BEACH MONITORING QUALITY ASSURANCE PROJECT PLAN

(CWBMONQAPP002)

State of Hawaii
Department of Health
Environmental Management Division
Clean Water Branch
Monitoring and Analysis Section

Revision 0

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ACRONYMS AND ABBREVIATIONS

CFR	Code of Federal Regulations
CFU	colony forming units
COC	chain of custody
CWA	Clean Water Act
CWB	Clean Water Branch
DO	dissolved oxygen
DQA	data quality assessment
DQO	data quality objective
EHASB	Environmental Health Analytical Services Branch
EHS	Environmental Health Specialist
EPA	(U.S.) Environmental Protection Agency
GM	geometric mean
HAR	Hawaii Administrative Rules
HIDOH	Hawaii Department of Health
IR	Integrated Report
MDL	method detection limit
MPN	most probably number
MQO	measurement quality objective
MRL	minimum reporting limit
QA	quality assurance
QAO	Quality Assurance Officer
QAPP	Quality Assurance Project Plan
QAPrgP	Quality Assurance Program Plan
QC	quality control
QMP	Quality Management Plan
SLD	State Laboratory Division
SOP	standard operating procedure
SSM	single sample maximum
TCB	temperature control beginning
TCE	temperature control end

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1.0 INTRODUCTION

This QAPP is an internal document for the Hawaii Department of Health (HIDOH) Clean Water Branch (CWB) Monitoring and Analysis Section that describes the Beach Monitoring Program and as such is written and maintained by personnel in the Monitoring and Analysis Section. Data generated under this QAPP are specifically intended for use by Monitoring and Analysis Section personnel in assessing the water quality at the beaches in the State. Other uses of these data are not supported and the responsibility for determining the appropriateness of any such use lies solely with the user. The content and format of this QAPP follows the requirements and guidance of the United States Environmental Protection Agency (EPA) QA/R-5, *EPA Requirements for Quality Assurance Project Plans* (EPA, 2001). The CWB Quality Assurance Program Plan (QAPrgP) (HIDOH, 2011) describes general QA/QC requirements, and SOPs cited throughout this QAPP provide details for specific procedures.

