Appendices

List of Appendices:

Appendix A. Morro Bay Volunteer Monitoring Program
Bacteria Monitoring Protocols

Morro Bay Volunteer Monitoring Program
Bacteria Monitoring Protocols

Total Coliform and *E. coli* Monitoring Protocol

Background:

- Pathogens, consisting of viruses, bacteria and protozoans, can cause disease.
- Sources include fecal contamination from sewage, leaking septic systems, urban runoff, boat and marina waste, and waste from pets, farm animals and wildlife.
- Direct testing is very expensive and impractical since pathogens are rarely found in water bodies. Also, there are no existing regulatory standards for all of the individual pathogens.
- Instead, monitor for pathogens by testing for "indicator" species. Their presence indicates that fecal contamination may have occurred.
- Four common indicators: total coliforms, fecal coliforms, *E. coli*, and enterococci. These bacteria are prevalent in the intestines and feces of warm-blooded animals. The indicators themselves are usually not pathogenic.

Types of Indicators:

- Coliform bacteria live in the lower intestines of warm-blooded animals and may constitute as much as 50% of fecal waste. Not pathogenic themselves typically, but their presence indicates sewage contamination, perhaps accompanied by disease-causing pathogens.
- Total Coliforms are a group of closely related bacterial genera that all share the ability to ferment lactose. Total coliform tandards exist for recreational or shellfish waters, although some species are found naturally in plant material or soil. More useful for testing drinking water where plant or soil material would be of concern.
- Fecal coliforms: Subgroup of total coliform. Widely used to test recreational waters and shellfish waters. Generally considered the best available indicators of contamination at this time. The current regulations are written for this indicator.
- *Escherichia coli*: Occurs only in the feces of warm-blooded mammals, making it a good fecal-specific indicator. Can provide better correlation with swimming-associated gastrointestinal illness than fecal coliforms. However not widely used, despite EPA recommendations, due to continuity with previous data and cheaper analytical costs. This indicator is valid in marine and freshwater, although there is no regulatory standard for comparison in marine waters. Our program continues to monitor for *E. coli* in marine waters because it is more closely comparable to fecal coliform data than is Enterococcus data. Since shellfish regulations and the current Basin Plan standard are for fecal coliform, this *E. coli* monitoring will continue until the regulatory standards are changed.
- Enterococci: Group of bacteria found primarily in the intestinal tract of warm-blooded animals. Unrelated to coliforms, they are a subgroup of the fecal streptococci group. But expensive to monitor, despite EPA recommendations that it is a better indicator of harmful recreational contact in salt water environments. This indicator is valid in marine and freshwater, although there is no regulatory standard for comparison at this time. Our program monitors for Enterococcus in marine samples and at a tidally-influenced creek.

Background on Colilert-18 Tests:

- These tests are for freshwater or marine waters.

- Based on the Most Probable Number (MPN) technique, which uses multiple tubes with broth that are inoculated with the sample at different dilutions. After incubation, the tubes show a positive or negative reaction for the target organism. The number of positive tubes corresponds to a statistical probability that the sample contained a certain number of bacteria.
- Kits are approved by EPA for monitoring drinking water.
- Based on a color change in the wells after incubation, total coliform and *E. coli* can be detected in freshwater samples. Only *E. coli* can be detected in marine samples.
- Cost: Approximately $5/test.

Procedure for Sample Collection

Equipment:
- Sterile sample jars
- Latex gloves
- Data collection sheet
- Pen
- Clipboard
- Sharpie pen for labeling sample containers
- Ice chest
- Ice packs
- Tide book

Bay Sites (land-based):
- Cuesta Inlet (CIN)
- Baywood Park (BAY)
- Pasadena Point (PAS)
- Windy Cove (WIN)
- Public Boat Ramp at Tidelands Park (TID)
- State Park Marina (SPM)
- Coleman Park (COL)
- Sharks Inlet (SHI)

Creek Sites:
- Los Osos Creek at Turri Road near South Bay Blvd (SYB)
- Los Osos Creek at Clark Valley (CLV)
- Warden Creek off Turri Road near Los Osos Valley Road (TUR)
- Chorro Creek above the Ecological Reserve (UCR)
- Chorro Creek at Canet Road bridge (CAN)
- Chorro Creek at the Chorro Creek Ecological Reserve (CER)
- Chorro Creek at South Bay Boulevard Bridge (TWB)
- Pennington Creek on Cal Poly property (CPN)
- Pennington Creek on Rancho El Chorro property (PEN)
- Dairy Creek lower (DAL)
- Dairy Creek middle (DAM)
- Dairy Creek upper (DAU)
- San Luisito Creek (SLU)
- San Luisito Creek upper (USL)
- San Bernardo Creek (SBE)

Sample Collection in Bay or Creeks:
- Fill out data collection form with date, sampler names, weather in past 24 hours, current weather, time of high tide and height of high tide (for bay sites and SYB only). There is a tide book in the equipment room.
- Record the three letter site code and the time the sample was taken. In the notes section, note things such as presence of animals and birds, abundant leaf matter, any strange debris, any unusual smells, etc.
- Use sterile sample bottles, labeled with site ID.
- Wear latex gloves to protect both you and the sample.

- Site should be free of algal blooms, surface debris, oil slicks and congregations of water fowl. Avoid agitating the bottom sediment. Avoid splashing water. Choose site with good mixing and no stagnant pools.
- If entering the water to take the sample, be careful to not stir up sediment. Face upstream to take the sample, so that you do not affect the sample.
- Submerge bottle underwater and remove cap from sample bottle, being careful not to touch the rim or inside the lid. Try to collect the sample 12" underwater or at 1/3 of the depth below the surface.
- Fill the sample bottle with water, with the bottle facing into the current. Recap underwater.
- It doesn't matter if you leave a headspace in the container.
- Store in the ice chest.
- Change gloves at each site.
- If sampling on a beach, collect it on an incoming wave.
- For bay sites or at SYB, sample on an outgoing tide.
- Ideally, samples will arrive at the lab within six hours of collection, and must be maintained at 10 degrees C or lower. If they can't be tested within six hours, they must be tested within 24 hours of collection.

Procedure for Sample Analysis at the Morro Bay-Cayucos Wastewater Treatment Plant

Directions to the lab:
From Hwy 1, exit at the Hwy 41 exit and head west, toward Morro Bay High School. Pass the high school on your right. Pass the first gate on your left (the city maintenance yard). The second gate on the left is unlabeled – this is the WWTP. Turn left into the gate and take the first right. There is a small parking area on the right and the building to your right contains the WWTP operations center and lab. If you have more than one car, please park outside the facility and walk in.

Lab hours are as follows:

Monday – Friday: 8 a.m. to 4:30 p.m.
Saturday: 7:30 a.m. to 3:30 p.m.
Sunday: 7 a.m. to 3 p.m.

But you must be out of the lab a half an hour before closing time.

Equipment:
- Sterile deionized water
- Sterile pipette tips
- Pipetter
- Latex gloves
- Safety glasses
- Colilert-18 reagent packet
- Quanti-Tray/2000 foil packet
- Incubator
- Quanti-Tray sealer and rubber insert

1. Upon arrival at the lab, notify plant staff that you are at the facility and are going to be doing lab analysis for the VMP. It is crucial to let someone know you are there, in

case there is a plant emergency. Plant personnel will be notified in advance of the date and approximate time of VMP use of the lab.

2. Wash your hands, using the anti-bacterial soap mounted above the sink.
3. Put on latex gloves and safety glasses.
4. Turn on the Quanti-Tray sealer (power switch on back, right hand side) so it has time to pre-heat. The amber light goes on. The sealer is ready when the green light also goes on. **Make sure there is nothing behind the sealer that would block trays from exiting after they are sealed.**
5. Collect your sterile bottles.
6. For bay water quality samples:
   a. First you must dilute the sample 1:10 due to interference from marine samples.
   b. Invert sample bottle to mix.
   c. Put sterile tip onto pipetter. Dial pipetter to read 10 mL. Use a pipetter to remove 10 mL from the sample container. Be careful to not tip the pipette once you have filled it – you must keep the pipette upright so that the sample does not contaminate the paper plug in the pipetter.
   d. Add sample to a sterile plastic bottle.
   e. Add 90 mL of sterile DI water from squeeze bottled labeled 'sterile DI water' into graduated cylinder. Add to the 10 mL of sample in the plastic bottle.
   f. Add Colilert-18 reagent.
   g. Swirl to dissolve powder. (Avoid shaking vigorously, which adds bubbles and foam to the sample.)
   h. If sample is foamy, let sit for a few minutes to let foam settle.
   i. Sample is ready to add to Quanti-Tray
7. For undiluted freshwater samples:
   a. Invert sample bottle to mix. Open sample container. Pour out excess sample so that have a 100 mL sample remaining. Suggest pouring into sterile jar in case you accidentally pour out too much.
   b. Add Colilert-18 reagent.
   c. Re-cap container.
   d. Swirl to dissolve reagent.
   e. If sample is foamy, let sit for a few minutes to let foam settle.
   f. Sample is ready to add to Quanti-Tray.
8. If a 1:10 dilution is required for freshwater samples, see Step 6.
9. If a 1:100 dilution is required:
   a. Invert sample bottle to mix. Open sample container.
   b. Insert clean, sterile tip into pipetter. Dial pipetter to read '1 mL.'
   c. Place 1 mL of sample in sterile plastic bottle.
   d. Add 99 mL of sterile DI water from squeeze bottle into plastic bottle using the graduated cylinder.
   e. Add Colilert-18 reagent and swirl to dissolve.
   f. If sample is foamy, let sit for a few minutes to let foam settle.
   g. Sample is ready to add to Quanti-Tray.
10. Must use new sterile equipment (flasks, pipettes, plastic containers, etc.) for each site and each dilution.
11. If a blue flash occurs upon addition of Colilert-18 reagent, the sample is considered invalid due to excessive chlorine and testing should be discontinued.
12. To put sample in Quanti-Tray:
    a. Look over the tray and make sure it has no tears or wrinkles in the seals.

b. First label the back of the Quanti-Tray with a Sharpie marker. Mark the site code, date, time of testing and dilution. **Label the back of the tray as 'E. coli' if you are also running Enterococcus samples to avoid confusion.**
c. Use one hand to hold the Quanti-Tray upright with the well side facing the palm.
d. Squeeze the upper part of the Quanti-Tray so that the tray bends toward the palm.
e. Gently pull foil tab to separate foil from the tray. **Avoid touching the inside of the foil or tray**.
f. Pour the sample directly into the tray, avoiding contact with the foil. Tap the small wells 2-3 times to release any air bubbles. Allow foam to settle.

13. To seal the Tray:
    a. Wait until both the amber and green lights are lit, indicating sealer is pre-heated.
    b. Check behind the sealer to ensure that nothing is blocking the slot where trays exit the sealer.
    c. Place the empty sealer rubber insert on the input shelf with the large cutout facing away from the sealer.
    d. Place the tray filled with sample onto the rubber insert, making sure that the tray is properly seated on the rubber insert, with each well of the tray in its corresponding hole in the rubber insert.
    e. Slide the insert into the sealer until the motor grabs it and draws it into the sealer.
    f. In approximately 5 seconds, the tray will be sealed and partially ejected from the rear of the sealer. Remove the rubber insert and tray from the rear of the sealer.
    g. If you wish to reverse the motor drawing the rubber tray into the sealer (if a misaligned tray is accidentally fed into the sealer), press and hold the reverse button on the front of the sealer. However, do NOT reverse the motor once the rubber insert has been drawn fully into the sealer.
14. When done sealing all trays, turn the sealer off.
15. As you finish sealing each tray, stack in the incubator.
16. The incubator does not need to be pre-heated before the samples are incubated. The incubator temperature should be between 34.5 and 37 degrees C during the incubation period.
17. On the data sheet, note the time the samples were put into the incubator.
18. Triple rinse all autoclavable bottles with hot tap water and then give a final rinse with DI water. Do not use soap. Once washed, place them in the bin that is labeled 'DIRTY'. Put caps on the bottles but don't tighten.
19. Place the pipette tips in the autoclavable tray and place in bin.
20. Refill empty squeeze bottles with DI water from our large carboy sitting on the bench top. Put the tops on loosely, and do not put foil over the tip. Put those in the bin to be autoclaved. Be sure to refill them so there's enough sterile DI water for the next volunteer!
21. Put the graduated cylinder in the 'DIRTY' bin. Be sure to cover the top with foil, located in the drawer.
22. Lab personnel will sterilize the equipment before your next visit to the lab and place them under the counter.
23. Discard the sample collection bottles in the recycle bin and the caps in the garbage. These are not re-usable.
24. Wipe down the bench top.
25. Dispose of gloves in the trash. Wash hands with anti-bacterial soap.
26. Let plant personnel know that you are leaving.

Collecting Samples for QA Purposes:

Occasionally we will request that you collect a split sample for QA purposes. One sample will be analyzed by the VMP using our test kits, and the other will be analyzed by a certified laboratory as a QA of our methodology.

In order to increase the success with which the QA results are similar to those we obtain in the lab, we will collect a single sample from the site that is *later* split between two separate bottles, rather than *initially* collecting two separate samples in separate bottles.

Two separate samples, despite being collected simultaneously, can have very different concentrations of bacteria because bacteria are not dispersed equally throughout the water column. By collecting one sample, mixing it, then splitting that sample into two bottles, we hope to increase the likelihood that both the sample we test and that tested for QA will return similar results.

- We have designated autoclavable 250 ml bottles to use for collecting samples that will be split for QA purposes.

- For each site that you need to collect a QA sample from, bring a QA bottle along with two of the IDEXX bottles (one for your sample, one for the QA sample) for bay sites and three IDEXX bottles for creek sites (two for your samples, one for the QA sample).

- Collect a sample from your site using one of the QA bottles in the same manner with which you collected your samples using the IDEXX bottles.
    1. Wear rubber gloves to prevent contamination from your hands
    2. Submerge bottle and remove cap, do not to touch the rim or inside the lid
    3. Fill the sample bottle with water, with the bottle facing into the current
    4. Recap underwater

- Split the sample. Wearing clean gloves, open the IDEXX bottles, and then shake the QA bottle 25 times to mix the sample well.

- Label the three IDEXX bottles with the site code.

- If you run diluted samples you can pour 100 ml of the sample into each of the IDEXX bottles.

- If you run an undiluted sample along with a diluted sample, fill one IDEXX bottles to the 100 ml mark for your undiluted sample, fill another bottle to the 100 ml line for the QA sample, and then pour the remaining sample into a third bottle for the diluted sample. This should allow 100 ml for your undiluted sample, 100 ml for the QA sample, and nearly 100 ml for the diluted sample .

- The bottle that goes to QA should not always be the first, or always the second, bottle that the sample is poured into. So, vary which bottle you fill first. Set the QA bottle aside in the ice chest to place in fridge when you return to the office.

- To proceed with the lab test, begin by shaking the IDEXX bottle with your sample in it to dissolve all the granules that neutralize any chlorine that may be present in the sample, and to ensure a well mixed sample. Then, run the test as usual.

Reading the Sample Trays

The trays must incubate between 18 and 22 hours at 34.5 to 37 degrees C before reading. **If you read the trays later than the 22 hour incubation time period, the results are not valid**.

There are a total of 49 large wells and 48 small wells per tray. The large, rectangular well at the top of the tray is counted as a large well.

Fill out the bottom section of the data collection form with your name, the incubator temperature and the date and time the results were read.

For total coliform results (for freshwater only):

1. Pull out the color comparator from the drawer.
2. Face the doorway to the lab, with your back to the room, and hold the tray and comparator out at arms length and below eye level. This seems to facilitate detection of the color change.
3. Count the number of large wells (including the large rectangular well at the top of the tray) and small wells that are **more** yellow than the comparator tray. These wells as positive for total coliforms. All wells that are less yellow than the comparator are negative for total coliforms.
4. Record these values on the data sheet.
5. Use the MPN chart and based on the number of large and small wells that changed color, record the MPN value on the data sheet.
6. If your sample was diluted, then you must multiply the MPN value by the dilution factor (i.e., multiply by a factor of 10 if diluted original sample 1:10) to get the MPN value for the original, undiluted sample.
7. Return the color comparator to its red bag in the drawer. Do NOT autoclave it!

If a different bacteria, other than coliform bacteria, were present in the sample and caused a color change other than yellow or fluorescing, do not record these as positive wells.

This gives an MPN value for total coliform. Note that the test kits can't be used to monitor for total coliforms in marine samples.

For *E. coli* results (both freshwater and marine samples):

1. Put the tray into the UV cabinet and plug in the UV light. Push the red button and look through the viewing screen on the cabinet.
2. Count the number of large and small wells that are both fluorescing AND yellow. These are positive wells for E. coli. Record on the data sheet. All wells that fluoresce more than the comparative **and** are yellow are positive for *E. coli*.
3. If it is difficult to distinguish whether the well is both yellow and fluorescing when it is in the cabinet, use a Sharpie to make each of the fluorescing wells while it is in the cabinet. Then pull the tray out of the cabinet and verify that all of those fluorescing

wells also have the yellow color change. Only the wells with BOTH fluorescence and a yellow color change are positive for E. coli.

4. Look up the MPN value from the chart and record on the data sheet.
5. If your sample was diluted (all marine samples are diluted to at least 10:1), then you must multiply the MPN value by the dilution factor (i.e., multiply by a factor of 10 if diluted original sample 1:10) to get the MPN value for the original, undiluted sample.
6. Be sure to turn off and unplug the UV light when you are done.

If a different bacteria, other than coliform bacteria, were present in the sample and caused a color change other than fluorescing (i.e., a bright blue fluorescence), do not record these as positive wells. If the tray fluoresces but did not turn yellow, this is not a positive result for *E. coli* but rather some other undetermined organism.

This gives the MPN value for *E. coli*.

Once the readings are complete:

1. The trays must be autoclaved before they can be thrown out. Mark the back 'Destroy' and double bag it in **two** autoclave bags and place in the 'To be autoclaved' bin. Bags are located in the drawers under our lab space. Lab personnel will autoclave and then dispose of the tray.

2. Don't turn off the incubator since someone else may be coming in to use it.

Positives observed before 18 hours are valid, and negatives after 22 hours are valid.

Suggested Dilutions for Bacteria Testing:

Creek Sites: Due to variance in E.Coli and Total Coliform levels, undiluted and 1:10 dilutions are run at each creek site. For Walters Creek (WAL) it is recommended to run a 1:10 and 1:100 dilution.

Bay Sites: All sites are tested with a 1:10 dilution.

Enterococcus Monitoring Protocol

Background:

- Enterococci: Group of bacteria found primarily in the intestinal tract of warm-blooded animals. Unrelated to coliforms, they are a subgroup of the fecal streptococci group. Enterococcus is less sensitive to salt than *E. coli* and is thus considered a better indicator in marine environments.

Background on Enterolert Tests:

- These tests are valid for freshwater or marine waters. We will continue to monitor total coliforms and *E. coli* in freshwater. We will monitor *E. coli* as well as enterococcus in marine waters. The reason for continuing to monitor *E. coli* in the bay is that regulatory agencies use the levels of the coliform family of bacteria (which includes *E. coli*) to determine if the shellfish that grow in the water are safe for consumption. Since we are collecting data that may be used to assess the safety of bay waters for shellfish growing, we need to continue collecting E. coli data.
- Based on the Most Probable Number (MPN) technique, which uses multiple tubes with broth that are inoculated with the sample at different dilutions. After incubation, the tubes show a positive or negative reaction for the target organism. The number of positive tubes corresponds to a statistical probability that the sample contained a certain number of bacteria.
- Based on a color change in the wells after incubation, enterococcus can be detected in samples.
- Cost: Approximately $6/test.

Notes on Sample Collection

Sample collection procedure is the same as for Colilert-18 testing. Since only 10 mL of sample are needed for each test, you only need to collect one sample jar at each site in order to conduct both enterococcus and *E. coli* testing.

We will conduct enterococcus monitoring at the following sites:

Bay Sites:
- Cuesta Inlet (CIN)
- Baywood Park (BAY)
- Pasadena Point (PAS)
- Sharks Inlet (SHI)
- Windy Cove (WIN)
- Public Boat Ramp at Tidelands Park (TID)
- State Park Marina (SPM)
- Coleman Park (COL)

Creek Sites:
- Los Osos Creek at Turri Road near South Bay Blvd (SYB)

Note: At SYB, we might want to bring along the salinity meter and take a reading at the time of sample collection.

Notes on Sample Analysis

Enterolert samples are processed identically to Colilert-18 samples (same process, same Quanti-trays, etc.). The only differences are as follows:

- A different packet of reagent is used. The Colilert-18 reagent packets are labeled in red, and the Enterolert reagent packets are labeled in purple.
- The samples incubate at 41 +/- 0.5 degrees C (versus 34.5 to 37 degrees C for Colilert-18)
- The incubation time is 24 to 28 hours (versus 18 to 22 hours for Colilert-18)

Some information for the lab analysis:

- All samples must be diluted 1:10.
- **Label the back of each tray with either "E. coli" or "Entero" to help keep them straight.** Once the reagent is added to the water sample, it is difficult to distinguish whether you have a Colilert-18 or an Enterolert sample. The Enterolert samples appear to be a slightly darker shade of yellow than the Colilert-18 samples.
- Be careful to place your enterococcus samples in the incubator labeled 'Enterolert'. The incubator for the *E. coli* samples is labeled 'Colilert-18.' The enterococcus incubator is set for 41 +/- 0.5 degrees C, and the *E. coli* incubator is set for 34.5 to 37 degrees C.

Reading the Enterolert Trays

The trays must incubate between **24 and 28 hours** at 41 +/- 0.5 degrees C before reading. **If you read the trays later than the 28 hour incubation time period, the results are not valid**.

Fill out the bottom section of the data collection form with your name, the incubator temperature and the date and time the results were read.

For enterococcus results:

1. Put the tray into the UV cabinet and plug in the UV light. Push the red button and look through the viewing screen on the cabinet.
2. Count the number of large and small wells that are fluorescing blue. These wells are positive for enterococcus. Any amount of fluorescing is considered to be a positive result. Record on the data sheet. If the wells fluoresce a color other than blue, do not record these as positive wells.
3. Look up the MPN value from the chart (the same chart as for the Colilert-18 results) and record on the data sheet.
4. Multiply the result by the dilution factor. All samples are diluted at least 1:10.
5. Be sure to turn off and unplug the UV light when you are done.
6. Once the readings are complete, treat them the same way as the Colilert-18 trays. Double bag in autoclave bags and put in the 'To be autoclaved' bin.

Morro Bay Volunteer Monitoring Program
Updated Bacteria Monitoring Protocol for Creek Monitoring

In addition to the regular sampling equipment, you need to bring the following with you:

- **One large 250-mL sterile jar PER SITE**. These bottles are the same ones you've been using to split QA samples. There is a container of them next to the IDEXX bottles in the cabinet that will be labeled 'Collection Bottles.'
- **Two sealed 120-mL IDEXX jars PER SITE**

Here is the procedure for sample collection for all creek monitors:

- When you get to your site, collect a 250-mL sample in the large bottle using your usual sterile techniques. [Note to sampler at SYB: The golf ball retriever pole won't work with these large bottles. We have a different sampler (basically a small bucket at the end of an extendable pole) that you can use to collect water and split between the smaller jars. They'll be located where the golf ball retrievers are in the equipment room. Be sure to triple rinse the sampler in the creek before you collect a sample.]

- Label both of your sealed 120-mL jars with the site name.

- Gently mix your collected sample in the larger bottle by inverting the bottle 25 times.

- Pour at least 100 mL into each 120-mL jar. You want to be sure you have at least 100 mL, but you don't want to fill it so full that there is no airspace on top.

- If you leave the extra sample in the large bottle and bring it with you, then you'll know that bottle has already been used.

- Seal up your 120-mL jars and place them in the cooler.

- Are your next site, **do not reuse the large bottle**. You must use a new sterile 250-mL bottle at each site.

- At the lab, process your samples as usual, **using one jar for the undiluted sample and one jar for the 1:10 sample at each site**.

- Rinse out the large 250-mL bottles in the sink and leave them in the Dirty Glassware bin to be reautoclaved along with the rest of your glassware.

Morro Bay Volunteer Monitoring Program Bacteria Monitoring Datasheet

Date:	
Samplers:	
Weather, past 24 hrs:	
Weather currently:	

High Tide Time:	
High Tide Height:	
Rainfall in past week:	

Site ID	Collection Time	Parameter	Dilution Factor	# Large Wells	# Small Wells	MPN/100 mL	Notes
		Total coliforms					
		E.coli					
		Enterococcus					
		Total coliforms					
		E.coli					
		Enterococcus					
		Total coliforms					
		E.coli					
		Enterococcus					
		Total coliforms					
		E.coli					
		Enterococcus					

Test	Colilert-18	Enterolert
Time incubation started:		
Name of sample reader:		
Incubator temp when read:		
Date samples read:		
Time samples read:		

Site Codes

BAY SITES: Cuesta Inlet (**CIN**), Baywood Park (**BAY**), Pasadena Pt. (**PAS**), Windy Cove (**WIN**), State Park Marina (**SPM**), Coleman Beach (**COL**),Tidelands Park (**TID**), Santa Lucia Seep (**SLS**) 3rd Street Dock, North/South (**TRN, TRS**), Pismo Seep (**PSS**) Midway Seep (**MID**)

CREEK SITES: Los Osos Crk at Turri **(SYB),** Walters Crk near Hwy 1 **(WAL)** Pennington Crk near REC school (**PEN**),Warden Crk at Turri (**TUR**), Chumash Crk at flume (**CHU**) San Bernardo Crk at culvert (**SBE**), San Luisito Crk at bridge (**SLU**)Chorro Crk at Canet Rd (**CAN**), Chorro Crk at Ecological Reserve (**CER**), Chorro Creek at South Bay Blvd (**TWB**) Dairy Crk at culvert (**DAL**), Dairy Crk at gate (**DAM**), Dairy Creek at crossing (**DAU**)

Colilert-18 samples: read after 18-22 hours **Enterolert: read after 24-28 hours**

If multiple dilutions were run, report results that have between 48 and 78 positive wells (50-80% of the 97 wells). This might be separate dilutions for the different bacteria types.

Appendix B. Morro Bay Volunteer Monitoring Program
Water Quality Monitoring Protocols and Field Guide

Morro Bay Volunteer Monitoring Program
Water Quality Monitoring Protocols and Field Guide

Morro Bay Volunteer Monitoring Program
Water Quality Monitoring Protocols

Table of Contents

Field Hazards and Precautions

Poison Oak and Stinging Nettle are two noxious plants that grow along side many creeks throughout the watershed. If you need to move your sampling location upstream or downstream slightly to avoid contact with these plants please do so!

If you do brush up against poison oak, wash the affected area with Technu and Cala gel which are available in our office.

If you brush up against stinging nettle, it is best to soak the affected area in cold water and apply a Benadryl gel to block the antihistamine response.

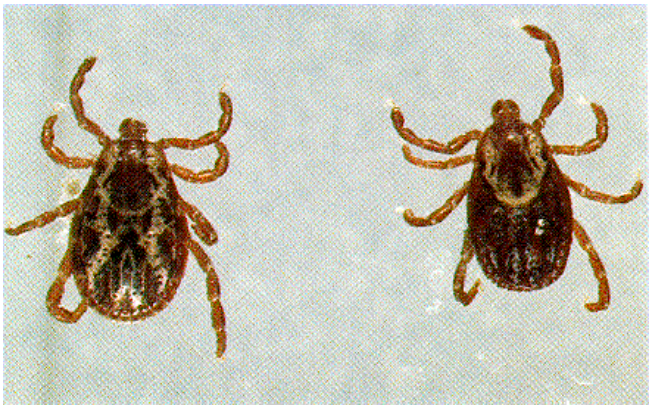
Poison Oak:
Identify by shiny 'leaves of three' and lack of thorns on branches. Leaves turn red and orange seasonally.

Stinging Nettle:
Leaves have jagged edges, and small grainy flowers hanging from where leaves meet the stem. These plants

Field Hazards and Precautions

Ticks are often found in cool riparian areas during the spring and summer. They will climb onto clothing and then onto skin where they bite and attach. They are known to transmit diseases, and should be avoided and removed immediately. See the following page for additional information.

Rattlesnakes are also occasionally encountered in the watershed. They can be identified for the dark diamond pattern and characteristic rattle. If you see a rattlesnake, leave the area immediately.



Two common varieties of ticks in the Morro Bay area.

Rattlesnakes: Identify by diamond patterning and rattle at the tail.

Emergency Phone Numbers and Contacts

EMERGENCY: 911

Morro Bay Police: (805) 772-6225

Morro Bay Fire: (805) 772-6242

County Sheriff: (805) 781-4550

California Highway Patrol: (805) 593-3333

National Estuary Program Office: (805) 772-3834

Wildlife:

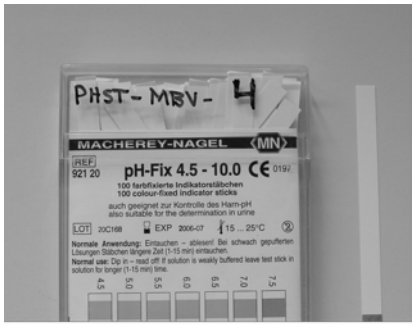
Marine Mammal Rescue Center: (415) 289-7327
Injured or sick marine mammals.

Pacific Wildlife Care: (805) 543-9453
Injured or orphaned wildlife (fawns, birds of prey, other animals)

Where to Take Measurements:

- Optimum location: center of creek at 1/3 of water depth
- Try to sample in part of creek with mixing, do not sample in stagnant pools.
- Don't stir up water when taking measurements.
- Face upstream when taking sample – stay downstream of the equipment/sample.

pH Measurement



- Take out piece of paper and CLOSE THE CONTAINER.
- Dip into water quickly so that all three color bars are wetted.
- Shake off water.
- Compare to color chart immediately!
- **Color is stable for only 10 seconds**, according to the manufacturer.
- Read in shade, not in sun for more accurate color.

Dissolved Oxygen, Temperature, and Conductivity with YSI Model 85 Meter

These YSI meters can measure DO, temperature, salinity, conductivity and specific conductance, which is a temperature-adjusted conductivity value.

- Turn on meter upon arriving at the site by hitting the ON/OFF button. The meter requires ten to 15 minutes to stabilize before you can take readings.

