MARCH 26, 2008

CALLEGUAS CREEK WATERSHED MANAGEMENT PLAN

Calleguas Creek Watershed Metals and Selenium TMDL

Special Study #3
Metals High Concentration Area Work Plan

submitted to:

LOS ANGELES REGIONAL WATER QUALITY CONTROL BOARD

on behalf of::

CALLEGUAS CREEK WATERSHED MANAGEMENT PLAN
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Introduction

The *Total Maximum Daily Load for Metals and Selenium in Calleguas Creek, Its Tributaries, and Mugu Lagoon* (TMDL) was adopted by the Los Angeles Regional Water Quality Control Board on June 8, 2006 and became effective on March 26, 2007. The TMDL was developed to address impairments in Calleguas Creek and its tributaries caused by metals (copper, zinc, mercury, and nickel) and selenium. Metals and selenium sources come from urban and agricultural runoff, groundwater, and POTW effluent. Additionally, the source analysis indicates that naturally occurring metals in soils may be a significant source. Naturally occurring concentrations in soils may be located on multiple land uses. In open space areas, naturally occurring sources would be mobilized by natural runoff, whereas in other locations anthropogenic uses could mobilize natural sources (ex. agricultural fields). As part of the TMDL's implementation, this work plan is being submitted to address Special Study #3 required in the Basin Plan Amendment (BPA).

Special Study #3 has three purposes:

1. Characterize the naturally occurring levels of metals in soils in the watershed.
2. Identify natural or anthropogenic metals high concentration areas (HCAs).
3. Identify actions to be taken to address identified HCAs, such as remediation or erosion control.

Special Study #3 will be conducted using a phased approach as outlined in the following sections.

Phase 1

The purpose of Phase 1 is to gather information to determine if existing studies and information can answer the special study questions. Further phases will be conducted if necessary based on the results of Phase 1. The following tasks will be completed under Phase 1.

Task 1. Gather existing soil concentration data. Some programs, such as at remediation locations, require collection of soils data to determine background concentrations. Any available soils data will be obtained from monitoring programs in the CCW.

Task 2. Gather information on soils in the watershed including detailed soils maps and what types of soils would contain naturally high levels of metals. As discussed in the Metals and Selenium TMDL, some general information about soils and naturally occurring concentrations of metals in soils exists. This information will be obtained and used, along with results from Task 1 and Task 3, to assess where additional monitoring may be needed.

Task 3. Collect sediment samples for metals analysis at all OC Pesticides and PCBs TMDL Special Study #2 HCA sampling locations. The OC Pesticides and PCBs TMDL Special Study #2 is a similar study designed to try and identify where higher concentrations of OC pesticides in

sediment may exist. The sampling program for that study includes areas that could be characterized as more "background" (i.e. have less anthropogenic influence) and areas where historical pesticide applications may have been prevalent. Although the assumptions used to develop monitoring locations for the OC HCA study may not be applicable to the Metals and Selenium TMDL, collecting metals samples during this study will provide information on a number of areas in the watershed and will not result in a significant extra cost.

Task 4. Identify need for additional monitoring. Based on the results of the first three tasks, the need for additional data collection to meet the special study requirements will be assessed. An analysis will be conducted to identify potential HCA and background areas for further sampling.

If Task 4 identifies the need for additional monitoring, Phase 2 of the study will be conducted. If Task 4 does not identify the need for additional monitoring, Phase 2 will not be completed and work will proceed directly to Phase 3.

Phase 2

If determined to be necessary, Phase 2 will consist of writing a detailed Monitoring Plan and implementing the Monitoring Plan. The Monitoring Plan will include:

1. Approach
2. Sampling Locations
3. Schedule
4. Parameters to be Monitored
5. Collection Methods
6. Quality Control
7. Data Use and Analysis

APPROACH

The approach will consist of an initial monitoring effort and evaluation, followed by a second monitoring effort if warranted by the results of the first effort.

SAMPLING LOCATIONS

Sampling locations will be determined based on the results of Phase 1. At a minimum, sampling locations will be selected based on an analysis of existing data and soils information to determine the most probable HCAs and characterize the background load.

