Specific Reduction as required in section 5.3.

Example Calculation 2: Using the example above, but adding an additional 0.4 acres of new industrial impervious cover will result in the following revised Site-Specific Reduction value:

$$\text{Site-Specific Reduction} = [(7.0 \text{ acres} * 1.78 \text{ lbs/acre-yr}) + (0.6 \text{ acres} * 0.21 \text{ lbs/acre-yr})] * 68\% + [(0.4 \text{ acres} * 1.78 \text{ lbs/acre-yr}) * 100\%]$$

$$\text{Site-Specific Reduction} = [(12.46 + 0.13) * 68\%] + [(0.71) * 100\%]$$

$$\text{Site-Specific Reduction} = 8.56 + 0.71 = 9.27 \text{ lbs/yr}$$

In accordance with Part V.D.7.b. of the Mashapaug General Permit, the Phased Site-Specific Phosphorus Load Reduction Requirements would be as follows:

$$\text{First Permit Term: } 30\% * 9.27 \text{ lbs/yr} = 2.78 \text{ lbs/yr}$$

$$\text{Second Permit Term: } 65\% * 9.27 \text{ lbs/yr} = 6.03 \text{ lbs/yr}$$

$$\text{Third Permit Term: } 100\% * 9.27 \text{ lbs/yr} = 9.27 \text{ lbs/yr}$$

8.4.2 Stormwater Map

The stormwater mapping requirement in the SCP is intended to ensure that permittees are able to confirm their impervious cover acreage as part of their site-

specific pollution reduction requirement and develop a plan for implementing or retrofitting SCMs on site, whether they are structural or nonstructural. The map also allows permittees to identify the locations of existing SCMs and areas where structural SCMs can be installed.

8.4.3 Stormwater Control Measures (SCMs)

The Mashapaug General Permit does not mandate the use of any particular SCM to treat stormwater to the specified reduction percentages, but instead provides flexibility for permittees to use an array of options to meet the pollutant reduction requirements. Permittees can select from a menu of structural and nonstructural stormwater controls to meet the pollution reduction requirements. However, if a permittee determines their site may be exposed to, or has previously experienced major storm and flood events, or contributes to localized flooding, the permittee should prioritize green infrastructure and/or SCMs that reduce such flooding or enhance evapotranspiration where appropriate.

Each permittee must plan SCM implementation scenarios to meet the phosphorus reduction requirements specific to their site. Appendix D of the permit includes a framework for quantifying stormwater phosphorus load reduction credits for several non-structural and structural SCMs. This approach allows stormwater phosphorus load reduction amounts to be quantified by all permittees. Using a consistent approach with creditable SCM performance information representative of long-term cumulative reduction rates will allow RIDEM and permittees to track phosphorus load reduction progress as part of this permit. This approach has two benefits. First, it allows RIDEM to apply its adaptive management model and quantify the water quality improvements made as part of this permitting action. Second, this approach also eliminates the need for permittees to develop their own pollution reduction models and estimates using potentially disparate sources of information and assumptions and thus, allows permittees to move forward in the relatively near future with the needed information to develop the SCP.

If the permittee chooses to use non-structural and structural SCMs to receive phosphorus reduction credits, they must include supporting computations for the proposed phosphorus reduction credits as part of their SCP.²² The permittee will also need to report the pollution reduction achieved, and certify it in the Annual Report that the pollution prevention measures and non-structural SCMs continue to be maintained in order to continue to receive any phosphorus reduction credit from them.

²² Permittees can annually provide in the Annual Report an inventory and accounting of SCMs and treatment credits as they are implemented using EPA's BMP Accounting and Tracking Tool (BATT) (<https://snepnetwork.org/batt-tutorial/>) or equivalent.

8.4.3.1 Structural SCMs

The permittee may satisfy its phosphorus load reduction requirement in whole or in part by installing and maintaining structural SCMs onsite or offsite.

The Mashapaug General Permit establishes reduction credits for the following structural stormwater control measures:

1. Infiltration Trench
2. Surface Infiltration Practices (e.g., basins, rain gardens, bio-retention, etc.)
3. Bio-filtration Practice
4. Gravel Wetland System
5. Enhanced Bio-filtration with Internal Storage Reservoir (ISR)
6. Sand Filter
7. Porous Pavement
8. Wet Pond or Wet Detention Basin
9. Dry Pond or Extended Dry Detention Basin
10. Dry Water Quality Grass Swale w/Detention
11. Impervious Area Disconnection through Storage (e.g., rain barrels, cisterns, etc.)
12. Impervious Area Disconnection
13. Conversions of Impervious Area to Permeable Pervious Area
14. Soil Amendments to Enhance Permeability of Pervious Areas

RIDEM is aware that retention of stormwater on site through infiltration is not always preferable. This is especially true in areas with high pollutant load potential (industrial sites) and sites with documented soil contamination where infiltration could contaminate groundwater and potentially harm public water supplies. In such cases, permittees should select and implement other structural SCMs.

8.4.4 Maintaining Stormwater Pollution Reduction Credits

The permittee must undertake appropriate operations, inspections, and maintenance practices for each selected SCM that they install. In the SCP, the permittee would outline how structural SCMs are being maintained and how often nonstructural SCMs are being implemented. This section of the SCP would include two subsections that describe how the permittee claims phosphorus reduction credits and related inspections and maintenance activities.

8.4.4.1 Structural SCMs

Structural SCMs require regular inspections and maintenance to ensure that SCMs are operating as designed and achieving the full stormwater phosphorus load reduction credits estimated and being claimed by the permittee. Structural stormwater SCMs are susceptible to falling into disrepair if debris and accumulated sediments are delivered by incoming stormwater runoff. Regular inspection of all SCMs is needed to identify potential operational problems that may arise and to

trigger immediate remediation corrective actions to resolve operational problems and maintain the SCMs' optimal functional capacities and performance. Reduced SCM capacity due to accumulation of sediments and debris, clogging, short-circuiting and other operational problems will reduce SCM pollutant removal efficiency and potentially create local hazards to the public. Additionally, a I&M (Inspection and Management) program is essential for protecting the significant financial investment made in implementing the SCMs and maintaining their maximum beneficial return for the permittee.

Therefore, permittees must engage in maintenance to ensure all stormwater control measures, including all treatment system components and related appurtenances used to achieve the Mashapaug General Permit's limitations, remain in effective operating condition, and do not result in leaks, spills, and other releases of pollutants. To demonstrate compliance with this requirement, the permittee shall document procedures and protocols, develop a maintenance schedule for all treatment system components and related appurtenances used to meet the limitations of this general permit, and keep records of the completion of regular maintenance activities.

Because performance of the SCM is directly tied to functionality and maintenance, pollution reduction credits can only be achieved if permittees are maintaining SCMs on a regular basis. If the permittee does not regularly maintain the structural SCM installed on their site, the permittee will lose the pollution reduction credit for that SCM.

Routine inspections must be conducted by site personnel who have direct knowledge of the stormwater management activity (i.e., Stormwater Pollution Prevention Team, as outlined in the SWMP).²³ This activity should occur on a regular basis but no less than once per year, and more frequently if the SCM that the permittee has installed requires more frequent maintenance. Situations that may require more frequent inspections and maintenance include but are not limited to: sites with higher potential pollutant loads, sites that have soils that are not yet stabilized or where construction is occurring nearby, or sites that have SCMs located at the bottom of a slope.