- 

- To collect Dissolved Oxygen (DO) readings:
    - Place probe in water. The entire probe **up to the cable** must be submerged to ensure that all necessary instrumentation is in contact with the water.
    - Gently move the probe while measuring. The instrument requires a minimum of 1 ft/sec of flow across the probe for an accurate reading to be taken.
    - Press the mode button until DO percent saturation is displayed. This is indicated by a small '%' sign in the upper right corner of the screen.
    - Once the value has stabilized, record it on the datasheet as Dissolved Oxygen, %.
    - Next, hit the MODE button. The screen will display the DO value in mg/L. This will be indicated by a 'mg/L' on the screen to the right of the value.
    - Once the value has stabilized, record it on the datasheet as Dissolved Oxygen, mg/L.
    - Record the temperature in ^{o}C from the bottom right corner of the screen.

- 

The units will be in uS or mS.

The ° C symbol will be flashing when you are in the correct mode.

- Take a Specific Conductance reading:
  - Hit the mode button one more time and you will see a value with either a **µS** or **mS** as the units. This value is a conductivity reading without any temperature correction. This is NOT the value we want from this meter.
  - Hit the mode button again and you will see a value with either **µS** or **mS** and the **^{o}C** will be **flashing on and off**. This is the **Specific Conductance** mode, which is the value we want. It is also known as a temperature compensated conductivity value, which means that the meter has adjusted the reading to the calculated value which would have been read if the sample had been at 25 ^{o}C.
  - Record the specific conductance value in the Conductivity column on the datasheet.
  - The meter will indicate the units as either **µS** or **mS**. Circle the correct units on the datasheet.

- When finished monitoring:
  - Rinse the probe thoroughly with DI water.
  - Store the probe in the chamber on the side of the meter
  - Only push the probe in until the black o-ring enters the chamber, do not shove it in all the way.
  - Leave the meter on as you travel to the next site, or turn it off when done sampling.

Turbidity with HACH 2100P Portable Turbidimeter

- Triple rinse the syringe with creek water.
- Use syringe to fill glass sample cell to the 10 mL mark (white band/arrow). Handle cell by the top, not the sides.

- If outside of cell gets wet, wipe off cell with cloth in the kit – do not use your shirt or a paper towel since it could scratch the cell.
- Place a small drop of silicone on the cell then rub in with cloth to reduce the effect of scratches in the glass on the reading.
- Turn instrument on.
- At the bottom of the screen it should say 'Auto Rng'. If it doesn't, press the RANGE button until the words appear.
- Insert sample cell with diamond on cell lined up with the notch on meter.

- Close lid.
- Press READ.
- Record value after light bulb icon turns off. Units in NTU.
- Turn instrument off.
- Empty cell. Rinse cell and syringe with DI. Leave cap off in case so cell can air dry.
- Return cloth to its plastic bag to keep it clean.

Collecting Nutrient QA Sample

- Collect equipment: sample container, cooler and ice packs. They are all available in the back of the storeroom near our refrigerator.
- Label sample container as follows:
    - Client: Morro Bay Volunteer Monitoring Program
    - Location: Code for your site
    - Project: MBNEP
    - Sampler: Your name
    - Date
    - Time **[NOTE: It's very important to note the time because we need to get the sample analyzed by the lab before the holding time is exceeded.]**
    - Preservative: None
    - Sample#: Code for site and date

- At site, wade into stream at sampling location, taking care to not stir up water. Stay downstream of the area where you will be collecting the sample.
- Open the container underwater at 1/3 the depth and fill. The container does not need to be completely full. It is all right to leave an air space at the top.
- Cap the container.
- Store in cooler and return to NEP office.
- Put sample bottle in the refrigerator. Return the ice packs to the freezer.
- Let VMP staff know that you've left samples in the fridge.
- VMP staff will take the sample to the lab to be processed within 48 hours of collection.

Flow Measurement Protocol with Flo-Mate

- Choose a point on the creek with the following characteristics:
    - Wadeable (less than 3 feet deep) and not moving so swiftly as to be unsafe;
    - Lacks obstructions within 15 ft up or downstream of site;
    - Depth greater than 0.1 feet;
    - Bottom of the creek should be relatively flat and even;
    - Bottom of the creek should be solid so you won't sink;
    - Site at the beginning of a riffle, not a pool.

- Extend the tape measure across the section of the creek to be measured. When you are facing upstream, the zero end of the tape should be on the left bank. Make sure you use the side of the tape that measures feet in tenths, not inches. The tape must be held in place firmly during all measurements and not moved.
- Measure the total width of the creek.
- Record the creek length in the 'Total length' spot on the data collection form.
- Divide the total length into segments following these guidelines:
    - If your site is <5 feet wide – take at least 6 readings
    - If your site is >5 feet wide – take at least 12 readings
- If the creek length is not easily divided into segments of even length, it is fine to have shorter or longer segments at either end.
- Begin by sliding the sensor onto the mounting shaft of the top-setting rod and securing by tightening the thumbscrew. Be sure to mount the sensor so that the cable is coming straight up. Turn only till snug, do not over tighten.
- **Start on the left bank when facing upstream**. Place the top-setting rod in the water so that the sensor faces upstream, directly into the current. Stand downstream of the meter and tape so that you do not interfere with the flow. Do not stand directly behind the flow meter or you might create eddies – try to stand off to the side. Make sure the rod sits flat

on the bottom, stands upright, and that there are no rocks, sticks, algae, etc. interfering with the sensor.

- Under 'Distance from Bank', record the distance from the point on the left bank where the water begins to the point where the flow measurement is being taken.
- Visually measure the depth of the creek using the graduation lines on the hexagonal rod. Single line = 0.1 feet, double lines = 0.5 feet, triple lines = 1.0 feet. Record the depth on the data collection sheet.
- Adjust the rod so the sensor is raised above the bottom of the channel by setting the gauge on the top of the rod to the depth of the channel. To set the sensor at the correct depth, press the trigger to slide the smaller rod up or down. The smaller rod has graduations marked in feet starting with '0' for depths less than 1 foot. For example, if the creek depth is 1 foot, move the small rod so that the 1 foot graduation lines up with the "0" on the large rod. If the creek depth is 1.4 feet, raise the small rod so the 1 foot graduation is aligned with the "4" on the large rod.
- Be sure the electrodes on the sensors are submerged. They are two shaded areas on the front of the sensor. If they are not submerged, there is insufficient depth to take a reading and you can record '0' flow in the fps column on the datasheet. (Typically 0.2 feet or less.) Make sure the electrodes on the sensor are facing directly into the flow.
- Once the rod is set, press the 'ON/C' button on the box to start your first measurement.

- The meter will take readings for 30 seconds as indicated by the 'Period ■■■■…' counter. You will see the reading fluctuate as the meter calculates an average. After 30 seconds, an average value in feet per second (ft/s) will be displayed on the readout. Record this value in the fps column of the datasheet. The counter will start over and give an average value after 30 more seconds. Note: If the sensor gives a negative number, record '0'.
- Repeat measurements across the channel. At each segment, measure the depth, set the rod, press the 'ON/C' button, wait thirty seconds, then record the ft/s value.
- When you are done, turn off the meter by pressing the 'OFF' button.
- Disconnect the sensor from the rod, coil the cable, and place in mesh pocket.
- If a Low Battery warning ('Low Bat') is displayed on the screen, please notify the VMP staff so we can change the batteries.
- Use the 'Notes/Field Observations' portion of the datasheet to record any changes at the site (i.e., algal growth, wildlife, etc.). If you have had to move the site due to obstructions, note that on the datasheet.
- Report any problems with equipment to VMP staff.

Site and Gate Codes

Site ID Codes:

Chorro Creek at Twin Bridges: TWB
San Bernardo Creek: SBE
Pennington Creek: PEN
Dairy Creek, lower: DAL
Dairy Creek, middle: DAM
Dairy Creek, upper: DAU
Chumash Creek: CHU
Los Osos Creek near S.Bay Blvd: SYB
Los Osos Creek at Clark Valley: CLV
Walters Creek: WAL
San Luisito Creek: SLU
Chorro Creek at Canet Road: CAN
Warden Creek at Turri Road, near Los Osos Valley Road: TUR
Los Osos Creek near LOVR: LVR
Coon Creek at Montana de Oro: COO
Chorro Creek at Camp San Luis: CHO
Chorro Creek Ecological Reserve: CER

Gate Codes:

CER: 2855
(Please note that we are occasionally asked to use either the south or north gate depending on where animals are grazing.)

DAM and DAU
This lock is on a rotating combination based on the month and year.

	Even	Odd
JAN	**3288**	**5431**
FEB	**1302**	**6797**
MAR	**3110**	**1006**
APR	**8129**	**2083**
MAY|	**5014**	**4132**
JUN	**6722**	**9465**
JUL	**1813**	**8649**
AUG	**7522**	**1981**
SEP	**2304**	**7057**
OCT	**7602**	**2146**
NOV	**4498**	**8081**
DEC	**1112**	**5503**

Equipment Malfunctions and Common Mistakes

DO Meter:

- **Won't Stabilize:**
  This meter can jump back and forth between a few values for a long time. Pick a mid range value of those that are being repeatedly displayed and record on datasheet.
- **Displays LO BAT or will not turn on:**
  These meters take 6 AA batteries which are in the small Tupperware container in the kit. Unscrew the knob at the base of the meter by the cord and replace the batteries. Re-screw tightly!

pH paper:

- **Color changed after reading:**
  These papers are extremely time sensitive. The paper must be read within 10 seconds of being dipped in the water. If you cannot decide on a value that quickly, get an estimate with the first strip then re-test with a new strip of paper.

Nitrate Test Kit:

- **Tablets take a long time to dissolve:**
  Colder water temperatures tend to do this with our kit. There isn't a time limit to worry about when the tablets are dissolving.
- **Sample turned orange after putting in first tablet:**
  This reaction happens when the Number 2 tablet is dissolved before the Number 1 tablet. Empty the water into the waste jar, draw a new sample and make sure you are dissolving the Number 1 tablet first.

Phosphate Test Kit:

- **Screen displays a strange message, or won't zero:**
  There is a full guide to display codes for this meter in the Phosphate Meter directions in this guide.
  - If the meter repeatedly displays 'LO' bring back to the office and we'll fix it.
- **Meter will not turn on:**
  This meter takes a nine volt battery. There should be a replacement battery in the Tupperware container in the kit.

FLOW Mate:

- **Meter blinks on and turns off immediately:**
  This meter takes size DD batteries, and has to be unscrewed in order to replace them. You do not need to attempt this replacement in the field. Notify the office when you return so that staff can fix the meter and make the measurements later in the day.
- **Meter displays negative numbers:**

This may be due to very low depth (less than 0.2) so the meter is unable to take a good reading. (If this is the case, record 0 on the datasheet.)

If the meter is entirely submerged, check for obstacles in front of the bulb (rocks, large tree roots.) These large obstacles may be creating turbulence near the meter and resulting negative numbers. You can often correct this problem by raising the bulb higher up in the water and re-starting the reading.

Quality Assurance Instructions

- The data for QA is recorded on a separate form, the 'Replicate and QA Datasheet.' This form will be provided for you and is always on blue paper to distinguish it from the regular datasheets.

- **Collect replicate readings with the meters:**
  - **Dissolved Oxygen and Temperature:**
    After your initial readings have been recorded, remove the probe. Wait 10 seconds, then place the probe back into the water and allow it to stabilize. Record these readings.
  - **Turbidity:**
    After the initial reading has been recorded on the datasheet, remove the vial from the chamber and invert it a few times. Place the vial back into the meter and press 'READ.' The result is your replicate value.
  - **Conductivity:**
    Remove the probe from the water and allow the reading to drop back to zero. Place back into the water and record the reading.
  - **pH:**
    Test the water using a new pH strip from the container.

- **Nutrient Blanks:**
  A nutrient blank is sterile water that is refrigerated and transported to the water quality site for testing. AFTER you test the creek water, rinse the Nitrate and Phosphate kit vials as you normally would, then run the test the water from the Nutrient Blank bottle that you took from the fridge in the equipment room. The goal is to get a zero value for both tests.

- **Sample for QA**
  Please record the samplers name, sample ID and time on the datasheet. For instructions on collecting the sample please see the next page.

- **Flow Measurement Replicates:**
  Randomly select three points in the creek with high velocity where you are measuring flow. After the first measurement, re-start the meter to count for another 30 second period. Record the second velocity, as well as the distance from the bank on the Replicate Datasheet.

Water Quality Monitoring Data, Morro Bay Volunteer Monitoring Program

Date:	Time:	Site ID:
Team names:		
Current weather:		Rainfall in past week:

Parameter	Equipment ID (fill in number)	Data	Units (circle)	Notes/Field Observations
Water Temperature	DOE-MBV-☐		C	***Algae Present?*** YES or NO
Dissolved Oxygen	DOE-MBV-☐		mg/L	**If YES**, please describe below. (Dense or patchy, color, stringy or mats)
Dissolved Oxygen	DOE-MBV-☐		%	
Turbidity	TUN-MBV-☐		NTU	
Conductivity	EC-3NET-☐ or SAL-MBV-☐		uS or mS	
pH	PHST-MBV-☐		-	
Nitrate as Nitrogen	NO3-MBV-☐		ppm	
Ortho-phosphates	PO4-MBV-☐		ppm	

Flow Measurement		FLOW-MATE Equip. ID #: FLO-MBV:	Total Width of Stream (ft):
Distance from Bank	**Depth (0.00)**	**Velocity (ft/s)**	If your site is <5' wide take at least 6 measurements. If your site is >5' wide take at least 12 measurements.
1)			**Notes/Field Observations on Flow Conditions**
2)			
3)			**Circle one for each category below:**
4)			***Flow Volume*** **: Stagnant Trickle Moderate High**
5)			
6)			***Pools and Riffles:***
7)			☐ connected slow-moving pool
8)			☐ continuous stream with pools and riffles
9)			☐ continuous stream with uniform depth
10)			☐ separated pools or puddles
11)			***Additional Notes:***
12)			Trash/ Litter Present: YES or NO
13)			Oily Sheen or scum on Surface? YES or NO
14)			Odor detected? YES or NO
15)			
16)			
17)			
18)			

Morro Bay NEP's Volunteer Monitoring Program
Creek Nutrient Monitoring Protocol

This protocol describes the procedure for processing nutrient samples for creek water quality monitoring.

Samples are collected at the creek by the volunteers. They return to the office with the sample and conduct the analysis at the office.

This protocol is for all creek water quality sites.

Field Sample Collection

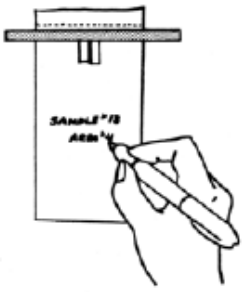
Equipment:

- Clean Whirl-pak bag
- Gloves
- Sharpie
- Pen
- Datasheet
- Clipboard
- Sampling pole (if necessary)

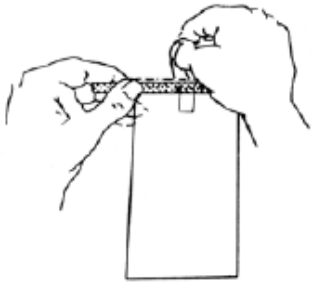
Sample Collection Procedure:

1. Collect the sample when you first arrive at the site.
2. Label the container with the site code, date of collection and time of collection.
3. Wear gloves for collecting the sample.
4. Be careful to not stir up sediment
5. Fill the Whirl-pak bag as follows:

INSTRUCTION SHEET FOR *WHIRL-PAK*® SAMPLE BAGS

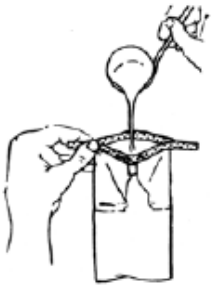


1. Label the bag with sample information if necessary.

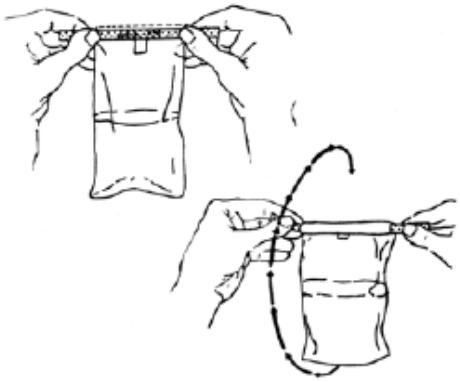


2. Tear off the top of the bag along the perforation.

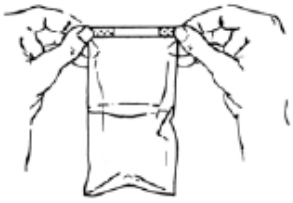
3. Use pull tabs on each side to open the bag. Sometimes a little pull on the bottom of the bag helps open it completely.



4. Put sample, liquid or solid, into bag. Leave enough space at the top for closing and mixing if needed.



5. Pull the ends of the wire to close the bag. Holding the bag by the wire ends, whirl the bag three complete revolutions to form a leakproof seal. Whirling the bag will form the tightest seal. Larger bags can be closed by "folding" the tab over as tightly as possible.



6. Bend the wire ends over onto the bag to complete the closing.

Note from VMP Staff: We recommend folding the bag down, rather than whirling it. Otherwise you might end up wearing your sample.

6. Do not store the sample on ice. Bring sample to the office to conduct the analysis.

Note: Occasionally we will request that you collect a quality assurance sample to be sent to a laboratory for analysis. If that is the case, you must also bring with you 8 oz. bottles from Creek Laboratories, one per site, as well as a cooler and ice packs. Collect the QA samples in the same manner as the other samples and store in a cooler with ice packs.

In-Office Sample Analysis

Return to the office with the sample. All equipment for analysis is contained in the bin in the white cupboards. The bin is labeled "Nutrient Analysis Equipment."

Sample Analysis for Nitrates

Equipment:

- Gloves
- Nitrate test kit
- DI water
- Timer
- Nitrate Waste Container
- Infrared thermometer
- Safety glasses

Sample Analysis Procedure

Sample temperature should be between 18 and 25°C (near room temperature) at the time of analysis.

1. Put on gloves and safety glasses.
2. Measure the sample temperature with the infrared thermometer.
    a. Aim the thermometer lens at the sample and push and hold the grey button. A number will appear on the screen.
    b. Record this value on the datasheet under Sample Temperature.
3. Record the test kit ID# on the datasheet.
4. Record the time of analysis on the datasheet.
5. Triple rinse the plastic test tube and cap from the test kit with DI water.
6. Triple rinse the syringe and plunger with DI water.
7. Record the date and time of analysis on the datasheet.
8. Mix the Whirl-pak bag by inverting it 10 times.
9. Fill the syringe with sample water and fill the sample tube approximately half way.
10. Put the cap on the tube, shake, and then discard the water.
11. Use the syringe to fill the sample tube to the 5 mL line.
12. Add Reagent #1, put on the cap and shake to dissolve.
13. Add Reagent #2, put on the cap and shake to dissolve.
14. Set timer for 5 minutes.

15. When timer rings, insert the tube in the slot in the color comparator and compare the test tube to the color bar. Hold the comparator up to a light colored surface such as the wall. Do not hold it up in front of direct light.
16. Record the nitrate value on the datasheet.
    a. For values between 0 and 1, enter '<1' on the datasheet.
    b. If values appear to be between two values other than 0 and 1, you may extrapolate the reading (i.e., if the sample color is between 2 and 4, enter a 3).
17. Pour waste into Nitrate Waste Container.
18. Triple rinse test tube and cap with DI water and discard rinse water into Nitrate Waste Container.

Sample Analysis for Orthophosphates

Samples should be near room temperature (approximately 18 to 25°C) at the time of analysis.

Equipment:

- Hanna orthophosphate meter with glass cuvets and black plastic caps
- Orthophosphate reagent made by HACH (Phos Ver 3)
- Kim Wipes
- DI water
- Syringe
- Timer
- Scissors
- PO4 Waste Container

Sample Analysis Procedure

1. You may use the same gloves from the nitrate analysis.
2. Record the meter ID# on the datasheet.
3. Record the time of analysis on the datasheet.
4. Triple rinse the glass cuvet and plastic cap with DI water.
5. You may reuse the same syringe from the nitrate analysis.
6. Analyze the sample:
    a. Fill the syringe with sample water.
    b. Fill the cuvet about halfway, put on the cap, shake, and then discard the water.
    c. Fill the syringe again with sample water.
    d. Fill the glass cuvet to the 10 mL line, cap the cuvet, and clean the outside of the cuvet with a Kim Wipe.
    e. Turn on the meter, insert the glass cuvet and press the 'Zero' button to take a zero reading.
    f. Set the timer for 30 seconds.
    g. Use scissors to cut the reagent packet open.
    h. Remove the cuvet from the meter, remove the cap and add the reagent packet.
    i. Replace the cap on the cuvet.
    j. Start the timer and swirl the cuvet for 30 seconds to dissolve the reagent.

k. Set the timer for two minutes and wait for the reaction to complete. You may need to re-clean the outside of the cuvet with an additional Kim Wipe. The caps sometimes leak and leave liquid on the outside of the cuvet.
l. Insert the cuvet in the meter.
m. When the timer rings, push the 'Read Direct' button.

7. The meter screen will show the result.
    a. If the resulting orthophosphate value is less than 2.50 mg/L, record the value on the datasheet.
    b. If the value is greater than 2.50 mg/L, then the sample must be diluted and the analysis run again. Save the sample in the fridge. **Notify staff that additional dilutions must be run before the 48-hour hold time expires.**
8. Clean up:
    a. Empty the glass cuvet in the waste container labeled 'PO4 Waste'.
    b. Triple rinse the cuvet and cap with DI water and discard into the PO4 waste container.
9. Place the used syringe and Whirl-pak bag in the bin labeled 'Dirty Glassware'.
10. Return equipment to bin and return to shelf.
11. Leave datasheet by sign-in sheet.

Procedure for Dilutions of Orthophosphate Samples
To be Conducted by VMP Staff Only

If orthophosphate results are greater than 2.50 mg/L, then the sample requires a dilution to obtain an accurate result. VMP staff check the sample fridge at the start of each day to determine if samples are present that require further dilutions.

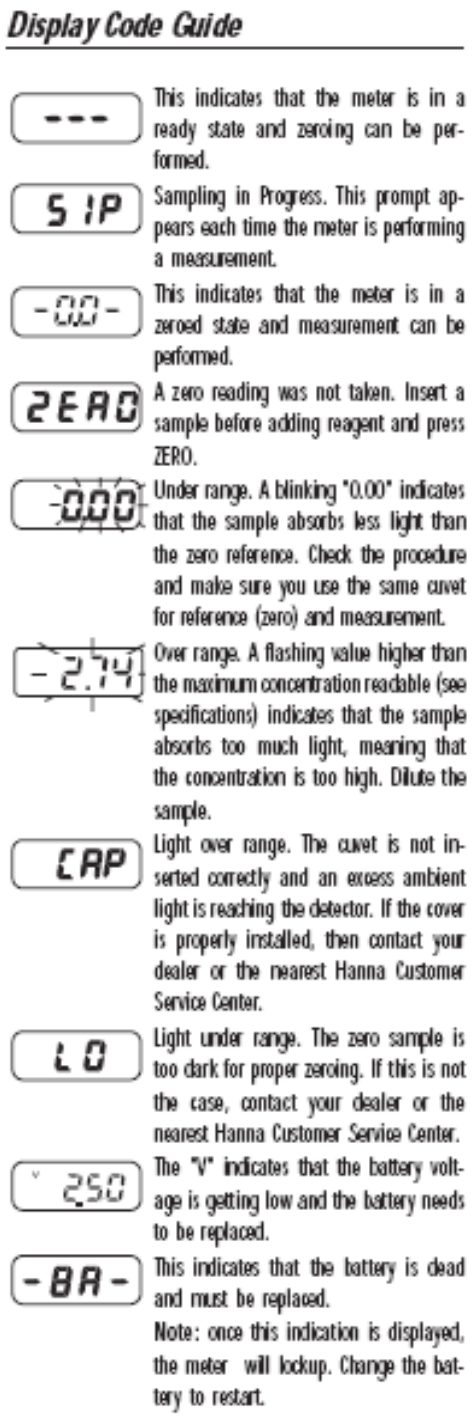
Equipment:

- Hanna orthophosphate meter with glass cuvets and black plastic caps
- Orthophosphate reagent made by HACH (Phos Ver 3)
- Kim Wipes
- DI water in a bottle
- Adjustable pipetter
- Pipette tip
- Timer
- Scissors
- PO4 Waste Container

Sample Analysis Procedure:

1. Put on gloves.
2. Record the date and time of analysis on the datasheet.
3. Triple rinse the glass cuvet and plastic cap with DI water.
4. Triple rinse the pipette tip, inside and out.
5. Place a pipette tip on the pipetter.
6. Dial the pipetter to 5 mL.
7. Dispense 5 mL of DI water from the bottle into the glass cuvet.
8. Dispense 5 mL of sample water into the glass cuvet.
9. Clean the outside of the cuvet with a Kim Wipe.
10. Turn on the meter, insert the glass cuvet and press the ‘Zero’ button to take a zero reading.
11. Set the timer for 30 seconds.
12. Use scissors to cut the reagent packet open.
13. Remove the cuvet from the meter, remove the cap and add the reagent packet.
14. Replace the cap on the cuvet.
15. Start the timer and swirl the cuvet for 30 seconds to dissolve the reagent.
16. Set the timer for two minutes and wait for the reaction to complete. Re-clean the outside of the cuvet with an additional Kim Wipe.
17. Insert the cuvet in the meter.
18. When the timer rings, push the ‘Read Direct’ button.
19. The meter screen will show the result. Record the value times a factor of two on the datasheet. Record the dilution factor of 50% on the datasheet.
20. Clean up: Empty the glass cuvet in the waste container labeled ‘PO4 Waste’. Triple rinse the cuvet and cap with DI water and discard into the PO4 waste container. Place the used pipette tip and Whirl-pak bag in the bin labeled ‘Dirty Glassware’.

Orthophosphate Meter Error Codes:



Appendix C. Morro Bay Volunteer Monitoring Program
Back Bay Nitrate Monitoring Protocol

Morro Bay Volunteer Monitoring Program
Back Bay Nitrate Monitoring Protocol

Background

Nitrate is the most oxidized form of nitrogen, and is the primary form of biologically available nitrogen. We are measuring Nitrate as a concentration of Nitrogen (NO_3_N). When expressed in this form, concentrations are approximately 4.5 times lower than when processed as Nitrate (NO_3).

Concentrations >2.25 mg/l (NO_3_N) (>10mg/L of NO_3) can cause Methemoglobinemia (Blue Baby Syndrome) in infants. Toxicity is the result of reduction of NO_3 to Nitrite (NO_2), which reacts with hemoglobin and prevents the blood cells from transporting oxygen to tissues. Relationships with other health effects, including bladder cancer and non Hodgkins Lymphoma, have been documented.

Excessive nitrate and resulting nitrite concentrations have been shown to be toxic to aquatic life such as frogs and marine invertebrates. Excessive concentrations stimulate growth of algae and aquatic plants, which can negatively affect water quality. Extensive growth of algae increases decaying vegetative material, resulting in low or fluctuating dissolved oxygen levels. Low dissolved oxygen can be lethal to fish and other aquatic species.

Excessive nitrate can originate from direct discharge from treated wastewater and sewer overflows, and non-point sources such as agriculture and urban runoff. Specific sources include fertilizers, confined livestock/animal wastes, septic systems and sewage treatment systems, and atmospheric deposition. Nitrate does not adhere readily to sediments and is transported primarily in the dissolved phase in surface runoff and through the substrate into ground water.

Source: Federal Interagency Stream Restoration Working Group. 1998. Stream Corridor Restoration: Principals, Processes and Practices.

Our level of Concern = >2.25 mg/l (NO_3-N)

Sites

#	ID	DESCRIPTION
3	BPR	Baywood Pier
4	SWT	Sweet Springs - sample from second bridge
6	CUI	Cuesta Inlet - sample from launch

Site Photos

Site 4 – Trail at Sweet Springs and Site Near Second Bridge

Site 6 –Site at Cuesta Inlet

Testing

Safety:

- **Your safety is more important than collecting the sample, so never put yourself in a situation that makes you feel uncomfortable.**
- Always go with a partner.
- Carry a cell phone. VMP Office: 772-3834 Police, Los Osos (Non-Emergency): 528-6083 Harbor Patrol: 772-6254
- Be sure to wear gloves. This protects both you and the sample from contamination.
- Wear rubber boots. The shoreline is often muddy so step carefully to avoid slips and sinking in the mud.
- Begin sampling just after a high tide, preferably a +5 tide or greater, but no less than +4 tide.

Field Equipment:

- 2 pairs of rubber boots (both people)
- 3 sample bottles (labeled 1-3)
- 1 "blank" bottle (filled with DI)
- 1 box of gloves
- 1 salinity/temp meter
- 1 bottle DI water
- 1 extendable sampling rod
- 1 cooler with ice

- datasheet

Test Equipment:

- 2 Nitrate test kits
- 2 QA bottles
- timers
- DI water
- waste collection container

Procedure:

- Gather field equipment from office.
- Fill "Blank" with DI water and place in cooler before leaving.
- Collect samples (see instructions below).
- Return to office.
- Gather test equipment.
- Run tests (See instructions below).

Collecting a Sample:

- Each site will have a sample bottle that is labeled with the site number.
- Remove lid then slide the neck of the bottle between the prongs of the extendable sampling rod.
- Carefully walk to water's edge and fully extend rod.
- Turn bottle upside down, dip underwater, turn right side up, and lift out of water.
- Carefully bring bottle back to you and cap.
- Place in cooler.
- Record time of collection on data sheet.

Measure the salinity at the site:

- Turn on the salinity meter and if necessary press the 'Mode' button until the units are '**ppt**'.
- Wrap the end of the cable around the prongs of the extendable sampling rod so the probe hangs down about 6 inches, then extend the rod.
- Insert the probe just below the surface of the water and bob it up and down so that all air bubbles are forced out of the holes in the probe. The probe must be fully submerged for the readings to be accurate.
- Wait for the reading to stabilize.
- Record the salinity and temperature values on the datasheet.
- Rinse the probe with DI water and return to the chamber in the side of the meter.

Running a Test:

- See attached pages for test procedures.

