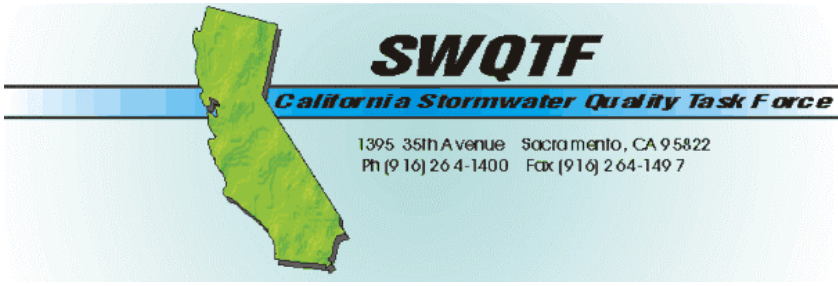

Storm Water Sampling Guidance Document

For Compliance with California State Water Resources Control Board Resolution No. 2001-046 (NPDES General Permit For Storm Water Discharges Associated With Construction Activity)

DRAFT - July 31, 2001

Disclaimer

This preliminary draft is a work in progress by the Construction Workgroup of the California Stormwater Quality Task Force (Task Force), an advisory body of storm water dischargers. The document has not been approved by the California Stormwater Quality Task Force, State Water Resources Control Board, or any Regional Water Quality Control Board.

The purpose of this guidance document is to assist members of the Task Force and other dischargers subject to the Construction Activity Storm Water Discharge Permit (Order 99-08-DWQ, as amended by Order 2001-046) in attaining compliance with the permit.

The preliminary draft is being made available to construction dischargers to provide assistance in developing the sampling and analysis plans required by State Water Resources Control Board Order No. 2001-046. The final guidance document will be released once it is completed and approved by the California Stormwater Quality Task Force. The release of the final guidance document is expected in September 2001.

If you have comments on the guidance, please email them to the Construction Workgroup leader at mathews6@llnl.gov

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Construction Storm Water Sampling Guidance Document

1.0 Introduction

The purpose of this document is to provide guidance to owners and operators of construction sites who are permitees under the State Water Resources Control Board's National Pollutant Discharge Elimination System (NPDES) General Permit For Storm Water Discharges Associated With Construction Activity (General Permit), as modified by Resolution No. 2001-046, "*Modification of Water Quality Order 99-08-DWQ State Water Resources Control Board (SWRCB) National Pollutant Discharge Elimination System (NPDES) General Permit For Storm Water Discharges Associated With Construction Activity (General Permit)*". The modifications to the General Permit require that a sampling and analysis strategy and sampling schedule for discharges from construction activity be developed and included in the project's Storm Water Pollution Prevention Plan (SWPPP). A sampling and analysis strategy and sampling schedule must be developed regardless of the time of the year that construction occurs.

This document was developed by the Construction General Permit Working Group of the California Storm Water Quality Task Force (Task Force). The Task Force was formed in 1989 to advise the State Water Resources Control Board (State Board) on storm water discharge issues. The Task Force membership is composed of storm water management and storm water quality professionals from cities, counties, special districts, industries, and consultants throughout California.

The sampling requirements and guidance provided in this document will apply to most construction projects, but it may not apply to all construction projects. For further guidance and/or direction about what must be accomplished to comply with the General Permit and Resolution 2001-46, please contact your local Regional Water Quality Control Board (RWQCB) for further guidance and assistance.

1.1 Organization of this Document

This document is organized in the following manner:

Section 1 provides the user with general information on why a sampling and analysis strategy is required.

Section 2 provides information on sediment, silt and turbidity monitoring and sampling.

Section 3 provides information on non-visible pollutant sampling, including what to sample for in construction storm water runoff.

Section 4 provides general information on the sampling and analysis procedures, which are applicable to the types of sampling and analysis required by the General Permit.

Section 5 provides useful definitions.

Section 6 provides other sources where one can obtain more information.

1.2 Background

The General Permit was reissued by the SWRCB on August 19, 1999. The San Francisco BayKeeper, Santa Monica BayKeeper, San Diego BayKeeper, and Orange Coast Keeper filed a petition for writ of mandate challenging the General Permit in the Superior Court, County of Sacramento.

On September 15, 2000, the Court issued a judgment and writ of mandate and directed the SWRCB to modify the provisions of the General Permit to require permittees to implement specific sampling and analytical procedures to determine whether Best Management Practices (BMPs) implemented on a construction site are:

(1) preventing further impairment by sediment in storm waters discharged directly into waters listed as impaired (Clean Water Act Section 303(d) List [303(d) List]) for sediment, silt, or turbidity; and

(2) preventing other pollutants that are known or should be known by permittees to occur on construction sites and that can not be visually observed or detected in storm water discharges, from causing or contributing to exceedances of water quality objectives.

The monitoring, sampling and analysis provisions in the General Permit were modified pursuant to the court order and were issued as Resolution No. 2001- 046, adopted by the SWRCB on April 26, 2001.

1.2.1 Impaired Water Bodies

Certain lakes, streams, rivers, creeks and other bodies of water in California have been determined by Regional Water Quality Control Boards to be impaired for Sedimentation. These bodies of waters are listed on Attachment 3 of the General Permit. (Clean Water Act [CWA] Section 303(d) [303(d)] Water Bodies listed for Sedimentation). Discharges of storm water from construction sites into a 303(d) listed body of water is not prohibited as long as the type and level of pollutant(s) does not cause or contribute to a water quality exceedance.

To obtain the latest list of 303(d) water bodies, visit the State Water Resources Control Board's Web site at http://www.swrcb.ca.gov/.

1.3 Purpose of Sampling

The purpose of sampling is to determine whether the BMPs employed on a site are effective in controlling potential construction site pollutants from coming in contact with storm water, leaving the site and causing or contributing to an exceedance of water quality objectives in the receiving waters. According to the modifications to the (Resolution No. 2001-046) General Permit, there are two categories of monitoring required, as shown below. These new monitoring requirements are illustrated in Figure 1-1.

- sediment in storm water discharged directly to water bodies listed as impaired for sediment / siltation or turbidity on the SWRCB's 303(d) list water bodies; and
- non-visible pollutants.

