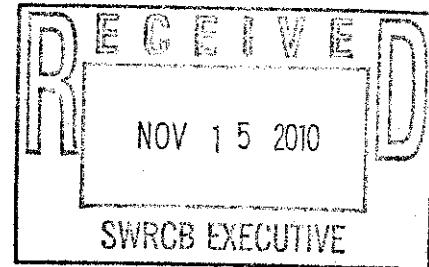


Public Comment  
Effective Assessment Doc  
Deadline: 11/30/10 by 12 noon

**From:** Adam Fischer  
**To:** commentletters@waterboards.ca.gov  
**Date:** Monday, November 15, 2010 1:58 PM  
**Subject:** Comment Letter - Effectiveness Assessment Document  
**Attachments:** PEA flowchart.PDF; effctve\_assmnt.PDF

Please find attached the Effectiveness Assessment Document containing comments and suggested edits. Attached also is a flowchart representing a performance improvement-based method for conducting assessments, which to some extent, forms the basis of many of the edits and comments. Thank you and good luck. --Adam

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## EXECUTIVE SUMMARY

1  
2  
3  
4 The federal Clean Water Act requires that discharges from large and medium municipal  
5 separate storm sewer systems (MS4) be in compliance with National Pollutant Discharge  
6 Elimination System (NPDES) permits. The Clean Water Act further requires that the  
7 discharge of pollutants from the MS4 is to be reduced to the "maximum extent  
8 practicable" (MEP). The NPDES permits for MS4s, adopted by the Regional Water  
9 Quality Control Boards (Regional Water Boards) require the municipalities to implement  
10 various programmatic elements that have the goal of reducing the pollutants in the storm  
11 water discharges.

12  
13 One of the challenges that the Regional Water Boards, municipalities implementing  
14 storm water programs and the public have faced when reviewing program  
15 implementation, is assessing whether or not the programs are in fact improving water  
16 quality. ~~Assessment of a program as a whole and linking activities conducted with water~~  
17 ~~quality improvement~~ are difficult tasks. ~~And it may not be possible to immediately~~  
18 ~~assess a program as a whole, but it is possible to begin assess the program using a system~~  
19 ~~of tiers or levels~~ that eventually lead to an assessment of the program as a whole.

20  
21 This paper lays out a framework for assessing the effectiveness of MS4 program  
22 implementation as a whole, rather than looking at the individual programmatic elements.  
23 By assessing the program as a whole, the assessments move from counting "outputs"  
24 (how many inspections were conducted) to looking at "outcomes" (was water quality  
25 improved?).

26  
27 It is worth noting that ~~while the determination of~~ whether or not water quality is  
28 improving as a result of storm water program implementation may take years, efforts  
29 need to be taken now in order to begin the process of evaluating the storm water program  
30 implementation as a whole in order to better understand the relationships between  
31 implementation and water quality.

32

33 **Guidance for Assessing the Effectiveness of Municipal Storm Water Programs and**  
34 **Permits**

35  
36 **I. Purpose of this Guidance Document**

37 The purpose of this guidance document is to assist the State Water Resources Control  
38 Board (State Water Board) and Regional Water Quality Control Boards (Regional Water  
39 Board) (collectively, Water Boards) in establishing effectiveness assessment  
40 requirements in municipal storm water permits and programs. It establishes standardized  
41 concepts and terminology, presents a general framework for conducting assessments, and  
42 identifies issues to be considered in exploring and adopting specific permit conditions for  
43 assessment. This document does not, and is not intended to provide guidance on  
44 substantive implementation requirements to be included in municipal storm water  
45 permits. Such guidance would be beyond the scope of this document. In accordance  
46 with the requirements of Water Code section 13383.7 (added by Assembly Bill 739,  
47 Chapter 610 of the Statutes of 2007 [Attachment A]), this document promotes the use of  
48 quantifiable measures for evaluating the effectiveness of municipal storm water programs  
49 and provides for the evaluation of all of the following:

- 50  
51 ■ "Compliance with storm water permitting requirements;  
52 ■ "Reduction of pollutant loads from pollution sources;  
53 ■ "Reductions of pollutants or stream erosion due to storm water discharge; and  
54 ■ "Improvements in the quality of receiving water in accordance with water quality  
55 standards."

56  
57 While the primary purpose of this document is to provide Water Board staff with the  
58 tools needed to assess effectiveness, storm water program managers within local agencies  
59 can also use the principles found in this document to assess the effectiveness of their  
60 program implementation.

61  
62 **II. Introduction**

63 In California, there are currently 26 municipal storm water permits for large and medium  
64 municipal separate storm sewer systems (Phase I MS4 permits). Collectively, the Phase I  
65 permits address the storm water discharges from approximately 300 cities, counties and  
66 special districts. A number of these permits have already incorporated, or are in the  
67 process of incorporating, specific assessment requirements. In 2003, the State Water  
68 Board adopted a general storm water permit for small municipal storm sewer systems  
69 (Phase II MS4 permit), which addresses municipal areas with populations less than  
70 100,000 that are either located within a census-defined "urbanized area" or designated as  
71 subject to permit pursuant to the terms of the Phase II MS4 permit.

72  
73 Many of the current Phase I MS4 permits require effectiveness assessment evaluations.  
74 As seen in Attachment B (excerpts from selected MS4 permits), the requirements vary  
75 from permit to permit, with no clear guidance to the permittees on conducting  
76 assessments.

77

78 The MS4 permits require the implementation of programs that have many substantive  
79 elements, including, but not limited to: public education and outreach; commercial,  
80 industrial and construction activities inspection; illegal connection/illicit discharge  
81 detection and elimination; and post-construction storm water controls. The Water Boards  
82 generally presume that the effective implementation of these programs will result in  
83 improved water quality. However, making the connection between program  
84 implementation and water quality improvement has been a challenge for regulators and  
85 permittees. ~~Water Board staff often evaluate program implementation activities, which  
86 do not always result in measurable water quality outcomes.~~

87  
88 Many of the Phase I MS4 permits require permittees to conduct an effectiveness  
89 assessment. However, the requirements vary from permit to permit and thus Regional  
90 Water Board staff does not typically conduct regionwide comparisons of permittees'  
91 programs. ~~Likewise, permittees generally do not conduct regionwide or statewide  
92 comparisons of programs.~~ Having a consistent statewide framework for effectiveness  
93 assessments will be critical to determining the water quality benefits of these programs.  
94

95 The California Stormwater Quality Association (CASQA) described "effectiveness  
96 assessment" in a 2005 white paper titled "An Introduction to Stormwater Program  
97 Effectiveness Assessment" as follows:  
98

99 *Effectiveness assessment is a fundamental and necessary component of*  
100 *developing and implementing successful programs. It begins with the*  
101 *establishment of goals, objectives, and desired outcomes during program*  
102 *planning, and continues throughout subsequent implementation and review*  
103 *stages. A well-executed assessment element can provide managers the feedback*  
104 *necessary to determine whether their programs are achieving intended outcomes*  
105 *(complying with permit requirements, increasing public awareness, changing*  
106 *behaviors, etc.), and ultimately whether continued implementation will result in*  
107 *water quality and/or habitat improvement.*

108  
109 *Storm water managers currently find themselves at an important crossroads.*  
110 *Faced with a continually increasing need to demonstrate measurability and*  
111 *accountability, they must have a reasonable expectation of success before*  
112 *committing resources toward specific activities. Therefore, good effectiveness*  
113 *assessment tools are critical. Managers have historically relied on a combination*  
114 *of programmatic or implementation evaluations and direct water quality*  
115 *evaluations to determine whether their efforts are effective in achieving intended*  
116 *outcomes. In addition, some program managers are still in need of basic*  
117 *information on useful assessment methods.*

118  
119 As noted earlier, many Phase I MS4 permits require permittees to conduct an  
120 effectiveness assessment of their storm water programs. However, the permits have not  
121 been consistent in specifying how to conduct these assessments. Many of the  
122 assessments conducted in the early phases of program implementation focused on  
123 measuring the success of education and outreach efforts. While these are important, it is

124 also important to assess both permit compliance and also whether the other program  
125 elements are improving water quality.

126  
127 The tools to conduct effectiveness assessments of MS4 programs have been lacking. As  
128 a result, the Water Boards often use different criteria to evaluate MS4 programs. The  
129 lack of consistent criteria has led to the creation of various effectiveness assessment  
130 guidance documents. The most notable are:

- 131
- 132 ■ Monitoring to Demonstrate Environmental Results: Guidance to Develop Local  
133 Storm water Monitoring Studies Using Six Example Study Designs, published  
134 12/18/2008 (Center for Watershed Protection);
- 135 ■ Municipal Separate Storm Sewer System (MS4) Program Evaluation Guidance  
136 (EPA-833-R-07-003), published 01/01/2007 (U.S. Environmental Protection  
137 Agency); and
- 138 ■ The California Stormwater Quality Association (CASQA): Municipal Stormwater  
139 Program Effectiveness Assessment Guidance, published May 2007.

140  
141 Each of these documents fills a void relative to effectiveness assessment (Attachment C  
142 lists additional resources, but is not an exhaustive list.) ~~However, none of these meets~~  
143 the requirements of Water Code section 13383.7.

144  
145 ~~As outlined in~~ Water Code section 13383.7, “No later than July 1, 2009, and after holding  
146 public workshops and soliciting public comments, the State Board shall develop a  
147 comprehensive guidance document for evaluating and measuring the effectiveness of  
148 municipal storm water management programs undertaken, and permits issued, in  
149 accordance with Section 402(p) of the Clean Water Act and this division .... The state  
150 board and the regional boards shall refer to the guidance document... when establishing  
151 requirements in municipal storm water programs and permits.” ~~As specified in~~  
152 ~~Government Code section 11352, subdivision (e), “the development, issuance, and use<sup>22</sup>~~  
153 ~~of this guidance document is not subject to the administrative rulemaking provisions of~~  
154 ~~the California Administrative Procedures Act.~~

155  
156 This effectiveness assessment guidance is largely the result of the collective work of a  
157 sub-group of the Storm Water Advisory Task Force appointed by the State Water Board  
158 pursuant to Water Code section 13383.8 (added by AB 739). While it used the *Municipal*  
159 *Storm water Program Effectiveness Assessment Guidance* (CASQA, May 2007) as the  
160 foundation for this guidance, the sub-group relied upon its own expertise to adapt the  
161 broad concepts of the CASQA Guidance and other effectiveness guidance documents to  
162 meet the requirements of the statute.

163  
164 ~~Because effectiveness assessment is a developing discipline,~~ users are encouraged to  
165 consult the references listed in Attachment C for more detailed information. In several  
166 instances, the terminology and content presented in this guidance document are slightly  
167 modified from the CASQA Guidance and other references primarily because of new  
168 hydromodification requirements that have been added to many MS4 permits.

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### III. Overview of General Concepts

Effectiveness assessment is the process that managers use to evaluate whether their programs are resulting in desired outcomes, and how the achievement of outcomes in programs and implementing populations is related to MS4 discharges and receiving water conditions. This section introduces the main elements of effectiveness assessment and introduces standardized concepts and terminology.

#### A. Assessment Outcomes

Outcomes are end results associated with the implementation of storm water control measures, program activities or elements, or overall programs. Outcomes are essential to effectiveness assessment because they define specific measurement points to which storm water programs can be targeted, evaluated, and periodically modified. Outcomes can be broadly categorized according to six levels as described below and shown in Figure 1.