Notes:

- Shake samples before running them to mix water.
- Run samples in the same order as they were collected, but include blank randomly (i.e. some months run the blank first, some second, some third, etc.)
- Each month, two samples will be sent to Creek Laboratory in SLO for QA comparison to our samples (we will tell you which two to send). Run your sample as usual, then pour the remaining water into a sample QA bottle. Label that bottle, then place into the refrigerator.
- When reading results from the nutrient test kits, if the color from your test looks like it's between two different values on the color chart, it's OK to interpolate a value. For instance, if the color of your nitrate test looks like it's between 2 mg/L and 4 mg/L, it's fine to put 3 mg/L on the data sheet.
- Dump test waste into a plastic bottle that is labeled "NITRATE TEST KIT WASTE".
- Rinse test tubes with DI water at least three times before running next sample, pour rinse water into test waste bottle, shake out excess to dry tube.

Names:	High & Low Tide (Time & Height):	Current Weather - Rain Last Week:
Date:	Notes:	

Site #	GPS		Time of Sample	Temp (°C)	Salinity (ppt)	Equip ID	Nitrate (ppm)	Kit ID	Site Notes
3 BAY	Latitude	35°19.62' N				SAL-MBV-1		NO3-MBV-	
	Longitude	120°50.51' W							
4 SWT	Latitude	35°19.33' N				SAL-MBV-1		NO3-MBV-	
	Longitude	120°50.50' W							
6 CUI	Latitude	35°19.18' N				SAL-MBV-1		NO3-MBV-	
	Longitude	120°50.92' W							

Site Codes: BAY = Baywood Pier, SWT = Sweet Springs, CUI = Cuesta Inlet

Appendix D. Morro Bay Volunteer Monitoring Program Dissolved Oxygen in the Bay ("Dawn Patrol") Protocol

Morro Bay Volunteer Monitoring Program Dissolved Oxygen in the Bay ("Dawn Patrol") Protocol

NEP Provided Equipment

- DO meter with safety leash
- Temp/Salinity meter with safety leash
- Clipboard
- Laminated data sheet and grease pencil
- DI water to rinse probes
- Headlamp
- Kayak
- Paddles
- Lifejacket
- Anchor

Recommended Personal Equipment

Heavy nylon or water repellant jacket and pants (rubberized clothing or wetsuits can get hot) under layers of fleece. Use neoprene or rubber gloves and booties and wool cap or bandana to cover head.

Preferred optimal tides for monitoring lowest level of oxygen in the bay would be at minimum tides. The tricky part is to account for sufficient tides to avoid getting stuck! General amount of time necessary for collection is 30 minutes.

MINIMUM TIDES NECESSARY TO GET IN AND OUT:

At least 3ft+ for an incoming tide

At least 4ft + for an outgoing tide

PROCEDURE

1. Always go out with a partner. Choose a day that has an early morning high tide. You'll need three+ feet or more of water when you're taking your measurements. Field work should be conducted within two hours after sunrise. Choose a tide that allows enough water to get back safely without getting stuck in the mud (see above).

2. The most efficient route for upper bay sites (ATP, STP, LO2 and PSP), is to check ATP (Tidelands Park boat launch) from dock then drive to STP (State Marina) and launch there to get other three sites. The three backbay sites (CSI, SHI, and CHI) can accessed by launching from Cuesta Inlet.

3. Before setting out, turn on the DO meter to give it time to warm up. It's a good idea to turn on the meter as you start out so it has adequate time to stabilize before you start taking measurements.

4. Use the safety leashes to clip the meters to either yourself or your kayak. We've lost many meters at the bottom of the bay!

5. For safety, and to help fill out the data sheets, use the headlamps. Don't forget to wear a lifejacket.

6. On the data sheet record the date, time, dawn time, sunrise time, height of tide, whether it is in or out going, and the current weather (especially wind, clear, foggy or rain).

7. Paddle to the site. Approximate your location based on landmarks.

8. Measure the DO at the site.
   a. Remove the probe from the chamber.
   b. Hit the Mode button so that the units shown for the reading is '%'.
   c. Place probe in the water just below the surface and move the probe slowly. You want to move the probe at an even pace, about 2 feet per second, either back and forth or in a circle. Alternatively, you could use faster and shorter strokes in an up and down motion. You'll know when you're moving the probe correctly because the meter reading will stabilize.
   d. Wait until the meter reading stabilizes.
   e. Record DO value at the surface (or a depth value of '0') in %.
   f. Hit the Mode button to switch the units to mg/L. Wait for the reading to stabilize and record the value.
   g. Record the temperature.

9. Measure salinity at the site.
   a. Insert the probe just below the surface of the water and bob it up and down so that all air bubbles are forced out of the holes in the probe. The probe must be submerged in the water beneath the vent holes on the top of the probe. If not adequately submerged, the water won't come in contact with the probe and the reading will be inaccurate.
   b. Hit the Mode button until the units for the reading are 'ppt.'
   c. Wait for the reading to stabilize. (The range message must complete.)
   d. Record the salinity value on the datasheet.
   e. Rinse the probe with DI water and return to the storage chamber on the side of the meter.

10. Paddle to the next site and continue monitoring.

11. Upon completion of data collection, return equipment and datasheet to the NEP office. Let NEP staff know if there are any problems with the equipment.

Dawn Patrol	Date:	Time:	Sunrise:
Samplers:		Weather:	
Tide (height & time): Incoming / Outgoing (circle)			Equipment ID:

		Readings at the Surface				
Site	**Time**	**Salinity (ppt)**	**Temp (C)**	**DO (mg/L)**	**DO, %**	**Description**
CSI						1/2 way between sign board on shore at boat launch & the other side of inlet
SHI						mouth of shark's inlet - end of golf course and across from last houses
CHI						next to 'no hunting' sign, water stick marker, south of private pier, north of cuesta inlet mouth
PSP						across from big brown house up on point, water marker to the west
LO2						midway between red tube bouy and black water marker 100 yds apart
SPM						directly out from museum of natural history
ATP						just off boat tie-up at tidelands

Appendix E. Morro Bay Volunteer Monitoring Program Stormwater Monitoring ("First Flush") Protocol

Morro Bay
Volunteer Monitoring Program
Stormwater Monitoring ("First Flush") Protocol

Pre-Flush Preparations

1. Note all coolers and sample bottles labeled with Site and Sample ID codes.

2. Note site locations, site codes, and site monitoring route for specified city.

3. Visit sites during daylight to become familiar with monitoring locations and site needs.

First Flush Event

1. Designate a data recorder from the team of volunteers assembled. This person will be responsible for recording all data for the four sites.

2. **Assemble all equipment:**

Coolers for designated sites
Gloves
Bucket and Cup
Site Maps and Descriptions
Datasheets and Pencils
Rainjackets and boots
Sampling Pole
Headlamps / FlashlightsDI Water

3. Upon arrival at each site data recorder fills out top half of the *Field Datasheet.*

4. At the site, rinse the bucket or sampling cup 2-3 times in the outflow before collecting samples.

5. Collect outflow and use cup to pour water into sample bottles. **DO NOT RINSE SAMPLE BOTTLES!** Sample bottles have been sterilized and contain preservatives!

6. Data recorder notes time each sample is collected, and who completes the collection on the 'Sample Collection' area of the datasheet.

7. Data recorder notes all measurements and time taken under the 'Field Measurements' portion of the *Field Datasheet*.

8. Bucket and cup are rinsed 2-3 times with outflow at next site.

10. Data recorder notes departure time at the top of the datasheet.

Morro Bay National Estuary Program
Volunteer Monitoring Program

Stormwater ("First Flush") Sampling Bottles and Kit Supplies

Oil and Grease:

- Creek Laboratory Analysis
- 1 quart glass bottle, sulfuric acid preservative
- 28 day hold time

Metals (dissolved metals):

- Creek Laboratory Analysis
- 8 oz. plastic bottle, no preservative.
- We conduct filtration ASAP after sample collection.

Nutrients (orthophosphates and nitrates), TDS and TSS

- Creek Laboratory Analysis
- ½ gallon plastic bottle, no preservative.
- 48 hour hold time for nutrients, 7 day hold time for TDS and TSS.

Bacteria (E. Coli, Total Coliform)

- San Luis Obispo County Public Health Agency
- 1 sealed IDEXX bottle with sodium thiosulfate
- 24 hour hold time.

pH

- VMP analysis
- 8 oz. sterile plastic bottle.
- Check pH ASAP.

Additional Supplies

De-Ionized water

Headlamps and Flashlights

Rain jackets

Sampling pole, bucket.

Maps and Datasheets (Rite-in-Rain)

Coolers and Icepacks, all samples must be chilled to 4 degrees Celsius!!

Stormwater ("First Flush") Timeline of Events

Today:	Review of site locations and protocol. Designation of Los Osos Team Captain.
24-48 hours prior:	Team captains notify volunteers of incoming weather and potential for first flush monitoring.
1-4 hours prior:	Team captains watch local weather conditions, look for potential sheet flow from the streets.
Minutes Prior / Start Time:	Team captains observe sheet flow, mobilize volunteers.

Sheet Flow Observed:

Volunteers need to mobilize as quickly as possible, all water must be collected during first hour after sheet flow is observed!

20 Minutes of SF	Volunteers meet at designated meeting points: Baywood Pier Parking Lot in Los Osos MBNEP Office in Morro Bay
30 Minutes of SF	Volunteers leave from meeting points, begin site routes.
1 Hour after SF	All water is collected, stored in coolers. Coolers brought to MBNEP office. Samples analyzed for pH.

MBNEP staff will conduct analysis of selected water quality parameters.
Remaining samples will be prepared for laboratory analysis.

Morro Bay National Estuary Program
Volunteer Monitoring Program
First Flush Monitoring

Monitoring Route: | Date:

Team Captain: | Captain's Phone Number:

Team Members:

Sample ID	Time Collected	Collected By	Container Type
310-			Large ½ gallon plastic
			Amber glass bottle
			Medium plastic unsealed
			Small sealed plastic

Captain Signature _____

VMP Staff Signature _____

Time Relinquished to MBNEP _____

Morro Bay National Estuary Program

Date:	Site Code:
Arrival Time at Site:	Departure Time at Site:

Site Conditions: **(**please circle one)

Precipitation: Mist Drizzle Rain Downpour

Water Clarity: Clear Cloudy Murky Muddy Dark/Black

Wind: Calm Light Medium Strong

Flow: 5 gal/min 10 gal/min 25 gal/min 50 gal/min

Observations: **Description and Notes:** (eg. kinds of trash seen)

Oily Sheen? Y/N _____

Odor Y/N _____

Floating Trash Y/N _____

Bubbles/Foam Plume at outlet? Y/N _____

Dark Plume at outlet? Y/N _____

Other Observations and Notes:

Creek Environmental Laboratories, Inc. Chain-of-Custody

141 Suburban Road, Suite C-5, San Luis Obispo, CA 93401 www.creeklabs.com lab@creeklabs.com phone (805) 545-9838 fax (805) 545-0107 Order # _____

- Please Print in Pen

Client Name	Contact	Phone	Due Date:
Morro Bay NEP Volunteer Monitoring Program	Annie Gillespie or Ann Kitajima	(805) 772-3834	24Hr 48Hr Other Normal TAT
Address / **City** / **State** / **Zip**		Fax	Cell
601 Embarcadero, Suite 11 / Morro Bay / CA / 93442		(805) 772-4162	Beeper (805) 540-0861
Project Name/Number		PO#	Copies To:
FIRST FLUSH (FFLUSH)			
Bill to: (if different from above)	Address	City	State Zip
Sampler Name (Print)	Comments:		**Matrix Key:** DW = Drinking Water AQ = Aqueous SL = Soil/Solid

Sample Description	Date/Time Sampled	Analysis	Matrix	# of Bottles	Preservative / Type Bottles	Creek Lab Sample #
		Dissolved Metals, Pb, Ni, Zn, Cu (sample already filtered)	AQ	1	8 oz. plastic	
		Oil and Grease	AQ	1	1 qt. Amber glass, H2SO4	
		TDS, TSS.	AQ	1	1 quart plastic	
		Orthophosphates (OP as P), Nitrates (NO3 as N), pH, Turbidity (NTU), conductivity	AQ	1	8 oz. plastic	

RELINQUISHED BY (Sign)	(Print)	(Organization)	DATE/TIME	RECEIVED BY (Sign)	(Print)	(Organization)
						Creek Environmental Laboratories, Inc.

FOR LAB USE ONLY: Shipping Method: Client/ Lab/ Courier: Sample Conditions: Intact: Y/ N **Temp:** _____ Custody Sealed: Y/ N

REMARKS_____

Sample Chain-of-Custody for First Flush

Morro Bay National Estuary Program's Volunteer Monitoring Program
First Flush Dissolved Metal Sample Filtration Procedure

Equipment:

Stormwater samples
10 mL syringes (one per sample)
Syringe filters, 40 um pore site with 1um pre-filter (three per sample)
Clean 8 oz. plastic bottles (one per sample)
Sharpie
Gloves
Waste container

Procedure for Filtering Dissolved Metal Samples:

1. Wear gloves.
2. Allow metals stormwater samples to sit, undisturbed, for approximately 10 minutes before filtering.
3. Label all sample containers with site names.
4. Remove a sterile syringe from its packaging.
5. Draw 10 mL of stormwater sample into the syringe.
6. Remove a syringe filter from the container.
7. Attach the syringe filter to the end of the syringe.
8. Press the plunger of the syringe and filter approximately 2 mL of sample into the waste container.
9. Filter the remaining volume in the syringe into the sample container.
10. Remove the filter and draw up 10 mL into the syringe.
11. If the filter was beginning to offer resistance during the filtration, then put a new filter on the syringe. If a new filter is used, be sure to discard the first few mL of filtered sample into the waste container. If it was not yet clogged, then re-attach the same filter.
12. Filter the water into the sample container.
13. Repeat until you have approximately 30 to 50 mL of filtered sample.
14. Note the time of filtration on the datasheet for the site.

Appendix F. Morro Bay Volunteer Monitoring Program Urban Watch Monitoring Protocol

Morro Bay Volunteer Monitoring Program
Urban Watch Monitoring Protocol

Urban Watch Goals: To provide regular monitoring of storm drains in the communities bordering Morro Bay estuary to document the types and frequency of urban contamination reaching the bay. To generate data to educate residents and to help identify illicit discharges to assist local communities in remedying problems associated with these discharges.

Volunteer Commitment: Volunteer will monitor once a week during their assigned week. Each volunteer will be assigned two weeks per month. Each monitoring trip will take approximately two hours.

Overview of the Monitoring: Volunteers will observe their sites and fill out a site checklist indicating whether the drain is flowing or not. If a drain is flowing, the volunteer will fill out a more detailed 'Dry Weather Flow Datasheet' and provide more observations of the flow. Some simple analysis will be conducted at the site, and samples will be collected to be taken back to the office. More detailed analysis will be conducted by the volunteer at the office. The volunteer must return in 24 to 48 hours to interpret the bacteria results or coordinate with VMP staff to read the results.

Equipment Checklist

- Cooler
- Ice packs in a clean zipped plastic bag
- Gloves
- Deionized (DI) water
- Whirl-pak bags
- Coli-Test Whirl-pak bags (containing white pills)
- Conductivity meter
- pH paper
- Ammonia test strips
- Camera
- Datasheets, 2 types: Site Checklist and Dry Weather Flow Datasheet
- Clipboard and pen
- Sharpie
- Safety glasses
- Bucket on rope
- Timer

Scheduling UW Monitoring

Do not conduct monitoring if a there has been significant rainfall in the previous 72 hours.

Try to schedule your monitoring trips at random times. If possible, conduct one set of observations on a weekday and one set on a weekend.

Completing the Site Checklist

1. Collect your equipment and proceed to your first storm drain.

2. Complete the general information on the Site Checklist: Name, date, weather, and tide information.

3. At each site, enter the three letter site code on the checklist.

4. Enter the time you are at the site making the observation.

5. Check whether the site is flowing, ponded, dry or tidally influenced. The tidal category would apply if the storm drain appears to have been recently inundated by the tide.

6. If a site has flow that is not tidal, then fill out a Dry Weather Flow Datasheet for the site.

7. Complete the checklist for all sites. If you've collected flow samples for some of your sites, return to the office to analyze the samples. If none of the sites were flowing, then Urban Watch monitoring is complete.

What To Do If a Site Has Flow

- First you should collect your sample, because the flow could end quite quickly.

- If the runoff is particularly egregious (i.e., clearly polluted), contact the authorities that can respond. Some clues to look for include a solvent smell, a hydrocarbon smell, large amounts or dirt or paint, etc.

- For Morro Bay:
    - During the week: if you suspect that the source is from a construction site, call Damaris Hanson at the city offices at 805-772-6165. If she is not available, call the city offices at their general number 805-772-6162and ask for Rob Livick or Dan Doris. If none of them are available, be sure to leave a message with the front office staff rather than leaving a voice mail. If it is not a construction site or if none of the City of Morro Bay staff are available, call the police department at 805-772-6237 and ask for Commander Tim Olivas.
    - During the weekend and after hours: call the police department at 805-772-6237.

- For Los Osos:
    - During the week: Call SLO County Environmental Health Department at 805-781-5544 and tell the receptionist that you would like to report a potentially illegal discharge.
    - During the weekends and after hours: Call 911 and tell the Sheriffs Dispatch that you have a non-emergency call and would like to report a potentially illegal discharge that the County Environmental Health Department might need to respond to.

- If you can't get a response and the runoff is particularly nasty, then call 911.

- If you can determine that the runoff is from a private citizen (i.e., irrigation or car washing, oil, foam, gasoline), note the address or general neighborhood of the source. Local agencies will use that information to determine where to target their education and outreach efforts. In the future, a mailer might be distributed in the area to educate local residents.

- If you can clearly identify that the runoff is from a business, make a note of the business name and location. Take pictures if possible to document the amount and condition of the runoff.

- **It is NOT the role of program volunteers to confront or educate either the public or local businesses about runoff regulations.** The volunteer role is to collect as much documentation as possible about a discharge incident so that local authorities can use it to target their efforts.

Collecting a Runoff Sample

1. When a site is flowing, the first thing you should do is collect a sample. Flows are often short in duration and you don't want to miss it.

2. Put on gloves and safety glasses.

3. Label two Whirl-Pak bags and one Coli-Test Whirl-Pak bag (contains white pills) with the site code BEFORE you collect the sample. One Whirl-Pak bag is for the analysis conducted in the field, and one is for the analysis to be conducted at the office. The Coli-test Whirl-Pak bag is for bacteria analysis, which will be conducted at the office.

4. Open each Whirl-Pak bag by tearing off the strip across the top. Pull open the bag using the paper tabs and hold by the wires. The bags are sterile and so to avoid contaminating the sample, you should not touch the inside of the bag.

5. Try to collect the flow without disturbing the sediment at the bottom of the storm drain. Fill the bags up to about 4 cm from the top.

6. Seal the Whirl-Pak bags by rolling the top edges down three times and then twisting the wire edges together. Check for leaks by upending the bag and giving it a gentle squeeze.

7. Store the Coli-Test bag and one of the Whirl-Pak bags in the clean plastic bag with the ice packs in the cooler for analysis at the office.

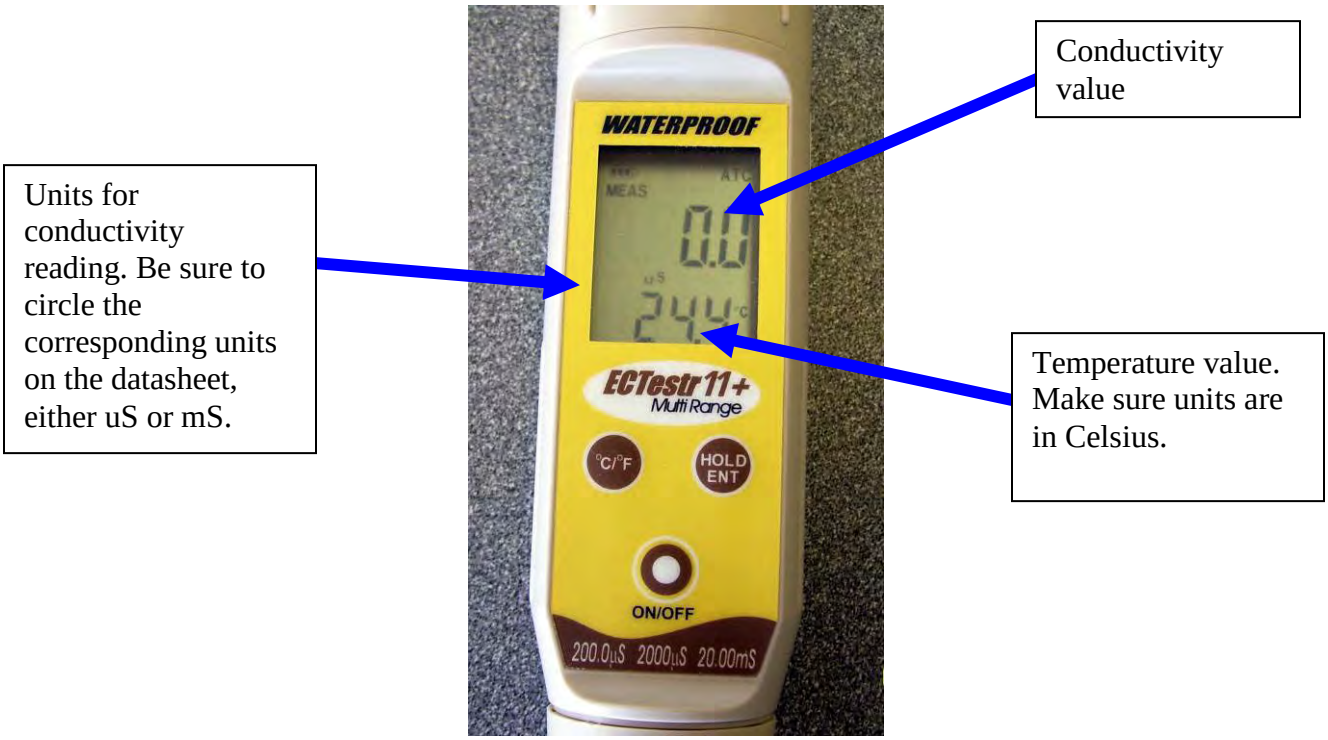
8. Conduct your field measurements (temperature, conductivity, total residual chlorine, ammonia and pH) on the remaining Whirl-Pak bag.

Conducting Field Analysis

- Use your collected water in the Whirl-Pak bag for field measurements.
- Record the Urban Watch Kit # on the datasheet (written on the lid of the cooler).
- Be sure to conduct analysis for pH last.

Water Temperature and Conductivity

1. Uncap the meter and press the ON/OFF button to turn on the meter. Check that the temperature readout is in Celsius
2. Triple rinse the metal probes with DI water to ensure that they're clean.
3. Hold the Whirl-Pak bag by the wire on top to avoid heating the water sample with the heat from your hand
4. Insert probes into the Whirl-Pak bag.
5. Make sure the electrodes are fully submerged but are not near the bottom or sides of the Whirl-Pak bag.
6. Once the reading stabilizes, press the HOLD button and remove the meter from the water to read the result. (This holds the latest reading from the meter.)
7. Record the temperature reading on the datasheet, which is the number at the bottom of the meter's screen. Make sure the reading is in Celsius.
8. Record the conductivity reading on the datasheet, which is the value at the top of the screen. Circle the correct units, either uS or mS. If the meter reads 'OR', this means the reading is out of range for the meter. Record 'OR' on the datasheet.



9. Turn the meter off.

10. Triple rinse the electrodes with DI water and recap the meter.

11. Record the meter's Equipment ID# on the datasheet.

Ammonia Nitrogen

1. Rinse sample vial twice with DI water.

2. Fill with sample water and then discard into the Nontoxic Waste Container.

3. Fill with sample water to top line.

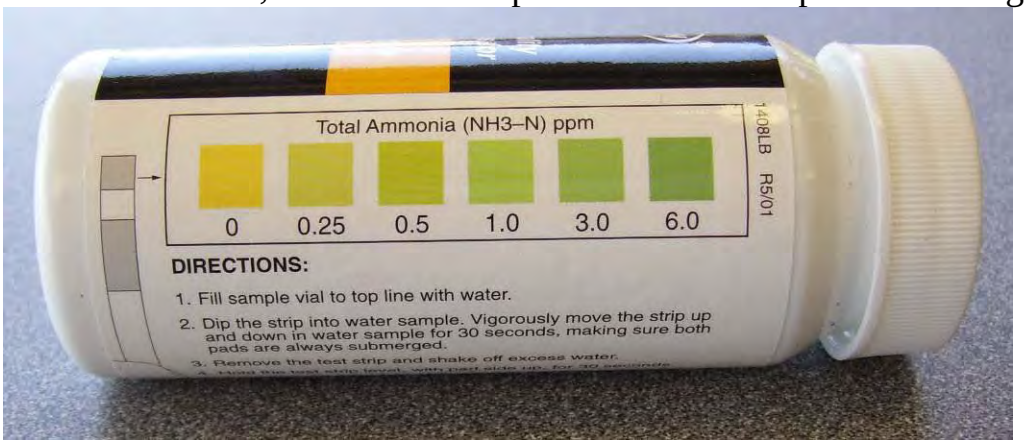
4. Remove a strip from the container and recap tightly. Be careful to not touch the pads on the test strip to avoid contaminating it.

5. Dip the strip into the water sample. Vigorously move the strip up and down in the water for 30 seconds, making sure both pads are always submerged. Use the timer to track the time.

6. Remove the test strip and shake off excess water.

7. Hold the test strip level, with pad side up, for 30 seconds.

8. To read result, turn the test strip over so that both pads are facing away from you.



9. Compare the color of the small pad to the color chart on the bottle. Read the result through the clear plastic of the test strip. Record the corresponding value on the datasheet. Remove your sunglasses before reading. If the color seems to fall between two different levels, do NOT interpolate the results. Choose the closest value and record that on the datasheet.

10. Discard the test strip in the trash bag in the kit.

11. Rinse the sample vial with DI water twice and discard in Nontoxic Waste Container.

12. Keep the test strip container tightly sealed and out of the sun.

Total Residual Chlorine

Sample should be analyzed as soon as possible after collection.

1. Use the same syringe used for previous tests.

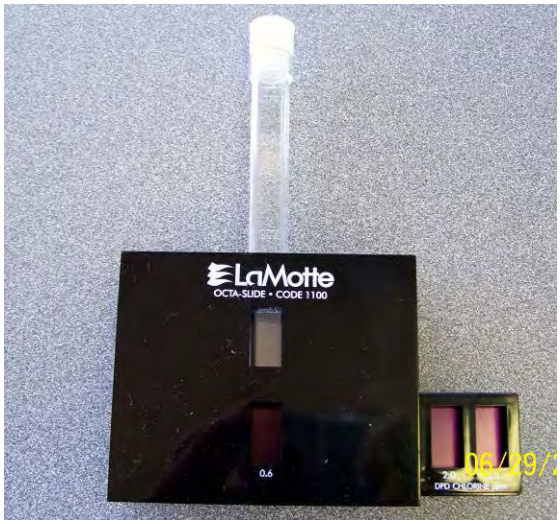
2. Rinse the sample tube twice with DI water.

3. Rinse sample tube once with water to be tested and discard into Nontoxic Waste Container.

4. Use the syringe to fill the tube to the 10 mL line with the sample water.

5. Add one DPD #1R tablet, cap and shake to dissolve.

6. Add one DPD #3R tablet, cap and shake to dissolve.



7. Immediately insert tube into Octa-Slide Viewer and match sample color with the Octa-Slide. You must pick a number from the color bar. Do not estimate between numbers. If the color is lighter than the lightest color on the bar, record <0.2 mg/L on the datasheet.

8. Dispose of sample into Nontoxic Waste Container.

9. Rinse the tube twice with DI water, dumping the water into the Nontoxic Waste Container. Store the tube, uncapped, in the kit.

pH

1. Remove one pH strip from the package and re-cap the package.

2. Insert the pH paper into the bag (be sure to hold the bag by the wire on the top).

3. Submerge all three bars and immediately remove from the water.

4. Flick to remove surface water.

5. Read within 10 seconds. Compare it to the color bars on the package and record the data. Be sure to choose the best match for all three color bars. Read in the shade, not the sun for more accurate color. Remove your sunglasses before reading for a more accurate interpretation.

6. Record the pH package ID# on the datasheet under Equipment ID#.

7. Discard the used test strip in the trash bag in the kit.

Once all of these readings are complete, you can use the same water for the Runoff Characteristics (odor, color, etc.).

Completing the Urban Watch Flow Datasheet

1. Complete the general information including date, time of observation, your name and the three letter site code.

2. **Odor**: Hold the open Whirl-Pak bag about six inches from your nose. Use your free hand to fan the scent toward your nose. Never inhale the air directly off the top of the sample. Record your observations.

3. **Color**: Under natural light and not in direct sunlight, hold the Whirl-Pak bag against a white background and observe the color.

4. **Clarity**: Hold up the Whirl-Pak bag to the light and observe the sample clarity. Record your observations.

5. **Floatables**: Observe the flow from the storm drain and note any floatables including trash, cigarette butts, food wrappers, bubbles or foam, oily sheen, fecal matter or Other. For the category "Other", please provide a brief explanation.

6. **Deposits in pipe**: Look into the storm drain pipe and note any sediment or gravel, fine particulates, stains, oily deposits or Other. For the category "Other", please provide a brief explanation.

7. **Water Flow**: Estimate the water flow from the storm drain. The best way to do this is to imagine how long it would take for the flow from the drain to fill a one quart bottle or a gallon-sized bottle.

8. **Does the flow reach the receiving water?** Note whether or not the flow is reaching the bay or whether it appears to be absorbed by vegetation, evaporating, etc.

9. **Evidence of Overland flow?** Note any obvious sources of flow, including irrigation runoff and vehicle washing that are visible from the outfall.

10. **Location of source**: Make notes about the source including an address or business name.

11. **Photos**: If you take photos of the site, provide notes and details to help understand the photo. Examples of things to photograph: unusual water colors or flows, unusual amounts of trash, pollution sources.

Conducting Lab Analysis

- If samples were collected, return to the office to conduct further analysis.

- Analysis must take place at the office when the building is open. Building hours are typically 8 a.m. to 5 p.m. on weekdays and 10 a.m. to 5 p.m. on weekends.