2.0 PROJECT MANAGEMENT

2.1 Project/Task Organization

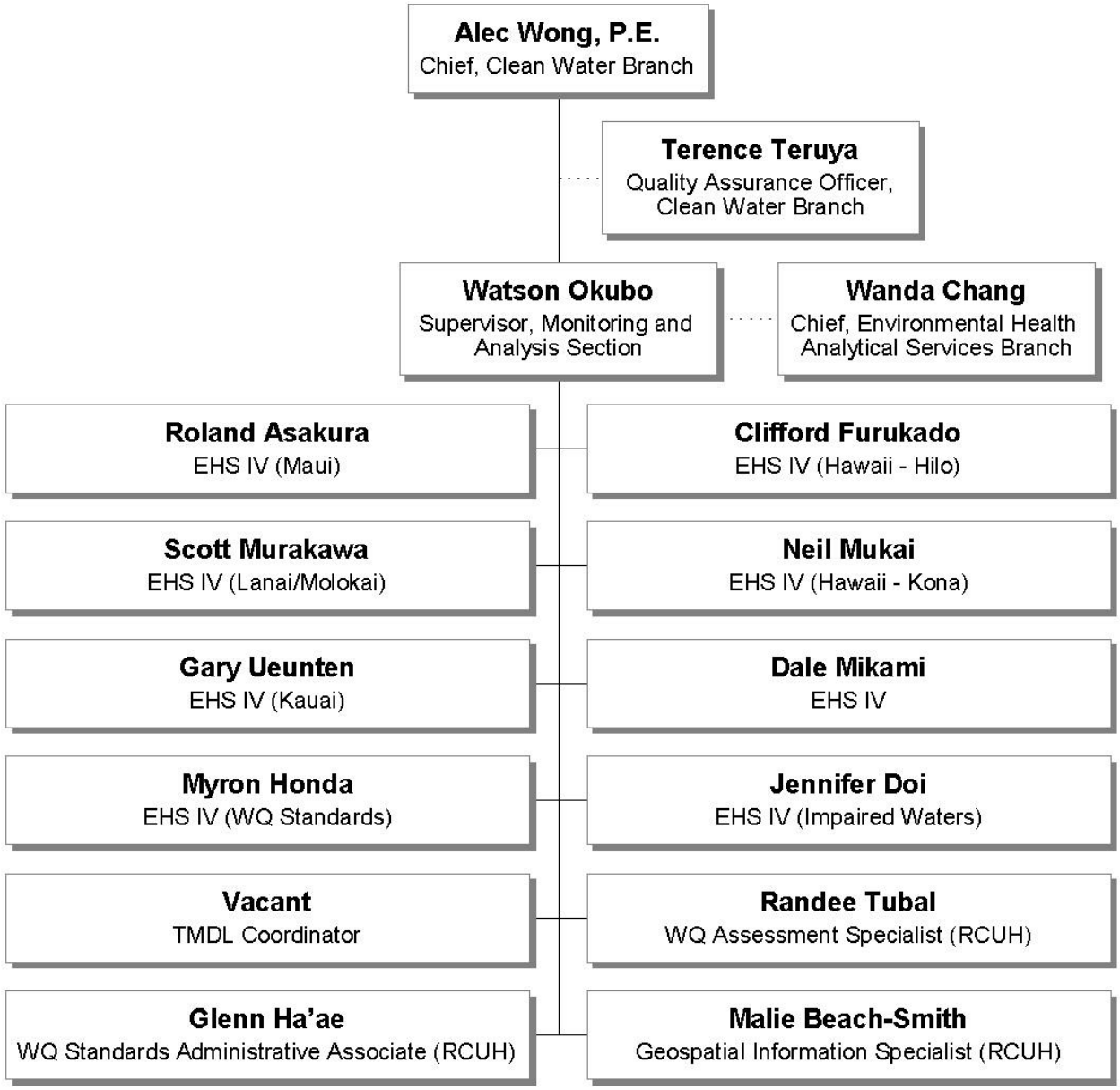
The Monitoring and Analysis Section is charged with identifying "sources of water pollution through area surveillance and routine inspections. Complaint investigations are no longer a function of the Monitoring and Analysis Section, but are now conducted by the Enforcement and Compliance Section. The Monitoring and Analysis Section evaluates the impact of water pollutants on public health, determines compliance with rules via source testing, water sampling, and special studies; and submits data that appear to indicate non-compliance to the Enforcement Section."[1] The major activity of the CWB Monitoring and Analysis Section is the water quality monitoring of beaches (Beach Monitoring) on four Hawaiian islands: Kauai, Oahu, Maui and Hawaii. Beaches on Lanai, and Molokai are not monitored at this time due to State budget cuts and reduction-in-force. Stream monitoring and offshore monitoring have also been temporarily suspended. The CWB also carries out near shore monitoring in support of Clean Water Act (CWA) §303(d) assessments, §305(b) integrated reports, and §319 non-point source management grants.[2] Occasionally and with time permitting, the Monitoring and Analysis Section will assist other governmental agencies or non-governmental entities with monitoring for research projects. In the past, the Monitoring and Analysis Section has participated in various outreach activities with schools, community groups, and environmental organizations. This QAPP, describes the Beach Monitoring activities only; other activities performed by the CWB Monitoring and Analysis Section are described in the QAPrgP or in project-specific QAPPs.

