



## **1.0 Scope and Application**

- 1.1 Guam EPA will collect surface water and marine water samples and physical conditions information as part of microbiological examination efforts outlined by Guam EPA monitoring programs. These programs include the Recreational Beach Monitoring Program, the Island-wide Surface Water Monitoring Program and special studies involving point and nonpoint source discharges. All project Quality Assurance (QA) documents (QAPPs and SAPs) are listed in the Quality Assurance Document Tracker.
- 1.2 Adopted standards outlined in the latest revision of the Guam Water Quality Standards protect human health from illness contracted by swimming and wading (primary-contact recreation) in polluted marine waters. The appropriate standards should be applied to designated uses.
- 1.3 Waters classified as per the Guam Water Classification will be treated as such upon microbiological examination efforts and standards application. M-series waters are marine waters while S- series are fresh surface water. Classification levels 1 & 2 are designated for primary-contact recreation while level 3 is designated for secondary recreational use.

## **2.0 Summary of Method**

- 2.1 Water samples are collected from established marine and fresh water sites using sterile sample container(s). Samples will be collected from the water column and treated aseptically. Samples will be released to a laboratory for microbiological examination.
- 2.2 Alongside sampling for bacteria concentrations, site and physical conditions will be documented. These parameters are:
  - Wind (calm, light breeze, moderate breeze, windy)
  - Wind Direction (N,NE,S,SE)
  - Tidal Stage (flooding, high slack, ebbing, low slack)
  - Water Surface (calm, shoreline breakers)
  - Water Color (clear, med. Brown, Dk. Brown, Red-brown, Green-brown, brown, green, Yellow-brown, other)
  - Smell (none, sewage, oily, fishy, rotten eggs)
  - Other (dead fish, dead crabs, jelly fish, algal bloom, litter/trash)
  - Rainfall Weekly Accumulation
  - Air Temp (oC)
  - Weather in the past 24 hours: Storm (heavy rain), Rain (steady rain), Showers (intermittent rain), Overcast, Clear/Sunny
  - Weather now: Storm (heavy rain), Rain (steady rain), Showers (intermittent rain), Overcast, Clear/Sunny

These parameters are found on appropriate field sheets (*Field Sheet - Microbiological Assessment, Northern Recreational Waters Beach Sites – Field Sheet and Southern Recreational Waters Beach Sites – Field Sheet*) along with **Sampler Name**, **Witness Name**, **Sample Date**, **Field ID**, **Location Name**, **Location Description**, and **Sample Collection Time** (These field sheets are attached here but can be found on the Guam EPA server at F:/Users/amelg/Water Monitoring Strategy for the Island of Guam/Forms/REC WATER/Recreational Water Field Form Template.xls).

- 2.3 Site choice is dependent on the environmental factors affecting a designated public beach area. Beaches are selected for sampling at the start of every calendar year pending site review and the occurrence of new watershed impacts.

### 3.0 **Definitions**

- 3.1 **Enterococcus** is the approved indicator used to determine the extent of human-waste contamination of marine water.
- 3.2 **Escherichia coli** is the approved indicator used to determine the extent of human-waste contamination of fresh surface water.
- 3.3 **Surface waters** are defined as (1) waters that flow continuously over land surfaces in a defined channel or bed, such as streams and rivers; (2) standing water in basins such as lakes, wetlands, ponds, sinkholes, ponding basins, impoundments, and reservoirs either natural or man-made; and (3) all waters flowing over the land as runoff, or as runoff confined to channels with intermittent flow. For the purpose of this definition, the term includes all waters with a concentration of less than 500 parts per million (ppm) for dissolved inorganic ions, and does not include coastal waters or those subject to the ebb and flow or tides.
- 3.4 **Marine waters** are defined as all coastal waters off-shore from the mean high water mark, including estuarine waters, lagoons and bays, brackish areas, wetlands and other special aquatic sites and other inland waters that are subjected to ebb and flow of the tides within the jurisdiction of Guam and having a concentration greater than 500 parts per million (ppm) for dissolved inorganic ions (salinity).
- 3.5 **Wadeable** refers to waterbodies less than 3 meters in depth at highest tide.
- 3.6 **Nonwadeable** refers to waterbodies greater than 3 meters in depth at highest tide.

#### **4.0 Health & Safety Warnings**

- 4.1 All field assessments require at least two qualified personnel.
- 4.2 Proper Personal Protection Equipment should be worn at all times.
- 4.3 A complete first aid kit must be included in the field equipment.
- 4.4 An Agency mobile phone or cellular should be included in the field equipment.
- 4.5 The Program Leader must be aware of all field assessment scheduling.
- 4.6 If sampling from the boat, a float plan (Attachment 1) must be filed with the Division Administrator.

