

Chapter 3: Program Effectiveness Assessment

3-1 INTRODUCTION AND OVERVIEW

Evaluation of the Sacramento Stormwater Management Program (Program) is required by the Stormwater Permit and is necessary in order to:

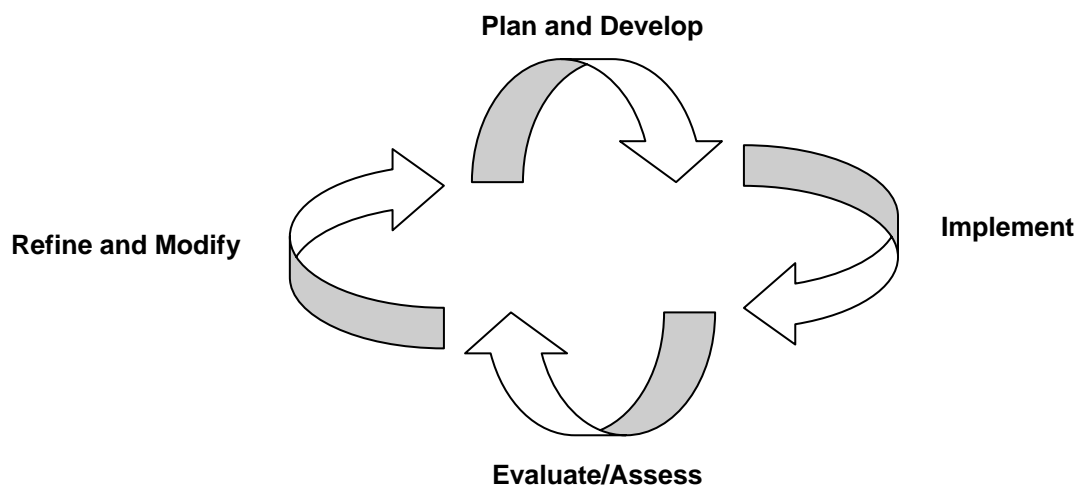
- Demonstrate compliance with the permit, which is designed to reduce pollutants in stormwater discharges to the maximum extent practicable (MEP) and ensure that these discharges do not cause or contribute to violations of water quality standards established for local rivers and creeks.
- Assess effectiveness of the Program at meeting the MEP and water quality standard goals, including, where possible, providing direct or surrogate measurements of water quality and changes in awareness and behavior as a result of the overall Program or individual actions.
- Provide data and feedback for informed management decisions related to ongoing Program improvement to satisfy these goals and ensure effective, efficient use of public funds.

Evaluation of the City of Sacramento Stormwater Management Program

- *Demonstrates compliance with the Stormwater Permit.*
- *Assesses Program effectiveness at meeting permit, MEP and water quality standard goals.*
- *Provides Program management with feedback for better decision-making and efficient use of public funds.*

This continuous feedback loop is described more below in the context of the iterative process. The Permittees rely on this process as illustrated in Figure 3-1 to better understand and improve their efforts to protect water quality.

Figure 3-1 Stormwater Program Iterative Process



Effectiveness assessments provide an integral part of this cyclic process, where actions are planned, implemented, assessed, and refined in repeated cycles until a certain accomplishment or goal is achieved. This chapter presents the assessment strategy used by the Permittees (also collectively referred to as the Sacramento Stormwater Quality Partnership, or SSQP in this chapter), results of the assessment of third permit term activities, and proposed assessment methods for the fourth permit term.

3-2 ASSESSMENT STRATEGY

The SSQP evaluates the Program on various tiers, moving from a holistic program-wide evaluation to assessment of specific activities:

- **Overall Program** – *Permit term evaluation* conducted by the SSQP and submitted with the Report of Waste Discharge/ National Pollutant Discharge Elimination System (NPDES) permit application, 180 days prior to expiration of the current permit term.
- **Program Element** – *Annual evaluations* conducted by individual Permittees and reported in individual Permittee Annual Reports, except for Monitoring, Target Pollutant and Regional Public Outreach Elements, which are joint efforts by the SSQP. Evaluations of these three elements are included in the Joint Program Annual Report.
- **Activity, Task, Project, or BMP** – *Ongoing/periodic evaluations* conducted mainly by individual Permittees with annual summaries reported in individual Permittee Annual Reports. In addition, special studies of selected projects and BMPs are often undertaken by the SSQP, and results are reported in the Joint Program Annual Report.