Figure 1 presents the organizational structure of CWB's Monitoring and Analysis Section. The roles and responsibilities of the key members of the Monitoring and Analysis Section are defined

[1] http://www.hawaii.gov/health/environmental/water/cleanwater/about/aboutcwb.html
[2] As of 2006, EPA recommended that the §303(d) list and the §305(b) report be combined into one document: the biennial Integrated Report (IR). More information on the IR can be found on the EPA website: http://www.epa.gov/owow/tmdl/2006IRG

in Table 1 of the CWB Quality Assurance Program Plan (QAPrgP) (HIDOH, 2011). Contact information for these individuals can be found in the distribution list of this document. Environmental Health Specialists (EHSs) are responsible for conducting beach monitoring activities, including applicable quality assurance/quality control (QA/QC) procedures. EHSs deliver microbiology samples to the State Laboratory Division (SLD) (or to the specific contract laboratory) and submit the corresponding field data to the lead EHS. Conflicts or problems identified by the lead EHS are brought to the attention of Watson Okubo, the Monitoring Section Supervisor. Follow-up and corrective actions are implemented as specified in this document under the direction of the Monitoring and Analysis Section Supervisor.

Figure 1. CWB Monitoring and Analysis Section Organizational Chart



In the event that a situation is encountered that is not covered by this document, the EHS and Supervisor will consult with Alec Wong, the CWB Branch Chief and other involved parties. Such situations will be handled on a case-by-case basis and are considered beyond the scope of this document.

The Beach Monitoring Program will be reviewed quarterly by Terence Teruya, the QA Officer. The review may consist of, but not be limited to, assessing whether the procedures are being followed, the appropriateness of the procedures, whether procedural changes are necessary,

correctness of the data generated, the acceptability of QC data, adequacy of the data forms, future needs of the program, and follow up on any previously identified corrective actions to ensure they were implemented appropriately.

2.2 Problem Definition/Background

2.2.1 Problem Definition

Exposure to sewage contaminated recreational waters may cause gastrointestinal illnesses in swimmers. The CWB Monitoring and Analysis Section monitors the waters of Hawaii's beaches for concentrations of *Enterococcus*, which acts as an indicator of pathogens. The CWB also uses *Clostridium perfringens* as a secondary tracer of sewage contamination. Results of this monitoring are evaluated using a 'decision rule' to determine whether a beach is safe ('Compliant') or not safe (on 'Alert') for swimming and other water contact activities. If a beach is found to be on 'Alert' due to elevated indicator bacteria levels, the CWB Monitoring and Analysis Section issues public warnings and alerts and determines whether resampling of the area is necessary.

As part of its reporting requirements, the Monitoring and Analysis Section develops two major annual reports: (1) the Beach Annual Report and (2) the Annual Beach Notification Report. Both are submitted to EPA as summaries of the year's activities. Data collected by the Monitoring and Analysis Section via beach monitoring are also used to develop the EPA-required Integrated Report (IR) (see footnote in Section A.4.0 of the CWB QAPrgP (HIDOH 2011)) which combines the §303(d) list of impaired waters and the §305(b) report to Congress on water quality.

2.2.2 Background

The Beaches Environmental Assessment and Coastal Health Act of 2000 (BEACH Act) required that:

> "Each State having coastal recreation waters shall adopt and submit to the Administrator new or revised water quality standards for the coastal recreation waters of the State for all pathogens and pathogen indicators to which the new or revised water quality criteria are applicable."

Under the BEACH Act, the State receives an annual grant to implement Hawaii's beach monitoring program. This requires the State to conduct a monitoring and notification program that is consistent with performance criteria published by EPA (2002). Tables 1 and 2 describe the current notification program implemented by the CWB. As part of the monitoring program, CWB utilizes a secondary bacterial tracer to help determine the sources of elevated concentrations of the primary bacterial indicator.

In March 2010, EPA approved amendments to the Hawaii Administrative Rules (HAR), Chapter 11-54, Water Quality Standards (CWB QAPrgP, HIDOH 2011, Appendix D), which revised the previous State *Enterococcus* criteria of a geometric mean (GM) of 7 CFU/100 mL and a single sample maximum (SSM) of 100 CFU/100 mL to meet current EPA guidelines. The State of

Hawaii now uses the EPA recommended *Enterococcus* GM and SSM for recreational waters consistent in the 1986 *Ambient Water Quality Criteria for Bacteria*. The criterion lists the GM and SSM for marine waters as 35 CFU/100 mL and 104 CFU/100 mL, respectively.