- All analysis will take place in the VMP Equipment Room, located in the Estuary Nature Center in the Marina Square Building.

- If you cannot get into the building to conduct your analysis, you must store your samples properly until the next day when they can be analyzed. Place the Whirl-Pak bags into a clean zipped plastic bag and store in a refrigerator or store on ice in a cooler. Do not freeze samples. The samples must be analyzed within 24 hours after collection. Chlorine sample should be analyzed as soon as possible after collection because the sample rapidly degrades over time.

- **You must wear gloves and safety glasses** when conducting all laboratory analysis.

- For each piece of equipment, record the Equipment ID# on the datasheet. If a data reading ever seems suspect, VMP staff can test the meter to determine whether it is due to an equipment malfunction.

- Waste from the Orhophosphate and Nitrate tests each have a separate container. All other water waste can go into a single Nontoxic Waste Container.

- All equipment you need for your analysis is contained in the white cabinet in Water Quality Kit #2 and in a bin in the cabinet marked ‘Nutrient Analysis.’

Turbidity

1. Using the same syringe from the previous test (total residual chlorine), fill it with sample water and fill glass sample cell to the 10 mL mark (white band/arrow). Hold the glass cell by the top, not the sides.

2. If outside of cell gets wet, wipe off cell with cloth in the kit – do not use your shirt or a paper towel since it could scratch the cell.

3. Place a small drop of silicone on the cell then rub in with cloth to reduce the effect of scratches in the glass.

4. Push the POWER button to turn the meter on.

5. At the bottom of the screen it should say ‘Auto Rng’. If it doesn’t, press the RANGE button until the words appear.

6. Insert sample cell with diamond on cell lined up with the notch on meter.

7. Close lid.

8. Press READ.

9. Record value after light bulb icon turns off.

10. Push the POWER button to turn the instrument off.

11. Empty cell. Rinse cell and syringe with DI and discard into Nontoxic Waste Container. Store in the case with the cap off so cell can air dry.

12. Return cloth to its plastic bag to keep it clean.

Orthophosphate

1. Sample must be between 18 and 25° C at the time of analysis.

2. Turn the meter on by pressing the ON/OFF button.

3. When the meter displays '---' it is ready for use.

4. Use the syringe to fill the vial with sample water and then discard the water into the Nontoxic Waste Container.

5. Use the syringe to fill the vial to the 10mL line marking and screw on the cap.

6. Use lens paper to dry off the vial.

7. Place the vial in the chamber making sure that the notch in the cap is positioned securely into the groove.

8. Press the 'ZERO' button, a '5IP' message will appear, and will change to 0.0 in a few seconds.

9. Once zeroed, remove the vial and carefully add one packet of reagent manufactured by HACH.

10. Replace the cap and swirl gently for THIRTY SECONDS until most of the crystals are dissolved. Use the timer. Do not vigorously shake the vial or it will leak.

11. Place the vial back into the meter and set a timer for two minutes.

12. When the timer goes off, hit the READ TIMED button. Record the value on the datasheet.

13. Store waste in a container labeled Orthophosphate Waste. DO NOT MIX WASTES FROM THE DIFFERENT TYPES OF TESTS.

14. Rinse the vial and cap out twice with DI water and pour the rinse water into the Orthophosphate Waste Container.

15. Store vial in the kit with the cap off so that it can dry.

Nitrates

1. Sample must be between 18 and 25° C at the time of analysis.

2. Fill the plastic sample tube with DI water, cap, shake to rinse, and then discard water into the Nontoxic Waste Container. Repeat again.

3. Use the same syringe to fill plastic sample tube with water from Whirl-Pak bag. Swirl and discard into the Nontoxic Waste Container.

4. Refill the tube to the 5 mL line with the sample water.

5. Add one Nitrate # 1 Tablet, cap and mix until the tablet dissolves.

6. Add one Nitrate # 2 Tablet, cap and mix until the tablet dissolves.

7. Begin timing for 5 minutes once the tablet has dissolved.

8. At the end of 5 minutes, place the test tube into the color comparison slide viewer.

9. Match the sample color to the most appropriate color standard.

10. If the color from your test looks like it's between two different values on the color chart, it's OK to interpolate a value. For instance, if the color of your nitrate test looks like it's between 2 mg/L and 4 mg/L, enter 3 mg/L on the data sheet.

11. Store waste in the container labeled Nitrate Waste. DO NOT MIX WASTES FROM THE DIFFERENT TYPES OF TESTS.

12. Rinse the plastic vial and cap twice with DI water, discarding it into the Nitrate Waste Container.

13. Store vials with caps off so that they can dry properly.

Bacteria

1. Remove a paddle tester from the box in the equipment room refrigerator.

2. Remove the paddle from the vial. Do not touch the media.

3. Immerse the entire paddle into the Coli-Test Whirl-Pak bag.

4. Remove the paddle from the liquid and allow the excess liquid to drip off. Do not shake.

5. Return the paddle to the vial and screw on the cap. Label vial with site code.

6. Place the paddle tester in the incubator in an upright position.

7. Note the time that incubation started on the datasheet.

8. Read the thermometer inside the incubator, and record on the datasheet the temperature inside the incubator.

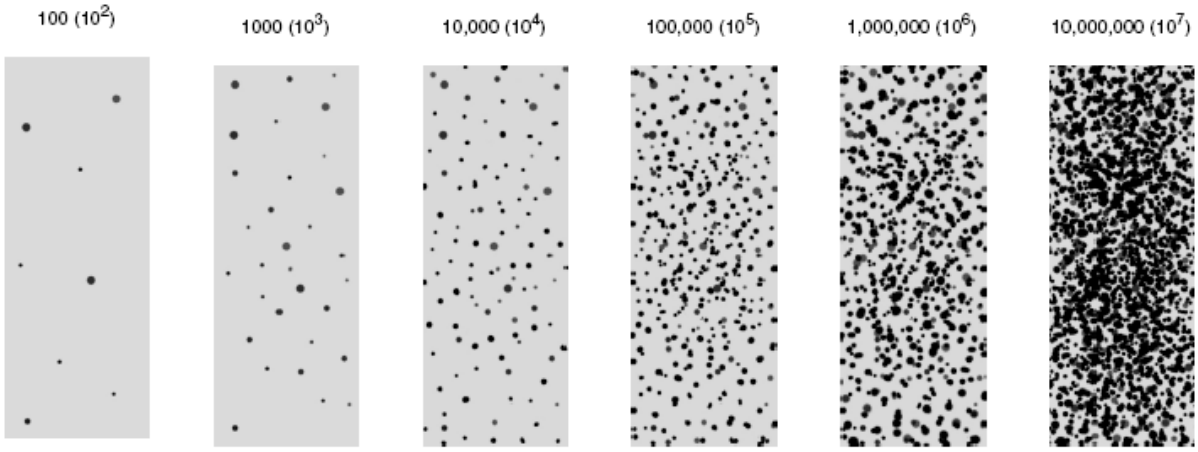
9. Results must be read in 24 hours. Notify VMP staff of start time of incubation so that they can read the results at the correct time. [If monitoring is taking place on a Friday or Saturday, VMP staff will not be available to read the results. If you cannot return 24 hours later to read the results, then do NOT run a bacteria test for the sample.]

10. Observe the red side of the paddle under direct light.

11. If no colonies are present, return the vial to the incubator and re-read after an additional 24 hours of incubation.

12. If pink colonies are present, count them and match the results to the chart below. Do not count colonies on the yellow side of the paddle. Record the value on the datasheet.

Interpreting the Level of Contamination for Total Bacteria or Total Coliform Bacteria



13. If clear or grey colonies are present, then the sample is negative for total coliform. Record '< 100' on the datasheet.

14. Sterilize the paddle tester prior to disposal. Remove the cap and add 10% bleach solution to the paddle tester as recommended by the manufacturer. Replace the cap. Dispose of in trash.

Upon Completion of Monitoring

- Pour extra water from Whirl-Pak bags into the Nontoxic Waste Container. Pour Nontoxic Waste Container down the drain and rinse with tap water.
- Rinse out the syringe so it is ready for the next volunteer.
- Make sure kit is clean and ready for the next volunteer.
- If any supplies are needed, notify VMP staff.
- Deliver datasheets and photos to the office.
- Sign-in on the clipboard in the equipment room with your name and the total time monitoring, including travel time to the sites.

Urban Watch Site Checklist

Date						
Observer name						

Atmospheric Conditions (check all that apply)

Weather	◻ Sunny	◻ Partly Cloudy	◻ Overcast	◻ Fog	◻ Windy	
Tide	◻ N/A	◻ Low	◻ High	◻ Incoming	◻ Outgoing	Tide ht (ft)

Dry Season Runoff Flow

		Check all that apply				
Site ID	**Time**	**Flowing**	**Ponded**	**Dry**	**Tidal**	**Comments**

Notes:

Morro Bay Site Codes: RMP, BWD, NTD, NTD2, PCF, PCF2, ROS, DUN

Los Osos Site Codes: ASHN, ASHS, PNE, BPR, BVH, FAR

Urban Watch Flow Datasheet

Date						
Time of observation						
Observer name						
Site ID						

Runoff Characteristics (check all that apply)						
Odor	☐ None ☐ Petroleum	☐ Musty ☐ Chlorine	☐ Rotten Egg ☐ Ammonia	☐ Chemical ☐ Sewage	Other:	
Color	☐ None ☐ Unknown	☐ Yellow	☐ Brown	☐ White	☐ Gray	Other:
Clarity	☐ Clear	☐ Slightly Cloudy	☐ Opaque	Other:		
Floatables	☐ None ☐ Cigarettes	☐ Trash ☐ Food wrappers	☐ Bubbles/ foam	☐ Oily Sheen	☐ Fecal Matter	Other:
Deposits in pipe	☐ None	☐ Sediment/ Gravel	☐ Fine particulates	☐ Stains	☐ Oily Deposits	Other:
Water Flow	☐ Stagnant/ ponded	☐ Trickle (<1 qt/min)	☐ Moderate (<1 gal/min)	☐ High (> 1 gal/min)		
Does the flow reach the receiving water?		☐ Yes	☐ No	☐ N/A		
Evidence of Overland flow?	☐ None	☐ Irrigation Runoff	☐ Vehicle Washing	Other:		
Location of source (address, business name, etc.):						
Photo taken	☐ Yes	☐ No	Photo #			

Runoff Sample Analysis

Urban Watch Kit #:

Field Analysis	Equipment ID#	Result	Notes and Observations:
Water temperature (°C)			
Conductivity (uS or mS)			
pH			
Ammonia Nitrogen (ppm)			
Total Chlorine (mg/L)			

Lab Analysis	Equipment ID#	Result	Time of Start of Lab Analysis:		
Turbidity (NTU)					
Orthophosphate as PO_4 (mg/L)					
Nitrate as N (mg/L)					
Total coliform (CFU)			Incubation start time:	Incubator temp:	Time read results:

Appendix G. Morro Bay Volunteer Monitoring Program
Stream Profiling Protocol

Morro Bay Volunteer Monitoring Program
Stream Profiling Protocol

Equipment List

1. Tripod
2. Level
3. Stadia Rod
4. Survey Tapes (100'and 200')
5. Clipboard, datasheet, pencil
6. Digital Camera
7. GPS (if needed)
8. Rebar, PVC Pipe (if needed)
9. Hammer (if needed)
10. Gloves, Machete (if needed)
11. Tecnu and Alcohol Wipes
12. Pants, Long Sleeves, Boots, Water

Main Steps

1. Locate Site
2. Define Cross Section
3. Measure Bankfull Width
4. Measure Bankfull Depth
5. Measure Floodplain Width
6. Set Up the Level
7. Measure Water Surface Slope (Option 1)
8. Conduct Cross Section Survey
9. Measure Water Surface Slope (Option 2)
10. Take Digital Photos
11. Clean-Up

Procedure

1. Locate Site

- GPS points, maps, photos, and descriptions should illustrate site locations. Additionally, sites should be marked with orange flagging and PVC pipes that stick out of the ground about 2 feet on each side of the stream (Figure 1). These pipes sit over rebar stakes that also mark the cross section.

Figure 1 - Stake

- The cross section number should be written on the pipe, the flagging, and a brass tag that is tied to one of the rebar stakes. If only one pipe/rebar can be found, focus your search for the other stake at an angle that is perpendicular to the channel (Figure 2), and use a plot of the cross section from previous surveys to measure the distance from the known stake to where the unknown stake should be located (Figure 3).

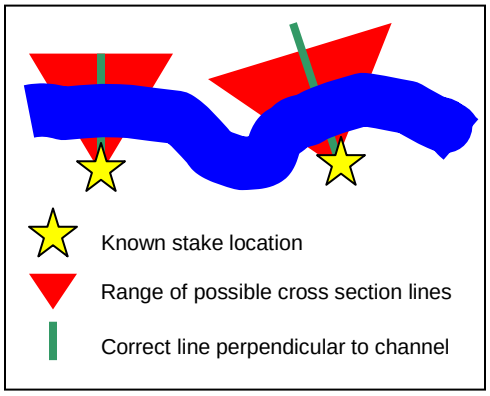


Figure 2 – Cross sections perpendicular to channel

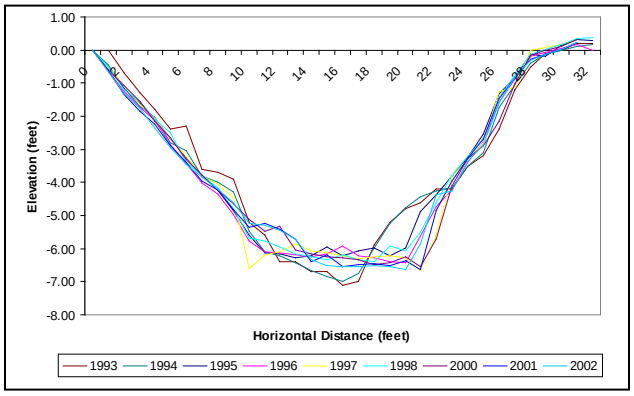


Figure 3 – Cross section plot showing 32 feet between stakes

- On data form, fill out **Creek Name**, **Site ID**, **Date**, and names of **Samplers** (Figure 4).

Creek: Chorro (upper)	Site ID: CU #5	Date: 7/1/03	Samplers: Sandy Smith, Dan Scott

Figure 4 – Example of general survey information

2. Define Cross Section

- Remove PVC pipes to reveal rebar benchmarks, then attach the measuring tape's metal hook to the rebar benchmark on the left bank (determine left bank by looking downstream) (Figure 5), stretch the tape tight across to the rebar benchmark on the right bank, and fasten by wrapping the tape around the rebar then knotting.

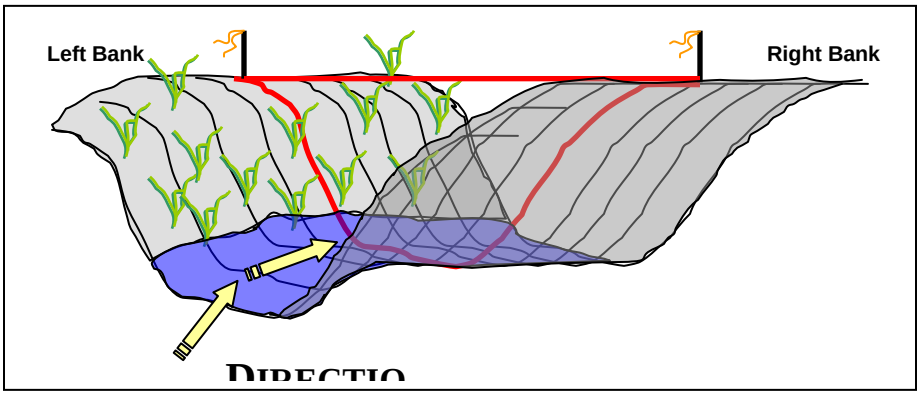


Figure 5 – The left and right banks are determined by facing downstream

3. Measure Bankfull Width

- Imagine you were standing in the stream during a large rainstorm and the channel was full of water from bank to bank. How deep would the water be? Looking both upstream and downstream try to identify combinations of clues on both banks that indicate a high water ("bankfull") line. Note that this is not the flood line, but rather a line of flow that occurs approximately every couple years from extra large storms. Things to look for: a) obvious scour/stain lines, b) breaks in slope, c) changes in vegetation, d) changes in deposits, e) undercut banks, and f) the tops of point bars (Figure 6).

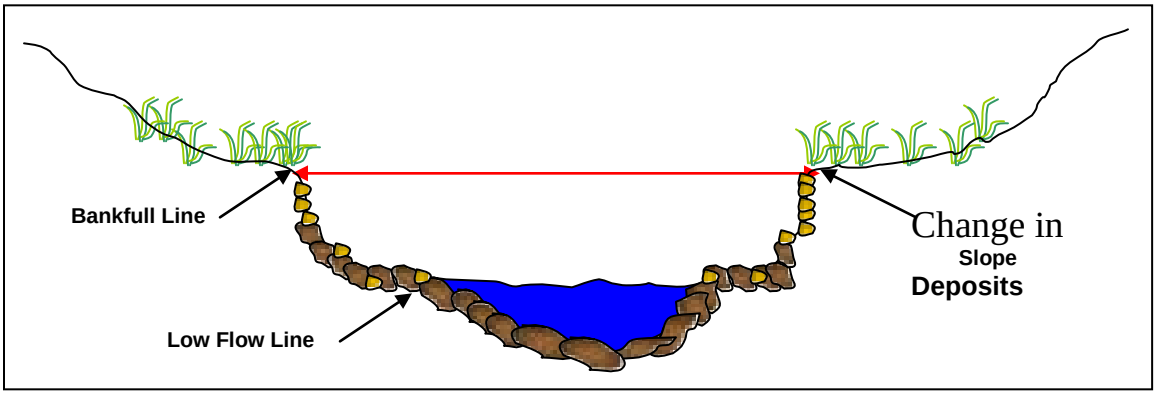


Figure 6 – Cross section depicting bankfull line

- Directly under the first tape you secured, stretch a second tape from the bankfull line on one bank, across the channel to the bankfull line on the other bank (Figure 7). This is your **Bankfull Width** — record it on the data sheet.

4. **Measure Bankfull Depth**

- While keeping the tape stretched across the bankfull channel, now imagine there was only a thin trickle of water in the stream. It would follow a path that wound through the deepest part of the channel bottom; this path is called the thalweg.

- To find the thalweg, use the stadia rod to locate the deepest point in the channel. Once this is established, measure the distance from the channel bottom up to the tape that represents a bankfull flow (Figure 7). This is your **Bankfull Depth** — record it on the data sheet.

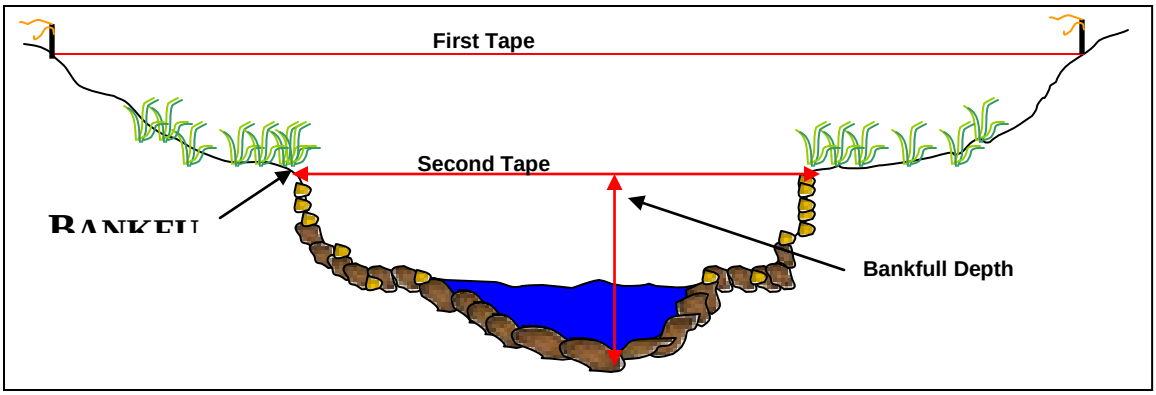


Figure 7 – Locating bankfull width and bankfull depth

5. **Measure Floodplain Width**

- The width of the floodplain is measured at a height above the thalweg equal to 2 times the bankfull depth (Figure 8).

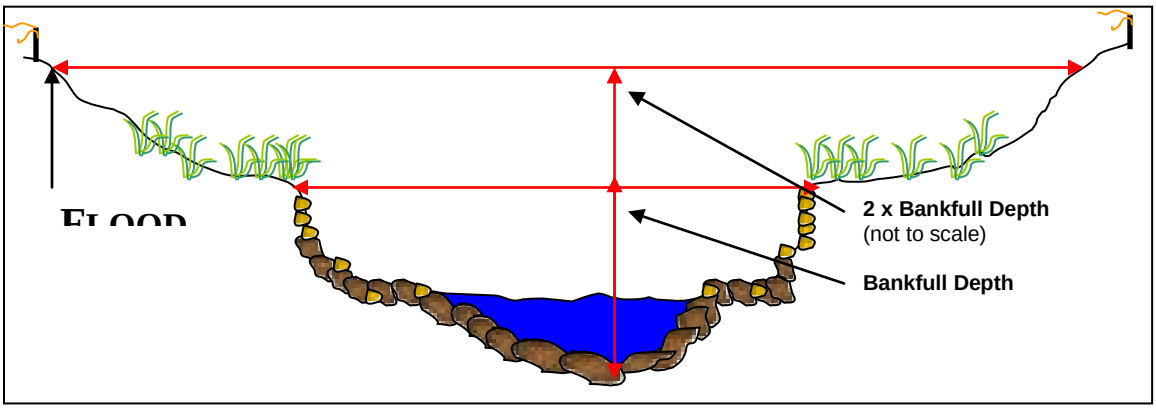


Figure 8 – Locating floodplain width

- While holding the rod in the thalweg, lift the tape to a height above the thalweg equal to 2 times the bankfull depth (e.g. if bankfull depth equals 2 feet, raise the tape to 4 feet) (Figure 9A), then raise both ends of the tape level and extend so the tape reaches both banks (Figure 9B). This is your **Floodplain Width** — record it on the data sheet.

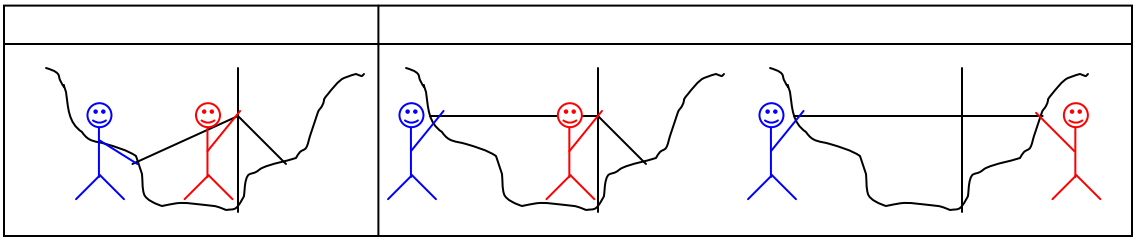


Figure 9 – Measuring floodplain width with two people

6. **Set Up the Level**

- Ideally, you want to be able to survey the cross section without moving the level, so try to locate the level so that it is *above* the entire line of measuring tape, although not above the extent the rod will extend, and not somewhere blocked by trees or other vegetation.

- When setting up the tripod, set it up in sturdy ground with the legs of the tripod spread sufficiently to keep it steady. Attach the level to the screw in the middle of the base on top of the tripod, tighten, and then adjust level until the bubble is centered in the middle of the circle.

7. **Measure Water Surface Slope (Option 1)**

- **Note:** Ideally the distance between the two readings would include at least two riffle pool sequences (Figure 10). If this cannot be achieved from the location on the bank where the level is set to read the cross section (e.g. brush obscures line of sight, creek bends, etc.), wait until you've completed surveying the cross section then move the level to a location that allows a better view both up and downstream - this may be in the channel itself rather than on the banks **(Option 2)**.

- Locate the furthest riffle upstream of the cross section that is within your line of sight. Measure, along the centerline of the bankfull channel*, the distance from the cross section to the beginning of that riffle (Figure 10). This is your **Upstream Distance** — record it on the data sheet.

- At the beginning of the riffle, have one person hold the stadia rod right *on top of the water's surface* (use a rock or the toe of your boot to set it at this level), while the other person takes a reading of the stadia rod with the level (Figure 10). This is your **Upstream Reading** — record it on the data sheet.

* This can be interpreted as the centerline of the creek if water was filled from bank to bank, which may be different than the centerline of the creek during the low flow summer months (Figure 11).

- Similarly, locate the furthest riffle downstream of the cross section that is within your line of sight, and repeat the same steps to measure your **Downstream Distance** and **Downstream Reading** (Figure 10) — record those on the data sheet.

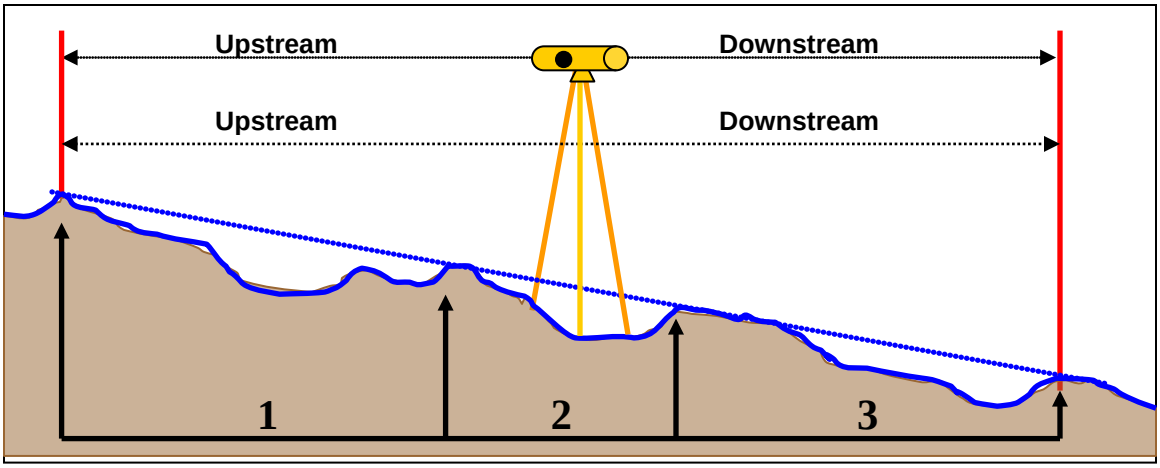


Figure 10 – Measuring slope

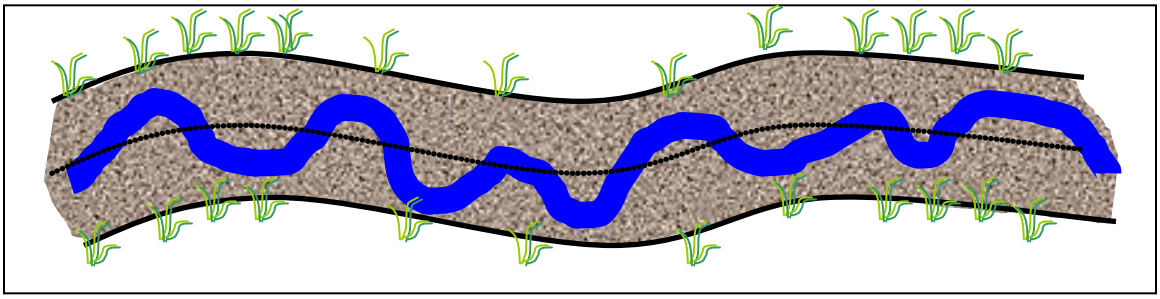


Figure 11 – Dotted line represents centerline of the bankfull channel; blue line represents a summer low flow channel

8. Conduct Cross Section Survey

- Place the rod at 0 feet (should be at the left-bank benchmark) then use the level to view where the cross hairs intersect the rod (Figure 12). This is your **Stadia Reading** — record it on the data sheet.

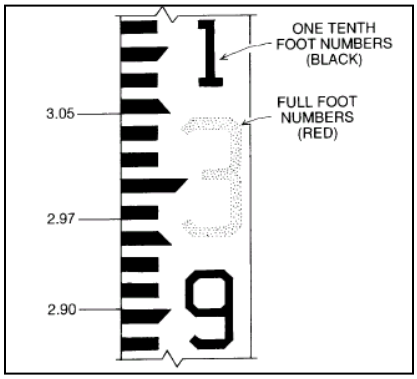


Figure 12 – Reading stadia rod

- Continue, taking a reading every horizontal foot, until you reach the right-bank benchmark (Figure 13).

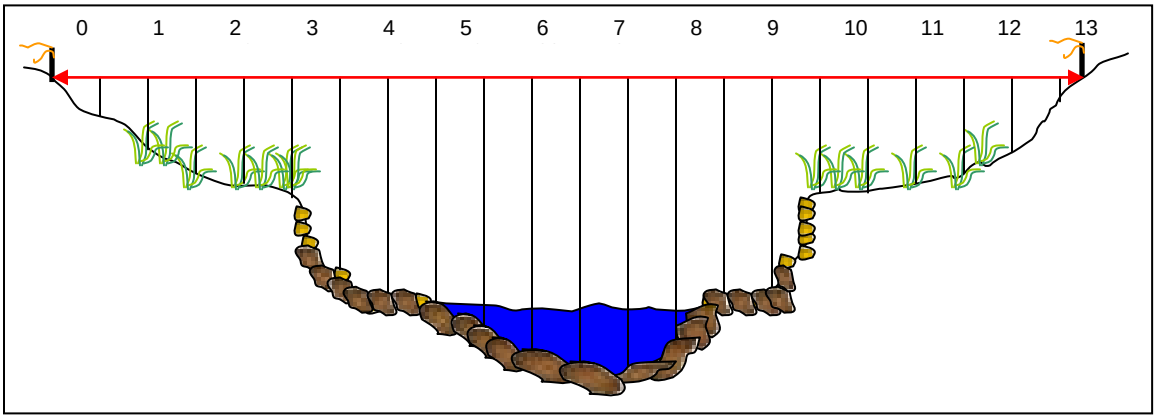


Figure 13 – Survey the cross section by taking a reading at every foot

- **Note:** It is very important that the rod be held vertically (Figure 14).

