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1 Introduction

The Federal Water Pollution Control Act of 1948 was the first major U.S. law to address water pollution. Growing public awareness and concern for controlling water pollution then led to sweeping amendments in 1972 and the amended law became commonly known as the Clean Water Act (CWA). The U.S. Environmental Protection Agency (USEPA) first regulated stormwater in 1973 under the CWA, requiring stormwater runoff that was contaminated by industrial or commercial activity to obtain a National Pollutant Discharge Elimination System (NPDES) permit. Other point sources of stormwater runoff were exempted from permitting requirements unless a discharge was determined to be a significant contributor of pollution to surface waters (NRC 2009).

NPDES stormwater permits require permittees to control stormwater during and after construction. Best management practices (BMPs) used during construction activities differ from those used post-construction. This document recognizes this division of BMP types and focuses on the post-construction BMPs. These BMPs will be in place for a significant period of time and will provide long-term water quality benefit. See USEPA National Pollution Discharge Elimination System (NPDES) for further details.

Noteworthy controversy and several lawsuits followed these regulations, resulting in new rules promulgated by USEPA in 1979 and 1980. In 1987, Congress passed the Water Quality Act, which added Section 402 (p) to the CWA, and required NPDES permits for stormwater discharges from industrial activities and large and medium localities', municipal separate stormwater sewer systems (MS4s) and for discharges of significant contributors of pollutants. These regulations also subjected construction-related land disturbance of greater than 5 acres to NPDES permitting requirements for the first time. Final versions of these regulations were issued in 1990. Most recently, the second phase of stormwater regulations was promulgated by USEPA in 1999. These regulations required small localities with MS4s to obtain permit coverage and lowered the construction stormwater permitting land disturbance threshold from 5 acres to 1 acre (NRC 2009).

EPA has delegated authority for the NPDES program to 46 state governments. Generally, states opt to regulate post-construction stormwater more stringently than federal regulations require. In addition, several states have allowed local governments (i.e., cities, counties, ports, etc.) to add requirements or perform oversight in addition to the state-administered stormwater management program. As a result, post construction stormwater management requirements vary not only across the country, but also sometimes within the same drainage basins.

There is no national consensus on how to determine which post-construction BMPs will achieve the pollution reduction necessary to comply with diverse and complex stormwater requirements set by various regulatory authorities. Many states and local municipalities have robust stormwater management programs (SMPs) with specific standards and manuals detailing stormwater system design, installation and maintenance requirements. Other states have adopted the applicable federal regulations, but have not provided municipalities' additional resources or guidance to assist in full implementation. This is a challenge to all parties involved in land development and stormwater management across the nation.

To document how different states approach post-construction stormwater management and evaluate post-construction BMPs, ITRC conducted a survey (details in Section 1.5). The responses to the survey were used to help develop objectives that reflect the varying agency requirements, where they exist.

1.1 Document Objectives

The primary objective of this document is to provide a centralized resource for information on stormwater BMP effectiveness (water quality treatment improvement) and provide the reader with guidance on how to use and implement that information.

The guidance document should:

- Serve as a guidance during post-construction BMP screening, selection, installation, operation, and monitoring

and maintenance.
- Provide direction to available resources to help assess performance relative to meet applicable standards.
- Provide additional information on potential limitations and benefits of specific BMPs.
- Provide a starting point for BMP evaluation in the absence of established numeric standards.
- Direct users to a broader array of information sources than is currently available in any one locality to help aid in resolving regulatory conflicts or encourage the use of emerging technology.

This guidance document does not:

- Address sediment and erosion BMPs during construction.
- Replace policy or regulatory standards.
- Provide detailed design criteria for individual site-specific use.
- Provide an exhaustive BMP selection tool.
- Verify or certify BMPs.

Document limitations are discussed in more detail in Section 1.3.

1.2 How to Use the Document

This guidance document contains two components: 1) descriptive text and 2) a BMP Screening Tool. The text has been written to provide an overall approach to evaluating the water quality benefit of stormwater BMPs from selection through proper installation to long-term operations and maintenance. The result of this effort is intended for technical users as well as those with limited technical knowledge. This document also provides the users with general guidance on how to evaluate the appropriateness of specific BMPs for a given stormwater management scenario. The text provides links to more detailed resources and to the .

The BMP Screening Tool allows users from different regions of the country to quickly navigate through the enormous amount of publically available data to meet their specific data needs. The BMP Screening Tool starts with a general overview of what each BMP type is and the water quality parameters they have been documented to treat. The Tool will also link the user to BMP information sheets that drive the user towards more detailed descriptions of BMPs including regional guidance documents and references; providing the user with additional sources of information about each BMP.

1.2.1 Definitions

Best Management Practice (BMP) – In the context of this document, a product or practice is used to capture, retain, treat, or otherwise manage stormwater runoff and the pollutants commonly associated with runoff. This term is often, but not always, used synonymously with the term “Stormwater Control Measure” (SCM), but BMP will be used throughout this document. The use of BMP in this guidance does not include policy or administrative actions that may be considered a BMP in some instances, such as pet waste programs. Modified from (WEF 2014).

