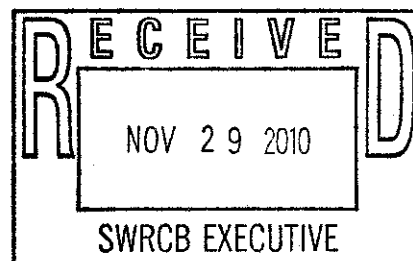


California Stormwater Quality Association
Dedicated to the Advancement of Stormwater Quality Management, Science and Regulation

Public Comment
Effective Assessment Doc
Deadline: 11/30/10 by 12 noon

November 30, 2010

Jeanine Townsend, Clerk to the Board
State Water Resources Control Board
1001 I Street, 24th Floor
Sacramento, CA 95814



Submitted via email commentletters@waterboards.ca.gov

Subject: Comment Letter – Effectiveness Assessment Document

Dear Ms. Townsend and Board Members:

On behalf of the California Stormwater Quality Association (CASQA)¹, thank you for the opportunity to provide comments on the Draft *Guidance for Assessing Effectiveness of Municipal Storm Water Programs and Permits* (State Water Board Guidance Document). The development of a Guidance Document to assist the State Water Resources Control Board (State Water Board) and the Regional Water Quality Control Boards (Regional Water Boards) in defining and establishing consistent effectiveness assessment requirements for municipal stormwater programs is both welcomed and supported by CASQA.

As you know, CASQA has consistently advocated for and led the development of effectiveness assessment methods and approaches over the past six years. Over that period, these statewide collaborative efforts have included a number of important milestones including the following:

- In August 2005, CASQA released a white paper, *An Introduction to Stormwater Program Effectiveness Assessment*.
- In May 2007, CASQA released the *Municipal Stormwater Program Effectiveness Assessment Guidance* (CASQA Assessment Guidance). This document was developed by the CASQA Program Effectiveness Assessment Subcommittee, which includes representatives of municipal programs statewide, as well as USEPA.
- In June 2008, CASQA led a USEPA webcast on effectiveness assessments.
- From 2007-2009, CASQA provided interactive training workshops on the CASQA Assessment Guidance document with almost 300 Phase I and Phase II municipal stormwater program managers and staff, as well as regulators in California attending.
- In September 2010, CASQA published an article in *Stormwater Magazine* that provides an updated description of program effectiveness assessment concepts and principles and identifies many of the critical assessment issues still facing managers and regulators.

¹ CASQA is comprised of stormwater quality management organizations and individuals, including cities, counties, special districts, industries, and consulting firms throughout California. Our membership provides stormwater quality management services to more than 22 million people in California. CASQA was originally formed in 1989 as the Stormwater Quality Task Force to recommend approaches for stormwater quality management to the California State Water Resources Control Board.

Based on this extensive experience, we believe the following comments are particularly relevant and will be helpful in crafting the final State Water Board Guidance Document.

I. Consistency with Previously-established CASQA Content

Since its release in 2007, the CASQA Assessment Guidance has been widely acknowledged and incorporated into other documents such as the *MS4 Program Evaluation Guidance Manual* (USEPA 2007) and *Evaluating the Effectiveness of Municipal Stormwater Programs* (USEPA 2008). In addition, many Phase I stormwater permits and programs have become increasingly reflective of its content.

To date, the CASQA Assessment Guidance has become widely recognized as the preeminent source of program effectiveness assessment content for municipal stormwater programs in California. Given the leadership of CASQA in establishing a consistent framework, terminology, and concepts for program effectiveness assessments, and the time and effort that it has taken to establish this content as a standard part of the planning and implementation of municipal stormwater programs, the State Water Board Guidance Document should be as consistent as possible with the work we have already completed, as well as that still underway. Ultimately, our goal is that CASQA's and the State Water Board's efforts will be collaborative and complementary, and that permit writers and program managers will be able to transition seamlessly from one document to the other. Discrepancies in terminology or other content between the State Water Board Guidance and the CASQA Assessment Guidance are likely to cause confusion or inconsistency in the application of assessment methods.

Regarding the "most recently available" CASQA content, it should be recognized that several CASQA representatives participated in the AB 739 Storm Water Advisory Task Force that initially provided the content on which the State Water Board Guidance Document is primarily based². During that time, these individuals were also working through CASQA's Effectiveness Assessment Subcommittee to make updates to the CASQA Assessment Guidance, and, more importantly, to ensure consistency in the evolving content of both documents. Significant changes that developed during that period are not only reflected in the draft materials provided to State Water Board staff, but were also memorialized in the September 2010 Stormwater Magazine article, *A California Perspective on the Assessment of Municipal Stormwater Programs*. This is currently the most up-to-date articulation of the CASQA framework, and, in combination with the 2007 CASQA Assessment Guidance, should be considered the reference point for establishing consistency of effectiveness principles, concepts, and terms. A copy of that article is provided with these comments (see Attachment A).

Please note that we are not advocating for the exclusive use of the CASQA Assessment Guidance; indeed, we strongly encourage the use of any materials that are found to be helpful to users in improving the measurability and effectiveness of their programs, including those already mentioned. Moreover, we fully recognize that the AB 739 Statutes require the development of a separate State Water Board Guidance Document that addresses the unique needs of Water Board staff in issuing and evaluating municipal stormwater permits. However, given the degree to which the Draft State Water Board Guidance Document draws on the basic concepts and principles (outcome levels, assessment types, etc.) already established by CASQA, we do believe

² It bears emphasis that, while the draft State Water Board Guidance Document provides references to other sources of effectiveness assessment guidance, only the CASQA content has been utilized.

that they should be fully aligned wherever possible. This issue that will be especially important for Water Board staff and others needing to consult the CASQA Assessment Guidance for more detailed and updated information in the future.

CASQA recommends that inconsistencies between the two documents be resolved by aligning the State Water Board Assessment Guidance with the most recently available CASQA content. In particular, the Draft State Water Board Guidance Document should be reviewed in its entirety for consistency with the CASQA content as initially articulated in its May 2007 Assessment Guidance and updated in the September 2010 Stormwater Magazine article, "A California Perspective on the Assessment of Municipal Stormwater Programs". Any inconsistencies identified as part of that review should be reconciled preferably through modifications to the State Water Board Guidance Document, or alternatively by notating the differences in terminology (e.g., through footnotes). CASQA is available to assist in reconciling these differences.