- Outcome Level 1: Storm Water Program Activities.** Many program activities are either required by or necessary to meet the requirements of storm water permits. For example, MS4 permittees are required to provide education and outreach, to inspect industrial facilities, and to enforce discharge prohibitions. Level 1 Outcomes can be outputs that provide a means of evaluating whether or not program activities are being implemented in accordance with permit requirements. They are essential to the effectiveness assessment process because they represent the means by which MS4 permittees influence or control other Outcome Levels.
- Outcome Level 2: Knowledge and Awareness.** An important goal of storm water programs is to increase the knowledge and awareness of target audiences such as residents, businesses, and municipal employees. Increasing awareness and changing attitudes about storm water pollution and control measures is generally assumed to be necessary as a basis for achieving targeted behavioral changes. Level 2 Outcomes provide a means of gauging whether outreach, training, or other facilitation activities are achieving progress toward these changes.
- Outcome Level 3: Behavior.** Level 3 Outcomes measure the effectiveness of programs in effecting changes in the behavior of target populations. A wide variety of behaviors are addressed by municipal storm water programs. For example, residents may be asked to pick up after their pets, or to reduce pesticide use in their gardens. Likewise, municipal employees may be required to modify road maintenance practices, or to install and maintain permanent post-construction structural BMPs.
- Outcome Level 4: Pollution Source Load Reductions.** Pollution load reductions are changes in the amounts of pollutants associated with specific sources before and after a BMP or other control strategy is employed. Because these reductions can directly impact the quality and quantity of MS4 discharges (Outcome Level 5) to receiving waters (Outcome Level 6), many storm water program activities are intended to reduce pollutant loadings from targeted sources or reduce/eliminate flows associated with non-storm water discharges.
- Outcome Level 5: MS4 Discharge Quality & Hydrology.** A primary focus of storm water management programs is to reduce to the discharge of pollutants to the

216 maximum extent practicable. Consequently, storm water must be effectively managed  
217 and non-storm water discharges must be effectively prohibited to ensure that these  
218 discharges do not cause or contribute to violations of water quality standards in  
219 receiving waters. In addition to improvements in storm water quality, the runoff being  
220 generated by a given sized storm and the rate at which it is discharged to and from the  
221 MS4 are factors that need to be considered in order to protect the receiving waters  
222 from stream erosion and other harm. Level 5 Outcomes are a critical expression of  
223 successful program implementation because they can provide a direct linkage between  
224 the sources regulated by storm water programs and the receiving waters they are  
225 intended to protect.

226  **Outcome Level 6: Receiving Water Conditions.** The overriding objective of storm  
227 water management programs is to protect the water bodies receiving discharges from  
228 MS4s. ~~Changes to receiving water and environmental quality may be expressed~~  
229 ~~through a variety of outcomes such as compliance with water quality standards,~~  
230 ~~protection of biological integrity, and beneficial use attainment.~~ Level 6 assessments  
231 may be complicated by the fact that receiving water conditions may reflect pollutants  
232 and flows discharged from sources other than MS4s.  
233  
234

DRAFT

Figure 1: Overview of Assessment Outcomes and Elements

Assessment Elements	Implementation Assessment	Target Audience & Pollutant Source Reduction Assessment	MS4 Discharge Effluent & Receiving Water Assessment
Outcome Levels and Types	<b>Outcome Level 1</b> Storm water Program Activities	<b>Outcome Level 2</b> Knowledge & Awareness	<b>Outcome Level 3</b> Behavior
	<b>Outcome Level 4</b> Pollutant Load Reductions	<b>Outcome Level 5</b> MS4 Discharge Quality & Hydrology	<b>Outcome Level 6</b> Receiving Water Conditions
	<ul style="list-style-type: none"> <li>▪ Program administration</li> <li>▪ Facilitation activities</li> <li>▪ Feedback activities</li> </ul>	<ul style="list-style-type: none"> <li>▪ Knowledge Awareness</li> </ul>	<ul style="list-style-type: none"> <li>▪ Information seeking</li> <li>▪ Pollution reporting</li> <li>▪ Participation and involvement</li> <li>▪ Administrative and procedural behaviors</li> <li>▪ Implementation of control measures</li> <li>▪ Regulatory compliance</li> </ul>
	<ul style="list-style-type: none"> <li>▪ MS4 Discharge quality</li> <li>▪ MS4 Discharge hydrology</li> </ul>	<ul style="list-style-type: none"> <li>▪ Pollutant loads</li> </ul>	<ul style="list-style-type: none"> <li>▪ Receiving water quality</li> <li>▪ Hydromodification impacts</li> <li>▪ Beneficial use protection</li> </ul>
	<ul style="list-style-type: none"> <li>▪ MS4 Discharge quality</li> <li>▪ MS4 Discharge hydrology</li> </ul>	<ul style="list-style-type: none"> <li>▪ MS4 Discharge quality</li> <li>▪ MS4 Discharge hydrology</li> </ul>	<ul style="list-style-type: none"> <li>▪ Receiving water quality</li> <li>▪ Hydromodification impacts</li> <li>▪ Beneficial use protection</li> </ul>
	<ul style="list-style-type: none"> <li>▪ Receiving water quality</li> <li>▪ Hydromodification impacts</li> <li>▪ Beneficial use protection</li> </ul>	<ul style="list-style-type: none"> <li>▪ Receiving water quality</li> <li>▪ Hydromodification impacts</li> <li>▪ Beneficial use protection</li> </ul>	<ul style="list-style-type: none"> <li>▪ Receiving water quality</li> <li>▪ Hydromodification impacts</li> <li>▪ Beneficial use protection</li> </ul>



237  
238 As shown in **Figure 2** (page 11), these six Outcome Levels collectively represent a gradation  
239 from storm water program activities (Level 1) to receiving water conditions (Level 6). It should  
240 also be noted that, while the Outcome Levels are presented in sequence, each is usually assessed  
241 independently. For example, awareness or knowledge is assessed independently of source load  
242 reductions even if an objective is to eventually evaluate the relationship of these or other  
243 outcomes. Although each Outcome Level has some value in informing management decisions,  
244 not all are necessary or possible in every instance. For example, knowledge (Level 2) is  
245 generally not an assessment endpoint where behavior (Level 3) can be directly measured (e.g.,  
246 through regulatory inspections).

## 247 **B. Assessment Elements**

248 As shown in Figure 1 above, a comprehensive assessment strategy will address four broad  
249 assessment elements – Implementation Assessment, Target Audience and Pollutant Source  
250 Reduction Assessment, MS4 Discharge Effluent and Receiving Water Assessment and an  
251 Integrated Assessment. These four elements take into account the six (6) outcome levels  
252 described above.  
253

- 254
- 255  **Implementation Assessment (Outcome Level 1)** is the analysis of the effectiveness of storm  
256 water programs in meeting required or targeted implementation objectives (completion of  
257 inspections, etc.). See Section IV.A for additional detail on Implementation Assessment.
  - 258  **Target Audience and Pollutant Source Load Reductions Assessment (Outcome Levels 2-  
259 4)** is the analysis of changes in the individuals, populations, and sites or sources to which  
260 program activities are directed. Examples of changes include increased knowledge, best  
261 management practice (BMP) implementation, and other behavioral changes of target  
262 populations. See Section IV.B for additional detail on Target Audience and Pollution Source  
263 Assessment. In addition, data gathered through direct measurement or estimated indirectly is  
264 analyzed in order to determine the existence of trends relative to pollutant source loads and  
265 any reductions occurring due to the implementation of best management practices. See  
266 Section IV.C for additional detail on Pollution Source Load Reduction Assessment.
  - 267  **MS4 Discharge Effluent and Receiving water Assessment (Outcome Levels 5 and 6)** is  
268 the use of environmental data and related information to characterize the hydrologic and water  
269 quality characteristics of storm water discharges. See Section IV.D for additional information  
270 on MS4 Discharge Reduction in Pollutants and Reduction in Stream Erosion. See Section  
271 IV.F for information on Monitoring Program Design considerations. Environmental data is  
272 used to characterize the water quality and stream health (associated with hydromodification)  
273 characteristics of receiving waters subject to MS4 discharges. See Section IV.E for additional  
274 information on Receiving Water Monitoring Assessment and Section IV.F for information on  
275 Monitoring Program Design considerations.
  - 276  **Integrated Assessment (Outcome Levels 1-6)** is the evaluation of relationships between  
277 Outcomes and Outcome Levels. Considered most broadly, Integrated Assessment is intended  
278 to address the relationship between program implementation and receiving water conditions.  
279 It can also include numerous other, more narrowly-defined objectives (e.g., the relationship of  
280 targeted behaviors to source pollutant load reductions, or that of MS4 discharge quality to

281 receiving water conditions). See Section IV.D for additional detail on Integrated Assessment.  
282 See Section IV.G for additional information on Integrated Assessment.  
283

### 284 **C. Assessment Measures and Methods**

285 For Effectiveness Assessment to be successful, it is critical that specific measures and methods  
286 be established and consistently utilized for each identified Assessment Outcome.  
287

288  ~~Assessment Measures~~ are established to determine whether or how successfully an Outcome  
289 has been achieved. Measures may be qualitative (e.g., yes / no) or quantitative (% of targeted  
290 audience reached, % reduction in a constituent level, etc.). ~~All priority Outcomes should have~~  
291 ~~at least one Assessment Measure associated with them, but some~~ may have more than one.

292  **Assessment Methods** are the specific activities, actions, or processes used to obtain and  
293 evaluate assessment data or information. Depending on the particular outcome in question,  
294 numerous assessment methods may be possible. Reasons for selecting a particular method  
295 include cost, ease of use, need for statistical rigor, applicability, and clarity in communicating  
296 progress to the general public. Assessment Methods are a critical consideration during the  
297 design of the feedback strategies discussed in Section IV, which provides an overview of the  
298 methods that should typically be used by storm water programs to gather data and  
299 information.  
300

### 301 **D. Targeting Assessment Outcomes**

302 An important consideration in establishing Assessment Outcomes is the selection of measurable  
303 targets, performance standards, or other metrics that can be used in assessing the effectiveness of  
304 the programs being implemented.  
305

306 ~~Targets can be taken from the permit requirements or Storm Water Management Programs.~~  
307 These would include activities such as establishment of a complaint response program,  
308 measurable goal commitments made by Phase II MS4 permittees, or the implementation plans  
309 for permittees assigned with total maximum daily load (TMDL) waste load allocations.  
310

311 ~~Performance standards can also be taken from the permit requirements.~~ In some instances the  
312 permit will specify the level of effort on an activity level (e.g., inspect 25% of high priority  
313 industrial facilities annually).  
314

315 ~~As the assessment moves from activities to water quality improvements, the outcomes will~~  
316 ~~likewise shift from counting completed activities to quantifying reductions in pollutant loading~~  
317 ~~or improvements in water quality, both effluent and receiving water.~~  
318

## 319 **IV. Guidance for Evaluating the Effectiveness of MS4 Programs**

320 A comprehensive effectiveness assessment strategy will ideally address four distinct types of  
321 assessment activity, each of which is described below. The degree to which each element can be  
322 incorporated in individual effectiveness assessments will vary depending on the details of the  
323 storm water management program, the assessment objectives, and the timeframe of analysis. It  
324 is critical that appropriate timeframes be established and considered in setting requirements for

325 and evaluating effectiveness assessments. In particular, it is unlikely that Integrated Assessment  
326 methods and principles are sufficiently evolved to allow their incorporation into effectiveness  
327 assessments at this time.

328  
329 This guidance document encourages the use of checklists for assessing the effectiveness of  
330 program elements. Attachment D provides sample questions and checklists, organized by  
331 outcome levels, that can be used by Regional Water Boards and MS4s in assessing the  
332 effectiveness of MS4 programs. While the Appendix C checklists have been developed for  
333 consideration by the Regional Water Board staff in when setting effectiveness assessment  
334 requirements in MS4 permits, they can also be used to conduct audits of the various MS4  
335 program elements relative to permit compliance.

