C.8. Water Quality Monitoring

C.8.a. Compliance Options

i. Regional Collaboration – All Permittees shall comply with the monitoring requirements in C.8, however, Permittees may choose to comply with any requirement of this Provision through a collaborative effort to conduct or cause to be conducted the required monitoring in their jurisdictions. Where all or a majority of the Permittees collaborate to conduct water quality monitoring, this shall be considered a regional monitoring collaborative.

Where an existing collaborative body has initiated plans, before the adoption of this Permit, to conduct monitoring that would fulfill a requirement(s) of this Provision, but the monitoring would not meet this Provision's due date(s) by a year or less, the Permittees may request the Executive Officer adjust the due date(s) to synchronize with such efforts.

The types, quantities, and quality of data required within Provision C.8. establish the minimum level-of-effort that a regional monitoring collaborative must achieve. Provided these data types, quantities, and quality are obtained, a regional monitoring collaborative may develop its own sampling design. For Pollutants of Concern monitoring required under C.8.e, an alternative approach may be pursued by Permittees provided that: either similar data types, data quality, data quantity are collected with an equivalent level of effort described under C.8.e; or an equivalent level of monitoring effort is employed to answer the management information needs stated under C.8.e.

ii. Implementation Schedule – Monitoring conducted through a regional monitoring collaborative shall commence data collection by ~~December~~October ~~2010~~2011. All other Permittee monitoring efforts shall commence data collection by October ~~2011~~2010. By July 1, 2010, each Permittee shall provide documentation to the Water Board, such as a written agreement, letter, or similar document, that confirms whether the Permittee will conduct monitoring individually or through a regional monitoring collaborative.[1]

iii. Permittee Responsibilities – A Permittee may comply with the requirements in Provision C.8. by performing the following:

(1) Contributing to its stormwater countywide program, as determined appropriate by the Permittee members, so that the stormwater countywide Program conducts monitoring on behalf of its members;

(2) Contributing to a regional collaborative effort;

[1] This documentation will allow the Water Board to know when monitoring will commence for each Permittee. Permittees who commit to monitoring individually may join the regional monitoring collaborative at any time. Any Permittee who discontinues monitoring through the regional collaborative must commence complying with all requirements of Provision C.8 immediately.

(3) Fulfilling monitoring requirements within its own jurisdictional boundaries; or

(4) A combination of the previous options, so that all requirements are fulfilled.

iv. Third-party Monitoring – Permittees may choose to fulfill requirements of Provision C.8. using data collected by citizen monitors or other third-party organizations, provided the data are demonstrated to meet the data quality objectives described in Provision C.8.~~i~~h. Where an existing third-party organization has initiated plans to conduct monitoring that would fulfill a requirement(s) of this Provision, but the monitoring would not meet this Provision's due date(s) by a year or less, the Permittees may request that the Executive Officer adjust the due date(s) to synchronize with such efforts.

C.8.b. San Francisco Estuary Receiving Water Monitoring

With limited exceptions, urban runoff from the Permittees' jurisdictions ultimately discharges to the San Francisco Estuary. Monitoring of the Estuary is intended to answer questions[2] such as:

- Describe the distribution and trends of pollutant concentrations in the Estuary
- Project future contaminant status and trends using best understanding of ecosystem processes and human activities
- Describe sources, pathways, and loading of pollutants entering the Estuary
- Measure pollution exposure and effects on selected parts of the Estuary ecosystem
- Compare monitoring information to relevant benchmarks, such as TMDL targets, tissue screening levels, water quality objectives, and sediment quality objectives.
  - ~~Are pollutants of concern increasing, decreasing, or remaining the same in the Estuary?~~
  - ~~Do pollutant concentration distributions indicate particular areas of origin or regions of potential ecological concern?~~
  - ~~What are the likely consequences of various management actions or risk reduction measures?~~
  - ~~For pollutants of concern, what are the magnitudes and temporal variations of concentrations and loadings?~~
  - ~~How do loads change over time in relation to management activities?~~

Permittees shall participate in implementing an Estuary receiving water monitoring program, at a minimum equivalent to the San Francisco Estuary Regional

[2] These are the objectives of the Regional Monitoring Program (RMP) as stated at http://www.sfei.org/rmp/rmp_prog_info.html#objectives on June 12, 2009. While the stated objectives may change over time, the intent of this provision is for Permittees to continue contributing financially and as stakeholders in such a program as the RMP, which monitors the quality of San Francisco Bay.

Monitoring Program for Trace Substances (RMP), by contributing their fair-share financially on an annual basis.

C.8.c. Status Monitoring/Rotating Watersheds

i. Status Monitoring is intended to answer these questions: Are water quality objectives, both numeric and narrative, being met in local receiving waters, including creeks, rivers and ~~stream~~ tributaries? Are conditions in local receiving waters supportive of or likely to be supportive of beneficial uses?

ii. **Parameters and Methods** – Permittees shall conduct Status Monitoring using the parameters, methods, occurrences, durations, and minimum number of sampling sites as described in Table 8.1. Spring sampling shall be conducted during ~~April and~~ the ~~May~~April - June timeframe; dry weather sampling shall be conducted during ~~June,~~the July ~~, August and~~ - September timeframe. Minor variations of the parameters and methods may be allowed with Executive Officer concurrence.

iii. **Frequency** – Permittees shall complete the Status Monitoring in Table 8.1 at the following frequencies:

- Alameda Permittees – annually
- Contra Costa Permittees – annually
- Fairfield-Suisun Permittees – twice during the Permit term
- San Mateo Permittees – annually
- Santa Clara Permittees – annually
- Vallejo Permittees – once during the Permit term