Based on our initial review, CASQA notes the following examples of specific inconsistencies needing to be addressed:

- In Section III.A (Overview of General Concepts; Lines 187 and 237), Outcome Level 1 is referred to as "Storm Water Program Activities." The correct terminology, "Implementation Assessment," is utilized later in Sections III.B (line 256) and IV.A (line 238).
- In Sections III.A (Overview of General Concepts; Lines 208 and 237) and IV.C (line 482), Outcome Level 4 is referred to as "Pollution Source Load Reductions." The correct terminology is "Source Reductions." This terminology should be utilized because it is broad enough to include both (1) reductions in the discharge of pollutants from sources, and (2) reductions in flow rates and volumes from sites. In addition to being consistent with the CASQA terminology, this broader terminology is internally consistent with the Draft State Water Board Guidance Document, which addresses both of these outcome types.
- Lines 653-674 discuss limitations to site-based changes in runoff volume, velocity, or duration through implementation of LID techniques. This discussion is incorrectly included under Outcome Level 5. It should be moved to Level 4, and references to hydrological outcomes should be added to the previously-referenced Level 4 sections (III.A and IV.C.).
- In Section III.A (Overview of General Concepts; Lines 215 and 237), Outcome Level 5 is referred to as "MS4 Discharge Effluent and Receiving Water Assessment," and in Section IV.D (line 543) as "MS4 Discharge Monitoring." The CASQA terminology is "Runoff Quality and Hydrology."
- In Section III.A (Overview of General Concepts; Lines 237 and 259), "Target Audience and Source Assessment" is incorrectly referred to as "Target Audience and Pollutant Source Load Reductions Assessment." In Section IV.B., the CASQA terminology is used, but this assessment category is incorrectly presented as consisting of only Outcome Levels 2 and 3. Under the CASQA framework, Outcome Level 4 (Source Reductions) is also included in this element, which is consistent with its inclusion of the term "Source."

We recognize that continuing changes to the State Water Board and CASQA documents, as well as other sources of effectiveness assessment guidance, will continue to be necessary in the future.

Because of this, it is critical that ongoing efforts continue to be as closely coordinated and consistent as possible. As mentioned, CASQA is currently updating its May 2007 Assessment Guidance to become an even more useful tool for stormwater program managers and regulators throughout the state. We expect the next iteration of the CASQA Assessment Guidance to be completed in spring 2011, and will ensure that State Water Board staff has the opportunity to provide input throughout the completion of this process.

II. Assessment of Stormwater Programs as a Whole

Under AB739, Chapter 610, Statutes of 2010, the State Water Board is charged with the development of a comprehensive Effectiveness Assessment Document *"for evaluating and measuring the effectiveness of municipal stormwater management programs undertaken, and permits issued, in accordance with Section 402(p) of the Clean Water Act (33 U.S.C. Sec. 1342(p)) and this division," and that promotes "the use of quantifiable measures for evaluating the effectiveness of municipal stormwater management programs and provides for the evaluation of, at a minimum, all of the following:*

(1) Compliance with stormwater permitting requirements, including all of the following:

(A) Inspection programs;

(B) Construction controls;

(C) Elimination of unlawful discharges;

(D) Public education programs;

(E) New development and redevelopment requirements;

(2) Reduction of pollutant loads from pollution sources;

(3) Reduction of pollutants or stream erosion due to stormwater discharge;

(4) Improvements in the quality of receiving water in accordance with water quality standards.

(c) The state board and the regional boards shall refer to the guidance document developed pursuant to subdivision (a) when establishing requirements in municipal stormwater programs and permits."

Although AB739 identifies that the completed document should provide for the evaluation of all of the items listed above (including the programmatic requirements listed under (1)), CASQA is concerned that the Draft State Water Board Guidance Document does not seem to clearly identify what the purpose of the document is and, at times, seems to primarily focus on the water quality-based areas as identified in (2)-(4).

On one hand, the Draft State Water Board Guidance Document concedes "[a]ssessment of a program as a whole and linking activities conducted with water quality improvement are difficult tasks. And it may not be possible to immediately assess the program as a whole, but it is possible to begin to assess the program using a system of tiers or levels that eventually lead to an assessment of the program as a whole" (Lines 16-19). CASQA agrees with this statement and that stormwater program managers need to assess the effectiveness of their program and permitting requirements in addition to their programs as a whole (a much more difficult task).

However, the Draft State Water Board Guidance Document appears to contradict itself and the charge of AB739 when it then states "This paper lays out a framework for assessing the effectiveness of MS4 program implementation as a whole, rather than looking at the individual program elements" (Lines 21-22).

Other places within the document seemingly propose to rely on water quality instead of programmatic information to assess the effectiveness of the program. These include the following:

- "Water Board staff often evaluates program implementation activities, which do not always result in measureable water quality outcomes." (Lines 85-86)
- "Having a consistent statewide framework for effectiveness assessments will be critical to determining the water quality benefits of these programs." (Lines 92-93)
- "While these are important, it is also important to assess both permit compliance and also whether the other program elements are improving water quality." (Lines 123-125)

CASQA fundamentally believes that the Guidance Document should support the work that has already been completed to define program effectiveness assessment, and should recognize and incorporate the interim, programmatic assessments that can and should be accomplished in addition to water quality assessments. For several reasons, including the following, stormwater program managers cannot be expected to assess only the "program as a whole" by evaluating water quality; a) the regulatory framework does not support this when the permits require very specific Outcome Level 1 assessments, b) water quality evaluations (and environmental data) take many years to collect before a statistically significant change can be detected, and c) in the interim, it is critical for stormwater program managers to understand the tangible benefits of implementing their programs.

CASQA recommends that the purpose and focus of the State Water Board Guidance Document be clearly stated to better demonstrate consistency with the AB 739 directive. To this end, it should promote a comprehensive effectiveness assessment approach that emphasizes all outcome types (i.e., all of the elements described in the statute) rather than focusing on urban runoff and receiving water quality as broad indicators of program success.

CASQA recommends that line 13-15 be modified as follows:

One of the challenges that the Regional Water Boards, municipalities implementing stormwater programs and the public have faced when reviewing program implementation, is assessing whether or not the programs have been effective and are in fact improving water quality.

III. Intended Use of the State Water Board Guidance Document

One of the most critical issues surrounding the completion and adoption of the State Water Board Guidance Document is how it will be used by Water Board staff. CASQA is particularly concerned about two issues; first, that the content of the State Water Board Guidance Document might be translated to prescriptive permit requirements, and, secondly, that effectiveness assessment requirements might be used to indirectly impose other permit obligations. The following comments and recommendations address these concerns.

Prescriptive assessment requirements have been determined to constitute an unfunded state mandate

Attachment B in the State Water Board Guidance Document (lines 1116-1251) provides selections from the effectiveness assessment requirements of three MS4 permits, including the 2007 San Diego Municipal Stormwater Permit (Order No. R9-2007-0001). However, in March 2010, the California State Commission on Mandates found the effectiveness assessment provisions of the San Diego Permit to constitute an unfunded state mandate, noting the following:

"Based on the mandatory language on the face of the permit, the Commission finds that parts I.1 [jurisdictional assessment] and I.2 [watershed assessment] of the permit are a mandate on the copermitees..."

In support of this decision, the Commission rejected the State Water Board's arguments that broad support is provided for these requirements under Clean Water Act section 402(p)(3)(B)(ii)-(iii) and 40 C.F.R. sections 122.26(d)(2)(i)(B)-(C), (E), and (F).