The CWB utilizes *Clostridium perfringens* as a secondary tracer in addition to the *Enterococcus* indicator to detect sewage contamination in marine coastal waters. The reliability of *Enterococcus* as an indicator organism in tropical environments has been questioned. This issue was formally documented in the report, *Tropical Water Quality Indicator Workshop* (Fujioka and Byappanahalli, 2003). The workshop was a joint effort between EPA and the Water Resources Research Center of the University of Hawaii (WRRC). Local, national, and international experts on indicator organisms gathered at the workshop to express their collective concerns regarding this issue. The findings of this group were as follows:

1. Soil, sediments, water, and plants may be significant indigenous sources of indicator bacteria in tropical waters.
2. The inherent environmental characteristics of the tropics affect the relationships between indicators of fecal contamination (*E. coli*, fecal coliforms, *Enterococcus*) and health effects observed in bathers, which may compromise the efficacy of EPA guidelines.
3. Fecal indicator bacteria (fecal coliforms, *E. coli*, *Enterococcus*) can multiply and persist in soil, sediment, and water in some tropical/subtropical environments (Hawaii, Guam, Puerto Rico, South Florida).
4. Recreational water quality guidelines for the tropics/subtropics should be supplemented with additional alternative indicators (*C. perfringens*, coliphages) for watershed assessment (or sanitary survey).

4.a. (Alternate version) In the absence of a predominant point source pollution, recreational water quality guidelines for the tropics/subtropics should be supplemented with additional alternative indicators (*C. perfringens*, coliphages) for watershed assessment (or sanitary survey).

To help distinguish between sewage and non-sewage sources of elevated *Enterococcus* levels, CWB began using *C. perfringens* as a tracer organism. The use of *C. perfringens* can help to determine whether sewage is present, and if so, the *Enterococcus* results can be used to assess the health risk associated with contacting those waters. This approach was once presented by EPA in the draft *Implementation Guidance for Ambient Water Quality Criteria for Bacteria*, (EPA 2004), page 31, which stated that

> "for states and authorized tribes that do not wish to undertake resource-intensive epidemiological studies, *C. perfringens*, or another microorganism associated with fecal pollution may be adopted as supplemental indicators of fecal pollution. EPA recommends the use of *Enterococcus* (expressed both as a geometric mean and the upper percentile value) as the primary bacteriological indicator for marine and fresh water (or *E. coli* for fresh waters), with a supplemental indicator of human fecal contamination if desired."

The spatial and temporal concerns associated with beach monitoring have been addressed by the report *EMPACT Beaches Project: Results from a Study on Microbiological Monitoring in Recreational Waters* (EPA, 2005). Some of the findings from this study include the following:

- Sampling in knee- to waist-deep water would seem to offer a reasonable, but still conservative, approach to estimating water quality.
- Sampling at 0.3M below the surface is justified.
- Sampling in the morning will likely be a conservative practice.
- Sampling should be performed as close as practical to the day on which a decision is to be made regarding beach closure or advisement.

These practices have been implemented by the CWB.

2.3 Site Description

There are six major islands where members of the general public have access to recreational marine waters. The four largest islands of Kauai, Oahu, Maui, and Hawaii are staffed by CWB personnel (EHSs) who regularly monitor the recreational beaches. The islands of Lanai and Molokai are serviced by an EHS stationed on Oahu, but due to logistical problems and loss of personnel due to state budget restrictions and reduction-in-force actions taken by the state, water monitoring is not currently conducted on those islands; however; monitoring stations have been established for both Lanai and Molokai. In the future, CWB will solicit and train volunteers to conduct water monitoring activities on the islands of Lanai and Molokai. It is the goal of CWB to eventually monitor all beaches in the State.