Table 8.1 Status Monitoring Elements

Status Monitoring Parameter	**Sampling and/or Analytical Method**[3]	**Minimum Sampling Occurrence**[4]	**Duration of Sampling**	**Minimum # Sample Sites to Monitor/Yr**[5] Santa Clara & Alameda Permittees/ Contra Costa & San Mateo Permittees/ Fairfield-Suisun & Vallejo Permittees	**Result(s) that Trigger a Monitoring Project in Provision C.8.ed.i.**
Biological Assessment[6] (Includes Physical Habitat Assessment and General Water Quality Parameters[7]) Nutrients (total phosphorus, dissolved	SWAMP Std Operating P~~p~~rocedure[8,9,10] for Biological Assessments & PHab; SWAMP comparable	1/yr (Spring Sampling)	Grab sample	Spring 20 / 10 / 4	BMI metrics that indicate substantially degraded community as per Attachment G, Table G-1 For Nutrients: 20% of results in one waterbody exceed one or more water quality standard

3 Refers to field protocol, instrumentation and/or laboratory protocol.

4 Refers to the number of sampling events at a specific site in a given year.

5 The number of sampling sites shown is based on the relative population in each Regional Stormwater Countywide Program and is listed in this order: Santa Clara & Alameda Countywide / Contra Costa & San Mateo Countywide / Vallejo & Fairfield-Suisun Programs.

6 The same general location must be used to collect benthic community, sediment chemistry, and sediment toxicity samples.

7 Includes dissolved oxygen, temperature, conductivity, and pH ~~and stream depth~~. General Water Quality Parameters need not be collected twice, where it is collected by a multi-parameter probe at a subset of these sample sites (see next row of Table 8.1),

8 Ode, P.R. 2007. Standard Operating Procedures for Collecting Benthic Macroinvertebrate Samples and Associated Physical and Chemical Data for Ambient Bioassessments in California, California State Water Resources Control Board Surface Water Ambient Monitoring Program (SWAMP), as subsequently revised (http://www.waterboards.ca.gov/water_issues/programs/swamp/docs/phab_sopr6.pdf). Permittees may coordinate with Regional Board staff to modify their sampling procedures if these referenced procedures change during the Permit term.

9 Biological assessments shall include benthic macroinvertebrates and algae. Bioassessment sampling method shall be multihabitat reach-wide. Macroinvertebrates shall be identified according to the Standard Taxonomic Effort Level I of the Southwestern Association of Freshwater Invertebrate Taxonomists, using ~~a fixed count of 600 organisms per sample~~the most current SWAMP approved method. Current methods are documented in (1) SWAMP Standard Operating Procedure (SOP) and Interim Guidance on Quality Assurance for SWAMP Bioassessments, Memorandum to SWAMP Roundtable from Beverly H. van Buuren and Peter R. Ode, 5-21-07, and (2) Amendment to SWAMP Interim Guidance on Quality Assurance for SWAMP Bioassessments, Memorandum to SWAMP Roundtable from Beverly H. van Buuren and Peter R. Ode, 9-17-08. For algae, include mass (ash-free dry weight), chlorophyll a, diatom and soft algae taxonomy, ~~silicate,~~ and reachwide algal percent cover. Physical Habitat (PHab) Assessment shall include the SWAMP basic method plus 1) depth and pebble count + CPOM, 2) cobble embeddedness, 3) discharge measurements, and 4) in-stream habitat. ~~PHab Assessment form is at http://www.waterboards.ca.gov/swamp/docs/reports/fieldforms_fullversion071007.pdf~~. Permittees may coordinate with Regional Board staff to modify these sampling procedures if SWAMP procedures change during the Permit term.

10 Algae shall be collected in a consistent timeframe as Regional SWAMP. For guidance on algae sampling and evaluation: Fetscher, A. and K. McLaughlin, May 16, 2008. Incorporating Bioassessment Using Freshwater Algae into California's Surface Water Ambient Monitoring Program (SWAMP). Technical Report 563. Available at http://www.waterboards.ca.gov/water_issues/programs/swamp/docs/reports/563_periphyton_bioassessment.pdf .

Status Monitoring Parameter	**Sampling and/or Analytical Method**[3]	**Minimum Sampling Occurrence**[4]	**Duration of Sampling**	**Minimum # Sample Sites to Monitor/Yr**[5] Santa Clara & Alameda Permittees/ Contra Costa & San Mateo Permittees/ Fairfield-Suisun & Vallejo Permittees	**Result(s) that Trigger a Monitoring Project in Provision C.8.ed.i.**
orthophosphate, total nitrogen, nitrate, ammonia, silica, chloride, dissolved organic carbon, suspended sediment concentration)	methods for Nutrients				or established threshold
General Water Quality[11]	Multi-Parameter Probe	2/yr (Concurrent with bioassessment & during the Aug. - Sept. timeframe)	15-minute intervals for 1-2 weeks	3 / 2 / 1	20% of results in one waterbody exceed one or more water quality standard or established threshold
Chlorine (Free and Total)	USEPA Std. Method 4500 Cl F[12]	2/yr Spring & Dry Seasons	Grab sample	Spring 20 / 10 / 2 Dry 3 / 2 / 1	After immediate resampling, concentrations remain > 0.08 mg/L
~~Nutrients (total phosphorus, dissolved orthophosphate, total nitrogen, nitrate, ammonia, silica, chloride, dissolved organic carbon, suspended sediment concentration)~~	~~Applicable SWAMP comparable method~~	~~3/yr in conjunction with algae sampling & water column toxicity~~	~~Grab sample~~	~~20 / 10 / 4~~	~~20% of results in one waterbody exceed one or more water quality standard or established threshold~~

[11] Includes dissolved oxygen, temperature, conductivity, pH and stream depth.
[12] The method of analysis shall achieve a method detection limit at least as low as that achieved by the Amperometric Titration Method (4500-Cl from *Standard Methods for Examination of Water and Wastewater*, Edition 20).