It should also be noted that the Attachment B selections are unnecessary to support the general assertion in the State Water Board Guidance Document (lines 75-77) that "[a]s seen in Attachment B (excerpts from selected MS4 permits), the requirements vary from permit to permit, with no clear guidance to the permittees on conducting assessments." This statement is self-explanatory, and generally supported by the existence of AB 739 itself.

Moreover, CASQA is concerned that the inclusion of sample effectiveness assessment language as an attachment may, in fact, perpetuate the inconsistency. There is a likelihood that a permit writer may look at Attachment B as choice of permit language, pick the language that they like the best – potentially modify the language, and then include it within a permit.

CASQA recommends that Attachment B either be removed, or that purpose of the language, including limitations on its use, be clearly stated. Moreover, if the attachment is retained, we recommend that the existing examples be replaced with a single set of sample language that best represents the management questions, concepts, and issues that should be addressed by a comprehensive effectiveness assessment. CASQA is available to assist in identifying potential language that could accomplish this.

We acknowledge that the Mandates Commission decision applies only to the San Diego Permit, and faces future appeals, but its potential precedent is clear. Any assertion that the San Diego decision will be overturned by the courts would be both speculative and premature since any such decision could follow the completion of the State Water Board Guidance Document by as much as two years. Moreover, while this or other similar decisions would not, in themselves, lessen the Water Boards' authority to require detailed assessment provisions under the California Water Code, it's extremely unlikely that the state would be willing or able to compensate permittees for conducting assessment activities.

Permittees should determine the specifics of their effectiveness assessment approaches

The choice of how effectiveness assessment options are selected and utilized should ultimately be made by permittees, not Water Board staff. In addition to minimizing the potential for unfunded mandates claims, requiring that permittees define and justify their own effectiveness assessment approaches is consistent with the Water Boards' working approach to Maximum Extent Practicable (MEP). This approach generally holds that programs and activities should be initially proposed and justified by permittees, and that Water Board imposition of detailed

program requirements be held out as a last resort (see the San Diego permit definition of MEP for example).

CASQA recommends that the State Water Board Guidance Document advocate an approach whereby permittees are responsible for determining the methods by which their programs will be assessed.

Assessment requirements should not be used to impose additional program obligations

As already noted, CASQA strongly believes that effectiveness assessment requirements should not provide an indirect means of introducing other permit requirements (inspection targets, changes in knowledge, etc.). Rather, they should provide clarity on options and methods for assessing requirements otherwise already established in permits. To obscure this distinction would circumvent a proper and transparent public review process. Avoiding such problems initially appears to be the State Water Board's intent. Section I (Lines 44-46) states that "[t]his document does not, and is not intended to provide guidance on substantive implementation requirements to be included in municipal storm water permits. Such guidance would be beyond the scope of this document."

Based on this, it appears that the intent of State Water Board staff is to avoid the indirect imposition of other permit requirements through assessment requirements. CASQA strongly supports this position, but feels that the State Water Board Guidance Document falls short both in emphasis and consistency.

First, the statement quoted above, while clear enough in its intent, is simply too easy to miss. By embedding it in the middle of an introductory paragraph, readers may miss it entirely or underestimate its importance.

CASQA recommends that the statement referenced above (lines 44-46) be broken out as a separate paragraph and underscored (bold, italics, etc.) for emphasis. This would provide an appropriate level of emphasis for this critical concept, and reduce the probability that the statement might be skipped over entirely.

CASQA also recommends that all instances of guidance on setting specific implementation requirements be deleted from the State Water Board Guidance Document since they are beyond its stated purpose and the AB 739 mandate.

Secondly, some instances of text in the State Water Board Guidance Document seem to contradict the above statement by establishing very specific permit requirements. Examples include the following:

- **Standards for structural BMP performance.** Beginning on line 782, the State Water Board Guidance Document discusses the need to have Permittees report the performance of structural BMPs relative to median water quality performance. On lines 790-794 it specifically states that "[p]ermits should require those permittees using structural controls to compare the design performance of the structural control with specified BMP performance criteria for storm water pollutants of concern (see Table 3 below as an example). For these structural control BMPs, permittees should be required to report the performance of the BMP relative to the median water quality performance for the 85th percentile design storm."

Such direction is clearly beyond the stated purpose of the State Water Board Guidance Document, and contradicts the statement cited above.

- **SB72 and monitoring requirements.** The Draft State Water Board Guidance Document states (Lines 744-745) “[b]elow is monitoring program guidance that the Regional Water Boards should consider when setting monitoring requirements in MS4 permits.”

Instead of providing tools for the permit writer to identify how the effectiveness of the monitoring program can be measured, it identifies how a monitoring program should be designed. This section was written to provide guidance pursuant to Water Code Section 13383.5(d) (i.e., SB 72); however the scope of the State Water Board Guidance Document should only be to provide guidance pursuant to Water Code Section 13383.7.

CASQA recommends that Section F. (Guidance for MS4 Monitoring Program Design) be deleted or significantly modified so that it only provides guidance for the reader regarding the methods, measures, and metrics that can be used for assessing the effectiveness of monitoring programs as established under individual permits.

CASQA also recommends that the use of other existing monitoring resources be advocated. For example, see the Southern California Stormwater Monitoring Coalition (SMC) Model Monitoring Guidance, which was partially supported by SB72 funding, and the Center for Watershed Protection’s “Monitoring to Demonstrate Environmental Results: Guidance to Develop Local Stormwater Monitoring Studies Using Six Example Study Designs (August 2008).

Both of these documents provide a more in-depth treatment of monitoring program options and considerations than the Draft State Water Board Guidance Document.

Ultimately, the State Water Board Guidance Document should assist in improving the quality of effectiveness assessments conducted, and in particular supporting the AB 739 objective of promoting the use of quantifiable measures in evaluating the effectiveness of municipal stormwater management programs. The best use of the State Water Board Guidance Document is, therefore, to introduce Water Board staff to basic principles and concepts that will increase their understanding of effectiveness assessment concepts and principles, enable them to conduct quality critical reviews of proposed and existing assessment content, and better align their thinking with the CASQA content already in general use by MS4 permittees.

If the State Water Board wishes to provide guidance on implementation requirements to permit writers, it would be more appropriate to do so within a permit writer’s guidance document. Clearly, such content is beyond the scope of this document.

IV. Other Issues

Finally, CASQA offers the following additional comments and recommendations.

Section G. Integrated Assessment

Although this section provides a good introduction to integrated assessment, additional context is necessary so that readers understand the inherent difficulties it presents, and the need for methods and approaches to further evolve over time.

CASQA recommends that line 891 (3. Outcomes, Measures, and Methods) be deleted. The information presented in this section provides general guidance regarding the objectives and

questions that the Permittee would seek to answer with an integrated assessment – it does not provide specific information for how the assessment would be conducted (the metrics, methods, measures, linkages, etc.).