SAMPLE SCHEDULE

The sample schedule will be determined following the results of Phase 1.

PARAMETERS TO BE MONITORED

The constituents for which samples will be analyzed are listed below. Analytical methods, project method detection limits, and project reporting limits will be provided for each constituent in the Monitoring Plan.

1. Copper
2. Mercury
3. Nickel
4. Selenium

All results will meet data quality objectives as stated in the CCW TMDL Monitoring Program QAPP (LWA, 2008), and be otherwise qualified in conformity with USEPA QA/QC guidance. An analytical method used for this monitoring program may change if a different method is found to give better results (better QC data and/or a more relevant detection limit). Laboratories selected to analyze samples for this program must be certified either by the National Environmental Laboratory Accreditation Program, or by the California Department of Health Services – Environmental Laboratory Accreditation Program (ELAP), or by both agencies.

MONITORING EVENT PREPARATION

Monitoring event preparation includes preparation of field equipment, placing container orders, and contacting the necessary personnel regarding site access and schedule. Table 1 provides a checklist of field equipment to prepare prior to each monitoring event. The following steps will be completed prior to each sampling event:

1. Contact laboratories to order sample containers and coordinate sample exchange.
2. Confirm scheduled monitoring date with field crew(s), and set-up sampling day itinerary including sample drop-off.
3. Prepare equipment (see Table 1).
4. Prepare sample container labels and apply to containers.
5. Prepare the monitoring field log sheets to indicate the type of field measurements, field observations and samples to be collected at each of the monitoring sites.
6. Verify that field measurement equipment is operating properly (i.e., check batteries, calibrate, etc.)

Table 1. Field Equipment Checklist

X	Monitoring Plan	X	Camera	X	4-mil Poly Bags
X	Sample Containers w/ Pre-Printed and Extra Labels	X	Event Summary Sheets (including calibration logs)	X	Stainless Steel Sampling and Mixing Trowels/Spoons
X	Tape Measure	X	Paper Towels or Rags in a Box	X	Pens
X	Field Log Forms	X	Safety Equipment	X	Watch
X	Chain of Custody Forms	X	First Aid Kit	X	Field Measurement Equipment and Calibration Standards
X	Bubble Wrap	X	Cellular Telephone	X	Plastic Trash Bags
X	Coolers w/ Ice	X	Gate Keys	X	Distilled/DI Wash Bottles
X	New Powder-Free Nitrile Gloves	X	Hip Waders	X	Blank Water

Container Order/Preparation

Sample container orders will be placed with the appropriate analytical laboratory in sufficient time prior to each sampling event. Containers will be ordered for all samples, including quality control samples. The containers must be the proper type and size. The proper container type, volume, and immediate processing and storage needs will be provided in the Monitoring Plan. The field crew must inventory sample containers upon receipt from the laboratory to ensure that adequate containers have been provided to meet analytical requirements for each monitoring event. After each event, the laboratory will clean any equipment or containers used to collect samples and the containers will be either picked up by or shipped to the field crew.

Sample Container Labeling

All samples will be pre-labeled before each sampling event to the extent practicable. Pre-labeling sample containers simplifies field activities; leaving only sample collection time and date, and the names of sampling personnel to be filled out in the field. Custom labels will be produced using blank water-proof labels. This approach will allow the stations and analytical constituent information to be entered into the computer program in advance, and printed as needed prior to each sampling event.

Labels shall be applied to the appropriate containers in a dry environment; attempting to apply labels to sample containers after filling may cause problems, as labels usually do not adhere to wet containers. The labels shall be applied to containers rather than to the caps. Field labels shall contain the following information:

- Program Name
- Station ID
- Sample ID
- Date
- Time
- Sampling Personnel
- Analytical Requirements
- Preservation Requirements
- Laboratory Conducting Analysis

SAMPLE COLLECTION

Sampling Technique

Samples will be collected in a manner that minimizes the possibility of sample contamination. These sampling techniques are summarized below:

- Samples are collected only into rigorously pre-cleaned sample containers.
- At least two persons are required on a sampling crew.
- Clean, powder-free nitrile gloves must be worn while collecting samples and must be changed whenever something not known to be clean has been touched.
- To reduce the potential for contamination and to ensure crew safety, field crews must observe the following precautions while collecting samples:

    1. Smoking is prohibited.
    2. Collecting samples near a vehicle, running or otherwise, is prohibited.
    3. Eating or drinking during sample collection is prohibited.
    4. Sampling personnel should avoid breathing, sneezing or coughing in the direction of an open sample container.
    5. Do not allow rain water to drip from rain gear or any other surface into sample containers.