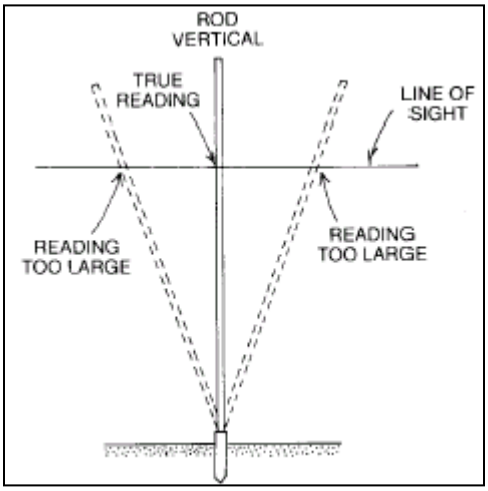


Figure 14 – Leaning the rod results in incorrect readings

9. Measure Water Surface Slope (Option 2)

- If your view upstream and downstream of the cross section was impaired from your location on top of the banks, relocate the level at this time, then take the water surface slope measurements.

10. Take Digital Photos

- Before removing the tape that stretches between the rebar, replace the PVC markers then take four digital photos to document site: 1) standing in the channel facing upstream 2)

standing in the channel facing downstream 3) standing on the left bank facing the right bank, and 4) standing on the right bank facing the left bank (Figure 15).

- If possible, include the tape and markers in the view to clarify the location of the cross section within the photos. Also, if you feel that any additional photos are needed to clearly portray the cross section, feel free to take more than the primary four.

Figure 15 – Example photos

11. **Clean-Up**

- Remove measuring tape from rebar benchmarks, replace PVC pipes over rebar, and apply fresh flagging if needed to assist in relocating site for subsequent surveys.

- Use alcohol wipes to clean off all equipment that might have come into contact with poison oak. Then, clean any poison oak off your own skin with the alcohol wipes in the field, and wash with Tecnu when you return to the office. Also, thoroughly check yourself and your partner(s) for ticks.

- Finally, report your successful completion of the survey or any problems you encountered to the VMP staff.

Measuring Stream Gradients Using a Hand Level

Equipment:

- Stadia rod
- Hand level
- Tape measure

1. Person one (P1) stands in the upstream pool with the hand level. Stand so you have an unobstructed view of the downstream pool.
2. Person two (P2) holds the stadia rod at the water surface and takes a stadia reading of the eye level of P1.
3. P2 stands in the downstream pool and holds the stadia rod at the water surface.
4. P1 uses the hand level to take a stadia rod reading of the downstream pool.
5. Calculate the difference between the two elevation readings. This value is the rise.
6. Use the tape measure to measure the distance between P1 and P2. This value is the run.
7. Calculate the % Slope = (Rise / Run) x 100

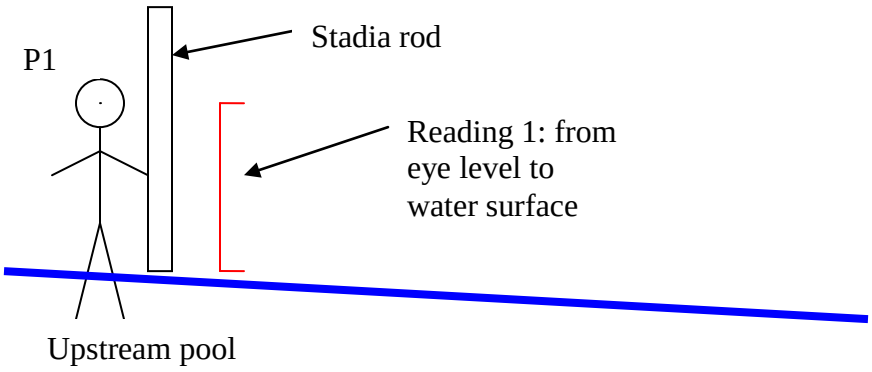
For example:

Rise: Downstream reading = 6.81; Upstream reading = 5.19 - therefore 6.81-5.19 = 1.62
Run: using tape measure = 73
% Slope = (Rise / Run) x 100 = (1.62 / 73) x 100 = 2.2 %

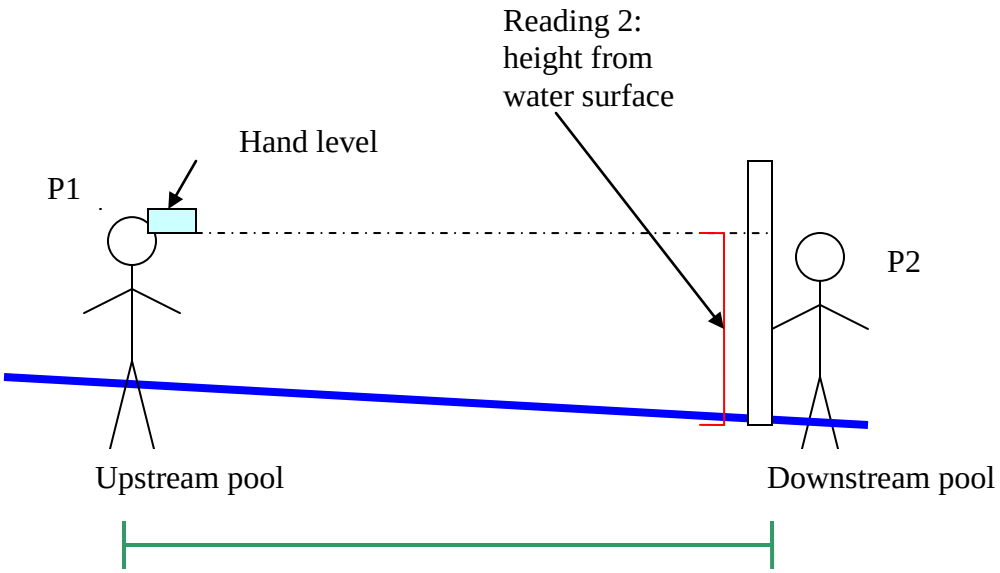
Note:

- The hand level does not magnify as much as the bigger level. To make a more accurate stadia rod reading, it helps to have the person holding the rod place their finger at different points on the rod. The person with the level can call out 'higher' or 'lower' until the rod holder's finger is at the correct reading.

Step 2.



Step 3.


Reading 2:
height from
water surface
Hand level
P1
P2
Upstream pool
Downstream pool
Run = distance between two measurements

Stream Profiling Datasheet

Creek:		Site ID:		Date:		VMP Staff:
Volunteers:						
Foot #	Stadia Reading	Foot #	Stadia Reading	Foot #	Stadia Reading	Bankfull and Floodplain Dimensions
0		35		70		Bankfull Width:
1		36		71		Bankfull Depth:
2		37		72		Flood-Prone Width:
3		38		73		Slope Measurements
4		39		74		Upstream Distance:
5		40		75		Upstream Reading:
6		41		76		Downstream Distance:
7		42		77		Downstream Reading:
8		43		78		Notes
9		44		79		
10		45		80		
11		46		81		
12		47		82		
13		48		83		
14		49		84		
15		50		85		
16		51		86		
17		52		87		
18		53		88		
19		54		89		
20		55		90		
21		56		91		
22		57		92		
23		58		93		
24		59		94		
25		60		95		
26		61		96		
27		62		97		
28		63		98		
29		64		99		
30		65		100		
31		66		101		
32		67		102		
33		68		103		
34		69		104		

Appendix H. Morro Bay National Estuary Program Surface Elevation Table Monitoring for Measuring Sediment Accretion in Morro Bay Estuary

Morro Bay National Estuary Program
Surface Elevation Table Monitoring for
Measuring Sediment Accretion in Morro Bay Estuary

Purpose and Methods

The surface elevation table (SET) –also referred to as a sedimentation erosion table - is used to measure the sediment accumulation on the surface of a marsh or mudflat over time. In conjunction, a thin layer of feldspar can be placed around the SET as a marker horizon to measure shallow subsidence of the surface caused by compaction, desiccation, or other processes (Figure 1).

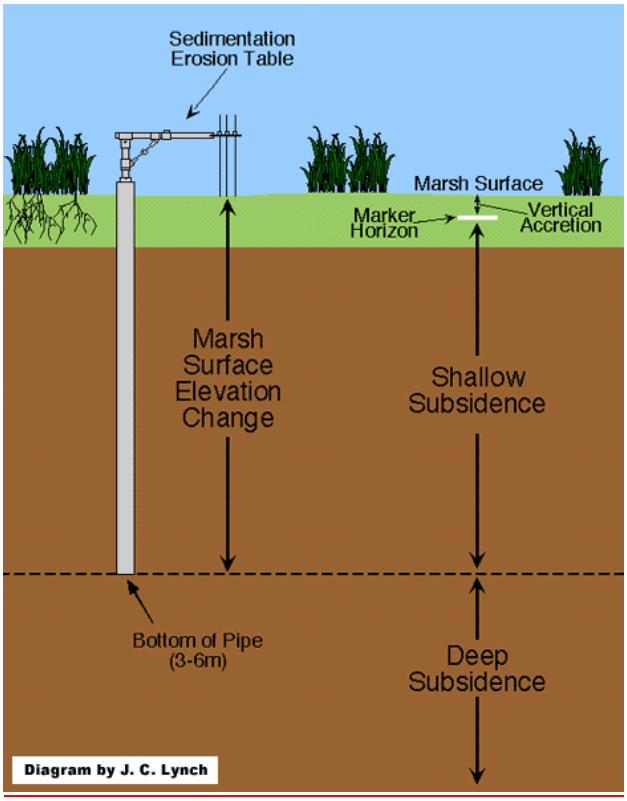
The SET is attached to a stable benchmark on the marsh surface (Figure 1). The benchmark is a 3'' aluminum pipe driven into the sediment as far as possible (until refusal). The benchmarks are driven by hand, and extend 6 to 8 inches above the sediment surface. In order to take measurements, the SET is placed over the benchmark and the surface elevation is measured relative to the benchmark at radial points around the station. Since a footprint in the measurement area can contaminate the readings for years, a platform or walkway, which serves as a working surface can also be constructed (Figure 2). We anticipate using these platforms in the salt marsh as needed, but not in the mud flats.

The plan for Morro Bay is to use the SET devices mainly in and adjacent to the salt marsh, and to use marker horizons and some PVC benchmarks elsewhere in the estuary. The final site locations, will be determined based on field conditions, site access, and the expertise of the Battelle consultants. A final map showing exact locations will be made available to you upon installation. Both salt marsh and intertidal mudflats will be represented.

Recording measurements after the initial installation consists of walking to the benchmark, attaching the SET device, and measuring the elevation. The precision of measurements at the 95% confidence interval for the SET technique ranges from ±0.4 mm to ±1.5 mm, depending on substrate characteristics. For the horizon markers, a small core is taken and the amount of sediment that has accumulated above the horizon marker is measures from the core. The direct measurements of elevation change can be used to measure overall sediment deposition or erosion, to compare rates of sediment deposition in different regions of the estuary, and to provide data to 'ground-truth' the numerous sediment models of the estuary. Elevation change can be compared to the local rate of sea-level rise to determine the potential for submergence or elevation of the wetland.

We plan to take measurements pre and post wet season in the first year, and annually thereafter. We will adjust the sampling frequency depending on results, and in response to extreme events such as major storms. The time required to collect data, once on site, is relatively short (less than an hour for an experienced operator) and so man-hours depend on ease of access to the site. Our data collection program should extend for at least five years; probably longer assuming the method proves effective. Additional information on the SET methodology can be found at: http://www.pwrc.usgs.gov/resshow/cahoon/

Layout of Surface Elevation Tables



Surface Elevation Tables Data Collection Form

SET DATASHEET

Date	______________
Location	Morro Bay
Transect	A B C
Station	low high

direction	pin	reading (mm)	notes
________	1	________	________
	2	________	________
	3	________	________
	4	________	________
	5	________	________
	6	________	________
	7	________	________
	8	________	________
	9	________	________
________	1	________	________
	2	________	________
	3	________	________
	4	________	________
	5	________	________
	6	________	________
	7	________	________
	8	________	________
	9	________	________
________	1	________	________
	2	________	________
	3	________	________
	4	________	________
	5	________	________
	6	________	________
	7	________	________
	8	________	________
	9	________	________
________	1	________	________
	2	________	________
	3	________	________
	4	________	________
	5	________	________
	6	________	________
	7	________	________
	8	________	________
	9	________	________

Surface Elevation Table Data Collection Form

MARKER HORIZON DATASHEET: SALT MARSH SAMPLING LOCATIONS

Date: _____
Observers: _____
Location: Morro Bay
Transect: A B C
Station: low high

plot location	repl.	random x	random y	readings 3 per core	notes
_____	1	29	29	_____ _____ _____	_____
	2	16	19	_____ _____ _____	_____
	_____	18	14	_____ _____ _____	_____
	_____	38	18	_____ _____ _____	_____
_____	1	20	12	_____ _____ _____	_____
	2	36	18	_____ _____ _____	_____
	_____	14	38	_____ _____ _____	_____
	_____	8	11	_____ _____ _____	_____
_____	1	44	10	_____ _____ _____	_____
	2	27	11	_____ _____ _____	_____
	_____	18	36	_____ _____ _____	_____
	_____	40	28	_____ _____ _____	_____
_____	1	15	17	_____ _____ _____	_____
	2	45	29	_____ _____ _____	_____
	_____	43	12	_____ _____ _____	_____
	_____	19	14	_____ _____ _____	_____

Appendix I. Morro Bay Volunteer Monitoring Program
Macroinvertebrate Monitoring Protocol

Morro Bay Volunteer Monitoring Program
Macroinvertebrate Sampling Protocol

Refer to the 'Standard Operating Procedure for Collecting Benthic Macroinvertebrate Samples and Associated Physical and Chemical Data for Ambient Bioassessments in California,' February 2007, prepared by the California Department of Fish and Game, Aquatic Bioassessment Laboratory.

Appendix J. Morro Bay National Estuary Program
Eelgrass Monitoring Standard Operating Protocol

Morro Bay National Estuary Program
Eelgrass Monitoring Standard Operating Protocol

Equipment List

- Motorized boat
- Lifejackets, orange safety vests, mudders, hip waders
- Digital Camera and cell phone
- Differential GPS unit and data logger
- PVC 0.25 meter quadrat
- Clinometer
- Stadia rod
- 100 meter tape
- Ziploc Freezer Bags
- Clipboard with Rite in rain data sheets, map and protocol
- Pencils and sharpies
- Large backpack and water bottles
- Algae Guide (optional)

Transect Locations and Transport

Coleman Transect

In 2006 a new transect was established at Coleman beach near the Power Plant. This area was selected due to the permanent and dense eelgrass bed that has been documented in that location for several years. This site can be accessed from Coleman beach near the power plant, no boat is necessary for transport. The substrate for this eelgrass bed is sandy, mudders are not necessary. Short PVC markers are visible at low tide marking the transect which runs parallel to the shore and adjacent to the rock road embankment. This transect was monitored on 11/4/06 at 1:56 PM on a -0.9' low tide turning at 3:15 PM

Tidelands Transect

This transect just north and across the channel from the Tidelands boat launch. The transect poles can be easily sighted at low tide conditions. This transect was monitored on 11/15/2005 at 1:30 PM on a –0.90' low tide turning at 3:56 PM, and on 11/04/06 at 3:56 on a -0.90' tide turning at 3:15pm. This transect was monitored while still submerged, and has sandy substrate that does not require the use of mudders. Eelgrass blades are quite long and dense at this site. This transect can be quickly reached by boat, and can be accessed by kayak if necessary.

Chorro Transect

The original Chorro transect was established on an unusually low tide. In 2005 a new site was established where it could be accessed but in the same immediate region. Specifically, this second transect was established in a westerly direction from the southwest marker pole of the oyster bed, approximately 200 ft from the main channel. In 2006, the transect was again moved to provide better access and reduce trampling of eelgrass on the mudflats. The new 2006 transect runs perpendicular to the main channel and is located slightly north of the oyster beds. White

PVC marking poles at each end of the transect are permanent and easy to locate during low tide conditions. The second transect was monitored on 11/15/2005 at 3:15 PM on a –0.90' low tide turning at 3:56pm. The newest 2006 transect was monitored on 11/05/06 at 2:57 PM on a -1.2 tide turning at 4:02pm. The eelgrass at this site is best described as medium density, with heavy algae coverage at the base near the shoots. Mudders are necessary at this site. This site must be reached by boat. Harbor patrol provided transport in 2005 and 2006.

Pasadena Transect

The Pasadena transect was established with transport to the site in mind. This region is midway between Cuesta Inlet and State Park Marina, thus kayaking or hiking to the site is not feasible. Harbor patrol provided transport to this site, which was monitored on 12/12/05 at 2:00 PM on a –0.50' low tide, turning at 2:33 PM and on 11/5/06 at 4:41 pm on a -1.2' low tide turning at 4:02 pm. This transect was established with the northernmost point approximately 30 feet from the channel edge and was staked during the 2006 visit. This area is where depth limits transport by most boats, thus the transect is at the northern end of this region. The eelgrass at this site can be described as patchy with a good deal of algae cover and substrate exposed.

Field Team

Three people are necessary for efficient monitoring of each transect. Two members conduct the transect survey and collect the samples while a third records data and photographs the site. All members should be supplied with hip or chest waders, mudders, lifejackets and orange safety vests. A backpack should be used to transport smaller items to the site. During the Fall 2005 survey it was found that the quadrat could be operated more easily if the division wires were removed to prevent grass from tangling and tearing along the transect.

Survey Methods

1.) Using the GPS unit and maps, navigate to the transect sites.

2.) At the site, secure the tape starting at the northern end of the transect.

Notes: At back bay sites with only one pole, wedge the tape securely into the mud at the far end of the transect. At muddy sites it works best to start from the western end of the transect and work back towards the channel, reeling in the tape while you go. This prevents extra tromping and damage to the grass beds. *Be careful not to walk through the transect itself when securing the tape! Mudders disturb the surface and expose additional substrate!*

3.) **Transect Instructions**

Begin the survey by placing the center of the quadrat at the 1 meter mark. Readings are conducted every 2.5 meters as indicated by the 'Position' column on the datasheet. For each quadrat determine the following:

a.) **Eelgrass % coverage and Density**.
Percent coverage is determined in increments of 5%. Density is the total number of shoots within the 0.25 meter square, counted at the surface of the mud.

b.) **Substrate % coverage and Type.**

Percent coverage is determined in increments of 5%, this is the amount of substrate visibly exposed before the eelgrass or algae are moved in any way. Type of substrate can be classified as mixed fines (MF), mud (MD), or sand (SD).

c.) **Macroalgae % coverage and Type.**
Percent coverage is determined in increments of 5%. Type of algae is classified as Ulva (ULV), green enteromorpha (GENT), Chaetomorpha(GC), gracilaria (GRC) and Gelidium (GEL). In 2005 red enteromorpha (RENT) was classified, however this was a misclassification. The Algae Guide which includes photographs of these algae types should be reviewed prior to monitoring and brought into the field if necessary.

Notes:
The cumulative % coverage may exceed 100% for macroalgae, substrate and eelgrass. A quadrat with 100% eelgrass overstory may have a significant amount of algae in the understory among the shoots.

d.) **Water Coverage**
The two classifications submerged [(SUB) and exposed (EXP)], refer to the conditions of the shoots, not the entire length of the blades. For example, the shoots may be submerged at the base with 3 in. of water while the blades are still exposed. If the shoots and substrate are submerged, record the depth of the water (in tenths of feet) using the stadia rod.

e.) **Grazing**
There are three categories of grazing impact: heavy (HG), medium (MG), and light(LG). This column only needs to be filled if the grass has obviously been grazed, it can be left blank if no grazing is apparent.

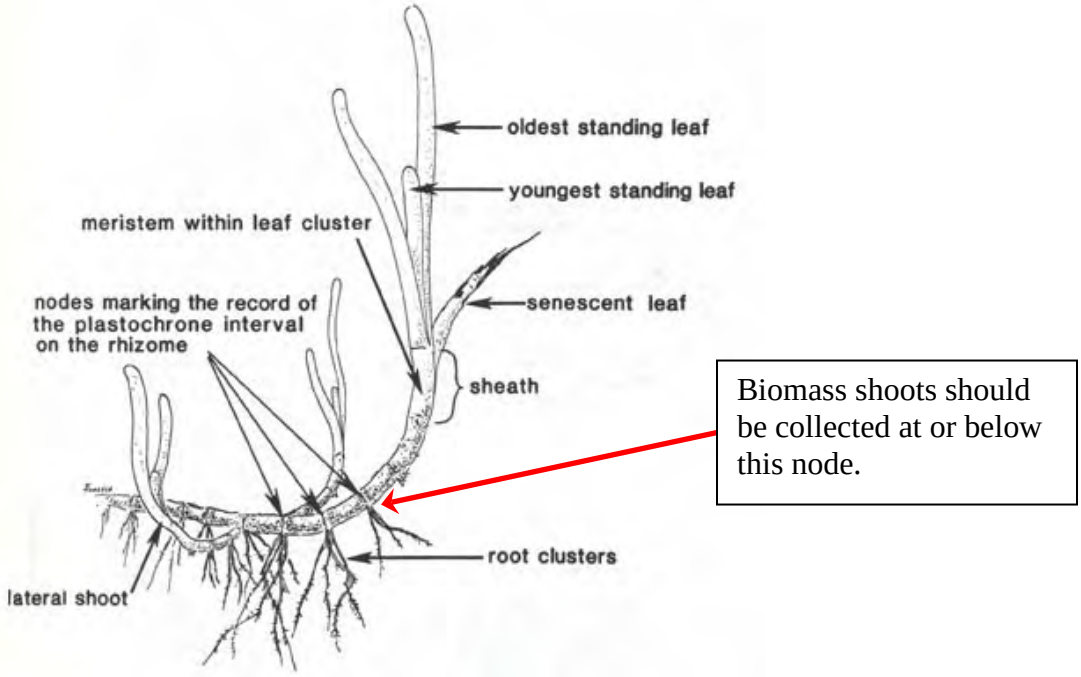
f.) **Notes**
In this section record information on epiphyte coverage and other transect details that might be useful for future work. Additionally, presence of flowering shoots should be recorded here.

4.) **Slope to Water Surface**
Find the midpoint along the transect to measure the slope to the waters edge. One crew member should be positioned a known distance (perpendicular to the transect) at the channel edge with the stadia rod extended and placed at the waters edge. From the center of the transect, another crew member uses the clinometer to determine the height on the stadia rod. Lastly the eyeline of the crewmember using the clinometer should be measured using the stadia rod. In 2006 consultants from Battelle Marine Sciences conducted these measurements along with taking perpendicular transects.

Notes: This measurement will not be possible at the Mitchell site due to the distance to the main channel.

5.) **Sample Collection**

30-40 samples should be randomly collected throughout the area parallel to the transect. It is important that shoot collection be randomized, so that there is no bias to collect the longest and healthiest shoots. Shoots should be collected as close to the rhizome as possible, and removed without damaging the leaves. The entire lengths of eelgrass should be placed in a large Ziploc bag. Label the outside of the Ziploc bag and record the sample label on the datasheet. All samples from the same transect site can be stored in the same bag. However, if blades seem particularly long and prone to breakage, it may be preferable to place 5-10 shoots in several bags.



6.) **Photographic Documentation**

General site photos were taken during the fall 2005 monitoring. Photos of the mudflat conditions in the area near the transect are useful to convey the degree of algae or eelgrass coverage and substrate exposure. Additionally, this is a good opportunity to take file photos of eelgrass, algae and marine life for the NEP. When using a digital camera record which photo numbers correspond to the site. In 2006 more site photos, stock photos of algae and eelgrass were taken and can be viewed in the 2006 eelgrass/ site photos folder.

Morro Bay National Estuary Program
Eelgrass Monitoring Field Datasheet

DATE:	**RECORDER:**
SITE:	**SAMPLERS:**
LAT., LONG.:	**Tide:**
Time Survey Completed:	**QUAD SIZE: 0.25 meters**

Position	**Eelgrass**		**Substrate**		**Macroalgae**		**Water Coverage**		**Grazing**
X,Y	*% COVER*	*DENSITY*	*% COVER*	*TYPE*	*% of : ULV, GENT, RENT, GRC*		*Depth*	*Exposed*	*Degree*
	%	# shoots	%	MF, MD, SD	%	ULV, GENT, RENT…	if SUB, in ft.	SUB, EXP	MG, LG, HG
1.0									
3.5									
6.0									
8.5									
11.0									
13.5									
16.0									
18.5									
21.0									
23.5									
26.0									
28.5									
31.0									
33.5									
36.0									
38.5									
41.0									
43.5									
46.0									
48.5									

KEY: MG=Medium Grazing, HG= Heavy Grazing, LG= Light Grazing
SUB= Submerged, EXP= Exposed. MF= Mixed Fines, MD=mud, SD= Sand
GRC= Gracilaria, GENT= Green Enteromorpha, RENT=Red Enteromorpha, ULV= Ulva

Photo Numbers: _____ Samples: _____

Clinometer Reading: _____ Eye Line: _____ Distance: _____

NOTES:

Morro Bay National Estuary Program
Eelgrass Biomass Measurements Protocol

Sample Collection

Randomly collect 30-40 shoot samples from the area immediately adjacent to the transect line. It is important that shoots be collected from an area outside the transect that has not been disturbed by mudders.

To collect shoots, break off the shoot at the node closest to the surface of the mud. If easier, expose the entire rhizome to determine where the blade should be broken off. Hold the shoots together in long strands while collecting (so it looks like a mop) and wind the whole group in a loose coil. This helps prevent breakage or tangling of the leaves. Thirty shoots are needed for biomass measurements, it is a good idea to collect up to ten extra shoots in case of breakage.

Sample Storage

Carefully place the shoots into a labeled Ziploc Gallon size freezer bag. Samples can be stored in sealed Ziploc bags in a refrigerator for up to five days following collection.

Equipment Needed:

Drying oven (80-90 degrees C)
Thermometer
Tin foil
Electronic scale (to hundredth gram)
Sharpie permanent marker
Masking tape
Eelgrass Biomass Datasheets
Desiccator

Sample Preparation Procedures

Drying and weighing operations can be conducted either at Cal Poly or at the wastewater treatment plant. Phone ahead to determine if facilities are available for use the week of eelgrass fieldwork.

Drying operations can be conducted at the wastewater treatment plant with advance planning. Ask staff a week or more ahead of time if they can set up their older drying oven in the generator room for a 2 week period. If using their drying oven, provide a thermometer to determine which temperature setting needs to be used for drying the eelgrass.

1. Carefully remove individual shoots from the bag and wash gently under cool tap water.
2. If a shoot has been removed with multiple nodes or its rhizome intact, break the shoot off at the uppermost node.
3. If there are excessive amounts of epiphytes growing on the eelgrass blades, carefully scrape them into a separate bowl. Rinse epiphytes onto 2mm mesh screen, dry and weigh to nearest milligram.
4. Randomly select ten shoots of eelgrass and measure the total length from the base to the tip of the longest blade. Note on the datasheet if the longest blade has been torn or if the rounded tip is intact.

5. Cut off six to eight squares of foil and use masking tape and a sharpie to number each square.
6. Weigh each foil square individually and record mass (to nearest milligram) for each square.
7. Carefully wrap five blades of eelgrass into each square, leaving the foil open slightly for venting.
8. Place in oven to dry. Temperature and time may vary, oven temperature should be between 80-90 C. Do not fill the oven too full to ensure adequate air movement.
9. For each monitoring season, determine the amount of drying time needed. After 48 hours in the oven, remove the three largest samples from oven place in desiccator. Allow to come to room temperature and then weigh in foil. Record weight of eelgrass and foil.
10. Return the three samples to the oven for four additional hours and then place in the desiccator to cool and re-weigh. If the difference in weight is greater than 1%, then the samples should be returned to the oven and the procedure repeated until a constant weight is achieved. The total time the samples are placed in the oven will be used as a guide to determine the total amount of time to dry all of the samples to a constant weight.
11. Once all samples have been dried, cooled and weighed, subtract weight of foil to determine weight of dried eelgrass.
12. Calculate average shoot weight for each transect site.
13. Calculate above ground biomass for each transect by multiplying mean shoot density by mean shoot weight.
14. Enter data into a new excel sheet in the **U:\Monitoring\vmp\VMP Data\Eelgrass\Data - Summaries\VMP BIOMASS DATA.**

Morro Bay National Estuary Program
Eelgrass Biomass Datasheet (2006)

Site Code:	
Name of Lab Sampler:	
Number of shoots per foil:	
Date of Sample collection:	
Date of Drying Start:	**Starting Temp:**
Date of Drying Finish:	**Ending Temp:**

Number of Shoots	**Foil Weight** (g)	**Dry Weight (with foil)**	**Biomass Weight**	**Shoot Length** (10 stems)	**Blade Condition** (round or broken)

Avg. dry weight per shoot: ____________

Total dry weight for all shoots: ____________

Epiphyte coverage? ____________

Appendix K. Morro Bay Volunteer Monitoring Program
Instructions for Photodocumenting Algae at Morro Bay Watershed Creek Sites

Morro Bay Volunteer Monitoring Program
Instructions for Photodocumenting Algae at
Morro Bay Watershed Creek Sites

Please collect information on algae at the following sites:
CHO, DAM, PEN, CHU, CAN, TWB, SYB, AND TUR

Algae monitoring should be conducted once a month between 11 a.m. and 3 p.m. It is important to collect the data when the sun is fairly high in the sky to ensure that there is enough ambient light present for capturing detailed photographs and for conducting observations of the algae. Ideally all sites should be monitored on the same day or as close together as possible. The monitoring will occur from May through November.

At each monitoring site, you will collect two sets of data. One will be from a shaded area, and one from a sunny area of the creek. If the site is stagnant, do not monitor it. Try to monitor the same spots each time you return to the site.

