APPENDIX G

Dry Weather Analytical and Field Screening Monitoring Procedures Manual

County of San Diego, Department of Public Works
Watershed Protection Program

Updated February 2006

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I. PURPOSE

This document describes the process and procedures for field site visits and the collection of surface water samples during dry weather flows and investigation procedures for the detection of illicit connections and illegal discharges (IC/ID) to and from the County of San Diego Municipal Separate Storm Sewer System (MS4). This Dry Weather Analytical and Field Screening Monitoring Program (hereinafter Dry Weather Monitoring Program) is required under the Urban Runoff Permit, Order No. 2001-01, NPDES No. CAS0108758, Section F.5.b. The County of San Diego, Department of Public Works (DPW) Watershed Protection Program is responsible for implementing this program.

II. SCOPE

The purpose of this Dry Weather Monitoring Program is to detect and eliminate illicit connections and illegal discharges to the MS4 using geographically widespread dry weather discharge monitoring and follow up investigations. All Watershed Protection Program, Science and Monitoring staff responsible for collecting, analyzing and investigating dry weather flows, shall implement the procedures described below and follow the quality assurance and quality control plan as described in the Dry Weather Monitoring Program Quality Assurance Project Plan (QAPP).

III. TRAINING

All staff conducting activities directly related to the implementation of the Dry Weather Monitoring Program, and the related activities described in this Manual, must receive training prior to their involvement in such activities. Training will consist of: review of safety procedures, use of field sheet including field observations, flow estimation, and field sampling, calibration of field instruments, use of field screening test kits, and procedures for conducting an IC/ID investigation.

IV. DEFINITIONS

Blank Solution - Solution that is free of the analyte(s) of interest. Such a solution would be obtained from the laboratory.

Duplicate Sample - Two discrete aliquots collected from the same sample location at the same time.

Field Blank - Laboratory sterilized water (blank solution) that is subjected to all aspects of sample collection, field processing, preservation, transportation, and laboratory handling as an environmental sample.

Grab Samples - A specific location at a given time is represented by a discrete aliquot. The sample is collected all at once and at only one particular point in the sample medium.

Matrix Interference - Also referred to as matrix effects. Matrix interference is a chemical and/or physical interference that impedes the analytical instrumentation in detecting the true value concentration of a target analyte within a sample. One possible source of matrix interference may be caused by contaminants that are co-extracted from the sample and result in a positive or negative bias. The extent of matrix interferences will vary considerably from source to source, depending upon the nature and diversity of the sample matrix.

MS4 - Municipal Separate Storm Sewer System.

Outlier - A datum that appears to deviate markedly from that of other members of the sample in which it occurs.

Quality Assurance (QA) - All those planned or systematic actions necessary to provide adequate confidence that a product or service will satisfy given requirements for quality.

Split Sample - The collection of one discrete aliquot split into two discrete sample aliquots. Each sample is analyzed for the same parameters.

V. BACKGROUND AND SAFETY PRECAUTIONS

Dry weather monitoring will not occur when the sampling environment and/or discharges create hazardous conditions (e.g. diesel spill to a creek) or when there is any rain event > 0.1 inch. Seventy-two (72) hours must pass from the end of the storm event before dry weather monitoring can be resumed. Use the following safety precautions at all times when conducting dry weather monitoring and be sure to heed all warnings and precautionary statements. This program is intended to assess dry weather conditions.

- Do not sample during dangerous conditions such as high winds, lightning storms, or flooding conditions.
- Do not remain in open areas or stand under trees if lightning is occurring in the vicinity.
- Do not enter a conveyance if it is raining. Staff should not be sampling during any rain event. If adverse conditions develop while in the field, return to the vehicle and if necessary return to DPW Headquarters.
- Do not enter confined spaces.
- Do not open any manhole with out consulting DPW, Roads Division (Mark Lumpkins, 619-660-5831).
- Wear appropriate attire (i.e. hat, safety boots, gloves, and long pants).
- Be aware of your environment! Watch for: snakes, ticks, bees, poison oak, and stinging nettle (see Appendix 1 for photos).
- Be familiar with Material Safety Data Sheets (MSDS) for all chemicals used in the field and when calibrating instruments. Know the health hazards and emergency medical treatments, and follow proper disposal instructions.
- Keep a first aid kit and fire extinguisher in the vehicle.
- Make sure accident reporting packet with film camera is in the vehicle.
- Park vehicle off road if possible, turn hazard light on, and place orange safety cones out if you are parking near traffic lanes.

- Watch out for traffic along the access road when sampling or making observations.
- Watch your step; the ground may be wet and slippery, steep, or unstable. Rocks may be loose. Do not attempt to climb down unsafe slopes. Return another day.
- Always wear clean disposable gloves when sampling.
- Protect eyes and skin against contact with acids and other preservatives.
- Use a backpack when transporting sample bottles from the sample location back to the ice chest in the vehicle.

Safety Equipment

The following safety equipment is required during dry weather monitoring:

- First aid kit
- Safety glasses
- Disposable gloves
- Proper safety boots
- Snake guards
- Safety vests
- Orange traffic cones
- Sun screen
- Insect repellent containing DEET
- Cell phone
- Drinking Water

VI. RESPONSIBLE PERSONNEL

Field Staff

- Calibrate and maintain equipment
- Follow sample collection procedures
- Follow record keeping procedures
- Conduct initial IC/ID investigations

Dry Weather Coordinator

- Maintain all electronic and hard copy data received from the laboratory
- Maintain field datasheets in the appropriate binder

Quality Assurance Officer

- Conduct routine QA/QC on analytical data
- Conduct routine QA/QC on field data
- Verify database entries
- Verify instrument calibrations, and upkeep of all required log sheets.

Watershed Coordinators

- Verify sample locations are within County MS4
- Coordinate dates and locations for sampling events

- Enter your specific watersheds' data sheets and follow database entry procedures.
- Lead IC/ID investigations in your specific watershed(s)

VII. EQUIPMENT

The Dry Weather Monitoring Program is required to perform monitoring while in the field. All applicable equipment and supplies needed to implement this program are listed in Appendix 2. The field screening analyses are performed using the following equipment:

- Horiba U-10, 5-parameter probe
- VVR Water Analysis System (handheld spectrometer) and CHEMetrix® reagent kits.
- Global Flow Probe, Model FP101-FP201 (arrow points downstream with the current).

A. EQUIPMENT MAINTENANCE

- Field staff will maintain clean and properly functioning equipment at all times.

- The viability of field screening test kit reagents will be assessed periodically by noting the reagent expiration dates on a reagents' package.

- The Horiba U-10 Meter is to be calibrated before each day of use using the AutoCal solution provided by the manufacturer following the procedure in Appendix 3. All calibration results will be documented in the calibration log sheet. Care should be taken to keep calibration solution uncontaminated. Solutions should not be used after the expiration date.

- Field meters and cameras must be in proper working order. Make sure that batteries have sufficient voltage to power the equipment for the entire field trip.

- Recharge or replace batteries as necessary. Keep extra batteries in the instrument case. Probes should be inspected, cleaned and reconditioned regularly.

- Clean and rinse all other sampling equipment after returning from the field.

- Sample containers used in the field (e.g. graduated cylinders for sample dilutions, test kit flasks and / or beakers) should be cleaned immediately after usage. Rinse three to four times with deionized water. Rinsewater from test kit cleaning must be poured into the waste container.

- Supply of containers used for analytical laboratory analysis should be checked and restocked as needed.

VIII. PROCEDURES

A. FIELD SITE VISITS

1. INTRODUCTION

The Dry Weather Monitoring Program is intended to be a tool to detect illicit connections and illegal discharges (IC/ID) into the County of San Diego's MS4. The dry weather analytical monitoring and field screening sampling requirements were clarified during discussions between the Copermittees' Monitoring Workgroup and the San Diego RWQCB. The parties agreed that each Copermittee would collect a grab sample for laboratory analysis at a minimum of 25% of the sites where ponded or flowing water was observed. In addition, the Copermittees were required to perform field screening at each identified station a minimum of one time between May 1st and September 30th of each year. Sample locations should be identified and located each day prior to leaving the DPW facility. Appendix 14 lists all sample locations for the dry weather season 2006.

Monitoring will not be conducted during any rain event >0.1 inch or within 72 hours of the end of any rain event, or if local hydrologic conditions indicate that storm flow is still occurring at a site after a rain event. If rain is scattered, check if rainfall occurred within the watershed to be sampled. If staff is in the field and the weather turns to rain, staff should discontinue sampling and return to DPW headquarters. If weather conditions are suspect, verify conditions prior to departure to sampling locations using the following sources:

- Department of Public Works Flood Control Section at (619) 495-5557 (7:00 am - 4:00 pm weekdays).
- National Weather Service weather forecasts 24-hour recorded message at (619) 289-1212 or http://www.wrh.noaa.gov/sgx/

2. FIELD SHEETS/ DOCUMENTATION

Field sheet documentation is the most critical aspect to conducting dry weather monitoring. Each site visit must have a Dry Weather Field Monitoring Sheet filled out (Appendix 4) at the time of site visit and be assigned a unique sample event ID number from the Sample Event ID log sheet, kept in the vehicle. All information fields (observations and measurements) on the sheet should be filled. If a site visit triggers an IC/ID investigation a new field sheet should be filled out and assigned its own unique Sample Event ID Number. The Sample Event ID Number will be obtained from the Sample Event ID Number table each time a sample is collected. Special care must be taken to insure that each sample event or site visit has a unique number assigned to it. This Sample Event ID Number is the primary reference number in the Dry Weather database for each unique sample and should be recorded on all related documents pertaining to that sample (i.e. Chain of Custody and sample bottles). All documentation should be filled out accurately and neatly.

If a parameter was not measured "NA" should be placed in the applicable cell. This ensures that the parameter was not overlooked. If a field screening analysis is over-

range then “Over Range” should be placed in the applicable cell and re-measure the sample using a dilution (procedure in Appendix 8) and noting the dilution ratio in the “Dilution (Dil.) Times” cell and the field screening analysis reading in the “Dilution (Dil.) Reading” cell on field sheet. If a measurement was recorded inaccurately, a line should be drawn through the error, correct result noted, and the person responsible for documenting the results should initial and date the correction. This is good practice for correcting any written errors on any documents.

3. FIELD OBSERVATIONS

Qualitative field observations must be made during each site visit when ponded or flowing water is observed. These observations are intended to provide a general assessment of the site and include variables like weather, odor, water clarity, presence of floatable matter, visible deposits / stains, vegetative coverage and biological status (detailed discussion in Appendix 5). If a location is dry, a datasheet must be filled out noting the lack of water and current weather condition. Evidence of past or present IC/IDs to the MS4 can often be ascertained by careful field observations. Each field screening location should be photographed to provide additional information and documentation of site conditions. In addition to providing important descriptive information, photos serve as an official record of the site visits, a visual record of the condition of the pipes, structures and the surrounding environment, and can assist other staff in locating the site in subsequent visits. At least one photograph should be collected at each site visit. If a site is new, one photograph looking upstream and one looking downstream should be taken.

4. FLOW MEASUREMENT PROCEDURES

A flow measurement should be made during each site visit where flowing water is observed. Flow measurements can be used to estimate pollutant mass loading, prioritize storm drains for future investigations, or to identify significant changes in flow that may be indicative of an illegal release upstream. Since a majority of sample locations lack a permanent flow measurement installation, several field methods may be employed to estimate flow rate. If water is ponded, take width, length, and depth and record velocity as zero (0).

Velocity-area method - The most practical method for measuring the discharge of a stream is the velocity-area method. This method requires the physical measurement of the cross-sectional area and the velocity of the flowing water. Discharge is determined as the product of the area times the velocity.

Discharge (ft^3/sec) = Velocity (ft/sec) x Depth (ft) x Width (ft)

Using the Global Flow Probe, measure the velocity of the water flow (see flow probe instruction in Appendix 6). Use the measurement marks on the probe to measure the stream width and depth. Note: The probe markings are in tenths of a foot, therefore you read directly from the markings and do not need to make any conversions. Record results on the datasheet; the Dry Weather database will calculate the discharge flow.