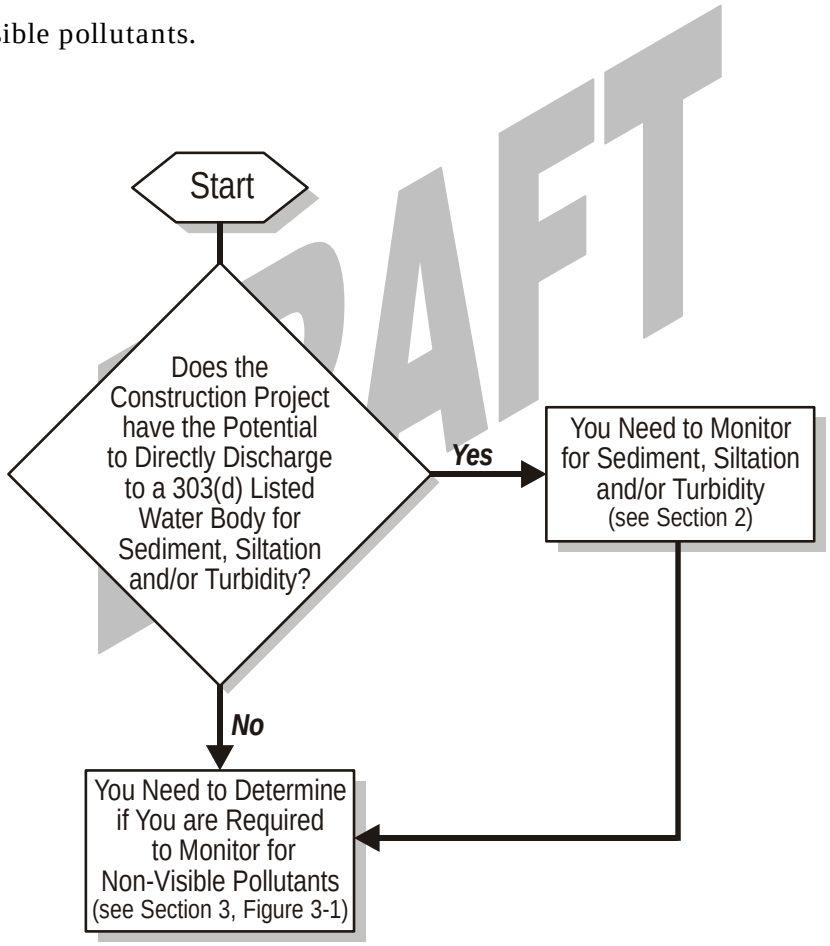

Figure 1-1
General Permit Monitoring and Analysis Requirements

2.0 Monitoring Program for Sedimentation/Siltation

2.1 What the Permit Says on Monitoring

The General Permit requires that storm water BMPs be developed, designed, installed and maintained during construction and post construction phases. The purpose of the storm water BMPs is to reduce or eliminate pollutants which are caused by, or are the result of, the construction activities from coming in contact with rainfall and storm water surface drainage and / or being discharged off-site with the construction site's storm water runoff.

Soils, sediments, and fine (suspendable) particles that result from grading and earthwork activities and soil erosion from disturbed, un-stabilized land areas are a potential significant source of storm water pollution at construction sites. The General Permit requires construction sites to develop, implement and maintain a combination of effective erosion control and sediment control BMPs to prevent soils, sediments, debris and suspendable solids from leaving the construction site and moving into receiving waters at levels above pre-construction levels.

The General Permit requires that the SWPPP identify a strategy for conducting the sampling and analysis, including the frequency at which sampling will be conducted. The SWPPP must also show:

- the location(s) of direct discharges from construction activities to a water body listed on the SWRCB's 303(d) list for sediment, silt and / or turbidity;
- the designated sampling location in the listed water body representing the prevailing conditions up-stream of the discharge; and
- the designated sampling location in the listed water body representing the prevailing conditions down-stream of the discharge.

2.2 Deciding When to Sample

- Sampling must occur when storm water runoff directly discharges from the construction site to a 303(d) listed water body. Refer to Section 2.5, Where to Sample, for guidance on sampling locations.
- Samples need only be collected during daylight hours (sunrise to sunset), during the first two hours of discharge (runoff) from storm events which result in a direct discharge to any 303(d) listed water body.
- Storm water runoff samples must be collected regardless of the time of year, status of the construction site, or day of the week. Samples should be collected during the first two hours of runoff. Storm water inspections and sample collections are required even during non-working days (including weekends and holidays).

- Dischargers do not need to sample runoff for more than four (4) rain events per month.

2.3. Deciding What to Sample

- If the water body is listed as impaired for sedimentation or siltation, samples should be analyzed for Settleable Solids (mL/L) and Total Suspended Solids (mg/l) according to EPA 160.2. Samples may be analyzed for suspended sediment concentration (SSC) according to ASTM D3977-97 instead of or in addition to Total Suspended Solids.

- If the water body is listed as impaired for turbidity, samples should be analyzed for turbidity per EPA 180.1 or analyzed in the field using a turbidity meter.

- It is very important that consistent sampling and analysis methods are used for all samples taken at the upstream and downstream points of the 303(d) listed water body.

- Table 2-1 shows general sample handling and laboratory requirements for sediment sampling.

2.4 Deciding How to Sample

- Only personnel trained in water quality sampling procedures should collect storm water samples.

- Sampling methods and locations must be determined in advance of the runoff event in order to provide sufficient time to gather the supplies and equipment necessary to sample and plan for safe access by the sampling crew(s).

- General guidance for sampling procedures is provided in Section 4 of this document.

Table 2-1
LABORATORY REQUIREMENTS FOR STORM WATER MONITORING OF SEDIMENT, SILTATION AND/OR TURBIDITY
Analytical Constituents, Volumes, and Holding Time Requirements

Parameters	Analytical Method	Target Reporting Limit	Minimum Sample Volume [1]	Container	Preservative	Holding Time
Total Suspended Solids (TSS) [2]	EPA 160.2	1 mg/L	100 mL	500 mL polypropylene	Store in ice or refrigerator at 4°C (39.2°F)	7 days
Settleable Solids (SS)	EPA 160.5	0.1 ml/L/hour	1 liter	500 mL polypropylene	Store in ice or refrigerator at 4°C (39.2°F)	48 hours
Suspended Sediment Concentration (SSC) [2]	ASTM D 3977-97	Contact Laboratory	200 mL	Contact Laboratory	Store in ice or refrigerator at 4°C (39.2°F)	7 days
Turbidity	EPA 180.1	1 NTU	100 mL	500 mL polypropylene or Glass	Store in ice or refrigerator at 4°C (39.2°F), Dark	48 hours

[1] Minimum sample volume recommended. Specific volume requirements will vary by laboratory; please check with your laboratory when setting up bottle orders.