#### **5.0 Cautions**

- 5.1 Surface water: Sampling during heavy rains or flash floods must not be allowed. It is imperative that all field personnel listen and observe weather forecasts.
- 5.2 Marine water: Sampling during small craft warnings or during hazardous shoreline conditions is not allowed. It is imperative that all field personnel observe weather and marine forecasts.
- 5.3 Ensure all field personnel are aware of the locations of all Sewage Treatment Plants (STPs) and their associated outfalls. Personnel should also be aware that sampling in microbiologically polluted waters may compromise personal health.

#### **6.0 Personnel Qualifications**

- 6.1 Prior to initial sampling, all personnel (new and experienced) must be briefed by the Program Leader on sampling techniques, field data sheet(s) and field safety.
- 6.2 Yearly re-briefing and introduction of new field techniques and/or revisions to the SOP should be conducted.

#### **7.0 Apparatus & Materials**

- 7.1 Wadeable Surface and Marine Water Equipment
  - 7.1.1 Sterile glass or sterile plastic bottles (100 mL min) OR sterile Whirlpak® baggies (8 – 18 oz)

- 7.1.2 Cooler with wet ice or ice packs
  - 7.1.3 Sample label
  - 7.1.4 Permanent marker
  - 7.1.5 Field data sheet (dependent on program/study requirements)
  - 7.1.6 Indelible ink
  - 7.1.7 Rubber gloves
  - 7.1.8 A copy of this SOP
  - 7.1.9 Anemometer (wind meter with additional physical condition capabilities)
- 7.2 Nonwadeable Surface and Marine Water Equipment
- 7.2.1 All equipment under section 7.1 above
  - 7.2.2 Horizontal water sampler with attached calibrated line
- 7.3 Health & Safety Equipment Needs
- 7.3.1 Proper Personal Protection Equipment
  - 7.3.2 Complete first aid kit
  - 7.3.3 Agency cellular/mobile phone
  - 7.3.4 Filed float plan (for nonwadable waters)
- 7.4 Pre-sampling Equipment Concerns
- 7.4.1 Inspect all bottles used previously and ensure the bottles have been thoroughly cleaned and sterilized. Discard caps with compromised lining and discard glass bottles with chipped necks. Inspect all sterile Whirl-pak® bags for tears/punctures.
  - 7.4.2 Label all bottles prior to placing them into the cooler with ice.

## **8.0 Sample Collection**

- 8.1 Sampling Technique **FOR WADEABLE SURFACE WATER AND MARINE WATER** will be as follows:
- 8.1.1 At fixed sites, ensure sampling occurs at locations described. If applicable, use the GPS.
  - 8.1.2 Avoid sample collection close to swimmers/waders. Sample upstream if swimmers/waders are at the fixed site.
  - 8.1.3 The samples will approach the sampling site from downstream or down current until at about knee-high depth in the water.

- 8.1.4 When using **sterile bottles**, uncap container<sup>1</sup> and submerge the bottle neck-first into the water. The container should be submerged to 0.3m (about elbow depth). Avoid touching rocks or other solid objects with the sample container. Face the opening of the container toward the prevailing current and allow it to fill with water. If there is no current, create a current artificially by pushing the bottle forward horizontally in the direction away from the hand. Remove the container from the water column. Pour off some of the sample to allow for ample air space in the container (at least 2.5 cm) to facilitate mixing by shaking. Replace the cap immediately.
- 8.1.5 When using sterile **Whirl-pak® baggies**, remove the perforated portion which will allow the bag to open. Pull gently on the white tabs to open the bag. Submerge the container neck-first into the water. The container should be submerged to 0.3m (about elbow depth). Avoid touching rocks or other solid objects with the sample container. Face the opening of the container toward the prevailing current and allow it to fill with water. If there is no current, create a current artificially by pushing the bottle forward horizontally in the direction away from the hand. Remove the container from the water column. Pour of some of the sample to allow for ample air space in the container (at least 2.5 cm) to facilitate mixing by shaking. Seal by first pinching closed the opening of the baggie and then flipping (or whirl) the baggie over two to three times.
- 8.1.6 Complete all information on the sample label. For laboratory purposes, include the word 'marine' or 'seawater' for marine water samples and 'freshwater' for surface water. Depending on the type, samples may require specific dilution prior to analysis. Estuarine waters are considered 'marine' or 'seawater' samples.
- 8.1.7 Place the container upright on ice in the cooler.
- 8.1.8 Complete all entries on the Field Sheet. The site and physical condition assessment is performed at the same fixed site from where the sample is collected. However, some parameters require an observation of a broader section of the catchment than just the sampling reach.