CASQA recommends that a qualifier be added at line 891 to identify that the initial objectives and questions that are provided as examples still need to evolve over time and that additional work will be needed to define the appropriate methods, measures, metrics, and linkages that should be used during integrated assessment. While some Permittees may be able to qualitatively report out on some aspects of Integrated Assessments, this is an area that still requires a fair amount of work for the stormwater community to be able to define with any degree of certainty the types of linkages that can be made. The qualifier should lend support to the statement in lines 325-327 – “In particular, it is unlikely that Integrated Assessment methods and principles are sufficiently evolved to allow their incorporation into effectiveness assessments at this time.”

The Attachment D sample checklist needs improvement

Lines 331-333 state that "Attachment D provides sample questions and checklists, organized by outcome levels, that can be used by Regional Water Boards and MS4s in assessing the effectiveness of MS4 programs."

Although CASQA agrees that a sample checklist/framework similar to the one in Attachment D could be provided and might be useful, it does not appear that this checklist is suitable for its stated purpose. In particular, we are concerned it is too generic and, that it has not been developed with the goals, objectives, or targets associated with each of the individual program elements in mind. For example, it may be better to either include a sample checklist for each of the stormwater program elements or to, at least, have a more fully developed sample checklist for one program element that provides the permit writer with clearer guidance on how the information can be framed based on specific program information generated (not to mention what information can be best used for adaptively managing the program). We are concerned that a permit writer may simply refer to or attach Attachment D to a permit and require that this be completed as a part of a program effectiveness assessment.

CASQA recommends that Attachment D either be deleted or revised (e.g., to include one full set of sample questions for at least one program element). CASQA is available to assist in identifying potential language that could accomplish this. In fact, this is something that CASQA promotes within the 2007 Guidance Document and is currently in the process of revising.

In addition, we would note that the USEPA 2007 MS4 Program Evaluation Guidance contains numerous instances of well-developed checklists that should be considered in the development of a checklist for Water Board staff.

Finally we would note that any checklist included in the State Water Board Guidance Document should be carefully crafted and presented so as to avoid use as a means of indirectly imposing additional program requirements.

The Use of Other Effectiveness Assessment Documents

As noted above, although the Draft State Water Board Guidance Document identifies a number of potential resources for conducting effectiveness assessment, the actual content of the Document almost exclusively reflects the CASQA Assessment Guidance. The State Water

Board Guidance Document identifies three resources that were created by other organizations to provide guidance for conducting program effectiveness assessments (Lines 127-139) and provides a list of recommended resources in Attachment C. However, these two lists of resources are not the same and do not provide a context for the reader so that they understand the types of information and assessment guidance that are provided in each of the resources.

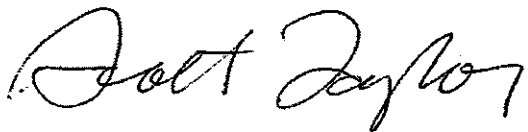
CASQA recommends that the State Water Board Guidance Document provide one consistent list of recommended resources as well as additional information for each of the resources listed so that it is clearer to the reader what types of program effectiveness assessment guidance they each contain. For example – the section could be revised to state the following:

- *Municipal Separate Storm Sewer System (MS4) Program Evaluation Guidance (EPA-833-R-07-003), published 01/01/2007 (U.S. Environmental Protection Agency)[Guidance on Assessing Outcome Level 1]*
- *The California Stormwater Quality Association (CASQA): Municipal Stormwater Program Effectiveness Assessment Guidance, published May 2007. [Guidance on Assessing Outcome Levels 1-6]*
- *A Framework for Assessing the Effectiveness of Jurisdictional Urban Runoff Management Programs (San Diego Stormwater Copermittees, October 2003). [Guidance on Outcome Levels 1-6]. Note: This document served as a basis for much of the CASQA Assessment Guidance, and has since been superseded in its use by that document.*
- *Monitoring to Demonstrate Environmental Results: Guidance to Develop Local Storm Water Monitoring Studies Using Six Example Study Designs, published 12/18/2008 (Center for Watershed Protection)[Guidance on Assessing Outcome Levels 5-6]*

As you know, a well developed and implemented effectiveness assessment can provide Water Board staff and stormwater program managers with the feedback necessary to determine if stormwater programs are achieving intended results such as compliance with permit requirements – and ultimately to relate these changes to conditions in urban runoff and receiving waters.

CASQA appreciates this opportunity to provide comments on the draft Guidance Document. Please feel free to contact me at (760) 603-6242 if you have any questions regarding these comments. Alternately, you may contact Jon Van Rhyn or Karen Ashby, Co-Chairs of CASQA's Effectiveness Assessment Subcommittee, at (858) 495-5133 or (530) 753-6400 x232, respectively.

Sincerely,



Scott Taylor, Chair
California Stormwater Quality Association

Attachment A - *A California Perspective on the Assessment of Municipal Stormwater Programs*

cc: Bruce Fujimoto, State Water Board

A California Perspective

on the Assessment of Municipal Stormwater Programs

Introduction

The term *Program Effectiveness Assessment* refers to the methods and activities that stormwater program managers use to evaluate how well their programs are working and to identify modifications necessary to improve them. A comprehensive assessment strategy is fundamental to the development and implementation of a successful stormwater program. A well-developed and well-executed assessment can provide managers with the feedback necessary to determine if their programs are achieving intended results such as compliance with permit requirements, increases in public awareness, or behavioral change—and ultimately to relate such changes to conditions in urban runoff and receiving waters.

After the inception of municipal separate storm sewer system (MS4) programs in the early 1990s, managers' efforts were understandably focused on funding and implementing permit-compliant and legally defensible programs. Program design was guided by a maximum extent practicable (MEP) performance standard that was generally understood to represent an iterative process toward eventual compliance with water-quality standards. However, the relationship of these two endpoints was not well understood. Compliance with permit requirements was often measured on a task basis rather than understanding of how or when permit compliance was likely to bring about corresponding improvements to water quality. Over the next two decades, the cities, counties, districts, and flood control agencies tasked with carrying these programs forward continued to modify their implementation strategies based almost exclusively on the increasingly prescriptive requirements of reissued permits. But, even after multiple rounds of permit reissuance and more than a decade of implementation

experience, most program managers were still struggling to keep up with minimum permit requirements. The prospect of achieving demonstrably measurable and effective programs remained remote. In hindsight, the absence of substantive assessment provisions in most first- and second-generation municipal stormwater permits and corresponding guidance almost certainly limited the ability of program managers to assess the impacts that their programs were having. The program managers had neither the resources, the mandate, nor the experience required to determine how to demonstrate the effectiveness of their programs—or to balance these considerations with the economic considerations implicit in a MEP standard. Nevertheless, this situation has begun to change, and effectiveness assessment is now emerging as a distinct discipline within the broader stormwater management field with California MS4 managers at the forefront of this movement.