Field Protocols

Field crews (2 persons per crew, minimum) will be mobilized for sampling only when weather conditions and flow conditions are considered to be safe. Sampling events will proceed in the following manner:

1. Before leaving the base of operations, confirm number and type of sample containers as well as the complete equipment list.
2. Proceed to the first monitoring site.
3. Record the general information on the field log sheet.
4. Collect the samples as indicated on the field log sheet in the manner described herein. Collect additional volume and blank samples for field-initiated Quality Control (QC) samples as necessary. Place filled sample containers in coolers and carefully pack and ice samples as described herein. Using the log sheet, confirm that all appropriate containers were filled.
5. Collect field measurements and observations, and record these on the field log sheet.
6. Repeat the procedures in steps 3, 4, and 5 for each of the remaining monitoring sites.
7. Complete the chain of custody forms using the field log sheets.
8. After sample collection is completed at all monitoring sites, deliver and/or ship samples to the appropriate laboratory.

Sediment Sample Collection Methods

The OC Pesticides and PCBs TMDL HCA Special Study utilizes sediment sample collection as described below, and sediment samples for metals analysis will also be collected at these locations using these procedures during Phase 1. Depending on the locations selected for Phase 2 sampling, additional sampling procedures may be needed for the identification of metals and

selenium HCAs. Any additional sampling protocols will be included in the Phase 2 monitoring plan.

Sediment samples will be collected from the top two to three centimeters (cm) of sediment using pre-cleaned trowels. Collection of sediments in the top two to three cm is a common approach to conducting sediment sampling for the purpose of sediment toxicity testing. This approach was used in sediment toxicity studies conducted by the Southern California Coastal Water Research Project (SCCWRP) Bight Program and the State Water Resources Control Board Bay Protection and Toxic Cleanup Program (BPTCP), which led to the sediment toxicity listing in Mugu Lagoon. Due to the difficulty of determining depth of sediment deposited after each new storm event, sediment collection for this work plan will follow this approach as well.

All sediment samples shall be collected directly into a clean polyethylene bag, mixed, and then placed into the appropriate containers. SOPs for collection of sediments in the freshwater portion of the watershed are provided in Appendix C of the CCW TMDL Monitoring Program QAPP (LWA 2006).

For the OC HCA study, in-stream (tributary) and detention basin sampling will be conducted. The sample collection methods for each type of location are discussed below. The VCWPD shall be contacted at least one month prior to monitoring to determine if there is a potential for sediment removal activities to affect sediment sample collection in the basins.

Streams/Channels

Collection of sediment samples from streams or channels for chemical analysis shall be conducted in manner generally according to methods developed by the USGS and outlined in *Guidelines for Collecting and Processing Samples of Stream Bed Sediment for Analysis of Trace Elements and Organic Contaminants for the National Water Quality Assessment Program* (1994). Sediment sampling will take place in a section of the reach within approximately 100 meters in length from water-column sampling locations. However, this definition may vary based on conditions at each sampling station. Sediment sampling stations should contain 5 to 10 wadeable depositional zones if possible. Samples may be collected with or without the presence of water at the sampling location. Sediment sampling will begin at the downstream end of the 100 meter section. Each depositional zone encountered shall be subsampled several times and composited in the field for chemical analysis. The number of subsamples collected at each depositional zone shall be based on the size of the zone.

Basins

Basins will be sampled using simple random sampling. During simple random sampling, all locations within the sample site are identified, and a suitable number of samples (5-10 or until sufficient sediment volume is collected) are randomly selected from the population. At each basin, random sampling locations shall be selected using a three-dimensional grid and a random numbers table as follows:

1. Sketch the sampling area on a sampling grid like the one shown in Figure 1.
2. Using a random numbers table, select 5-10 numbers between 001 and 100. Random numbers should be selected without looking, by placing a finger on the random numbers

table.