The CWB Monitoring and Analysis Section has completed an inventory of Hawaii's 385 beaches and divided them into Tier 1, Tier 2, and Tier 3 beaches to make sampling more efficient and cost effective by prioritizing the high-use beaches that are most likely to be impacted by pollution according to the Performance Criteria of the Hawaii BEACH Grant application[3] (Section 3.1). Tier 1 beaches are beaches that are important economically and socially to Hawaii, are heavily used, and threatened by some type of pollution. All other beaches in Hawaii are classed as either Tier 2 or Tier 3 beaches. A Tier 1 beach can be redesignated as Tier 2 (and vice versa) if information indicates that the characteristics defining it as a Tier 1 (or Tier 2) have changed. If a Tier 2 beach shows consistently low bacterial concentrations, low human traffic, and is difficult to access, the beach may be reassigned as Tier 3. Tier 3 beaches receive no monitoring, although their general status as Tier 3 beaches is reviewed by the CWB Monitoring and Analysis Section annually. The criteria for determining the different Tier designations are discussed in Section 3.1. A list of all of Hawaii's beaches is shown in Appendix A. There are no Tier 1 or Tier 2 beaches on Lanai or Molokai.

[3]Hawaii Department of Health Grant for the Development of Coastal Recreational Water Quality Monitoring and Public Notification Programs at Hawaii's Beaches.

Specific sampling sites on each beach are chosen to be representative of how the particular beach is typically used. For example, most of the sampling sites will target water near the geographic center of the beach or near an easily recognizable landmark (*e.g.*, pavilion, public restroom). If a stream flows into the ocean near the beach, the Beach Monitoring sampling site will be located away from its mouth due to the potential for the sample to be influenced by stream constituents. Additionally, the Monitoring and Analysis Section attempts to locate beach sampling sites near where most bathers and other people involved with water contact activities are most apt to enter the water. The specific coordinates of the sampling site are recorded. An inventory of beach monitoring sampling sites (including maps, latitude and longitude coordinates, and a general description) is available on the CWB website (http://www.hawaii.gov/health/environmental/water/cleanwater/index.html). Appendix A also presents the Storet number, location, and tier levels for each of the beach monitoring sampling locations. Sampling stations with coordinates listed are more recent sampling locations.

2.4 Project/Task Description

It is the responsibility of the CWB Monitoring and Analysis Section to conduct routine beach monitoring activities at Hawaii's recreational marine beaches to assess public health conditions, and to issue any public notices or warnings, if applicable. In addition, the data gathered during beach monitoring activities are used by the CWB Monitoring and Analysis Section to develop the Annual Beach Report, the annual Beach Notification Report, and the Integrated Report (IR) (Section 2.7.5). The schedule for beach monitoring sampling is described in the Clean Water Branch QAPrgP, (HIDOH, 2011) and in Section 3.1 of this document.

During beach monitoring, water samples are taken by Monitoring and Analysis Section EHSs to assess public health conditions of the recreational marine waters. The beach monitoring samples are analyzed at the State Laboratory Division (SLD) for the bacterial indicator organisms *Enterococcus* and *Clostridium perfringens*. For *Enterococcus* analyses from the Kona region of Hawaii, a private microbiological laboratory may be used to ensure that holding times are met. The detection of these organisms in water indicates that the area may be contaminated with sewage, which can cause gastrointestinal illnesses among swimmers. In addition to bacterial indicators, CWB Monitoring and Analysis Section's beach monitoring also includes *in situ* measurements for temperature, salinity, dissolved oxygen (DO), pH, and turbidity. The specific sample collection procedures are described in the SOP CWBMON009 *Standard Operating Procedure for Beach Sampling Protocol* (Appendix B).

The CWB Monitoring and Analysis Section uses the water sampling results obtained through the beach monitoring program to determine the public health conditions of local recreational marine waters, and if the results indicate noncompliance, to post warnings and conduct additional sampling. The decision rule for beach monitoring is described in Section 2.5.1 of this QAPP.