The procedure is as follows:

- Each monitoring site will include one sunny and one shaded area. Do not monitor under bridges, due to the altered substrate.
- Record on the datasheet the Date, Time and the three letter code for the Site.
- Take photos:
    - At each area (sunny and shaded), take photos facing upstream and downstream.
    - Record on the datasheet the Frame # and the Vantage Point (i.e., upstream, downstream, close-up)
    - Try to capture not just the algae but some of the surroundings as well for scale.
    - If the algae look interesting, take a close-up photo.
    - Take as many photos as you think you need to fully capture the extent of the algae at the site.
- Estimate canopy cover.
    - Using the densiometer, estimate the canopy cover at the site. See detailed procedure for densiometer use.
    - Record the Canopy Cover value on the datasheet.
- Assess the algae:
    - On the datasheet, record the following under Algae Description:
        - Color: Note algae color
        - Location: Note if algae is floating, rooted, etc.
        - Structure: Describe structure – stringy, clumped, etc.
        - Estimate % Area Covered: Estimate the percent of the area in the reach length that is covered with the particular type of algae (i.e., 35% coverage over 10 feet reach that is 2 feet wide).
    - If no algae are present, be sure to record that on the datasheet.
- Add any additional Notes on the back of the datasheet that might be helpful in documenting the presence or absence of algae.

Please remember to be aware of safety concerns at all times. If you own a cell phone, we advise you to take it with you when monitoring, as some of the sites are remote. If you have questions, please contact VMP staff at 772-3834.

Notes on Site Access for Algae Documenting on Morro Bay Watershed Creeks

CHO: This site is on Chorro Creek, just below where Hwy 1 crosses the creek, on Camp San Luis property. Enter Camp SLO through the main gate off Hwy 1. Tell the guards at the gate that you are there to monitor the creek and ask them to direct you to the Range Control office. Check-in with the Range Control office prior to going down to the creek by signing in to their log book at the office on the way to the creek and sign out as you leave. Beware poison oak at this site.

DAM: This site is on Dairy Creek, above the gate that crosses the road that runs through Chorro Regional Park. The combination changes each month. The kit includes a card with the combinations for each month. This is public property and the County Parks & Rec know that we will be monitoring here.

PEN: The monitoring site is on Pennington Creek on the Rancho El Chorro Outdoor School property. We will have called ahead to let them know that you are coming. The parking lot gate will be locked on the weekends. Please park at the gate and walk down to the creek. Do not attempt to drive through the wetland area surrounding the creek. During the summer, the dry grass is a fire hazard if you drive through it. We have school permission to monitor on their site. We need to notify them ahead of time before we go out there to monitor, so please let us know when you plan to go out so we can give them a heads up. We don't need very much advance notice.

CHU: This site is on Chumash Creek, across from the Rancho El Chorro Outdoor School property. The gate to the pasture is next to the sign warning you to not enter the pasture if you've recently been in a foreign country. We do not have the combination to the gate so you will have to climb the fence and hike down to the creek. We monitor just above the concrete flume, near the structure that used to hold monitoring equipment. This site is Cal Poly property and we have permission to monitor there from their Risk Management Division.

CAN: This site is on Chorro Creek just upstream of the bridge that crosses Canet Rd. Park off the road (there are a few small pull-out areas) and hike down to the creek. We are restricted to the county easement, which is 20 feet upstream and downstream of the bridge. Do not monitor beyond the area immediately adjacent to the bridge. There have been landowners in that area that do not want any monitors on their property, so please stay within the county easement. We will give you a copy of the letter from the county granting us permission to monitor within their easement.

TWB: This site is on Chorro Creek just above the bridge on S. Bay Boulevard. You may enter the site either by crossing S. Bay Blvd. and climbing down the rip-rap or by going through the willows on the flats below the bridge. This is State Park property. We will give you a copy of our collector's permit which gives you permission to monitor on State Park property.

SYB: This site is Los Osos Creek on Turri Road, near S. Bay Blvd. Park in the wide pullout on the creek side of the road, before it turns to the left, under the sign that says '$1000 Fine for Littering.' Hike down to the creek. This site is public property and you should not have any site access issues.

TUR: This site is on Warden Creek on Turri Road near Los Osos Valley Rd. The site is just downstream of the bridge on Turri that crosses the creek. Climb down the trail by the downstream side of the bridge. The pooled, reedy area is likely the best monitoring spot. This is private property and we have landowner permission to monitor at this site.

Equipment List

- Datasheet
- Clipboard with calculator
- Pen
- Densiometer
- Camera with extra batteries
- Notebook containing instructions, gate combos, site access agreements, etc.

Site ID	Time	Sunny or Shady	Frame #	Vantage Point/Notes	Canopy Cover (%)	Algae Description				
						Color	Location	Structure	% Coverage	Approx Area
		SUN								
		SUN								
		SUN								
		SHD								
		SHD								
		SHD								
		SUN								
		SUN								
		SUN								
		SHD								
		SHD								
		SHD								

Appendix L. Morro Bay Volunteer Monitoring Program Shorebird Survey Protocol

Morro Bay Volunteer Monitoring Program
Shorebird Survey Protocol

(from Point Reyes Bird Observatory – Pacific Flyway Project)

Shorebirds can be counted more easily than many birds due to their use of tidal flats and other open habitats. Further, shorebirds generally move shoreward as the tide rises, affording land-based observers an improving view until the flood tide forces the birds to alternative high tide habitat. However, due to their habits of aggregating, sometimes in very large, mixed-species flocks, and flying (often unexpectedly during a count!), skill and experience are necessary to obtain accurate counts.

COUNTING METHODS

Counting methods vary, depending on the number of birds, their edginess, and census conditions. The number of birds in a flock can be obtained by:

1. Counting birds individually.
2. Counting birds in groups of some number
3. Estimating the number of birds in a flock without actually counting them.

The first two methods are always more accurate and preferred over the third, which should be used only for preliminary observations of flocks or to salvage an interrupted count.

Counting birds individually: If there are only a few birds in an area, (less than 100 total), they should be counted individually.

Counting birds in groups of some number: *If you are counting larger flocks, say 200 birds, begin at one end of the flock - count the first 10 birds, then the second 10 birds, continuing until you can easily see the birds in groups of 10. At that point, start counting by 10-bird groups. This method can be generalized to counting by 20-bird, 25-bird, 50-bird, or even larger groups, for larger flock sizes. This method can also be used for counting birds in flight.*

Estimating the number of birds: It is wise to initially estimate numbers of all the birds quickly, to determine the relative proportions of the most common species, to roughly determine the numbers of the less common species, and to determine whether the species are segregated or homogeneously mixed throughout the flock. Then, if the actual count is interrupted, some reasonable estimates of numbers will be possible. Making a rapid estimate of the number of birds may be the only way to salvage a count in which birds fly away before they are counted.

SPECIES IDENTIFICATION

1. Try to identify all the birds (except dowitchers) to species.
2. Whenever possible, allocate unidentified shorebirds to species groups (such as Least Sandpiper or Western Sandpiper) rather than just listing them as unidentified large or small shorebirds.

On the census form we have provided species categories that might commonly be used. Four groupings: yellowlegs spp., dowitcher spp., phalarope spp., and Least or Western sandpiper are self-explanatory. The plover species would include Semipalmated Plover, Snowy Plover, and Killdeer. The large sandpiper grouping could include any combination of Willet, Marbled Godwit,

Greater Yellowlegs, Long-billed Curlew, or Whimbrel. If you use any of these categories please indicate which species you believe could have been involved. Write in any species not on the census sheet in one of the empty columns at the bottom of the census form and provide details on the sightings.

APPORTIONING THE COUNT OVER SEVERAL SPECIES

1. Count out each species separately.
2. Count all species together.
3. Count severa1 species together.

Counting each species separately: Counting each species separately is time consuming if there are many species to count but can be the least confusing method if there are few abundant species per counter.

Counting all species together: If the group of shorebirds comprises primarily one species, with a few individuals of other species, it is often easiest to count the total number of birds, then to count out the rarer species and subtract their numbers from the total, to get the number of the common species. An assistant, recording for the counter, can aid in this process by either counting the rarer species in the flock or by making the subtractions on the recording form. In cases where there are tens of thousands of shorebirds and several species are very abundant, it may be necessary to count all species together and to sample species composition at many places in the flock in order to determine the proportion of the total made up by each species.

Counting severa1 species simultaneously: In a mixed flock, it is often fastest to make a combined count of similarly sized species. For example, say there are six species present: Dunlin, Western Sandpiper, Least Sandpiper, Willet, Marbled Godwit, and Long-billed Curlew. It might be easiest to count the first three species together, by writing down the number of the less common species as they are encountered and keeping a running tally of the most common species in your head until the flock has been scanned completely. Similarly, the Willet, Marbled Godwit, and Long-billed Curlew could be counted together. Counting several species simultaneously can often be done most effectively if there is both a counter and a recorder. The counter can give the recorder the counts of the less common species as they are seen but accumulate the count for the most common species until the flock is completely counted.

WHAT TO DO WHEN BIRDS FLY DURING A CENSUS

Movement of birds during a census creates some particularly troublesome problems. Our basic strategy is to count the birds before they move from tidal flat areas. Counts at shoreline segments should not take longer than about 1 hour so that the overall amount of bird movement is minimized. It is also important that counters in the same general area of the Bay are counting at the same time. Using the guidelines below, we hope that you will be able to best judge whether or not you should count certain birds.

1. **If you are covering a shoreline segment:** Count birds that fly into and stay in your area during the first hour of your count. You should count birds that fly out of your area only if they are leaving for non-tidal, high tide roosts (such as salt ponds). If a bird (or flock) moves to another tidal flat area and it is less than an hour since your starting time for that area and there is still a counter visible to you in the area into which the bird(s) moved, you should not count the bird(s) for your area. Alternatively, if a bird (or flock) moves into your area in the first hour of your count, you should count them, unless it is apparent to you that they have been counted by an observer in an adjacent area and the observer did not see them move to your area.

2. **If you are covering a non-tida1 area at the same time that shoreline segments are being covered:** Only count flying birds in your area that leave for other tidal areas. If birds leave your area for the tidal flats (this shouldn't' happen too often) do not count them if it is less than an hour since tidal flat counts have begun. Do not count birds that fly into your area once the shoreline segment counts have begun.

3. **For both tidal and non-tidal sites:** If you do not know where departing birds go, note them separately on your form with the time they leave and general direction that they go. Make similar notes on arriving birds. If birds fly by your area without stopping, note them separately with the time and direction of flight, if possible. Do not include any of the birds noted separately in the totals for your area; we will decide after the census if they have been counted by any other team. However, the best decisions on whether or not a flock shou1d be counted are often most easily made in the field.

FOR FIRST TIME CENSUSERS: WHAT YOU 'LL WANT TO REMEMBER TO BRING

- Binoculars
- Telescope (if you have one)
- Wrist watch
- Letter or card indicating permission to restricted land (if applicable)
- Recording pad (use census form for final tally only)
- Pencils (mechanical pencils don't need to be sharpened if they break)
- Rubber boots (your letter will indicate if needed for your area)
- Warm layers of clothes, water, sunscreen
- These forms and instructions
- A field guide (although there usually isn't time to refer to it during the census)

Morro Bay Volunteer Monitoring Program Shorebird Census Location Information

See Map for reference. All boat sections concentrate the on the main body of the bay excluding the salt marsh and Chorro/Los Osos creek outlets. Those areas will be covered from the shore.

1. Section 1: Land Section.Use scope near Morro Rock, T-Piers, and several street-end viewing docks along the Embarcadero.

2. Section 2 & 3: Boat Section. Depart from embarcadero. Sections 2 & 3 are usually completed together. Concentrate on Grassy Island & the shore of sand spit. The boundary of Section 4 starts at the southern tip of Grassy Island and runs from the sandspit east to Fairbanks Point.

3. Section 4: Boat Section. Depart from State Park Marina. South of Grassy Island. Concentrate on shore of sandspit and any exposed mudflats. The southern boundary of Section 4 runs east to west from just north of the Marina to the sandspit.

4. Section 5: Boat Section. Depart from State Park Marina. Concentrate on sand spit and any exposed mudflats south of the Marina to approximately the northern tip of Pasadena Point. The southern boundary of Section 10 runs east to west from Cuesta Inlet to the sandspit.

5. Section 6: Land Section. Use scope around State Park Marina (to the south side) and east along the Salicornia (pickle weed) as far as necessary.

6. Section 7. Land Section. Can be done with Section 6 from the same vantage points. Boundary between Sections 6 & 7 is approximately along the Chorro Creek channel.

7. Section 8. Land Section. Use scope from Bush Lupine Point in Elfin Forest. Park at north end of 13th Street in Los Osos. If vantage point further east is necessary, go along boardwalk to Siena's View, the next point at which the boardwalk affords a bay view.

8. Section 9. Land Section. Use scope (if needed) from pullout on Pasadena Drive, from Baywood Pier, Sweet Springs Nature Preserve (enter at Broderson St.), & further west at public access near intersections of Mitchell Dr. & Doris St.

9. Section10: Boat Section. Depart from Cuesta Inlet. Concentrate on sand spit and any exposed mudflats south to approximately Cuesta Inlet. The southern boundary of Section 10 runs east to west from Cuesta Inlet to the sandspit.

10. Section 11. Land Section. Starting from west end of Butte Dr. checking near shore, then when closer to Shark's Inlet (back corner of bay), look across to shore of sand spit. Boundary with Section 10 is north end of a large bare dune.
    Note: If sand spit side of Section 10 is done on foot, the Section 11 team can do the portion of Section of 10 that is Cuesta by the sea shoreline.

11. Section 12. Land Section. Use scope from bay side of South Bay Blvd. across from Turri Rd. Further north access is available just south of Chorro Cr. Bridge.

12. Section 13. Land Section. Ocean side of sandspit. Use Montana de Oro access. Census the beach while walking north, then walk back.
    Note: Can arrange pick up with boat on north sandspit rather than walking back.

13. Sections 14/15. Land Section. Walk from Morro Rock to North Point (or vice versa). To avoid wading Morro Creek, walk north from Morro Rock to the creek, walk back and drive to north side of creek (Highway 41 west to the end). Park and walk from north side of Morro Creek to North Point. With two people & a desire to walk less, a car can be dropped off at North Point, return to Morro Rock to begin survey, census and finish at North Point and awaiting car.

We need at least 11 bird survey leaders.

Morro Bay Volunteer Monitoring Program
Shorebird Monitoring Datasheet

Location _____ **Date** _____

Team Members (first, last names) _____

Area _____

Start Time _____ **End Time** _____

Black Bellied Plover		Western Sandpiper		Great Blue Heron	
Snowy Plover		Least Sandpiper		Great Egret	
Semipalmated Plover		Least/Western sandpip.		Snowy Egret	
Killdeer		(*) Ratio >>		Cattle Egret	
Am. Black Oystercatcher		Dunlin		Green Heron	
American Avocet		Least/West/ Dunlin		Blck-cr. Night Heron	
Greater Yellowlegs		(*) Ratio >>		Virginia Rail	
Lesser Yellowlegs		Baird's Sandpiper		White Pelican	
yellowlegs spp.		Short-bill. Dowitcher		Brown Pelican	
Willet		Long-bill. Dowitcher		Turkey Vulture	
Wanderling Tattler		dowitcher spp.		Osprey	
Spotted Sandpiper		Wilson's (common) Snipe		White-tailed Kite	
Whimbrel		Wilson's Phalarope (u)		Northern Harrier	
Long-billed Curlew		Red-necked Phalarope		Red-tailed Hawk	
Marbled Godwit		Red Phalarope (u)		American Kestrel	
Ruddy Turnstone		phalarope spp.		Merlin	
Black Turnstone		Brant		Peregrine Falcon	
Surfbird		Other species (d)		Red-shouldered Hawk	
Red Knot					
Sanderling					

(u) indicates species we suspect will be very uncommon or local

Dowitchers--We suggest the censusers count all dowitchers as **dowitcher spp.** If dowitchers are identified to species we would like some information on how the determination was made.

Mixed Species Groups -- Indicate the possible species and number. For example, if you saw a mixed flock of 155 Willet and Marbled Godwit, you would write Willet/Marbled Godwit and 155. **Whenever possible, indicate proportions of mixed species groups.**

(*) Use these spaces only to record numbers of sandpipers that you are able to separate into Least or Western sandpipers. Count the species together and record the total number. **If possible, list the ratio of the unseparated species.**

Appendix M. Morro Bay Volunteer Monitoring Program Phytoplankton Monitoring Protocol

Morro Bay Volunteer Monitoring Program
Phytoplankton Monitoring Protocol

Equipment:

- plankton net
- bucket
- sample container with weight

Sampling sites:

1. Morro Bay T-pier: The T-pier near the Coast Guard/Harbor Patrol offices at the northern end of Embarcadero in Morro Bay (near the power plant). Sample on an incoming tide. It is best to sample from the southern portion of the 'T' so that the current will pull the net away from the pier pilings to avoid snags.
2. Cayucos Pier: This site is at the Cayucos Pier in the city of Cayucos. Drive north on Highway 1 and take the main exit for the city of Cayucos. Head northwest on south Ocean Avenue. The pier is approximately 1 mile north at the intersection of Cayucos Drivej and North Ocean Avenue. The pull should be done from the pier at the point where the pier begins an upward slope.

Sample collection procedure:

1. Sampling should occur on an incoming tide, preferable at the mid-point between the low tide and the high tide. This is crucial for the Morro Bay pulls. For the Cayucos pulls, they can be conducted on any tide.
2. Secure the rope that is attached to the net to a fixed object (i.e., railing).
3. Do not place sample cup on railing where it can be easily knocked into the water.
4. Attach the sample cup to the net and make sure that it is secure.
5. Drop the net into the water down to the flagging tape, which is a 10 ft length.
6. Pull the net up until it clears the surface of the water and allow water to drain out.
7. Be careful not to snag the net on the pier or pilings.
8. Repeat the dropping and pulling up of the net until the total tow length equals 50 feet.
   Tow length = length of rope dropped x number of times net is dropped
   = 10 feet x 5 drops = 50 foot tow length
9. When completed towing, pull up the net and pour sample into sample container.
10. Label the sample container. Avoid violently shaking or jostling the sample jar to help preserve the sample.
11. Rinse net in freshwater using the bucket. There are hoses on the boat slips on Marina Square that you can use. Use the public shower or rest rooms at Cayucos Pier.
12. Soak net in a bucket of freshwater for a few hours.
13. Rinse net and hang net to dry in the NEP storage room. Be careful, the fabric of the net can snag or tear.
14. Fill out the top of the DHS data sheet with the date, your name, sample location, sample time, tow type (vertical for land-based sites), tow depth (10 ft if that's how deep you let the net drop each time), and tow length (see above for calculation). You do not need to provide the water temperature or salinity.

NOTE: If we aren't seeing a lot of cells in our back bay samples, try increasing the tow length (try towing 8 times instead of 5, for instance) and see if that helps. As long as we indicate the total tow length on the data form, DHS doesn't care.

Analyzing the Sample

Equipment:

- microscope
- TV
- droppers
- slides
- slide covers
- DPH worksheet
- DPH sample container

1. Bring samples back to the NEP equipment room to use the microscope. The equipment is in a box labeled 'Phytoplankton Supplies' in the white cabinets in the equipment room.
2. Gently invert the sample container to re-suspend the sample.
3. Use the dropper to place a few drops of sample onto a glass slide.
4. Place the cover slip on the sample and try to avoid trapping air bubbles under the slide cover.
5. Turn on the microscope by pushing the red button and green switch on the back of the microscope. They should light up.
6. Turn on the TV.
7. Make sure that the video feed in the TV is coming from the microscope. (The cord is a yellow video signal cable. Sometimes the VCR is connected to the TV instead of the microscope.) You may need to use the TV remote to switch the signal from the TV to the external output by pushing the 'TV/VCR' button on the remote. The remote is usually located in the top right hand drawer of the desk.
8. The silver lever on the top of the microscope has three positions:
   - Pulled all of the way out: image on TV and microscope
   - Pulled halfway out: image on TV only
   - Pushed all of the way in: image in microscope only
9. Using the 10X magnification, scan the entire slide to ensure that the slide is fairly uniform (i.e., phytoplankton is fairly evenly distributed throughout the slide). If the slide is not uniform, create a new slide and try again.
10. Make three complete passes through the slide. Estimate population counts for each type of phytoplankton in each pass to complete the DPH data sheet, which is available in the NEP equipment room.
11. Don't fill out the relative abundance scale or the percentage. We will calculate it.
12. Complete data sheet. Leave a copy in the NEP office or equipment room to be faxed to DPH. Do NOT mail the data sheet with the sample or we won't get a copy of it!
13. Put the sample for DPH into the sample container and pack in the plastic bag with the absorbent cotton.
14. Complete the slip of paper contained in the mailing tube to help identify the sample. If there is no slip of paper in the tube, extras are in an envelope in the phytoplankton supply bin.

15. Drop the sample container into the mailbox.
16. Turn off microscope and replace the cover.
17. Wipe the slides and slide covers clean. Rinse out the eye droppers and return equipment to the shelf.
18. Please pour out the remaining sample and rinse the sample containers for the next use. That's probably easiest to do in the restroom.
19. Please report any problems with equipment to VMP staff. Also let them know if any additional supplies are needed before the next pull.

Appendix N. Morro Bay National Estuary Program's Suspended Sediment Monitoring Protocol

Morro Bay National Estuary Program's
Suspended Sediment Monitoring Protocol

Background

As the main entity conducting monitoring for the Morro Bay Sediment TMDL, the MBNEP recognizes the importance of tracking sediment loads and sourced as best management practices and restoration projects are installed throughout the watershed. This monitoring effort is intended to supplement existing ambient turbidity monitoring (captured via the Water Quality Monitoring effort) by collecting continuous monitoring data during large storm events. The goals are to monitor suspended sediment concentration and stream discharge to allow for better calculations of suspended sediment load. This effort employs automated samplers for sample collection at a higher frequency than could be attained by field visits.

Overview

Automated samplers are deployed in the field to collect water during storm flows. Permanent equipment shelters have been installed at creek sites to house automated samplers. If a storm is forecasted, the samplers are stocked with empty bottles and programmed to begin sampling at a certain time and collect samples on a certain frequency. Once all 24 sampler bottles have been filled VMP staff return to the site to swap out the bottles and re-program the sampler if further sampling is desired. Samples are processed in our Water Science Lab located at nearby Cuesta College. Samples are weighed and then poured onto pre-weighed filter. The dried filters provide the mass of sediment contained in the sample and based on the volume of water originally collected, a suspended sediment concentration can be obtained corresponding to various flow levels in the creek.

A. Field Sampling Protocol

1. Bottle Preparation for Sampling

Each site has three assigned bottle sets (A, B or C). Bottles are individually labeled with the site code (three letters), set code (A, B or C) and bottle number (1 through 24). Each bottle has a unique tare weight, written on both sides of the bottle. To prepare bottles for field sampling, follow the method below.

1. Rinse bottles thoroughly with DI water.
2. Fill halfway with DI water, cap, shake vigorously, and pour out DI water.
3. Bottles from especially dirty or contaminated bottle sets should be washed with dishwashing soap and the bottle brush, and rinsed thoroughly with DI water.
4. Place bottles on drying rack over sink.
5. After bottles have rested for 20 minutes, tip forward to pour out water settled in the bottle neck.
6. Place bottles back on rack until completely dried.
7. Place caps into 500 mL beaker, and then fill with DI water and pour out several times.

Once bottles have dried completely:

1. Wipe out sampler base to remove any debris, dirt or water.
2. Gather bottles into matching sets of 24. (Sets are A, B or C for each site).
3. Inspect bottles to ensure that the bottle ID number, tare weight, etc. are legible. If needed, use a Sharpie to refresh these labels.
4. Install bottles in numeric order, with bottle numbers matching numbers stamped on the sampler base.
5. Fasten the round bottle plate to the base with the three elastic bands.
6. Lightly screw caps onto each bottle.

2. Battery Charging and Installation

There are two types of batteries used in the field to power the ISCO samplers. The small black batteries are used primarily at SLU, the large battery is used at CAN.

Charging the 34 amp Battery:

- NEVER charge a frozen battery
- NEVER set battery on top of charger
- Never place charger directly above battery being charged. The gases from the battery will corrode and damage the charger

1. Be sure to set the charger to the 12V setting
2. Place the battery on top of the Styrofoam block.
3. Not the polarity of the battery posts by checking the identification marks.
4. Connect the POSITIVE (red) output clamp from the charger to the POSITIVE (red) post on the battery.
5. Position yourself as far away from the battery as possible, and then connect the NEGATIVE (black) output clamp from the charger to the free end of the cable (black).
6. Plug in charger power cord.
7. Select the appropriate charge rate and battery voltage. The yellow LED light labeled "CHARGING" should light up and the charging process should start.
8. Battery charging takes approximately 6 hours.
9. After charging is done, disconnect the charger using the following steps. First, unplug the charger power chord. Second, remove the output clamp from the NEGATIVE (black) post. Third remove the POSITIVE (red) output clamp from the positive (red) post.
10. Wash hands each time you finish handling the battery and charger.

3. Filling out the Field Logbook

Upon arrival at the site, start a new record in the field logbook. Each field record should include the following:

1. Date and time
2. Staff gauge height (recorded off the staff gauge on the bridge wall)
3. Code for the bottle set being removed (i.e., CAN-A for the A set of bottles from the Canet site)

4. Description of samples collected in bottle set being removed. Note if any bottles failed to fill, overtopped, or drew a varying volume.
5. If battery required changing out
6. Code for new bottle set being installed
7. Code for new battery being installed
8. Program start date and start time
9. Program sampling frequency
10. Program sampling volume

4. Programming the Sampler

Downloading Sampling Data

Sampling report data should be downloaded from the sampler at the beginning of each visit to retrieve sample bottles.

1. Unscrew the cap on the back of the sampler for the port with the computer icon sticker.
2. Connect the RTD device to the port.
3. Wait for data download to complete.
    a. The orange light on the RTD should light up.
    b. The green light on the RTD will blink while data is being downloaded.
    c. The green light on the RTD will become solid when data downloading is complete.
4. Disconnect the RTD from the port when the green light has become solid.
5. Screw the cap back onto the port.

Standard Programming

With standard programming, the sampler purges the sampling line, draws a sample, and then purges the line again after sampling. Only in the extended programming mode does the sampler rinse the line before sampling and retry for sampling.

Each sampler has been pre-programmed with a site description, which does not need to be changed. Suction line length has also been entered and should not be changed unless changes have been made to the sampler intake.

Sampling at One-Hour Intervals with a Manual Start

1. Press the power button to turn the sampler on.
2. If the first screen shows ‘Standard Programming’ proceed to step 7. If the first screen shows ‘Extended Programming’ continue to step 3.
3. Before changing the programming setting, connect the RTD device and download all data.
4. Remove the RTD and use the number keypad to type in **6712.1**. This number sequence will change back to standard programming.
5. A message will flash on the screen warning that all data will be lost. Press **Enter** to continue.
6. The next screen will show ‘Standard Programming’.

7. Go to the main menu.
8. Go to **Program**, press **Enter**
9. At “Site description change?”, scroll to **No**, and press **Enter**.
10. At “Number of Bottles,” scroll to **24,** and press **Enter.**
11. At “Bottle Volume,” type in **1000** mL, and press **Enter.**
12. At “Suction Line Length,” check that lengths are the same as shown below, press **Enter**. (Should not need to be changed)
13. Line lengths by site are:
    CANET: 99
    SAN LUISITO: 35
14. At “Time Paced or Flow Paced” sampling, select **Time Paced**, and press **Enter**.
15. At “Time Between Sample Events,” **type** in the **Number of Hours and Minutes**, and press **Enter**.
16. At “Sequential, Bottles/Sample, Samples/Bottle” select **Sequential**, and press **Enter**.
17. At “Run Continuously?” select **No**, and press **Enter.**
18. At “Sample Volume” type in **350** ml, and press **Enter.**
19. At the next menu “No Delay to Start, Delayed Start, or Clock Time” scroll to **Clock Time**, and press **Enter.**
20. At “First Sample at --:--“, type in the start time, and press **Enter.** Time should be entered as time on a 24-hour clock.
21. At “Select Days” scroll through days, press E**nter** to select or un-select. Scroll to **Done**, press **Enter.**
22. The final screen should show the time the program is scheduled to start (top line) and the countdown to the first sample (bottom line). Double check that the start time is consistent with when you want to begin sampling, and that the countdown is accurate.

Setting the Clock

1. Synchronize sampler clock to time and date on cell phone. Remember to change clocks with daylight savings time.
2. Go to **Other Functions**, and press **Enter**.
3. Go to **Maintenance**, and press **Enter**
4. Press **Enter** again to select **Set Clock**.
5. Enter **Hour**, and press **Enter**. Enter **Minutes**, and press **Enter.** Enter **Day**, and press **Enter.** **E**nter **Months**, and press **Enter**. Enter **Year**, and press **Enter**.
    a. Hours must be set using the 24 hour clock. If it is after 12pm, add 12 to the standard time to get the 24 hour time. (4:00PM + 12 = 16:00)
6. Press **Stop** to return to the main menu.

5. Sample Preparation and Handling

In the field:

1. Immediately upon removing sampler base, cap bottles tightly.
2. Note any bottles where the volume appears to be inaccurate.
3. Fill out RITR labels for each bottle. Labels should include:
    a. Bottle ID

b. Time of Sample Collection
c. Date of Sample Collection
d. Sampling Site (if different from bottle set assigned)
e. Be sure to leave room for recording Tare weight.

4. Bottles should be transported to the lab the same day they are removed from the field.

At the lab:

1. Remove capped bottles from the sample base.
2. Check the water level of each bottle, note bottles with suspect volumes.
3. Clean and dry outside of each bottle, and look for floating debris (leaves, sticks or algae).
4. Remove the bottle cap.
5. Set bottle on high capacity scale.
6. Record the weight of the sample on the RITR label.
7. Re-cap bottle tightly and remove from scale.
8. Apply the RITR label(s) to the bottle.
9. Bottle is ready for storage.
10. Continue with login for sample processing.

Sample Handling QA

To ensure sterility and accuracy, one blank sample should be run for each bottle set that comes in from the field. The blank bottle is filled with DI water, stored at the lab, and filtered alongside samples in the field bottle set.

To prepare a QA Blank:

1. Locate one-liter Nalgene bottles from the BLK bottle set at the lab.
2. Do not pre-rinse the bottle! Bottles have been washed and treated in the same manner as the field ISCO bottles.
3. Fill the bottle approximately halfway with DI water.
4. Weigh the un-capped bottle on the high capacity scale.
5. Create a RITR label noting the QA Blank sample, and the date it was prepared.
6. Record the weight of the sample on a RITR label.
7. Re-cap bottle tightly and remove from scale.
8. Apply the RITR label(s) to the bottle.
9. Place bottle into storage with the appropriate field bottle set, or continue with login for sample processing.