Fill a bottle method - If conducting an IC/ID investigation on an outfall, staff should record information on the diameter of an outfall for the determination of the discharge flow. The rate can be determined by measuring the length of time it takes to fill a 1-Liter bottle. This method is very helpful for low-flow situations.

Partially filled pipe method - Another method for measuring flow is the partially filled pipe method. This method is helpful when you have a substantial flow coming from an outfall. For this method all measurements must be converted to a common unit before calculation (ft, in, or cm). Measure the water depth and inside pipe diameter and apply the following formula using the partially filled pipe formula chart in Table 1.

- Let D = water depth.
- Let d = *inside* pipe diameter
- Calculate D/d.
- Find the tabulated (Ta) value on the partially filled pipe formula chart below using the D/d value. (i.e. if D/d = 0.263 then Ta =0.1623).
- Find the area using the formula

  $a = Ta*d^2$.
- Multiply area (a) by the water velocity.
- Convert to desired value.

Table 1: Partially Filled Pipe Formula Chart (need to explain)

Calculating the Area (a) of the Cross Section of a Circular Pipe Flowing Partially Full

D = Depth of water
d = diameter of the pipe
a = area of water in partially filled pipe
Ta = Tabulated Value
Then a = Ta*d2

D/d	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.0000	0.0013	0.0037	0.0069	0.0105	0.0147	0.0192	0.0242	0.0294	0.0350
0.1	0.0409	0.0470	0.0534	0.0600	0.0668	0.0739	0.0817	0.0885	0.0951	0.1039
0.2	0.1118	0.1199	0.1281	0.1365	0.1440	0.1535	0.1623	0.1711	0.1800	0.1890
0.3	0.1982	0.2074	0.2187	0.2280	0.2355	0.2450	0.2540	0.2642	0.2780	0.2836
0.4	0.2934	0.3032	0.3130	0.3220	0.3328	0.3428	0.3527	0.3627	0.3727	0.3827
0.5	0.3980	0.4030	0.4130	0.4230	0.4330	0.4430	0.4520	0.4620	0.4720	0.4820
0.6	0.4920	0.5020	0.5120	0.5210	0.5310	0.5400	0.5500	0.5590	0.5690	0.5780
0.7	0.5870	0.5960	0.6050	0.6140	0.6230	0.6320	0.6400	0.6490	0.6570	0.6660
0.8	0.6740	0.6810	0.6890	0.6970	0.7040	0.7120	0.7190	0.7250	0.7320	0.7360
0.9	0.7450	0.7500	0.7560	0.7610	0.7660	0.7710	0.7750	0.7790	0.7820	0.7840

5. SAMPLING PROCEDURES

The permit requires that we perform field screening at each identified station a minimum of one time between May 1st and September 30th of each year if flow or ponded runoff is observed at a dry weather station and there has been at least 72 hours of dry weather.

Field screening involves making observations, collecting at least one grab sample (for: nitrate, phosphate, and ammonia), measuring water quality properties (for: pH, conductivity, turbidity, dissolved oxygen (see Appendix 15), temperature, and salinity), recording general information, site descriptions, flow estimation, and visual observations on a dry weather field monitoring sheet as stated in the Permit Attachment E.4.b. **Do not** collect ponded water samples after the initial permitted required sample has been completed.

All samples are to be analyzed in the field for the physical and chemical constituents as stated in the Permit Attachment E.4.d and are included in Table 2 below. A grab sample may be brought back to the DPW lab for analysis of nitrate, phosphate and ammonia if time is limited. Sample should be transported on ice. Make a note on the field sheet if this is done. The analytical laboratory analysis will be conducted at a minimum of 25% of the sites where ponded or flowing water is observed. Table 3 provides a summary of all field screening and analytical laboratory analysis parameters available for the Dry Weather Monitoring Program and for use in site investigations.

Field Sample Collection - Grab samples (see below for Oil and Grease grab sample procedure) are to be collected by standing downstream and submerging the sample container immediately below the water surface in the upstream direction, disturbing as little of the bottom material as possible. If practical, collect the sample at about 60% of the stream depth (from the surface) in an area of maximum turbulence (except when sampling for volatile organics). If the water level is very low, collect the water sample using a clean syringe and fill sample container. Note on field sheet if a syringe was used for sample collection. Avoid sampling the slowly flowing water near the edge of stream, unless intended. For Oil and Grease grab sample collection, fill bottle with water at the water-air interface, and avoid collecting sediments.

Analytical Laboratory Sample Collection - Samples for analytical laboratory analysis need to be collected in the appropriate containers (see Table 3 for container type, holding time and necessary preservative for each analyte). The contracting laboratory will provide the appropriate pre-cleaned sample containers with preservative added (see Appendix 7). Samples are to be collected by standing downstream and at the horizontal and vertical center of the stream/creek flow for a more representative sample of the whole stream. When sampling, make sure the container opening faces upstream. For shallow water (less than 6-inches deep), it will suffice to fill the bottle from the surface of the stream rather than sample mid-depth. For deeper water, sample mid-depth by leaving the lid on the sample bottle and lowering the bottle to the mid-depth position, then removing the lid and allowing the container to fill. Be sure to firmly screw cap on the container to prevent leakage. If water level is very low, collect the water sample using a clean syringe and fill appropriate sample container. Note on the field sheet if a syringe was used for sample collection. Avoid sampling the slowly flowing water near the edge of stream, unless intended. Store all samples in an ice chest with ice at approximately 4^{o} C until custody is transferred to the analytical laboratory directly or via contracted courier.

Note: Bacteria samples must be delivered to the laboratory within 6 hours of collection.

Table 2: Field Screening Monitoring Parameters

Parameter	Method		Units	Detection Limit
pH	Glass electrode	Horiba U-10	pH unit	0.01
Conductivity	Alternating 4-electrode		mS/cm	1
Turbidity	Light scattering/ absorption		NTU	1
Dissolved oxygen	Membrane/ galvanic cell		mg/L	0.01
Temperature	Thermistor		^{o}C	0.1
Nitrate NO_3^-	Colorimetric	VVR	mg/L	6.0
Orthophosphate PO_4^{3-}	Colorimetric		mg/L	0.2
Ammonia NH_4^+	Colorimetric	Color-wheel	mg/L	0.05

Table 3: Summary of Field and Laboratory Sampling and Analysis Requirements

Physical and Inorganic Non-Metals	Permit Requirement?	Analytical or Field Method	Container[1]	Volume (mL)	Preservative (+ 4o C)	Holding Time	Detection Limit(s)
Field Screening Parameters							
Turbidity	Y	Horiba Multiparameter Water Quality Instrument	in situ field measurement			N/A	N/A
pH	Y		in situ field measurement			N/A	N/A
Conductivity	Y		in situ field measurement			N/A	N/A
Temperature	Y		in situ field measurement			N/A	N/A
Dissolved Oxygen	Y		in situ field measurement			N/A	N/A
Ammonia-N	Y	Field Colorimetric[2]	P	250	none	N/A	0.10 mg/L
Dissolved Phosphorous-P	Y		P	250	none	N/A	0.32 mg/L
Nitrate-N	Y		P	250	none	N/A	0.68 mg/L
Copper	N		P	250	none	N/A	
Zinc	N		P	250	none	N/A	0.07 mg/L
Phenols	N		P	250	none	N/A	
MBAS	N	Detergent Test Kit[3]	P	250	none	N/A	0.25 mg/L
Laboratory Analytical Parameters							
Oil and Grease	Y	EPA 413.1	G	500	HCl	14 d	1.0 mg/L
Diazinon	Y	EPA 8140	G	1000	none	7 d	0.05 ug/L
Chlorpyrifos	Y	EPA 8140			none		0.05 ug/L
Methylene Blue Substances (MBAS)	Y	SM 5540 C	P	250	none	48 h	0.5 mg/L
Cadmium (dissolved)	Y	EPA 6010	P	500	none	6 months after filtration and preservation w/ HNO_3	5 ug/L
Copper (dissolved)	Y						5 ug/L
Lead (dissolved)	Y						5 ug/L
Zinc (dissolved)	Y						20 ug/L
Coliform, total	Y	SM 9221	P (sterile)	125	$Na_2S_2O_3$	6h	20 MPN/100 mls
Coliform, fecal	Y	SM 9221	P (sterile)				
Enterococcus	Y	SM 9230	P (sterile)				
Nitrate and Nitrite-N	N	SM 4500 NO2-NO3	P	100		48 h	0.1/0.05 mg/L
Total Kjedahl Nitrogen-N	N	SM 4500 C	P	200		28 d	0.1 mg/L
Ammonia-N	N	SM4500 NH3 D	P	500	H2SO4	28 d	0.1 mg/L
Total P and Orthophosphate	N	SM 4500 P E	P	100	H2SO4	28 d	0.05 mg/L
Petroleum Hydrocarbons, total (d + g)[4]	N	EPA 8015	G + 2V	250 + 40 (2)	HCl	14 d	1 mg/L
Phenols	N	EPA 8270	G	1000	none	7 d	2 mg/L

[1]V=VOA / G=Amber Glass / P=Plastic

[2]Analyzed with Chemetrics VVR Water Analysis System - an automatic colorimetric method. Ammonia was measured using a Chemetrics colorimetric test kit using a color wheel beginning July 15, 2002.

[3]Analyzed with Chemetrics detergent test kit - visual colorimetric method using a color wheel

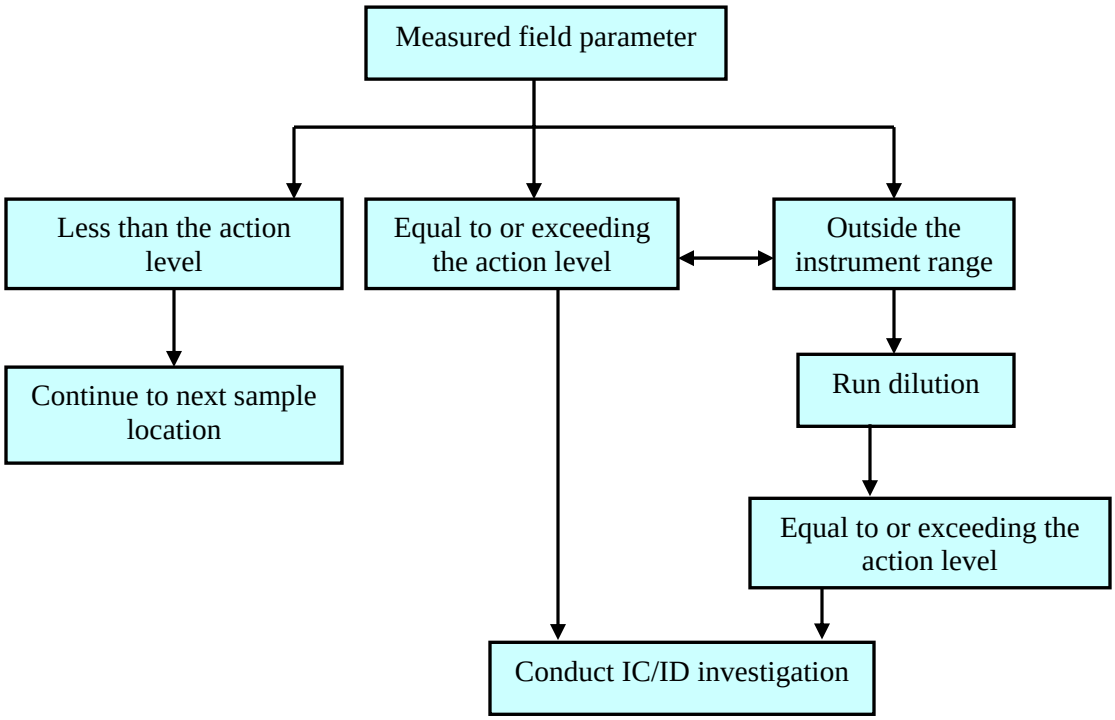
[4]ZHS (Zero Head Space Required)

6. WATER SAMPLE ANALYSIS

A. Field Screening Monitoring Procedures

Each site visit is sampled and analyzed for field screening parameters if flow or ponded water is observed. Collect approximately 200 ml of water for field test kit screening analysis. Test kit procedures are described below. Measured field parameters should be checked against the following decision matrix in Figure 1 and action levels shown in Table 4. Please refer to the "Interpretation of Data" section for further discussion. If a particular parameter being measured is outside of range on the field test kit, a dilution should be run to determine the concentration of the parameter. The appropriate method for diluting a sample is described on Appendix 8. Remember to avoid contaminating the sample.