Corrective action must be initiated within 24 hours of the time of discovery of a violation of a permit condition or requirement and completed within a reasonable timeframe to: evaluate, and revise (i.e., repair, modify, or replace), if necessary, any SCM used at the site if the stormwater control measure is identified as installed incorrectly or operating ineffectively. In all circumstances, the cause of the permit violation must be identified and documented, and the permittee must immediately take all reasonable steps to minimize or prevent the discharge of pollutants until a permanent solution is achieved.

²³ This person shall have the skills to assess the effectiveness of any stormwater control measure(s) in use at the site in order to meet the requirements of this general permit to: assess the stormwater treatment system and site areas, and discharge, including the outfall where practicable; and identify any uncontrolled leaks, spills or discharges.

8.4.4.2 Nonstructural SCMs

Nonstructural SCMs, such as street and parking lot sweeping, catch basin cleaning, and leaf litter management are effective methods that reduce pollutant loading to waterways. Regular implementation of these nonstructural controls ensures that these nonstructural SCMs are effective and achieving the full stormwater phosphorus load reduction credits estimated and being claimed by the permittee. Nonstructural stormwater SCMs act as pollution prevention measures by removing debris and accumulated sediments that are delivered to impervious surfaces by incoming stormwater runoff. Regular removal of this debris ensures that runoff not only does not accumulate and flush these pollutants into the nearby structural controls, but also prevents pollutants from being flushed into the stormwater drainage system, allowing the systems to operate and maintain the optimal functional capacities and performance they were designed for. As mentioned above, reduced SCM capacity due to accumulation of sediments and debris, clogging, short-circuiting and other operational problems will reduce SCM pollutant removal efficiency and potentially create local hazards to the public. A I&M program is essential for protecting the significant financial investment made in implementing SCMs and drainage infrastructure and maintaining their maximum beneficial return for the permittee.

Therefore, the Mashapaug General Permit would allow permittees engaging in preventative maintenance to remove debris from impervious surfaces and catch basins to receive credit for this work. To demonstrate compliance with this requirement, the permittee shall document procedures and protocols, develop a maintenance schedule for all treatment system components and related appurtenances used to meet the limitations of this general permit, and keep records of the completion of regular maintenance activities.

Because pollutant reductions via the implementation of nonstructural SCMs are directly tied to frequency of implementation of the practice, credits depend on the frequency of nonstructural SCM application. If the permittee conducts street and parking lot sweeping more frequently, the permittee may be able to achieve higher pollution reductions.

8.4.5 Credit for Offsite Stormwater Treatment

The permittee can elect whether they want to meet the pollution reduction requirements of the permit onsite or offsite. Onsite stormwater management for phosphorus reductions refers to pollutant removal practices that are implemented at the location that is the permitted site. Offsite phosphorus reduction refers to pollutant removal practices that are implemented at another location that is not the permitted site. The sections below describe the various options permittees have to meet the pollution reduction requirements outlined in the Mashapaug General Permit.

There are three options for offsite phosphorus reductions in the Mashapaug General Permit. One option allows permittees to enter into a legally binding agreement with

a local Watershed Management Group (“WMG”),²⁴ or similar entity, to achieve offsite phosphorus load reductions at a regionalized scale. The second option allows for Permittee-to-Permittee credit trading through purchasing of credits on new and/or existing stormwater control measures. The third option allows for permittees to co-fund stormwater control projects.

All offsite phosphorus reduction options require the permittee to enter into a legally binding agreement with another party (WMG or other Mashapaug site permittee(s)), in which the permittee agrees to contribute funding for a new or existing project in the same subwatershed that the site discharges to. This agreement must account for both installation of the SCM, if applicable, and ongoing operation and maintenance. The funding may include costs for initial construction, maintenance and operation, project revision and enhancement, and administrative and other supplemental work. The entity receiving credits for the SCM will be required to certify annually that I&M is ongoing.

9. REPORTING AND RECORDKEEPING

The Mashapaug General Permit includes reporting and recordkeeping requirements, which include the submission of an Annual Report and requirements for permittees to retain records for at least five (5) years. Permittees must submit an Annual Report to the Director by February 15th for the previous reporting year (January 1 – December 31). Any reports or documentation required by this permit must be submitted to the Director by hard copy, unless an electronic reporting tool becomes available, or an electronic submission is approved by the RIDEM.

10. AUTHORIZATION

10.1 How to Obtain Authorization

To obtain authorization under the Mashapaug General Permit, the permittee must be an owner of a property covered by the permit, meet the above-mentioned eligibility requirements, and submit a complete and accurate Notice of Intent (NOI) form. The property owner must submit to the RIDEM a complete and accurate NOI by the following deadlines:

Existing properties consisting of one or more (≥ 1) but less than seven (< 7) acres of impervious cover that intend to obtain coverage under this general permit shall submit a completed NOI no later than six (6) months after the effective date of this permit.

²⁴ RIDEM has included this condition to allow a Watershed Management Group, or similar entity, to participate in implementation of stormwater controls should such an entity be established in the future.

Existing properties consisting of seven or more (≥ 7) acres of impervious cover that intend to obtain coverage under this general permit shall submit a completed NOI and Stormwater Management Plan (SWMP) no later than twelve (12) months after the effective date of this permit.

For properties which become eligible for coverage under this permit after its effective date, a completed NOI must be submitted sixty (60) days prior to the commencement of a discharge. This includes any newly developed site or any site that is not yet permitted under the Mashapaug General Permit that increases its impervious cover to one acre or more (≥ 1).

RIDEM has developed this staggered schedule because larger sites will require additional time to develop a SWMP prior to the submission of the NOI to be covered by the Mashapaug General Permit.

10.2 Notice of Intent (NOI) Requirements

The Mashapaug General Permit requires the submission of the following information as part of the NOI:

- The property owner's name, point of contact name (first name, last name), mailing address, e-mail address, telephone number;
- Facility/Property's information including: name and location/street address of the facility, the latitude and longitude of the approximate center of the facility to the nearest 15 seconds, for which the NOI is being submitted;
- A brief description of the site including: the total acreage of the site, total acreage of impervious surface, and a description of existing stormwater management controls;
- For each outfall: outfall ID and description of location; latitude and longitude; name of the receiving water(s) and if the discharge is through a municipal separate storm sewer system, the name of the operator of the municipal separate storm sewer system; receiving water(s) waterbody ID#; receiving waterbody impairment; identify if receiving waters are subject to an EPA approved TMDL; and pollutants causing the impairment;
- Identification of existing stormwater controls.

10.3 How to Submit Your NOI

All NOIs must be submitted to the Department by hard copy, unless an electronic application tool becomes available.

10.4 Granting of Authorization

For existing facilities (i.e., properties that are subject to this permit on its effective date), authorization to discharge shall be automatically granted upon the Department's receipt of a complete and accurate NOI unless notified by the Director to the contrary in writing. For properties that become subject to this permit after its effective date (e.g., properties that meet the one or more acre of impervious cover threshold after the permit's effective date), authorization will be granted sixty (60) days after receipt of a complete and accurate NOI, unless otherwise notified by the Director in writing.

10.5 Continuation of Coverage for Existing Permittees After the Permit Expires

If the permit is not reissued or replaced prior to the expiration date, it will be administratively continued in accordance with Title 250 RICR-150-10-1 §1.13 and remain in force and effect for discharges that were covered prior to its expiration. All permittees authorized to discharge prior to the expiration date of the Mashapaug General Permit will automatically remain covered under the Mashapaug General Permit until the earliest of:

1. Authorization under a new version of the Mashapaug General Permit following the timely submittal of a complete and accurate NOI. Note that if a timely NOI for coverage under the reissued or replacement permit is not submitted, coverage will terminate on the date that the NOI was due; or
2. The Department terminates the facility's coverage under this permit; or
3. A formal permit decision by the Department not to reissue this general permit, at which time the Department will identify a reasonable time period for covered dischargers to seek coverage under an alternative general permit or an individual permit. Coverage under the issued Mashapaug General Permit will cease at the end of this time period.