Certification – The approval of a BMP based upon testing and evaluation efforts. This approval provides assurance that the BMP will perform to a level deemed sufficient by the certifying agency or group. A certification may stipulate conditions of approval, such as sizing, land use or structural elements. Modified from (WEF 2014).

Evaluation – The analysis of results based on testing that may be carried out by any entity with or without regard to standard or accepted protocols.

Monitoring – The collection of data for the purposes of understanding natural systems and features, evaluating the impacts of development proposals on such systems, and assessing the performance of BMPs.

Construction BMPs – BMPs that are designed for and installed during the active phase of construction to control and treat runoff from the construction site.

Post-Construction BMPs – Post-construction stormwater technologies that are permanent controls used to manage stormwater for a development project after completion of the construction phase.

Product – A manufactured, proprietary system that captures, retains, treats or otherwise manages stormwater and the pollutants commonly associated with runoff.

Practice – A non-proprietary system that captures, retains, treats or otherwise manages stormwater runoff and the

pollutants commonly associated with it.

Quality Assurance Project Plan (QAPP) – The purpose of a QAPP is to ensure that all necessary steps are taken to acquire the type and quality of data needed. For example, the QAPP, Guidelines for Preparing Quality Assurance Project Plans for Environmental Studies:

- Lists the goals and objectives of a study.
- Identifies the type and quality of data needed.
- Describes the sampling and measurement procedures needed to acquire those data.
- Describes the quality control (QC) and assessment procedures needed to ensure that the study objectives are met.

Source Control BMP – Structural or non-structural practice that prevents stormwater from coming into contact with pollutants through physical separation of areas or careful management of activities that are sources of pollutants. Often source control BMPs are separated into one of two types: Structural and Non-structural Source Control BMPs. Structural Source Control BMPs are physical, structural or mechanical devices or facilities that are intended to prevent pollutants from entering stormwater. Non-structural Source Control BMPs are non-structural practices that prevent or reduce pollutants from entering stormwater.

Stormwater Control Measure (SCM) – This term is often, but not always, used synonymously and interchangeably within the industry term BMP. However, throughout this document the term BMP will be used.

Testing – Assessment of a treatment BMP through physical means. This may refer to controlled testing in a laboratory/indoor environment or field testing of equipment under typical installation conditions.

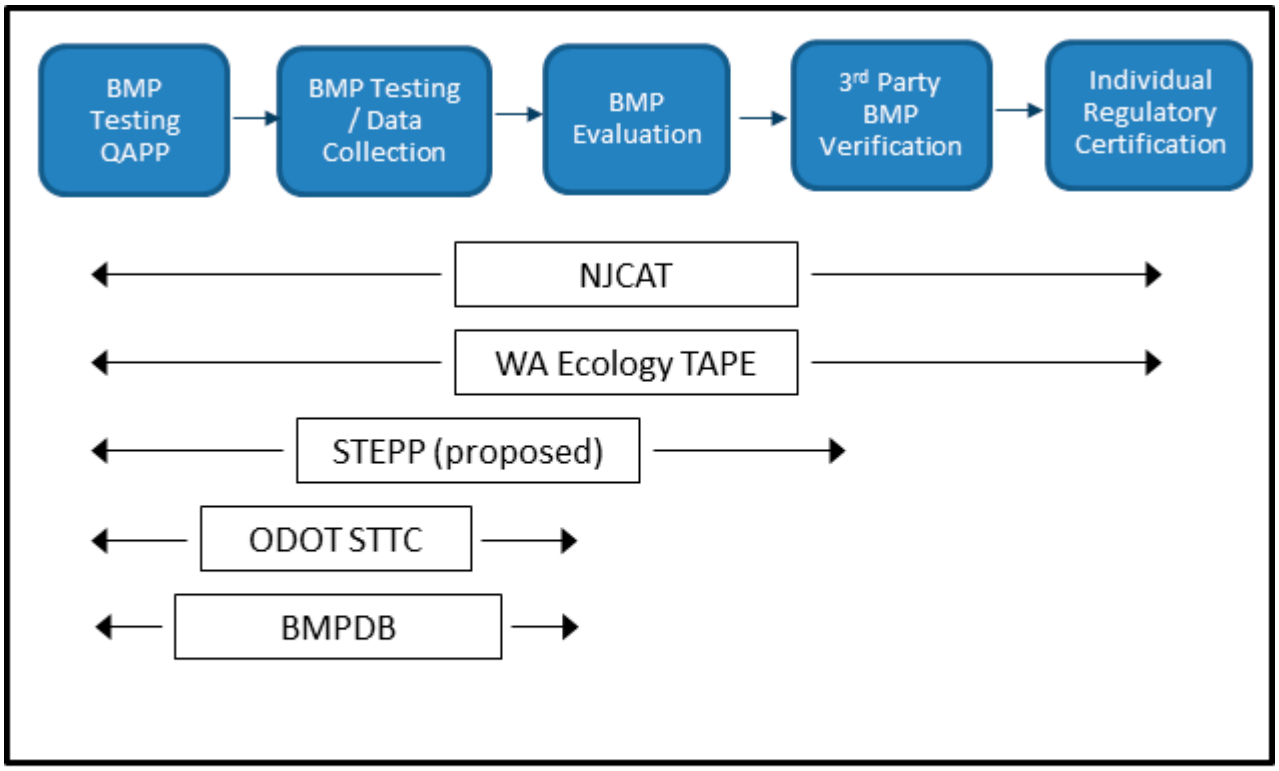
Verification – The testing and evaluation of a BMP through employment of specific procedures provided by a third-party entity to confirm its performance as compared to results from the BMP provider.