Status Monitoring Parameter	**Sampling and/or Analytical Method**[3]	**Minimum Sampling Occurrence**[4]	**Duration of Sampling**	**Minimum # Sample Sites to Monitor/Yr**[5] Santa Clara & Alameda Permittees/ Contra Costa & San Mateo Permittees/ Fairfield-Suisun & Vallejo Permittees	**Result(s) that Trigger a Monitoring Project in Provision C.8.ed.i.**
~~General Water Quality[13]~~	~~Multi-Parameter Probe~~	~~1/yr (During June-Sept.)~~	~~15-minute intervals for 1-2 weeks~~	~~3 / 2 / 1~~	~~20% of results in one waterbody exceed one or more water quality standard or established threshold~~
Temperature	Digital Temperature Logger	60-minute intervals	60-minute intervals April through Sept.	8 / 4 / 1	20% of results in one waterbody exceed applicable temperature threshold[14]
Toxicity ~~& Diazinon and Chlorpyrifos~~ – Water Column[15]	Applicable SWAMP Comparable Method	2/yr (1/Dry Season & 1 Storm Event)	Grab or composite sample	3 / 2 / 1	If toxicity results < 50% of control results, repeat sample. If 2nd sample yields < 50% of control results, proceed to C.8.ed.i.
Toxicity– Bedded Sediment, Fine-grained[16]	Applicable SWAMP Comparable Method	1/yr	Grab sample	~~10 / 5~~3 / 2 / 1 At fine-grained depositional area at bottom of watershed	See Attachment G, Table G-1

[13] Includes dissolved oxygen, temperature, conductivity, pH and stream depth.

[14] If temperatures exceed applicable threshold (e.g., Maximum Weekly Average Temperature, Sullivan K., Martin, D.J., Cardwell, R.D., Toll, J.E., Duke, S. 2000. *An Analysis of the Effects of Temperature on Salmonids of the Pacific Northwest with Implications for Selecting Temperature Criteria, Sustainable Ecosystem Institute*) or spike with no obvious natural explanation observed.

[15] *US EPA three species toxicity tests: Selenastrum* growth and *Ceriodaphnia* -and *Pimephales* with lethal and sublethal endpoints. *Also Hyalella azteca with lethal endpoint.*

[16] Bedded sediments should be fine-grain from depositional areas. Grain size and TOC must be reported. Analytes shall include all of those reported in MacDonald (including copper, nickel, mercury, PCBs, DDT, chlordane, dieldrin) as well as ~~other contaminants of interest, including~~ pyrethroids. Coordinate with TMDL Provision requirements as applicable. MacDonald, D.D., G.G. Ingersoll, and T.A. Berger. 2000. Development and Evaluation of Consensus-based Sediment Quality Guidelines for Freshwater Ecosystems. *Archives of Environ. Contamination and Toxicology* 39(1):20–31

Status Monitoring Parameter	**Sampling and/or Analytical Method**[3]	**Minimum Sampling Occurrence**[4]	**Duration of Sampling**	**Minimum # Sample Sites to Monitor/Yr**[5] Santa Clara & Alameda Permittees/ Contra Costa & San Mateo Permittees/ Fairfield-Suisun & Vallejo Permittees	**Result(s) that Trigger a Monitoring Project in Provision C.8.ed.i.**
Pollutants – Bedded Sediment,[17] fine-grained	Applicable SWAMP Comparable Method ~~Inc~~inc. grain size	1/yr	Grab sample	~~10 / 5~~3 / 2 / 1 At fine-grained depositional area at bottom of watershed	See Attachment G, Table G-1
Pathogen Indicators[18]	~~Applicable SWAMP Comparable Method~~U.S. EPA protocol[19]	1/yr (During Summer)	Follow U.S. EPA protocol	5 / 5 / * *Fairfield-Suisun & Vallejo Permittees: 3 sites twice in permit term	Exceedance of USEPA ~~or Basin Plan~~ criteria (this involves multiple values)
Stream Survey (stream walk & mapping)[20]	USA[21] or equivalent	1 waterbody/yr	N/A	9 / 6 / 3 stream miles/year	N/A

[17] Bedded sediments should be fine-grain from depositional areas. Grain size and TOC must be reported. Analytes shall include all of those reported in MacDonald (including copper, nickel, mercury, PCBs, DDT, chlordane, dieldrin) as well as ~~other contaminants of interest, including~~ pyrethroids. Coordinate with TMDL Provision requirements as applicable.

[18] Includes fecal coliform and *E. Coli.*

[19] Rather than collecting samples over five separate days, Permittees may use Example #2, pg. 54, of USEPA's *Implementation Guidance for Ambient Water Quality Criteria for Bacteria*, May 2002 Draft.

[20] The Stream Surveys need not be repeated on a watershed if a Stream Survey was completed on that waterbody within the previous five years. The number of stream miles to be surveyed in any given year may be less than that shown in Table 8-1 in order to avoid repeating surveys at areas surveyed during the previous five years. ~~The Stream Survey need not be repeated on a waterbody if a Stream Survey was completed on that waterbody within the previous four years.~~

[21] Center for Watershed Protection, Manual 10: *Unified Stream Assessment: A User's Manual*, February 2005.

iv. Locations – For each sampling year (per C.8.c.iii.), Permittees shall select at least one waterbody to sample from the applicable list below. Locations shall be selected so that sampling is sufficient to characterize ~~reaches~~ segments of the waterbody(s). For example, Permittees required to collect a larger number of samples should sample two or more waterbodies, so that each sampling effort represents a reasonable ~~reach~~ segment length and/or type. Samples shall be collected in reaches that receive urban stormwater discharges, except in possible infrequent instances where non-urban-impacted stream samples are needed for comparison[22]. Waterbody selection shall be based on factors such as watershed area, land use, likelihood of urban runoff impacts, and existing monitoring data.