10.6 Permit Termination

Termination of the Mashapaug General Permit coverage indicates that permittees no longer have an obligation to manage stormwater per the Mashapaug General Permit's provisions. To terminate Mashapaug General Permit coverage, permittees must submit to the Director a completed Notice of Termination (NOT) form by hard copy, unless an electronic application tool becomes available.

Permittees must submit a signed and certified NOT within thirty (30) days after one or more of following conditions have been met:

- There is a change in the owner of the property subject to this permit;

- There are no longer any discharges of stormwater from the property to waters of the State in the Mashapaug Watershed; or
- Coverage under an individual or other general RIPDES permit that authorizes the same stormwater discharges as this permit has been obtained .

Any NOTs are subject to review and approval by the Department. The Department retains the authority to require permit authorization (and deny a termination request) on a case-by-case basis based on the information provided. If the RIDEM determines, for example, that the NOT is incomplete or that the permittee has not satisfied one of the termination conditions, then the notice is not valid, and permittees must continue to comply with the conditions of the permit.

10.7 No Discharge Notice of Non-Applicability

Owners of property(ies) with No Discharge should submit a RIPDES No Discharge Certification (NDC) form to the Director by hard copy unless an electronic application tool becomes available, along with documentation supporting that stormwater discharge from their property does not discharge to waters of the State or a private or municipal separate storm sewer system within the Mashapaug Watershed.

11. RIDEM CONTACTS

Additional information concerning the permit may be obtained by calling the RIPDES Municipal and Industrial Stormwater Program staff at (401)-537-4262, between the hours of 8:30 a.m. and 4:00 p.m., Monday through Friday, excluding holidays; via e-mail at Leon.Ly@dem.ri.gov; or by writing to the Office at:

Attention: Leon Ly, Environmental Engineering Associate
 Rhode Island Department of Environmental Management
 Office of Water Resources
 235 Promenade Street
 Providence, RI 02908

February 13, 2026
 Date


 Brian D. Lafaille, P.E.
 Environmental Engineer IV

Attachment 1
Properties Subject to the Mashapaug General Permit

TABLE A-1. List of Parcels/Merged Parcels and Property Owners Subject to the Requirements of the Mashapaug General Permit^{††}

Cranston					
Parcel Owner	Parcel Address	Total Parcel Acres	Impervious Cover Acres	Impervious Cover Percentage	Merged Y/N
ACHIEVEMENT FIRST RHODE ISLAND INC	85 GARFIELD AVENUE	3.7	2.5	0.67	N
ALDI INC	1015 CRANSTON STREET	3.2	1.4	0.44	N
ANTHONY P RUSSO TRUSTEE **	85 CARLSBAD STREET	1.1	1.1	0.98	N
BAHLMANN GROUP LLC	51 WASHINGTON AVE	1.6	1.3	0.82	Y
BREWERY PARKADE INC 50%	GARFIELD AVENUE	3.8	3.0	0.79	N
CARLSBAD STREET LLC	123 CARLSBAD STREET	3.8	3.6	0.95	Y
CHARLES MONTAGUE REALTY LLC 45%	99 GARFIELD AVENUE	2.4	1.4	0.57	N
COMPREHENSIVE COMMUNITY ACTION INC	1090 CRANSTON ST	1.7	1.6	0.94	Y
CRANSTON BVT ASSOCIATES LP *	300 GARFIELD AVENUE	27.8	19.7	0.71	N
CRANSTON CITY OF CITY BUILDINGS	1070 CRANSTON STREET	1.2	1.2	1.00	Y
CRANSTON CITY OF CITY BUILDINGS	23 JORDAN AVE	11.7	6.9	0.59	N
CRANSTON CITY OF CITY BUILDINGS	109 CARLTON ST	7.8	1.0	0.13	Y
CRANSTON CITY OF SCHOOLS	50 GLADSTONE STREET	8.2	3.5	0.43	N
CRANSTON CITY OF SCHOOLS	100 CRESCENT AVENUE	3.2	2.9	0.90	N
CRANSTON CITY OF SCHOOLS	155 PRINCESS AVENUE	2.7	1.1	0.41	Y
CRANSTON HOUSING AUTHORITY MANORS	50 BIRCH STREET	4.0	2.8	0.69	N
DEVAN MANOR ASSOCIATES	1214 CRANSTON STREET	2.3	1.9	0.82	N
FALVEY LINEN SUPPLY INC	50 BURNHAM AVENUE	2.4	2.4	1.00	N
FARTHINGALE FROTHINGHAM & FOSTER LTD	88 SPECTACLE STREET	1.4	1.3	0.93	N
GRAYBAR ELECTRIC CO INC	245 NIAN TIC AVENUE	1.4	1.4	0.99	N
HARRIS HOUSE PARTNERS LP	28 HARRIS AVENUE	4.3	2.5	0.58	N
JMDH REAL ESTATE OF CRANSTON LLC	14 NAVAHO STREET	4.4	4.2	0.94	Y
JUST FAMILY CORPORATION	1011 CRANSTON STREET	1.9	1.5	0.82	N
LOWES HOME CENTER INC *	247 GARFIELD AVENUE	12.9	12.0	0.93	N
NIAN TIC PLACE LLC	335 NIAN TIC AVENUE	5.2	4.3	0.83	N
PAM REALTY INC	0 NIAN TIC AVENUE	2.8	2.7	0.97	Y
RHODE ISLAND INDUSTRIAL FACILITIES CORP	5 GARFIELD AVENUE	3.6	3.2	0.87	N
TACO PRODUCTS INC *	1160 CRANSTON STREET	14.2	13.0	0.92	N
TWIN OAKS INC	100 SABRA STREET	4.1	3.2	0.78	Y
WALTER STREET REALTY LLC	MANHASSETT STREET	6.0	2.9	0.48	Y