### 336 337 A. **Implementation Assessment (Outcome Level 1)**

#### 338 1. Overview

339  
340 **Implementation Assessment** is the analysis of how well MS4s are meeting required, targeted,  
341 ~~or desired implementation objectives (completion of inspections, etc.)~~. In this context, the term  
342 "storm water programs" should be broadly interpreted to include all aspects of storm water  
343 program management, including those focused on non-storm water discharges. Implementation  
344 Assessment addresses three primary objectives:

- 345
- 346 ■ Objective 1: Determine whether program implementation is achieving required, targeted,  
347 ~~or desired outcomes~~.
- 348 ■ Objective 2: Characterize changes in program implementation results over time.
- 349 ■ Objective 3: Establish a basis for addressing Integrated Assessment Elements 1 and 3

350  
351 A comprehensive Implementation Assessment strategy will ideally address three levels of  
352 analysis: (1) the overall storm water management program; (2) the elements that comprise the  
353 program (public education and outreach; illegal connection/illicit discharge detection and  
354 elimination; commercial, industrial and construction runoff controls; municipal operations; and  
355 post-construction storm water controls, etc.); and (3) the specific activities that are conducted  
356 within individual program elements (inspections, street sweeping, debris collection, or  
357 implementation of best management practices). Depending on the intended objectives at each  
358 level, assessment approaches will vary. They may range in complexity from verifying the  
359 completion of activities to more sophisticated techniques such as assessing the probable or actual  
360 locations of sources and activities and the significance of their spatial distribution.

361  
362 Elements of the storm water program that should be considered in Implementation Assessment  
363 include, but are not limited to:

- 364
- 365 ■ Land Use Planning and Land Development Activities (including planning, construction,  
366 and post-construction phases)
- 367 ■ Residential Areas and Sources
- 368 ■ Industrial and Commercial Sources (including stationary and mobile)

- 369     ▪ Municipal Sources and Operations
- 370     ▪ Public Education and Outreach (including adults and schoolchildren)
- 371     ▪ Public Participation
- 372     ▪ Illegal Connection / Illicit Discharge Detection and Elimination

373  
374 Each of these elements can be further broken down into the various activities that are conducted  
375 pursuant to the requirements contained in the permit and/or storm water management program  
376 (SWMP).

377  
378 Within each of these components, it is convenient to consider program activities according to  
379 three broad categories:

- 380     ▪ Administration
- 381     ▪ Facilitation, and
- 382     ▪ Feedback

383  
384 **Figure 2** illustrates how these categories of activity are related as part of an ongoing adaptive  
385 management process, each continuously informing the next in an iterative cycle of feedback and  
386 improvement. To be successful, Effectiveness Assessment must not only begin during program  
387 planning, but ~~key measures and metrics~~ must be tracked during implementation and routinely  
388 evaluated as part of an ongoing assessment process. This enables MS4 Permittees to identify and  
389 implement needed program modifications to ensure continuous program improvement.  
390 ~~Currently, much of the effectiveness assessment is focused on Outcome level 1. However, over~~  
391 ~~time, the effectiveness assessments will begin to address Outcome levels 2-6 as shown in~~  
392 ~~Figure 2.~~

393  
394 **Figure 2: Implementation Assessment as Part of an Iterative Program Approach**

395  
396  
397 **Administrative Activities** support the effective operation or management of, rather than to  
398 directly implement, the storm water program. These activities typically include reviewing and  
399 updating program implementation strategies and other supporting program elements such as

400 source inventories and program documentation. They are focused solely on the program itself.  
 401 Many administrative activities are explicitly required by storm water permits, and therefore must  
 402 be assessed and reported to maintain regulatory compliance; others are implicitly required, or  
 403 simply necessary to assure the ongoing implementation of a quality program.

404  
 405 **Facilitation Activities** assist, encourage, or require changes in the knowledge or behaviors of the  
 406 individuals and populations to which program activities are directed. To be successful, Storm  
 407 water Management Programs must bring about (or "facilitate") changes in target populations  
 408 (municipal staff, contractors, or the public) that will in turn result in the protection of receiving  
 409 water conditions.

410  
 411 **Table 1** describes Facilitation Activities that are typical of Storm Water Management Programs.  
 412 As shown, MS4 programs can employ a considerable number of options to facilitate intended  
 413 outcomes. Not all need to be tracked or assessed. Because the strategy for achieving a given  
 414 targeted outcome (or set of outcomes) often includes multiple facilitation activities (e.g.,  
 415 permitting, industry outreach, partnerships, etc.), the importance of assessing each is usually  
 416 directly related to its importance in that overall strategy. For example, if an MS4 permittee relies  
 417 primarily on the permitting or inspection process to ensure BMP implementation on construction  
 418 sites, industry workshops might be a minor emphasis, or not included at all, when conducting  
 419 assessments. As such, MS4 Permittees should be encouraged to propose, with justification,  
 420 specific facilitation activities to be measured and included in their assessment strategies.

421  
 422  
 423 **Table 1— Examples of Activities to Facilitate Outcomes**

Activity Type	Description
<b>Agreements</b>	Formal agreements such as contracts, leases, and maintenance agreements are often used to require contractors or other regulated parties to implement required control measures.
<b>Licenses and Permits</b>	Licenses (pesticide use, etc.) or permits (grading, hazardous materials, statewide Construction General Permit, etc.) may be used to require regulated parties to implement required control measures.
<b>Plan Requirements</b>	A number of different plans (grading, storm water pollution prevention plan [SWPPP], etc.) may be used to require regulated parties to implement required control measures. Plans are often required as a condition of the issuance of a license or permit.
<b>Educational Outreach</b>	Various outreach methods can be used to bring about changes in knowledge or awareness in target populations. Outreach is often embedded in inspection or other regulatory processes, but may also be approached independently through a variety of means such as workshops, trainings, mass media, field trips, and distribution of brochures.
<b>Partnerships</b>	MS4 permittees can often extend the reach of their programs by partnering with other parties such as professional and industry organizations. Partners may develop or print materials, conduct outreach or training for their members, or conduct a variety of other activities that support the MS4 permittee's objectives.
<b>Incentives</b>	Incentives can be used to motivate, reward, or recognize municipal staff (time off, bonuses, etc.) or external audiences (prizes, reductions in permit fees, etc.).

<b>Waste Collection and Recycling Services</b>	Waste collection and recycling services are often used to assist residents and businesses in properly disposing of wastes. Common examples include: <ul style="list-style-type: none"> <li>• Household hazardous waste collection</li> <li>• Used motor oil collection</li> <li>• Trash collection</li> </ul>
<b>Enforcement / Disciplinary Action</b>	Whether formal or informal, enforcement actions can be used to encourage or require compliance with applicable legal requirements. Disciplinary actions are commonly used in an analogous role for municipal staff.

424  
425 **Feedback Activities** are conducted to determine whether and to what degree targeted Level 1, 2,  
426 3, or 4 outcomes have occurred in implementing populations, or to evaluate Level 5 and 6  
427 outcomes. **Table 2** presents and describes examples of Feedback Activities that are typical of  
428 many programs.

429  
430

**Table 2 – Examples of Feedback Activities**

Activity Type	Description
<b>Internal Tracking by Storm water Program</b>	Internal tracking and evaluation of data is the primary means by which outcome Level 1 activities can be assessed.
<b>Reporting to Storm water Program</b>	Various types of program data or information may be reported to the storm water program either by regulated parties or other municipal staff who are not part of the storm water program. In some instances, regulated parties must periodically certify compliance with specific requirements (e.g., maintenance of structural treatment controls).
<b>Site Investigations</b>	Site inspections and audits are among the most common tools used to verify compliance or gather additional data and information. Inspections typically consist of observations, record reviews, and sampling as needed. Complaint investigations are similar to site inspections except that they are in response to reports of potential violations (e.g., through complaints or staff referrals).
<b>Surveying and Testing</b>	Surveys, tests, and quizzes are important for assessing Level 2 and 3 outcomes in target populations. Surveys are generally focused on entire populations (e.g., all residents) or sub-populations (e.g., used oil recyclers), and tests and quizzes administered to individuals (e.g., municipal staff, schoolchildren, etc.). Tests and quizzes are fundamentally different in that surveys generally focus on understanding the prevalence or distribution of attitudes, knowledge, or behaviors within a population, whereas tests and quizzes focus on “correct” knowledge, i.e., respondents’ understanding of specific facts.
<b>Monitoring and Sampling</b>	Monitoring or sampling of MS4 discharges and receiving water quality may be required by the MS4 permit, or may occur as part of routine programs (e.g., dry weather field investigations) or in response to conditions identified during other investigations. Sampling may be focused on MS4 discharges, receiving waters, or the sources discharging to them.

431  
432  
433

2. Outcomes, Measures, and Methods

434 The most basic means of assessing measuring Level 1 Outcomes is to determine compliance with  
435 activity-based permit requirements. Level 1 Outcome measures may therefore take the form of a  
436 simple yes/no answer. They may also be quantified, counted, or tracked over time to  
437 demonstrate effort or progress.

## 438 439 **B. Target Audience and Source Assessment (Outcome Levels 2 to 3)**

### 440 441 1. Overview

442 **Target Audience and Source Assessment** is the analysis of changes in the individuals,  
443 populations, and sites or sources to which program activities are directed. Examples of changes  
444 include increased knowledge and increased BMP implementation. Knowledge and behavior are  
445 intimately related. Changes in behavior must be accompanied or preceded by corresponding  
446 changes in knowledge or awareness. However, increases in knowledge will not necessarily bring  
447 about desired behavioral changes. Moreover, knowledge and awareness may often be considered  
448 beneficial whether or not they lead to quantifiable behavioral changes.  
449 By focusing on changes in implementing populations, Level 2 and 3 Outcomes provide an  
450 important bridge between program activity and pollutant load reductions. In some cases,  
451 measuring Level 2 and 3 Outcomes is appropriate; in others, measuring Level 2 Outcomes can  
452 demonstrate progress toward behavioral change.

453  
454 Assessments should provide an effective mix of these measures for all major program elements.  
455 Target Audience and Source Assessment addresses five primary objectives:

- 456  
457 ■ Objective 1: Characterize the existing knowledge and awareness of target populations (i.e.,  
458 establish baseline).
- 459  
460 ■ Objective 2: Characterize changes in the knowledge and awareness of target populations  
461 over time.
- 462  
463 ■ Objective 3: Characterize the existing behaviors of target populations (i.e., establish  
464 baseline).
- 465  
466 ■ Objective 4: Characterize changes in the behaviors of target populations over time.
- 467  
468 ■ Objective 5: Establish a basis for addressing Integrated Assessment Objectives 2 and 3 (see  
469 page 34).

### 469 470 2. Outcomes, Measures, and Methods

471 Various methods and tools, both quantitative and qualitative, are currently utilized to measure  
472 knowledge and awareness. These generally take the form of surveys and quizzes. Knowledge  
473 and awareness may also be inferred by tracking levels of public involvement (e.g., through  
474 complaints or requests for information received via storm water hotlines). However, there may  
475 be limitations to using this method because many different factors influence levels of public  
476 involvement.