3. Use the sampling grid (Figure 1) to locate the 5-10 randomly selected sampling locations in the horizontal plane. Since the sediment to be sampled may be of irregular shape, it is possible that one or more of the selected locations on the grid will not contain material to sample. If this occurs, randomly select an alternate location as described in step 2 above.
4. Each randomly selected location will be subsampled several times and composited in the field for chemical analysis.

1				5	6				10
41									50
51									60
91				95	96				100

Figure 1. Sampling Grid

Additional Sample Collection Methods

Based on the results of Phase 1, additional types of monitoring locations beyond those types covered in the OC HCA study may be required to identify metals HCAs. The additional monitoring locations may require different sample collection procedures (i.e. terrestrial soil sampling procedures). If necessary, additional sample collection methods will be described in the Phase 2 monitoring plan.

Field Measurements and Observations

Field measurements will be collected and observations will be made at each monitoring site after all samples associated with the site are collected. Field measurements will include flow, pH, temperature, dissolved oxygen, turbidity, and conductivity. Measurements (except for flow) will be collected at approximately mid-stream, mid-depth at the location of greatest flow (if feasible) with a portable field meter that meets data quality objectives listed in the CCW TMDL Monitoring Program QAPP (LWA, 2008).

All field measurement results and comments regarding site observations will be recorded on a field log sheet for each site. Field crews shall be required to keep a field log for each sampling event. The following items should be recorded in the field log for each sampling event:

- Time of sample collection.
- Sample ID numbers and unique IDs for any replicate or blank samples.
- The results of any field measurements (flow, temperature, dissolved oxygen, pH, conductivity, turbidity) and the time that measurements were made.
- Qualitative descriptions of relevant water conditions (e.g., water color, flow level, clarity) or weather (e.g., wind, rain) at the time of sample collection.
- A description of any unusual occurrences associated with the sampling event, particularly those that may affect sample or data quality.

Sample Handling and Custody

Sample custody procedures provide a mechanism for documenting information related to sample collection and handling. Sample custody must be traceable from the time of sample collection until results are reported. A sample is considered under custody if:

- It is in actual possession.
- It is in view after in physical possession.
- It is placed in a secure area (accessible by or under the scrutiny of authorized personnel only after in possession).

Chain-of-Custody Form

A chain-of-custody (COC) form must be completed after sample collection and prior to sample shipment or release. The COC form, sample labels, and field documentation will be cross-checked to verify sample identification, type of analyses, number of containers, sample volume, preservatives, and type of containers. A complete chain-of-custody form is to accompany the transfer of samples to the analyzing laboratory. A typical chain-of-custody form is illustrated in Appendix C of the CCW TMDL Monitoring Program QAPP.

Sample Shipments and Handling

The field crews shall have custody of samples during field sampling. Chain of custody forms will accompany all samples during shipment to contract laboratories. All water quality samples will be transported to the analytical laboratory by the field crew or by overnight courier. All sample shipments are accompanied by the COC form, which identifies the contents. The original COC form accompanies the shipment and a copy is retained in the project file.

All shipping containers must be secured with COC seals for transportation to the laboratory. The samples must be placed with ice to maintain the temperature at 4°C. The ice packed with samples must be approximately 2 inches deep at the top and bottom of the cooler, and must contact each sample to maintain temperature. Samples must be shipped to the contract laboratories according to the United States Department of Transportation standards. The method(s) of shipments, courier name, and other pertinent information is entered in the

"Received By" or "Remark" section of the chain of custody form. The following procedures are used to prevent container breakage and cross-contamination:

- Prior to packaging, outsides of the containers need to be rinsed off with DI water.
- Bubble wrap or foam pouches will be used to keep glass containers from contacting one another to prevent breakage.
- All samples will be transported inside hard plastic coolers or other contamination-free shipping containers.
- The coolers will be taped shut and sealed with chain-of-custody seals to prevent accidental opening.
- If pre-arrangements are not made, prior to shipment of the samples field staff must notify laboratory sample control.