Providence					
Parcel Owner	Parcel Address	Total Parcel Acres	Impervious Cover Acres	Impervious Cover Percentage	Merged Y/N
Ave LLC Pharmacy-Elmwood	533 Elmwood Ave	2.1	1.9	0.88	N
B&M Realty LLC	250 Niantic Ave	5.0	4.7	0.94	N
BROWN UNIVERSITY	40 Park Ln	4.2	3.7	0.88	Y
D & D Properties LLC	195 Dupont Dr	2.9	2.9	0.99	N
Document Realty LLC	333 Bucklin St	1.8	1.6	0.86	N
Dupont Realty Associates LLC	175 Dupont Dr	4.7	3.0	0.64	N
FAP Properties XXXIII LLC	140 Narragansett Ave	2.6	2.5	0.96	Y
First Reservoir LLC	1 Reservoir Ave	1.5	1.5	0.99	Y
Foxrock 55 Dupont Realty LLC	55 Dupont Dr	6.4	4.3	0.68	N
Funding XIII LLC Store Master	88 Niantic Ave	2.3	2.2	0.97	N
Gutierrez And Sons LLC	891 Elmwood Ave	1.2	1.1	0.92	N
Ha & Ahn Properties LLC	176 Narragansett Ave	1.0	1.0	1.00	N
JLJ REALTY CO	100 Niantic Ave	5.3	4.9	0.91	N
JOHN B MCENERY Jr	635 Elmwood Ave	1.3	1.3	0.97	N
Kingfield Real Estate LLC **	200 Dupont Dr	2.3	1.4	0.61	N
Little Bay Realty Company LLC *	100 Dupont Dr	10.7	8.6	0.81	N
LLC Sabrs	207 Dupont Dr	2.6	2.6	0.99	N
Mashapaug Partners LLC *	77 Reservoir Ave	12.4	9.4	0.76	N
Mastro Realty Associates	555 Elmwood Ave	1.0	1.0	0.99	N
Morvco Realty LLC	160 Niantic Ave	5.3	4.8	0.89	Y
Ocean State Equity Partners LLC	361 Reservoir Ave	6.3	5.0	0.79	N
Ocean State Property Management LLC	50 Niantic Ave	4.7	3.5	0.75	N
Park Lane Realty LLC	150 Park Ln	1.4	1.1	0.80	N
ProPartners in Parking LLC	282 Niantic Ave	5.1	4.0	0.79	N
Providence LLC Prime Storage	90 Reservoir Ave	2.8	2.8	1.00	N
Providence Public Buildings Authority	375 Adelaide Ave	4.1	3.2	0.79	N
Providence Water Board *	125 Dupont Dr	16.5	10.8	0.65	N
Pvd LLC Cf Ocelot **	115 Dupont Dr	6.4	6.0	0.68	N
Rhode Island Community Food Bank *	170 Niantic Ave	8.1	7.0	0.97	N
RI Public Transit Authority	705 Elmwood Ave	6.4	6.0	0.99	Y
Skywater-Providence LLC	124 Narragansett Ave	1.7	1.6	0.92	N
State Of Rhode Island & Prov Plantations	50 Park Ln	2.2	2.0	1.00	N
Stratford House Associates	675 Elmwood Ave	1.7	1.3	0.58	N
Wildcat Equities Inc	669 Elmwood Ave	1.6	1.4	0.91	N

†† See also the [RIDEM Mashapaug General Permit Interactive Map](#).

* Parcels with ≥ 7 acres of impervious cover.

** Parcel exempt from this permit; stormwater discharge covered by RIPDES Multi-Sector General Permit (MSGP) for Industrial Activity.

Response to Comments
RIPDES General Permit for Stormwater Discharges in the Mashapaug Watershed
RIPDES Permit Number: RIR060000

From October 10, 2025, to December 22, 2025, the Rhode Island Department of Environmental Management (“RIDEM”, “DEM”, or “Department”) solicited public comments on the draft Rhode Island Pollutant Discharge Elimination System (RIPDES) General Permit for Stormwater Discharges in the Mashapaug Watershed (RIPDES Permit Number RIR060000). The original public comment period was scheduled from October 10, 2025, to November 21, 2025. Based on numerous requests from the public, the Department extended the public comment period to Monday, December 22, 2025, at 4:00 PM.

Additionally, the deadline to submit requests for a public hearing was 4:00 PM on Thursday, November 13, 2025. Prior to this deadline, the RIDEM received numerous requests for a public hearing indicating significant public interest. Therefore, a public hearing was held on Thursday, November 20, 2025, at 5:00 PM in Room 300, at the RIDEM Headquarters located at 235 Promenade Street in Providence, Rhode Island.

In response to the comments received either at the hearing or during the public comment period, the RIDEM has prepared the following “Response to Comments.”

Individual Submitting Verbal Comments During the Public Hearing:

- Greg Gerritt
- Suzannah Rutherford, Representative of the Reservoir Triangle Neighborhood Association
- Jucimar Nascimento
- Jed Thorp, Representative of Save the Bay
- Dan Corley
- Yvonne Kettels

Written Comments Submitted During the Public Comment Period:

- VHB / Kevin Nagle (December 15, 2025)
- Save the Bay / Topher Hamblett (December 22, 2025)
- ENACTS – Equitable NATURE-based Climate Solutions / Na Chioh (December 22, 2025)
- State of Rhode Island Office of the Attorney General / Peter F. Neronha (December 22, 2025)
- Reservoir Triangle Neighborhood Association (RTNA) / Dave Talan and Suzannah Rutherford (December 22, 2025)

Comment 1: Greg Gerritt. Comment was made on the overall adequacy of the draft Mashapaug General Permit in achieving the Clean Water Act goal of fishable and swimmable waters. Drawing on the commentors experience working on polluted waterbodies in Rhode Island, including the Moshassuck River, it was stated that “in all of my 29 years of looking at DEM stuff [I have not seen] anything that actually is going to clean this body of water up.” He expressed concern that the proposed permit’s measures are insufficient, noting that “the proposals are inadequate to do the job that we really need to do, which is fishable and swimmable,” and that he was not convinced the draft permit demonstrates how those goals will be met. Mr. Gerritt further emphasized the State’s responsibility given past environmental degradation, stating that “we have an obligation to do an even better job, to really stand up for this.” It was requested that RIDEM more clearly articulate the expected outcomes of the permit, specifically asking to see “just how far [DEM] expect[s] to get along the fishable, swimmable continuum and any explanation in there of why you’re not.”

Response 1: *The Department acknowledges the commenter’s concerns regarding the urgency of restoring Mashapaug Pond and the desire for clear and decisive action. As described in the Mashapaug General Permit and Fact Sheet, the permit is structured to address stormwater discharges in a complex and impaired watershed by implementation of an adaptive management strategy which uses incremental improvements over time.*

Consistent with this framework, the Mashapaug General Permit establishes initial requirements to reduce pollutant loadings from previously unregulated stormwater discharges, requires pollution prevention measures for all covered properties, and requires more comprehensive stormwater controls for properties with greater impervious cover during the first permit term. By implementing these measures and adjusting requirements over successive permit terms, the adaptive management approach provides a structured pathway to incrementally improve water quality and advance progress toward restoring designated uses, including the long-term goal of achieving fishable and swimmable waters. See Response 8 for additional details on the adaptive management’s approach in future permit terms.

No change to the permit has been made.

Comment 2: Suzannah Rutherford. Comment was made that the draft permit needs to be strengthened through additional research and coordinated watershed-scale action. It was stated that the commentor has been “monitoring oxygen and algae growth on the pond since we lived there at watershed watch, and I’ve been waiting for someone to do something,” noting that “pond closures and toxic algae are becoming more common.” While it was acknowledged that “the Mashapaug General Permit is a good, if belated, start,” the commentor cautioned that “to be more than meaningless and annoying red tape and reporting requirements placed at the feet of property owners who really are quite innocent in all of this, it needs to be strengthened and revised,” and warned that “the current version of the permit will result in a patchwork of efforts on different properties by different individuals that will not be a coherent strategy that’s needed to actually solve the problem.” Ms. Rutherford emphasized that the permit “can be more effective if the DEM

completes the much-needed research on Tongue and Spectacle Pond so we know where and what kinds of remediation are needed,” adding that “I did a back-of-the-envelope calculation, the Narragansett Brewery was on Tongue Pond for 91 years...based on the number of bottles...and the amount of detergents it was putting in the water, that amount dwarfed the amount needed to cause algae blooms on the pond.” The commentor stated that the permit “can be more effective if the various permitted properties and different property owners work together with experts, treat the watershed as a whole system that it is, share costs and credits, and go after the big controllable targets first...” and also encouraged the RIDEM to pursue broader stormwater and green infrastructure collaboration, stating that the permit “can be more effective if the DEM works with the Department of Transportation to start to undo the devastating effects of urban renewal on our neighborhood,” urging the RIDEM to “work with RTNA to look at the feasibility of a bike path that connects the Washington secondary rail trail... around Mashapaug Pond, with bioswales and raised berms to Roger Williams Park.”