An important advocate for the development and implementation of effectiveness assessment methods and guidance has been the California Stormwater Quality Association (CASQA; www.casqa.org). CASQA assists the State Water Resources Control Board (SWRCB) and municipalities throughout California in implementing the National Pollutant Discharge Elimination System (NPDES) stormwater mandates of the federal Clean Water Act (CWA). There are currently 33 Phase I Area Wide MS4 permits in California. A Phase II Permit (WQ Order No. 2003-0005-DWQ) was adopted in 2003 to extend permit coverage to smaller municipalities, including nontraditional Small MS4s, which are governmental facilities such as military bases, public campuses, and prison and hospital complexes. Most Phase I, and many Phase II, permittees in California are currently represented through CASQA.

In 2004, CASQA initiated a statewide collaborative effort to develop a framework, methodology, and standard terminology for conducting program effectiveness assessments so that program managers could begin to assess the impacts that their programs were having and use that information to refine the stormwater programs. In August 2005, CASQA released a white paper, *An Introduction to Stormwater Program Effectiveness Assessment*, followed in May 2007 with the *Municipal Stormwater Program Effectiveness Assessment Guidance*, available at <http://casqa.org>. The latter guidance document is considered one of the most comprehensive and fully developed sources of stormwater program effectiveness assessment information and guidance currently available. Since its release, the CASQA *Guidance* has been used in interactive training workshops with almost 300 Phase I and Phase II municipal stormwater program managers and staff, as well as regulators in California. It was also the primary reference for a 2008 USEPA webcast on effectiveness assessment and has been incorporated into other guidance documents, including USEPA's *MS4 Program Evaluation Guidance* manual (USEPA 2007) and *Evaluating the Effectiveness of Municipal Stormwater Programs* document (USEPA 2008). Reissued California stormwater permits are also increasingly reflective of the CASQA *Guidance* and approaches.

In addition to the CASQA efforts, the California State Assembly and the SWRCB have also recently been evaluating effectiveness assessment approaches. Assembly Bill 739, Stormwater Discharge introduced by Assemblymember John Laird in February 2007 and chaptered in October 2007, requires the SWRCB to develop a comprehensive guidance document for evaluating the effectiveness of municipal stormwater management programs and permits issued, and it further requires the SWRCB and Regional Water Quality Control Boards (RWQCBs) to utilize the document when establishing assessment requirements for programs and permits. This is an important step toward bringing regulators and dischargers into greater alignment on assessment requirements and approaches. The draft SWRCB guidance is based on the CASQA *Guidance*, and several CASQA members have played an instrumental role in its development as members of an AB 739 Stormwater Advisory Task Force. The SWRCB staff is currently working to complete the document in 2010.

Considerable experience has been gained in the six years since CASQA began its program effectiveness assessment work. CASQA is continuing to update its *Guidance* to reflect new information, lessons learned, and the refinement of assessment concepts over time. Our current focus is to translate the framework and concepts of the current document to a more specific "how to" guidance for managers. All of this experience, including that gained through the AB 739 process, is being used to inform the next CASQA guidance update, planned for completion by the end of 2010. It also forms the basis of the remainder of this article.

The Effectiveness Assessment Challenge

For the purposes of program planning and assessment, it's helpful to think about MS4 programs within an overall management framework that consists of three components: 1) the stormwater management (or MS4) program itself; 2) the target audiences, sites, or sources to which the program is directed; and 3) the urban runoff and receiving waters that are influenced by discharges from those target audiences, sites, or sources. Figure 1 depicts the relationship of these components. Moving from left to right, the arrows illustrate an implicit causal relationship between them. That is, it's assumed that MS4 program implementation will result in increased awareness and behavioral changes in target audiences, and that these changes will in turn improve, or at least not adversely impact, urban runoff and receiving water conditions.

Considered within this very broad context, effectiveness assessment seems fairly straightforward—establish measures within each component, implement the program, review results, modify the program, and repeat. Were it not for the details, things might actually be this simple. However, MS4 programs are fundamentally more complex than other NPDES permit programs in several important ways, all of which have implications for effectiveness assessment.

The first of these differences is the wide array of sources that are subject to the programs. MS4 programs categorically address almost all major sources of stormwater pollution—construction and development sites, residential areas, municipal operations, and industrial and commercial facilities—meaning that even a very small program must necessarily be administered to thousands of individuals, sites, and sources, with larger programs easily addressing more than a million. From a permitting perspective, it makes good sense to cast a wide net, but successful program implementation depends on the unique behavioral responses of each of the people to whom these programs and activities are directed. Assessments must therefore be conducted at a level of detail and in a way that reflects these individual differences, but that also supports meaningful analysis from a broader programmatic perspective.

Another important characteristic of MS4 programs is their

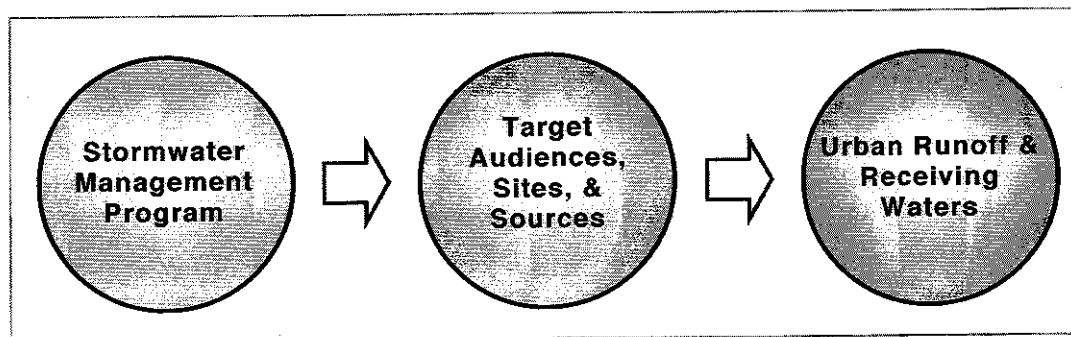


Figure 1. Generalized municipal stormwater management framework

predominant focus on the requirement or use of nonstructural or source control best management practices (BMPs), such as good housekeeping practices, pesticide use reduction, and picking up after pets. This is certainly not to say that larger structural or treatment controls don't have an important place in the MS4 implementation environment, but MS4 managers far more often ask people to change their habits than they do to install expensive treatment controls. To a very large degree, the success of MS4 programs

depends on the mass-scale implementation of many very small controls, and it's this multitude of small changes that presents the most acute assessment challenges. One important reason is that programs rely extensively on third parties to select and implement their own BMPs, but lack the specific feedback needed to determine whether and where they were implemented or how well they worked. Add to this the inherent difficulty of measuring the effectiveness of source controls, and the likely negligible individual impact of many of them, and it can become increasingly difficult to paint a clear picture of how well an MS4 program is performing. Of course, there are exceptions, and the positive effect of broadly applied and powerful control measures (i.e., "true source controls") such as product bans or reformulations, can be shown relatively easily. But very few such controls exist.