8.2 **Nonwadeable Surface Water and Marine Water Sampling Technique** will be as follows:

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<sup>1</sup> Protect the underside of the cap from contamination. Protect the neck of the container from contamination as well.

- 8.2.1 At fixed sites, ensure sampling occurs at locations described. If applicable, use the GPS.
- 8.2.2 Collect sample using a Horizontal Alpha Bottle Apparatus according to SOP #GEPMP029.
- 8.2.3 Open the sample bottle or container (protect the caps underside; do not contaminate), control the flow of the water sample using the valve on the tube of the Horizontal Alpha Bottle Apparatus, and aseptically fill the container with sample. Close the bottle or container.
- 8.2.4 Complete all information on the sample label. For laboratory purposes, include the word 'marine' or 'seawater' for marine water samples and 'freshwater' for surface water. Depending on the type, samples may require specific dilution prior to analysis. Estuarine waters are considered 'marine' or 'seawater' samples.

## **9.0 Sample Labels, Chain of Custody and Documentation**

- 9.1 Sample labels must be properly completed to include the sample's field identification number, waterbody name, sampling location, date and time of collection, Analysis (either *enterococci* or *E. coli*. Only one can be selected per bottle) and collector's name. The label should be placed outside the sample container.
- 9.2 Upon arrival to the laboratory, complete and sign the appropriate chain-of-custody form(s) and release samples to trained laboratory personnel only. The laboratory representative must sign the chain-of-custody form.

## **Quality Control and Quality Assurance Section (QA/QC)**

- 1.1 For each sampling day, one replicate will be collected for QA/QC. The replicate sample will be a second sample collected at any established site. Any problems encountered when collecting the replicate sample should be noted. The results for replicate samples should be similar. Although some variation in bacterial counts in consecutively collected samples is expected, a large difference (e.g. more than a factor of two) may indicate errors or contamination during field sampling or laboratory analysis. If replicate samples exceed this criteria it may be prudent to resample.<sup>2</sup>

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<sup>2</sup> Taken from USEPA Region 9 Laboratory SOP#1106

- 1.2 Samples collected for microbiological examination must be analyzed within 6 hours of collection. Ensure samples are delivered to and relinquished by the laboratory within the appropriate holding time.
- 1.3 Each biologist is to be trained in the sample collection procedure and in the visual-based assessment technique.
- 1.4 Wind meters (Kestrel® 3000) will be used according to instrument manual and will be maintained accordingly. **Avoid excess contact with salt water.** The humidity sensor has been factory calibrated to be accurate within  $\pm 3\%$ . If this specification appears to no longer be met (quarterly calibration checks – Attachment 3), the humidity sensor will need to be recalibrated. Return the meter to the factory for recalibration or contact the factory for field recalibration instructions. Refer to SOP #GEPAMP026 *SOP for the Operation and Maintenance of the Kestrel® 3000 Pocket Weather Meter*.

#### References

1. APHA, AWWA, WEF. 1992. Standard Methods for the Examination of Water and Wastewater, 18<sup>th</sup> edition.
2. Guam EPA, 1999. Recreational Beach Monitoring Program Field Sheets. F:/Users/amelg/Water Monitoring Strategy for the Island of Guam/Forms/REC WATER/Recreational Water Field Form Template.xls
3. Guam EPA, 2001. SOP #GEPAMP026. *SOP for the Operation and Maintenance of the Kestrel® 3000 Pocket Weather Meter*.
4. USEPA Region 9 Laboratory. May 6, 1999. Standard Operating Procedure for Volunteer Monitoring of Surface Waters for Bacteria (SOP# 1106).



GUAM ENVIRONMENTAL PROTECTION AGENCY  
MONITORING PROGRAM  
FLOAT PLAN  
(FOR FILING PRIOR TO BOATING ACTIVITIES)

Date: \_\_\_\_\_

Departure Time: \_\_\_\_\_

Contact Number: \_\_\_\_\_

GOING TO: \_\_\_\_\_

PURPOSE: \_\_\_\_\_

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Estimated Return Time: \_\_\_\_\_

Crew List: \_\_\_\_\_

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