Response 2: *The Department acknowledges the commenter’s concerns regarding the need for additional research and coordinated watershed-scale action. With respect to Tongue and Spectacle Ponds, the Department recognizes the importance of understanding pollutant sources and remediation needs in these waterbodies.*

TMDLs are only developed for waters listed on the State’s Impaired Waters (303(d)) List. Tongue Pond is not currently listed as impaired and is considered unassessed due to the absence of recent water column data. To the Department’s knowledge, the most recent such data collection occurred in 1974, prior to implementation of Clean Water Act impaired waters listing requirements. However, the Department notes that EPA-approved nutrient TMDLs have been completed for Mashapaug and Spectacle Ponds, and that Tongue Pond is included within the Mashapaug watershed, which is the land area where pollutant load reductions are required to meet the applicable TMDLs. Therefore, for these reasons, RIDEM is not planning to develop new Total Maximum Daily Loads (TMDLs) for Tongue Pond.

The Department notes that water quality monitoring in Rhode Island relies heavily on volunteer monitoring programs due to limited state staffing. Historically, volunteer monitoring data collected for Mashapaug and Spectacle Ponds supported their placement on the Impaired Waters List and subsequent TMDL development. The Department continues to evaluate available volunteer monitoring data as part of its biennial Impaired Waters assessments and supports efforts to sustain and expand water quality monitoring where feasible.

The Mashapaug General Permit was developed pursuant to residual designation authority to regulate previously unpermitted stormwater discharges contributing to water quality impairments in the Mashapaug Watershed. The Department notes that the Mashapaug General Permit is issued under the RIPDES program and is limited to the regulation of point source stormwater discharges. Projects such as bike paths or transportation infrastructure improvements fall outside the scope of the RIPDES program and cannot be required through this permit.

The Mashapaug General Permit allows permittees to coordinate compliance efforts, including forming cooperative arrangements or stormwater utilities, consistent with Part V.D.11 (Credit for

Offsite Stormwater Treatment) of the permit. As provided in Part V.D.11.a, permittees may participate in regionalized stormwater management approaches to meet phosphorus load reduction requirements. Parts V.D.11.b and V.D.11.c allow permittees to satisfy requirements through shared or offsite stormwater control projects, including permittee-to-permittee credit trading or co-funding of stormwater controls. Pursuant to Part V.D.11.d, participation in any cooperative or regionalized approach does not transfer permit responsibility, and each permittee remains individually responsible for complying with all applicable permit requirements. Participation in any cooperative entity or group arrangement is voluntary, and the Department cannot require or compel permittees to join or form such organizations. The permit further prioritizes implementation of more comprehensive stormwater controls on properties with larger impervious areas during the initial permit term.

No change to the permit is required.

Comment 3: Jucimar Nascimento. Comment was made on the importance of recognizing the cultural, spiritual, and personal significance of Mashapaug Pond as part of restoration efforts. It was explained that “one of the main reasons [the commentor] moved there was because the lake,” stating, “I am a water person, I am very attracted to water,” and emphasized that restoration should go beyond physical cleanup, noting that “now we’re talking about cleaning up the lake, it’s much more than that.” Mr. Nascimento described restoration as an opportunity to heal deeper impacts and asked decision-makers to consider “the spiritual side of restoring that lake.” The commentor expressed hope that cleanup efforts could also “restore the dignity of the people who lived there before,” and shared the commentor’s personal connection to the site, explaining, “I go there every day for meditation and walk and see the sunset on the lake.”

Response 3: *The Department recognizes that Mashapaug, Spectacle, and Tongue Ponds provide important environmental and community value and appreciates the perspective shared.*

The Mashapaug General Permit is issued under the RIPDES program and regulates point source stormwater discharges. As described in the Permit and Fact Sheet, the goal of the permit is to improve water quality in the Mashapaug Watershed by reducing pollutant loadings, including phosphorus, through enforceable stormwater management and pollution prevention requirements. By addressing stormwater discharges that contribute to water quality impairments, the permit is intended to support long-term restoration of these waterbodies and progress toward attainment of designated uses.

No change to the permit is required.

Comment 4: Jed Thorp. The commentor explained that “by not including the 1-acre to 6.9-acre parcels in the requirement to have the stormwater management plan [and] the stormwater control plans, [RIDEM is] leaving potential improvements on the table.” The commentor suggested a longer-term approach to permit planning, noting that “what the Department could do is write a permit with a longer term, instead of 5 years, looking at 10 years,” adding “if we wrote the permit

with that longer term in mind, it would give those smaller parcels the regulatory certainty to know what's coming, and it would enable groups like Save the Bay, like the Stormwater Innovation Center, to start working now with those smaller property owners to start working on some of these improvements,” and concluding that “rather than have to come back and update the permit in 5 years or 10 years, let's just write the thing now with those smaller parcels included.”

Response 4: *The Department refers the commenter to Response 1 for additional discussion regarding the permit's structure and adaptive management approach to water quality restoration.*

With respect to permit duration, permits issued under the RIPDES program are limited by regulation to a maximum term of five (5) years. Title 250 RICR-150-10-1 §1.20 provides that RIPDES permits may not exceed the duration specified in 40 C.F.R. § 122.46, which establishes a maximum permit term of five years. Accordingly, the Mashapaug General Permit cannot be issued for a 10-year term. The permit prioritizes implementation of more comprehensive stormwater management and control requirements on properties with larger areas of impervious cover during the initial permit term.

Properties with between 1 acre and 6.9 acres of impervious cover will be required to develop a Stormwater Management Plan and Stormwater Control Plan in future permit cycles. The Department has revised the Fact Sheet to outline the anticipated timeframes and due dates for all properties to address their phosphorus load reductions in future permit cycles consistent with the adaptive management approach. See Response to Comment 8 for additional discussion on this point.

The Department further notes that the phased approach established in the Mashapaug General Permit provides benefits to smaller properties that are not yet subject to Stormwater Management Plan and Stormwater Control Plan requirements during the initial permit term by allowing smaller property owners additional time to pursue voluntary stormwater improvements and access available grant funding opportunities and guidance from environmental groups. This structure also recognizes and rewards property owners who proactively implement stormwater controls in advance of future regulatory requirements.

No change to the permit is required.

Comment 5: Dan Corley. The commenter expressed interest in improving public access and recreational use around the waterbody and indicated that “I got excited when I looked at the map that Suzannah drew because it showed a path, a walking path of some kind, kind of around the pond.” The commenter highlighted support for enhanced pedestrian access and community-oriented improvements as part of broader efforts to reconnect residents with Mashapaug Pond.

Response 5: *The Department acknowledges and notes the commenter's interest in improved public access and recreational opportunities around the waterbody. The Department appreciates the perspective shared and recognizes that Mashapaug Pond is an important community resource. However, the Mashapaug General Permit is issued under the RIPDES program and is limited in scope to the regulation of point source stormwater discharges. As described in the Permit and*

Fact Sheet, the goal of the permit is to improve water quality in the Mashapaug Watershed by reducing pollutant loadings, including phosphorus, through enforceable stormwater management and pollution prevention requirements. By addressing stormwater discharges that contribute to water quality impairments, the permit is intended to support long-term restoration of these waterbodies and progress toward attainment of designated uses.

No change to the permit is required.