(There are two types of source control BMPs: true and operational. The more common operational source controls work by physically keeping potential pollutants out of contact with rainfall and runoff through covering, berming, or cleaning. True source control works on the original source of a potential pollutant by eliminating or significantly reducing the existence of the potential pollutant in the first place, thereby negating the need to physically prevent contact between the potential pollutant and rainfall and runoff [i.e., operational source control], let alone the need for treatment controls.)

Although program resources are more often focused on the management and evaluation of regulated sources, MS4 managers also have a broad responsibility for the quality of discharges from their MS4s. The defining characteristic of these discharges is that they are constituted by pollutant sources that are connected via manmade and natural, open systems. This is in contrast to sources to a wastewater system (sinks, toilets, etc.), which are completely anthropogenic and controlled. Sampling of MS4 discharges is comparatively straightforward, but analysis is complicated by the fact that many discharges come within

the system, pick up windblown and directly deposited materials, and receive aerial deposition along the way. In recent years, many permittees have initiated focused studies to evaluate these relationships, but results tend to be difficult to extrapolate beyond the study area or the specific parameters under investigation. Interestingly, some California MS4 permits have recently begun to require the use of numeric action levels at MS4 outfalls, suggesting that quantitative MS4 runoff quality will increasingly become a focus of program evaluation. While it's clear that important consideration is being given to the role of MS4 discharge quality as a programmatic performance standard, its relationship to specific upstream source contributions remains unclear and difficult to discern.

A number of important issues must be confronted for MS4 program assessment methods to have increasing utility for managers and regulators in the future. In the broadest sense, our goal is to better understand how MS4 program implementation

come Levels, is updated from that of the May 2007 CASQA *Guidance*. These differences will be reconciled when it is updated later this year.) The primary focus of this approach has been the establishment of consistent metrics and terminology, and a framework to apply them in. The following discussion is focused on the basic elements of this framework.

The fundamental building blocks of the CASQA approach are *Outcomes*. Outcomes are the measures we use to characterize results associated with implementing stormwater management programs. They are essential to effectiveness assessment because they define specific, measurable endpoints by which stormwater programs can be targeted, evaluated, and periodically modified. The CASQA approach utilizes a series of six categories of Outcomes, referred to as *Outcome Levels*, to establish a logical and consistent organizational scheme for assessing and relating individual Outcomes. An additional layer of structure is provided by grouping them in three general areas of

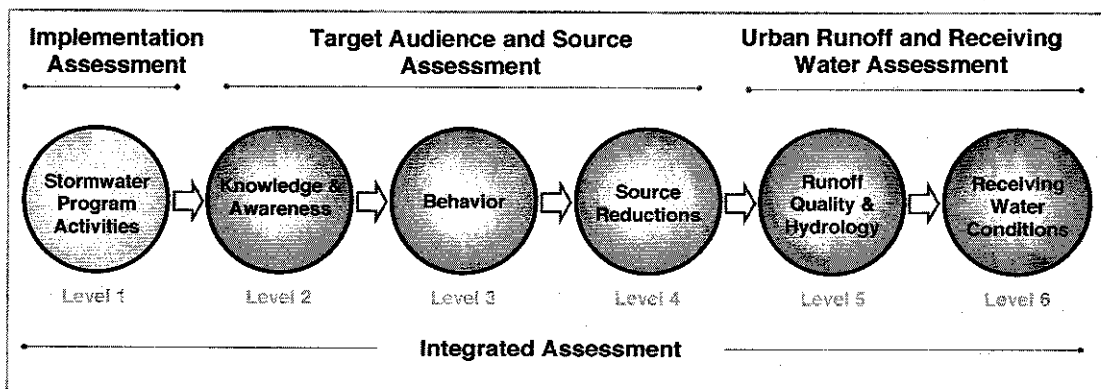


Figure 2. Relationship of assessment types to the six Outcome Levels

relates to an overarching goal of water-quality protection and improvement. We're unlikely to get there without a blueprint, or, in this case, a conceptual framework for the continued development and improvement of effectiveness assessment methods and approaches into the future. The next section introduces just such a framework as it's currently being developed in California.

Toward a Common Solution: A Short Primer on the California Approach

The following provides an introduction to the program effectiveness assessment approach introduced by CASQA in August 2005. (Some of the content described here, such as the specific naming of Out-

assessment activity:

1. Implementation Assessment
2. Target Audience and Source Assessment
3. Urban Runoff and Receiving Water Assessment

These categories mirror the three areas of focus introduced in Figure 1. Their basic relationship to the six Outcome Levels is illustrated in Figure 2. As shown, a fourth category, Integrated Assessment, is also included to further explore the relationships of individual Outcomes and Outcome Levels.

Since these six Outcome Levels illustrate a natural progression from program implementation to receiving water conditions, it may appear that the higher numbered levels have greater relative importance.

However, this is not the case. Each Outcome Level is individually necessary to support effective management decisions. It may be useful to visualize them as a chain of six links. Understanding the relationship of each of the links to its nearest neighbor helps us to make informed decisions, learn from our mistakes, and focus on what works. In short, the ability to effectively assess MS4 programs requires that managers recognize the inherent and unique value of each Outcome Level.

Implementation Assessment (Outcome Level 1) analyzes the different activities that make up MS4 programs. It consists exclusively of Level 1 Outcomes (Stormwater Program Activities). These Outcomes, which are often defined by specific stormwater permit requirements, address a variety of program activities such as providing education to residents, inspecting construction sites or industrial facilities, conducting surveys of target audiences, and conducting receiving water monitoring. They are often derided as "bean counting," but their importance is easily underestimated. Without these critical measures, managers would lack the ability to establish a basic understanding of how their programs work. They are essential to effectiveness assessment because they define the means by which MS4 programs facilitate the changes sought in target populations and receiving waters, as well as the methods by which feedback is obtained. It does managers little good to know that targeted changes are occurring if they can't look into their programs to determine the reasons, or where they might make adjustments to repeat or optimize results.

Target Audience and Source Assessment (Outcome Levels 2 through 4) evaluates the impact of program implementation on target audiences and sources. Simply stated, managers need to understand what target audiences know and how they act, and from this information to characterize their potential for impacting MS4s and receiving waters. A couple of definitional distinctions are helpful here. First, the defining characteristic of a "target audience" is that it consists of the people (individuals and populations) that are expected to gain knowledge or engage in the behaviors that the program is intended to elicit. BMPs are implemented by many types of third parties, so the term "target audience" is broadly defined and virtually any group of people could be a target audience, including fellow municipal staff members, the general public,

elected and appointed officials, other government agencies, etc. "Source" means anything with the potential to generate urban runoff pollutants prior to its introduction to the MS4. A typical MS4 program addresses the following source categories: residential areas, construction, and development sites, commercial and industrial sources, and municipal operations. (Residential programs often include outreach to school-aged children, but not because they're considered significant sources of stormwater pollution; the purpose is primarily to deter them from polluting behaviors in the future.) "Target audience" and "source" can often be used interchangeably, but it's useful to keep in mind that the changes targeted for sites, facilities, or other areas of focus can't be achieved unless the people responsible for achieving them understand what they should and shouldn't do.