Sample Storage at the Lab

If samples will not be processed immediately:

1. Make sure sample is completely and clearly labeled and weighed in. Note: Do NOT enter the information for the bottle into the Sediment Data Management System until you begin filtering the samples.
2. Re-cap tightly and place back in base, or other storage container.
3. Samples stored in the water lab should be covered with a tarp.

4. Samples with a high sediment/solids concentration should be stored in the refrigerator in the Geology Prep Room.

B. Laboratory Protocol

1. Equipment Accuracy and Calibration Checks

At the beginning of each major lab session, all equipment should be checked and re-calibrated if necessary.

DI Water

DI water should be checked for conductivity before filling the DI squeeze bottles.

1. Run the DI tap for a full minute.
2. Rinse a 500 mL beaker with DI water and pour out.
3. Fill a 500 mL beaker with DI water.
4. Insert the conductivity probe, and allow reading to settle.
5. Record time, date, and conductivity in the DI logbook.
6. If DI water conductivity is over 10 uS/cm, run the tap an additional 1-2 minutes, collect and test a new sample.
7. Once DI water is reading below 10 uS/cm, fill all squeeze bottles that will be used during sample processing.

Oven Temperature

1. Flip the middle switch to 'Power' to turn on the oven.
2. Flip the lower switch upwards to 'Heat'.
3. Set the dial thermostat to 225° F.
4. The red (Power) and orange (Heating) indicator lights on the front of the oven should come on.
5. When the orange indicator light has gone off, open the oven door and record the temperature on the internal thermometer.
6. In the logbook record the date, time and temperature.
7. Oven temperature should be between 103°and 110° Celsius.
8. Make adjustments to thermostat dial as needed.
9. Oven temperature should be checked periodically as samples are drying in the oven. Should we be more specific? Maybe check it once after the oven has time to come up to temperature, say 30 minutes or so?

High Capacity Balance

The high capacity balance should be checked for accuracy before weighing in each round of samples.

1. Make sure the bubble level in the back left corner of the scale is centered. If it isn't, use the dials located on sides of the scale to level the scale.
2. Turn the scale on. The scale display should fill in completely to indicate a self-check.
3. Make sure the surface of the scale is clean and that there is no water on the metal plate.
4. Tare the balance by pressing the 'ZERO' button. The scale will beep when zeroing is complete.
5. When the scale is stable, press the CAL button to begin calibration.

6. Place the indicated calibration weight on the scale (500 grams).
7. After calibration, the calibration weight is displayed with weight units.
8. Remove the calibration weight.
9. Perform several weight checks with the smaller weights in the calibration weight set. Perform weight checks with the 200, 300, and 500 gram weights in the set.
10. The scale capacity is 810 grams, do not exceed this capacity when performing weight checks.
11. When testing with calibration weights, record the time and date of the test, weight of the calibration weight, and scale reading in the scale logbook.

Fine Scale Balance

The fine scale balance should be checked for accuracy before weighing in any filters. It is also important to watch the scale for signs of drift when weighing for an extended period of time.

1. Make sure the bubble level in the back left corner of the scale is centered.
2. Turn the scale on. The scale display should fill in completely to indicate a self-check.
3. Make sure the surface of the scale is clean and all of the glass sides are closed.
4. Tare the balance by pressing the 'ZERO' button. The scale will beep when zeroing is complete.
5. When the scale is stable, press the CAL button to begin calibration.
6. Place the indicated calibration weight on the scale (50 grams) and close the doors.
7. After calibration, the calibration weight is displayed with weight units.
8. Remove the calibration weight.
9. Perform several weight checks with the smaller weights in the calibration weight set. Perform weight checks with the 1.0000, 2.0000, and 3.0000 gram weights in the set.
10. When testing with calibration weights, record the time and date of the test, weight of the calibration weight, and scale reading in the scale logbook.

If the scale is left on for an extended period or bumped off balance, it may begin to drift. To check for scale drift, follow the steps below.

1. Close all of the doors and wait for the scale to stabilize. If the scale does not stabilize at 0.0000 it may be drifting.
2. Test the scale with the low weight calibration weights.
3. If the scale drifts between more than +/- 0.0002 it should be re-zeroed and re-calibrated.

Annual Scale Maintenance and Calibration

The High Capacity Balance and Fine Scale balance will be checked and calibrated annually by an independent calibration firm.

Annual Bottle Tare Weight Checks

Bottle tare weights should be checked annually, and updated if needed. Bottles that have been retired due to leaks or cracks should be flagged as 'Retired' in the Bottles table in the database.

Desiccator Cabinet

At the beginning of each lab session, check the desiccant in each desiccator. Desiccant needs to be re-charged in the oven if more than 20% of the crystals have changed color from blue to pink. To recharge the desiccant, spread it into baking pans and heat according to instructions below.

- Dark blue desiccant beads should be heated to 120°C (248° F) for one to two hours.
- Light blue desiccant crystals should be spread into a single layer and heated to 230°C (450° F) for one to two hours.

Upon removal from the oven, desiccant should be placed immediately into the cabinets. Record the date of recharge in the desiccant log book.

Vacuum Carboy

1. Empty the vacuum carboy frequently when processing samples.
2. The carboy should be emptied when the water depth in the carboy reaches the label marked on the side.
3. Unscrew the white cap on the top of the carboy, being careful not to disconnect tubing from the cap.
4. Pour carboy contents into the sink.
5. Replace white cap on carboy and screw on tightly.

Inspect the tubing that runs from the vacuum to the carboy, there should not be any moisture in the tubing. To remove moisture from the tubing:

1. Loosen the white plastic cap on the carboy so that air can circulate out of the carboy.
2. Disconnect the clear tubing line at the 'Vacuum' side of the pump.
3. Attach the tubing to the nozzle on the 'Pressure' side of the pump.
4. Turn on the pump and let it run for one to two minutes.
5. Disconnect the tubing from the 'Pressure' side, and re-attach to the 'Vacuum' side.
6. Replace white cap on carboy and screw on tightly.

2. Lab Safety Equipment and Procedures

Water samples should be considered and handled as samples containing pathogenic material. Historic water quality data from sediment monitoring sites has shown high levels of pathogenic bacteria, thus safety precautions are necessary for sample handling.

Sample Handling Safety Procedures

1. Powderless gloves should be worn at all times when samples are being unloaded, weighed or filtered.
2. In isolated instances, face shields should be worn when filtering to avoid potentially hazardous splashing.
3. Lab personnel should wash hands with anti-bacterial soap following all sample handling.

Filter Contamination Prevention

Filter weights and subsequent sediment concentration data can be influenced by lab contamination. The following steps should be taken to prevent filter contamination.

1. Lab personnel should wash hands prior to commencing any work in the lab.
2. Lab personnel should put on powderless gloves before handling any filters.
3. Filters should be transported to the manifold and into foil trays using clean forceps. Following rinsing on the manifold, filters should not be touched with gloved or bare hands.
4. Filters that have been rinsed and dried for one hour should be moved into the 'clean dessicator' using clean tongs immediately upon removal from the oven.

General Lab Safety

A First Aid kit is mounted on the wall near the sink of the lab. An updated red folder of MSDS forms is available in the file holder near the door of the lab.

Potentially hazardous materials in the lab include:

NiCd batteries (4)
AGM Batteries (1)
Turbidimeter calibration standards
Winkler DO kit solutions and reagents
Compressed air

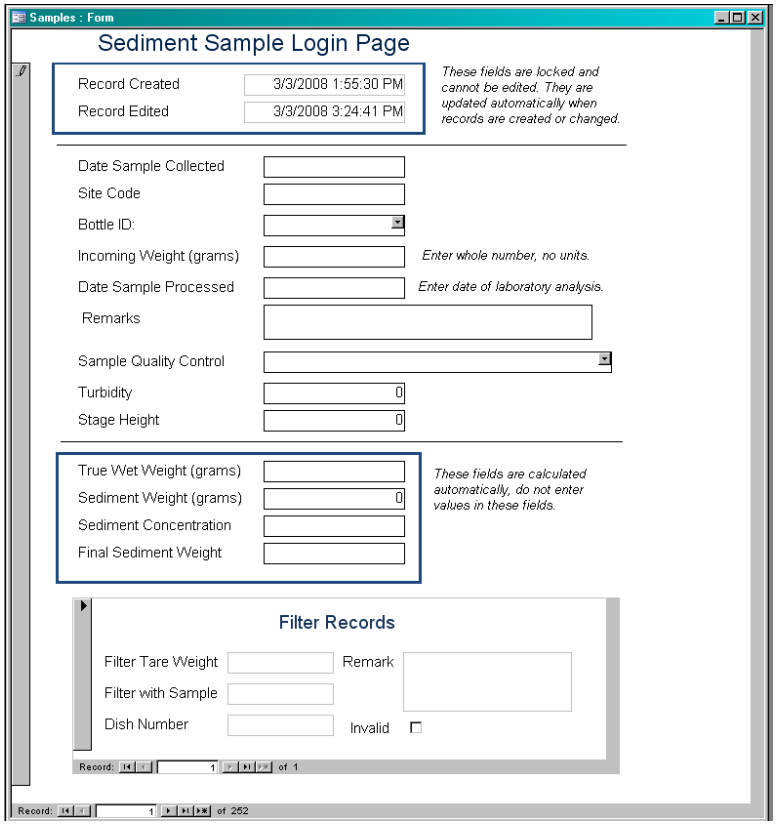
3. Filter Preparation and Storage

Important: Filters must always be handled with forceps.

1. Using forceps, remove filters from the box and separate carefully.
2. Visually inspect filters for holes or tears. Discard defective filters.
3. Rinse manifold platforms and filter funnels with DI water.
4. With valves closed, place filters on all six manifold stages.
5. Turn on vacuum and open valves.
6. Rinse filters several times with DI water to remove any loose fibers or dust.
7. Check filters for holes by listening for a whistling sound, indicated by a whistling sound as air passes through a hole in the filter.
8. Watch for filter centers to change from transparent to white, indicating that most of the moisture has been removed. (Pressure on the vacuum valve will be at 17 in. Hg)
9. Close valves and carefully remove filters with forceps.
10. Place each filter into a clean, numbered foil tray.
11. Place foil trays on clean baking sheet and allow to air dry.
12. Place baking sheet into oven and heat at 103° to 105°C for one hour.
13. Remove baking sheet from oven.
14. Using tongs, place foil trays into Clean Filter Desiccator for cooling and storage.
15. Foil trays must cool in desiccator for at least 30 minutes before being used for filtration.

4. Sample Filter Assignment and Log in

Samples are not logged in to the computer until they are ready to be filtered and processed. All samples are logged in using the 'Samples' form in the Suspended Sediment Database, seen below.



Field Title	Purpose	Entry Instructions
Record Created	Tracks when records are created.	Locked field, no entry permitted.
Record Edited	Tracks when records are changed or updated.	Locked field, no entry permitted.
Date Sample Collected	Records when samples are collected.	Enter date and time on bottle label, using 24-hour clock. For midnight enter 00:00:01.
Site Code	Records which site samples are from.	Enter 3 letter site code, SLU or CAN. For blanks enter BLK.
Bottle ID	Records which bottle is being used, subtracts tare weight	Enter 3 letter site code, bottle set letter, bottle number.
Incoming Weight	Records weight of bottle with sample. Should not include weight of cap.	Enter incoming wet weight, as written on bottle label.
Date Sample Processed	Tracks when samples and filters are processed.	Enter date that sample processing starts.
Remarks	Notes anything unusual about the sample.	Note low sample volume, if sample has spilled, if there is algal growing in the bottle.

Field Title	Purpose	Entry Instructions
Turbidity (NTU)	Record turbidity reading for the sample.	Enter this value if a turbidity reading is available.
Stage Height	Identifies creek stage when sample was collected.	Enter the most recent stage reading, downloaded from the County datalogger.
True Wet Weight (grams)	Calculates the weight of the sample. Automatically subtracts the tare weight of the bottle containing the sample.	This field is locked, and is shown only to reference the weight of the sample being analyzed.
Sediment Weight (grams)	Calculates the net weight of sediment collected on filters	This field is locked, and is only shown to reference the raw sediment weight of the sample.
Sediment Concentration (ppm)	Uses the 'True Wet Weight' and 'Sediment Weight' fields to calculate the sediment concentration of the sample in parts per million.	This field is locked, and is only shown to display the sediment concentration of the sample.
Final Sediment Weight (mg/L)	Uses the 'Sediment Concentration' field and a numeric equation to calculate the final sediment concentration in milligrams per liter.	This field is locked, and is only shown to display the sediment concentration of the sample.
Filter Tare Weight (grams)	Records the weight of the clean filter and dish assigned to the sample.	When the fine balance has stabilized, press 'Print' on the balance to transmit data to this field directly.
Filter With Sample (grams)	Records the weight of the used filter and dish assigned to the sample.	When the fine balance has stabilized, press 'Print' on the balance to transmit data to this field directly.
Dish Number	Tracks the dish assigned to the sample.	Type in the three digit number of the filter, written on the tab of the foil dish.
Remarks	Notes any problems with the filter during filtering.	Enter notes as needed.
Invalid	Checkbox used to invalidate filters that have been incorrectly assigned or damaged. Checking this box halts all automatic data calculations for the sample.	Check this box when filters have been damaged or contaminated.

5. Sample Login

1. Remove samples from long term storage and inspect visually.
    a. Bottles should be dry, with roughly equal volume samples. Set aside any bottles that are wet or have suspect volumes (might indicate a leaky bottle.)
2. In the 'Suspended Sediment' master database, open the form called 'Samples'.
3. Enter the following fields in order:
    a. Date Sample Collected. (Includes Time entered as 24 hour clock.)
    b. Site Code

c. Bottle ID (An error message will pop up if your bottle is not identified in the database.)
d. Incoming Wet Weight
e. Date Sample Processed
f. Remarks
    i. Use this field to note any suspect sample volumes, floating debris, or macroinvertebrates in the sample.

Activate the 'Filters' sub-form of the Samples form to assign filters to the sample.

6. Assigning Filters

Depending on the sediment content of samples, they may require from one to ten or more filters to process the entire sample. Reviewing the stage data and processing samples in the order they were taken in the field will help determine the number of filters needed for each sample.

1. Use tongs to remove clean and dry filters from 'Clean Filter Desiccator'.
    a. Only remove as many filters as you can use in a ten-minute period. Filters will pull moisture from the air which will result in an artificially high tare weight.
2. Place one filter on the fine scale balance and close all of the glass doors.
3. Place the mouse pointer into the 'Filter Tare Weight' field and activate the field.
4. When the weight has stabilized on the balance, press 'Print' on the balance to transmit data to the field.
5. Enter the three digit number on the foil tab into the 'Dish Number' field.
6. To assign an additional filter, press the new record form located at the bottom of the form. (Indicated by the right pointing arrow and star symbol)

7. Filtering Samples

It is important to note the vacuum pressure on the manifold when filtering samples. Pressure applied to the filters should not exceed 20 in. Hg. If filtering on several stations concurrently, leave one station clear so that vacuum pressure can be relieved if needed.

For samples that require a single filter:

1. Turn on the vacuum pump and open all of the valves on the manifold.
2. Rinse down all stations on the manifold to clear any debris or dust that might have settled on the surface.
3. Remove one of the magnetic cups and place the filter on top of the black filtering surface.
    a. Filters should be handled with forceps and should not be 'flipped'. The side of the filter 'face-up' in the dish should be the side 'face-up' on the manifold.
4. Place the empty foil dish directly beneath the filter station. Filters and dishes are not transferable! It is important to keep the filter with the assigned dish throughout the process.
5. Wet down the filter with DI water and check the filter for contamination or tears.
6. Replace the magnetic cup on top of the manifold station.
7. Slowly pour the sample into the magnetic cup, being careful not to splash water out of the cup.
8. Hold the sample bottle cap over the magnetic cup and rinse down the cap with DI water.

9. Hold the sample bottle over the magnetic cup and rinse down the inside of the bottle with DI water. Tilt the bottle at an angle to flush out any particles trapped in the neck of the bottle.
10. When all of the sample and rinse water has filtered through the filter, rinse down the inside of the magnetic cup with DI water.
11. Watch the filter carefully to see that all water drains through the filter.
12. Switch off the suction to the station and remove the magnetic cup.
13. Using forceps, carefully slide the filter back into the assigned foil tray. It is important not to tilt or flip the wet filter as sands or other large particles may fall off.
14. Place the foil tray with filter onto a large baking sheet.
15. Allow wet filters to air dry on baking sheet until the baking sheet is full.

*Process the blank sample using the protocols for filtering with a single filter. One blank sample should be run for each bottle set (24 bottles) that comes in from the field.

For samples that require multiple filters:

1. Turn on the vacuum pump and open all of the valves on the manifold.
2. Rinse down all stations on the manifold to clear any debris or dust that might have settled on the surface.
3. Remove the magnetic cups and place the filters on top of the black filtering surface.
    a. Filters should be handled with forceps and should not be 'flipped'. The side of the filter 'face-up' in the dish should be the side 'face-up' on the manifold.
4. Place the empty foil dish directly beneath the filter station. Filters and dishes are not transferable! It is important to keep the filter with the assigned dish throughout the process.
5. Wet down the filters with DI water and check the filter for contamination or tears.
6. Replace the magnetic cup on top of the manifold station.
7. Place filters on up to 5 stations. Leave the sixth station clear so that vacuum pressure can be relieved if needed.
8. Slowly pour between 50 to 100ml of the sample onto each of the filters in turn.
9. Watch the vacuum pressure as each of the manifolds begin to pull water through the filters. If vacuum pressure rises to 19 in. Hg, open the valve on the empty station to relieve the pressure.
10. Close the valve at the empty station to increase the pressure on the filtering stations.
11. Open and close the valve at the empty station as needed to continue filtering.
12. When the majority of the sample volume has been poured out, carefully use DI water to dislodge remaining particles in the bottom of the bottle.
13. Distribute the remaining sample among the filters.
14. Hold the sample bottle over one of the magnetic cup and rinse down the inside of the bottle with DI water. Tilt the bottle at an angle to flush out any particles trapped in the neck of the bottle.
15. Hold the sample bottle cap over one of the magnetic cups and rinse down the cap with DI water.
16. When all of the sample and rinse water has filtered through the filter, rinse down the inside of the magnetic cup with DI water.
17. Watch the filters carefully to see that all water drains through the filters.

18. Switch off the suction to the station and remove the magnetic cup.
19. Using forceps, carefully slide the filters back into their assigned foil trays. It is important not to tilt or flip the wet filter as sands or other large particles may fall off.
20. Place the foil trays with filters onto a large baking sheet.
21. Allow wet filters to air dry on baking sheet until the baking sheet is full.

8. Drying Samples

Used filters should be placed on a baking sheet in preparation for drying. Once the baking sheet is full, place baking sheet into the oven to dry samples.

1. Turn on the oven.
2. Set the thermostat to 225° F
3. Place baking sheets with filters into oven.
4. Bake from three to 24 hours. Minimum drying time for processed filters is 3 hours.
5. Remove baking sheets from oven.
6. Read thermometer inside the oven and record the date, time and temperature on the log sheet posted on the oven door.
7. Using tongs, carefully transfer foil trays with filters into the 'Sediment Sample Desiccator'.
8. Samples should cool in the desiccator for 30 minutes before they are weighed.

9. Final Filter Weights

The fine scale balance should be checked for accuracy before weighing in any filters. It is also important to watch the scale for signs of drift when weighing for an extended period of time.

1. Make sure the bubble level in the back left corner of the scale is centered.
2. Turn the scale on. The scale display should fill in completely to indicate a self-check.
3. Make sure the surface of the scale is clean and all of the glass sides are closed.
4. Complete the scale calibration and weight checks described in the Equipment Accuracy and Calibration section of this protocol.
5. Open the form called 'Final Weights'.
6. Locate the dish number that corresponds to the dish being weighed.
7. Using the tongs, place the dish with filter onto the fine scale balance and close the glass doors.
8. Place the mouse pointer into the 'Filter With Sample' field and activate the field.
9. When the weight has stabilized on the balance, press 'Print' on the balance to transmit data to the field.
10. After weighing several dishes, save changes and close the form. Re-opening the form will limit the display to only the filters that are missing a final weight.

C. Data Management

The database should be copied and saved to a USB data transfer device twice each month. The database should be given a sequential number to identify the most recent version. The database is then downloaded from the USB device to a staff computer at the MBNEP office and saved to a specified folder on the server. The back-up of the server created weekly and stored in a fireproof box.

Database copies can be made and transferred more frequently when a high volume of samples is being processed at the lab.

A query has been developed so that a hard copy of all sample results can be created. The query is run twice a month during times of sample processing. These paper records are stored at the lab.

Appendix O. Morro Bay Volunteer Monitoring Program Equipment Calibration Protocols

Morro Bay Volunteer Monitoring Program
Equipment Calibration Protocols

Hach 2100 Turbidimeter

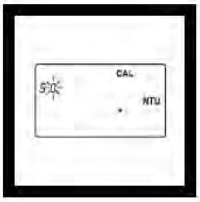
This instrument is designed for long-term stability and minimal need for recalibration. It is recommended that recalibration be performed at least once every three months, or more often if experience indicates a need. To guarantee accurate calibration, use only the formazin standards issued by Hach.

The formazin calibration standards have a long shelf life, but must be stored properly. Standards should be stored in their respective kit with cover in place, out of direct sunlight. For long term storage, refrigeration at 5^{o} C is recommended, do not store above 25^{o} C.

Calibration:

- Shake the standard vigorously for 2-3 minutes to resuspend particles.
- Allow standard to stand undisturbed for 5 minutes.
- Gently invert the bottle 5 to 7 times.
- Prepare the sample cell for measurement using traditional preparation techniques. (Oil the sample cell and wipe with velvet cloth).


- Let the cell stand for one minute after oiling.
- Insert the <0.1 ntu standard cell, align the orientation marks on the cell and chamber. Close the lid and press the **I/O** button to turn on the meter.
- Press the **CAL** button, both the **SO** and **CAL** buttons will be displayed and the **'0'** will flash.

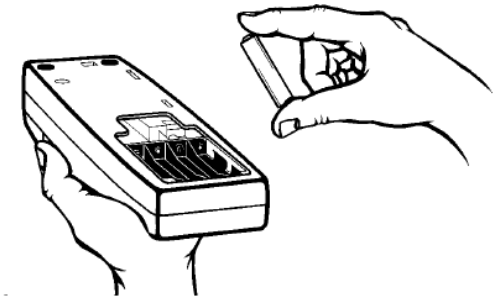
- Press **READ** and the meter will count down from 60 to 0, read the sample and calculate the correction factor.

- The display will show the 20.00 ntu value on the screen. Insert the 20.00 ntu standard with correct alignment and press the **READ** button.

- Repeat these procedures sequentially for the remaining standards as the meter prompts.
- After reading the final standard (800 ntu), the meter will re-display the **S0** screen from the beginning of the calibration.
- Remove the 800 ntu standard and press **CAL** to accept the calibration.

Battery Replacement:

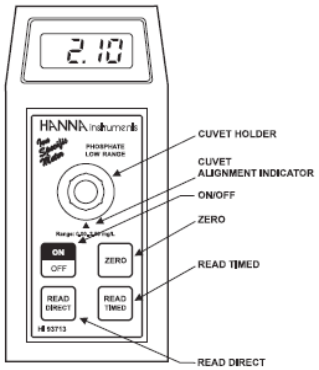
- This meter works on 4 AA-size alkaline batteries. Brand name 'digital' batteries are recommended for best performance.
- Remove the battery compartment cover on the bottom of the meter to install new batteries.
- Check the polarity diagram on the inside of the panel to ensure correct installation.



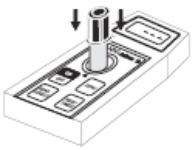
Hanna Phosphate Meter
Calibration Protocol

This instrument is designed for long-term stability and minimal need for recalibration. This meter cannot be calibrated in house, however, due to variations in accuracy against quality assurance tests this meter is given a two point test on a quarterly basis.

Calibration:



- Remove the cap of a glass cuvet and rinse thoroughly with DI water.
- Using a syringe, fill the cuvet up to the 10ml line with DI water as the 0.0mg/L standard and replace the cap.
- Record the calibration standard value in the calibration log.
- Turn the meter on by pressing the **ON/OFF** button. When the meter displays  it is ready to take measurements.
- Remove the travel cap and place the cuvet into the holder. Ensure that the notch on the cap is positioned securely in the groove.
- Press the **ZERO** button and **SIP** will appear on the screen. Wait a few seconds for the '0.0' reading to appear on the screen indicating that the sample has been zeroed effectively.
- Remove the cuvet and add a packet of the reagent. Swirl gently for thirty seconds.

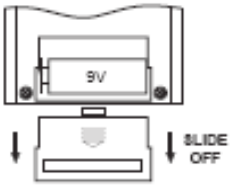


- Reinsert the cuvet into the holder and press the **READ TIMED** button to begin timing the reaction.
- The display will show the countdown of the reaction and display **SIP** immediately before showing the result.
- Record the result in the post-calibration area on the calibration log.
- Repeat above procedures with the 1.0 mg/L PO4 calibration standard.

Battery Replacement:

The meter can signal a need for battery replacement in two ways. A small **'V'** appears in the upper right corner of the display to indicate low remaining voltage.
The meter signals that batteries have died by displaying a **-BA-** warning when the meter is turned on. (See displays below.)

This meter requires one alkaline 9-volt battery that can be installed by sliding open the panel on the bottom of the meter.

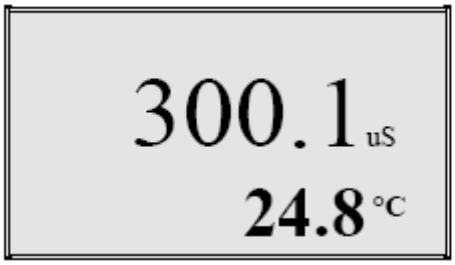


YSI 30 and 85 Salinity Meter
Calibration Protocol

Calibration:

The YSI 30 meter requires only a single point calibration to adjust the meter for all parameters. As the VMP uses these meters in brackish and saline waters, a 15,000us or 50,000 us standard is suitable for most testing.

- Turn the instrument on and allow it to complete its self test procedure.
- Select a calibration solution most similar to the sample the meter will be measuring.
- Pour at least 3 inches of solution into a clean glass calibration jar.
- Insert the probe into the beaker deep enough to completely submerge the oval shaped hole on the side of the probe. Do not rest the probe on the bottom of the container, suspend it above the bottom by at least ¼ inch.
- Press the mode key until the instrument is reading conductivity or specific conductance. (Indicated by the display below).



°C Not flashing = Conductivity

°C Flashing = Specific conductance

- Allow at least 60 seconds for the temperature reading to become stable.
- Move the probe vigorously from side to side to dislodge any air bubbles from the electrodes.
- Press both the UP ARROW and DOWN ARROW keys at the same time. The CAL symbol will appear on the bottom left of the display to indicate the meter is now in calibration mode.

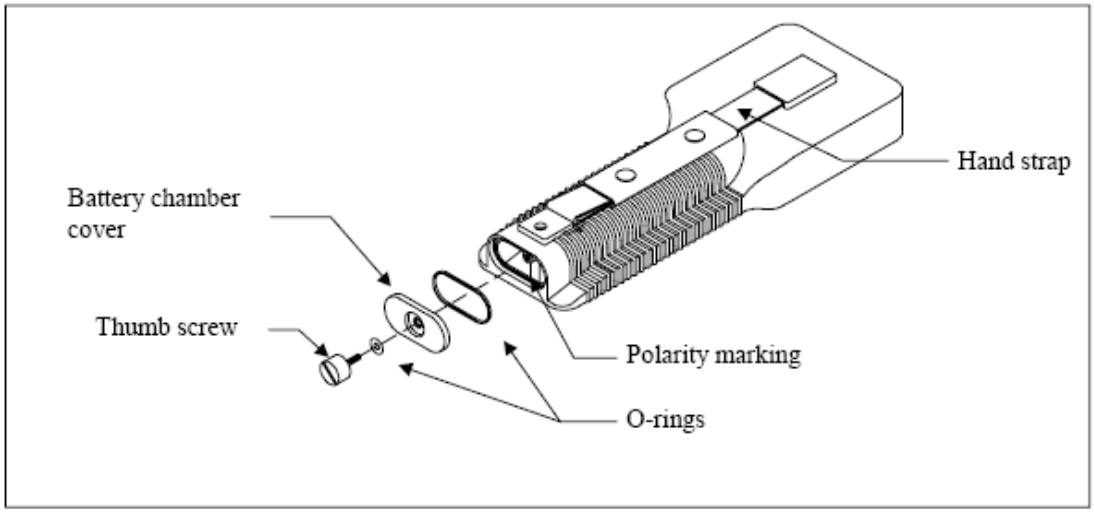
Value of calibration solution at 25°C

- Use the UP ARROW or DOWN ARROW key to adjust the reading on the display until it matches the value of the calibration solution you are using.
- Once the display reads the exact value of the calibration solution being used (the meter will make the compensation for temperature variation) press the ENTER key.

- The word SAVE will flash across the display for a second indicating that the calibration has been accepted.

Battery Replacement:

- This meter works on 6 AA-size alkaline batteries. Brand name ‘digital’ batteries are recommended for best performance.
- Use a screwdriver or small coin to remove the thumbscrew on the bottom of the instrument and open the battery chamber.
- The battery chamber is marked with the words OPEN and CLOSE to guide you.
- Check the labels inside the two battery chambers that illustrate the correct polarity of the batteries



YSI 85 Dissolved Oxygen Meter
Calibration Protocol

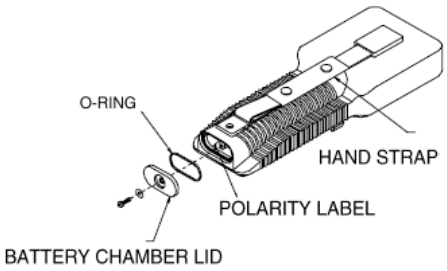
Before calibrating, determine if meter is being calibrated for fresh water (creeks) or salt water (bay) monitoring. Determine the approximate altitude of the area where the meter will be used.