Comment 6: Yvonne Kettels. Comment was made on the urgency of restoring Mashapaug Pond and the commentor questioned the level of commitment reflected in the draft Mashapaug General Permit. It was stated that “it is absolutely beyond me that we cannot use the body of water that is right next to my house”. The commentor questioned “what is the real commitment here” and asked, “what is the problem here?” Ms. Kettels urged the Department to move forward “in a fashion that is actually sort of predictable and not just lip service,” emphasizing the need for clearer and more decisive action to restore the pond.

Response 6: *The Department refers the commentor to Responses 1 and 4 for discussion of the permit’s structure and overall approach towards establishing enforceable stormwater management and pollution prevention requirements to address stormwater discharges contributing to water quality impairments.*

No change to the permit is required.

Comment 7: VHB. VHB commented on the draft permit condition III.C. Minimize Impacts from Major Storm Events and Appendix B – Method for Estimating Base Flood Elevation, stating “better clarity and objectivity is needed in the implementation of this permit condition.” Furthermore, VHB stated that Appendix B does not provide useful information for estimating the Base Flood Elevation (BFE) and should be “distilled to ‘consult FEMA mapping,’ which ... is of no use in estimating the BFE.”

Response 7: *Part III.C (Minimize Impacts from Major Storm Events) and Appendix B of the permit have been modified to clarify how to comply with this condition. The following highlighted language has been revised in Part III.C in the permit:*

III.C. Minimize Impacts from Major Storm Events. The permittee must identify any areas of the property that are subject to flooding and implement appropriate pollution minimization controls for these areas, such as moving products stored in these areas prior to significant storm events. The permittee must also implement structural improvements, enhanced/resilient pollution prevention measures, and/or other mitigation measures that can help to minimize impacts from stormwater discharges from major storm events, such as hurricanes, storm surge, extreme/heavy precipitation, and flood events. Control measures that may be considered include, but are not limited to:

- *When a delivery of exposed materials, e.g., mulch, salt, or sand, is expected, and a storm is anticipated within 48 hours, delay delivery, if possible, until after the storm or store materials as appropriate;*
- *Temporarily store materials and waste outside the Flood Zone;*
- *Temporarily reduce or eliminate outdoor storage;*
- *Temporarily relocate any mobile vehicles and equipment to higher ground;*
- *Plan for future site improvements, construction, and/or remodeling projects in a manner that takes into consideration the Flood Zone and appropriate corresponding control measures.*

To determine whether your facility is within a Flood Zone for planning and design purposes, see Appendix B “Guidance for Determining Flood Risk for Planning and Design Purposes”.

Appendix B has also been modified to clarify how to use RIDEM’s GIS maps to determine Flood Zones.

Comment 8: Save the Bay. Save the Bay commented on the lack of a clear long-term timeline for requiring Stormwater Management Plans (SWMPs) and Stormwater Control Plans (SCPs) and questioned how and when smaller parcels will be brought into compliance. They noted that “under the current draft permit only seven properties in the Mashapaug Watershed are required to submit and implement Stormwater Management Plans (SWMPs),” and emphasized that “neither the Draft Permit nor the Fact Sheet includes a long-term timeline and goals for full compliance with phosphorus reduction targets.” Save The Bay stated that “this uncertain and extended timeline is unacceptable in the face of ongoing, well-documented water quality impairments in Mashapaug, Spectacle, and Tongue Ponds,” and requested that RIDEM “revise the Fact Sheet to include a timeline that lets all property owners know what their long-term obligations for managing stormwater will likely be.” They further noted that “a long-term timeline that phases in SWMP and SCP requirements for medium and smaller lots over time, with clearly defined phosphorus reduction goals, will give property owners regulatory certainty needed to guide their long-term investments in their property,” and warned that “in the absence of prospective regulatory requirements, these smaller property owners are not incentivized to make any changes.”

Response 8: *The Department acknowledges the commenter’s request for greater clarity regarding the long-term implementation of Stormwater Management Plan (SWMP) and Stormwater Control Plan (SCP) requirements and how additional properties may be phased into compliance over time. Accordingly, the Department has revised the Fact Sheet to include additional discussion of future permit requirements following the initial five-year permit cycle, including how the Department anticipates it will require subsequent tiers of permittees to make additional pollutant load reductions in subsequent permit cycles. See a copy of Table 2 from the Fact Sheet on the next page.*

Table 2. Projected Phased Approach for Mashapaug General Permit Reduction Requirements			
Permit Term (5-yr cycle)	7+ Acres Impervious Cover	3–7 Acres Impervious Cover	1–3 Acres Impervious Cover
Permit Term 1	<ul style="list-style-type: none"> • SWMP Development → Sweeping and catch basin cleaning → Pollution Prevention & Good Housekeeping → O&M and reporting • SCP Development • SCM Installation to achieve 30% phosphorus reduction 	<ul style="list-style-type: none"> • Green Infrastructure and Impervious Cover Reduction Evaluation • Sweeping and catch basin cleaning • Pollution Prevention & Good Housekeeping • O&M and reporting • No numeric load reduction 	<ul style="list-style-type: none"> • Green Infrastructure and Impervious Cover Reduction Evaluation • Sweeping and catch basin cleaning • Pollution Prevention & Good Housekeeping • O&M and reporting • No numeric load reduction
Permit Term 2	<ul style="list-style-type: none"> • SCM Installation to achieve 65% phosphorus reduction • Continued SWMP/SCP implementation 	<ul style="list-style-type: none"> • SWMP Development → Sweeping and catch basin cleaning → Pollution Prevention & Good Housekeeping → O&M and reporting • SCP Development • SCM Installation to achieve 30% phosphorus reduction 	<ul style="list-style-type: none"> • Green Infrastructure and Impervious Cover Reduction Evaluation • Sweeping and catch basin cleaning • Pollution Prevention & Good Housekeeping • O&M and reporting • No numeric load reduction
Permit Term 3	<ul style="list-style-type: none"> • SCM Installation to achieve 100% phosphorus reduction • Continued SWMP/SCP implementation 	<ul style="list-style-type: none"> • SCM Installation to achieve 65% phosphorus reduction • Continued SWMP/SCP implementation 	<ul style="list-style-type: none"> • SWMP Development → Sweeping and catch basin cleaning → Pollution Prevention & Good Housekeeping → O&M and reporting • SCP Development • SCM Installation to achieve 30% phosphorus reduction
Permit Term 4	<ul style="list-style-type: none"> • Continued SWMP/SCP implementation 	<ul style="list-style-type: none"> • SCM Installation to achieve 100% phosphorus reduction • Continued SWMP/SCP implementation 	<ul style="list-style-type: none"> • SCM Installation to achieve 65% phosphorus reduction • Continued SWMP/SCP implementation
Permit Term 5	<ul style="list-style-type: none"> • Continued SWMP/SCP implementation 	<ul style="list-style-type: none"> • Continued SWMP/SCP implementation 	<ul style="list-style-type: none"> • SCM Installation to achieve 100% phosphorus reduction • Continued SWMP/SCP implementation

Note that the percent reductions noted in the table above refer to each parcel’s pollutant load reduction responsibility.

With respect to permit duration, the Department refers the commenter to Response 4.

Comment 9: Save the Bay. Save the Bay also commented on the need to require stormwater planning when redevelopment occurs and recommended a tiered review framework to address stormwater impacts while minimizing unnecessary burden. They stated that “when a property owner wants to make redevelopment investments in their property and a RIDEM Wetlands Permit or RIPDES review is triggered, those properties should also be required to develop SWMPs and

SCPs under this General Permit,” explaining that “this requirement is intended to require properties that are less than 7 acres that have the resources for redevelopment to more efficiently address stormwater pollution as part of their project.” Save The Bay suggested flexibility in implementation, noting that “applying a tiered approach for review of these plans could ease the regulatory burden on properties under an acre, requiring just an administrative review vs requiring a permit.” They further recommended that the permit require a “Green Infrastructure and Impervious Cover Reduction Evaluation required for projects disturbing between 5,000 square feet and 10,000 square feet of land,” and that “a Stormwater Management Plan (SWMP) and Stormwater Control Plan (SCP) [be] required for disturbance of 10,000 square feet or more of land,” concluding with the recommendation to “add this redevelopment language to section III of the draft permit as a special section that speaks specifically to redevelopment.”