Depending on the specific assessment objectives, analysis can be conducted in several different ways. For instance, residential awareness and behavior are often evaluated by conducting representative population-based surveys; however, assessment of construction or industrial operations more typically focuses on conditions observed at sites or facilities using inspection results. Target Audience and Source Assessment encompasses three types of Outcomes: Knowledge and Awareness (Outcome Level 2), Behavior (Outcome Level 3), and Source Reductions (Outcome Level 4).

Outcome Level 2: Knowledge and Awareness. Level 2 Outcomes provide a means of gauging whether outreach, training, or other program activities are producing changes in the awareness, knowledge, or attitudes of target audiences. An important objective of MS4 programs is to utilize these Outcomes as a basis for inducing desired behavioral changes. That is, people shouldn't be expected to act differently if they don't first understand why and how. Examples of Level 2 Outcomes range from awareness of basic concepts (why stormwater pollution is a problem, the difference between storm drains and the sanitary sewer, what a watershed is, etc.) to very specific knowledge (e.g., how to dispose of pet waste, or how to properly install and maintain a silt fence). They're often used to gauge progress in, or to refine approaches for, achieving Level 3 Outcomes. But they may be pursued independently when targeted knowledge is not specifically tied to a behavioral Outcome, or when Level 3

assessment is impracticable.

Outcome Level 3: Behavior. Level 3 assessment examines the behaviors of target populations. As already mentioned, a wide variety of sources and behaviors are addressed by MS4 programs. In one program component, managers may seek to compel residents to report stormwater pollution, to pick up after their pets, or to reduce pesticide use in their gardens. In another, they may require construction-site operators to install and maintain temporary erosion and sediment control BMPs or permanent post-construction treatment controls.

Level 3 Outcomes provide critical feedback on how effective MS4 programs have been in facilitating these and other behavioral changes. It should be emphasized that, while BMP implementation is the most obvious focus of Level 3 assessment, there's also considerable value in understanding other behaviors such as pollution reporting, public involvement, and completion of stormwater pollution prevention plans. Because BMP implementation can't always be easily characterized, it's important that managers consider the variety of behavioral Outcomes available to them in defining the success of their programs. That said, it's also important to note that BMP implementation represents a crucial linkage to Level 4 Outcomes. That is, reductions in pollutants or flows from targeted sources can't be estimated without at least a partial understanding of BMP implementation.

Outcome Level 4: Source Reductions. Outcome Level 4 addresses two distinct but related types of targeted change: 1) reductions in the discharge of pollutants from sources, and 2) reductions in flow rates and volumes from sites. This latter category is generally associated with selected development and redevelopment activities, but it has the potential to be applied to other program components in the future. (These Outcomes are not addressed in the current CASQA Guidance because it predates the widespread application of new program elements requiring them.) Both types of reduction share a goal of producing corresponding improvements in MS4 discharges and receiving waters.

Outcome Level 4 is considered by many to be the most challenging part of the assessment puzzle. One reason is that there are a limited number of ways to approach measuring source reductions, and all of them have inherent limitations. Pollutant loads from some BMPs such as street sweeping, MS4 cleaning, and used oil and

household hazardous waste collection can be directly measured because permittees usually have physical possession of the waste stream, but this doesn't apply much beyond these activities. (This is, of course, an oversimplification; a number of assumptions may need to be made to convert waste stream quantities to pollutant loads.) Pollutant and flow reductions can also both be monitored, but the best opportunities are usually for sites with large treatment controls, or where representative monitoring programs already exist. A third approach is to calculate reductions using known results, assumed parameters, or a combination of the two. Calculated reductions often require a heavy reliance on assumptions (e.g., numbers of BMPs, rates of application, pollutant removal efficiencies, or pollutant concentrations in site runoff or effluent), but even where assumptions can be augmented with data from surveys or special investigations, estimates still tend to have the greatest value for making broad comparisons over time or determining where resource allocations are likely to be most useful. An important future focus will be developing consensus on the most useful Level 4 approaches and the highest priority sources to employ them on.

Urban Runoff and Receiving Water Assessment (Outcome Levels 5 and 6) is the use of environmental data and related information to characterize the quality and hydrologic characteristics of stormwater discharges and the water bodies that receive them. This area of assessment is distinct from Target Audience and Source Assessment in that its focus is on the impacts of discharges once they enter or leave the MS4.

Outcome Level 5: Runoff Quality & Hydrology. Level 5 Outcomes apply exclusively to MS4s. When Congress amended the CWA to permit MS4s in 1986, it made a deliberate decision to treat them as point sources, imposing a very broad responsibility on managers to ensure the quality of discharges into and from these systems. Phase I California permits have recently added requirements to mitigate flows from upstream development and redevelopment sites and to ensure that they don't cause downstream erosion and sedimentation problems in receiving waters. Level 5 Outcomes provide a direct linkage between upstream sources and receiving waters, and as such are a critical expression of how well these responsibilities are being met.

Monitoring programs have recently been modified to increase their emphasis on characterizing the quality of discharges from MS4s, and this has coincided with more recent changes in some permits to impose "action levels" on these discharges. Taken as a whole, it appears that Level 5 Outcomes will continue to play an increasingly important role in the evaluation of MS4 programs. However, this type of analysis is complicated by a variety of factors such as the comingling of discharges, characteristics and timing of storm events, wind patterns, and economic activity. While this makes it difficult to differentiate the contributions of individual upstream sources or to relate them to receiving water impacts, the central importance of discharge characteristics to interpreting program success underscores the importance of continuing to focus on them in the future.

Outcome Level 6: Receiving Water Conditions. The fundamental objective of MS4 programs is the protection of water bodies receiving discharges from MS4s. Level 6 Outcomes can provide managers the data and information necessary to determine the overall success of their programs. Receiving water conditions can be evaluated in a variety of ways, including comparison of monitoring results to benchmarks, compliance with water-quality standards, protection of biological integrity, and beneficial use attainment. Each of these

approaches presents its own issues and challenges for monitoring design, representative data collection, and interpretation of results. In California, most Phase I programs have had extensive monitoring programs in place for at least 15 years. Although these programs provide a fairly extensive record of receiving water data and results, they continue to evolve with each permit reissuance. A significant change is the recent modification of some reissued permits to add requirements to monitor potential hydromodification impacts from significant development and redevelopment sites. As with Level 5 analysis, receiving water assessment will continue to be confronted by existing and new challenges, ensuring that it will remain a work in progress into the foreseeable future.