[2] Use either TSS or SSC, or both, for suspended solids analysis. Up-gradient and down-gradient samples should be analyzed by the same method.

2.5 Deciding Where to Sample

The General Permit requires that samples be collected at the following locations:

- Sample the 303(d) listed water body upstream of the construction site discharge
- Sample the 303(d) listed water body downstream of the construction site discharge

Additionally, for the purpose of interpreting the results of the samples collected from the 303(d) listed water body, dischargers may want to collect and analyze samples of the discharge from the construction site. Remember that samples should only be collected from safely accessible locations.

In general, sample away from the streambank in or near the main current. Collecting samples directly from ponded, sluggish, or stagnant water should be avoided. Be careful when collecting water upstream or downstream of confluences or point sources to minimize problems caused by backwater effects or poorly mixed flows. Note that samples collected directly downstream from a bridge can be contaminated from the bridge structure or runoff from the road surface.

Choose the upstream location in water that appears to represent the nature of the flow in the stream, for example, if there is a noticeable muddy plume in the center of the stream versus the outer edges, collect the sample from the center of the stream, if possible.

Downstream samples should represent the stream water mixed with flow from the construction site. For instance if the flow from the site can be observed either by a color or flow difference, collect the downstream sample from within the affected water.

2.6 How to Use Your Data

2.6.1 Coupling Your Visual Observations with Your Analytical Data

The General Permit requires that an effective combination of erosion and sediment control measures be implemented on the site at all times during the rainy season. Site inspections and observations before, during, and after storm events should provide visual indications of whether accelerated erosion is occurring on the site and whether the eroded material is being transported off-site. Visual observations of storm water runoff that appears to be transporting silt or sediment off-site (e.g., the water is soil-colored and non-transparent) probably indicate that you have a problem on the site that will be confirmed by the analytical data.

2.6.2 What on Your Site May Be Causing Sediment, Silt and/or Turbidity

Conditions or areas on your site that may be causing sediment, silt, and / or turbidity in your storm water runoff may include:

- Exposed soil areas with inadequate erosion control measures
- Active grading areas
- Poorly stabilized slopes
- Lack of perimeter sediment controls
- Areas of concentrated flow on unprotected soils
- Poorly maintained erosion and sediment control measures
- Unprotected soil stockpiles
- Failure of an erosion or sediment control measure

2.6.3 What To Do If You Get Data That Shows a Problem

The General Permit requires that BMPs be implemented on the construction site to prevent a net increase of sediment load in storm water discharges relative to pre-construction levels. Although the upstream uncontaminated (background) sample may not be representative of pre-construction levels at your site, it will provide a basis for comparison with the sample taken downstream of the construction site.

If a comparison of the upstream and downstream samples indicates a significant increase in silt, sediment and / or turbidity, it is recommended that the following steps be taken as soon as possible:

1. Repair or replace any BMP that has failed.
2. Maintain any BMP that is not functioning properly due to lack of maintenance.
3. Evaluate whether additional or alternative BMPs should be implemented to provide an effective combination of erosion and sediment control measures on the site. Do not rely solely on perimeter sediment controls, particularly where there are fine-grained soils (such as silts or clays) on the site. Implement erosion controls (source controls) that keep the soil in place, even on temporary slopes and rough graded areas, wherever possible and as necessary to prevent sediment from leaving the site.

4. Follow the reporting requirements as shown in section B.3 (Receiving Water Limitations) of the General Permit.

If sampling and analysis during subsequent storm events shows that there is still a problem, then repeat the steps above until the analytical results on upstream and downstream samples are relatively comparable.

2.7 Retention of Data

It is recommended that field sampling and laboratory analysis data, training logs, Chain-Of-Custody (COC) forms and other documentation relating to sampling and analysis be kept with the project's Storm Water Pollution Prevention Plan (SWPPP), which is to remain at the construction site at all times until a Notice of Termination for the project is submitted and approved by the appropriate RWQCB. The General Permit requires that records of all inspections, compliance certifications, and noncompliance reporting must be retained for a period of at least three years from the date generated or after project completion.

3.0 Monitoring Program for Pollutants Not Visually Detectable in Storm Water

3.1 What the Permit Says on Monitoring

The General Permit requires that a sampling and analysis program be developed and conducted for pollutants which:

- Are not visually detectable in storm water discharges,
- Are or should be known to occur on the construction site, and
- Could cause or contribute to an exceedance of water quality objectives in the receiving water.

Pollutants that should be considered for inclusion in this sampling and analysis program are those identified in your SWPPP (as required by Sections A.5.b. and A.5.c. of the General Permit). The General Permit states that the SWPPP needs to identify a strategy for conducting the sampling and analysis, including the frequency and location(s) at which sampling will be conducted.

Sampling for non-visibly detectable pollutants is required under the following two conditions:

- Visual inspections, currently required before, during and after storm events, indicate that there has been a breach, malfunction, leakage or spill from a BMP that could result in the discharge of pollutants in storm water and the pollutants would not be visually detectable; or
- Storm water comes into contact with soil amendments, other exposed materials, or site contamination that is allowed to be discharged off the construction site.

A sample of uncontaminated (background) storm water from the site must be collected for comparison with the sample(s) collected from storm water suspected of containing construction-related pollutants. The General Permit also states that the SWPPP needs to describe the sampling procedure, location and rationale for obtaining the uncontaminated sample of storm water.

3.2 Deciding If Sampling is Required (When to Sample)

All construction projects must ensure that proper inspections are conducted throughout the duration of the project to make sure that appropriately selected BMPs have been implemented, are being maintained, and are effective in preventing potential pollutants from coming in contact with storm water and causing or contributing to an exceedance of water quality objectives in the receiving waters.

The frequency of sampling for non-visible pollutants must be determined based on the exposure of pollutant sources. Runoff only needs to be sampled when there is

exposure of a pollutant source to storm water that runs off the construction site. Inspections of material storage areas that identify a BMP failure, which exposes potential non-visible pollutants to storm water that runs off the construction site, trigger sampling and analysis. If spills are cleaned up and the contaminated material is isolated, eliminating exposure to storm water runoff, sampling does not need to occur. For instances when the potential for previously existing contamination is identified, it may be appropriate to conduct screening analysis during the first one or two storm events of the season to determine if the potential contaminant is running off the construction site.