Table 8.2 Status Monitoring Locations – Waterbodies

SCVURPPP	ACCWP	CCCWP	SMCWPPP	FSUMRP	VALLEJO
Coyote Creek and tributaries	Arroyo Valle (below Livermore or lower)	Kirker Creek	San Pedro Creek and tributaries	Laurel Creek	Chabot Creek
Guadalupe River and tributaries	Arroyo Mocho	Mt. Diablo Creek	Pilarcitos Creek	Ledgewood Creek	Austin Creek & tributaries
San Tomas Creek and tributaries	Tassajara Creek	Walnut Creek and tributaries	Colma Creek		
Calabazas Creek	Alamo Creek	Rodeo Creek	San Bruno Creek and tributaries		
Permanente Creek and tributaries	Arroyo de la Laguna	Pinole Creek	Millbrae Creek and tributaries		
Stevens Creek and tributaries	Alameda Creek (at Fremont or below)	San Pablo Creek	Mills Creek and tributaries		
Matadero Creek and tributaries	San Lorenzo Creek & tribs	Alhambra Creek	Easton Creek and tributaries		
Adobe Creek	San Leandro Creek & tribs	Wildcat Creek	Sanchez Creek and tributaries		
Lower Penitencia Creek and tributaries	Oakland, Berkeley, or Albany Creeks		Burlingame Creek and tributaries		
Barron Creek			San Mateo Creek (below dam only)		
			Borel Creek & tributaries		
			Laurel Creek & tribs		
			Belmont Creek & tribs		
			Pulgas Creek & tribs		
			Cordilleras & tributaries		
			Redwood Creek & tribs		
			Atherton Creek & tribs		
			San Francisquito Creek and tributaries		

[22] Sampling efforts shall focus on stream reaches with urban stormwater system discharges. Sampling upstream of urban outfalls is not precluded where needed to meet sampling plan objectives.

v. Status Monitoring Results – When Status Monitoring produces results such as those described in the final column of Table 8.1, Permittees shall conduct Monitoring Project(s) as described in C.8.~~e~~d.i.

~~C.8.d.Long-Term Monitoring~~

~~Long-Term Monitoring is intended to detect exceedances of water quality objectives in receiving waters, update and refine estimates of mass emissions from MS4s, help assess long-term trends in pollutant concentrations and toxicity in receiving waters and sediment, and evaluate if stormwater discharges are causing or contributing to toxic impacts on aquatic life.~~

~~**i.**Parameters and Methods – Permittees shall conduct sampling pursuant to Table 8.3. Samples, other than sediment samples, shall be wet weather flow-weighted composite samples, collected during storm events that produce rainfall of at least 0.10 inch. Sampled storms should be separated by 21 days of dry weather, but, at a minimum, sampled storms must have 72 hours of antecedent dry weather. Samples must include the first rise in the hydrograph.~~

~~**ii.**Frequency – Permittees shall conduct Long-Term Monitoring every other year (biennially). Where possible, Long-Term Monitoring should be done in conjunction with Pollutants of Concern Monitoring and/or SWAMP monitoring.~~

~~Table 8.3. Long-Term Monitoring Elements~~

~~**Long-Term Monitoring Parameter**~~	~~**Sampling &/or Analytical Method**~~	~~**Minimum Sampling Occurrence**~~	~~**Result(s) that Trigger a Monitoring Project in Provision C.8.e.i.**~~
~~Dissolved & Total Metals[23]~~	~~Applicable SWAMP Comparable Method~~	~~Average of 4 wet weather events/year~~	~~If applicable water quality objective is exceeded, repeat wet weather sample. If 2nd sample yields < 50% of control results, proceed to C.8.e.i.~~
~~Semi-Volatile Organics~~	~~Method 8270C~~		
~~Suspended Sediment Concentration~~	~~Applicable SWAMP Comparable Method~~	~~Average of 4 wet weather events/year~~	~~Not applicable~~
~~Toxicity – Water Column~~	~~Applicable SWAMP Comparable Method~~	~~Average of 4 wet weather events/year~~	~~If Ceriodaphnia or Pimephales survival or Selenastrum growth is < 50% of control results, repeat wet weather sample. If 2nd sample yields < 50% of control results, proceed to C.8.e.i.~~

~~[23] Include total and dissolved aluminum, antimony, arsenic, beryllium, cadmium, total chromium, hexavalent chromium, iron, lead, nickel, selenium, silver, thallium, and zinc. Note that copper and mercury are required under Pollutants of Concern Monitoring.~~

~~**Long-Term Monitoring Parameter**~~	~~**Sampling &/or Analytical Method**~~	~~**Minimum Sampling Occurrence**~~	~~**Result(s) that Trigger a Monitoring Project in Provision C.8.e.i.**~~
~~Toxicity – Bedded Sediment, fine-grained~~	~~Applicable SWAMP Comparable Method~~	~~Once, during April-July, coordinate with SWAMP~~	~~See Attachment G, Table G-1~~
~~Pollutants – Bedded Sediment, fine-grained~~	~~Applicable SWAMP Comparable Method~~	~~Once, during April-July, coordinate with SWAMP~~	~~See Attachment G, Table G-1~~

~~**iii.**Locations – Permittees shall participate in a program to sample and monitor one long-term monitoring station per county, except for Fairfield-Suisun and Vallejo Permittees, who shall jointly sample one long-term station. Permittees shall locate fixed monitoring stations and conduct Long-Term Monitoring on the applicable waterbody shown in Table 8.4. Permittees may select and monitor alternate Long-Term Monitoring locations based on their knowledge of such factors as site access and stream characteristics (e.g., depositional properties) and upon approval from the Executive Officer.~~

