Office of Environmental Health Hazard Assessment

George V. Alexeeff, Ph.D., D.A.B.T., Acting Director
Headquarters • 1001 I Street • Sacramento, California 95814
Mailing Address: P.O. Box 4010 • Sacramento, California 95812-4010
Oakland Office • Mailing Address: 1515 Clay Street, 16th Floor • Oakland, California 94612

Matthew Rodriquez
Secretary for
Environmental Protection

Edmund G. Brown Jr.
Governor

MEMORANDUM

TO: Jeanine Townsend, Clerk to the Board
State Water Resources Control Board
1001 I Street, 24th floor
Sacramento, California 95814

FROM: George V. Alexeeff, Ph.D., D.A.B.T.
Acting Director, Office of Environmental Health Hazard Assessment
1001 I Street
Sacramento, California 95814

DATE: September 7, 2011

SUBJECT: Comment letter: Phase II NPDES Permit Monitoring Plan

---

The Office of Environmental Health Hazard Assessment (OEHHA) is providing comments on the draft Phase II NPDES Permit's proposed monitoring requirements. OEHHA staff prepared these comments in response to an invitation by staff of the Division of Water Quality, Storm Water Section, to review the permit and offer comments and suggestions in the form of a letter that would be entered into the public record.

If you have any questions, please contact Barbara Washburn, Ph.D., at (916) 324 6430 or at Barbara.Washburn@oehha.ca.gov.

Attachment

cc: Barbara Washburn, Ph.D.
Staff Toxicologist
Office of Environmental Health Hazard Assessment

Comments on the Draft Phase II NPDES Permit's Proposed Monitoring Requirements
by the
Office of Environmental Health Hazard Assessment

The Office of Environmental Health Hazard Assessment is providing comments on the draft Phase II NPDES Permit's proposed monitoring requirements. The Permit states that "control measures/BMPs and other actions" will be implemented to reduce pollutants in Receiving Waters (Section D. Receiving Water Limitations). The Permit also states in Section E.14. (ii) that program effectiveness will be assessed and that receiving water conditions will be part of measuring effectiveness of the requirements of the Permit. To this end, the Permit requires monitoring for biological, physical, and chemical conditions within the watershed (Section E.13). This monitoring requirement serves to verify that the new Permit is achieving its intended environmental outcomes. This complements monitoring of outputs, such as the number or size of best management practices (BMPs) installed. Conditions in the creeks and streams are an excellent measure of the effectiveness of the BMPs implemented as part of the Permit. While tracking the use of BMPs is important, the best indicators of success are those associated with the actual aquatic/riparian conditions. It is a very positive step that monitoring these conditions has been included in the new Phase II Permit.

However, we have some concerns regarding the location of monitoring stations, the amount of data that has been proposed for collection, and the development of numeric criteria for long-term watershed processes.

Our concerns about monitoring sites and data collection and recommendations are briefly outlined and further discussed below.

1. The Permit indicates that monitoring stations should be located at the 'farthest downstream extent of the urbanized portion of the watershed'. We recommend sites closer to the upstream end of urbanization so as to better isolate and identify changes associated with new development.

2. The draft Permit proposes that a bioassessment be performed on a yearly basis, including the analysis of benthic macroinvertebrates, algae, and physical habitat assessment. We recommend reducing the number of endpoints to focus on only those metrics relevant to the purpose of the Permit and to adding a few metrics that might have been overlooked.

3. The Permit requires yearly sediment toxicity testing. Annual toxicity testing should not be necessary unless there is evidence of impaired biological life or poor sediment quality.

4. The Permit requires monitoring for a broad range of contaminants, including legacy contaminants. We recommend that the monitoring focus on the conditions over which the Permittees have control.

While scientific merit is the primary factor we have used to assess the proposed monitoring requirements, we have also considered cost of the proposed monitoring requirements, especially in light of the Permittees limited ability to raise funds during the current economic downturn.