3.2.1 Sampling and Analysis is Not Required

A sampling and analysis program is not required to be implemented under the following conditions. However, a contingency sampling plan is advised in the event of an incidental discharge.

- Where a construction project is "self-contained", meaning that the project contributes no runoff to other sources or areas and that any potential discharge of pollutants can be totally contained within the construction project site without discharging to a water body or storm drain system.

- Where construction materials and compounds are kept or used so that they are not in contact with storm water (e.g., in water-tight containers, under a water-tight roof, inside a building, etc.).

- Where for specific pollutants, the BMPs implemented at the construction site fully contain the exposed pollutants (e.g., bermed concrete washout area).

- For building materials that are in their final constructed form (e.g., fence materials, support structures and equipment that will remain exposed at the completion of the project, etc.).

- Where pollutants that may have been spilled or released on-site, but have been properly cleaned-up and storm water exposure has been eliminated prior to a storm event.

- For stockpiles of construction materials for which both cover and containment BMPs have been properly implemented to protect them from run-on and from contributing pollutants to storm water runoff.

3.2.2 Sampling and Analysis Is Required

Sampling is required when non-visible pollutants have the potential to contact storm water and runoff the construction site into a storm drainage system or water body. Some examples of this situation are:

- Where construction materials and compounds are stored or used such that they are in contact with storm water.

- For construction projects that utilize soil amendments (see definition in Section 5) that are in contact with storm water runoff, unless independent test data are available that demonstrate acceptable concentration levels.

- When a leakage or spill occurs prior to a storm event and is not fully contained and cleaned.

- When a leakage or spill occurs during a storm event, and it can not immediately be isolated and / or cleaned-up, and the possibility of an off-site discharge exists..

- During regular inspections of stockpiles it is discovered that cover and containment BMPs have been compromised and storm water comes in contact with the materials, and the resulting runoff discharges into a storm drain system or water body.

- If material storage BMPs have been compromised, breached, or have failed..

If a determination has been made that sampling is needed, storm water runoff samples must be collected regardless of the time of year, status of the construction site, or day of the week. Samples should be collected during the first two hours of runoff. Storm water inspections and sample collections are required even during non-working days (including weekends and holidays).

3.2.3 Coordinating between Inspection Findings and Sampling

- A breach or malfunction in a BMP, leakage, or spill observed during regular inspections, which could result in the discharge of pollutants to a storm drain system or water body (e.g., because it was not cleaned up) and that would not be visually detectable in storm water, triggers sampling and analysis.

- If a leakage or spill is observed during inspections, and appropriate measures are taken to fully contain and clean the leakage or spill, the potential to discharge pollutants to storm water no longer exists and no sampling is required.

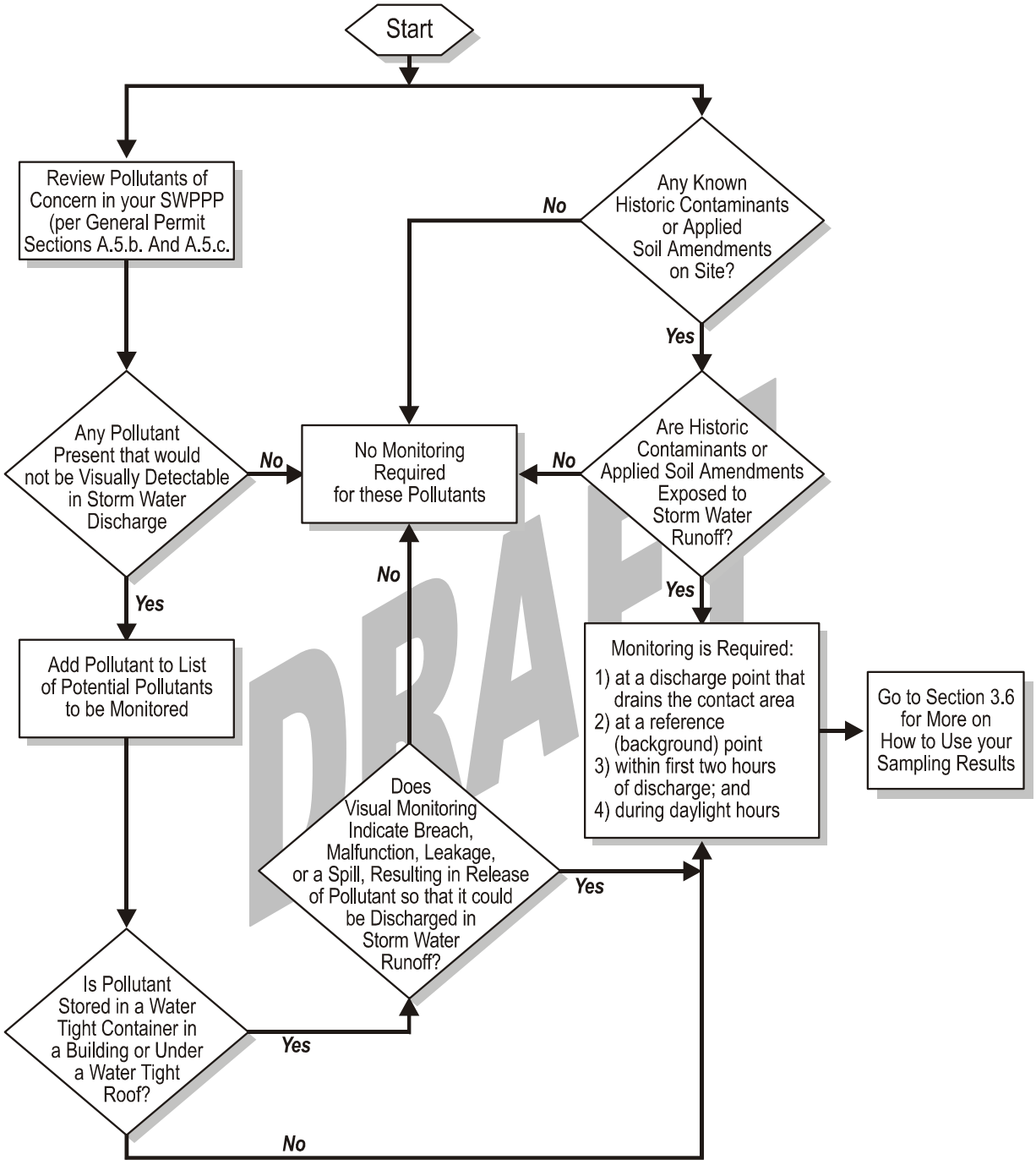

Figure 3-1
Monitoring for Non-Visually Detectable Pollutants

3.3 Deciding What to Sample

Based on your review of your potential sources from your SWPPP (required by General Permit sections A5b and A5c), which will include your construction related materials, soil amendments, and historic contaminants, develop a list of potential pollutants. Identify from this list those pollutants that are not visibly detectable. These are the constituents that you will likely have to sample for in runoff if the materials are exposed to storm water. Consult with your analytical laboratory or water quality chemist to determine if there are field tests or indicator parameters that can be used. Table 3.1 lists typical construction materials that might cause contamination of runoff if exposed to storm water.