~~**Table 8.4. Long-Term Monitoring Locations**~~

~~**Stormwater Countywide Program**~~	~~**Waterbody**~~	~~**Suggested Location**~~
~~Alameda Permittees~~	~~Alameda Creek OR~~	~~East of Alvarado Blvd*~~
	~~Lower San Leandro Creek~~	~~Empire Road*~~
~~Contra Costa Permittees~~	~~Kirker Creek OR~~	~~Floodway*~~
	~~Walnut Creek~~	~~Concord Avenue*~~
~~Fairfield-Suisun & Vallejo Permittees~~	~~Laurel Creek~~	~~Pintail Drive*~~
~~Santa Clara Permittees~~	~~Guadalupe River OR~~	~~USGS Gaging Station 11169025*~~
	~~Coyote Creek~~	~~Montague*~~
~~San Mateo Permittees~~	~~San Mateo Creek~~	~~Gateway Park*~~

~~* The SWAMP plan is to collect sediment toxicity and sediment chemistry samples annually at these stations during the month of June.~~

~~**iv.**Long-Term Monitoring Results – When Long-Term Monitoring produces results such as those described in the final column of Table 8.3, Permittees shall conduct Monitoring Project(s) as described in C.8.e.i., or, for bedded sediment, as described in Attachment G.~~

~~**C.8.e.**~~**C.8.d.** **Monitoring Projects –** Permittees shall conduct the Monitoring Projects listed below.

i. Stressor/Source Identification – When Status ~~or Long-Term Monitoring~~ results trigger a follow-up action as indicated in Table 8.1~~ or Table 8.3~~,

Permittees shall take the following actions, as also required by Provision C.1. If the trigger stressor or source is already known, proceed directly to step 2. The first follow-up action shall be initiated as soon as possible, and no later than the second fiscal year after the sampling event that triggered the Monitoring Project.

(1) Conduct a site specific study (or non-site specific if the problem is wide-spread) in a stepwise process to identify and isolate the cause(s) of the trigger stressor/source. This study should follow guidance for Toxicity Reduction Evaluations (TRE)[24] or Toxicity Identification Evaluations (TIE).[25] A TRE, as adapted for urban stormwater data, allows Permittees to use other sources of information (such as industrial facility stormwater monitoring reports) in attempting to determine the trigger cause, potentially eliminating the need for a TIE. If a TRE does not result in identification of the stressor/source, Permittees shall conduct a TIE.

(2) Identify and evaluate the effectiveness of options for controlling the cause(s) of the trigger stressor/source.

(3) Implement one or more controls.

(4) Confirm the reduction of the cause(s) of trigger stressor/source.

(5) Stressor/Source Identification Project Cap: Permittees who conduct this monitoring through a regional collaborative shall be required to initiate no more than ten Stressor/Source Identification projects during the Permit term in total, and at least ~~three~~ two must be toxicity follow-ups, unless monitoring results do not indicate the presence of toxicity. If conducted through a stormwater countywide program, the Santa Clara and Alameda Permittees each shall be required to initiate no more than five (two for toxicity); the Contra Costa and San Mateo Permittees each shall be required to initiate no more than three (one for toxicity); and the Fairfield-Suisun and Vallejo Permittees each shall be required to initiate no more than one Stressor/Source Identification project(s) during the Permit term.

(6) As long as Permittees have complied with the procedures set forth above, they do not have to repeat the same procedure for continuing or recurring

[24] USEPA. August 1999. *Toxicity Reduction Evaluation Guidance for Municipal Wastewater Treatment Plants*. EPA/833B-99/002. Office of Wastewater Management, Washington, D.C.

[25] Select TIE methods from the following references after conferring with SWAMP personnel: For sediment: (1) Ho KT, Burgess R., Mount D, Norberg-King T, Hockett, RS. 2007. *Sediment toxicity identification evaluation: interstitial and whole methods for freshwater and marine sediments*. USEPA, Atlantic Ecology Division/Mid-Continental Ecology Division, Office of Research and Development, Narragansett, RI, or (2) Anderson, BS, Hunt, JW, Phillips, BM, Tjeerdema, RS. 2007. *Navigating the TMDL Process: Sediment Toxicity*. Final Report- 02-WSM-2. Water Environment Research Federation. 181 pp. For water column: (1) USEPA. 1991. *Methods for aquatic toxicity identification evaluations. Phase I Toxicity Characterization Procedures*. EPA 600/6-91/003. Office of Research and Development, Washington, DC., (2) USEPA. 1993. *Methods for aquatic toxicity identification evaluations. Phase II Toxicity Identification Procedures for Samples Exhibiting Acute and Chronic Toxicity*. EPA 600/R-92/080. Office of Research and Development, Washington, DC., or (3) USEPA. 1996. *Marine Toxicity Identification Evaluation (TIE), Phase I Guidance Document*. EPA/600/R-95/054. Office of Research and Development, Washington, DC.

exceedances of the same receiving water limitations unless directed to do so by the Water Board.

ii. BMP Effectiveness Investigation – Investigate the effectiveness of one BMP for stormwater treatment or hydrograph modification control. Permittees who do this project through a regional collaborative are required to initiate no more than one BMP Effectiveness Investigation during the Permit term. If conducted through a stormwater countywide program, the Santa Clara, Alameda, Contra Costa, and San Mateo Permittees shall be required to initiate one BMP Effectiveness Investigation each, and the Fairfield-Suisun and Vallejo Permittees shall be exempt from this requirement. The BMP(s) used to fulfill requirements of C.3.b.iii., C.11.e. and C.12.e. may be used to fulfill this requirement, provided the BMP Effectiveness Investigation includes the range of pollutants generally found in urban runoff. The BMP Effectiveness Investigation will not trigger a Stressor/Source Identification Project. Data from this Monitoring Project need not be SWAMP-comparable.

iii. Geomorphic Project – This monitoring is intended to answer the questions: How and where can our creeks be restored or protected to cost-effectively reduce the impacts of pollutants, increased flow rates, and increased flow durations of urban runoff?