Figure 1: Decision Matrix for Field Screening Analysis



7. QA /QC FOR FIELD ANALYSIS

Field Staff should refer to the Dry Weather Monitoring Program Quality Assurance Project Plan (QAPP) for QA/QC procedures and schedules. When collecting a sample for duplicate analysis use two sample containers to collect two discrete aliquots. When collecting a sample for split analysis, use one large sample container and split this into two separate aliquots at the field station.

8. FIELD SCREENING TEST KIT METHODS

Dry Weather field screening analyte testing is conducted using a VVR water analysis photometer and field test kits. Each test kit contains a sample mixing container, necessary reagent-filled ampoules and the appropriate filter for the hand-held photometer.

Note: Dispose of all spent reagents, reacted samples, and rinsewater solutions into the appropriate waste container stored in the field vehicle.

Nitrate (NO_3)

1. Add 2 ml of sample using syringe into mixing container
2. Dilute to 15 ml mark with D.I. water
3. Pour cadmium pocket into mixing container and cover
4. Place in Vortex-Genie and shake for 3 minutes on setting 7 to 8
5. Let stand for 30 seconds **(Very important step!)**
6. Break ampoule in mixing container to suck up sample, invert several times to mix, and wait 10 minutes for color development
7. Place nitrate filter in VVR and calibrate with standard
8. Read the VVR sample value in milligrams/Liter for NO_3 and record in appropriate cell

Test kit: CHEMetrics Catalog V-6933, Vacu-vials refill: CHEMetrics Catalog R-6903.

Orthophosphate (PO_4)

1. Fill mixing container to 25ml mark with sample
2. Add 2 drops of phosphate activator solution A-8500
3. Shake or stir for 30 seconds till well mixed
4. Break ampoule in mixing container to suck up sample, invert several times to mix, and wait 3 minutes for color development.
5. Place phosphate 2 filter in VVR and calibrate with standard
6. Read the VVR sample value in milligrams/Liter for PO_4 and record in appropriate cell.

Test kit: CHEMetrics Catalog V-8513, Vacu-vials refill: CHEMetrics Catalog R-8513, Activator solution: A-8500.

Ammonia (NH_3-N)

1. Fill mixing container to 25ml mark with sample
2. Add drops of the ammonia stabilizer solution A-1500 (see table below for quantity, the higher the conductivity the high number of drops needed)

Conductivity (mS/cm)	Number of Drops
Less that 1.0	5
1 .0 to 3.0	10
3.0 to 5.0	15
Greater than 5.0	20

3. Stir with the ampoule for approximately 30 seconds
4. Break ampoule in mixing container to suck up sample, invert several times to mix, and wait 2 minutes for color development.
5. Read sample value using the color comparator in milligrams/Liter for NH_3-N and record in appropriate cell.

Test kit: CHEMetrics Catalog K-1510, Vacu-vials refill: CHEMetrics Catalog R-1510, Activator solution: A-1500.

B. ANALYTICAL LABORATORY ANALYSIS

1. INTRODUCTION

At a minimum of 25% of the sites where ponded or flowing water is observed, grab samples must be collected and submitted to a California Department of Health Services - ELAP certified laboratory for analysis of the constituents stated in Table 4. Be sure to collect necessary samples in the appropriate container provided by the laboratory (Appendix 7). If sample contains a preservative be sure to handle the container appropriately and avoid contaminating sample or spilling preservative. Staff should contact receiving personnel at the laboratory to arrange for the pick-up of sample containers for each week sampling needs (see FAX order form in Appendix 9). Staff should give the laboratory one-week notice to prepare the required containers.

Samples collected for laboratory analysis should be submitted to the laboratory as soon as possible after collection. Bacteria samples **must be** delivered to the laboratory within **six (6)** hours of collection. The following procedures must be followed for analytical laboratory samples:

1. Fill out the chain of custody (COC) form making sure that all sample containers are correctly labeled (see sample COC in metal clip board.). Do a bottle count to make sure none are missing.
2. Carefully pack sample containers in the cooler with ice, making sure samples stay cold.
3. Meet the laboratory courier in the field at the prearranged location or at the Hazard Way office at the prearranged meeting time to ensure that the samples are transported to the laboratory within the appropriate holding times.
4. Complete the chain of custody form in the field or at the Hazard Way office. Make a photocopy of the completed COC if at the Hazard Way office. Give the original to the courier. Be sure and request a faxed copy if needed.

Note: Do not store food or drinks in the ice chest.

2. CHAIN OF CUSTODY

The chain of custody (COC) form (Appendix 10) is an integral part to the Dry Weather Program. It is essential that this be filled out accurately. A chain of custody form must be filled out when a sample is transferred to another individual or laboratory personnel. Field staff must follow strict sampling and chain of custody protocols when conducting dry weather analytical monitoring. Proper chain of custody records provides critical documentation in enforcement cases involving illegal discharges.

The completed copy of the COC should remain at DPW Headquarters and filed chronologically in a binder at the desk of the Dry Weather Coordinator. The COC is a good reference document when reviewing analytical hard copy data and should be reviewed to ensure that the requested analyses were conducted.

3. QA/QC FOR LABORATORY ANALYSIS

Field staff should refer to the Dry Weather Monitoring Program Quality Assurance Project Plan for laboratory QA/QC protocols and schedules. Laboratory data will be submitted electronically to the Dry Weather Coordinator and Quality Assurance Officer from the contract laboratory. The Quality Assurance Officer should become familiar with the QA/QC procedures of the lab and review QA/QC results to ensure that there are no issues regarding the quality of data submitted. The laboratory QA/QC results are usually documented on “Sheet 2” of the Excel data spreadsheet.

C. IC/ID INVESTIGATION

1. INTRODUCTION

If a parameter is measured and it is equal to or above the action level, an IC/ID investigation must be conducted (Figure 1), exceptions are made on a case by case basis using best professional judgment for certain parameters (see IX. Interpretation of Data). If the exceedance involves a field measured parameter, the IC/ID investigation must be conducted/started the day the exceedance was detected, time permitting. If the exceedance involves an analytical laboratory measured parameter, the IC/ID investigation must be conducted/started in a reasonable amount of time after receiving the laboratory results.

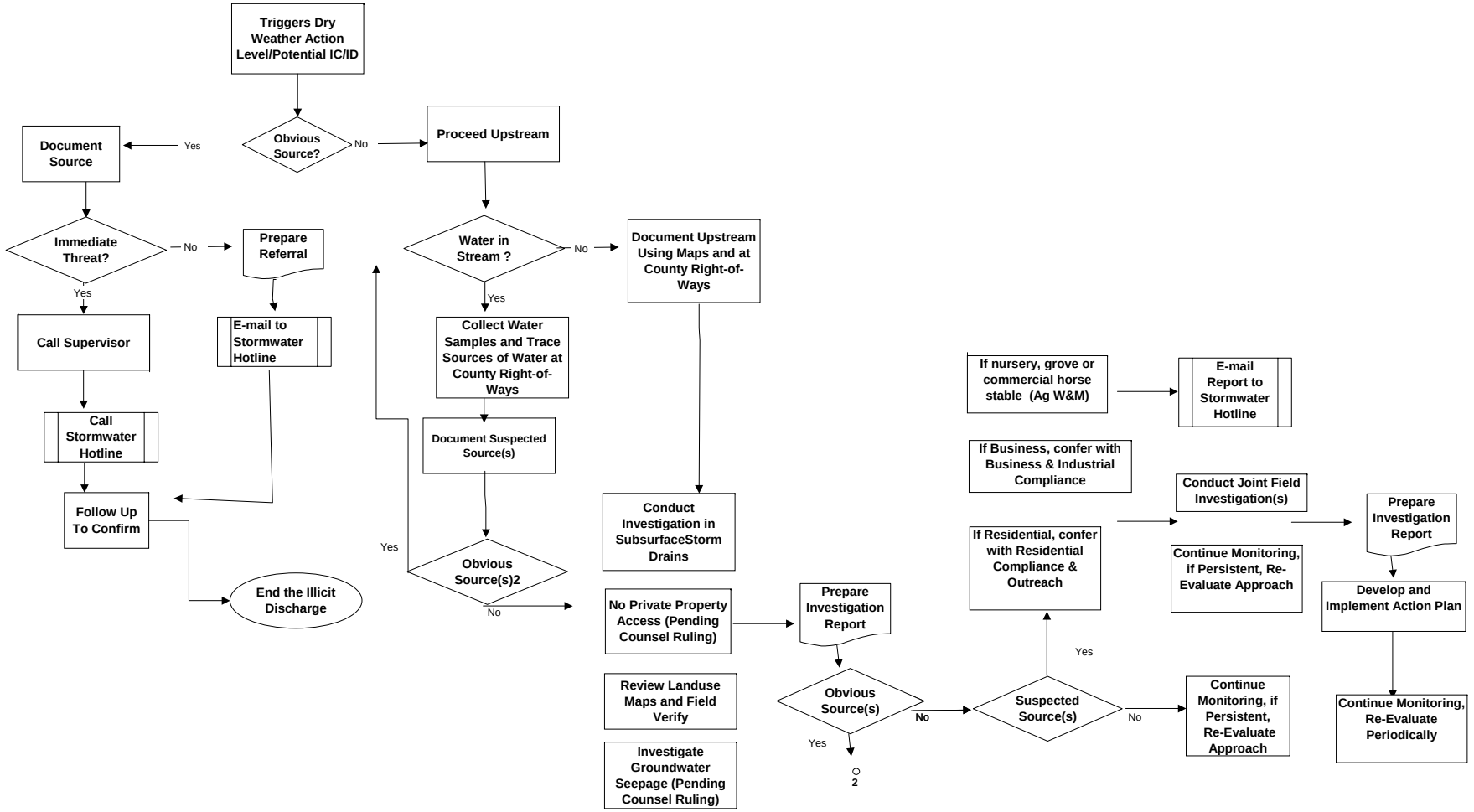
Dry weather flows will generally be followed from the location where they are first observed in an upstream direction along the conveyance system. The Exceedance of Action Level Process flow chart (see Figure 2) is the process followed during an IC/ID investigation. Prior to returning to an IC/ID investigation, field staff should compile and review available resources including past dry weather monitoring reports, GIS land use maps, MS4 maps, available aerial photographs, and property ownership.

Note: Do not enter or sample on privately owned land or jurisdictions other than unincorporated San Diego County.

The following steps to be taken during an IC/ID investigation:

1. Proceed upstream in conveyance to trace possible source, collect samples at upstream confluences for chemical analyses. (If tracking a nitrate exceedance, nitrate test strips can be used as a screening tool in determining which flows to follow. If tracking a pH exceedance, use pH test strips instead of Horiba if pH is >10.5 or <5.0.)
2. If possible, trace dry weather flow from conveyance to street/storm drains; if possible collect sample for chemical analysis.
3. If dry weather flow is traced to a facility, collect sample at curb or public right of way and submit for chemical analysis. Document with photos. Notify your supervisor for further instructions.
   Note: Always take GPS coordinates at each new site and fill in a datasheet.
4. If the flow is coming from another jurisdiction make a note and notify your supervisor, so a formal notification in writing can be made to a representative of the relevant jurisdiction, informing them of the situation. County staff will <u>not</u> track flows into other jurisdictions.

Figure 2: Exceedance of Action Level Process



2. FOLLOWING FLOWS

If field staff are initially unable to locate the source of the flow (e.g. the flow is traces to a seep, flow discharges from a pipe, the channel terminates, etc.) consider the following possibilities: first, the flow may originate from a road gutter. Check catch basins and gutters between sites for evidence of flows such as runoff from steam-cleaning operations, car washing, irrigation runoff, etc. There may also be a new or illegal connection to the system, possibly between manholes. Look for areas in the road that have been dug up and re-paved. Also consider checking with the Wastewater Management/Operations and Maintenance Section in DPW for any recent work that may have been done in the area. Finally, look for evidence of recent or past dumping such as wet and/or stained pavement or gutters.