3.4 Deciding How to Sample

- Only personnel trained in water quality sampling procedures should collect storm water samples.

- Sampling methods and locations must be determined in advance of the runoff event in order to provide sufficient time to gather the supplies and equipment necessary to sample and plan for safe access by the sampling personnel.

- General guidance for sampling procedures is provided in Section 4 of this document.

3.5 Deciding Where to Sample

Sampling locations must be identified that provide information on both the runoff quality that is affected by material storage, historic contamination or other exposed potential pollutants, and the background runoff quality (i.e., uncontaminated sample). Material storage may be confined to a small area of the project while historic contamination or exposed materials, such as soil amendments may be widely spread through the construction site. For this reason the sampling locations identified for these two types of potential pollutants may be different.

- Samples must be collected at locations identified in your SWPPP or areas identified by visual observations / inspections where there has been a BMP failure or breach and which can be safely accessed.

- A location that is not affected by material storage activities or by runoff from material storage areas should be selected as a background or reference sampling location for collecting the uncontaminated runoff sample. For widely spread potential contaminant, you may need to select sampling locations at the perimeter of your site, where storm water enters (unaffected by your activities) and leaves (affected by your activities) the site. The SWPPP must describe the sampling procedure, location, and the rationale for selecting this location.

Table 3-1

LIST OF TYPICAL CONSTRUCTION MATERIALS

This is a preliminary table which is being refined to include field and laboratory analysis for pollutants not visually detectable.

Asphalt Work

Asphalt (conventional and rubberized)
Asphalt emulsion
Asphalt releases - Monocyclic Terpet
Asphaltic concrete is usually inert
Liquid asphalt
Sand
Gravel/pea gravel
Aluminate
Aluminum sulfate

Concrete Work

Concrete curing compound - Resin based
"Monkey blood" (a retardant compound used for concrete curing)
Arbitol or Arabitol (1,2,3,4,5 - pentanepentol)
pH from concrete sawing or freshly placed or washed off Portland cement products
Cement
Sand
Cement
Gravel/pea gravel
Diesel fuel (sprayed on wooden forms as a non- sticking compound between concrete and wood)

Cleaning

Various citrus based cleaners
Solvents
Thinners
Cleaners
Water
Detergents
Trisodium phosphate
Sodium hypochlorite

Vehicle and Equipment

Various greases and oils - For heavy equipment maintenance - Tracked types require daily lubing.
Oil and grease are a concern with any heavy equipment
Oil
Grease
Coolants
Diesel
Gasoline
Hydraulic fluid

Table 3-1
LIST OF TYPICAL CONSTRUCTION MATERIALS
This is a preliminary table which is being refined to include field and laboratory analysis for pollutants not visually detectable.

Pipe Work

Pipe joint compound,
ABS and PVC primers
Chlorine – water line flushing disinfection

Painting

Striping Paints
Other paints
Thinners
Mineral spirits
Latex paint (propylene glycol)
Epoxy
Silicone

Landscaping etc.

Herbicides
Pesticides
Fertilizers
Mulch
Compost

Brick Work

Etching compounds
Acid wash of brick work

Soil Stabilization

Wood fiber mulch
Compost
Wood and bark chips
Straw mulch
Emulsified asphalt
Lime
Plant gums
Bonded fiber matrix
Coconut fiber
Paper mulch
Grass
Various proprietary products

Table 3-1
LIST OF TYPICAL CONSTRUCTION MATERIALS
This is a preliminary table which is being refined to include field and laboratory analysis for pollutants not visually detectable.

Dust palliatives

Three general classes petroleum based, salts, and organic (non-petroleum)

Petroleum based (Note the CA BMP manual recommends against these because of ground water concerns and plant growth inhibition)

Bunker oil
Asphalt primer
Emulsified asphalt

Salts Note the CA BMP manual recommends against these because they plant inhibit growth)

Magnesium Chloride
Calcium chloride
Natural brines

Organic

Calcium lignosulfonate
Sodium lignosulfonate
Ammonium lignosulfonate

Wood work

Lumber treatment/preservative
Water sealants
Stains
Saw dust

Structural finishing

Plaster
Fire retardants
Epoxies
Paints (see painting)
Tar
Urethane

3.6 How to Use Your Sampling Data

Corrective action must be initiated where non-visible pollutant sample test results indicate that the construction site's storm water discharges may cause or contribute to a water quality exceedance of the receiving water. This can be determined by comparing your construction site's storm water test results with the background sample.

Where your site's stormwater test results significantly exceed the background concentrations, you must evaluate the BMPs to determine what is causing the difference. Possible solutions may include repairing the existing BMPs, evaluating alternative BMPs that could be implemented, and / or implementing additional BMPs (cover and / or containment) which further limit or eliminate contact between storm water and non-visible pollutant sources at your site. Where contact cannot be reduced or eliminated, storm water that has come in contact with the non-visible pollutant source should be retained on-site and not allowed to be discharged. Contact your RWQCB to determine whether it is permissible to discharge the retained storm water. It is advisable to conduct additional sampling during the next runoff event after corrective actions are implemented to demonstrate and document that the problems have been corrected.

3.6.1 Coupling Your Visual Observations with Your Sampling Results

If visual inspection of storm water BMPs used to contain non-visible pollutants at a construction site indicates that a BMP has failed or been compromised then field monitoring of the storm water from the site for non-visible pollutants is required. Of course, any BMP that has been visually inspected and found breached or compromised should be immediately repaired or replaced.