This basic assessment strategy was used during the third permit term and will be continued into the fourth term. However, the approaches and methods have been refined using guidance provided by the California Stormwater Quality Association (CASQA) as described in the next section. Annual reports will continue to be used as the primary mechanism for summarizing effectiveness assessment results.

CASQA ASSESSMENT APPROACH

This section provides background and briefly describes the new CASQA approach to assessing program effectiveness. The CASQA document, *Effectiveness Assessment Guidance*,¹ was created by a committee of experienced stormwater professionals as a tool for use statewide by stormwater program managers in evaluating their programs. An understanding of these concepts and terms is necessary before proceeding to the rest of this chapter.

Performance Goals

CASQA defines a performance goal as a design objective or goal that quantifies the progress of program implementation and the performance of the activities. Performance measures typically identify the level of effort required. In other words, the performance measure is the desired outcome.

Outcome Levels

A program or activity is effective if it is producing a desired outcome. Figure 3-2 below shows that outcomes can be characterized in terms of six levels and illustrates the progression of each successive level toward the ultimate goal of environmental improvement. In general, Levels 1, 2 and 3 have *implementation endpoints*; Levels 5 and 6 have *water quality endpoints*; and Level 4 reflects a combination of the two.

Figure 3-2: General Classification of Outcome Types (CASQA, 2007)



Table 3-1 on the following page provides additional information about each level. While each level has value in informing management decisions, it bears emphasis that not all are necessary or possible in every instanceⁱⁱ. It will not be possible to measure changes in awareness, behavior or water quality for some Program Elements and activities undertaken as required by the Stormwater Permit. Indeed, some activities will never move beyond Level 1. However, this does not mean that the activity was not meaningful and did not contribute toward the ultimate goal in some way.

Types of Effectiveness Assessments

In assessing the effectiveness of a stormwater program using the outcome levels described above, it is helpful to differentiate between assessment types. The CASQA *Effectiveness Guidance* document recognizes three types: implementation, water quality and integrated, described in Table 3-2, on page 3-4. It should be recognized that evidence of positive environmental outcomes can be elusive because: (1) water quality changes in response to program implementation are likely to be very slow; and (2) establishing a link between receiving water condition and program activities is difficult at the watershed scale when programs are being implemented incrementally.

Baseline or Reference Conditions

Effectiveness assessment beyond Outcome Level 1 requires the establishment of a set of baseline (reference) conditions. Thereafter, effectiveness can be determined by comparing successive years of indicator information against the baseline data. This is not possible for the first few years of a new program because there is insufficient data with which to establish the baseline condition.

Table 3-1: Goals and Examples for Outcome Levels

Outcome Level	Goal	Example Evaluation Measures
Level 1 – Document Activities	Program development and implementation and basic compliance with the NPDES Stormwater Permit.	<ul style="list-style-type: none"> • # training events • # media impressions • new program implemented • brochure created or translated • # brochures distributed
Level 2 – Raise Awareness	Raise a target audience’s awareness and understanding of an issue.	<ul style="list-style-type: none"> • % residents who know that stormwater runoff is not treated • % inspectors who understood concepts presented
Level 3 – Change Behavior	Change a target audience’s behavior which results in the implementation of actions related to stormwater pollution prevention.	<ul style="list-style-type: none"> • % construction sites with erosion and sediment controls in place • % businesses with BMPs in place • adoption of new agency policies and standards re: WQ protection
Level 4 – Reduce Pollutant Loads	Reduce the load of pollutants from sources into the municipal storm drain system. Can be real (measured) or estimated.	<ul style="list-style-type: none"> • amount of material removed from streets by street sweepers • quantity of used oil collected • estimates of sediment kept on-site due to use of erosion controls.
Level 5 – Improve Discharge Quality	Improve the quality of stormwater/urban runoff discharges from the municipal storm drain system to the receiving water.	<ul style="list-style-type: none"> • decrease in pollutant levels measured at a particular outfall
Level 6 – Protect Receiving Water Quality	Protect receiving water from adverse impacts caused by discharges.	<ul style="list-style-type: none"> • decrease in pollutant levels (typically associated with urban runoff) in rivers/creeks • improvement in biota richness