Detailed discussion of our recommendations

Recommendation 1: Establish sampling stations at the interface of developed and relatively undeveloped areas of the Hydrologic Unit Classification (HUC) 12 sub-watershed. Include upstream and downstream sites to serve as controls to monitor natural variability in the HUC 10 watershed,

The purpose of the monitoring, as we understand it, is to determine if the requirements of the Permit, in particular the BMPs, protect aquatic resources, including aquatic life, habitat, and water quality. With this is mind, we recommend that monitoring sites be established in close proximity to those areas that will be most affected by the new requirements: new development. The majority of new development will be in greenfields or rural residential areas. Data collected at the interface of these areas with already developed areas would provide information to answer the question: Are pre-development conditions (e.g. aquatic life and habitat) being protected by the Phase II Permit?

The proposed location for the sampling station in the draft Permit is the most downstream site in the HUC 12 sub-watershed. Since many of the new requirements will affect areas miles upstream from this location, it would be difficult to distinguish the impacts of the new BMPs over the background of the existing conditions. For example, it will be hard to assess the effectiveness of the BMPs at protecting the invertebrate community if they have already been degraded by existing urban stormwater runoff. The signal-to-noise ratio is likely to be very low. Given the fact that all new commercial and residential development will be subject to the more protective standards in the Permit and that the condition of aquatic life is likely less impaired upstream than downstream, small changes in aquatic habitat and life could most easily be detected if the sampling site is located at the interface of more developed and less developed areas. Another serious problem with this approach is that it can result in significant amount of bias in the physical settings of monitoring sites since the downstream monitoring sites are likely to have lower gradients and lower mean substrate sizes than the average site in each HUC. This could introduce a significant bias to bioassessment indicators. Approximate locations of the developed/less developed interface could be identified based on the community's general plan by focusing on those areas that have not yet been built-out.

In addition to the main sampling site at the interface of developed and less developed areas, two additional stations within the HUC 10 watershed would be useful to control

for cumulative effects and natural variability. First, a monitoring station at the most downstream location within the larger HUC 10 watershed would report on the cumulative effect of all activities within the watershed. In addition, to control for natural variability (large storm events, geological variation, etc.) a site that has little influence by human activity should also be identified in the HUC 10 watershed.

Benefits can be gained from data collection if reach-level criteria are developed for monitoring sites. For example, a minimum distance from a grade control structure such as a bridge should be established to avoid mischaracterizing stream morphology. Once the general area for the monitoring site is identified, the Permittees should be able to follow a list of criteria to identify the appropriate reach for the monitoring stations.

Lastly, efficiency could be gained if the Water Board's Reference Conditions Monitoring Program (RCMP) data was used to interpret data from the Permit's monitoring sites. There is an opportunity for cost sharing in which existing RCMP sites might reduce the need for some of the Permit-related monitoring sites. Conversely, reference monitoring by Permitees could fill gaps in regions where RCMP sites are under-represented.

Recommendation 2: Use a modified version of SWAMP's BASIC option of the physical habitat characterization (PHAB) protocol.

Collection of physical habitat data serves two purposes in the context of the Phase II Permit. This data could be used to 1) help interpret the pattern of biological data, and 2) detect changes in stream morphology associated with disturbances, especially those associated with urbanization. The BASIC protocol calls for measuring 8 sets of parameters and photo documentation. This information should contribute to interpreting biological data. However, these measurements will not necessarily help in detecting geomorphic changes such as stream downcutting, widening, and changes in substrate composition, all of which are important indicators of the anthropogenic influences. Therefore, we suggest adding a small number of additional measurements that are normally part of the FULL protocol. Specifically we suggest the following:

- **Turbidity:** An important indicator of erosion and scour. Measurements should be tracked with the data loggers proposed for general water quality monitoring.
- **Bankfull dimensions and cross-sections:** Key information for estimating changes in stream morphology associated with urbanization. Measurements of bankfull width and depth, taken with sufficient frequency to calculate cross-sectional dimensions, should also be included. Changes in cross-sectional parameters frequently are the result of altered hydrology, which the Permit is designed to minimize.
- **Pebble Count:** Linked to the changes in cross-sectional area is the character of bedded sediments. The nature of bedded sediment is also a key factor for anadramous fish habitat. We suggest using the method developed by Bunte et al.

(2009), which samples the entire bankfull channel width. We recognize that the current PHAB protocol utilizes a different methodology for pebble counting and there is great benefit to using a standardized approach. However, a key goal of monitoring in the context of the Permit is to report on the effectiveness of the BMPs. Collecting pebbles at the same cross-sections as bankfull dimensions would provide the most accurate information to assess changes (or the lack of) in stream morphology.