Permittees shall select a waterbody/reach, preferably one that contains significant fish and wildlife resources, and conduct one of the following projects within each county, except that only one such project must be completed within the collective Fairfield-Suisun and Vallejo Permittees' jurisdictions:

(1) Gather geomorphic data to support the efforts of a local watershed partnership[26] to improve creek conditions; or

(2) Inventory locations for potential retrofit projects in which decentralized, landscape-based stormwater retention units can be installed; or

(3) Conduct a geomorphic study which will help in development of regional curves which help estimate equilibrium channel conditions for different-sized drainages. Select a waterbody/reach that is not undergoing changing land use. Collect and report the following data:

- Formally surveyed channel dimensions (profile), planform, and cross-sections. Cross-sections shall include the topmost floodplain terrace and be marked by a permanent, protruding (not flush with ground) monument.
- Contributing drainage area.
- Best available information on bankfull discharges and width and depth of channel formed by bankfull discharges.
- Best available information on average annual rainfall in the study area.

[26] A list of local watershed partnerships may be obtained from Water Board staff.

Permittees shall complete the selected geomorphic project so that project results are reported in the Integrated Monitoring Report (see Provision C.8.~~h~~g.iii.).

C.8.e. Pollutants of Concern and Long-Term Trends Monitoring

~~This~~ Pollutants of Concern (POC) monitoring is intended to assess inputs of Pollutants of Concern to the Bay from local tributaries and urban runoff, assess progress toward achieving wasteload allocations (WLAs) for TMDLs and help resolve uncertainties associated with loading estimates for these pollutants. In particular, there are four priority management information needs toward which POC monitoring must be directed: 1) identifying which Bay tributaries (including stormwater conveyances) contribute most to Bay impairment from pollutants of concern; 2) quantifying annual loads or concentrations of pollutants of concern from tributaries to the Bay; 3) quantifying the decadal-scale loading or concentration trends of pollutants of concern from small tributaries to the Bay; and 4) quantifying the projected impacts of management actions (including control measures) on tributaries and identifying where these management actions should be implemented to have the greatest beneficial impact.

Permittees shall implement the following POC monitoring components or pursue an alternative approach that addresses each of the aforementioned management information needs. An alternative approach may be pursued by Permittees provided that: either similar data types, data quality, data quantity are collected with an equivalent level of effort described; or an equivalent level of monitoring effort is employed to answer the management information needs.

Long-Term monitoring is intended to assess long-term trends in pollutant concentrations and toxicity in receiving waters and sediment, in order to evaluate if stormwater discharges are causing or contributing to toxic impacts on aquatic life. Permittees shall implement the following Long-Term monitoring components or, following approval by the Executive Officer, an equivalent monitoring program.

i. Pollutants of Concern **Loads Monitoring Locations** – Permittees shall conduct Pollutants of Concern monitoring at stations listed below. Permittees may install these stations in two phases providing at least half of the stations are monitored in the water year beginning October 2010, and all the stations are monitored in the water year beginning October 2012. ~~After conferring with the Regional SWAMP program, and u~~Upon approval by the Executive Officer, Permittees may use alternate ~~Pollutant of Concern~~POC monitoring locations.

(1) Castro Valley Creek S3 at USGS gauging station in Castro Valley

(2) Guadalupe River

(3) Zone 4 Line A at Chabot Road in Hayward

(4) Rheem Creek at Giant Road in Richmond

(5) Walnut Creek at a downstream location

(6) Calabazas Creek at Lakeside Drive in Sunnyvale, at border with Santa Clara

(7) San Mateo Creek at downstream location

(8) Laurel Creek at Laurie Meadows park, off Casanova Drive in City of San Mateo.

ii. **Long-Term Monitoring Locations** – Permittees shall conduct Long-Term monitoring at stations listed below. After conferring with the Regional SWAMP program, and upon approval by the Executive Officer, Permittees may use alternate Long-Term monitoring locations.

Table 8.3. Long-Term Monitoring Locations

Stormwater Countywide Program	Waterbody	Suggested Location
Alameda Permittees	Alameda Creek OR	East of Alvarado Blvd*
	Lower San Leandro Creek	Empire Road*
Contra Costa Permittees	Kirker Creek OR	Floodway*
	Walnut Creek	Concord Avenue*
Santa Clara Permittees	Guadalupe River OR	USGS Gaging Station 11169025*
	Coyote Creek	Montague*
San Mateo Permittees	San Mateo Creek	Gateway Park*

* SWAMP is scheduled to collect sediment toxicity and sediment chemistry samples annually at these stations during the month of June.

iii. **Parameters and Frequencies** – Permittees shall conduct Pollutants of Concern sampling pursuant to Table 8.~~5~~4, Categories 1 and 2. In Table 8.~~5~~4, Category 1 pollutants are those for which the Water Board has active water quality attainment strategies (WQAS), such as TMDL or site-specific objective projects. Category 2 pollutants are those for which WQAS are in development. The lower monitoring frequency for Category 2 pollutants is sufficient to develop preliminary loading estimates for these pollutants.