1.2.2 Applicability

Currently there is no national testing and verification program for stormwater control BMPs. In the absence of national leadership, state and local governments, as well as other entities responsible for stormwater management, have been forced to develop their own programs to test treatment products and practices and interpret the resulting data. Many state governments and local jurisdictions do not have the resources, technical expertise or desire to create a comprehensive testing and verification program for new and existing technologies. This sometimes causes agencies to defer full implementation of their stormwater programs, preventing the use of measures that are effective at protecting surface water bodies. For device manufacturers and land developers, the lack of a clear and consistent path to obtaining BMP approval limits innovation and the emergence of new, more cost-effective technologies.

To respond to this issue, the Water Environment Federation (WEF) established the Stormwater Testing and Evaluation for Products and Practices (STEPP) Initiative in 2014 (WEF 2014). The intent of the STEPP Initiative is to develop a standard testing protocol and verification program that can be applied nationally. Currently STEPP is in its preliminary recruitment stage, but its proposed structure builds on existing state programs. See Section 2.5 for more information on STEPP.

In the absence of a national testing protocol and verification program, this guidance document provides a general overview of the current state of practice for evaluating stormwater BMPs. This document also provides links to established testing protocols and associated results that have been developed and currently are being administered by several agencies across the country, including the International Stormwater BMP Database (BMPDB) (See Section 2.3.4), and Stormwater Testing and Evaluation for Products and Practices (STEPP) (See Section 2.4), the Washington State Department of Ecology (Ecology) (See Section 2.3.1), the New Jersey Department of Environmental Protection (NJDEP) (See Section 2.3.2), and the Oregon Department of Transportation (ODOT) (See Section 2.4.3). Each of these provide varying levels of information on BMPs as shown in Figure 1-1.



NJCAT - New Jersey Corporation for Advanced Technology
WA Ecology TAPE – Washington Department of Ecology Technology Assessment Protocol
STEPP – Stormwater Technical Evaluation of Practices and Protocols
ODOT STTC – Oregon Department of Transportation Stormwater Technology Testing Center
BMPDB – International Storm water BMP Database

Figure 1-1. Extent of coverage of selected programs.

1.2.3 Intended Users

This document is intended to serve as guidance for primarily state and local regulators during BMP screening, selection, design, installation, operation and maintenance and monitoring.

Secondarily this document will also benefit:

- Owners and developers
- Consultants and engineers
- Manufacturers and vendors
- Public and tribal stakeholders

State and local regulators may find the content useful in their BMP vetting processes. Owners and developers may consult this guidance to build a case to support regulatory acceptance of non-standard BMPs that are proposed. As many developers are currently limited to selection of approved BMPs listed in design manuals, this document will help broaden the range of structural BMPs that may be considered.

Consultants and engineers will find this document useful to guide them to resources such as BMP literature reviews and structural BMP research and testing programs, success or failure of installation, operation, and/or monitoring. In addition, this guidance will describe opportunities to promote new research on BMPs.

Manufacturers and vendors may use the resources presented in this document to help establish or confirm the performance of their products, which are usually proprietary in nature.

Public and tribal stakeholders are likely to have concerns about water quality and about the usability of lakes, rivers and streams downstream of the stormwater project for fishing, swimming and other recreational opportunities as well as land use, safety and real estate value. Tribal stakeholders may have treaties or other pacts with the federal government that grant them fishing, hunting or access rights in areas that are not necessarily near their present-day reservations. Stakeholders may find this document useful in understanding how BMPs relate to these concerns.

1.3 Limitations

1.3.1 ITRC Stormwater BMP Performance Evaluation Guidance and BMP Screening Tool (Does not replace or modify laws, rules, or policies)

The stormwater guidance and BMP Screening Tool were developed to provide a resource for regulators and end users to gain access to existing information about the water quality performance of stormwater BMPs that may be applicable in their state or for their project. Each State, and the USEPA, is still responsible for issuing and enforcing laws, rules and policies to protect state waters. This tool does not replace policy. However, it was developed with the intent to provide guidance that is consistent with the objectives set forth in the Federal Clean Water Act as implemented through state agency policies and rules. It is general enough to apply in any state, regardless of the specific policies or BMP verification standards in place at a given location.

1.3.2 BMP Screening Tool (Does not select final BMPs)

The BMP Screening Tool is not an exhaustive list of BMPs and not intended to help users design a BMP for a specific site. The Tool directs users to applicable BMPs based on user inputs and links to information sheets. Information sheets for each BMP will help users locate other published sources of water quality performance data.