2.5 Quality Objectives and Criteria

2.5.1 Data Quality Objectives

Data quality objectives (DQOs) are qualitative and quantitative statements that clarify study objectives and are defined as the criteria needed to design a study so that the technical and quality objectives defined by the data user for a project are met. Beach monitoring DQOs are mandated in the specific legislation that defines the activities and thus were not developed through the formal seven-step process described in *Guidance for the Data Quality Objective Process* (EPA QA/G-4) (EPA, 2000a). All elements of the DQO process are, however, discussed in this QAPP:

Step 1: State the Problem - Section 2.2

Step 2: Identify the Decisions – Section 2.5.1 below

Step 3: Identify Inputs to the Decision – Section 3.1

Step 4: Define the Study Boundaries – Section 2.2.1

Step 5: Develop a Decision Rule(s) – Section 2.5.1 below

Step 6: Evaluate Decision Errors – Section 3.1

Step 7: Optimize the Design for Obtaining Data – Section 2.5.1 and 3.1

The CWB Monitoring and Analysis Section monitors the waters of Hawaii's beaches for concentrations of *Enterococcus* which serves as an indicator of pathogens and *Clostridium perfringens*, which acts as a secondary tracer of sewage contamination.. The Monitoring and Analysis Section maintains a 'decision rule' for evaluating beach monitoring data, or a set of numerical guidelines that must be followed to determine whether a beach is safe ('Compliant') or not safe (on 'Alert') for swimming and other water contact activities. In March 2011, the Monitoring and Analysis Section revised the decision rule for determining a beach's compliance with water quality criteria (Tables 1 and 2).

Table 1. Decision Rule for Beach Monitoring.

Beach Status	*Enterococcus* **CONCENTRATIONS (*)**			
	30-day Running Geometric Mean		**Single Sample Maximum (SSM)**	**Action**
IN COMPLIANCE	≤35 cfu/100mL	**AND**	≤ 104cfu/100mL	None – maintain routine schedule
ON ALERT	>35cfu/100mL	**OR**	>104 cfu/100mL	Resample See resampling decisions on Table 2.
STORM EVENT (Brown Water Advisory)	Issued in the event of likely polluted runoff due to heavy rain. **Do not wait for laboratory results**.			• Notify Communications Office (may issue press release) • Send e-mail advisory • Post CWB website advisory • Add advisory notice to CWB hotline
WASTE WATER EVENT	Issued for known or likely wastewater spill or discharge. **Do not wait for laboratory results**.			• Notify Communications Office • Post CWB website warning notice • Initiate email alerts • Responsible party to post warning signs at the site. DOH may order or post more signs. • Responsible party issues press release if spill is ≥ 1,000 gallons • Check warning signs twice a day • Responsible party to collect and analyze samples immediately and daily. DOH may also sample.
WASTE WATER CONDITION	>35 cfu/100 mL	**OR**	Resample SSM is >104 cfu/100 mL	• Notify Communications Office (may issue press release) • Post warning signs at the site • Send e-mail warning
	AND: SSM for C. perfringens is >50 cfu/100 mL			

	AND: Kualoa Procedure indicates human fecal source	notice • Post CWB website notice • Add warning notice to CWB hotline • Check warning signs twice a day

(*) The Membrane Filtration procedure expresses concentration units as cfu/100 mL. Defined Substrate Methods (Enterolert) utilize MPN/100 mL. Although not technically equivalent, both methods (and therefore the resulting units) are acceptable for the monitoring purposes described in this document.

If *Enterococcus* concentrations indicate that a beach is in compliance (Table 1), no action is required. If *Enterococcus* concentrations fall within the 'Alert' range for either the geometric mean or the SSM, the potential causes of the elevated concentrations are investigated. To determine whether the causes of elevated *Enterococcus* levels are due to human sources or animal/environmental sources, a survey of the area is conducted by the sample collector (EHS). Potential sources such as nearby restrooms or streams, unusual objects, evidence of animal fecal matter from sources such as wild animals (ducks, sea turtles, Monk seals), nearby domestic animal housing (such as dog kennels, pig pens, chicken coops) or evidence of unusual activity are identified. Additional information regarding wind direction and strength, ocean current flow and stream flow are also noted. This information in conjunction with the local knowledge acquired by the sample collector is used to assess the possible source of contamination. Should these causes be determined to not be human- or controllable animal-related (*e.g.*, wildlife-originating), then the beach is designated as compliant and the normal sampling schedule is resumed. If the causes are determined to be human- or controllable animal-related, then resampling must occur: immediately if the SSM is exceeded and the following day if only the geometric mean is exceeded. Resampling analyses will test for *Enterococcus* as well as *Clostridium perfringens* concentrations. See Table 2 for the decision rule for resampling results.