All samples remaining after successful completion of analyses will be disposed of properly. It is the responsibility of the personnel of each analytical laboratory to ensure that all applicable regulations are followed in the disposal of samples or related chemicals

QUALITY CONTROL

Quality control (QC) samples will be collected in conjunction with environmental samples to verify data quality. QC samples collected in the field include field blanks and equipment blanks. QC sample collection for the subsequent monitoring phases will be determined prior to the start of monitoring. Specific collection methods for each type of quality control sample are described below.

Equipment Blanks

The purpose of analyzing equipment blanks is to demonstrate that sampling equipment is free from contamination. Equipment blanks will be collected and analyzed for all analytes of interest along with the associated environmental samples if samples are collected using equipment. Equipment blanks will consist of laboratory-prepared blank water (certified contaminant-free) processed using the sampling equipment used for environmental samples.

The blanks will be analyzed using the same analytical methods specified for environmental samples. If any analytes of interest are detected at levels greater than the method detection limit (MDL), the source(s) of contamination should be identified and corrected, the affected batch of containers or equipment should be re-cleaned, and new equipment blanks should be prepared and analyzed.

Field Duplicates

The purpose of analyzing field duplicates is to demonstrate the precision of sampling and analytical processes. Field duplicates will be prepared at the rate of one per sampling event, and analyzed along with the associated environmental samples. Field duplicates will consist of two aliquots from the same composite sample.

Matrix Spikes and Matrix Spike Duplicates

The purpose of analyzing matrix spikes and matrix spike duplicates is to demonstrate the performance of the sample preparation and analytical methods in a particular sample matrix. Double or triple the sample volume will be necessary for each set of MS/MSD samples.

Quality Control Sample Collection Schedule

QC samples will be collected at one site during each sampling event. A more precise schedule will be developed following site selection. The QC schedule is intended to provide general guidance on the timing of QC sample collection. However, due to the nature of environmental sampling, it may not be possible to collect all QC samples as outlined in the schedule. Therefore, this schedule is flexible and may be modified to meet in-field conditions and sampling schedule requirements. Deviations from this schedule will be recorded on the field log sheet.

Phase 3

Phase 3 will consist of reviewing the results of Phase 1 and Phase 2 to characterize background concentrations of metals in the watershed and identify HCAs. Numeric criteria to define HCAs will be determined by looking at the 95^{th} percentiles of metals concentrations in existing watershed sediment data and the model output of suspended sediment entering Mugu Lagoon. Additionally, sites with concentrations below appropriate TMDL targets and allocations will not be considered as HCAs.

Phase 3 will also consist of investigating actions to be taken in response to sites defined as HCAs. These actions may include options to remediate or minimize discharges from HCAs or evaluation of regulatory options to address background loads. HCAs with ambient sources will be evaluated to determine if metals concentrations constitute a background load. As defined in the Metals and Selenium TMDL, ambient sources are environmental sources of metals and selenium in the watershed, such as natural soil concentrations, atmospheric deposition, and natural groundwater seepage, and background load is defined as discharges from undeveloped open space due to ambient sources and/or natural groundwater seepage (agricultural and urban ambient sources not included). All HCAs will be evaluated for appropriate actions.

Schedule

The results of this study will be submitted to the Regional Board within two years of EO approval of the work plan. The following schedule provides an approximate timeframe for completion of each of the work plan tasks.

Table 2. Estimated Schedule to Complete Phases

Task		Timeframe for Completion
Phase 1	Existing Data Collection and Review	3 months after EO approval of work plan for exiting data collection OC HCA monitoring may continue for up to 12 more months
Phase 2	Monitoring	Up to 20 months after EO approval of work plan depending on monitoring required
Phase 3	Identify HCAs and Potential Actions	2 years after EO approval of work plan

References

Larry Walker Associates, 2008. On behalf of Calleguas Creek Watershed Management Plan. Calleguas Creek Watershed Management Plan Quality Assurance Project Plan (QAPP), Monitoring and Reporting Program Plan for the Nitrogen, OC and PCBs, and Toxicity Total Maximum Daily Loads.