1.3.3 Lack of Available Standardized Data

There are relatively few comprehensive, standardized databases for stormwater BMP assessment and verification. This is due to many factors including difficulty of monitoring, variability of climate and rainfall patterns, and the lack of available funding for BMP effectiveness monitoring. The inherent differences across BMP design, operation and maintenance, and other site-specific conditions make it challenging to conclusively compare performance between one installation to another. A handful of states, notably Washington, New Jersey and Oregon have developed rigorous testing, verification or certification programs.

1.4 Other Considerations

There are other areas that should be taken into consideration in regards to stormwater guidance including cost, source control and risk. Cost is an important factor that drives the consideration of BMPs due to its variability based on site conditions, regulatory requirements and project goals. Source control is an important component of stormwater management that includes structural, design and operational measures. Given the range of BMPs and site considerations that exist, use of the document inherently requires both engineering judgment and an understanding of data analysis for the user to exercise due diligence and minimize risk of failure.

1.4.1 Cost

Costs can generally be separated into those incurred during the development, design, installation and operational phases (Clary 2017). Another important factor in BMP selection is which parties incur the various costs. This section first covers the various types of costs, then addresses the relevance of who typically pays each type, and finishes with a discussion of the significance of these cost drivers to the adoption of innovative new technologies.

During the development, design and installation phase, property owners incur design, permitting and installation costs, with installation typically being the most significant of these costs. Technology footprint and site placement have potential costs associated with them that can also drive BMP selection. BMPs with a large footprint can require valuable site space (e.g., affecting the placement of underground utilities) or potentially increasing construction costs or decreasing property values. These costs, often referred to as opportunity costs, occur more frequently in dense urban areas where space is scarce and land costs are high. Careful design can help to minimize opportunity costs; however, this can increase design costs.

The operational phase begins once the stormwater BMPs have been installed. All BMPs should be regularly inspected once they begin operating. Inspection costs consist of planning, visiting the sites, and documenting results and performance. Maintenance costs arise from both routinely scheduled maintenance (e.g., preventative or aesthetic maintenance) and maintenance done on an as-needed basis (e.g., corrective maintenance due to a minor erosion problem). Major repair costs can occur if the BMP fails or is damaged. These costs are typically considered in combination with the expected probability of failure. All BMPs have an effective lifespan and so the cost for the potential replacement cost is an important lifecycle cost consideration. See Community-enabled Lifecycle Analysis of Stormwater Infrastructure Costs (CLASIC).

Parties that have a stake in determining which technologies are selected incur the BMP costs mentioned above. The two primary stakeholders are the property owner and the authority responsible for managing stormwater for the jurisdiction. Owners have an incentive to minimize costs during the development, design and installation phases, and to also minimize maintenance costs if they intend on maintaining ownership after construction is completed. The local stormwater management authority has an incentive to minimize BMP failure risk. If the stormwater management authority is unfamiliar with a BMP being proposed for a project, they can either incur a cost of time and resources to learn about the technology, they can require the owner (or the engineer working for the owner) to produce sufficient information to demonstrate that the technology will function as intended, or they can deny regulatory approval. This may be a major impediment for adoption of an innovative BMP. Even if the BMP is ultimately permitted, the local authority will be responsible for inspecting the BMP and, depending on the type of construction project (i.e., public right-of-way, school, residential subdivision), they may also be in charge of maintaining the BMP. If they are not familiar with the BMP, they again need to spend time learning about the BMP in order to trust its design features and lifespan are true to the manufacturer's specifications and claims.

The difference in cost incentives for project owners and local authorities can create a barrier to the adoption of new innovative BMPs. Local authorities need assurance to determine that any BMP they allow for use within their jurisdiction will meet applicable stormwater requirements. Although innovative BMPs may be more cost-effective for the owner, they present the local authority with greater uncertainty and risk. Local authorities must increase their knowledge about the performance of a new BMP and this information cost often leads to delays in construction authorization and special conditions (i.e., provisions of a contract that are peculiar to the project under consideration and do not fall under the general conditions or supplementary conditions) being placed on the use of the BMP, if it is ultimately approved. These delays and special conditions can quickly negate any benefits for the owner considering a new BMP.

1.4.2 Source Control

Source control measures can minimize or prevent pollutant generation, control or prevent discharge and runoff at its source, and limit exposure to stormwater pollutants. It is typically more cost-effective to prevent pollution than to treat it after it enters stormwater. Source control measures can include street sweeping, enclosed refuse and outdoor storage areas, labeling of storm drain inlets with *No Dumping! Flows to Surface Water*, green infrastructure (GI) design, and sustainable landscaping that minimize irrigation and the need for pesticides and fertilizer. These are only a few of the many effective source control measures that can reduce the pollutant load on our water bodies. There are many more. The ITRC Stormwater Team recognizes source control as an important and effective measure in stormwater pollution control; however, it is not the focus of this guidance document and therefore is not covered.