The intent of conducting field monitoring for non-visible pollutants is to obtain an immediate indication if storm water that is discharging from a site has been contaminated. An immediate indication of a polluted discharge would require an immediate response in the form of back tracking from the point of discharge to verify that the failed BMP is responsible for the polluted discharge and appropriate measures be taken.

If at all feasibly possible, the contaminated discharge should be contained and prevented from being discharged off site. After taking steps to correct the failed BMP, it is advisable that field monitoring in the vicinity of the BMP be conducted to verify that pollutants are no longer in the storm water.

3.6.2 What To Do If You Get Data That Shows a Problem

If your data shows a problem, the options to correct such problems are:

- Repair or replace any BMP that has failed.
- Maintain any BMP that is not functioning properly due to lack of maintenance.
- Evaluate whether additional or alternative BMPs should be implemented.
- Follow the reporting requirements as shown in section B.3 (Receiving Water Limitations) of the General Permit.

3.7 Retention of Data

It is recommended that field sampling and laboratory analysis data, training logs, Chain-Of-Custody (COC) forms and other documentation relating to sampling and analysis be kept with the project's Storm Water Pollution Prevention Plan (SWPPP), which is to remain at the construction site at all times until a Notice of Termination for the project is submitted and approved by the appropriate RWQCB. The General Permit requires that records of all inspections, compliance certifications, and noncompliance reporting must be retained for a period of at least three years from the date generated or after project completion.

4.0 Sampling Procedures

The collection and handling of storm water runoff samples requires care to ensure the integrity and validity of the samples. Special documentation, a Chain Of Custody (COC) form, must follow the sample from the collection through the analysis process. Additional documentation to track other information of interest, e.g. field conditions, or required field measurements may also be used. This type of information is recorded on a field tracking form.

Every sample must be collected with care to ensure that the sample is representative of the runoff being tested, must be collected in the right kind of container, be preserved in accordance with the test method's specifications, and stored cold until delivered to an analytical laboratory. Some types of samples have very short hold times and must be analyzed before this hold time is exceeded. Sample handling requirements and documentation form the basis of your sampling quality assurance program.

Before starting any sampling program, contact the analytical laboratory that you plan to use to analyze your samples. Make sure to select a laboratory that will provide you with properly cleaned and preserved sampling containers and COC needed, and that can assist in identifying courier services available to transport samples to the laboratory, or that may be able to provide sampling service for you. All these details need to be worked out in advance of sample collection. The analytical laboratory should also be consulted on what additional samples will need to be collected for quality assurance and quality control purposes.

Both field and analytical analysis methods can be used to meet the Permit requirements. Field techniques have the advantage of providing immediate results. However, there are only a limited number of analyses that can be done in the field. Analytical laboratories can analyze for a wide range of parameters, but the data may take several weeks or longer to get back.

Some constituents (e.g. pH) can be evaluated in the field with special equipment. Field samples must be collected and analyzed according to the specifications of the manufacturer of the sampling devices employed. Field equipment must be used by trained staff and the equipment must be calibrated and maintained according to the manufacturer's specifications.

Laboratory analyses should be conducted by an accredited by the California Department of Health Services Environmental Laboratory Accreditation Program (ELAP). . Analyses must be conducted in accordance with 40 CFR Part 136.

All field and / or laboratory analytical data must be kept in the SWPPP document, which is to remain at the construction site at all times until a Notice of Termination has been submitted and approved.

Refer to the California Department of Transportation (Caltrans) *Guidance Manual: Stormwater Monitoring Protocols (Second Edition), July 2000* to assist you in developing a sampling and analysis program. This document may be downloaded from the Caltrans Website, at http://www.dot.ca.gov/hq/env/stormwater/special/index.htm.

Figure 4-1 is an outline for a typical storm water sampling and analysis plan. Since some laboratories may have specific requirements for sample collection and handling, specific information or requirements on your samples should be checked with your laboratory.

1 PROJECT OVERVIEW/DESCRIPTION
- 1.1 Description of why the project is being conducted
- 1.2 Description of who in conducting the project
- 1.3 General scope of monitoring activities
- 1.4 Project organization/roles and responsibilities

2 MONITORING SITES
- 2.1 Site location (map)
- 2.2 Written driving directions
- 2.3 Site access instructions (gates, locks, keys, combinations)
- 2.4 Notification procedures

3 ANALYTICAL CONSTITUENTS
- List of constituents for sampling and analysis (including sample collection methods, container type, volume required, preservation and laboratory performing analysis)

4 DATA QUALITY OBJECTIVES (DQOs)
- 4.1 Analytical reporting limits
- 4.2 Analytical precision, accuracy and completeness

5 FIELD EQUIPMENT MAINTENANCE
- 5.1 Equipment calibration
- 5.2 Equipment maintenance
- 5.3 Equipment cleaning (bottles/lids/tubing)

6 MONITORING PREPARATION AND LOGISTICS
- 6.1 Weather tracking
- 6.2 Storm selection criteria
- 6.3 Storm action levels
- 6.4 Communications/notification procedures
- 6.5 Sample bottle order
- 6.6 Sample bottle labeling
- 6.7 Field equipment preparation

7 SAMPLE COLLECTION, PRESERVATION AND DELIVERY
- 7.1 Sample collection methods
- 7.2 Field measurement methods
- 7.3 Field equipment list
- 7.4 Sample containers, preservation and handling
- 7.5 QA/QC sample collection methods
- 7.6 Sample labeling (site names, codes, etc.)
- 7.7 Composite sample splitting
- 7.8 Forms and procedures for documenting sample collection and field measurements
- 7.9 Laboratory communication procedures
- 7.10 Sample shipping/delivery, chain-of-custody

8 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)
- Field procedures for QA/QC sample collection

9 LABORATORY SAMPLE PREPARATION AND ANALYTICAL METHODS
- 9.1 Laboratory sample preparation procedures
- 9.2 Analytical constituent table (including analytical methods, holding times and reporting limits)

10 DATA MANAGEMENT AND REPORTING PROCEDURES
- 10.1 Analytical data validation
- 10.2 Electronic data transfer
- 10.3 Filing of electronic and hard copy data
- 10.4 Reports

APPENDICES
- A Clean Sampling Techniques
- B Health and Safety Plan

Figure 4-1
Outline for a Typical Storm Water Sampling and Analysis Plan

5.0 Definitions

Chain of Custody (COC) Form

A form used to track sample handling as samples progress from sample collection to the analytical laboratory. The COC is then used to track the resulting analytical data from the laboratory to the client. COC forms can be provided by an analytical laboratory upon request.