Below Ground Systems - Contact the Department of Public Works, Road Division for assistance on tracking below ground storm drain systems and before opening any manholes (Mark Lumpkins, 619-660-5831). When tracking flows in below ground systems it may be necessary to follow flows from the outfall or manhole to the next manhole with a junction. Manholes will not always need to be checked if there are no junctions between them. Field staff will record information on the surrounding areas and look for water flowing in gutters and streets. Areas where illegal dumping may typically occur include parking lots and garages behind buildings and warehouses. DO NOT ENTER MANHOLES.

Multiple Outlet Systems - If flow is observed coming from only one outlet, continue tracking from that outlet. If flow is observed coming from more than one outlet, track them one at a time, using visual observations, odors, and/or field screening sampling to determine the order of investigation. It is generally easiest to track the largest flows first, but if they are about the same size, start with the one that is easiest, shortest, or with the least number of junctions, or track those originating from areas with the greatest potential for illegal discharges. (Use nitrate test strips for quick preliminary results for multiple flows.)

3. POST INVESTIGATION REFERRALS

When an exceedance of a field or analytical parameter has been measured or determined, field staff will conduct the initial IC/ID investigation. Field Staff will follow the procedures outlined in the above sections and illustrated in Figure 2.

Referrals will be based upon the following criteria and best professional judgment:

- If this site was previously investigated for the same parameter and similar levels were observed during previous dry weather sampling years and no source was identified, then discuss site investigation with supervisor to determine future strategies.

- If field staff identifies the source of a discharge, a “Science and Monitoring Referral” document needs to be filled out (see Appendix 12) and send to the supervisor for review. The supervisor will then send the referral to the appropriate responsible party.

- If field staff identify a blocked storm drain culvert, trash/debris/vegetation issue, or other storm drain infrastructure issue, a DPW Road Service Request (see Appendix 13) must be filled out and sent to DPW Roads division. (Does not need to go to the supervisor.)

- If field staff identifies a trash/debris/vegetation/etc. issue on CalTrans right-of-way, then e-mail the CalTrans point of contact for stormwater, Chi Vargas (Chi.Vargas@dot.ca.gov). In the e-mail include photo of site, location (mile marker if possible), and description of issue. Send the e-mail via Supervisor.

Note: If field or laboratory sampling is conducted, appropriate documentation will be completed and submitted to the Dry Weather Coordinator (i.e. COC and data field sheets).

IX. INTERPRETATION OF DATA

There are two primary approaches to assist in the interpretation of dry weather monitoring program data. These are (1) the use of numeric action levels (see Table 4), and (2) the use of best professional judgment when interpreting all dry weather water quality data. The numeric action levels were established through the San Diego Copermittees' Dry Weather Monitoring Workgroup in Winter 2003 and submitted to the RWQCB in April 2003.

1. Numeric action levels

The use of numeric action levels is the primary approach for interpreting, nitrate, ammonia, orthophosphate, pH, conductivity, MBAS, oil and grease, trace metals, indicator bacteria, and pesticides. If these action levels are exceeded, then a source identification investigation to determine the cause of the elevated levels is necessary unless best professional judgment indicates otherwise.

2. Best professional judgment

The use of best professional judgment is the primary approach for interpreting turbidity and water temperature data, and the secondary approach for interpreting the results of all other field and laboratory analyses. The use of best professional judgment may indicate that results, which either exceed certain action levels or are statistical outliers, may be the result of natural or background factors, and an IC/ID investigation is not warranted.

Conductivity/TDS - If a conductivity exceedance is measured in the field, other factors need to be examined at to determine if an IC/ID investigation is warranted.

1. Does a particular location have a history of exceedances, which previously investigates have found to be due to natural occurrences?

2. Are you in a known high conductivity/TDS area (i.e. Escondido Creek)?

Then staff should note this on the field observation sheet and not conduct an IC/ID investigation. If this scenario does not exist, then an IC/ID investigation is warranted.

Ammonia – If an ammonia exceedance is measured in the field, save remaining sample for submittal to laboratory and immediately collect a new water sample and test for ammonia. If second the sample still exceeds the action level, then conduct an IC/ID investigation using best professional judgment. Other field parameter and observations need to be examined (best professional judgment) to determine if an IC/ID investigation is warranted.

1. Is the water is ponded or very nearly ponded?
2. Is the dissolved oxygen level low?

If both conditions are met, then nitrate reduction to ammonia may have occurred. A secondary parameter to look at is the nitrate level, if the nitrate concentration is relatively low, then the evidences would point to the chemical reduction of nitrate to ammonia. Staff should note this on the field observation sheet and not conduct an IC/ID investigation. If this scenario does not exist, then an IC/ID investigation is warranted.

pH - If a pH exceedance (pH > 9.0) is measured in the field, other field parameter and observations need to be looked at to determine if an IC/ID investigation is warranted.

1. Are you located in a concrete type conveyance or immediately downstream of a concrete type conveyance?
2. Is the water slowly flowing or very nearly ponded?
3. Is the water temperature is elevated?

If all three conditions are met, then dissolution of minerals from the concrete conveyance may have occurred. A secondary observation to look for is if there are algae present in the conveyance. Photosynthesis by algae can cause the pH to increase during day light hours. Staff should note these on the field observation sheet and not conduct an IC/ID investigation. If this scenario does not exist, that an IC/ID investigation is warranted.

Phosphate - If an orthophosphate exceedance is measured in the field, other field parameter and observations should to be examined at to determine if an IC/ID investigation is warranted.

1. Does a particular location have a history of exceedances?
2. Is the water is ponded or very nearly ponded?
3. Are there fine sediments present?

If all some or all of these conditions are met, the following scenario may exist: phosphate can be adsorbed strongly by fine particles and therefore accumulate

with time, leading to an elevated concentration in sediment (Sposito, 1989). When the water is ponded or nearly stagnant, an equilibrium is established between sediment and water, and the concentration of orthophosphate in the water column will increase. Staff should note these on the field observation sheet and not conduct an IC/ID investigation. If this scenario does not exist, then an IC/ID investigation is warranted.

X. DATA MANAGEMENT

A. HARD COPY DATA

There are two forms that need to be managed. The first form is the dry weather field sheet, which contains data collected in the field at each sample site. The second form is the report received from the contract laboratory with the analytical results and chain of custody. Both sets of hard copy data need to be managed appropriately by placing them in binders and storing them at the Dry Weather Coordinator desk.

Table 4: 2005 Action Levels for Field Screening and Laboratory Analytical Parameters

Field Screening Analytes	Action Levels[1]	Source/ Notes
pH	<6.5 or >9.0	Basin Plan, w/ allowance for elevated pH due to excessive photosynthesis. Elevated pH is especially problematic in combination with high ammonia
Orthophosphate-P (mg/L)	2.0	USEPA Multi-sector General Permit
Nitrate-N (mg/L)	10.0	Basin Plan, and drinking water standards
Ammonia-N (mg/L)	1.0	Based on Workgroup experience. May also consider unionized ammonia fraction
Turbidity (NTU)	Best Professional Judgment	WQOs relevant to inland surface waters are not available. Base judgment on channel type and bottom, time since last rain, background levels, and most importantly visual observation (e.g. unusual colors and lack of clarity), and unusual odors.
Temperature (^{o}F or ^{o}C)	Best Professional Judgment	Base judgment on season, air temperature, channel type, shading, etc.
Conductivity (umhos/cm)	Best Professional Judgment	Values > 5,000 umhos/cm may indicate IC/ID however; EC may be highly elevated in some regions due to high-TDS groundwater exfiltration to surface water, mineral dissolution, drought, and seawater intrusion. Normal source ID and discharge elimination work is not effective in these situations. Knowledge of area background conditions is important. Values < 750 may indicate excessive potable water discharge or flushing.

Laboratory Analytes	Action Levels	Source/ Notes
MBAS (mg/L)	1.0	Basin Plan, w/ allowance based on Workgroup field experience and possible field reagent interferences
Oil and Grease (mg/L)	15	USEPA Multi-sector General Permit. If a petroleum sheen is observed, the sample should be collected from the water surface. Visual observations may justify immediate investigation.
Diazinon (ug/L)	0.5	Response to diazinon and chlorpyrifos levels above 0.5 ug/L should focus on education and outreach to potential dischargers in the target drainage basin. Highly elevated levels should be investigated aggressively as with other potential IC/IDs.
Chlorpyrifos (ug/L)	0.5	
Dissolved Cadmium (ug/L)	California Toxics Rule	Use California Toxics Rule Table, 1-hour citeria to determine appropriate action level for individual samples. Table provides benchmarks based on hardness and dissolved metals concentration. For example, at 300 mg/L hardness the following action levels would apply: Cd - 14 ppb; Cu - 38 ppb; Pb - 209 ppb; and Zn - 297 ppb.
Dissolved Copper (ug/L)	California Toxics Rule	
Dissolved Lead (ug/L)	California Toxics Rule	
Dissolved Zinc (ug/L)	California Toxics Rule	
Total Coliform (MPN/ 100 mls)	50,000	Action levels are based on upper 90% confidence level of Copermittees 2002 dry weather analytical monitoring data.
Fecal Coliform (MPN/ 100 mls)	20,000	
Enterococcus (MPN/ 100 mls)	10,000	

[1]The referenced action levels should not be the sole criteria for initiating a source identification investigation. Dry weather monitoring data should be interpreted using a variety of available information including best professional judgment and within-site and between-site sample variability.

1. FIELD SCREENING DATA

When Field Staff return to the office, all data from the dry weather field sheet should be entered into the Dry Weather Database (refer Dry Weather Database Instructions, Appendix 11). If field staff are unable to enter data for that day, staff should set aside one day during the week to enter data. Field sheets must be entered in a sequential order into the database.

The Quality Assurance Officer should perform routine QA/QC of the data periodically.

2. ANALYTICAL DATA/FILING

After samples have been submitted to and analyzed by the contract laboratory, the County of San Diego will receive a hard copy report of the data and a copy of the original Chain of Custody. This hard copy data will usually be received after the pesticide analysis has been conducted, which can take up to three weeks after the submission of samples. The contract laboratory is required to fax a preliminary copy of data to the County, when bacteria samples have been analyzed.

The Dry Weather Coordinator should create a folder to file the hard copy data. The folder should be labeled with the following information.

1. Dry Weather Season Year
2. Site ID
3. Sample Event ID Number
4. Date
5. Log Number used by the Contract Laboratory.

B. ELECTRONIC DATA

1. ANALYTICAL DATA

The contract analytical laboratory will send an electronic copy of the data to the County of San Diego. This data will be in an Excel spreadsheet in the format specified in Dry Weather Coordinator will place a hard copy printout in the appropriate binder and maintain the electronic data in the appropriate computer folder.

XI. WASTE MANAGEMENT

Field Staff will store all spent reagent used in the field and during instrument calibration and standardization in an appropriate container. Field Staff are to conduct routine calibrations in the laboratory. Staff use the County of San Diego, Department of Environmental Health laboratory, at 9325 Hazard Way. Waste containers must be label with the follow information:

- Date of Storage
- Waste Accumulation Date (Date waste first accumulate)

- Waste Organics
- Waste Metals
- Oil & Water
- Mixed Solvents
- Glass
- Name of Program Responsible for waste storage
- Point of Contact

Every six months, contact Jo Ann Weber (858-495-5317) to arrange for removal of waste.

XII. ADMINISTRATIVE / FISCAL

The Analytical Laboratory Coordinator will receive periodic invoices from the contract laboratory. Each invoice will contain a copy of the chain of custody form for the set of analyses performed. The Analytical Laboratory Coordinator is to review the invoice to ensure that the data for the analysis stated on the invoice has been received and is correct. After this review of the invoice, the Analytical Laboratory Coordinator will get a "sign-off" from the supervisor on the invoice with the date, activity code, and an "o.k. to pay" issue. A copy of the invoice should be made and placed in a three ring binder. The original invoice should be sent to the appropriate account clerk for payment.

XIII. CHECK-OUT & CHECK-IN PROCEDURES

All staff must let the supervisor know that you are heading out to the field and must check-in once your return from the field. If you are still in the field by 4:00 pm, staff must phone the supervisor to update your status and estimate time back to the office.