1.4.3 Risk

To date, there has been a lack of standardized BMP monitoring protocols nationwide, which has resulted in variable quality, representativeness and documentation of individual BMP studies. Users of this document will either need to review individual data sources to screen for issues affecting the suitability of a study for a particular application, or accept the uncertainty introduced by not doing so. The level of review requires some expertise from the user to assess the applicability of study results to different circumstances.

Potential issues with existing performance data may include: study duration (e.g., sampling conducted during one season), representativeness (e.g., sampling of atypical storms), invalid or inconsistent sampling and laboratory methods, and other issues that might limit a study's applicability. For example, the reported pollutant removal rate from a dirty site (i.e., where coarse pollutant loads are easily removed via settling) may exaggerate the expected performance at a more typical site. Similarly, well performing practices can appear to be poorly performing since pollutant concentrations from a clean site will be difficult to reduce further, which can calculate as a low percent removal. As an additional example, even results from different acceptable studies may not be directly comparable. For instance, simply averaging pollutant removal metrics from studies with different numbers of sampled storms will give undue weight to smaller studies. Users of this document will need some technical knowledge of these considerations to ensure that this document will properly inform their BMP screening process. Consistent with the document objectives, existing BMP data verification programs and BMP data sources are included that meet the minimum criteria defined in Section 2.0, as well as a comprehensive overview of factors to be considered in BMP screening.

1.5 ITRC Survey Description

During development of the guidance and tool, ITRC distributed a survey to the ITRC State Points of Contact (POCs) in 2017. The survey sought state and local perspectives on

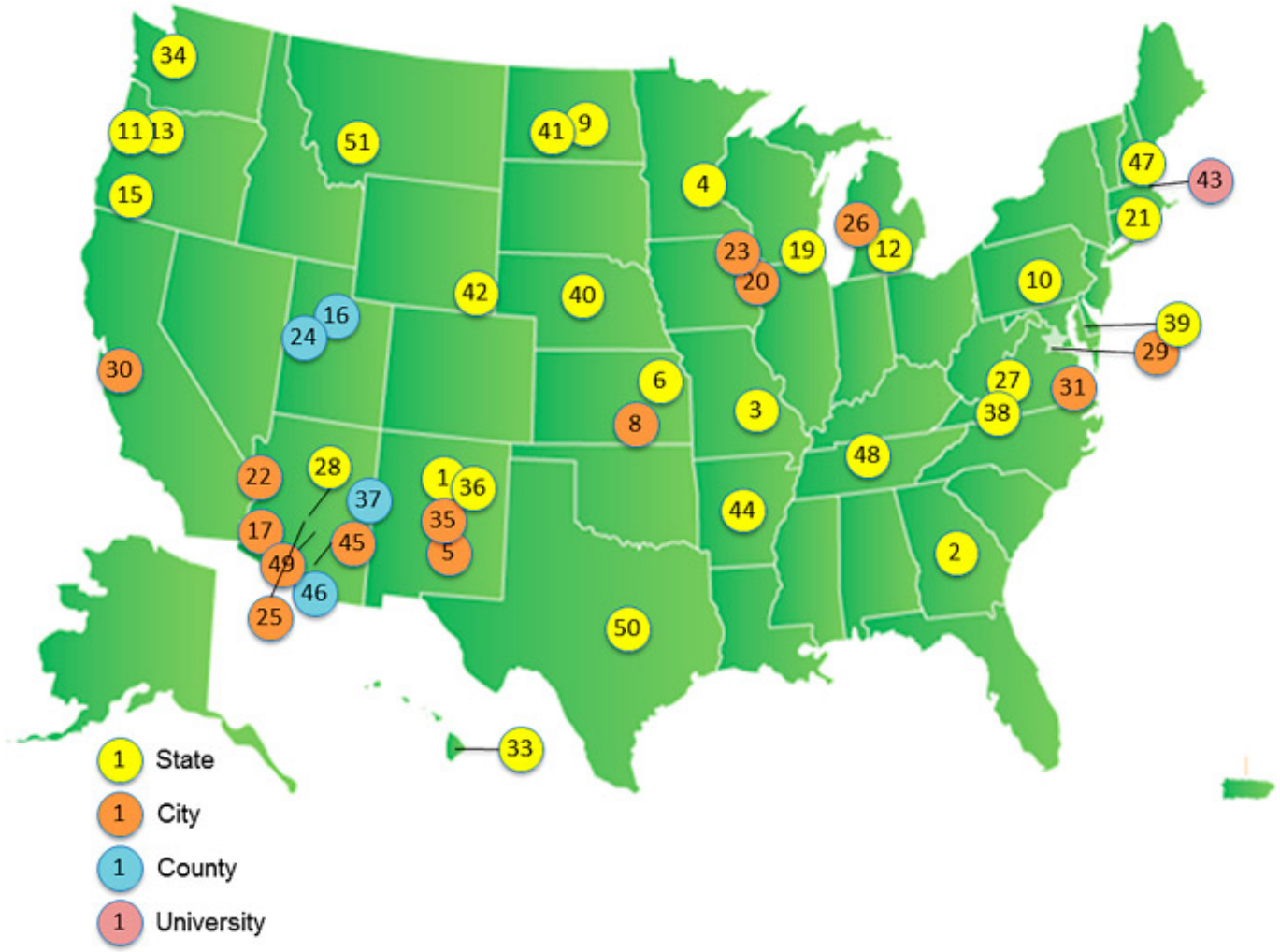


Figure 1-2. Distribution of responses to the ITRC Survey 2017.
Response locations on Figure 1-2 may be based on direct response that the responder works for a specific state, city or county agency; or indirect evidence such as use of a specific city guidance manual supported by a telephone number or agency e-mail address. Regardless, the locations within the state are accurate.