Field Measurements

Water quality testing performed in the field with portable field-testing kits or meters.

Field Tracking Form (FTF)

A form that serves as a guide to sampling crews to obtain sampling information and to prescribe and document sample collection information in the field. The FTF contains sample identifiers, sampling locations, requested analyses, QC sample identifiers, special instructions, and field notes.

Sampling and Analysis Plan

A document which describes how the samples will be collected and under what conditions, where and when the samples will be collected, what the sample will be tested for, what test methods and detection limits will be used, and what methods / procedures will be maintained to insure the integrity of the sample during collection, storage, shipping and testing (i.e., quality assurance / quality control protocols).

Direct Discharge

Storm water runoff that flows from a construction site directly into a 303 (d) water body listed for sedimentation, siltation, or turbidity. If storm water runoff from the construction site reaches one of the 303(d) listed water bodies without first flowing through a municipal separate storm sewer system (MS4) that has been formally accepted by and is under control and operation of a municipal agency or district, or a separate storm water conveyance system where there is co-mingling of site storm water with off-site sources, or an unlisted tributary to the listed water body, it is considered a direct discharge to the water body and sampling is required.

Holding Time

Holding time is specified by the analytical method and is the elapsed time between the time the sample is collected and the time the analysis must be initiated.

Electrical Conductivity (EC)

Measure of the ability of water to carry an electric current. This ability depends on the presence of ions, their concentration, valence, mobility and temperature. EC

measurements can give an estimate of the variations in the dissolved mineral content of storm water in relation to receiving waters.

pH

The pH is universally used to express the intensity of the acid or alkaline condition of a water sample. The pH of natural waters tends to range between 6 and 9, with neutral being 7. Extremes of pH can have deleterious effects on aquatic systems.

Sediment

Solid particulate matter, both mineral and organic, that is in suspension, is being transported, or has been moved from its site of origin by air, water, gravity, or ice and has come to rest on the earth's surface either above or below sea level.

Sedimentation/Siltation

The process of sediment/silt deposition.

Settleable Solids

The settleable solids (SS) tests measures the solid material that can be settled within a water column during a specified time frame. This typically is tested by placing a water sample into an Imhoff settling cone and allowing the solids to settle by gravity. Results are reported either as a volume (mL/L) or a weight (mg/L).

Silt

Soil particles between 0.05mm and 0.002mm in size. (For the purposes of its use here, it also includes clay, which is categorized by a particle size less than 0.002mm.)

Soil Amendment

Any material that is added to the soil to change its chemical properties, engineering properties, or erosion resistance that could become mobilized by storm water and would be not visible in the runoff. Soil amendments include lime, cementitious binders, chlorides, emulsions, polymers, soil stabilizers, and tackifiers applied as a stand-alone treatment (i.e., without mulch). Plant fibers (such as straw or hay), wood and recycled paper fibers (such as mulches and matrices), bark or wood chips, green waste or composted organic materials, and biodegradable or synthetic blanket fibers would not be included as soil amendments in this context because they would be visible in storm water runoff.

Suspended Sediment Concentration (SSC)

The suspended sediment concentration (SSC) test measures the concentration of suspended solid material in a water sample by measuring the dry weight of all of the solid material from a known volume of a collected water sample. Results are reported in mg/L. A high suspended solids level impacts the clarity of the water which may decrease the depth to which sunlight can penetrate the water and adversely impact aquatic plant growth. It also reduces the concentration of oxygen in the water,

potentially affecting the ability of aquatic animals and plants to survive and flourish due to oxygen deprivation.

Total Suspended Solids (TSS)

Suspended solids in a water sample include inorganic substances, such as soil particles and organic substances, such as algae, aquatic plant/animal waste, particles related to industrial/sewage waste, etc. The total suspended solids test (TSS) test measures the concentration of suspended solids in water by measuring the dry weight of a solid material contained in a known volume of a sub-sample of a collected water sample. Results are reported in mg/L.

A high suspended solids level impacts the clarity of the water which may decrease the depth to which sunlight can penetrate the water and adversely impact aquatic plant growth. It also reduces the concentration of oxygen in the water, potentially affecting the ability of aquatic animals and plants to survive and flourish due to oxygen deprivation.

Turbidity

Cloudiness of water quantified by the degree to which light traveling through a water column is scattered by the suspended organic and inorganic particles it contains. The scattering of light increases with a greater suspended load. Turbidity is commonly measured in Nephelometric Turbidity Units (NTU).

6.0 Sources of Further Assistance

Regional Water Quality Control Boards

Regional Water Quality Control Board	Address	Contact Name E-mail	Telephone/Fax
NORTH COAST REGION	5550 Skylane Boulevard, Suite A Santa Rosa, CA 95403	John Short shorj@rb1.swrcb.ca.gov	(707) 576-2065 FAX: (707) 523-0135
SAN FRANCISCO BAY REGION	1515 Clay Street, Suite 1400 Oakland, CA 94612	Hossain Kazomi mhk@rb2.swrcb.ca.gov	(510) 622-2369 FAX: (510) 622-2460
CENTRAL COAST REGION	81 Higuera Street, Suite 200 San Luis Obispo, CA 93401-5427	Jennifer Bitting jbitting@rb3.swrcb.ca.gov	(805) 549-3334 FAX: (805) 543-0397
LOS ANGELES REGION	320 W. 4th Street, Suite 200 Los Angeles, CA 90013	Yi Lu (Inland Los Angeles) ylu@rb4.swrcb.ca.gov	(213) 576-6728 FAX: (213) 576-6686
		Ejigu Soloman (Ventura County) esoloman@rb4.swrcb.ca.gov	213) 576-6727 FAX: (213) 576-6686
		Xavier Swamikannu (Coastal) xswami@rb4.swrcb.ca.gov	(213) 576-6654 FAX (213) 576-6686
CENTRAL VALLEY REGION **Sacramento Office**	3443 Routier Road, Suite A Sacramento, CA 95827-3098	Sue McConnell mcconns@rb5s.swrcb.ca.gov	(916) 255-3098 FAX: (916) 255-3015
CENTRAL VALLEY REGION **Fresno Branch Office**	3614 East Ashlan Avenue Fresno, CA 93726	Jarma Bennett bennettj@rb5f.swrcb.ca.gov	(559) 445-6046 FAX: (559) 445-5910
CENTRAL VALLEY REGION **Redding Branch Office**	415 Knollcrest Drive Redding, CA 96002	Carole Crowe crowec@rb5r.swrcb.ca.gov	(530) 224-4849 FAX: (530) 224-4857
LAHONTAN REGION **South Lake Tahoe Office**	2501 Lake Tahoe Boulevard South Lake Tahoe, CA 96150	Mary Fiore-Wagner fiorm@rb6s.swrcb.ca.gov	(530) 542-5245 FAX: (530) 544-2271
LAHONTAN REGION **Victorville Office**	15428 Civic Drive, Suite 100 Victorville, CA 92392	Eugene Rondash erondash@rb6v.swrcb.ca.gov	(760) 241-2434 FAX: (760) 241-7308
COLORADO RIVER BASIN REGION	73-720 Fred Waring Drive, Suite 100	Abdi Haile haila@rb7.swrcb.ca.gov	(760) 776-8939 FAX: (760) 341-6820