477 Methods used to measure Level 3 Outcomes (behavioral changes) include those described above  
478 for Level 2 Outcomes (knowledge and awareness), as well as direct observation via site visits  
479 and reporting by dischargers or third parties.  
480

## 481 **C. Pollution Source Load Reductions Assessment (Outcome Level 4)**

482

### 483 1. Overview

484

485 **Pollutant Load Reductions** are most valuable for ~~making broad comparisons~~ or for helping  
486 managers ~~to distinguish where resource allocations are likely to be most useful~~. They also help  
487 to determine whether permittees are reducing the discharge of pollutants to “the maximum extent  
488 practicable.” Developing a baseline of data and information to support load reduction estimates  
489 is key to their application. Development of such a baseline, as well as approaches for  
490 incorporating direct measurement, is expected to allow a significant expansion of the use of load  
491 reduction estimates.  
492

493 The assessment of Pollutant Load Reductions can generally be considered to address three  
494 primary objectives:  
495

- 496 ▪ Characterize pollutant loads from actual or potential sources.
  - 497 ▪ Characterize changes in pollutant loads from sources.
  - 498 ▪ Establish a basis for addressing Integrated Assessment Elements 2 and 3 (see Section  
499 IV.G).
- 500

501 One of the challenges in ~~estimating source load reductions~~ is the number of factors that affect the  
502 quality of the discharge. These factors would include the timing of the storm (first of the season,  
503 last of the season, etc.), how many dry days occurred before the storm, the intensity of the storm,  
504 the rainfall amount, etc. In many instances, estimates of loads are made from a snapshot in time.  
505

### 506 2. Outcomes, Measures and Methods

507

508 Various methods are available to determine pollutants source load reductions. However they are  
509 reliant upon the permittees' characterization of the sources of pollutants in storm water. Once  
510 the characterization studies have been conducted, the permittees can measure the amounts of  
511 pollutants that are being removed ~~through~~ the implementation of BMPs (both structural and non-  
512 structural) or calculate the amounts of pollutants being removed based upon accepted  
513 performance of structural BMPs. There will need to be a tracking mechanism relative to the  
514 placement and types of structural BMPs that are put in place, matched with the pollutant(s) that  
515 are being targeted. Over time, the efficacy of the structural BMPs can be monitored in order to  
516 ~~refine the estimated~~ pollutants being removed.  
517

518 Pollutant source load reductions are generally measured in three different ways: (1) directly  
519 measured, (2) monitored, and (3) calculated.  
520



- 521     ▪ Directly Measured Reductions are the result of activities including, but not limited to,  
522 street sweeping or waste collection. In these activities, measurements such as the cubic  
523 yards of material swept up from the streets or the amount of waste collected via the  
524 various recycling programs can be quantified. In this instance, permittees may presume  
525 that the pollutant load reduction is comparable to the directly measured quantity.
- 526     ▪ Monitored Reductions would occur in those places where structural controls, site storm  
527 water controls, basins, etc. have been implemented. The quality of runoff that goes into a  
528 treatment device would be measured and compared to the quality of the treated runoff.
- 529     ▪ Calculated Reductions are those that can be inferred from known or assumed parameters  
530 such as the pollutant removal efficiency of a BMP and the concentration of the target  
531 pollutant in the flow being treated by the BMP. For additional considerations in  
532 calculating reductions based on BMP performance, see Section IV.F. (MS4 Monitoring  
533 Program Design) below.
- 534     ▪ Reductions in pollutant loadings can also be inferred from survey results (i.e. are there  
535 more people who claim to pick up after their dogs over a given period of time?) and from  
536 compliance activities (is the municipality using more pet waste bags at the dog parks or  
537 parkways over time?).
- 538     ▪ Combined Approaches  
539         A combined approach would compare the calculated reductions for a given device with  
540         monitoring to determine if in fact the reductions were as anticipated.

#### 541 542 **D. MS4 Discharge Monitoring (Outcome Level 5)**

##### 543 544 1. Overview

545  
546 ~~The assessment of MS4 discharges (Level 5) relative to the reduction in pollutants discharged~~  
547 ~~and/or the impacts these discharges have on the physical characteristics of the receiving waters~~  
548 ~~(stream erosion) uses data, monitored and observed, to characterize the quality of non-storm~~  
549 ~~water or storm water discharges and measure the physical characteristics of the receiving creeks,~~  
550 ~~streams, and rivers.~~

551 Level 5 assessments can generally be considered to address five primary objectives:

- 552     ▪ Objective 1: Characterize the baseline quality of discharges from the MS4.
- 553     ▪ Objective 2: Characterize changes in the quality of discharges from the MS4.
- 554     ▪ Objective 3: Characterize the baseline hydrology of storm water discharges in the urban  
555 environment.
- 556     ▪ Objective 4: Characterize changes in the hydrology of storm water discharges in the urban  
557 environment and their effects on stream erosion.
- 558     ▪ Objective 5: Establish a basis for addressing Integrated Assessment Elements 2 and 3 (see  
559 Section IV.G).

560  
561  
562 Objectives 1.a and 1.b. – Monitoring and Characterizing MS4 Discharge Quality

563 A standard provision applicable to most MS4 permittees is a prohibition against discharges that  
564 cause or contribute to exceedances of water quality standards. In order to determine whether

565 storm water discharges cause or contribute to exceedances of water quality standards in receiving  
566 waters and assess pollutant concentrations over time, permittees need a well-designed discharge  
567 quality monitoring program. A well designed discharge quality monitoring program is one  
568 where the purpose of the monitoring has been well defined. Asking a series of questions can  
569 help define the purpose. Key questions are:

570

571 What is the quality of the discharge from the MS4?  
572 Is it changing?

573

574

575 The data/information that is gathered through the monitoring program should answer the  
576 questions being asked.

577

578 Objectives 2.a and 2.b – Monitoring and Characterizing Hydrology and Stream Erosion.  
579 Urbanization changes the timing and intensity of stream flows and sets off a chain of  
580 consequences. These consequences include more frequent flooding, destabilized stream banks,  
581 armoring of stream banks with riprap and concrete, loss of streamside trees and vegetation,  
582 destruction of stream habitat, discharge of pollutants to surface water bodies, and other adverse  
583 impacts to beneficial uses of the waters of the State.

584

585 The increased volumes and velocities of storm water associated with impervious areas can be  
586 substantially reduced by providing facilities and features that detain and infiltrate storm water.  
587 To most closely replicate natural hydrology, the facilities and features are kept small-scale and  
588 distributed as much as possible throughout a development site or watershed. Schueler (1995)  
589 proposed imperviousness as a “unifying theme” for the efforts of planners, engineers, landscape  
590 architects, scientists, and local officials concerned with urban watershed protection. Schueler  
591 argued that (1) imperviousness is a useful indicator linking urban land development to the  
592 degradation of aquatic ecosystems, and (2) imperviousness can be quantified, managed, and  
593 controlled during land development.

594

595 A concept popularly known as “Low Impact Development” (LID) allows for infiltration, use  
596 and/or evapotranspiration of runoff by minimizing impervious area; using pervious pavements  
597 and green roofs; dispersing runoff to landscaped areas; capturing the water for subsequent use;  
598 and routing runoff to rain gardens, cisterns, swales and other small-scale facilities distributed  
599 throughout a site. In practical terms, the capability of a storm water program to ensure that LID  
600 features and facilities are thoroughly incorporated in the early planning of development and re-  
601 development projects and are properly designed and constructed is of great consequence to this  
602 aspect of the program’s overall effectiveness.

603

604 A well designed hydrology and stream erosion monitoring program is one where the purpose of  
605 the monitoring has been well defined. Asking a series of questions can help define the purpose.  
606 Key questions are:

607

608 What are the hydrologic characteristics of the MS4 discharge in the urban environment?  
609 How are they changing?

610  
611 2. Outcomes, Measures and Methods

612 Measurements and Methods for MS4 Discharge Monitoring

613 Through a well-developed program to monitor the discharges from the MS4, the effectiveness of  
614 the on-ground program implementation can be assessed. Monitoring would also lend itself to  
615 comparing similar land uses where there are differences in the types of BMPs (structural and  
616 non-structural) that are being used. However, it should be noted that monitoring to determine  
617 trends in the amounts of pollutants being discharged may take a long period of time. Monitoring  
618 programs that evaluate the quality of the discharge from the MS4 should take into account the  
619 land uses of the area monitored and should include monitoring during both wet weather and dry  
620 weather. See Section IV.F MS4 Monitoring Program Design below for additional considerations  
621 in developing and implementing a discharge monitoring program.  
622

623 Measurements and Methods for Monitoring and Characterizing Hydrology and Stream Erosion

624  
625 There are many effective ways to measure efforts to minimize changes to the timing and  
626 intensity of stream flows. The most direct way is to gauge rainfall and stream flows for many  
627 years. The objective is often to measure whether a watershed maintains or restores, as nearly as  
628 possible, the pre-project relationship between rainfall and storm water runoff for a wide range of  
629 rainfall intensities and durations. In practice, however, the long time scale for watershed  
630 urbanization and the limited frequency of rainfall events make it difficult to evaluate success  
631 based on empirical data.  
632

633  
634 A more indirect way is to establish a watershed model, which may be a simple computation with  
635 a few variables, or a complex computer program that simulates storm water runoff at hourly time  
636 steps over a period of decades.

637  
638 A general measure of the program's control of runoff volume, velocity or duration is the extent  
639 the program limits effective imperviousness. Effective imperviousness is typically measured at  
640 the scale of individual development projects, including private development projects and public  
641 works projects such as new roads and facilities. The relationship of outcomes at the site scale to  
642 benefits at the watershed scale is inferred and varies significantly from place to place, depending  
643 on the relative size of the project to the watershed, location within the watershed, slopes,  
644 susceptibility of the receiving waters to erosion, and other factors.

645  
646 Finally, another measure of the program's control of runoff volume, velocity or duration is the  
647 extent the program implements elements that address the increased volumes and velocities that  
648 accompany the use of impervious surfaces in the urban environment. Elements can include large  
649 scale basins that infiltrate runoff that has been conveyed via the storm sewer system or programs  
650 that effectively implement LID techniques.  
651

652 As mentioned above, the effectiveness of a program to limit changes in runoff volume, velocity,  
653 or duration may be measured by its implementation of LID. The most direct and quantifiable  
654 way of measuring the implementation of LID is to review the planning, design, and construction  
655 of recently approved land development and re-development projects early in the design process  
656 and calculate the effective impervious areas for each development and re-development project. A  
657 more indirect measurement is to monitor key characteristics associated with effective  
658 implementation of LID. Some of these characteristics are:  
659

- 660 ■ Clear guidance to applicants for development approvals regarding LID requirements.
- 661 ■ Ongoing outreach, such as workshops, to educate the land development community about  
662 LID.
- 663 ■ Policies and administrative mechanisms ensure that LID features and facilities are  
664 incorporated into site designs prior to consideration by design review boards, planning  
665 commissions or other elected or appointed bodies.
- 666 ■ Engineering review that quantifies impervious areas and determines whether runoff from  
667 impervious areas is directed to LID features and facilities, and whether those features and  
668 facilities are adequately sized.
- 669 ■ Development review engineers and construction inspectors certified to understand the  
670 proper design and construction of LID features and facilities.
- 671 ■ Policies that prioritize the implementation of LID for storm water treatment and restrict the  
672 use of non-LID facilities to special circumstances.
- 673 ■ Ongoing operation and maintenance verification of LID facilities.  
674

## 675 E. Receiving Water Monitoring (Outcome Level 6)

### 676 1. Overview

677  
678  
679 Receiving water monitoring is critical for assessing water quality standards attainment. Because  
680 MS4 discharge monitoring ~~does not~~ cover every outfall, receiving water monitoring is especially  
681 important for understanding MS4 impacts.  
682

683 Receiving Water Assessment can generally be considered to address three primary objectives:  
684

- 685 ■ Objective 1: Characterize receiving water conditions.
- 686 ■ Objective 2: Characterize changes in receiving water conditions.
- 687 ■ Objective 3: Determine whether receiving water conditions are protective of beneficial  
688 uses.