Response 9: *The Department notes that projects that meet the definition of “redevelopment” per the RI Stormwater Design and Installation Standards Manual are already subject to stormwater management regulations and requirements imposed under other RIDEM permits, such as the Freshwater Wetlands Permit, RIPDES Construction General Permit, etc. Redevelopment projects must also comply with the [RI Stormwater Management, Design, and Installation Rules \(250-RICR-150-10-8\)](#). Other divisions within the RIDEM’s Office of Water Resources are responsible for reviewing and issuing these permits under a separate process. Therefore, adding a special section to the Mashapaug General Permit for redevelopment projects would create a duplicative review and approval process.*

No change to the permit is required.

Comment 10: ENACTS. ENACTS commented on the importance of partnership, outreach, and public education as part of the iterative permitting process for the Mashapaug General Permit. They stated that “as this permitting process is iterative, ENACTS calls for RIDEM to partner with organizations such as the Woonasquatucket River Watershed Council, Farm Fresh, Rhode Island, Save the Bay, and the Stormwater Innovation Center,” emphasizing the role of community-based organizations in supporting equitable and effective stormwater solutions. ENACTS further recommended expanded outreach, stating that “ENACTS recommends a public information campaign to properly inform all residents living within the Mashapaug Watershed of the Stormwater Solutions presented on the official RIDEM webpage.” They noted that broader public understanding could support stronger regulatory outcomes, explaining that “with the education of residents as to their potential impact on not just the pond, but the bodies of water in Roger Williams Park, in addition to the Narragansett Bay, it may be possible to enforce the regulation of parcels less than one acre for a fishable and swimmable pond.”

Response 10: *The Department acknowledges the commenter’s recommendations regarding public outreach, education, and partnerships related to stormwater management in the Mashapaug Watershed. The Department notes that information on stormwater impacts and management practices is currently available through RIDEM’s [Mashapaug Pond Stormwater Management](#)*

webpage and the [RI Stormwater Solutions](#) webpage, which inform property owners, municipalities, and the public about actions that can be taken to reduce stormwater pollution.

In addition, public education and outreach regarding stormwater impacts are addressed through existing municipal stormwater requirements under RIDEM's Municipal Separate Storm Sewer System (MS4) program. Regulated MS4 communities are required to implement public education and outreach programs pursuant to the [RIPDES MS4 General Permit](#), including the Public Education and Outreach minimum control measure (Part IV.B.1.), which requires MS4s/municipalities to educate residents and businesses about stormwater impacts and actions to reduce pollution. It is highly recommended that MS4 communities engage with watershed groups and environmental advocacy organizations for help in implementing the public education and outreach program.

No change to the permit is required.

Comment 11: The Rhode Island Office of the Attorney General. The Rhode Island Office of the Attorney General commented on the need for the Mashapaug General Permit to clearly establish a long-term framework for regulating smaller parcels through future permit terms. While acknowledging that smaller parcels may not be subject to quantified discharge reduction requirements in the initial permit term, the Attorney General emphasized the importance of signaling future expectations, stating that “one way this could be done would be through the structure of the permit-term schedule in Section V.D.7.b of the Draft Permit to set out RIDEM’s expectations for regulating smaller parcels.” The Attorney General further suggested a phased approach to implementation, noting that “although smaller parcels will not be subject to quantifiable requirements for reducing discharge during this first permit term, RIDEM could create requirements for permit terms 2, 3, and a newly created term 4,” in order to ensure that smaller properties are not permanently exempt and that long-term cleanup goals for the Mashapaug Watershed are achieved.

Response 11: *The Department refers the commenter to Response 4 and Response 8 for discussion of the permit’s structure, the regulatory limitation on permit duration, and the Department’s intent to phase in additional requirements for smaller parcels in future permit cycles.*

Clarification has been added to the permit Fact Sheet as noted in Response 8. However, no change to the permit has been made.

Comment 12: RTNA. The RTNA commented that the draft Mashapaug Watershed General Permit does not meet existing Clean Water Act requirements and fails to comply with established phosphorus reduction targets. They stated that “specifically, the draft permit doesn’t comply with the EPA-approved 2007 Mashapaug Pond TMDLs for phosphorus reduction and dissolved oxygen,” and emphasized that “the Mashapaug Pond TMDL requires roughly 274 pounds/year of phosphorus reduction from controllable sources.” RTNA further noted that, based on prior

analysis, “as your own 2007 study shows, even perfect compliance of all properties ≥ 1 acre would still remove less than half of the EPA-mandated reduction needed to stop toxic algae blooms,” raising concerns that the permit’s current structure cannot achieve required water quality outcomes.

Response 12: *The Department refers the commenter to Response 1 for discussion of the permit’s overall structure and adaptive management approach to water quality restoration and Response 8 for how the adaptive management approach will be used to meet the TMDL reduction goals through future permit cycles.*

As described in the Mashapaug General Permit and Fact Sheet, the permit establishes initial enforceable requirements to reduce pollutant loadings from previously unregulated stormwater discharges, including pollution prevention measures applicable to all covered properties and more comprehensive stormwater management and control requirements for properties with seven (7) acres or more of impervious cover during the first permit term. The permit further establishes a framework through which requirements may be expanded or modified through future permit reissuance to advance progress toward restoring designated uses.

No change to the permit is required.

Comment 13: **RTNA.** The RTNA requested the Department to “Make the permit easier for property owners and the public to read and understand. A cover letter or introduction highlighting the choice between going it alone and benefit of a cooperative management structure for meeting permit requirements in a clear introduction. Recognize the Mashapaug Watershed Coalition, Hispanic Chamber of Commerce or similar cooperative management structure for cost- and credit-sharing in the Mashapaug Watershed.”

Response 13: *As described in Part V.D.11 (Credit for Offsite Stormwater Treatment) of the Mashapaug General Permit, the permit explicitly allows permittees to satisfy certain requirements through shared or cooperative stormwater management approaches, including watershed-based strategies, where appropriate.*

Specifically, Part V.D.11.a provides that permittees may meet applicable requirements through off-site or shared stormwater controls implemented as part of a cooperative effort, provided that such controls achieve equivalent or greater pollutant load reductions. Part V.D.11.a further states that these approaches may include “stormwater control practices implemented at locations other than the permittee’s property” and allows the use of “a watershed-based or cooperative stormwater management approach,” so long as the required reductions are documented and maintained in accordance with the permit. These provisions provide flexibility for property owners to coordinate efforts, share costs and credits, and implement stormwater controls at locations with the greatest potential benefit to water quality. Participation in any cooperative or watershed-based organization is voluntary, and the permit does not require property owners to join or be recognized as part of any specific entity.

No change to the permit is required.

Comment 14: RTNA. The RTNA suggested that RIDEM “Revise the permit to enable all properties with \geq 1-acre impervious cover to participate in cost and credit sharing. This is critical to encourage cooperation agreements among property owners by allowing even the smaller properties to share credits and reporting requirements for phosphorous reductions at off-site sources with the highest impact on phosphorous inputs to the pond (e.g. the industrial park storm drains).”