If the resampling continues to produce elevated levels of bacterial indicators and the area survey is not able to rule out human fecal contamination, a more in-depth sanitary survey may be conducted using the On-Site Sanitary Survey form (Appendix F). If the issue is still unresolved and the bacterial indicators remain at elevated levels, the Kualoa Protocol is implemented. The Kualoa protocol is a newly-instituted Wastewater and Nutrient Source Tracking Procedure that involves sampling beach pore water to determine if the indicator bacteria are originating in cesspools. The protocol is in the development stage and has not yet been finalized. An SOP will be produced when the protocol has been finalized. An addendum to this QAPP will be submitted to EPA when this protocol takes effect.

In the event of heavy rains and a Flash Flood Warning is issued by the National Weather Service, the CWB may issue a Brown Water Advisory. The Advisory is posted on the CWB website, an Email Notification is sent out and the CWB hotline updated. The CWB also notifies the Department's Communications Office. The Communications Office may issue a Press Release at their discretion, in which the public is advised to stay out of the affected water. Samples need not be collected before an advisory is issued.

In the event of a known or likely wastewater spill or discharge, a Wastewater Event may be issued. Under HAR 11-62, Appendix C, Responses for Wastewater Spills, Overflows and Discharges, the responsible party is required to notify the Department of all spills and must post warning signs in the affected area; however the DOH may require the responsible party to post more signs or the Department may post its own warning signs as needed. If the spill or discharge involves a thousand gallons or more, the responsible party must issue a press release warning the public of the spill or discharge. If the responsible party does not have that capability, the DOH Communications Office may issue a press release. The responsible party must also collect and analyze samples of the affected area. The Monitoring and Analysis Section staff may also collect samples if necessary.

In the event of a wastewater spill, the responsible party notifies the CWB during regular working hours. If the spill occurs after hours, the State Operator is notified by the responsible person. The State Operator then calls Watson Okubo or Dale Mikami (depending on who is on Standby Duty). The person on Standby Duty then updates the CWB website and CWB Hotline (808-586-5826). Automatic public notification will be made through RSS (Really Simple Syndication) technology which will provide subscribers immediate notification of the event as well as a geographic representation of its location and affected areas after the spill has been confirmed and verified. Notification is also made via email alerts to government officials, visitors' bureaus, environmental groups, and the news media. The email contact list is shown in Appendix C. A warning message is also recorded on the CWB hotline.

Table 2. Beach Monitoring Resampling Decision Rule.

	Enterococci concentrations (*)		***C. perfringens* concentrations**	**Action**
On Alert FIRST RESAMPLING RESULTS	Geomean >35 CFU/100 mL or SSM >104 cfu/100 mL	**AND**	>50 CFU/100 mL	• Post warning signs • Post CWB website warning • Survey area to identify possible sources • Resample the site • Sample surf sites if applicable and if surf is permitting
	Geomean >35 CFU/100 mL	**AND**	<50 CFU/100 mL	• Resample the site • Survey area to identify possible sources
	Geomean <35 CFU/100 mL	**AND**	<50 CFU/100 mL	• Return to "In Compliance" status • Resume regularly scheduled sampling • Remove signs if previously posted • Remove CWB website warning if previously posted
On Alert SECOND RESAMPLING RESULTS	Geomean >35 CFU/100 mL	**AND**	<50 CFU/100 mL	Perform Sanitary Survey. If sanitary survey rules out human source: • Remove warning signs • Remove CWB website warning • Resample the site
	Geomean >35 CFU/100 mL	**AND**	>50 CFU/100 mL	Perform Sanitary Survey. If sanitary survey indicates a human source or the source cannot be identified: • Resample the site • Implement Kualoa Protocol
	Geomean <35 CFU/100 mL	**AND**	<50 CFU/100 mL	• Return to "In Compliance" status • Resume regularly scheduled sampling • Remove signs if previously posted • Remove CWB website warning if previously posted