Table 3-2: Assessment Types

Type	Description	Outcome Level	Notes
Implementation	The analysis of the effectiveness of a program element or activity at meeting desired programmatic outcomes or goals	1-4	Typically focus on specific activities such as inspections and maintenance.
Water Quality	Use of environmental data and related information to characterize the quality of stormwater discharges and the water bodies receiving such discharges.	5-6	Can include a variety of chemical, biological and physical parameters or outcomes. Usually requires extended periods of monitoring to yield statistically significant results.
Integrated	The process of evaluating if program implementation is resulting in the protection or improvement of water quality.	all	In this process, relationships between program activities and water quality improvements are explored. Can be difficult due to external factors outside of permittees’ control.

Assessment Methods

CASQA identifies seven methods that can be used for assessing effectiveness, which are described in Table 3-3 below. A program element manager may choose to use other methods not shown on this table.

Table 3-3: Assessment Methods Suitable for Various Outcome Levels

Assessment Method	Description	1- Document Activities	2- Raise Awareness	3- Change Behavior	4 – Reduce Loads	5 – Improve Discharge Quality	6- Protect Receiving Waters
Confirmation	Document that an activity has been completed.	•					
Tabulation	Track the number of actions or items associated with an activity.	•	•	•			
Surveys	Gain specific information about a group or representative sample of the group.		•	•			
Inspections/ Observations	Determine if desired actions are being taken/outcomes are being achieved.	•	•	•	•		
Reporting	Allow target audience to report back via various reporting mechanisms.	•	•	•	•		
Quantification	Track quantities or estimate pollutant loadings.				•	•	•
Monitoring	Collect representative environmental samples and analyze to measure changes.				•	•	•

3-3 ASSESSMENT OF THIRD PERMIT TERM ACTIVITIES

Assessment and Reporting Methods

During the third permit term, efforts were evaluated using performance and effectiveness measures.

- *Performance measures* were designed to measure level of effort such as the number of staff assigned to the Program, number of public events attended, or number of brochures distributed.
- *Effectiveness measures* were intended to measure the degree to which a particular effort is successful (e.g., the percentage increase in public awareness as measured by public opinion surveys). In some cases, effectiveness measures were used to directly assess an activity's environmental benefit (e.g., measuring the amount of pollutants removed by pump station cleaning quantified the pollutants that otherwise would have been discharged downstream to a local receiving water).

The Work Plans submitted by the Permittees each May 1 during the third permit term outlined performance standards (essentially the activities and BMPs prescribed by the 2002 Stormwater Permit). The Work Plans also proposed evaluation measures to track efforts related to each activity during the upcoming fiscal year.

The Annual Reports submitted on October 1 each year reported on the Permittees' ability to satisfy the performance standards (i.e., complete the activity/BMP). In preparing the Annual Reports, records and data were compiled and analyzed from various internal departments in each Permittee's organization. Accomplishments were reported in the Annual Reports in terms of performance standards. For example, if the performance standard was to make 2.3 million impressions per year (i.e., 2.3 million people reached) via media outreach, the Annual Report listed the methods of media outreach conducted and the actual number of impressions made.

Discharge Characterization

The SSQP performs a detailed characterization of its urban discharges once every permit term. The characterization includes pollutant loading estimates, hydrology analysis and trend assessment. This analysis has been performed as a requirement of the 2007 Report of Waste Discharges/NPDES Permit re-application (ROWD) and is included in Appendix J of the SQIP.

The following can be shown from the current discharge characterization:

- Urban tributary monitoring has shown that concentrations of chlorpyrifos and diazinon have been reduced below WQO, largely due to pesticide registration changes.
- Urban runoff results show that results from the 2002-2007 monitoring period are lower than those from the 1990-2002 period for key constituents (i.e. cadmium, copper, lead and mercury). See Table 1 in Appendix E for complete list.
- Although river monitoring results haven't shown any significant trends during this permit term, there have been relatively few WQO exceedences during this period.