stormwater pollutants that require treatment, how performance of the treatment is measured, and how a BMP is monitored and maintained over time. The survey also asked for barriers to implementation of pollutant treatment and maintenance. Each state POC was asked to complete the survey and distribute it to three municipalities. Fifty-one responses were received from a mix of cities, counties, states and universities. The distributions of the responses are shown in Figure 1-2 with a numeric identifier for each of the completed responses. While state representation made up a majority of responses, municipal and other representation were valuable where provided.

The full set of survey responses are provided in Appendix A. Summaries and charts of responses to specific questions are included in related sections of this guidance.

1.6 Guidance Document Sections

This guidance document is divided into four sections that represent the programmatic elements of stormwater management control:

- Data Applicability (Section 2)
- Screening Considerations (Section 3)
- Installation (Section 4)
- Operations (Section 5)

A brief synopsis of each element below will provide the user with a quick reference to the topic and a direct link if preferred (Figure 1-3).

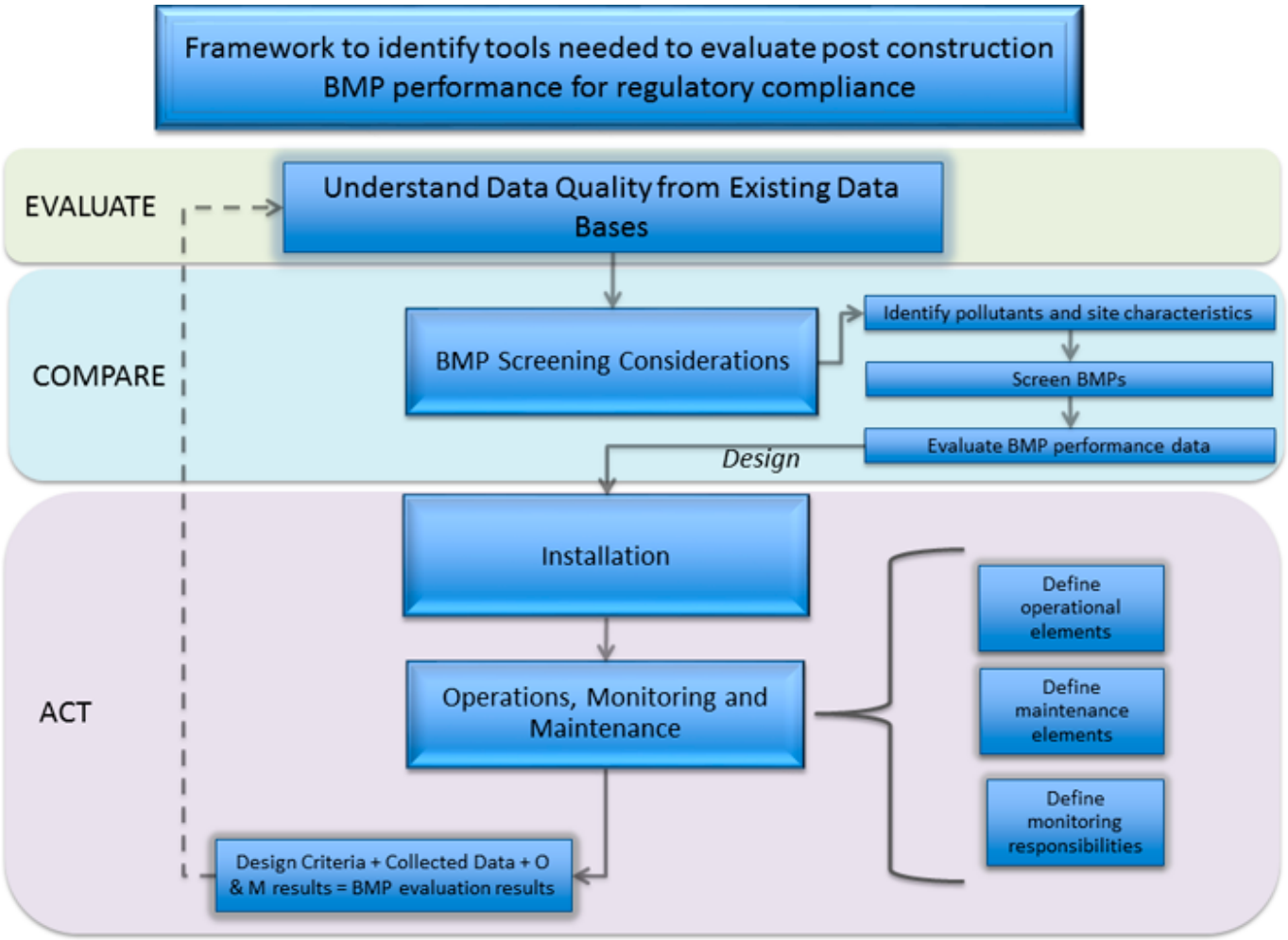


Figure 1-3. Flow diagram illustrating the elements of this guidance.