- **Discharge measurements**: A key indicator of increases in stormwater runoff.

We are aware that the experts with the SWAMP Program are re-evaluating the PHAB protocol and a future version might permit greater flexibility in selection of endpoints than the current more prescriptive approach. The bioassessment methods are also being re-examined and we understand it is likely that future protocols will streamline the bug analysis. These changes, likely to occur in the next 2-4 years, should reduce costs associated with monitoring. In the meantime, we believe that combining the endpoints of the BASIC protocol with this handful of additional measurements, will serve both as aquatic life correlates and performance measures for the BMPs that are linked to the new Permit. Finally, the focused scope of the physical assessment should not be unreasonably burdensome to the Permittees.

Recommendation 3: Eliminate sediment toxicity testing as a yearly requirement.

The analysis of sediment quality that has been proposed for inclusion in the Permit is highly correlated with the outcome of toxicity tests (MacDonald et al., 2000). For example, in most studies examined in the MacDonald paper, if the concentration of a contaminant exceeded the probable effects concentration (PEC, associated with an adverse effect), then the incidence of toxicity was upwards of 95%. The draft Permit requires inclusion of the suite of contaminants identified in the MacDonald paper. Due to this unusually strong relationship between exceedance of the PEC and toxicity, we believe that sediment toxicity tests should not be included in the standard group of assessment endpoints. Further, questions have been raised about the validity of the results of sediment toxicity testing when using the standard organism, *H. azteca*, for assessing risk to aquatic life from pyrethroids (Palmquist et al., 2010). Lastly, the cost of a single sediment toxicity test is significant, between $1000 – $1200. Taken together, we suggest the use of these tests be placed in a second tier of measurements, to be used for further evaluation if a problem is detected.

Recommendation 4: Eliminate yearly testing of legacy contaminants.

A suite of 28 contaminants, including metals, polycyclic aromatic hydrocarbons, PCBs, organochlorine pesticides, and pyrethroid pesticides have been recommended for yearly measurement. Some of these chemicals are legacy pesticides or products. While it is important to be aware of their presence, it would be surprising to find them in stormwater today except in cases when runoff entrains soil from contaminated sites. In

contrast, pyrethroids and metals such as copper are ubiquitous in urban stormwater. Pyrethroid pesticides and many metals are toxic to aquatic invertebrates at ultra low concentrations (parts per trillion to low parts per billion) whereas the threshold for toxic effects of polycyclic aromatic hydrocarbons ranges 40 – 400 parts per billion. The stormwater Permit is designed to foster best management practices that will reduce the presence of these toxic chemicals. Accordingly, the focus of evaluating sediment quality should be on tracking those contaminants which are most closely linked to improved stormwater management practices. We suggest testing for the presence of the legacy contaminants at the beginning of the monitoring, then again at 8 - 10 year intervals. This should be sufficient to determine if they might be playing a role in any observed impairment of biological life, especially given that the half-life of chlorinated compounds can extend for 75 years. This will also provide some cost savings to Permittees.

Recommendation 5: Collect data for 4 years, use the 5th year for analysis and report preparation.

Four years worth of monitoring data will provide a reasonable record of conditions within each sub-watershed. We suggest that the fifth year be used for reporting on these conditions. The data collected will be useful as a performance measure only if they are summarized and analyzed carefully. There is a long history of data collection that fails to inform management decision making because the data are not summarized in a form that decision makers can use. One form this report might take is a watershed indicators report. By devoting a year to report preparation, there is a better likelihood that the results of the monitoring will be analyzed carefully and used for their designated purpose.

In light of this recommendation, we suggest that yearly annual reports be limited to presentation of the monitoring results with a short summary of findings.

Recommendation 6: Eliminate the requirement to develop numeric criteria for long-term watershed processes.