689  
690 These objectives, when restated in the form of a question, provide the basis for designing  
691 monitoring program for receiving waters that has a well defined purpose.  
692

### 693 2. Outcomes, Measures and Methods

694 Receiving water monitoring programs are often required to assess pollutant concentrations over  
695 time and determine whether storm water discharges are causing or contributing to violations of

696 water quality standards and or whether beneficial uses are being protected. The following  
697 elements, in whole or in part, are commonly used, in whole or in part, to measure and assess  
698 receiving water conditions:

- 699
- 700 1) **Mass Emission Monitoring.** The purpose of mass emission monitoring is to identify  
701 pollutant loads to receiving waters and identify long- term trends in pollutant  
702 concentrations. Mass Emission sites are located in the lower reaches of major  
703 watersheds.
- 704
- 705 2) **Receiving Water Monitoring.** Receiving water monitoring is designed to  
706 characterize the quality of receiving waters rather than discharges to the receiving  
707 waters. This type of monitoring evaluates the water quality of smaller water bodies  
708 tributary to main river systems. Monitoring a localized section of the watershed allows  
709 the storm water monitoring program to better examine the impact of storm water on the  
710 watershed than mass emission monitoring.
- 711
- 712 3) **Bioassessment Monitoring** Bioassessment is a cost-effective biological monitoring  
713 tool that utilizes measures of the stream's benthic macroinvertebrate (BMI) community  
714 and its physical/habitat structure. Because they are ubiquitous and sensitive in varying  
715 degrees to anthropogenic pollutants and other stressors, BMIs can provide considerable  
716 information regarding the biological condition of water bodies. (Resh and Jackson  
717 1993, Karr and Chu 1999, Davis and Simon 1995).
- 718
- 719 4) **Toxicity Monitoring.** Toxicity monitoring is a process of using live organisms to  
720 determine whether a chemical or effluent is toxic. A toxicity test measures the degree  
721 of the effect of a specific chemical or effluent on exposed test organisms. (EPA Region  
722 9 and 10 Toxicity Training Tool, November 2007; Denton DL, Miller JM, Stuber RA.  
723 2007. EPA Regions 9 and 10 toxicity training tool (TTT). November 2007. San  
724 Francisco, CA.)
- 725
- 726 5) **Beach Water Quality Monitoring. (Does not apply to all municipalities)** Beach  
727 water quality monitoring is the monitoring of the receiving waters adjacent to beaches  
728 that have a high number of daily users. This monitoring focuses on bacteria and  
729 pathogens and is important because this monitoring is used for Health Department  
730 postings at the beaches.

731

732 Over time, the monitoring program should provide the data needed to determine if the pollutant  
733 reduction programs that are being implemented are having an effect on the receiving waters. For  
734 additional considerations in setting receiving water assessment requirements, see Section IV.F  
735 (MS4 Monitoring Program Design) below.

736

737

738

739

740 **F. Guidance for MS4 Monitoring Program Design**  
741

742 As required by Water Code section 13383.5(d) (Added by SB72, 2001), Phase I MS4 permits  
743 should include the minimum monitoring requirements required by the State Water Board  
744 pursuant to the statute. Below is monitoring program guidance that the Regional Water Boards  
745 should consider when setting monitoring requirements in MS4 permits. In establishing the  
746 guidance, the State Water Board has considered the goals and provisions of Water Code section  
747 13383.5.  
748

749 **1. General Considerations**

750 a. As discussed in Sections IV.D and IV.E monitoring programs should be designed such  
751 that they are well defined and the monitoring results will answer a series of questions  
752 that can be used to inform the overall storm water program.  
753

754 b. For the purposes of determining constituents to be sampled for and sampling  
755 frequencies, to be included in a municipal storm water permit monitoring program, the  
756 regional board should consider the following information, as the regional board  
757 determines to be applicable:

- 758 (1) Discharge characterization monitoring data.
- 759 (2) Water quality data collected through the permit monitoring program.
- 760 (3) Applicable water quality data collected, analyzed, and reported by federal, state,  
761 and local agencies, and other public and private entities.
- 762 (4) Any applicable listing under Section 303(d) of the Clean Water Act (33 U.S.C.  
763 Sec. 1313).
- 764 (5) Applicable water quality objectives and criteria established in accordance with the  
765 regional board basin plans, statewide plans, and federal regulations.
- 766 (6) Reports and studies regarding source contribution of pollutants in storm water not  
767 based on direct water quality measurements.  
768

769 c. To ensure sufficient data are collected and are comparable, the monitoring program  
770 required by the MS4 permit should include, but not be limited to, all of the following:

- 771 (1) Standardized methods for collection of storm water samples.
- 772 (2) Standardized methods for analysis of storm water samples.
- 773 (3) A requirement that every sample analysis under the program be completed by a  
774 state certified laboratory or by the regulated municipality in the field in accordance  
775 with quality assurance and quality control protocols.
- 776 (4) A standardized reporting format.
- 777 (5) Standard sampling and analysis programs for quality assurance and quality  
778 control.
- 779 (6) Minimum detection limits.
- 780 (7) Annual reporting requirements for regulated municipalities.  
781

782 d. Design Standards for Structural Controls - Where structural control BMPs are required,  
783 criteria should be established for the reporting of the control devices' design

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performance. This provides consistency in comparing the effectiveness of the device chosen and ensures to a degree that the device selected will in fact be effective. Factors that the criteria should report include the applicable pollutant(s) of concern to be treated, drainage area to be treated, volume and/or rate of runoff to be treated.

Permits 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. BMPs installed in watersheds with 303(d) listed water bodies where storm water has been determined to be a contributor to the impairment or a history of water quality standards exceedances associated with storm water discharges should be reported in a separate category. Expected BMP pollutant removal performance for effluent quality can be found at the WERF-ASCE/ U.S. EPA International BMP Database (<http://www.bmpdatabase.org>). Permittees should report the performance of structural BMPs based on the primary class of pollutants likely to be discharged from the site/facility (e.g. metals from an auto repair shop).

To evaluate program effectiveness, Regional Boards may consider whether permittees have developed guidance for the use of structural BMPs that is based on BMP performance. The guidance should apply to expected project types and receiving water conditions. Where structural controls are being used for the treatment of pollutants causing a water quality impairment, permittees should be required to report on the BMP selection process. This report would include a comparison of the performance of the selected BMP with other BMPs that target the same pollutant(s) and provide a rationale for the selection.

**Table 3 Example Structural BMP Performance Values  
Effluent Concentrations as Median Values**

BMP Category	TSS mg/L	Total Nitrate-N mg/L	Total Cu, ug/L	Total Pb, ug/L	Total Zn, ug/L
Detention Pond	27	0.48	15.9	14.6	58.7
Wet Pond	10	0.2	5.8	3.4	21.6
Wetland Basin	13	0.13	3.3	2.5	29.2
Biofilter	18	0.36	9.6	5.4	27.9
Media Filter	11	0.66	7.6	2.6	32.2
Hydrodynamic Device	23	0.29	11.8	5	75.1

2. Considerations for MS4 Discharge Monitoring

- a. Outfall Monitoring - A representative set of outfalls should be monitored to estimate the annual pollutant load and event mean concentration of cumulative discharges. Permittees should conduct monitoring at these outfalls each year during storm events and the dry season. Samples from each outfall monitoring

828 station should be analyzed for pollutants of concern related to the questions used  
829 to define the purpose of the monitoring.

- 830  
831 b. Toxicity Monitoring - Toxicity testing can be a "safety net" for any NPDES  
832 monitoring program. A representative set of outfalls should be monitored for  
833 chronic and acute toxicity each year during storm events and the dry season.  
834

835 **3. Considerations for Receiving Water Assessment**  
836

- 837 a. Mass Emission Monitoring - Mass emissions stations are critical for assessing  
838 both trends over time and exceedances of water quality objectives in the receiving  
839 water. Monitoring should occur each year at mass emission stations during storm  
840 events and the dry season. Samples from each mass emission station should be  
841 analyzed for pollutants of concern related to the question(s) used to define the  
842 purpose of the monitoring. Typically located at the bottom of the watershed,  
843 these locations are static and monitor receiving water quality where there have  
844 been a number of inputs.  
845

- 846 b. Receiving Water Monitoring - Monitoring should occur each year at receiving  
847 water monitoring locations during storm events and the dry season. Samples from  
848 each receiving water monitoring station should be analyzed for pollutants of  
849 concern related to the question(s) used to define the purpose of the monitoring.  
850 These monitoring stations differ from the mass emissions stations in that they may  
851 or may not be fixed with the water quality monitoring being associated with a  
852 much smaller drainage area with fewer inputs.  
853

- 854 c. Bioassessment Monitoring - Bioassessment monitoring is critical for assessing the  
855 full impacts of the discharge and should be performed at least once per year.  
856 Bioassessment should be performed at fixed sites throughout each watershed  
857 impacted by the MS4. An index of biological integrity should be calculated from  
858 the data set and reported to the Regional Water Board.  
859

- 860 d. Toxicity Monitoring - Toxicity testing can be a "safety net" for any NPDES  
861 monitoring program. Receiving water monitoring locations should be monitored  
862 for chronic and acute toxicity each year during storm events and the dry season.  
863

- 864 e. Beach Water Quality Monitoring (Does not apply to all municipalities) - For those  
865 municipalities with storm water discharges to beach locations, beach bacteria  
866 indicator monitoring should be conducted at beaches with storm water outfalls on  
867 a frequency and schedule determined by the Regional Water Board. In many  
868 cases, local health agencies already conduct this monitoring, so the MS4 should  
869 coordinate with local agencies and utilize any existing datasets.  
870

871 **G. Integrated Assessment**



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1. Overview

**Integrated Assessment** (Levels 1-6) is the process of exploring and understanding the interrelationships among Outcomes and Outcome Levels, together with their cumulative relationship to improved water quality. As shown in Table 4, this process should be ongoing during program implementation. Because of the number and variety of BMPs and control programs being implemented at any given time, and because many factors external to storm water programs affect water quality, establishing these relationships is difficult, but no less important. Efforts to date have included hypothetical exercises aimed at better understanding likely program outcomes and potential relationships to water quality. Quantitative "cause and effect" relationships should increasingly be sought in the future.

Implementation assessment is, in many cases, simpler and less costly than MS4 discharge and receiving water assessment, due in part to the shorter time frame needed to see measurable results. Over time the long term, however, correlating water quality improvement to implementation results will assist storm water managers in identifying the more efficient and cost-effective approaches to storm water management.

3. Outcomes, Measures and Methods

Integrated Assessment can generally be considered to address the three objectives described below.

**Objective 1: Relating Program Implementation to Target Populations and Sources**

- a. How is Storm Water Program Implementation related to Knowledge and Awareness, or Behavior?
- b. How are Knowledge and Awareness related to Behavior?
- c. How is Behavior related to Source Reductions?

**Objective 2: Relating Source Reductions to MS4 discharge and Receiving Water Conditions**

- a. How are Source Reductions related to the Quality of the Discharge from the MS4 or Hydrology?
- b. How are the Quality of the Discharge from the MS4 and Hydrology related to Receiving Water Conditions?

**Objective 3: Relating Program Implementation to Receiving Water Conditions**

915 How do all of the above elements combine to address the relationship of Storm Water Program  
916 Implementation to Receiving Water Conditions?

D A T

**Table 4 -- Key Questions and Objectives to be addressed by Storm water Program Effectiveness Assessments**

Level 1 Storm water Programs	Level 2 Knowledge and Awareness	Level 3 Behavior	Level 4 Source Reductions	Level 5 MS4 Discharge Quality and Hydrology	Level 6 Receiving Water Conditions
<b>3. Source &amp; Target Population Assessment</b>					
<b>2. MS4 Discharge and Receiving Water Assessment</b>					
<b>3. Integrated Assessment</b>					
<b>1. Implementation Assessment</b>					
Are Targeted Program Outcomes being achieved?	What is the Knowledge or Awareness of implementing populations?	What are the Behaviors of implementing populations?	What are the Source Pollutant Loads?  What are the Site / Source Hydrologic Characteristics?	What is the Quality of the MS4 Discharge?  What are the Hydrologic Characteristics of Discharges in the Urban Environment?	What are the Receiving Water Conditions?  Are conditions protective of Beneficial Uses?
<p><b>Objective 1 - Relating Program Implementation to Target Populations and Sources</b></p> <p>a. How is Storm water Program Implementation related to Knowledge, Awareness, or Behavior?</p> <p>b. How are Knowledge and Awareness related to Behavior?</p> <p>c. How is Behavior related to Source Reductions?</p>					
<p><b>Objective 2 - Relating Source Reductions to MS4 Discharges and Receiving Water Conditions</b></p> <p>a. How are Source Reductions related to MS4 Discharge Quality or Hydrology?</p> <p>b. How are MS4 Discharge Quality / Hydrology related to Receiving Water Conditions?</p>					
<p><b>Objective 3 - Relating Program Implementation to Receiving Water Conditions</b></p> <p>How do all of the above elements combine to address the relationship of Storm water Program Implementation to Receiving Water Conditions?</p>					

919 **Attachment A**  
920 **AB 739**

921  
922 AB 739, Laird. Stormwater discharge.