APPENDIX 1
Field Sampling Safety
Things to Watch out for

Poison Oak

Stinging Nettle

Deer Tick

Rattle Snake

APPENDIX 2

Equipment and Supplies List

- Clipboard, pens, pencils, Sharpie, or other waterproof pens
- Thomas Guide, MS4 maps, and land use maps
- Digital camera
- Latex gloves, protective eyeglasses or goggles, rubber boots
- Snake guards
- Safety traffic cone and safety vests
- Cooler and ice (if collecting laboratory samples)
- Paper towels, Chem Wipes, plastic bags
- Sample bottles with preservatives
- Cell phone
- GPS unit
- Portable field test kits, colorimeters, or spectrophotometer and all reagents for these meters (CHEMetrics)
- Multi-parameter (Horiba)
- Extra batteries for all meters
- Nitrate and pH test strips (SenSafe)
- Flow measurement equipment (required equipment will depend on method used)
    - Current meter or wristwatch
    - Measuring tape for measuring stream width
    - Folding scale for measuring stream depth
- De-ionized or ultra pure water in squeeze bottles for rinsing, dilutions, etc. (depending on methods used)
- Waste disposal bottles (keep in truck)
- Backpack
- Calculator for determining discharge using the area/velocity method
- Trash bags
- Plastic syringes
- 0.45 micron filters
- Plastic sample cups
- Graduated cylinder
- Sample Event ID log
- List of phone numbers
- County Road Station map and addresses
- Field data sheet
- Pole dipper stick for sampling
- Manhole cover opening tool
- Machete
- Drinking Water

APPENDIX 3

Horiba U-10 Calibration Procedure and Log Sheet

(Revised October 2005)

Instrument Calibration and Frequency

The Horiba U-10 Meter is to be calibrated using the Auto-Calibration procedure described below prior to use in the field each day. Upon return to the lab from the field (post deployment), the Horiba pH 4 (Autocal) solution and pH 10 solution will be checked and results recorded. All measurements will be checked against the data quality objectives (DQOs) listed in Table 1. If results are out of the DQO range then probe must be calibrated using the manual two-point calibration methods. Manual two-point calibrations for dissolved oxygen and pH will be conducted once every two weeks and once every six months for conductivity and turbidity. Following manual calibration the probe will be checked using the Horiba pH 4 (Autocal) solution and probe condition will be noted. All data will be recorded in the calibration data sheet.

Auto-calibration Procedure:

1. Rinse probe in tap water and dry
2. Using the MODE key put in MAINT mode then toggle to S.SET. Using the ↑↓ keys select A for Auto-salinity. Press ENT to complete salinity setting.
3. Horiba pH 4 (Autocal) solution. Using the MODE key put in MAINT mode then toggle to AUTO sub-mode. Press ENT to initiate auto-calibration. Readout will automatically return to MEAS mode
4. Record readouts for all parameters in the Daily Calibration Logsheet.
5. Remove the probe from the Horiba pH 4 solution, rinse in tap water, dry and place in pH 7 solution. Record pH value. Repeat this step with pH 10 solution.
6. Upon return from the field, checked probe using the Horiba pH 4 (Autocal) solution and pH 10 solution, record values in the Daily Calibration Logsheet, then rinse probe in tap water and place in a beaker of tap water for short-term storage.

Manual Two-point Calibrations:

pH Calibration:

pH calibration is done using two standard solutions of different pH values, one for the zero calibration, the other for the span calibration. Water Quality objectives for pH in surface waters for the San Diego region are 6.5 to 9.0, therefore it is recommended to use pH 7 and pH10 solutions.

Zero Calibration:

- Use the pH 7 solution (Must use pH7 solution), check temperature of standard.
- Press MODE, select MAINT mode.
- Press MODE again to move the lower cursor to ZERO.
- Press SELECT to move the upper cursor to pH
- Select the appropriate pH value after the readout has stabilized (e.g. enter pH = 6.86 if temp. is 25°C; note that different brands of standard pH solutions may have different pH values at a given temperature; Table 3) using the ↑↓ keys.

To complete pH zero calibration, press ENT. Record this value in the calibration data sheet.

Span Calibration:

- Rinse and dry probe and place in second standard solution (e.g. pH 10).
- Use the MODE key to move the lower cursor to SPAN.
- Check the temperature of the standard solution and select the appropriate pH value after the readout has stabilized using the ↑↓ keys.
- To complete pH span calibration, press ENT. Record this value in calibration data sheet.

Record all data into the logsheet.
Conductivity Calibration:
The Horiba U-10 automatically selects the proper range to measure conductivity. Therefore, manual calibration must be done for all three ranges used by the probe.

Zero calibration:

- Triple rinse probe in DI or distilled water. Shake off excess water and allow to air dry.
- Press MODE and move lower cursor to ZERO.
- Press SELECT and move upper cursor to COND
- Press the ↑↓ keys to set the readout to zero.
- To complete the zero COND calibration, press ENT. Record this value in the calibration data sheet.

Span calibration:

- Triple-rinse and immerse probe in 0.718 mS/cm solution.
- Press MODE and move lower cursor to SPAN
- Use the ↑↓ keys to select 0.718 once readout has stabilized.
- Press ENT to complete the 0.718 mS/cm conductivity calibration. Record this value in the calibration data sheet.
- Repeat the above procedure using the 6.67 mS/cm and 58.7 mS/cm standard solutions.

Note: Shelf life of conductivity solutions is six months. Keep solutions tightly capped. Conductivity standards are “one-shot” solutions – do not reuse the standard (from SWAMP guidelines).

Turbidity calibration:
When doing zero calibration it is crucial that you clean the probe thoroughly.

Zero calibration:

- Triple-rinse probe and shake off excess water droplets immerse probe in DI or distilled water.
- Press MODE and move the lower cursor to ZERO.
- Press SELECT and move upper cursor to TURB.
- Use the ↑↓ keys to select 0.0 once readout has stabilized.
- Press ENT to complete the zero turbidity calibration. Record this value in the calibration data sheet.

Span calibration:

- Triple-rinse and immerse probe in 100 NTU standard solution.
- Press MODE and move lower cursor to SPAN.
- Use the ↑↓ keys to select 100 NTU once the readout has stabilized.
- Press ENT to complete the 100 NTU turbidity calibration. Record this value in the calibration data sheet.

Note: Shelf life of turbidity solutions is six months.

DO calibration:

DO calibration solution for the span calibration must be prepared fresh just before it is used.

Zero calibration:

- Triple-rinse probe in tap water and immerse it in zero DO standard solution. This solution must be opened immediately before use.
- Press MODE and move the lower cursor to ZERO.
- Press SELECT and move the upper cursor to DO.
- Use the ↑↓ keys to select 0.0 once the readout has stabilized.
- Press ENT to complete the zero DO calibration.

Span calibration:

Fill a container with tap water, close lid and bubble air through it with an aquarium pump to saturate it with dissolved oxygen.
Triple-rinse the probe and immerse it in the container of O2-saturated water.
Make sure the probe is set for freshwater by setting the S.SET Sub-Mode to 0.0%.
Press MODE to move the lower cursor to SPAN.
After the readout has stabilized, slowly move the probe up and down in the water and set the readout value to the appropriate DO value based on the temperature of the water (refer to Table 4: DO saturation at various temperatures).
Press ENT to complete the SPAN calibration for DO. Record in the calibration data sheet.

Table 1:Calibration solutions and values at 25^{o} C.

Parameter	pH 4 (Horiba)	pH7 (Horiba)	pH 7 (YSI)	pH 10 (YSI)
pH	4.0 4.01	6.86	7.00	10.00
Conductivity (mS/cm)	4.49		5.87	16.7
Turbidity (NTU)	0		0	0
DDO (mg/L)	8.52		0.0 (Zero oxygen)	

Table 2: Data Quality Objectives for Accuracy and Precision

Parameter	Value	-5%	+5%
pH (± 0.1 units)	4.01*	3.96	4.06
	6.86*	6.76	6.96
	10.0	9.90	10.10
Conductivity	4.49	4.27	4.71
	5.87	5.58	6.16

Turbidity	100	95	105
DO	8.52	8.09	8.95

*Check manufactures standard reference value.

Table 3: Standard pH values at different temperatures

Temperature (°C)	pH 4 (Horiba)	pH 4 (YSI)	pH 7 (Horiba)	pH 7 (YSI)	pH10 (Horiba)	pH 10 (YSI)
15	4.00	4.00	6.90	7.05		10.12
20	4.00		7.006.88		10.06	
22	4.00		7.00		10.03	
25	4.01		7.006.86		10.01	

Table 4: Dissolved Oxygen at Various Temperatures

Temperature (°C)	Dissolved Oxygen (mg/L)	+ 5%	- 5%
15	9.76	10.25	9.27
16	9.56	10.04	9.08
17	9.37	9.84	8.90
18	9.18	9.64	8.72
19	9.01	9.46	8.56
20	8.84	9.28	8.40
21	8.68	9.11	8.25
22	8.53	8.96	8.10
23	8.39	8.81	7.97
24	8.25	8.66	7.84
25	8.11	8.52	7.70
26	7.99	8.39	7.59
27	7.87	8.26	7.48
28	7.75	8.14	7.36
29	7.64	8.02	7.26
30	7.53	7.91	7.15

Horiba U-10 Daily Calibration Logsheet

CALIBRATED BY_____ DATE_____ TIME_____ METER_____

Calibration		pH	Cond. (mS/cm)	Turbidity (NTU)	DO (mg/L)	Temp. (^{o}C)	Salinity (%)
1st Solution	Std. Value	4.00	4.49	0.0	8.52	@ 22	0.23
	Reading						
2nd Solution	Std. Value	7.00	5.87	0			0.31

	Reading						
3rd Solution	Std. Value	10.00	16.7	0			0.99
	Reading						
DO*	0.0 mg/L	N/A	N/A	N/A		N/A	N/A

*Zero DO calibration only.

CHECKED BY_____ DATE_____ TIME_____ METER_____

Calibration		**pH**	**Cond. (mS/cm)**	**Turbidity (NTU)**	**DO (mg/L)**	**Temp. (°C)**	**Salinity (%)**
1st Solution	Std. Value	4.00	4.49	0.0	8.52	@ 22	0.23
	Reading						
2nd Solution	Std. Value	7.00	5.87	0			0.31
	Reading						
3rd Solution	Std. Value	10.00	16.7	0			0.99
	Reading						
DO*	0.0 mg/L	N/A	N/A	N/A		N/A	N/A

*Zero DO calibration only.