The Permit requires the Permittees to develop numeric criteria to protect five important watershed processes, including groundwater recharge and discharge, sediment supply and delivery to stream channels, and surface runoff. Gaining an understanding of these processes in each watershed and developing numeric criteria is appropriately identified as a key to the long-term health of the watersheds. The Permit recognizes both the importance of sediment supply and increases in discharge as two key factors contributing to hydromodification. However, OEHHA does not believe it appropriate to ask the Permittees to develop such criteria. While different criteria are appropriate for different ecoregions of the State, the proliferation of numeric criteria that could result from this requirement would not be helpful in managing watersheds. But more importantly, analyzing these processes and developing numeric criteria is a significant

undertaking that would most appropriately be addressed by experts managed by the State in order to achieve consistency in the approach and methodology, perhaps in a process similar to the ongoing effort to develop Biocriteria.

Costs associated with monitoring

Finally, given current limitations on public resources, we believe it is appropriate to consider the economics of the proposed monitoring program. As part of our evaluation, we compared rough estimates of the cost of the proposed requirements with our suggested modifications. We obtained estimates from five consultants to arrive at these estimates. Briefly, the first year of sampling would involve additional expenses such as site scoping, equipment purchases, and construction of secure data logger boxes at each monitoring site. In the initial and all subsequent years, our modifications would slightly reduce monitoring expenditures. The average expenses per monitoring site would be about $13,500 for monitoring plan as written in the Permit and about $11,000 for the modifications we propose. A slight savings could be gained with the more focused monitoring plan we have recommended. However, it is notable that the costs for the monitoring requirements as stated in the Permit are still relatively modest. If every fifth year was devoted to reporting, as we recommend, expenses would remain constant from year to year. A more detailed description of the assumptions we used in our calculations as well as an estimate of costs in a sample watershed are provided in the attachment.

ATTACHMENT A

We spoke with five different consultants to develop these estimates. We added a 20% contingency fee, as is common in estimating project costs. In the first year of monitoring, extra expenses would be incurred that involve purchasing a data logger, setting up secure stations for monitoring, and scoping the monitoring site.

We also estimate costs associated with monitoring a 100 sq. mile watershed in the Sacramento area, the Dry Creek Watershed. It contains four HUC 12 sub-watershed (15 – 65 sq. miles). In addition to four sites, one in each sub-watershed, we included two additional sites, one an upstream site that would serve as a negative control, and a second at a downstream site that would reflect the cumulative effects of all the activity in the watershed. There are 3 municipalities and 2 counties that have jurisdiction in that watershed. We would expect that the monitoring costs would be shared, based on the percentage of the total area over which each entity has responsibility.

The scaled back measurements we have proposed in this letter would represent just under a 20% costs savings, or about $2500, for each site in an average year. For the example watershed, the savings would be about $15,000 per year. This is additional information that the Water Board can use in its final evaluation of the monitoring section of the Permit.

Alternative Scenarios	**Total**	**20% contingency**	**Grand Total**
As written in Phase II Permit, Year 1	$23,675	$4,635	$27,810
As written, Year 2 on out	$11,175	$2,235	$13,410
Modified Year 1	$19,875	$3,875	$23,250
Modified, Years 2 on out	$9,100	$1,820	$10,920
Dry Creek - 6 sites	**Total**	**20% contingency**	**Grand Total**
Permit, Year 1	$142,050	$28,410	$170,460
Permit, Year 2 on out	$67,050	$13,410	$80,460
Modified Year 1	$133,650	$26,730	$160,380
Modified, Years 2 on out	$54,600	$10,920	$65,520

References

Bunte, Kristin, Steven R. Abt, John P. Potyondy, and Kurt W. Swingle, 2009. Comparison of Three Pebble Count Protocols (EMAP, PIBO, and SFT) in Two Mountain Gravel-Bed Streams. Journal of the American Water Resources Association (JAWRA) 45(5):1209-1227.

MacDonald, D.D., Ingersoll, C.G., and T.A. Berger, 2000. Development and Evaluatin of Consensus-Based Sediment Quality Guideliness for Freshwater Ecosystems. Arch. Environ. Contam. Toxicol. 39; 20-31.

Palmquist, K., A. Fairbrother, J. Salatas, & P.D. Guiney (2010) Environmental fate of pyrethroids in urban and suburban stream sediments and the appropriateness of Hyallela azteca model in determining ecological risk. Integ. Env. Assmt. Mmgt.: pre-print published online.