Overall SSQP Evaluation

In most instances, due to the prescriptive nature of the last permit, the SSQP has focused on implementation and compliance rather than effectiveness. Activities have been largely implemented and assessed at Levels 1 and 2, with little effort to assess Level 3 behavior changes and Level 4 load reductions, which will be areas of focus during the coming permit term.

From a compliance standpoint, the SSQP has been very successful at performing all of the outreach, inspections, trainings, studies, and monitoring required. As previously mentioned, the focus in the next permit term will be to perform trainings and inspections, with an eye toward specifically measuring behavior changes and then measuring or estimating the resultant load reduction.

The goal of the SSQP outreach program has always been to change behavior and measure the change through surveys compared to a baseline. Substantial progress has been made with the City's English-speaking audience. This will continue, but will be supplemented with efforts to focus program outreach, based on survey results, on non-English-speaking groups that have not been effectively reached in the past.

Since the early 1990s, one goal of the SSQP has been to have the capacity to measure trends in discharge and receiving water quality. The Permittees will be in a position in the next permit term to demonstrate those trends, if they exist. Improvements have occurred in overall discharge and receiving water concentration levels of lead and OP pesticides, but these are the exceptions. Most other pollutants show no statistical trends one way or another. During the next permit term, the SSQP will have 20 years of monitoring data. At that point, the Permittees hope to be able to show statistically significant trends.

In the late 1990s, the SSQP performed an analysis to determine pollutants of concern, or "target pollutants," with the end to focus precious resources on the reduction of these pollutants. The focus of the past permit term was largely pesticides and mercury. In the upcoming permit term, the SSQP will continue to focus on these target pollutant reduction activities and also on other metals and bacteria.

More effectiveness assessment information for each element will be included in Chapters 4 through 7 of the SQIP.

3-4 ASSESSING PROGRAM EFFECTIVENESS DURING FOURTH PERMIT TERM

The SSQP used CASQA's new *Effectiveness Assessment Guidance* as a reference guide in developing a strategy for fourth permit term assessments, as defined in this section.

Overall Program Assessment

As in past years, the SSQP will evaluate the overall program as part of the process to prepare the Report of Waste Discharge/NPDES Permit application during the fifth year of the permit term.

The main component of this assessment will be another discharge characterization (analysis of the previous 4 years' chemical and biological data, and trends assessment). To the extent possible, the SSQP will conduct an integrated assessment, whereby program implementation data are correlated with environmental results, to answer the question: "Is program implementation resulting in improvements in receiving water health?"

Program Element and Activity Assessment

An assessment strategy is presented in this SQIP for each of the program elements. This strategy follows the following steps, as outlined with an example in Table 3-4 on pages 3-9 and 3-10:

- **Step 1 - Identify the performance measure or desired goal.** A performance goal is a design objective or goal that quantifies the progress of program implementation and the performance of the activities and typically identifies the level of effort required. For this step, determine what change is being sought by the Program Element or activity.
- **Step 2 - Identify the outcome level** for the performance goal.
- **Step 3 - Determine the focus of the assessment.** Determine who or what the target of the assessment is.
- **Step 4 - Select the assessment method(s).** Decide which of the assessment methods shown in Table 3-3 (or some other method) is most appropriate for the assessment target and which can be used to determine if the performance goal is being achieved.
- **Step 5 - Establish baseline/reference conditions.** Define baseline data needs and put mechanisms in place to collect that data .(This is applicable to Outcome Levels 2-6, but not to Level 1.)
- **Step 6 - Interpret and report the information.**
- **Step 7 - Recommend program changes if warranted.** This is part of the iterative process described earlier in Figure 3-1.

3-5 FUTURE UPDATES TO THE SSQP ASSESSMENT STRATEGY

While program effectiveness assessment is a key step in the iterative process of program implementation, it should be recognized that effectiveness assessment tools are still evolving. Assessing program effectiveness is considered a challenge for program managers across California, and the SSQP supports CASQA's efforts to develop and refine statewide guidance tools. As CASQA publishes additional information, and as the SSQP implements the assessment strategy further refinements may be made. Changes could also be made based on feedback from the California Regional Water Quality Board, Central Valley Region (Regional Board), including the results of any future regulatory audits.