Parameter	**Value**	**-5%**	**+5%**
pH	4.00*	3.90	4.10
	7.00*	6.90	7.10
	10.00*	9.90	10.10
Conductivity	4.49	4.27	4.71
	5.87	5.58	6.16
Turbidity	100	95	105
DO	8.52	8.09	8.95

*N/A

APPENDIX 4
Dry Weather Field Sheet

COUNTY OF SAN DIEGO
WATERSHED PROTECTION PROGRAM

DEPARTMENT OF PUBLIC WORKS
9325 HAZARD WAY, SAN DIEGO, CA 92123

DRY WEATHER MONITORING FIELD DATASHEET

New Site? Yes No **IC/ID Follow-Up For** _____

GENERAL SITE DESCRIPTION

Site ID		**Site Type**		**Sample Event ID**		**Sample Event Type**	
Location	(NAD 83 decimal degrees to 5th place)				**Watershed**	**Hydrologic Unit**	
Date		**Time**		**Latitude**		**Hydrologic Area**	
Field Staff				**Longitude**		**Hydrologic Subarea** (Optional)	

QC Sample	None	Orig-Dup	QC-Dup	Orig-Blank	QC-Blank	Field Standard	
Land Use (Primary) (Check one only)	Residential	Rural Resid.	Comm.	Indust.	Agr.	Parks	Open
Land Use (Secondary) (Optional, >10%)	Residential	Rural Resid.	Comm.	Indust.	Agr.	Parks	Open
Conveyance (Check one only)	Concrete Channel	Natural Creek	Earthen Channel	Manhole	Catch Basin	Outlet	

FLOW OBSERVED Yes No Ponded **REFERRAL #** _____ **DISCHARGE AREA** (Optional) _____

GENERAL CONDITION

Weather Sunny Partly Cloudy Overcast Fog **Last Rain** > 72 hours < 72 hours

OBSERVATIONS N/A

Odor	None	Musty	Rotten Eggs	Chemical	Sewage	Other
Color	None	Yellow	Brown (Silty)	White (Milky)	Gray	Other
Clarity	Clear	Slightly Cloudy	Opaque			Other
Floatables	None	Trash	Bubbles/Foam	Sheen	Fecal Matter	Other
Deposits	None	Coarse Particulates	Fine Particulates	Stains	Oily Deposits	Other
Vegetation	None	Limited	Normal	Excessive		Other
Biology	None	Insects	Algae	Snails/Fish	Mussels/Barnacles	Other

FLOW MEASUREMENT N/A

Flowing Creek	**T1**	**T2**	**T3**	**Average**	
Width					ft
Depth					ft
Velocity					ft/sec
Flow Rate					cfs

Evidence of Overland Flow? Yes No Irrigation Runoff
Other _____

Outlet Diameter _____ Liters/Second _____

Leaf Float Distance_____ft Time_____sec

FIELD MEASUREMENT N/A **Is the sample filtered?** Yes No

Field Screening Sample Collected? Yes No **Analytical Lab Sample Collected?** Yes No

Parameter	**Reading**	**Parameter**	**Reading**	**Parameter**		**1st**	**Dil. Times**	**Dil. Reading**	**Final**
pH (Unit)		DO (mg/L)		Phosphate (PO_4)	mg/L				
Cond (mS/cm)		Temp (°C)		Nitrate (NO_3)					
Turb (NTU)		Salinity (%)		Ammonia (NH_3-N)					

COMMENTS: _____

Completed by_____

COUNTY OF SAN DIEGO
WATERSHED PROTECTION PROGRAM

DEPARTMENT OF PUBLIC WORKS
9325 HAZARD WAY, SAN DIEGO, CA 92123

Land Use Types

1. **Residential**
   Single- and multi-family homes, mobile home parks, etc.
2. **Rural Residential**
   Single family homes located in rural areas with lot sizes of approximately 1 to 10 acres. Rural residential estates may have small orchards, fields or small storage buildings associated with the residential dwelling unit, etc.
3. **Commercial**
   Offices, schools, shopping centers, auto dealerships, government/civic centers, cemeteries, churches, libraries, post offices, fire/police stations, military use, jails, prisons, border patrol holding stations, dormitories, hotels, motels, resorts, and casinos, etc.
4. **Agricultural**
   Orchards, vineyards, nurseries, greenhouses, flower fields, dairies, livestock, poultry, equine ranches, row crops and grains, pasture, fallow, etc.
5. **Industrial**
   Shipbuilding, airframe, aircraft manufacturing, industrial parks, manufacturing uses such as lumber, furniture, paper, rubber, stone, clay, and glass; auto repair services/recycling centers; warehousing, wholesale trade; mining, sand and gravel extraction, salt evaporation; junkyard, dumps/landfills; auto wrecking/dismantling and recycling centers, etc.
6. **Parks**
   Recreation areas and centers, neighborhood parks, wildlife and nature preserves, golf courses, accessible sandy areas along the coast or major water bodies allowing swimming and picnicking, etc.
7. **Open**
   Vacant and undeveloped lands, etc.

Watersheds

HU	Watershed
902	Santa Margarita River
903	San Luis Rey River
904	Carlsbad
905	San Dieguito River
907	San Diego River
909	Sweetwater River
910	Otay River
911	Tijuana River

Action Levels

Field Screening Analyte	Action Level
pH	<6.5 or >9.0
Orthophosphate-P (mg/L)	2.0 (**6.0 PO_4**)
Nitrate-N (mg/L)	10.0 (**44.3 NO_3**)
Ammonia-N (mg/L)	**1.0**
Turbidity (NTU)	BPJ
Temperature (°F or °C)	BPJ
Conductivity (µS/cm)	BPJ

Laboratory Analyte	Action Level
MBAS (mg/L)	1.0
Oil and Grease (mg/L)	15
Diazinon & Chlorpyrifos (µg/L)	0.5
Dissolved Cd, Cu, Pb, Zn (µg/L)	CTR
Total Coliform (MPN/100 mL)	50,000
Fecal Coliform (MPN/100 mL)	20,000
Enterococcus (MPN/100 mL)	10,000

Sample Event Type: Field Screening, Source ID, QC-Duplicate, QC-Blank, QC-Standard, and Confirmation.

APPENDIX 5

Directions for filling out the 2005
Dry Weather Field Data Sheet

Before Leaving the Office

1. Make sure that there is an updated list of constant information queried from the Dry Weather Database in the vehicle.
2. Make sure you have a list of Sample Event ID numbers, also kept in the vehicle.

Sampling Procedures

Location Information

When you get to a site, whether or not flowing water is present a field sheet should be completed. This includes dry sites and sites with ponded water. A new field sheet should also be completed for all upstream IC/ID's.

1. **[Is this a new site? Yes/No]**. If yes be sure to turn the field sheet over and collect the GPS, location, report the land use, construction and conveyance type. If neither, land use, construction or conveyance type information is collected this new site will not be identified in the constant information during future queries. Be sure to collect all information. If this is an old site, review the constant information found in the constant information folder to ensure that the GPS, land use, construction and conveyance information is correct. If anything needs changing, record this information on the back of the field sheet.
2. If the sampling event is an IC/ID be sure to note the parameters being investigated, as this information is recorded in the database.

Flow Observed

1. **[Is flow observed at the site?]** Yes= flowing water, No=no flow or dry, Ponded=A pool of water, or water that does not appear to have any flow.

General Conditions

1. Use this section to report on the current weather conditions at the site. The **[Last Rain]** <72 hours should only be filled out if a very light rain occurred that was less than the 0.1 inch criteria.

Observations

1. This section should be completed only where flowing or ponded water is observed. This section is referring to the in-stream habitat. This includes the vegetation and biology, since we are concerned with how the quality of the water is serving as an indicator for stream health, by either supporting excessive algal

growth, or very little biology. For a complete description of each of the observations refer to the attached sheet.

Flow Observations

1. Flow observation should be collected at every site. If the flow is too low to measure using the flow probe (refer to flow probe directions below), use the floating leaf method to estimate the flow. If you have encountered a pipe, which is discharging water, you can measure the width of the pipe and count how many liters of water is captured in how many seconds. Be sure that when you use this method, you can capture all the water coming from the pipe in you container.
2. It is also important to note if there is any form of overland flow. This means that flowing water has to be observed discharging to the channel where the samples were collected. If there was, or is any evidence that water may have entered the channel do not check yes. Water has to be observed physically flowing into the channel. You cannot in the comments note that overland flow appears to have just occurred. **[Evidence of overland Flow?]** If you do see overland flow, check yes and check whether it is irrigation runoff or other.

Water Sampling (Flow Measurement)

Be sure that all the questions are completed fully in this section.

1. **[Flowing Creek]** Record the creeks' water flow characteristics using the hand held stick flow meter (FP-101 or FP-201). Record the waters' "Width", "Depth", and "Velocity" (see Appendix 6) in the appropriate box on the field sheet using the measurement scale on the side of the stick flow meter (note: the scale is shown in tenths of a foot and not in inches). If the water is ponded record "0" (zero) for the "Velocity" and estimate the "Length" of the pond and record in the appropriate box on the field sheet. If the flow is too slow or small to be measured with the stick flow meter, then a "Leaf Float" estimation can be used to determine the velocity. The leaf float method is conducted by floating a small leaf on top of the water and noting the drift, record "Distance" in feet and "Time" in seconds. The final alternate flow measurement technique is accomplished by recording the time need to fill a container with a known volume.

2. **[Field Measurement]** Measuring the following field screening water quality properties using the Horiba U-10 multimeter: pH, conductivity, turbidity, dissolved oxygen (see Appendix 15), temperature, and salinity. Let readings stabilize before recording all values in the appropriate box on the field sheet.

3. **[Is the sample filtered?]** Sample may be filtered at some sites because of its turbid nature or to remove color interferences. This can affect the field analysis and is important to note.

4. **[Dilution and Parameter?]** If a dilution is run on any parameter you must record the dilution and the parameter on which it was conducted. If this information is not recorded, the value is assumed a non-exceedance in the database, except for any follow up sample(s) collected. This is critical for making sense of the data once it is queried from the database.

5. [**Field screening sample collected?**] Circle yes or no, if field screening was conducted. (Field screening refers to the use of the field test kits to analyze a water sample, not simply taking Horiba measurements alone).

6. [**Analytical Lab Sample collected?**] Circle yes or no, if a lab sample was collected, whether part of an IC/ID, regular field screening or QA/QC. This is the only relationship between what was conducted in the field and the laboratory data submitted by the analytical laboratory. We should be able to query the database for all sites where lab samples were collected and this information should correlate with the lab data.

Comments

The comments section of the field sheet is designed to capture any other relevant information about the site that is not clearly outlined on the field sheet. It can also contain further explanation of sample locations, (address information) or distinguishing characteristics about a particular site. Observations are an important part to collecting field data and this section should be completed at every site visit. Examples of other comments might by if the water was collected via a syringe or if the Horiba measurements were conducted in a bucket versus in-situ. Also, note if birds or other animals are present or evidence exists that animals were present (manure or foot prints) at the site.

APPENDIX 6

Flow Probe User Instructions

1. The FP101 probe handle is a two-piece rod expandable from 3' to 6'. The FP201 probe handle is a three-piece rod expandable from 5' to 15'. To expand the rod for correct placement in flow, loosen the locking nut on the handle, pull out the top piece, and retighten the nut.

2. Make sure the Flow Probe's propeller turns freely by blowing strongly on the prop. Remove any accumulated debris (e.g.- magnetic sediment).

3. Point the propeller directly into the flow you wish to measure. Face the arrow inside the prop housing **downstream** (arrow points in the direction of flow). What arrow?? Raised bump on outside of housing should be pointed into the flow.

4. Scroll with the bottom button until the "AVGSPEED" for velocity appears on the bottom of the screen. Push the top button for three (3) seconds to reset the display. The display will read in feet/second units.

5. For small streams, the probe can be moved slowly and smoothly throughout the flow during average velocity measurement. Move the probe smoothly and evenly back and forth from top to bottom of the flow so that the probe stays at each point in the flow for approximately the same amount of time. Keep moving the probe for 20-40 seconds to obtain an accurate average value that accounts for surging. (Move the probe as if you were spray painting and attempting to get an even coat of paint over the entire surface.).

   The Flow Probe uses true velocity averaging. Reset "AVGSPEED" before starting a new measurement. One reading is taken per second, and a continuous average is displayed. For example, after 10 seconds, 10 readings are totaled and then divided by 10 and this average is displayed. Once the average reading becomes steady, the true average velocity of the stream is obtained. When you pull the probe from the water, this average value is frozen on the display until it is reset. Record this value in the proper cell on the field sheet.

6. Measure/calculate the cross-sectional area of your flow stream in square feet (Note: optional, the database will do this calculation). The average velocity (calculated with the Flow Probe in feet/second) times the cross-sectional area (square feet) equals flow in cubic feet per second (cfs), or $Q = V \times A$.

7. If the propeller gets fouled while measuring flow, clean it until the prop turns freely and start over.

APPENDIX 7
Laboratory Containers
2006 Season

Bottle	Parameters	Preservative
1 Liter or 500 mL HDPE Bottle	Dissolved Cu, Pb, Cd, Zn	None
	MBAS	
	Ortho-P	
	Nitrate	
	Nitrite	
2 x 1-Liter Amber Glass	Diazinon	None
	Chloropyrifos	
125 ml HDPE (yellow)	Hardness	HNO_3
100 ml Sterile PP Container	Total Coliform	Sodium Thiosulfate ($Na_2S_2O_3$)
	Fecal Coliform	
	Enterococcus	
500 ml HDPE	Ammonia	H_2S0_4
	Total-P	
	TKN	
1-Liter Amber Glass	Oil and Grease	HCl

APPENDIX 8

Sample Dilution Methods

Dilutions in the Field

It may be necessary to run dilutions in the field, to remove interferences such as high salt content or because a particular parameter is over the range of the field test kit. When preparing and running dilutions, the following procedures should apply:

1:1 Dilution
A 1:1 dilution is, one part sample to one part de-ionized water. When the measurement is made multiply the value by two (**2X**). This will give you the true concentration of the sample.