923 Under existing law, the State Water Resources Control Board and the California regional water  
924 quality control boards prescribe waste discharge requirements for the discharge of stormwater in  
925 accordance with the national pollutant discharge elimination system (NPDES) permit program  
926 established by the federal Clean Water Act and the Porter-Cologne Water Quality Control Act  
927 (state act).

928  
929 The Safe Drinking Water, Water Quality and Supply, Flood Control, River, and Coastal  
930 Protection Bond Act of 2006 (initiative bond act) authorizes the issuance of bonds in the amount  
931 of \$5,388,000,000. The Disaster Preparedness and Flood Prevention Bond Act of 2006  
932 authorizes the issuance of bonds in the amount of \$4,090,000,000 for the purposes of financing a  
933 disaster preparedness and flood prevention program.

934  
935 This bill would require the Department of Water Resources to develop project selection and  
936 evaluation guidelines to implement a specified stormwater flood management grant program  
937 financed by the Disaster Preparedness and Flood Prevention Bond Act of 2006. The bill would  
938 provide that the design and construction of projects for combined municipal sewer and  
939 stormwater systems are eligible for financing under that grant program. The bill would require  
940 the state board to develop project selection and evaluation guidelines for the allocation of funds  
941 made available by the initiative bond act for a stormwater contamination prevention and  
942 reduction program. The bill would provide for the expenditure of those funds, upon  
943 appropriation, for specified projects. Grant recipients would be required to assess and report on  
944 project effectiveness. The bill would require the state board and the department to consult with  
945 each other, as necessary, with regard to the development of project selection and evaluation  
946 guidelines for various programs involving stormwater management that are financed by the  
947 initiative bond act or the Disaster Preparedness and Flood Prevention Bond Act of 2006. The  
948 state board would be required, no later than July 1, 2009, and after holding public workshops and  
949 soliciting public comments, to develop a comprehensive guidance document for evaluating and  
950 measuring the effectiveness of municipal stormwater management programs undertaken, and  
951 permits issued, in accordance with the NPDES permit program and the state act. The state board  
952 and the regional boards would be required to refer to the guidance document when establishing  
953 requirements in municipal stormwater programs and permits for evaluation and reporting on  
954 program effectiveness. The bill would require the state board to appoint a stormwater  
955 management task force comprised of public agencies, representatives of the regulated  
956 community, and nonprofit organizations, and to submit a specified report on polluted runoff  
957 control to the Ocean Protection Council no later than January 1, 2009.

958  
959  
960 **THE PEOPLE OF THE STATE OF CALIFORNIA DO ENACT AS FOLLOWS:**

961  
962 **SECTION 1.** The Legislature finds and declares all of the following:

963 (a) The federal Clean Water Act requires the regulation of stormwater discharges under the  
964 national pollutant discharge elimination system (NPDES) permit program. The State Water  
965 Resources Control Board and the California regional water quality control boards have been  
966 designated by the United States Environmental Protection Agency to implement the NPDES  
967 stormwater program.

968 (b) Polluted runoff, including stormwater discharges, is generated by runoff from land and  
969 impervious areas such as paved streets, parking lots, and building rooftops during both dry and  
970 wet months. Stormwater discharges often contain pollutants in quantities that could adversely  
971 affect water quality. Stormwater discharges can also accelerate stream erosion, causing increased  
972 sedimentation downstream, loss of flood conveyance capacity, and increased flood damage risk.

973 (c) The State Water Resources Control Board and the California regional water quality control  
974 boards, in their 2001 strategic plan, indicate that polluted runoff is the leading cause of water  
975 quality problems in the state. The United States Environmental Protection Agency considers  
976 urban stormwater pollution a serious source of pollution in the waters of the United States.

977 (d) The State Water Resources Control Board's Resolution No.  
978 2000-0006, dated January 2005, which adopted sustainability as a core value for all activities and  
979 programs, supports sustainable practices related to water quality and water supply, including, but  
980 not limited to, low-impact development that seeks to maintain predevelopment runoff rates and  
981 volumes. Low-impact development includes specific techniques such as reducing the amount of  
982 impermeable surfaces and increasing infiltration.

983 (e) The State Water Resources Control Board and the Department of Water Resources should  
984 coordinate applicable financial assistance programs to maximize public benefits and leverage  
985 local and federal funding.

986 (f) The State Water Resources Control Board should provide state oversight regarding the  
987 NPDES stormwater program, including guidance, priorities, policy direction, technical  
988 assistance, and evaluation of program effectiveness.

989  
990 SEC. 1.5. Section 11352 of the Government Code is amended to read:

991  
992 11352. The following actions are not subject to this chapter: (a) The issuance, denial, or  
993 waiver of any water quality certification as authorized under Section 13160 of the Water Code.

994 (b) The issuance, denial, or revocation of waste discharge requirements and permits pursuant to  
995 Sections 13263 and 13377 of the Water Code and waivers issued pursuant to Section 13269 of  
996 the Water Code.

997 (c) The development, issuance, and use of the guidance document pursuant to Section 13383.7  
998 of the Water Code.

999  
1000 SEC. 2. Section 5096.827.2 is added to the Public Resources Code, to read:

1001 5096.827.2. (a) The department shall develop project selection and evaluation guidelines to  
1002 implement Section 5096.827. The State Water Resources Control Board shall advise the  
1003 department on the water quality portions of the guidelines, relying as appropriate on the  
1004 stormwater guidelines developed by the State Water Resources Control Board pursuant to  
1005 Section 75050.2.

1006 (b) The guidelines shall include a provision that gives preference to a project that reduces flood  
1007 damages for which one or both of the following applies:

1008 (1) The project is not receiving state funding for flood control or flood prevention projects  
1009 pursuant to Section 5096.824 or Section 75034.

1010 (2) The project provides multiple benefits, including, but not limited to, water quality  
1011 improvements, ecosystem benefits, reduction of instream erosion and sedimentation, and  
1012 groundwater recharge.

1013  
1014 SEC. 3. Section 5096.827.3 is added to the Public Resources Code,  
1015 to read:

1016 5096.827.3. Consistent with the requirements of Sections 5096.827 and 5096.827.2, the design  
1017 and construction of projects for combined municipal sewer and stormwater systems are eligible  
1018 for financing under Section 5096.827.

1019  
1020 SEC. 4. Section 75050.2 is added to the Public Resources Code, to read:

1021 75050.2. (a) The state board shall develop project selection and evaluation guidelines for the  
1022 allocation of funds made available pursuant to subdivision (m) of Section 75050. Upon  
1023 appropriation, the funds shall be available for matching grants to local public agencies, not to  
1024 exceed five million dollars (\$5,000,000) per project, for projects to achieve any of the following  
1025 purposes in accordance with the requirements of that subdivision:

1026 (1) Complying with total maximum daily load requirements established pursuant to Section  
1027 303(d) of the Clean Water Act (33 U.S.C. Sec. 1313(d)) and this division where pollutant loads  
1028 have been allocated to stormwater, including, but not limited to, metals, pathogens, and trash  
1029 pollutants.

1030 (2) Assistance in implementing low-impact development and other onsite and regional  
1031 practices, on public and private lands, that seek to maintain predevelopment hydrology for  
1032 existing and new development and redevelopment projects. Projects funded pursuant to this  
1033 paragraph shall be designed to infiltrate, filter, store, evaporate, or retain runoff in close  
1034 proximity to the source of water.

1035 (3) Implementing treatment and source control practices to meet design and performance  
1036 standard requirements for new development.

1037 (4) Treating and recycling stormwater discharge.

1038 (5) Implementing improvements to combined municipal sewer and stormwater systems.

1039 (6) Implementing best management practices, and other measures, required by municipal  
1040 stormwater permits issued by a California regional water quality control board or the state board.

1041 (7) Assessing project effectiveness, including, but not limited to, monitoring receiving water  
1042 quality, determining pollutant load reductions, and assessing improvements in stormwater  
1043 discharge water quality.

1044 (b) (1) For the purpose of implementing subdivision (a), the state  
1045 board shall give preference to a project that does one or more of  
1046 the following:

1047 (A) Supports sustained, long-term water quality improvements.

1048 (B) Is coordinated or consistent with any applicable integrated  
1049 regional water management plan.

1050 (2) The allocation of funds pursuant to this section shall be consistent with water quality  
1051 control plans and Section 75072.

1052 (c) The state board shall require grant recipients for projects described in subdivision (a) to  
1053 assess and report on project effectiveness, which may include monitoring receiving water  
1054 quality, determining pollutant load reductions, and assessing improvements in stormwater  
1055 discharge water quality resulting from project implementation.

1056  
1057 SEC. 5. Section 75050.4 is added to the Public Resources Code, to read:  
1058 75050.4. The state board and the department shall consult with each other, as necessary, with  
1059 regard to the development of project selection and evaluation guidelines for the following  
1060 financial assistance programs that are directed, in whole or in part, for municipal stormwater  
1061 management, to avoid duplication and maximize water quality benefits:

- 1062 (a) Section 5096.827.  
1063 (b) Subdivision (a) of Section 75026.  
1064 (c) Subdivision (m) of Section 75050.  
1065 (d) Subdivision (a) of Section 75060.

1066  
1067 SEC. 6. Section 13383.7 is added to the Water Code, to read:

1068 13383.7. (a) No later than July 1, 2009, and after holding public workshops and soliciting  
1069 public comments, the state board shall develop a comprehensive guidance document for  
1070 evaluating and measuring the effectiveness of municipal stormwater management programs  
1071 undertaken, and permits issued, in accordance with Section 402(p) of the Clean Water Act (33  
1072 U.S.C. Sec. 1342(p)) and this division.

1073 (b) For the purpose of implementing subdivision (a), the state board shall promote the use of  
1074 quantifiable measures for evaluating the effectiveness of municipal stormwater management  
1075 programs and provide for the evaluation of, at a minimum, all of the following:

- 1076 (1) Compliance with stormwater permitting requirements, including all of the following:  
1077 (A) Inspection programs.  
1078 (B) Construction controls.  
1079 (C) Elimination of unlawful discharges.  
1080 (D) Public education programs.  
1081 (E) New development and redevelopment requirements.  
1082 (2) Reduction of pollutant loads from pollution sources.  
1083 (3) Reduction of pollutants or stream erosion due to stormwater discharge.  
1084 (4) Improvements in the quality of receiving water in accordance with water quality standards.  
1085 (c) The state board and the regional boards shall refer to the guidance document developed  
1086 pursuant to subdivision (a) when establishing requirements in municipal stormwater programs  
1087 and permits.

1088  
1089 SEC. 7. Section 13383.8 is added to the Water Code, to read:

1090 13383.8. (a) The state board shall appoint a stormwater management task force comprised of  
1091 public agencies, representatives of the regulated community, and nonprofit organizations with  
1092 expertise in water quality and stormwater management. The task force shall provide advice to the  
1093 state board on its stormwater management program that may include, but is not limited to,

1094 program priorities, funding criteria, project selection, and interagency coordination of state  
1095 programs that address stormwater management.

1096 (b) The state board shall submit a report, including, but not limited to, stormwater and other  
1097 polluted runoff control information, to the Ocean Protection Council no later than January 1,  
1098 2009, on the way in which the state board is implementing the priority goals and objectives of  
1099 the council's strategic plan.