Permittees shall conduct Long-Term monitoring pursuant to Table 8.4, Categories 3 and 4. SWAMP has scheduled collection of Category 4 data at the Long-Term monitoring locations stated in C.8.e.ii. As stated in Provision C.8.a.iv., Permittees may use SWAMP data to fulfill Category 4 sampling requirements.

iv. **Protocols** – At a minimum, ~~Pollutants of Concern~~ sampling and analysis protocols shall be consistent with 40 CFR 122.21(g)(7)(ii).

v. **Methods** – Methyl mercury samples shall be grab samples collected during storm events that produce rainfall of at least 0.10 inch, shall be frozen immediately upon collection, and shall be kept frozen during transport to the laboratory. All other Category 1, 2, and 3 samples shall be wet weather flow-weighted composite samples, collected during storm events that produce rainfall

of at least 0.10 inch. Sampled storms should be separated by 21 days of dry weather, but, at a minimum, sampled storms must have 72 hours of antecedent dry weather. Samples must include the first rise in the hydrograph. Category 3 and 4 monitoring data shall be SWAMP-comparable.

Table 8.~~5~~ 4 Pollutants of Concern Loads & Long-Term Monitoring Elements

Category/Parameter	Sampling Years	Minimum Sampling Occurrence	Sampling Interval
Category 1 • Total and Dissolved Copper • Total Mercury[27] • Methyl Mercury • Total PCBs[28] • Suspended Sediments (SSC) • Total Organic Carbon • Hardness	Annually	Average of 4 wet weather events per year For methyl mercury only: average of 2 wet & 2 dry weather events per year	Flow-weighted composite For methyl mercury only: grab samples collected during the first rise in the hydrograph of a storm event.
Category 2 • Total and Dissolved Selenium • Total PBDEs (Polybrominated Diphenyl Ethers) • Total PAHs (Poly-Aromatic Hydrocarbons) • Chlordane • DDTs (Dichloro-Diphenyl-Trichloroethane) • Dieldrin • Nitrate as N • Pyrethroids - bifenthrin, cyfluthrin, beta-cyfluthrin, cypermethrin, deltamethrin, esfenvalerate, lambda-cyhalothrin, permethrin, and tralomethrin~~;~~ • ~~c~~Carboryl~~;~~ and fipronil • Total and Dissolved Phosphorus	Oct. 2010 - 2011 water year and Oct. 2012 - 2013 water year~~Year 2 of Permit term and Year 4 of Permit term~~	2 times per year	Flow-weighted composite
Category 3 • Toxicity – Water Column • Nitrate as N[29]	Annually	Average of 4 wet weather events per year	Flow-weighted composite
Category 4 Toxicity – Bedded Sediment, fine-grained[30]	Biennially, Coordinate	Once per year, during April-June,	Grab sample

[27] The monitoring type and frequency shown for mercury is not sufficient to determine progress toward achieving TMDL load allocations. Progress toward achieving load allocations will be accomplished by assessing loads avoided resulting from treatment, source control, and pollution prevention actions.

[28] The monitoring type and frequency shown for PCBs is not sufficient to determine progress toward achieving TMDL load allocations. Progress toward achieving load allocations will be accomplished by assessing loads avoided resulting from treatment, source control, and pollution prevention actions.

[29] Nitrate sampling need not be duplicated where Pollutant of Concern and Long-Term monitoring are done at the same station(s).

[30] If Ceriodaphnia, *Hyalella azteca,* or Pimephales survival or Selenastrum growth is < 50% of control results, repeat wet weather sample. If 2nd sample yields < 50% of control results, proceed to C.8.d.i.

Category/Parameter	Sampling Years	Minimum Sampling Occurrence	Sampling Interval
Pollutants – Bedded Sediment, fine-grained	with SWAMP	coordinate with SWAMP	

~~v.~~vi. **Sediment Delivery Estimate/Budget** – The objective of this monitoring is to develop a strong estimate of the amount of sediment entering the Bay from local tributaries and urban drainages. By July 1, 2011, Permittees shall develop a design for a robust sediment delivery estimate/sediment budget in local tributaries and urban drainages. Permittees shall implement the study by July 1, 2012.

~~vi.~~vii. **Emerging Pollutants** – Permittees shall develop a work plan and schedule for initial loading estimates and source analyses for emerging pollutants: endocrine-disrupting compounds, PFOS/PFAS (Perfluorooctane Sulfonates (PFOS), Perfluoroalkyl sulfonates (PFAS); these perfluorocompounds are related to Teflon products), and NP/NPEs (nonylphenols/nonylphenol esters — estrogen-like compounds). This work plan, which is to be implemented in the next Permit term, shall be submitted with the Integrated Monitoring Report (see Provision C.8.g~~h~~.).

~~C.8.g.~~C.8.f. Citizen Monitoring and Participation

i. Permittees shall encourage Citizen Monitoring.

ii. In developing Monitoring Projects and evaluating Status & Trends data, Permittees shall make reasonable efforts to seek out citizen and stakeholder information and comment regarding waterbody function and quality.

iii. Permittees shall demonstrate annually that they have encouraged citizen and stakeholder observations and reporting of waterbody conditions. Permittees shall report on these outreach efforts in the annual Urban Creeks Monitoring Report.