1.6.1 Data Applicability (Section 2)

The purpose of the data applicability section is to educate users on the availability and quality of BMP performance data. Specifically, this section provides an overview of the major data repositories and BMP evaluation programs that were active at the time of publication for this guidance and utilized by the regulatory community in making BMP approval decisions. For completeness, the data applicability section also calls attention to programs that are no longer active, but may have produced data that remains viable. Particular emphasis is placed on the Washington State Department of Ecology's TAPE program as well as the NJDEP's laboratory protocols and certification process, as a result of their national recognition. A number of other known programs and repositories are also included along with insight on how to access and use them. This section also contains a general discussion of BMP performance data collection that explores data quality and quantity objectives, lab and field protocols, and sampling methodologies.

1.6.2 Screening Considerations (Section 3)

The screening considerations section provides principles, information and a BMP Screening Tool to enable users with stormwater management responsibilities to make better decisions for optimal stormwater treatment. It is important when selecting a BMP that the land use, soil types and pollutant, pollutant loads, topography, climate, and available area are known or estimated. Based on this information, the BMP Screening Tool facilitates the consideration of the many stormwater BMPs with links to specific information, existing guidance and other resources. The BMP Screening Tool helps streamline the marriage of site pollutants and characteristics with applicable BMPs currently available. It provides details on what site data the user needs to help find applicable BMPs and then ultimately leads the user to potential BMPs that the can be considered for implementation at their facility.

1.6.3 Installation (Section 4)

The installation section provides guidance for the installation of post-construction stormwater BMPs to ensure they perform as intended from a water quality perspective and are in line with current regulatory and industry standards. The guidance

outlines information and recommendations intended to ensure the user has the necessary tools to develop a design plan and install a BMP that will perform effectively into the post-construction operation and management phase. This section offers information on contracting for installation of post-constructions BMPs including the installation process and timeline, general inspection and protection guidelines during site work, and considerations for site-specific conditions.

1.6.4 Operations (Section 5)

The purpose of this section is to provide guidance on necessary BMP maintenance to ensure proper operation and thus, pollutant removal performance. BMPs employ a variety of pollutant removal methods and thus require different maintenance activities to ensure proper operation. This section provides information to guide the user on what maintenance practices may be required and at what frequency, for different BMPs, making sure to address issues related to the primary removal mechanism of the BMP. Additionally the section describes what should be examined according to the primary removal mechanism of the BMP and how often inspections should occur. References to existing operations and maintenance guidance, for different states and regulatory agencies, are also provided.

1.7 Public and Tribal Stakeholder Involvement

Affected stakeholders are not limited to adjacent property owners and their tenants, employees and guests. Public and tribal stakeholders such as affected tribes, community members, representatives of environmental and community advocacy groups and local governments can also be affected (ITRC 2012). All stakeholders must be included at the earliest phases of decision-making and implementation of stormwater BMPs and should be advised periodically about operational results or modifications.

Across the country, citizen stakeholders are playing important roles in monitoring and protecting water resources. Citizen scientist stakeholders in several states collect water quality data, evaluate stream health, observe wildlife and expand the state regulatory workforce to monitor stormwater and other environmental projects. Stakeholders may possess valuable information about local characteristics and history that can enhance the evaluation process and improve the quality of decisions regarding stormwater control projects. For instance, long-time residents can provide valuable historical information about flooding and erosion.

To achieve successful, valuable and productive participation by stakeholders, it is important to always be inclusive in outreach treat stakeholders with respect, build trust by being transparent, open the lines of communication early and often, ask for input, provide timely and accurate information and set realistic goals. See Figure 1-4 for an illustration of these important principles.