Calibration:

- Ensure that the sponge inside the instrument's calibration chamber is saturated with de-ionized water.
- Rinse the probe with de-ionized water.
- Insert the probe into the calibration chamber.
- Turn the instrument on by pressing the ON/OFF button.
- Wait for the dissolved oxygen and temperature readings to stabilize, approximately 15 minutes.
- To enter calibration menu, press both the UP ARROW and DOWN ARROW keys at the same time.
- The screen will prompt you to enter the local altitude in hundreds of feet, use arrow keys to increase or decrease the altitude.
- When the proper altitude appears on the screen press the ENTER key.
- Model should no display CAL in lower left of display, the calibration value is displayed in the lower right of the display and the current DO reading should be on the main display.
- Make sure that the DO reading on the main display is stable, press ENTER.
- Model will prompt you to enter salinity of water being analyzed use UP ARROW and DOWN ARROW to adjust to the following:
    - For freshwater enter 0.0 ppt
    - For saltwater enter reading taken using YSI 30 Salinity meter, up to 40.0 ppt.
- Once calibration is complete only the MODE and ON/OFF keys will remain operational.

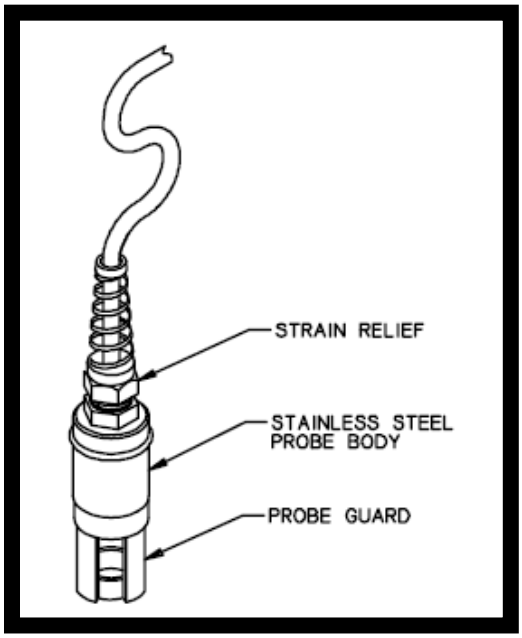
Battery Replacement:

- This meter works on 6 AA-size alkaline batteries. Brand name 'digital' batteries are recommended for best performance.
- Use a screwdriver or small coin to remove the thumbscrew on the bottom of the instrument and open the battery chamber.
- The battery chamber is marked with the words OPEN and CLOSE to guide you.
- Check the labels inside the two battery chambers that illustrate the correct polarity of the batteries.



Probe Conditioning:

- For the Model 85's, unscrew the membrane cap.
- If triangular silver anode appears tarnished,(it should appear white) soak in 3% ammonium hydroxide, and rinse with DI water.
- If gold cathode appears tarnished, clean using the probe reconditioning kit. Rub the gold cathode ring gently with tarnish cloth until shine is restored.
- To install new membrane on the Mode 85s, add electrolyte solution and then screw on a new membrane cap.
- Rinse with de-ionized water and reinstall sensor guard.
- Allow meter to stabilize in humid calibration chamber overnight before re-calibration.



Protocol for Winkler Titration to Verify DO Meter Accuracy
To be Conducted by VMP Staff Only

Equipment:

- 1 L beaker
- Magnetic stirrer
- Stirring plate
- DI water
- Dissolved Oxygen Test Kit (HACH, Cat. No. 1469-33)

Procedure:

1. Rinse all testing materials with DI water.
2. Conduct the High Range Test (1-20 mg/L)
3. Fill the beaker with DI water.
4. Place a stirrer in the water and place the beaker on the stirring plate.
5. Set the stirrer to the maximum rate and allow the water to mix for 2 minutes.
6. Turn off the stirrer and use the beaker to fill the DO bottle (round bottle with glass stopper). Allow sample water to overflow the bottle and avoid turbulence and bubbles in the sample while filing.
7. Replace the beaker on the stirring plate and turn the stirrer on to the maximum.
8. Place the DO meter probes into the beaker, making sure that they are fully submerged.
9. Conduct the Winkler DO test on the sample. Incline the bottle slightly and insert he stopper with a quick thrust to avoid trapping air bubbles. If bubbles become trapped, discard the sample and repeat the test.
10. Remove the stopper and add the contents of one Dissolved Oxygen 1 Reagent Powder Pillow and one Dissolved Oxygen 2 Reagent Powder Pillow. Stopper the bottle carefully to avoid trapping air bubbles. If bubbles become trapped, discard the sample and repeat the test.
11. Shake the bottle vigorously to mix. Flocculant (floc) precipitate will form. Brownish-orange precipitate indicates oxygen is present.
12. Wait for floc to settle to approximately half the bottle volume.
13. Shake the bottle vigorously.
14. Wait for floc to settle halfway.
15. Remove the stopper and add the contents of one Dissolved Oxygen 3 Reagent Powder Pillow. Stopper the bottle carefully to avoid trapping air bubbles. If bubbles become trapped, discard the sample and repeat the test.
16. Shake the bottle vigorously to mix. Floc will dissolved and the sample will turn yellow if oxygen is present.
17. Fill plastic tube full (to the top) with prepared sample.
18. Pour the contents of the tube into a square mixing bottle.
19. Add Sodium Thiosulfate Standard Solution one drop at a time to the mixing bottle. Count each drop. Swirl to mix after each drop. Add drops until the sample becomes colorless.
20. The total number of drops of titrant equals the total mg/L Dissolved Oxygen. Compare to the read-outs on the DO meters.
21. Record all values on the Equipment Calibration Log Sheet.
22. Discard waste in bottle labeled “Winkler Titration Waste Container.”
23. Triple rinse all DO testing bottles with DI water.

Equipment Calibration Log

Morro Bay Volunteer Monitoring Program
Equipment Calibration Log

Date	Name

Phosphate Meter: Hanna Low Range with HACH reagent

ID#	Reading with Standard (1.0 mg/L)	Reading with DI (0 mg/L)
PO4-MBV-		
PO4-MBV-		

Nitrate test kit: LaMotte

ID#	Reading with Standard (1.0 mg/L)	Reading with DI (0 mg/L)
NO3-MBV-		
NO3-MBV-		

Turbidimeter: HACH 2100P

ID#	Standard	Pre-cal	Post-Cal	Standard	Pre-cal	Post-Cal
TUN-MBV-	< 0.1 NTU			20 NTU		
	Standard	Pre-cal	Post-Cal	Standard	Pre-cal	Post-Cal
	100 NTU			800 NTU		
ID#	Standard	Pre-cal	Post-Cal	Standard	Pre-cal	Post-Cal
TUN-MBV-	< 0.1 NTU			20 NTU		
	Standard	Pre-cal	Post-Cal	Standard	Pre-cal	Post-Cal
	100 NTU			800 NTU		

Salinity Meter: YSI 30

ID#	Standard	Pre-cal	Post-Cal
SAL-MBV-			
SAL-MBV-			

DO Meter: YSI 55

WWTP Comparison	WWTP (mg/L)	MBV Meter (mg/L)	Salinity (ppt)
DOE-MBV-			
DOE-MBV-			

DO Meter: YSI 85

WWTP Comparison	WWTP (mg/L)	MBV Meter (mg/L)	Salinity (ppt)
DOE-MBV-			
DOE-MBV-			

Conductivity: YSI 85

ID#	Standard	Pre-cal	Post-Cal
DOE-MBV-			
DOE-MBV-			

Morro Bay Volunteer Monitoring Program
Equipment Calibration Log

Conductivity: ECTestr

ID#	Standard	Pre-cal	Post-Cal	Standard	Pre-cal	Post-Cal
EC-MBV-						
EC-NET-						

Conductivity: ECTestr 11+ Multi-Range

ID#	Standard	Pre-cal	Post-Cal	Standard	Pre-cal	Post-Cal
EC-MBV-						
EC-MBV-						

DO Meter Maintenance

Meter ID #:	Meter model #:	Membrane replaced:	Probe reconditioned:

Bacteria Laboratory Equipment

Thelco Model 2DG and Model #DM Incubators and Thermometers

This instrument is to provide a controlled dry heat environment from 5ºC to 70ºC $\pm$ 0.5 ºC for culture tubes or Petri dish incubations.

Temperature calibration will be conducted on a quarterly basis. A certified thermometer is placed in the incubator along with the incubator thermometer for 12 hours. The temperature on the certified thermometer should be at 34ºC $\pm$ 0.5ºC for IDEXX Colilert-18 incubation and 41ºC$\pm$0.5ºC for IDEXX Enterolert incubation. The temperatures are recorded on a calibration log sheet. If the incubator is not at the desired temperature, the temperature control will be adjusted until the temperature is correct.

If the incubator thermometer is not within $\pm$ 0.5ºC of the certified thermometer, the temperature difference will be recorded and corrections will be made to the incubator thermometer reading each time readings are taken.

Morro Bay Volunteer Monitoring Program
Bacteria Laboratory Equipment Calibration Log

Date	Incubator ID	Certified Thermometer Reading (ºC)	Incubator Thermometer Reading (ºC)	Temperature Difference (ºC)	Incubator Setting Adjustment

Appendix P. Morro Bay Volunteer Monitoring Program Data Management Protocols

Morro Bay Volunteer Monitoring Program
Data Management Protocols

Revised March 2008

Overview

All of the data that is collected for the volunteer monitoring program (except debris monitoring) is entered into an Excel database. Some of the projects are included in the CCAMP (Central Coast Ambient Monitoring Program) database, which is maintained by the Regional Board. The remaining projects have separate datasheets that were created by the VMP specifically for each project. Following is a list of the data that is collected and the file where it is entered.

Project	Data Entry File
Bacteria / Bacteria QA	CCAMP DataMon## / Bacteria QA Results
Water Quality and Flow / Nutrient QA	CCAMP DataMon## / Nutrient QA Results
Dawn Patrol	CCAMP DataMon##
Phytoplankton	CCAMP DataMon##
Macroinvertebrates	CCAMP DataMon##
First Flush	CCAMP DataMon ##
Urban Watch	…VMP DATA\STORMWATER\URBAN WATCH\URBAN WATCH.MDB
Suspended Sediment Data	…VMP DATA\SEDIMENT\SUSPENDED SEDIMENT.MDB
Eelgrass	…VMP DATA\ EELGRASS \ DATA-SUMMARIES\ VMP FIELD DATA **or** VMP BIOMASS DATA
Bird Survey	…VMP DATA \ BIRD SURVEYS \ DATA-SUMMARIES \ BIRD SURVEY DATA.xls
Stream Profiles	…VMP DATA\ STREAM PROFILES \ DATA-SUMMARIES \ PROFILE DATA **or** SUBSTRATE DATA
Back Bay Nutrients	…VMP DATA \ WATER QUALITY-BAY \ NUTRIENTS \ DATA-SUMMARIES \ BACK BAY SHORE NUTRIENT DATA.xls
Volunteer Hours	…VMP ADMIN \ RECOGNITION \ VOLUNTEER HOURS \ VOLUNTEER HOURS.xls
New Volunteers	…DATABASE\NEW DATABASE\MBNEP.MDB

CCAMP

CCAMP is an Excel database that was created by the Regional Board to provide a standard database for storage and analysis of data. There are a number of benefits to using CCAMP, but it

has some quirks. While there are approximately 80 worksheets in the CCAMP database, the VMP only uses about 7. Current VMP data is mixed with older data and columns that are not currently relevant, and sometimes the program rearranges the data so it's not sorted correctly. Hopefully the following explanations will help speed up the process of becoming familiar with the database. If there are ever any questions regarding the content or use of the database, our primary contact at the regional board is Mary Adams (805-542-4768). If Mary is not available and the question is related to the design or function of the database, questions can be directed to the creator Dave Paradies (805-528-0221).

The CCAMP database is named DataMon##. The ## refers to the version of the file. After entering a month's worth of data, or as the Regional Board makes updates, new versions of the file are saved and numbered consecutively. Following is a general explanation of the worksheets in CCAMP that the VMP regularly uses:

Control

1. This page is essentially the control panel for running analyses that create bar charts and time series graphs.
2. The menus are used to specify the data that will be analyzed and the type of analysis. 'Project' can be left as 'All Projects' or changed to a specific project if preferred. 'Hydrologic Unit' must stay as '(310) Estero Bay'.
3. 'Sample Type' would be 'Conventional Water Quality' if analyzing bacteria, dawn patrol, water quality, or flow data; 'Freshwater Benthic Bioassessment' if analyzing macroinvertebrate data; or 'Marine Plankton' if analyzing phytoplankton data.
4. Depending on the sample type that is specified, the options in analyte will change to reflect the types of data that can be analyzed. Simply select the analyte to be displayed in the bar chart, leave 'Matrix' as the default, then select the 'Expression' or type of analysis that is to be done, and the date range.
5. Currently the VMP only looks at data that has been collected since June 2002 because that is data that has been collected under Ann's supervision so she can vouch for the method and QA.
6. Pressing the Bar Chart button will take you to a new page where a chart should automatically be produced.
7. Pressing the Time Series button will take you to a separate page where you will again be asked to specify the analyte, as well as the site(s) the time series graph should display. Pressing the New Chart button creates the chart.

Options

1. Of the many buttons on this page there are only a few you will need to use.
2. Under the Tools section, select 'Recalculate Bioassessment' after adding new macroinvertebrate data.
3. Select 'Recalculate data Inventory' after adding a new site or analyte.
4. After entering the transect data for flow select 'Move transect flows to CWQdata' to calculate the flow value.
5. Periodically select the 'Check Sites' button which will notify you of missing data points or other errors.
6. Some actions will limit the number of worksheets visible so press 'Show all Sheets' to access all of the worksheets.

CWQData

1. This is the primary sheet you will be working with. It is here that the bacteria, dawn patrol, and water quality data is entered.

TransData

1. This is where flow data is entered.

MbiData

1. This is where the Phytoplankton data is entered

Sites

1. Each of the locations where data is collected has to be entered into the Sites page.
2. To enter a new site, use the existing entries as a guide and enter the 'Site Tag' and 'Site Name'.
3. Then scroll over to where the projects are listed (columns Q – AF). Under the appropriate project's name, you must type a '1' in the row of the new site. This flags the program to look for that site's name in the list of data associated with that project.
4. Once the site has been entered, go back to the Options page and select the 'Recalculate data Inventory' button.

Analytes

1. This page is very similar to the site page in that each of the analytes (types of data) collected has to be entered into the Analytes page.
2. To enter a new analyte, use the existing entries as a guide and enter the 'Analyte', 'CCAMPID', etc. Then scroll over to where the projects are listed (columns Z – AN). Under the appropriate project's name, you must type a '1' in the row of the new site. This flags the program to look for that site's name in the list of data associated with that project.
3. Once the site has been entered, go back to the Options page and select the 'Recalculate data Inventory' button.

<u>Additionally, a few other notes about data entry in CCAMP.</u>

1. With each data row there is a watershed code ('Shed' column), so if you are copying a row of data from one site then inserting it to be used for data entry of a different site, or if adding a new site, be sure to check that the 'Shed' code correctly refers to the watershed where the site is located.
    a. Bay Sites = 31020
    b. Los Osos Sites = 31022
    c. Chorro Sites= 31023
    d. Coon Creek = 31025
2. Sometimes when changes to sites, projects, or analytes are made the program doesn't seem to recognize those changes. Before getting too frustrated, try to "jiggle a big switch", which would mean going to the Options page and selecting a different Hydrologic Unit and/or Project, then switching back to '(310) Estero Bay'.
3. Also, some tasks, such as pressing 'Recalculate data Inventory' will cause the program to mix-up the order of the data on the CWQData page. When this happens, you'll have to select all of the data, then sort, first by 'ProjId', then by 'DateTime'.

Bacteria / Bacteria QA

1. Use the printed Idexx table, or the IDEXX MPN Generator (in the Start Menu), to verify that the volunteer correctly identified the MPN.
2. If the sample was diluted, verify that the MPN was multiplied by the dilution factor.
3. If multiple dilutions were run, enter data from the results that are closest to 80% positive wells (77 of 97 wells)This may be from separate dilutions for the separate types of bacteria. Indicate on the datasheet and in the Notes column of the database what dilution, for each type of bacteria, was used on the data entered.
4. If the results for a site are above this range then increase the dilution factor the following month, and likewise, if the results for a site are below this range, decrease the dilution the following month.
5. The data is entered in the CWQData worksheet in MorroMon##, under ProjId 'BAC'. The best thing to do is find the data entry for that site from the previous month, copy the row, then insert the row at the end of the BAC dataset and make appropriate changes by entering the current data in the appropriate columns.
6. If a QA sample was taken, open the **file U:\Monitoring\vmp\VMP Data\Bacteria\Data – Summaries\95% CI for QA.xls**, or the IDEXX MPN Generator, and write down on the datasheet the upper and lower limits of the 95% confidence interval.
7. To enter the QA data, copy the volunteer's row of data then insert the copied row just below the original, in the QA/QC column type 'yes', and in the Purpose column type 'QA'.
8. When the results of the QA are returned, write down on the datasheet the QA value and indicate if it falls within the 95% confidence interval of the volunteer's results by writing 'Yes' or 'No'.
9. Note that the Lab runs the QA samples at a 1:10 dilution so the QA results need to be compared to the volunteer's 1:10 dilution even if the volunteer did a different dilution that returned results that are closer to the target number of positive wells. In the database row for the QA results, indicate in the Notes column that the QA results are based on a 1:10 dilution for both types of bacteria, and write out the values obtained by the volunteer. Then enter the QA MPN values and yes or no in their appropriate columns.
10. A summary of the Bacteria QA results is computed in a separate file **U:\Monitoring\vmp\VMP Data\Bacteria\Data – Summaries\Bacteria QA Results.xls.** This file is not linked to the DataMon## file so it needs to be updated periodically.
11. When finished entering data, initial the datasheet in the upper right hand corner then file in the folder 'Data Entered – Needs QA'. The program manager will then double check the data, initial it, then either file it into the 'Need to File' folder or the appropriate project folder.

Dawn Patrol

1. The data is entered in the CWQData worksheet in MorroMon##, under ProjId 'DAWN'. The best thing to do is find the data entry for that site from the previous month, copy the row, then insert the row at the end of the dawn patrol dataset and make appropriate changes.
2. Be sure to describe tide and weather information in the Notes column.
3. When finished entering data, initial the datasheet in the upper right hand corner then file in the folder 'Data Entered – Needs QA'. The program manager will then double check

the data, initial it, then either file it into the 'Need to File' folder or the appropriate project folder.

Water Quality and Flow / Nutrient QA

1. The data is entered in the CWQData worksheet in MorroMon##, under ProjId 'WQUAL'. The best thing to do is find the data entry for that site from the previous month, copy the row, then insert the row at the end of the water quality dataset and make appropriate changes.
2. If duplicate readings are taken for any of the analytes (e.g. dissolved oxygen) check and see that they are similar then enter the first set of the numbers.
3. For conductivity at SYB the meter will read in ms. All of the other site's data is collected in µs. Therefore, the value that the volunteer records needs to first be converted (multiply by 1000) before being entered.
4. For the nutrients, if there were not any levels detected then the number entered would be equivalent to one half the detection limit. For example, the lower detection limit for our nitrate kits is 1, so if there were not any levels detected then 0.5 would be the value entered.
5. To enter the nutrient QA data, copy the volunteer's row of data then insert the copied row just below, and in the Purpose column type 'QA'. Delete all of the data from the row then enter only the lab results.
6. A summary of the nutrient QA results is computed in a separate file **U:\Monitoring\vmp\VMP Data\Water Quality - Creeks\Data – Summaries\Nutrient QA Results.xls**. This file is not linked to the DataMon## file so QA results need to manually entered.
7. Again, just copy a row that has already been created, paste it at the bottom of the data, then enter the new QA results along with the kit results.
8. Flow data is entered in the TransData worksheet. Again, copy a previous entry for that site then paste it at the bottom of the page.
9. Change the date, enter any appropriate notes, clear the old values in the 'W_D_F' column (Width_Depth_Flow), then enter the new transect info.
10. The 'Position' always starts at zero and ends with the total length of the transect. 'Depth' and 'Velocity' at each end is always zero.
11. Return to the CWQData page and manually enter the flow value by typing it into the 'Flow' column. Write the flow value on the datasheet.

12. When finished entering data, initial the datasheet in the upper right hand corner then file in the folder 'Data Entered – Needs QA'. The program manager will then double check the data, initial it, then either file it into the 'Need to File' folder or the appropriate project folder.

Stormwater (First Flush)

1. The data is entered in the CWQData worksheet in MorroMon##, under ProjId 'FFLUSH'. The best thing to do is find the data entry for sites tested the previous year so that the appropriate analyte fields are filled.
2. If duplicate readings are taken for any of the analytes (e.g. turbidity) check and see that they are similar then enter the first set of the numbers.

3. To enter the QA data, copy the volunteer's row of data then insert the copied row just below, and in the Purpose column type 'QA'. Delete all of the data from the row then enter only the lab results.
4. In the notes column enter the total rainfall from the storm as given by the Morro Bay NOAA rain gauge, the dilutions used for bacteria analysis, and the qualitative descriptions of the stormwater given by the volunteers.
5. When finished entering data, initial the datasheet in the upper right hand corner then file in the folder 'Data Entered – Needs QA'. The program manager will then double check the data, initial it, then either file it into the 'Need to File' folder or the appropriate project folder.

Dry Season Runoff (Urban Watch)

1. The data is entered in the UrbanWatch.mdb Access database.
2. When finished entering data, initial the datasheet in the upper right hand corner then file in the folder 'Data Entered – Needs QA'. The program manager will then double check the data, initial it, then either file it into the 'Need to File' folder or the appropriate project folder.

Suspended Sediment

1. All data is entered directly into the suspended sediment database. No worksheets or paper copies are generated from the sample collection or analysis.

Phytoplankton

1. On the datasheet, multiply each of the organism counts by 4 and write that value in the square with the picture. This is the number that you will enter into CCAMP.
2. Sum up all of these new counts and write down the total number of species on the bottom of the datasheet, then for each species counted figure what percentage of the total count that number was.
3. Finally, indicate the Relative Abundance – Rare = ≤1%, Present = 1% - 10%, Common ≥10% - ≤ 50%, Abundant > 50%.
4. Fax this datasheet to Gregg Langlois at the Dept. Health Services – fax # (510) 412-4637.
5. The count data is entered in the MbiData worksheet in MorroMon##. Relative abundance calculations are not entered in MorroMon.
6. Simply enter the descriptive data and organism counts in the appropriate columns.
7. If a new type of organism is identified, insert a column then type in the heading as 'Other-' followed by the organism's name.
8. That organism also has to be added to the Analytes page.
9. Open the Analytes page, highlight the 'D' column ('ChrGroup'), and filter the data by 'Mbi'. Make a copy of one of the other phyto entries, insert that copy as a new row, then simply change the name of the organism.
10. Scroll over to verify that the number 1 is written in the PLANK column. This tells the program that the analyte in that row is used in the plankton project.
11. Once the analyte has been entered, go back to the Options page and select the 'Recalculate data Inventory' button.
12. When finished entering data, initial the datasheet in the upper right hand corner then file in the folder 'Data Entered – Needs QA'. The program manager will then double check

the data, initial it, then either file it into the 'Need to File' folder or the appropriate project folder.

Macroinvertebrates

1. The macroinvertebrate data that is returned by the DFG is transferred into CCAMP by the RWQCB. We send them our latest version of the database, they insert the new data, then they send the updated version back.
2. With each new dataset that is added, a new 'BugData#' worksheet is added.
3. The specific reach characteristic data from the bioassessment field sheet and physical habitat field sheet is entered in the appropriate file found in **U:\Monitoring\vmp\VMP Data\Macroinvertebrates\Data - Summaries\Bioassesment Data.**
4. The physical habitat scores can also be entered at the bottom of the taxa list in the new 'BugData#' worksheet. Refer to the previous BugData worksheet for clarity.
5. When finished entering data, initial the datasheet in the upper right hand corner then file in the folder 'Data Entered – Needs QA'. The program manager will then double check the data, initial it, then either file it into the 'Need to File' folder or the appropriate project folder.

Eelgrass

1. Eelgrass field data is entered in files separate from biomass data from each site. For each year of monitoring, create a new file in each folder
2. ..\..\..\Monitoring\vmp\VMP Data\Eelgrass\Data - Summaries\VMP BIOMASS DATA or ..\..\..\Monitoring\vmp\VMP Data\Eelgrass\Data - Summaries\VMP FIELD DATA
3. Create separate worksheets within the spreadsheet for each site and label with site code and year.
4. Enter all data as shown on the datasheet, calculate average coverage and biomass for each site.
5. When finished entering data, initial the datasheet in the upper right hand corner then file in the folder 'Data Entered – Needs QA'. The program manager will then double check the data, initial it, then either file it into the 'Need to File' folder or the appropriate project folder.

Bird Survey

1. The bird survey data is entered in a separate excel database U:\Monitoring\vmp\VMP Data\Bird Surveys\Data – Summaries\Bird Survey Data.xls
2. Data is entered by survey area and species. There are a total of 15 survey areas, and 30 'original species'. The list of 'original' species corresponds to a list that has been used for data collection in the area since the 80's. When looking at long term trend data for the number of birds counted and the number of species counted then only data corresponding to this 'original' list is used. Do not add birds to this list.
3. With the surveys that the VMP oversaw in 2003, an 'other' bird category was added. The additional 'other' birds are listed following the 'original' birds, and are counted separately. If new species are sighted during a survey, add the names to this additional 'other' birds list.
4. If the volunteers count birds in their area, and those birds later fly into another area, then they indicate in the notes the number of birds that flew away and into what area they flew.

5. For the species Least/Western Sandpip., which is used when there is a mixed group of both least sandpipers and western sandpipers, the volunteers should indicate in the notes an estimate of the ratio of least to western sandpipers.
6. A summary of the total number of 'original' birds counted and the total number of 'original' species that were seen is located in U:\Monitoring\vmp\VMP Data\Bird Surveys\Data – Summaries\Bird Survey Summary.xls
7. Each time a new survey is completed, add the totals onto this summary page to allow comparisons to the historic data.
8. When finished entering data, initial the datasheet in the upper right hand corner then file in the folder 'Data Entered – Needs QA'. The program manager will then double check the data, initial it, then either file it into the 'Need to File' folder or the appropriate project folder.
9. FYI – We have hard copies of the historic data that is in the Bird Survey Summary file, but none of the individual species counts have ever been entered into a database.

Stream Profiles

1. The stream profile data is entered in a separate excel database for each site. These files are located in the folder U:\Monitoring\vmp\VMP Data\Stream Profiles\Data - Summaries\Profile Data
2. The file All Sites – Channel Data.xls is where all of the descriptive channel data is entered. This includes bankfull measurements and calculations of slope and entrenchment for all of the sites.
3. For each of the profile sites, open the file corresponding to that site's name. Under the 'Stadia Reading' heading, create a column that corresponds to the current year and enter the stadia reading data.
4. Under the 'Elevation' heading, also create a column that corresponds to the current year then enter the formula to compute the elevation data from the stadia data. Drag the formula down through all of the cells.
5. Open the profile plot worksheet. Update the source data by adding a new series in order to display the new data. Then remember to update the heading on the plot to reflect the correct time frame.
6. There is also a file, U:\Monitoring\vmp\VMP Data\Stream Profiles\Data – Summaries\Dates Sites Surveyed.xls, which shows a table that indicates which of the sites were measured in a given year. Update this file as well as sites are revisited.
7. When finished entering data, initial the datasheet in the upper right hand corner then file in the folder 'Data Entered – Needs QA'. The program manager will then double check the data, initial it, then either file it into the 'Need to File' folder or the appropriate project folder.
8. FYI – in the past, veg and substrate data was collected in conjunction with the stream profiling data. This data is saved in CCAMP ## in the TransData2 worksheet.

Back Bay Nutrients

1. This data is entered in U:\Monitoring\vmp\VMP Data\Water Quality - Bay\Nutrients\Data – Summaries\Back Bay Shore Nutrient Data.xls
2. Simply enter the data in the appropriate column.

3. For the nutrients, if there were not any levels detected then the number entered would be entered as one half the detection limit. For example, the lower detection limit for our nitrate kits is 1, so if there were not any levels detected then 0.5 would be the value entered.
4. To enter the nutrient QA data, copy the volunteer's row of data then insert the copied row just below, in the Site column type the site number followed by 'QA', and then enter the lab results.
5. When finished entering data, initial the datasheet in the upper right hand corner then file in the folder 'Data Entered – Needs QA'. The program manager will then double check the data, initial it, then either file it into the 'Need to File' folder or the appropriate project folder.

Volunteer Hours

1. There is a separate worksheet for each year, which has listed only the volunteers that participated during that year, and shows both monthly and annual participation hours.
2. The 'All Volunteer Hours' worksheet lists the names of all the volunteers that have ever participated, their annual participation hours and overall total for all years. This worksheet should be manually updated each December.
3. The volunteer list is sorted by last name so search for the appropriate location to add the volunteer.
4. Insert a row then in the first cell, type in the volunteer's last name. In the second cell, type in the volunteer's first name.
5. Now monthly hours can be added for that volunteer.
6. The previous worksheets have been protected to prevent accidental data loss from those years.
7. Should these sheets need to be edited, the protection can be removed by clicking on the pull down menu 'Tools', selecting 'Protection', and 'Unprotect Sheet'.
8. Similarly, to protect a sheet once data has been entered click on the pull down menu 'Tools', select 'Protection', and 'Protect Sheet'.
9. You will be prompted for a password which, in this case, should be left blank.

New Volunteers

1. All participants in program activities need to fill out a contact information/liability release form.
2. If the volunteer is interested in receiving monthly emails with program updates, enter their contact information into the Access database. Open the database and choose Data Input/Lookup.
3.
4. Enter contact info into appropriate cells.
5. Give the release form to Ann so she can add their email address to the active mailing list. She will return the sheet to you to file in the volunteer info binder.
6. If someone only participates in a one-time event and is not interested in getting email updates, do not enter their contact info into the database. Simply file their sheet in the brown Pendaflex folder.
7. Enter completed volunteer training in the Volunteer Training Log Sheet located at u:\monitoring\vmp\vmp admin\recognition\volunteer hours.xls. Enter the volunteer name, hours of training, type of training, location of training, and staff member conducting training.