**Table 3-4: Proposed Effectiveness Assessment Strategy
Industrial/Commercial Element (Example)**

Activity Task	Performance Goal (Step 1)	Outcome Level (Step 2)	Focus (Step 3)	Assessment Method (Step 4)	Baseline Information (Step 5)
Legal Authority					
Stormwater ordinance	Adopt revisions as needed	1	City Council, Department Managers	Confirmation - report revisions in AR	NA
Inventory					
List of Priority Industries-inspection	Develop List; Refine as needed	1	Agency Staff	Confirmation - report revisions in AR	NA
	Increase in facilities with no exposure of pollutants	3	Facility Operators	Tabulation – Track number of industries de-listed due to no exposure	Previous year's data
List of Priority Industries - outreach	Develop List; Refine as needed	1	Agency Staff	Confirmation - report revisions in AR	NA
Data Management					
Create/Maintain IIP database (EMD)	Create database Update annually	1	Agency Staff	Confirmation - include updated list in AR	NA
Create/Maintain database: non-EMD facilities	Create database Update annually	1	Agency Staff	Confirmation - include updated list in AR	NA
Create/Maintain business outreach database	Create database Update annually	1	Agency Staff	Confirmation - include updated list in AR	NA
Inspections					
Develop IIP (EMD)	Develop IIP Adopt fee ordinance Improve program as needed	1		Confirmation - report program/ordinance revisions in AR	NA
Conduct IIP inspections (EMD)	Inspect listed industries at least once every 3 years	1		Confirmation - report on completion of next cycle, 2007-10	NA
	Increase in facility operators' pollution prevention awareness	2	Facility operators	Survey Tabulation- Track web site hits; requests for CABs Inspections-follow up inspection results	Previous Year's Data
Enforcement					
Develop enforcement policy (EMD)	Create/adopt policy; revise as needed	1		Confirmation-report revisions in AR	NA
Develop enforcement policy	Create/adopt policy; revise as needed	1		Confirmation-report revisions in AR	NA
Issue NOVs to non-compliant facilities	Document/quantify enforcement actions	1		Confirmation-Report no. NOVs issued in AR	NA

Table 3-4: Industrial/Commercial Element (Example) – continued

Activity Task	Performance Goal (Step 1)	Outcome Level (Step 2)	Focus (Step 3)	Baseline Information (Step 5)	Assessment Method (Step 4)
	Decrease in NOVs as behavior changes	3	Facility operators	Previous inspection cycle results	Tabulation- results of 2007-10 inspection cycle
Issue fines when NOVs are not effective	Document/quantify fines	1		NA	Confirmation-Report total fines assessed in AR
	Decrease in fines assessed as behavior changes	3		Previous inspection cycle results	Tabulation- total fines issued during 2007-10 inspection cycle
Outreach					
Produce/distribute educational materials	Document/Quantify materials	1		NA	Confirmation-Include revised/new materials in AR; report no. materials distributed
Conduct targeted outreach	Increased awareness of pollution prevention	2	Facility operators	Survey results indicating percentage of targeted businesses knowledgeable about pollution prevention BMPs	Subsequent Surveys
Conduct training	Conduct at least one workshop/year	1		NA	Confirmation-Report no. workshops held, no. people reached in AR
	Increased awareness of pollution prevention	2	Facility operators, Agency inspectors	Survey results indicating percentage of targeted businesses knowledgeable about pollution prevention BMPs	Survey – Simple pre and post training quizzes
	Increased requests for training				
Clean Water Business Partner Program	Increased participation in the CWBP	2,3	Business owners	Number of businesses participating during previous year	Tabulation – Track % of businesses participating in CWBP (compare to no. businesses that could qualify, according to outreach database)

ENDNOTES

ⁱ California Stormwater Quality Association (CASQA), *Effectiveness Assessment Guidance*, January 2007.

ⁱⁱ CASQA, “An Introduction to Stormwater Program Effectiveness Assessment” (whitepaper), 2005. Available at www.casqa.org.