~~C.8.h.~~C.8.g. Reporting

i. **Water Quality Standard Exceedence** – When data collected pursuant by C.8.a.-C.8.f. indicate that stormwater runoff or dry weather discharges are or may be causing or contributing to exceedance(s) of applicable water quality standards, including narrative standards, a discussion of possible pollutant sources shall be included in the Urban Creeks Monitoring Report. When ~~receiving water~~ data collected pursuant by C.8.a.-C.8.f. indicate that discharges are causing or contributing to an exceedance of an applicable water quality standard~~an exceedance of applicable water quality standards~~, Permittees shall notify the Water Board within no more than 30 days of such a determination and submit a follow-up report in accordance with Provision C.1 requirements.

ii. **Status & Trends Electronic Reporting** – Permittees shall submit an Electronic Status & Trends Data Report no later than ~~September 30~~January 15 of each year,

reporting on all data collected during the foregoing ~~July~~ October 1~~–June~~ September 30 period. Electronic Status & Trends Data Reports shall be in a format compatible with the SWAMP database.[31] Water Quality Objective exceedances shall be highlighted in the Report.

iii. Urban Creeks Monitoring Report – Permittees shall submit a comprehensive Urban Creeks Monitoring Report no later than ~~December~~ March 15 of each year, reporting on all data collected during the foregoing ~~July~~ October 1~~–June~~ September 30 period, with the initial report due ~~December~~ March 15, 2011, unless the Permittees choose to monitor through a regional collaborative, in which case the due date is ~~December~~ March 15, 2012. Each Urban Creeks Monitoring Report shall contain summaries of Status, Long-Term, Monitoring Projects, and Pollutants of Concern Monitoring including, as appropriate, the following:

(1) Maps and descriptions of all monitoring locations;

(2) Data tables and graphical data summaries; Constituents that exceed applicable water quality standards shall be highlighted;

(3) For all data, a statement of the data quality;

(4) An analysis of the data, which shall include the following:

- Calculations of biological metrics and physical habitat endpoints.
- Comparison of biological metrics to:
  - Each other
  - Any applicable, available reference site(s)
  - Any applicable, available index of biotic integrity
  - Physical habitat endpoints.
- Identification and analysis of any long-term trends in stormwater or receiving water quality.
- ~~For Pollutants of Concern – methods, data, calculations, load estimates, and source estimates for each Pollutant of Concern Monitoring parameter.~~

(5) A discussion of the data for each monitoring program component, which shall:

- Discuss monitoring data relative to prior conditions, beneficial uses and applicable water quality standards as described in the Basin Plan, the Ocean Plan, or the California Toxics Rule or other applicable water quality control plans.
- Where appropriate, develop hypotheses to investigate regarding pollutant sources, trends, and BMP effectiveness.

[31] See http://mpsl.mlml.calstate.edu/swdataformats.htm. Permittees shall maintain an information management system that will support electronical transfer of data to the Regional Data Center of the California Environmental Data Exchange Network (CEDEN), located within the San Francisco Estuary Institute.

- Identify and prioritize water quality problems.
- Identify potential sources of water quality problems.
- Describe follow-up actions.
- Evaluate the effectiveness of existing control measures.
- Identify management actions needed to address water quality problems.

iv. Monitoring Project Reports – Permittees shall report on the status of each ongoing Monitoring Project in each annual Urban Creeks Monitoring Report. In addition, Permittees shall submit stand-alone summary reports within six months of completing BMP Effectiveness and Geomorphic Projects; these reports shall include: a description of the project; map(s) of project locations; data tables and summaries; and discussion of results.

v. Integrated Monitoring Report – No later than ~~December~~ March 15, ~~2013~~2014, Permittees shall prepare and submit an Integrated Monitoring Report through the regional collaborative monitoring effort on behalf of all participating Permittees, or on a countywide basis on behalf of participating Permittees, so that all monitoring conducted during the Permit term is reported.[32] This report shall be in lieu of the Annual Urban Creeks Monitoring Report due on ~~December~~ March 15, ~~2013~~2014.

The report shall include, but not be limited to, a comprehensive analysis of all data collected pursuant to Provision C.8., and may include other pertinent studies. For Pollutants of Concern, the report shall include methods, data, calculations, load estimates, and source estimates for each Pollutant of Concern Monitoring parameter. The report shall include a budget summary for each monitoring requirement and recommendations for future monitoring. This report will be part of the next Report of Waste Discharge for the reissuance of this Permit.

vi. Standard Report Content –All monitoring reports shall include the following:

- The purpose of the monitoring and briefly describe the study design rationale.
- Quality Assurance/Quality Control summaries for sample collection and analytical methods, including a discussion of any limitations of the data.
- Brief descriptions of sampling protocols and analytical methods.
- Sample location description, including waterbody name and segment and latitude and longitude coordinates.
- Sample ID, collection date (and time if relevant), media (e.g., water, filtered water, bed sediment, tissue).
- Concentrations detected, measurement units, and detection limits.
- Assessment, analysis, and interpretation of the data for each monitoring program component.

[32] Permittees who do not participate in the Regional Monitoring Group or in a stormwater countywide program must submit an individual Integrated Receiving Water Impacts Report.

- Pollutant load and concentration at each mass emissions station.
- A listing of volunteer and other non-Permittee entities whose data are included in the report.
- Assessment of compliance with applicable water quality standards.
- A signed certification statement.

vii. Data Accessibility – Permittees shall make electronic reports available through ~~their Web sites or through~~ a regional data center, and optionally through their web sites. Permittees shall notify stakeholders and members of the general public about the availability of electronic and paper monitoring reports through notices distributed through appropriate means, such as an electronic mailing list.

~~C.8.i.~~C.8.h. Monitoring Protocols and Data Quality

Where applicable, monitoring data must be SWAMP comparable~~, in terms of methods and quality~~. Minimum data quality shall be consistent with the latest version of the SWAMP Quality Assurance Project Plan (QAPP)[33] for applicable parameters, including data quality objectives, field and laboratory blanks, field duplicates, laboratory spikes, and clean techniques, using the most recent Standard Operating Procedures. A Regional Monitoring Collaborative may adapt the SWAMP QAPP for use in conducting monitoring in the San Francisco Bay Region, and may use such QAPP if acceptable to the Executive Officer.

[33] The current SWAMP QAPP at the time of Permit issuance is dated September 1, 2008, and is available at http://www.waterboards.ca.gov/water_issues/programs/swamp/docs/qapp/swamp_qapp_master090108a.pdf.