1. Rinse a 200 ml graduated cylinder 2-3 times with de-ionized water.
2. Pour 25 ml of sample into a clean sample cup, dilute the sample with 25 ml of de-ionized water.
3. Stir the solution to ensure complete mixing.
4. Pour the necessary 25 ml into the sample vial and snap the ampoule.

1:2 Dilution
A 1:2 dilution is one part sample to 2 parts de-ionized water. When the measurement is made multiply the value by three (**3X**). This will give you the true concentration of the sample.

1. Rinse a 200 ml graduated cylinder 2-3 times with de-ionized water.
2. Pour 25 ml of sample into a clean sample cup, dilute the sample with 50 ml of de-ionized water.
3. Stir the solution to ensure complete mixing.
4. Pour the necessary 25 ml into the sample vial and snap the ampoule.

If a higher dilution needs to be run follow the above steps, but increase the volume of de-ionized water and be sure to multiply the measured value by the correct number.

There's a few misspellings on the Truesdail container request form, below:

Ammonia, nitrite and orthophosphate are spelled incorrectly.

APPENDIX 9

Sample Container Request

Container Request Form

Today's Date: 12/29/2005 **Date Needed:** **10/5/2005 by 6 pm**

Project Manager: Xuan Dang **Place containers:**

Sample Matrix: Water **Date Delivery:** **10/6/2005**

Client: **SAN DIEGO COUNTY**

Address: **9325 Hazard Way** **San Diego, CA 92123**

Contact: **Ken Liddell** **PO#:**

Phone No: 858-495-5293 **Fax No:** ***858-495-5263***

Qty	Type of container	Description	Preservative
3	Bact-Idexx	Total & Fecal Coliform	Steriled/4^{0}C,Na2SO3
3	Bact-Idexx	Enterococcus	Steriled/4^{0}C,Na2SO3
3	500-ml plastic	MBAS	4^{0}C, None
3	500-ml plastic	Hardness	4^{0}C, None
3	500-ml plastic	Dissolved Cd, Cu, Pb, Zn	4^{0}C, None
	1-L amber glass	Oil and Grease	H2SO4
	1-L amber glass	EPA 8081	Sodium Thiosulfate
7	1-L Plastic	TSS; (3 Bottles + 1 Bottle for Duplicate Sample)	4^{0}C, None
20	1-L Plastic	TDS; (3 Bottles + 1 bottle for Duplicate Sample)	4^{0}C, None
20	1 -L Glass	TKN; EPA 351.3	4^{0}C, 0.5ml H_2SO_4 to pH<2
20	500-ml plastic	Amonia as N by Distillation ,EPA 350.2	4^{0}C, 0.5ml H_2SO_4 to pH<2
20	250-ml plastic	Nirtite as N; EPA 300.0	4^{0}C, None
20	250-ml plastic	Nitrate as N; EPA 300.0	4^{0}C, None
20	500-ml plastic	Phosphate as P; EPA 365.3	4^{0}C, 0.5ml H_2SO_4 to pH<2
20	500-ml plastic	Orto-Phosphate; EPA 365.2	4^{0}C, None, filter on site

Notes: **Bottles in coolers with blue ice.**

APPENDIX 10
Sample Chain of Custody

TRUESDAIL LABORATORIES, INC.
14201 FRANKLIN AVENUE - TUSTIN, CA 92780-7008
(714) 730-6239 - FAX (714) 730-6462

CHAIN OF CUSTODY

X TURNAROUND TIME Normal TAT
DATE: _____ PAGE: ___ OF ___

COMPANY **COUNTY OF SAN DIEGO**
CONTACT **Ken Liddell**
PHONE 858-495-5293 FAX 858-495-5263
ADDRESS 9325 Hazard Way
San Diego, CA 92123

PROJECT: **Dry Weather Monitoring Program**

SAMPLER (SIGNATURE) _____

SAMPLE I.D.	DATE	TIME	Matrix	Sample Event ID	MBAS by SM 5540C	Total Hardness by SM 2340C	Dissolved: Cd, Cu, Pb, Zn by ICPMS	Diazinon, Chlorpyrifos and Malathion by EPA 8081	Oil and Grease by EPA 1664								NUMBER OF CONTAINERS	COMMENTS

Chain of Custody Signature Record

1. _____ (Print Name) ⇦ ***Relinquished By***
_____ (Signature) _____ (Company/ Agency) _____ (Date/ Time)

2. _____ (Print Name) ⇦ ***Received By***
_____ (Signature) _____ (Company/ Agency) _____ (Date/ Time)

3. _____ (Print Name) ⇦ ***Relinquished By***
_____ (Signature) _____ (Company/ Agency) _____ (Date/ Time)

4. _____ (Print Name) ⇦ ***Received By***
_____ (Signature) _____ (Company/ Agency) _____ (Date/ Time)

Code	Description	Price
41-O&G	Oil & Grease by EPA 1664	25
41-MBAS	MBAS by SM 5540C	20
41-Hard	Total Hardness by SM 2340C	15
45-Met ICPMS	Cd, Cu, Pb, Zn by ICPMS	40
45-Prep Charg	Lab Filter for Dissolved metals	5
65-8081	EPA 8081	90

SAMPLE CONDITIONS:
Cool ☐ Warm ☐
_____ °F

CUSTODY SEALS
Yes ☐ No ☐
_____ °F

SPECIAL REQUIREMENTS:

APPENDIX 11

Step By Step Guide To Entering a Dry Weather Field Data Sheet into Database

Before Starting

1. Organize the field sheets by sample event ID number.
2. Review each field sheet for accuracy and understanding of the chain of events.
3. Place the field sheets into the binder.

Database Entry Procedures

1. Open the Dry Weather Database
2. Click on [Enter field screening data for a sampling event]
3. Check that your keyboard has **"numbers lock" ON**!!!! (very important)
4. Begin by entering the [Year], followed by the [Site ID] and then [Round Number]. When you tab to the next box you will be asked to enter the [Sample Location ID]. **(Note A, B, C, D… are sites which were identified in 2002 and were re-sampled as part of an IC/ID in 2003. If an IC/ID is being conducted and an upstream sample is collected, but it is not collected at the same A location as in 2002, it should have a Sample Location ID of A 03).** When you do this check the number in the [Sample Event ID] box to make sure it corresponds to the sample event ID on the field sheet. After you have entered the [Sample Location ID], [Event Type], [Date] and [Time], continue to the field [Personnel] box. If, when you click in the field [Personnel] you get a box stating, **" cannot create record because information is required in TBL:Location"** this means that this is a new site that has never been entered into the database. If this is an IC/ID site or a new Dry Weather Site, the database will not allow the input of field data with no relationship to a location.
5. Go back to the Main Switchboard and click on **[Add a New Dry Weather Monitoring Site]** and enter the necessary information (Site ID, lat/long, land use, construction…)
6. Once this information has been entered you can continue to enter the field data for that record back in the Major Event data entry form.
7. Continue to enter data. If a field is not completed on the field sheet leave it blank in the database.
8. Once you have completed entering the data for that record, **DO NOT CLICK ON ANY NEW RECORD BUTTONS AT THE BOTTOM OF THE PAGE!!!**
9. Initial and date the top right of each sheet after it is entered.
10. Continue to the next field sheet in the binder and determine what type of event it is. Use the following procedures based on the event type. If the next field sheet is:

    1. **A Duplicate/Split/Field Standard Control or IC/ID** related to the same site you previously entered-**click on the TOP new record button.** This one allows you to enter information related to one Major event.

2. If the next field sheet in line is a completely a new site-**click on the BOTTOM new record button.** This creates a new major event for that particular sampling event.

11. When all data has been entered for that day, make a copy of the database and save it to your own drive. (What's this??)
12. Send an e-mail to all Science and Monitoring field staff notifying them that field sheets were entered into the database.

Problems you may encounter and how to resolve them:

Problem 1:
You accidentally click the wrong new record button.

If you click the wrong new record button I am not aware of how you can correct the problem. If you meant to click on the TOP new record button, but you clicked the BOTTOM new record button that means you have created a new major event for a record that is actually meant to relate to another major event. This means that when you query the database for all information relevant to one major event the query would not contain the information entered under the new major event.

(e.g. an exceedance for nitrate is observed in the field, a duplicate nitrate sample is collected for laboratory analysis at the original sample location, and you proceed upstream and collect 4 field screening samples. In total there are 5 records related to the one major event created by the first field screening).

Problem 2:
Your computer shuts down on you while you are in the middle of entering a field data sheet. When you return to the database you find that the sample event ID used for that record did not get saved and was consequently deleted during the malfunction.

This means that your sample event ID's will be out of order, (once a sample event ID is deleted it can never be used again). The best thing to do to resolve this is to re-assign the next sample event ID in line found in the Sample Event ID table used in the field. The new number should be placed on the field sheet and the field information should be recorded in the field sample event ID table, prior to the next day of sampling.

NOTE: When entering the conductivity value convert it to uS/cm. (e.g. 1.23 mS/cm would become 1,230 uS/cm) The database is all in uS/cm. (Really??)

I recommend we all get together to review proper data entry procedures to make sure we're all hitting the right buttons, etc. before May 1.

APPENDIX 12
Science and Monitoring Referral form

Department of Public Works
Watershed Protection Program
Science and Monitoring Referral

IC/ID Parameter _____.

Type

☐ **Business** ☐ **Residential**
☐ **Nurseries, Groves, Golf Courses, and Commercial Equestrian**
☐ **Construction** ☐ **Other Jurisdiction** _____.
☐ **Other** _____.

Requestor _____. **Date of Referral** _____.

Requestor's Phone # _____.

Location / Address _____.

Thomas Brothers _____.

Parcel Number(s) _____.

GPS Coordinates **N° Lat.** _____. **W° Long.** (NAD 83) _____.

Issue _____.

Additional Information _____.

APPENDIX 13

Department of Public Works
Road Service Request form

DEPARTMENT OF PUBLIC WORKS
ROADS SERVICE REQUEST

CONTROL NUMBER

DATE RECEIVED: TBD TIME: TBD ROAD STA: _____ THOS. BROS: TBD

REQUESTOR: _____ PHONE (H): _____ PHONE (W): _____

ADDRESS: 9325 Hazard Way CITY: San Diego, CA ZIP: 92123

SERVICE LOCATION: TBD

STREETS

- ☐ POTHOLE(S)
- ☐ RAISED OR SUNKEN LATERAL
- ☐ ROCK OR MUD SLIDE
- ☐ SWEEPING REQUEST
- ☐ GLASS OR DEBRIS IN ROADWAY
- ☐ OTHER _____

DRAINAGE

- ☐ FLOODING
- ☐ BERM REPAIR OR BUILD
- ☐ WATER FLOWS DOWN DRIVEWAY
- ☐ CULVERT/STORM DRAIN PLUGGED
- ☐ DEBRIS/VEGETATION IN CHANNEL
- ☐ OTHER _____

SIGNS

TYPE OF SIGN: _____

- ☐ DOWN, POST INTACT
- ☐ DOWN, POST DAMAGED
- ☐ MISSING
- ☐ VANDALIZED
- ☐ LIMITED VISIBILITY
- ☐ OTHER _____

ROADSIDE

- ☐ TRASH OR DEBRIS REMOVAL
- ☐ TREE/BUSH NEEDS TRIMMING
- ☐ TREE/BRANCHES IN ROAD
- ☐ GRAFFITI REMOVAL
- ☐ LIMITED VISIBILITY
- ☐ OTHER _____

☐ REQUEST YOU CALL _____
DATE CALL RETURNED

ADDITIONAL INFORMATION TBD

DISPOSITION REPORT

NAME OF PERSON TAKING REPORT

COMPLETION STATUS:

☐ 25% ☐ 50%

☐ 75% ☐ 100%

TBD
DATE COMPLETED

NAME OF PERSON COMPLETING REQUEST

APPENDIX 14
Sample Location Table 2006

HAS	Site ID	Location	Lat.	Long.	TB Page	TB Grid
902.12	SMG01	Fallbrook Creek @ Clements Lane	33.36944	-117.25883	1027	E4
902.23	SMG03	Rainbow Creek @ Fifth Street	33.41390	-117.15610	998	H5
902.22	SMG05	Rainbow Creek @ Willow Glen Road	33.40788	-117.20104	998	C6
902.22	SMG06	Rainbow Creek @ Stage Coach Lane	33.41056	-117.21477	998	A5
902.22	SMG07	Sandia Creek @ Sandia Creek Drive	33.4246	-117.24904	997	F3
902.21	SMG08	De Luz Creek @ De Luz Road	33.42184	-117.32179	996	G4
902.22	SMG09	Santa Margarita River @ Ecological Reserve Entrance	33.42839	-117.19561	998	C3
902.21	SMG10	Santa Margarita River @ Sandia Creek Drive	33.4075	-117.25018	997	G5
903.12	SLR01	Moosa Canyon Creek @ Old River Road	33.28369	-117.21886	1068	A2
903.12	SLR02	Little Gopher Canyon Creek @ Old River Road	33.26578	-117.23320	1067	J4
903.11	SLR04	Hutchinson Street @ Hidden Lake Lane	33.24084	-117.24198	1087	H1
903.12	SLR05	Ostrich Farm Creek @ Overland Trail	33.34237	-117.2403	1047	A1
903.12	SLR06	Live Oak Creek @ Oak Cliff Drive	33.33545	-117.18830	1048	E1
903.12	SLR07	Ostrich Farm Creek @ Sterling Bridge Road	33.35211	-117.24503	1027	G6
903.14	SLR08	Moosa Canyon Creek @ Sunday Drive	33.21497	-117.03338	1090	E4
903.16	SLR09	Keyes Creek @ Valley Center Road	33.22896	-117.03758	1090	E2
903.13	SLR10	Old 395 Creek @ Old Hwy 395	33.20494	-117.12968	1089	C5
903.13	SLR11	Old 395 Creek @ Welk View Drive	33.23783	-117.14607	1089	A1
903.12	SLR12	Green Canyon Creek @ Sycamore Road	33.33312	-117.23551	1047	H2
903.12	SLR13	Winterheaven Creek @ Winterheaven Road	33.34736	-117.24027	1027	G7
903.12	SLR14	Ostrich Farm Creek @ Highway 76	33.29353	-117.22373	1048	A7
903.13	SLR15	Moosa Canyon Creek @ End of Betsworth Road	33.22763	-117.08392	1089	H2
903.12	SLR16	San Luis Rey River @ Vista Way	33.26052	-117.23836	1067	H5
903.12	SLR17	Keyes Creek @ Dunlin Road (San Luis Rey River)	33.32384	-117.15723	1048	H3
903.21	SLR18	San Luis Rey River @ Couser Canyon Pass	33.3404	-117.13124	1029	B7
903.22	SLR20	Yuma Creek @ Pala Road (Highway 76)	33.2884	-116.95981	1051	D7
903.22	SLR21	Pauma Creek @ Pala Road (Highway 76)	33.3237	-116.99665	1050	J2
903.12	SLR25	San Luis Rey River @ Camino Del Rey	33.28838	-117.22335	1068	A1
903.12	SLR26	Bonsall Creek @ Highway 76	33.28987	-117.22584	1068	A1
903.12	SLR27	Live Oak Creek @ Highway 76	33.31514	-117.19418	1048	D4
903.12	SLR28	San Luis Rey River @ Shearer Crossing	33.33281	-117.14975	1048	J2
903.12	SLR29	Keys Creek @ Lilac Road	33.28808	-117.08333	1069	H1
903.12	SLR30	Couser Canyon Creek @ Couser Canyon Road	33.33488	-117.1312	1049	B1
904.61	CAR01	San Elijo Creek @ La Granada	33.02297	-117.22729	1168	A3
904.62	CAR02	Escondido Creek @ East County Club Drive	33.09901	-117.13047	1129	C6
904.61	CAR03	Escondio Creek @ El Camino Del Norte	33.04839	-117.22716	1148	A6
904.52	CAR04	San Marcos Creek @ La Casita Road	33.12851	-117.20367	1128	D2
904.32	CAR05	Buena Creek @ Robelini Drive	33.17239	-117.20997	1108	C3
904.53	CAR06	San Marcos Creek @ Olive Street and Sycamore Drive	33.17993	-117.15341	1108	J2
904.62	CAR07	Jesmond Dene Creek @ Jesmond Dene Heights Road	33.17074	-117.10098	1109	F3
904.62	CAR08	Reidy Canyon Creek @ Paseo Del Norte	33.1781	-117.09193	1109	G2
904.61	CAR09	La Granada Creek @ El Camino Real	33.01084	-117.23985	1167	J4

904.61	CAR10	Tributary of San Elijo Creek @ San Elijo Road	33.02585	-117.21569	1168	C2
904.62	CAR12	Reidy Canyon Creek @ Bachelor Lane	33.19801	-117.08966	1089	G6
904.52	CAR13	Stormdrain Outfall to Lake San Marcos @ End of San Marino Drive	33.12012	-117.20997	1128	C3
904.52	CAR14	Tributary to Lake San Marcos @ End of El Chino Lane	33.11896	-117.20744	1128	C3
904.62	CAR15	Jesmond Dene Creek @ Jesmond Dene Heights Road	33.17084	-117.10002	1109	F3
905.41	SDG02	Etcheverry Creek & Highway 67	33.02243	-116.89673	1172	D2
905.41	SDG03	Santa Maria Creek @ Rangeland Road	33.03379	-116.93608	1151	H7
905.41	SDG04	Hatfield Creek @ Magnolia Avenue	33.05258	-116.84492	1153	A4
905.11	SDG05	San Dieguito River @ El Apajo	32.99948	-117.2055	1168	D6
905.41	SDG06	E and Eighth Street	33.04155	-116.86378	1152	H6
905.11	SDG07	La Zanja Canyon Creek @ Rancho Santa Fe Farms Road	32.97771	-117.18116	1188	G2
905.11	SDG08	Green Valley Creek @ Lone Quail Road	33.01962	-117.11974	1169	E3
905.23	SDG09	Felicita Creek @ Quite Hill Farm Road	33.07326	-117.08373	1149	J2
905.32	SDG10	Rockwood Canyon Creek @ San Pasqual Road (also called Guejito Creek or Quejito Creek)	33.09456	-116.96132	1131	E6
905.41	SDG11	E Street and Tenth Street	33.04025	-116.86741	1152	G6
907.33	SDR01	Chocolate Canyon Creek @ Arnold Way	32.84127	-116.8054	1233	F5
907.33	SDR02	Alpine Creek @ Tavern Road	32.83192	-116.77528	1234	A6
907.33	SDR03	Alpine Creek @ Midway Drive	32.83879	-116.79011	1233	H6
907.13	SDR05	Bradley Avenue @ Graves Avenue	32.81889	-116.95928	1251	F2
907.13	SDR07	Greenfield Drive @ Winrow Road	32.80826	-116.91151	1252	C3
907.14	SDR08	Los Coches Road @ I-8 Business Route	32.83599	-116.9004	1232	D7
907.12	SDR11	San Diego River @ Channel Road	32.86473	-116.92755	1232	A2
907.12	SDR13	Eucalyptus Hills Creek @ Riverside Drive	32.86204	-116.94466	1231	H3
907.12	SDR15	Lindo Lake @ Petite Lane	32.85716	-116.91278	1232	C3
907.14	SDR16	Los Coches Creek @ Los Coches Road	32.84004	-116.91346	1232	D6
907.12	SDR17	San Vicente Creek @ Willow Road	32.87565	-116.92145	1232	B1
907.12	SDR18	Quail Creek Inflow @ Lindo Lake	32.8603	-116.9176	1232	B3
907.23	SDR19	Tributary of San Vicente Creek @ San Vicente Road	33.00561	-116.82115	1173	D4
907.23	SDR20	San Vicente Creek @ Wildcat Canyon Road	32.99628	-116.84387	1173	A5
907.14	SDR21	Oak Creek @ Olde Highway 80	32.84807	-116.86946	1232	H5
907.33	SDR22	Tributary of Chocolate Canyon Creek @ Arnold Way	32.84232	-116.80839	1233	F5
907.12	SDR23	Eucalyptus Hills Creek @ Eucalyptus Hills Road	32.87729	-116.9521	1231	G1
907.12	SDR24	Tributary to the San Diego River @ 11633 Woodside Avenue	32.85504	-116.94268	1231	H4
907.23	SDR25	San Vicente Creek @ San Vicente Road	33.00162	-116.8016	1173	F4
907.14	SDR34	Tributary to Los Coches Creek @ 11962 Woodside Avenue	32.85565	-116.93548	1231	J4
909.12	SWT01	Sweetwater River @ Willow Road	32.65895	-117.04231	1310	F3
909.12	SWT02	Acacia Avenue @ Bonita Road	32.66558	-117.02409	1310	J2
909.12	SWT03	Sweetwater River @ Plaza Bonita Road	32.65069	-117.06374	1310	D4
909.12	SWT05	San Miguel Creek @ Bonita Road	32.66692	-117.02325	1310	J2
909.12	SWT07	Quarry Road @ Swap Meet Road	32.70114	-117.00927	1291	A4
909.12	SWT08	Casa de Oro Creek @ Valencia Street/Kings View Circle	32.73326	-117.00865	1271	A7
909.12	SWT09	Spring Valley Creek @ Valencia Street	32.73329	-117.00857	1271	A7
909.22	SWT10	Jamacha Road @ Willow Glen Drive	32.74445	-116.93002	1272	A5
909.21	SWT11	Sweetwater River @ Steele Canyon Road	32.74449	-116.91693	1272	C5
909.21	SWT12	Sweetwater River @ Old Bridge	32.73266	-116.94029	1271	J6
909.21	SWT13	Millar Ranch Road @ Hwy 94	32.73028	-116.93887	1271	J7

909.12	SWT14	Helix Street Next to Hwy 94	32.74968	-117.00087	1271	B5
909.12	SWT15	Casa de Oro Creek @ Kenwood Drive/Barbic Court	32.74544	-116.99168	1271	C5
909.23	SWT18	Harbison Canyon Road @ Collier Way	32.81511	-116.83599	1253	C2
909.31	SWT20	Via Viejas @ Private Lake	32.81894	-116.75211	1254	C1
909.26	SWT21	North Fork of Sweetwater River @ Tavern Road and Real Way Lane	32.80879	-116.78036	1253	J2
909.21	SWT22	Indian Springs Creek @ Highway 94	32.71963	-116.88031	1292	G1
909.21	SWT23	Jamul Road @ Mexican Canyon Creek	32.72929	-116.87239	1272	H7
909.21	SWT25	Jamacha Boulevard-Highway 94 @ Campo Road	32.73968	-116.95245	1271	H6
910.36	OTY03	Dulzura Creek @ Otay Lakes Valley Road	32.63624	-116.88456	1293	G6
910.33	OTY04		32.72169	-116.85350	1293	A1
911.6	TIJ01	Cottonwood Creek @ Old Highway 80 (Bridge Crossing)	32.78868	-116.49728	430	A6
911.41	TIJ02	Pine Valley Creek @ Old Highway 80 and Pine Valley Road	32.83776	-116.53725	1237	A5
911.82	TIJ04		32.60918	-116.47421	430	B10
					Total	**101**

Review and add/delete sites for 2006 (if any).

APPENDIX 15

Chart of Maximum Dissolved Oxygen vs. Temperature

Temperature(°C)	DO(mg/l)	Temperature(°C)	DO(mg/l)
0	14.60	23	8.56
1	14.19	24	8.40
2	13.81	25	8.24
3	13.44	26	8.09
4	13.09	27	7.95
5	12.75	28	7.81
6	12.43	29	7.67
7	12.12	30	7.54
8	11.83	31	7.41
9	11.55	32	7.28
10	11.27	33	7.16
11	11.01	34	7.16
12	10.76	35	6.93
13	10.52	36	6.82
14	10.29	37	6.71
15	10.07	38	6.61
16	9.85	39	6.51
17	9.65	40	6.41
18	9.45	41	6.41
19	9.26	42	6.22
20	9.07	43	6.13
21	8.90	44	6.04
22	8.72	45	5.95

*Table from EPA