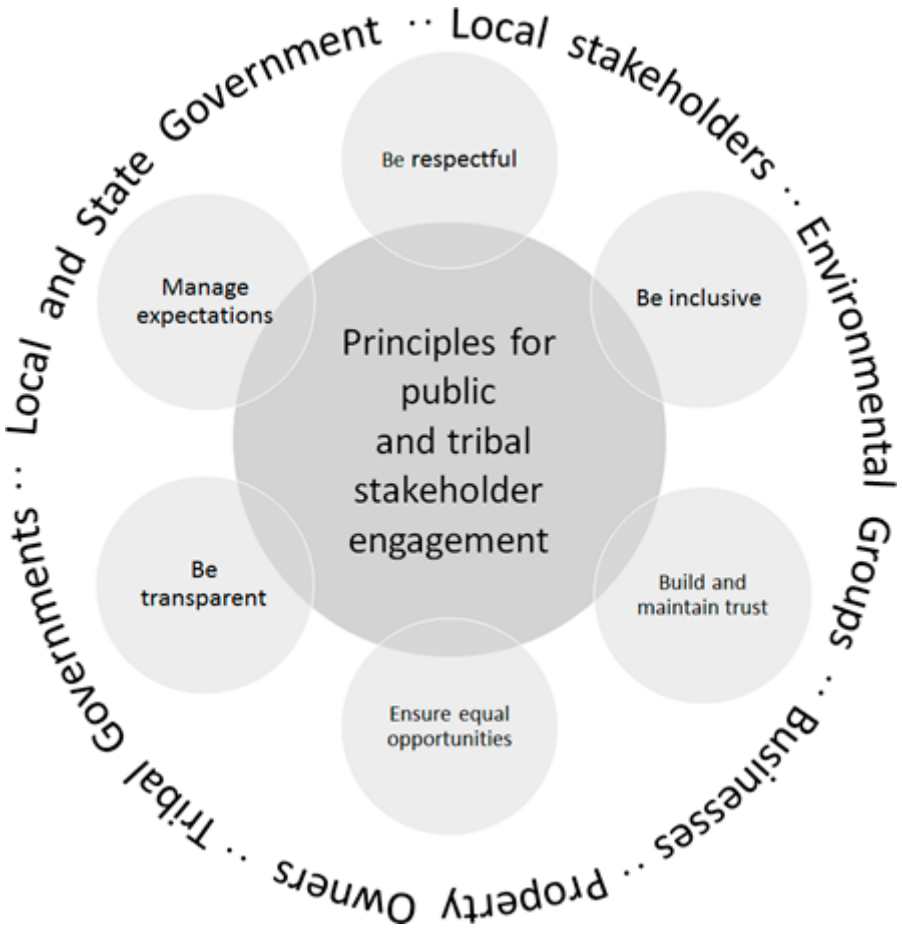


Figure 1-4. Important principles for stakeholder involvement in stormwater management.

Stakeholders are actively assisting stormwater management efforts through volunteer monitoring and observation programsand through citizen outreach and action projects (USEPA 2017a) (USEPA 2017c) (Libes 2012) (Jones 2012b) (Jones 2012a). Here are just a few examples of stakeholder involvement in stormwater management.

1.7.1 The Charles River Watershed Association (CRWA) of Massachusetts

▼*Read more*

The CRWA has an active Volunteer Water Quality Monthly Monitoring Program) with more than 80 citizen volunteers participating. Once each month, the volunteers collect water samples, measure depth and temperature, and record river conditions all along the Charles River and its tributaries. The USEPA uses the data collected by CRWA volunteers in its annual Charles River Report Card. The CRWA data informs cities, towns, environmental agencies and other environmental activist organizations who are working to reduce the impact of stormwater runoff and sewage contamination on the Charles River. CRWA also advises citizens on best landscaping and yard management practices to protect the river.

1.7.2 The Minnesota Pollution Control Agency (MPCA)

▼*Read more*

MPCA engages citizen stakeholders to collect data on lakes and streams. Over 1,000 volunteers in the Citizen Lake Monitoring Program (CLMP) collect data on over 900 lakes. A typical volunteer might use a Secchi Disk to take weekly water transparency measurements for a nearby lake. CLMP data are used by the MPCA to evaluate lake water quality and seek causes of lake degradation. Similarly, over 400 volunteers in the Citizen Stream Monitoring Program (CSMP) collect data on stream water quality in order to assess the impacts of changes in land use, of rainfall events, and of water quality improvement projects.

1.7.3 Stormwater Outreach for Regional Municipalities (STORM)

▼*Read more*

STORM is a coalition of 83 western Washington cities and counties that work together to address stormwater pollution of lakes, streams and the Puget Sound and promote salmon recovery in the Puget Sound. STORM engages citizens to reduce polluted stormwater runoff through simple household management practices for yards and vehicles.

1.7.4 The Region of the Great Bend of the Wabash River, Indiana

▼*Read more*

Starting in the fall of 2009, volunteers took samples to assess the water quality of the Region of the Great Bend of the Wabash River supported by the Indiana Department of Environmental Management Section 3019 Nonpoint Source Management Program Grant (Wabash River Enhancement Corporation). In 2011, the sampling effort was expanded with the help of over 250 volunteers to include monitoring over 29 miles of the Wabash River, the Wildcat Creek and their tributaries for temperature, turbidity, nutrient levels and pathogen concentrations.

1.7.5 Moffett Field, California

▼*Read more*

Stormwater sites may impact multiple jurisdictions, and stakeholders have proved instrumental in the decision-making process. For example, at Moffett Field in California, the US Navy included the Santa Clara Valley Water District and the cities of Mountain View and Sunnyvale in stormwater decisions; however, early discussions of wetlands remediation would have proceeded more smoothly if the Mid-Peninsula Regional Open Space District, owner of a large fraction of the federal stormwater retention pond, had also been involved in discussions because it had the site knowledge. Few local governments have the technical expertise to ask planning and implementation questions.