Integrated Assessment (Outcome Levels 1 through 6). The three types of assessment described above have a predominant focus on improving the measurability and interpretation of individual Outcome Levels; in contrast, Integrated Assessment focuses on understanding the relationships between them. This is a particularly challenging task because of the many variables that can complicate our understanding of correlative or causal relationships. The most important of these is simply the number of different program activities converging on individual target audiences and behaviors. For example, while it might be shown relatively easily that residents are increasing their use of integrated pest management practices, it's another matter to demonstrate which of the multiple program activities that targeted these changes, or which influences outside of the MS4 program, actually caused them to occur.

Considered very broadly, Integrated Assessment addresses the relationship between program implementation and receiving water conditions. But, to foster real progress, efforts must necessarily address numerous other, more narrowly prescribed objectives such as the relationship of program implementation to targeted changes in awareness or behavior, or that of individual behaviors to pollutant load reductions. For the present and near future, Integrated Assessment will have to focus on discrete and achievable objectives; lining up these results to draw larger conclusions will be a longer-term endeavor.

The Road Ahead

Up to this point, we've provided a cursory introduction to some of the key issues and concepts shaping the development of effectiveness assessment approaches in California. We believe that program effectiveness assessment is an indispensable discipline within the stormwater management field—and that, through the application of the scientific principles of measurability, repeatability, predictability, and causality to management practices, these approaches will provide solutions to many existing measurability and effectiveness problems. However, we're also mindful of the challenges that lie ahead. Some aspects of MS4 programs will continue to elude measurability well into the future, if not permanently. For reasons already described, the quantification of load reductions from many pollutant sources and the establishment of causal relationships between different outcome types (e.g., between outreach conducted and the implementation of BMPs by target audiences) will remain particularly challenging.

Albert Einstein presciently anticipated the complexity faced by MS4 program managers when he said "Not everything that can be counted counts, and not everything that counts can be counted." In this respect, it's useful to emphasize the difference between measurement and assessment. Measurability means that something can be computed or estimated (e.g., 100 industrial inspections conducted),

but assessment requires that measurements also be given a context for interpretation (e.g., that completion of 100 of 125 targeted inspections constitutes 80% success).

It's this simple distinction that can add value to results, but it also leads us to more difficult questions about how to determine whether a program is effective. In particular, where should we set our goals, and what level of effort or performance constitutes success? From a strict compliance standpoint, many of these answers have at least been partially answered through the specificity or "prescriptiveness" of existing permit requirements. But that situation has begun to change as programs have been more closely scrutinized and permitting agencies have continued to impose new performance standards. These changes bring to light important questions about whether the emphasis of permitting approaches should be primarily implementation based, achievement based (i.e., discharge or water quality), or a combination of the two. Ironically, the convergence of these factors may have added more confusion than clarity to an already complicated situation.

In California, MS4 programs have historically focused on reducing pollutants in stormwater discharges and urban runoff to the maximum extent practicable. Most observers have understood MEP to constitute an iterative "ratcheting down" toward eventual compliance with water-quality standards, but mounting frustration throughout the 1990s led many to conclude that the vagueness of the MEP standard was undermining the accountability that the CWA was intended to establish. Today, all Phase I MS4 permits in California retain the MEP standard, but since the mid-1990s they've also specifically prohibited discharges from MS4s that cause or contribute to the violation of water-quality standards. Moreover, some recently adopted permits have begun to incorporate "action levels" for MS4 discharges, bringing into the mix what many contend is the beginning of the incorporation of water-quality-based effluent limits. (For example, see Section C and D within Order No. R9-2009-0002 at www.waterboards.ca.gov/sandiego/water_issues/programs/stormwater/docs/oc_permit/updates_012710/FINAL_R9_2009_0002.pdf.)

The message is clear, but the meaning less so. Accountability and enforceability are clearly at a premium, and tougher performance standards seem to be the preferred method of achieving them, possibly leading some observers to question the value of investing new effort into the continued improvement of assessment methods. In essence, if water-quality improvements can be mandated through stricter standards, why not just do so? We believe that such a position is unsupported by experience, and that even the most stringent performance standards will fall short if they fail to produce corresponding programmatic improvements. In short, without the targeted feedback that can be provided through expanded program effectiveness assessment efforts, it will be difficult to achieve the significant water-quality improvements we'd like to see in the future.

We should also consider the fact that MS4 programs aren't static. In particular, the increasing influence of watershed management as an organizing principle is likely to have a strong influence on the way we approach assessment in the future. Certainly, all of the concepts and methods developed through CASQA to date are intended to be scalable. While jurisdictionally based programs have traditionally tended to be preventive and generically applied across broad source categories, watershed programs are typically more water-quality-based, i.e., specifically targeted to identified water-quality problems. Certainly, the most obvious benefit of conducting watershed-based effectiveness assessments is the increased potential for aligning source management

strategies to observed urban runoff and receiving water conditions. This has important implications in particular for the refinement of integrated assessment approaches in the future. Because of their potential for decreasing the distance between the six levels of outcomes, watersheds may well end up being the future testing ground for many of our integrated assessment methods.

In closing, the role of effectiveness assessment as an inseparable part of a larger planning and implementation process should once again be emphasized. Assessment and program design are two sides of the same coin, linked in an ongoing, iterative cycle of planning, implementation, feedback, and adjustment. In the end, the greatest benefit of keeping a steady gaze on effectiveness assessment is the insight it provides into the design and execution of MS4 programs. Looking back, opportunities to better define and utilize assessment methods have clearly been missed. Clean Water Act requirements are blameworthy not so much in the lack of specific guidance they provide for assessing MS4 programs, but in the implicit expectation that those details would have been subsequently developed through regulation and permitting. This task is clearly much more complex than could have been anticipated when Congress amended the CWA in 1987 or when the EPA promulgated Phase I regulations in November 1990. (In the Water Quality Act of 1987, Congress required that industrial stormwater dischargers and municipal separate storm sewer systems obtain NPDES permits by specific deadlines; in November 1990, EPA adopted Phase I regulations requiring NPDES permits for stormwater discharges from certain industrial and construction sites.) In the intervening years, state and local governments and the regulatory community have struggled with this challenge. Through CASQA and others, we now have a chance to put our heads together and improve on this. Certainly, opportunities to address existing and future technical and design considerations are directly impacted by the staffing and economic resources that can be brought to bear on them, but managers and regulatory agencies alike should embrace this opportunity because it will drive corresponding improvements to our programs that move us closer to the vision of water-quality protection and improvement that we all share.

For more information, or to become involved in the future development of effectiveness assessment strategies, please contact Jon Van Rhyn at Jon.VanRhyn@sdcountry.ca.gov or Karen Ashby at karena@twa.com.

References

- US Environmental Protection Agency. 2007. *MS4 Program Evaluation Guidance*. EPA-833-R-07-003, January 2007. Available at <http://cfpub.epa.gov/npdes/stormwater/munic.cfm>.
- US Environmental Protection Agency. 2008. *Evaluating the Effectiveness of Municipal Stormwater Programs*. EPA 833-F-07-010, January 2008. Available at <http://cfpub.epa.gov/npdes/stormwater/munic.cfm>. ○

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