Regional Water Quality Control Board	Address	Contact Name E-mail	Telephone/Fax
	Palm Desert, CA 92260	Rosalyn Fleming flemr@rb7.swrcb.ca.gov	(760) 776-8939 FAX: (760) 341-6820
SANTA ANA REGION	3737 Main Street, Suite 500 Riverside, CA 92501-3339	Michael Roth (Riverside County) mroth@rb8.swrcb.ca.gov	(909) 320-2027 FAX: (909) 781-6288
		Aaron Buck(Orange County) abuck@rb8.swrcb.ca.govmail to:	(909) 782-4469 FAX: (909) 781-6288
		Muhammad Bashir (San Bernardino County) bwhitake@rb8.swrcb.ca.gov	(909) 320-6396 FAX: (909) 781-6288
SAN DIEGO REGION	9771 Clairemont Mesa Boulevard, Suite A San Diego, CA 92124	Jane Ledford ledfj@rb9.swrcb.ca.gov	(858) 467-3272 FAX: (858) 571-6972

State Water Resources Control Board

Division of Water Quality
Storm Water Permit Section
P.O. Box 1977
Sacramento, CA 95812-1977
Construction Inquiry Line: (916) 341-5537
Web Site: http://www.swrcb.ca.gov/
e-mail: stormwater@swrcb.ca.gov

How to Obtain a List of State Certified Laboratories

http://www.dhs.ca.gov/ps/ls/elap/html/lablist_county.htm

Other Useful Web Sites

California Stormwater Quality Task Force
http://www.stormwatertaskforce.org/

California Department of Transportation
Environmental Program http://www.dot.ca.gov/hq/env/index.htm

Storm Water Management Program http://www.dot.ca.gov/hq/env/stormwater/

APPENDIX A

General Outline of Information that should be included in your SWPPP for the Sampling and Analysis Requirements

1. Sedimentation monitoring

(In this section identify whether you need to sample for sedimentation, siltation, or turbidity. Identify at minimum elements a & b. Note that some water bodies are identified as impaired on a segment basis rather than for the whole water body. Only direct discharges into water bodies impaired for sediment, silt, or turbidity need to do this sampling. This type of monitoring may not be necessary for all projects. If you do need to conduct this monitoring your SWPPP needs to include section 2, if not move on to section 3.)

a. Site storm water discharge points

b. Receiving water

c. Review 303d list

2. Monitoring strategy for sediment

(In this section identify the sampling process, include where you will sample (at least one up and down stream location is needed) what you will sample for, and your field quality control samples. Identify how your samples will be analyzed. Field measurements may be appropriate. If you conduct field sampling, you need to follow the field meter instruction and keep it calibrated.)

a. Sample locations

   i. Location upstream of the construction site in the receiving water

   ii. Location downstream of the construction site in the receiving water

b. Analytes for Analysis

   i. Field measurements

   ii. Laboratory analyses

c. Control samples

3. Non-visible pollutant monitoring

(In this section identify the potential sources of non-visual pollutants, your SWPPP should discuss the materials in use and the activities conducted on your site, and any past contamination of your project site. These three elements are the potential pollutant sources. Determine if these potential pollutants are non-visual and can be discharged in storm water runoff. Most projects will have to develop this sampling and analysis plan. If you don't think you can discharge pollutants, because every thing is either stored so that it doesn't contact storm water or because your site doesn't discharge runoff, you may want to develop the sampling plan as a contingency, in the event of spill or containment failure. Identify how you will use your current inspection program to trigger sampling and analysis.)

a. Source identification

    i. Pre-construction contamination

    ii. Construction activities

    iii. Construction materials

b. Connect your sampling program to you inspection program

4. Monitoring strategy for non-visual pollutants

(In this section identify the sampling process, include where you will sample, what you will sample for, when you will sample, and your field quality control samples. For sampling locations you need to collect samples of runoff that contacts the stored materials and runoff unaffected by it. The unaffected runoff can be immediately upstream or from a reference location on the site. Identify how your samples will be analyzed. Field measurements and indicator parameters may be appropriate. If you conduct field sampling, you need to follow the field meter instruction and keep it calibrated.)

a. Sample locations

    i. Location downstream from the storage or spill area

    ii. Location unaffected by the storage or spill area

b. b) Analytes for Analysis

c. c) Control samples

5. Data Evaluation

(In this section you need to identify how you will use your data. In general, If you find high levels of sediment, analytes or indicator parameters you should review your BMPs for malfunctions or potential upgrades.)

6. Training for sampling personnel

(All personnel collecting samples should have enough training to collect samples in accordance with the regulatory requirements (40 CFR Part 136) or follow manufacturers instructions for use and calibration of field meters and instruments. You may want to subcontract sample collection to firms that specialize in water quality sampling. Identify how you have trained you staff or whether you hired trained staff.)

7. Sampling procedures

(In this section identify your sampling procedures, e.g., how you will decide when to sample; how samples will be collected; if there is a special order to sample collection; what field paper work will be completed (field tracking forms, chains of custody); how samples will be handled and transmitted to the laboratory. Other sampling procedures may be needed depending on the specifics of you site and sampling program.)

8. Sampling and analysis records

(In this section identify where you are storing records associated with sampling and analysis. Field and analytical data must be kept in the SWPPP until the Notice of Termination is filed. But you also need to keep other documents associated with the sampling program, such as calibration charts, field tracking forms chains of custody, training records of samplers, laboratory certification information. Identify where this information is kept if other than in the SWPPP.)