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1108 **Attachment B**

1109 **San Diego County MS4 Permit** (beginning at page 58/119)

1110  
1111 [http://www.waterboards.ca.gov/sandiego/water\\_issues/programs/storm](http://www.waterboards.ca.gov/sandiego/water_issues/programs/storm)  
1112 [water/docs/sd\\_permit/r9\\_2007\\_0001/2007\\_0001final.pdf](http://www.waterboards.ca.gov/sandiego/water_issues/programs/storm/water/docs/sd_permit/r9_2007_0001/2007_0001final.pdf)

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1114

1115 **I. PROGRAM EFFECTIVENESS ASSESSMENT**

1116 **1. Jurisdictional**

1117 a. As part of its Jurisdictional Urban Runoff Management Program, each Copermittee  
1118 shall annually assess the effectiveness of its Jurisdictional Urban Runoff Management  
1119 Program implementation. At a minimum, the annual effectiveness assessment shall:

1120 (1) Specifically assess the effectiveness of each of the following:

1121

1122 (a) Each significant jurisdictional activity/BMP or type of jurisdictional activity/BMP  
1123 implemented;

1124 (b) Implementation of each major component of the Jurisdictional Urban Runoff  
1125 Management Program (Development Planning, Construction, Municipal,  
1126 Industrial/Commercial, Residential, Illicit Discharge Detection and Elimination, and  
1127 Education); and

1128 (c) Implementation of the Jurisdictional Urban Runoff Management Program as a whole.

1129 (2) Identify and utilize measurable targeted outcomes, assessment measures, and  
1130 assessment methods for each of the items listed in section I.1.a.(1) above.

1131 (3) Utilize outcome levels 1-69 to assess the effectiveness of each of the items listed in  
1132 section I.1.a.(1) above, where applicable and feasible.

1133 (4) Utilize monitoring data and analysis from the Receiving Waters Monitoring Program  
1134 to assess the effectiveness each of the items listed in section I.1.a.(1) above, where  
1135 applicable and feasible.

1136 (5) Utilize Implementation Assessment, Water Quality Assessment, and Integrated  
1137 Assessment, where applicable and feasible.

1138 b. Based on the results of the effectiveness assessment, each Copermittee shall annually  
1139 review its jurisdictional activities or BMPs to identify modifications and improvements  
1140 needed to maximize Jurisdictional Urban Runoff Management Program effectiveness, as  
1141 necessary to achieve compliance with section A of this Order. The Copermittees shall  
1142 develop and implement a plan and schedule to address the identified modifications and  
1143 improvements. Jurisdictional activities/BMPs that are ineffective or less effective than  
1144 other comparable jurisdictional activities/BMPs shall be replaced or improved upon by  
1145 implementation of more effective jurisdictional activities/BMPs. Where monitoring data  
1146 exhibits persistent water quality problems that are caused or contributed to by MS4  
1147 discharges, jurisdictional activities or BMPs applicable to the water quality problems  
1148 shall be modified and improved to correct the water quality problems.

1149 c. As part of its Jurisdictional Urban Runoff Management Program Annual Reports, each  
1150 Copermittee shall report on its Jurisdictional Urban Runoff Management Program  
1151 effectiveness assessment as implemented under each of the requirements of sections I.1.a  
1152 and I.1.b above.

1153

1154 **2. Watershed**  
1155 a. As part of its Watershed Urban Runoff Management Program, each watershed group of  
1156 Copermittees (as identified in Table 4) shall annually assess the effectiveness of its  
1157 Watershed Urban Runoff Management Program implementation. At a minimum, the  
1158 annual effectiveness assessment shall:  
1159 (1) Specifically assess the effectiveness of each of the following:  
1160 (a) Each Watershed Water Quality Activity implemented;  
1161 (b) Each Watershed Education Activity implemented; and  
1162 (c) Implementation of the Watershed Urban Runoff Management Program as a  
1163 whole.  
1164 (2) Identify and utilize measurable targeted outcomes, assessment measures, and  
1165 assessment methods for each of the items listed in section I.2.a.(1) above. (3) Utilize  
1166 outcome levels 1-6 to assess the effectiveness of each of the items listed in sections  
1167 I.2.a.(1)(a) and I.2.a.(1)(b) above, where applicable and feasible.  
1168 (4) Utilize outcome levels 1-4 to assess the effectiveness of implementation of the  
1169 Watershed Urban Runoff Management Program as a whole, where applicable and  
1170 feasible.  
1171 (5) Utilize outcome levels 5 and 6 to qualitatively assess the effectiveness of  
1172 implementation of the Watershed Urban Runoff Management Program as a whole,  
1173 focusing on the high priority water quality problem(s) of the watershed. These  
1174 assessments shall attempt to exhibit the impact of Watershed Urban Runoff Management  
1175 Program implementation on the high priority water quality problem(s) within the  
1176 watershed.  
1177 (6) Utilize monitoring data and analysis from the Receiving Waters Monitoring Program  
1178 to assess the effectiveness each of the items listed in section I.2.a.(1) above, where  
1179 applicable and feasible.  
1180 (7) Utilize Implementation Assessment, Water Quality Assessment, and Integrated  
1181 Assessment, where applicable and feasible.  
1182 b. Based on the results of the effectiveness assessment, the watershed Copermittees shall  
1183 annually review their Watershed Water Quality Activities, Watershed Education  
1184 Activities, and other aspects of the Watershed Urban Runoff Management Program to  
1185 identify modifications and improvements needed to maximize Watershed Urban Runoff  
1186 Management Program effectiveness, as necessary to achieve compliance with section A  
1187 of this Order. The Copermittees shall develop and implement a plan and schedule to  
1188 address the identified modifications and improvements. Watershed Water Quality  
1189 Activities/Watershed Education Activities that are ineffective or less effective than other  
1190 comparable Watershed Water Quality Activities/Watershed Education Activities shall be  
1191 replaced or improved upon by implementation of more effective Watershed Water  
1192 Quality Activities/Watershed Education Activities. Where monitoring data exhibits  
1193 persistent water quality problems that are caused or contributed to by MS4 discharges,  
1194 Watershed Water Quality Activities and Watershed Education Activities applicable to the  
1195 water quality problems shall be modified and improved to correct the water quality  
1196 problems.  
1197 c. As part of its Watershed Urban Runoff Management Program Annual Reports, each  
1198 watershed group of Copermittees (as identified in Table 4) shall report on its Watershed

1199 Urban Runoff Management Program effectiveness assessment as implemented under  
1200 each of the requirements of section I.2.a and I.2.b above.  
1201

### 1202 3. Regional

1203 a. As part of the Regional Urban Runoff Management Program, the Copermittees shall  
1204 annually assess the effectiveness of Regional Urban Runoff Management Program  
1205 implementation. At a minimum, the annual effectiveness assessment shall:  
1206 (1) Specifically assess the effectiveness of each of the following:  
1207 (a) Each regional activity/BMP or type of regional activity/BMP implemented, including  
1208 regional residential education activities; and  
1209 (b) The Regional Urban Runoff Management Program as a whole.  
1210 (2) Identify and utilize measurable targeted outcomes, assessment measures, and  
1211 assessment methods for each of the items listed in section I.3.a.(1) above.  
1212 (3) Utilize outcome levels 1-6 to assess the effectiveness of each of the items listed in  
1213 sections I.3.a.(1) above, where applicable and feasible.  
1214 (4) Utilize monitoring data and analysis from the Receiving Waters Monitoring  
1215 Program to assess the effectiveness each of the items listed in section I.3.a.(1)  
1216 above, where applicable and feasible.  
1217 (5) Utilize Implementation Assessment, Water Quality Assessment, and Integrated  
1218 Assessment, where applicable and feasible.  
1219 (6) Include evaluation of whether the Copermittees' jurisdictional, watershed, and  
1220 regional effectiveness assessments are meeting the following objectives:  
1221 (a) Assessment of watershed health and identification of water quality issues and  
1222 concerns.  
1223 (b) Evaluation of the degree to which existing source management priorities  
1224 are properly targeted to, and effective in addressing, water quality issues and concerns.  
1225 (c) Evaluation of the need to address additional pollutant sources not already included in  
1226 Copermittee programs.  
1227 (d) Assessment of progress in implementing Copermittee programs and activities.  
1228 (e) Assessment of the effectiveness of Copermittee activities in addressing priority  
1229 constituents and sources.  
1230 (f) Assessment of changes in discharge and receiving water quality.  
1231 (g) Assessment of the relationship of program implementation to changes in pollutant  
1232 loading, discharge quality, and receiving water quality.  
1233 (h) Identification of changes necessary to improve Copermittee programs, activities, and  
1234 effectiveness assessment methods and strategies.  
1235  
1236 b. Based on the results of the effectiveness assessment, the Copermittees shall annually  
1237 review their regional activities and other aspects of the Regional Urban Runoff  
1238 Management Program to identify modifications and improvements needed maximize  
1239 Regional Urban Runoff Management Program effectiveness, as necessary to achieve  
1240 compliance with section A of this Order. The Copermittees shall develop and implement  
1241 a plan and schedule to address the identified modifications and improvements. Regional  
1242 activities that are ineffective or less effective than other comparable regional activities  
1243 shall be replaced or improved upon by implementation of more effective regional  
1244 activities. Where monitoring data exhibits persistent water quality problems that are

1245 caused or contributed to by MS4 discharges, regional activities applicable to the water  
1246 quality problems shall be modified and improved to correct the water quality problems.  
1247 c. Based on the results of the Copermittees' evaluation of their effectiveness assessments,  
1248 the Copermittees shall modify their effectiveness assessment methods to improve their  
1249 ability to accurately assess the effectiveness of their urban runoff management programs.  
1250  
1251 d. As part of its Regional Urban Runoff Management Program Annual Reports, the  
1252 Copermittees shall report on its Regional Urban Runoff Management Program  
1253 effectiveness assessment as implemented under each of the requirements of sections I.3.a,  
1254 I.3.b, and I.3.c above.  
1255  
1256 **4. TMDL BMP Implementation Plan**  
1257 a. For each TMDL in a watershed, the Copermittees subject to the TMDL within the  
1258 watershed shall annually assess the effectiveness of its TMDL BMP Implementation Plan  
1259 or equivalent plan. At a minimum, the annual effectiveness assessment shall:  
1260 (1) Specifically assess the effectiveness of each of the following:  
1261 (a) Each activity/BMP or type of activity/BMP implemented; and  
1262 (b) Implementation of the TMDL BMP Implementation Plan or equivalent plan as a  
1263 whole.  
1264 (2) Identify and utilize measurable targeted outcomes, assessment measures, and  
1265 assessment methods for each of the items listed in sections I.4.a.(1) above.  
1266 (3) Utilize outcome levels 1-6 to assess the effectiveness of each of the items listed in  
1267 section I.4.a.(1)(a) above, where applicable and feasible.  
1268 (4) Utilize outcome levels 1-4 to assess the effectiveness of implementation of the TMDL  
1269 BMP Implementation Plan or equivalent plan as a whole, where applicable and feasible.  
1270 (5) Utilize outcome levels 5 and 6 to qualitatively assess the effectiveness of the TMDL  
1271 BMP Implementation Plan or equivalent plan as a whole. These assessments shall  
1272 attempt to exhibit the effects of the TMDL BMP Implementation Plan or equivalent plan  
1273 on the impairment that is targeted.  
1274 b. Based on the results of the effectiveness assessment, the Copermittees subject to the  
1275 TMDL shall modify their BMPs and other aspects of the TMDL BMP Implementation  
1276 Plan or equivalent plan in order to maximize TMDL BMP Implementation Plan or  
1277 equivalent plan effectiveness. BMPs that are ineffective or less effective than other  
1278 comparable BMPs shall be replaced or improved upon by implementation of more  
1279 effective BMPs. Where monitoring data exhibits persistent water quality problems that  
1280 are caused or contributed to by MS4 discharges, BMPs applicable to the water quality  
1281 problems shall be modified and improved to correct the water quality problems.  
1282 c. As part of its Watershed Urban Runoff Management Program Annual Reports, each  
1283 group of Copermittees subject to a TMDL shall report on any TMDL BMP  
1284 Implementation Plan or equivalent plan effectiveness assessments as implemented under  
1285 each of the requirements of sections I.4.a and I.4.b above.  
1286 **5. Long-term Effectiveness Assessment**  
1287 a. Each Copermittee shall collaborate with the other Copermittees to develop a Longterm  
1288 Effectiveness Assessment (LTEA), which shall build on the results of the Copermittees'  
1289 August 2005 Baseline LTEA. The LTEA shall be submitted by the Principal Permittee to  
1290 the Regional Board no later than 210 days in advance of the expiration of this Order.