Response 14: *Part V.D.11 of the permit includes provisions that allow cooperative and watershed-based approaches to achieving required pollutant load reductions. Specifically, Part V.D.11.b (Permittee-to-Permittee Credit Trading) provides that “a permittee may enter into a legally binding agreement to fund a new stormwater management control project or purchase pollution reduction credits from an existing stormwater management control project within the subwatershed.” This provision allows permittees to voluntarily participate in cost- and credit-sharing arrangements and to implement stormwater controls at locations with the greatest potential water quality benefit. Participation in permittee-to-permittee credit trading is optional, and the permit does not require properties to enter into cooperative agreements.*

No change to the permit is required.

Comment 15: RTNA. The RTNA commented that RIDEM needs to “Commit to needed research and a public timeline to develop a comprehensive, science-based management plan for the entire watershed—determine the major sources of phosphorous in Spectacle and Tongue Ponds and best methods for remediation.”

Response 15: *The EPA-approved TMDL for the Mashapaug Pond watershed identified stormwater runoff as a significant contributor of phosphorus loading to these waterbodies. The Department refers the commenter to Response 2, which addresses the Department’s recognition of the importance of understanding pollutant sources in Tongue and Spectacle Ponds and includes discussion of existing TMDLs and the status of any additional studies or assessments.*

As noted in Response 2, the Mashapaug General Permit was developed pursuant to residual designation authority and is issued under the RIPDES program, which limits the permit’s scope to regulation of point source stormwater discharges. The permit establishes enforceable requirements to address stormwater as a controllable source of phosphorus loading and prioritizes implementation of more comprehensive stormwater controls on properties with larger impervious areas during the initial permit term.

No change to the permit is required.

Comment 16: RTNA. The RTNA commented that RIDEM should “Condition NOI/coverage on participation in an approved watershed management entity via a binding agreement (membership contract) that can collect fees, coordinate projects, conduct inspections/maintenance, and submit a

single consolidated Annual Report—modeled on the Long Creek Watershed Management District approach.”

Response 16: *The Department refers the commenter to Response 2, Response 13, and Response 14 for discussion of the permit’s approach to cooperative and watershed-based stormwater management. As explained in those responses and provided in Part V.D.11 of the Mashapaug General Permit, the permit allows permittees to voluntarily coordinate compliance efforts, including through cooperative arrangements, shared stormwater control projects, and permittee-to-permittee credit trading. However, participation in any watershed management entity or cooperative organization is voluntary, and the permit does not require or condition coverage on membership in any such entity. Each permittee remains individually responsible for complying with all applicable permit requirements.*

No change to the permit is required.

Comment 17: RTNA. The RTNA commented that RIDEM should “Recognize a monitoring and assessment plan for Mashapaug, Spectacle, and Tongue (e.g., continuous DO/temperature logging, seasonal total phosphorus/chlorophyll-a sampling, and targeted inflow monitoring) with public annual reporting. The factsheet’s position that no ambient monitoring is necessary should be softened to recognize monitoring as a critical part of adaptive management strategies on the 5-year permit cycle.”

Response 17: *As described in the Mashapaug General Permit and Fact Sheet, the permit does not require ambient water quality monitoring as part of permit compliance, because compliance with applicable water quality standards and consistency with TMDLs are evaluated using pollutant load reductions based on EPA-developed performance curves for stormwater control measures. Specifically, the Fact Sheet states that “RIDEM has determined that no effluent and ambient monitoring is necessary to evaluate whether the limitations on the indicator parameter meet applicable water quality standards, because EPA has carried out extensive modeling on the cumulative performance of Stormwater Control Measures (SCMs).” Accordingly, the permit relies on established modeling tools and crediting methodologies to assess progress toward water quality goals within the scope of the RIPDES program.*

Additional information regarding other ongoing Mashapaug water quality monitoring efforts is available at <https://www.stormwaterinnovation.org/mashapaug-water-quality-monitoring>, and <https://psic.maps.arcgis.com/apps/dashboards/88e907a92f5e411bbe7b4b1d0aa38bdc>.

No change to the permit is required.

Comment 18: RTNA. The RTNA commented that RIDEM should “Add an explicit adaptive-management ‘reopener’ clause: if monitoring and/or the required research shows internal loading or Tongue-related sources dominate, DEM must update the implementation plan to include in-lake/internal-load controls on a defined schedule, not simply increase parcel-scale requirements.”

Response 18: *The permit already includes a reopener provision in Part VIII.P (Reopener Clause), which states that “the Director reserves the right to make appropriate revisions to this permit in order to incorporate any appropriate effluent limitations, schedules of compliance, or other provisions which may be authorized under the Clean Water Act (CWA) or State Law.” In addition, Title 250 RICR-150-10-1 §§1.15 and 1.24 and Part VIII.P of the permit further provide that if “any effluent standard or prohibition, or water quality standard is promulgated under the CWA or under State Law which is more stringent than any limitation on the pollutants limited in this permit, or controls pollutants not limited in the permit,” the Director may reopen and revise the permit as necessary.*

No change to the permit is required.

Comment 19: **RTNA.** The RTNA commented that RIDEM should “Include a real enforcement backstop like Long Creek’s: failure to participate in the approved watershed entity (e.g., nonpayment of required fees or refusal of reasonable access for inspection/maintenance of shared controls) should be grounds for termination of MWGP coverage.”

Response 19: *Participation in cooperative, regionalized, or shared stormwater management approaches is voluntary. Specifically, Part V.D.11.d of the permit states that participation in any offsite, shared, or cooperative stormwater management approach “does not transfer permit responsibility,” and each permittee remains individually responsible for complying with all applicable permit requirements. The Department does not have authority under the RIPDES program to require permittees to join or participate in a watershed management entity or to condition permit coverage on such participation. Accordingly, failure to participate in a cooperative entity cannot serve as grounds for termination of coverage under the Mashapaug General Permit.*

No change to the permit is required.

Comment 20: **RTNA.** The RTNA commented that RIDEM should “Insist property owners implement stormwater management practices when their properties undergo capital improvements. Include incentive mechanisms—such as tax credits or fee reductions—for all property owners who install infiltration measures.”

Response 20: *The Department notes that the Mashapaug General Permit was developed under the RIPDES program and is limited to establishing enforceable requirements for regulating point source stormwater discharges. The Department does not have authority under the RIPDES program to offer or mandate financial incentives such as tax credits or fee reductions through a discharge permit.*

As described in the Mashapaug General Permit, the permit establishes stormwater management and pollution prevention requirements applicable to covered properties within the scope of the Department’s permitting authority. Specifically, Part IV.A (Green Infrastructure and Impervious

Cover Reduction Evaluation) of the permit requires that any capital projects or other improvements address specific requirements, including improving stormwater infiltration, to the maximum extent feasible. While the Department supports voluntary implementation of stormwater controls beyond permit requirements and recognizes the value of incentive-based approaches, such mechanisms fall outside the scope of this permit.

No change to the permit is required.

Comment 21: RTNA. The RTNA commented that RIDEM should “Work with RIDOT, Providence Great Streets plan and the Mashapaug Watershed Coalition to prioritize feasibility studies and construction of a Mashapaug Watershed Extension of the Washington Secondary Rail Trail around Mashapaug Pond to Roger Williams Park – a multi-use raised berm trail with bioswale along the Industrial park shoreline.”

Response 21: *As noted in Response 2, projects such as bike paths or transportation infrastructure improvements fall outside the scope of the RIPDES program and cannot be required through this permit.*

No change to the permit is required.