- 1291 b. The LTEA shall be designed to address each of the objectives listed in section I.3.a.(6)  
1292 of this Order, and to serve as a basis for the Copermitees' Report of Waste Discharge for  
1293 the next permit cycle.  
1294 c. The LTEA shall address outcome levels 1-6, and shall specifically include an  
1295 evaluation of program implementation to changes in water quality (outcome levels 5 and  
1296 6).  
1297 d. The LTEA shall assess the effectiveness of the Receiving Waters Monitoring Program  
1298 in meeting its objectives and its ability to answer the five core management questions.  
1299 This shall include assessment of the frequency of monitoring conducted through the use  
1300 of power analysis and other pertinent statistical methods. The power analysis shall  
1301 identify the frequency and intensity of sampling needed to identify a 10% reduction in the  
1302 concentration of constituents causing the high priority water quality problems within each  
1303 watershed over the next permit term with 80% confidence.  
1304 e. The LTEA shall address the jurisdictional, watershed, and regional programs, with an  
1305 emphasis on watershed assessment.

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**Orange County Permit (Region 8) beginning at page 90/93**

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[http://www.waterboards.ca.gov/santaana/board\\_decisions/adopted\\_orders/orders/2009/09\\_030\\_oc\\_storm\\_water\\_ms4\\_permit.pdf](http://www.waterboards.ca.gov/santaana/board_decisions/adopted_orders/orders/2009/09_030_oc_storm_water_ms4_permit.pdf)

#### **IV. PROGRAM EFFECTIVENESS ASSESSMENT AND REPORTING**

1. All progress reports and proposed strategies and plans required by this order shall be signed by the principal permittee, and copies shall be submitted to the Executive Officer of the Regional Board under penalty of perjury.
2. The permittees shall submit an ANNUAL PROGRESS REPORT to the Executive Officer of the Regional Board and to the Regional Administrator of the U.S. EPA, Region 9, no later than November 15th, of each year. This progress report may be submitted in a mutually agreeable electronic format. At a minimum, annual progress report shall include the following:

A review of the status of program implementation and compliance (or non-compliance) with the schedules contained in this order;

An assessment of the effectiveness of control measures established under the illicit discharge elimination program and the Drainage Area Management Plan. The effectiveness may be measured in terms of how successful the program has been in eliminating illicit/illegal discharges and reducing pollutant loads in storm water discharges;

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**City of Stockton/San Joaquin County** beginning on page 60/142

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[http://www.waterboards.ca.gov/centralvalley/board\\_decisions/adopted\\_orders/san\\_joaquin/r5-2007-0173.pdf](http://www.waterboards.ca.gov/centralvalley/board_decisions/adopted_orders/san_joaquin/r5-2007-0173.pdf)

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**Program Effectiveness Assessment**

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a. The Permittees shall assess the effectiveness of their SWMP in their Annual Reports. The assessment shall identify the direct and indirect measurements that the Permittees used to track the effectiveness of their programs as well as the outcome levels at which the assessment is occurring consistent with this Order. Direct and indirect measurements shall include, but not limited to, conformance with established Performance Standards, quantitative monitoring to assess the effectiveness of Control Measures, measurements or estimates of pollutant load reductions or increases from identified sources, raising awareness of the public, and/or detailed accounting/documentation of SWMP accomplishments.

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b. The Permittees shall track the long-term progress of their SWMP towards achieving improvements in receiving water quality.

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c. The Permittees shall use the information gained from the program effectiveness assessment to improve their SWMPs and identify new BMPs, or modification of existing BMPs. This information shall be reported within the Annual Reports consistent with this Order.

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The annual report shall include an overall program assessment. The permittees may use the "Municipal Storm water Program Effectiveness Assessment Guidance" developed by the California Storm water Quality Association in May 2007 as guidance for assessing program activities at the various outcome levels. The assessment should include each program element required under this order, the expected outcome and the measures used to assess the outcome. The permittees may propose any other methodology for program assessment using measurable targeted outcomes.

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Each permittee shall develop and implement a plan and schedule to address program modifications and improvements identified during the program assessment.

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A summary and analysis of monitoring results from the previous year and any changes to the monitoring program for the following year;

A unified fiscal accountability analysis, as described in Section XX., Provision, 2, of this order;

A draft workplan which describes the proposed implementation of the DAMP for next fiscal year. The workplan shall include clearly defined tasks, responsibilities, and schedules for implementation of the storm water program and each permittee actions for the next fiscal year;

Major changes in any previously submitted plans/policies; and

An assessment of the permittees compliance status with the Receiving Water Limitations, Section IV of the Order, including any proposed modifications to the DAMP if the Receiving Water Limitations are not fully achieved.

3. The permittees shall be responsible for the submittal to the principal permittee of all required information/materials needed to comply with this order in a timely manner. All such submittals shall be signed by a duly authorized representative of the permittee under penalty of perjury.

4. The data transmittals to the Regional Board shall be in the form developed by the Storm water Monitoring Coalition (SMC) and approved by the State Water Resources Control Board in the document entitled "Standardized Data Exchange Formats." This document was developed in order to provide a standard format for all data transfer so that data can universally be shared and evaluated from various programs.

1415 **Attachment C**

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1417 Recommended Resources

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- 1419     ▪     *A Framework for Assessing the Effectiveness of Jurisdictional Urban Runoff*  
1420            *Management Programs* (San Diego Storm water Copermittees, October 2003)
- 1421     ▪     *MS4 Program Evaluation Guidance* (USEPA, January 2007)
- 1422     ▪     *Municipal Storm water Program Effectiveness Assessment Guidance* (California  
1423            Storm water Quality Association, May 2007)
- 1424     ▪     *An Introduction to Storm water Program Effectiveness Assessment* (California  
1425            Storm water Quality Association, Updated June 2007)
- 1426     ▪     *Monitoring to Demonstrate Environmental Results: Guidance to Develop Local*  
1427            *Storm water Monitoring Studies Using Six Example Study Designs* (Center for  
1428            Watershed Protection, August 2008)



1429 **Attachment D**

1430 Sample Checklists for Effectiveness Assessment

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1432 *Level 1 - Permit Requirements* (Note, this is not an exhaustive lists)

1433 Legal Authority  Yes  Code Citation

1434  No

1435 Industrial/Commercial Discharges Program

1436 Inventory of facilities  Yes  No

1437 How many or what percentage of facilities does the permit require to be  
1438 inspected each year?

1439  Number to be inspected  Percentage to be inspected

1440 How many or what percentage were actually inspected?

1441  Actual number inspected  Actual percentage inspected

1442

1443 Construction Discharges Program

1444 Complete Inventory of construction sites  Yes  No

1445 How many or what percentage of construction sites does the permit  
1446 require to be inspected each year?

1447  Number to be inspected  Percentage to be inspected

1448 How many or what percentage were actually inspected?

1449  Actual number inspected  Actual percentage inspected

1450

1451 New Development and Redevelopment Requirements (including Post-  
1452 Construction Requirements)

1453 Is there a Planning and Plan Check process in place?

1454  Yes  No

1455 Is there a mechanism to track requirements?

1456  Yes  No

1457

1458 Illegal Connection / Illicit Discharge Requirements

1459 Telephone Hotline?  Yes  No

1460                   \_\_\_ Number of call-outs for illegal connections or illicit discharges.

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1462           Public Education Programs

1463           \_\_\_ Number of Impressions required by permit

1464           \_\_\_ Actual number of impressions

1465           \_\_\_ Number of training events required by permit

1466           \_\_\_ Actual number of training events conducted

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1468   *Level 2 – Changes in Awareness/Knowledge*

1469           Target audience(s) identified

1470           What is the baseline awareness/knowledge of the target audience?

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1473           Outreach to audience

1474           What is the message?

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1477           How was the message delivered?

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1479

1480           Did Baseline awareness/knowledge change?   \_\_\_ Yes   \_\_\_ No

1481           How was this measured?

1482

1483

1484           If multiple formats or media were used, can it be determined which was  
1485           most effective and why?

1486

1487

1488           Are there future plans for outreach and education?

1489

Yes What the plans?

1490

\_\_\_\_\_

1491

\_\_\_\_\_

1492

No Why not?

1493

\_\_\_\_\_

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\_\_\_\_\_

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1497 *Level 3 – Changes in Behavior*

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What behavior does the program seek to change?

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\_\_\_\_\_

1500

\_\_\_\_\_

1501

What is the current baseline?

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\_\_\_\_\_

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\_\_\_\_\_

1504

If education/outreach was determined to be effective, did this translate to changes

1505

in behavior?  Yes  No

1506

How is this measured?

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What are the future plans for measuring changes in behavior?

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1513 *Level 4 – Reductions in Loads*

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What is the pollutant(s) that is being measured?

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Was a baseline pollutant load determined and if so how?

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1520 How are pollutant load reduction measured? By direct measurement or estimated  
1521 using BMP performance data?

1522 \_\_\_\_\_  
1523 \_\_\_\_\_

1524 \_\_\_\_\_  
1525 Do the results represent snapshots in time or trends?

1526 \_\_\_\_\_  
1527 \_\_\_\_\_

1528 \_\_\_\_\_  
1529 *Level 5 – Improvements in Runoff Quality*

1530 Are effluent discharges being monitored? \_\_\_Yes \_\_\_No  
1531 If yes, is this required by the permit and what is the frequency of monitoring?

1532 \_\_\_\_\_  
1533 \_\_\_\_\_

1534 Has baseline effluent quality been established? \_\_\_Yes \_\_\_No  
1535 What are the data needs to determine trends in the effluent quality?

1536 \_\_\_\_\_  
1537 \_\_\_\_\_

1538 Is the data needed to determine trends being collected?  
1539 \_\_\_\_\_

1540 \_\_\_\_\_  
1541 If enough data has been collected to determine trends, what do the trends show?

1542 \_\_\_\_\_  
1543 \_\_\_\_\_

1544 Is there any correlation between the trends and program implementation?  
1545 \_\_\_\_\_

1546 \_\_\_\_\_  
1547 \_\_\_\_\_

1548 *Level 6 – Improvements in Receiving Water Quality*  
1549 Does the permit require monitoring the receiving waters? \_\_\_Yes \_\_\_No  
1550 Have baseline conditions in the receiving waters been established? \_\_\_Yes \_\_\_No

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If so, how was this determined?

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Are sufficient samples being taken and locations being monitored to ensure enough data is being collected to determine trends in receiving water quality.

Yes  No

If effluent quality is being improved, can this improvement be linked to improvements in receiving water quality?  Yes  No

Are watershed activities that could affect receiving water quality being tracked

DRAFT

**From:** Adam Fischer  
**To:** commentletters@waterboards.ca.gov  
**Date:** Monday, November 15, 2010 1:58 PM  
**Subject:** Comment Letter - Effectiveness Assessment Document  
**Attachments:** PEA flowchart.PDF; effctve\_assmnt.PDF

Please find attached the Effectiveness Assessment Document containing comments and suggested edits. Attached also is a flowchart representing a performance improvement-based method for conducting assessments, which to some extent, forms the basis of many of the edits and comments. Thank you and good luck. --Adam

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Region 8 Water Quality Control Board  
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Riverside CA 92501  
(951) 320-6363

### Simplified Program Effectiveness Assessment Process