(*) The Membrane Filtration procedure expresses concentration units as cfu/100 mL. Defined Substrate Methods (Enterolert) utilize MPN/100 mL. Although not technically equivalent, both methods (and therefore the resulting units) are acceptable for the monitoring purposes described in this document.

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Current Warnings and Advisories are posted on the CWB website at: http://emdweb.doh.hawaii.gov/CleanWaterBranch/CurrentWarnings/default.aspx.
The criteria for issuing advisories and postings are listed in Tables 1 and 2 above. An advisory is a public warning issued to notify beachgoers of the potential risks at the affected beach or beaches either through the news media or via posted signs. A posting is a physical sign containing the advisory notice placed on the affected beach or beaches. The Department does not technically "close" beaches when postings are made or advisories are issued.

2.5.2 Measurement Quality Objectives

The Measurement Quality Objectives are stated in Section A.6.2 of the CWB QAPrgP (HIDOH, 2011).

2.6 Special Training and Certifications

2.6.1 Training Requirements

Individuals implementing this QAPP must receive, at a minimum, orientation to the project's purpose, scope, and methods of implementation. This orientation is the responsibility of the Monitoring and Analysis Section Supervisor. Field, laboratory, and data management personnel must have documented experience or direct training in the procedures that they will be performing for this project, including any applicable SOPs. The following section describes general training requirements that all personnel conducting beach monitoring should have.

Field Training. Field team members will be adequately trained in sampling methods and procedures outlined in this plan. For sampling and analysis procedures, minimum training involves reading the applicable SOP and demonstrating correct performance of the procedure. Prior to a staff member's independent performance of a procedure, a quantitative 'test' should be conducted when possible and applicable to ensure that the trainee results are comparable to those of an experienced staff member. Documentation of this training should be provided to the CWB QAO.

Specifically, field team members will have training in the following field activities:

- Water grab sampling (manual);
- Instrument operation, calibration checks, and routine maintenance (for the Hydrolab Quanta; Hach 2100P turbidimeters, Garmin etrex GPS, digital camera), as described in the appropriate SOPs;
- Data recording and summarization procedures;
- Sample handling and chain of custody procedures; and,
- General and project-specific safety.

Training records for all CWB personnel are maintained by the CWB QAO. The Monitoring and Analysis Section Supervisor is responsible for scheduling and arranging refresher courses when applicable.

2.7 Documentation and Records

2.7.1 Document Control

Controlled documents within the CWB include the QA Program Plan (QAPrgP), QAPPs, and SOPs. It is critical that CWB Monitoring and Analysis Section personnel have the most recent versions of this QAPP and related SOPs. Version control is maintained by defining the version number and effective date on the cover sheet of each of these documents. This QAPP, any subsequent revisions or addenda, and SOPs are reviewed and approved by the CWB Monitoring and Analysis Section Supervisor and QAO. When a new version is approved, it is distributed and the old versions must be destroyed or marked as "Obsolete." It is the responsibility of the CWB QAO to ensure that all relevant project personnel (including everyone on the distribution list and all signatories) have the most current version. Official, signed versions of each planning document will be maintained in the CWB central filing system.

In order to ensure that they remain current, this QAPP and associated SOPs must be reviewed at least annually by the CWB Chief (or his designee) and updated as needed. Further requirements for quality system documents can be found in Section A.8.0 of the CWB QAPrgP (HIDOH, 2011).

In addition to this QAPP, an SOP for beach water sampling (CWBMON009; Appendix B) describes specific sample collection procedures and equipment necessary. All beach monitoring sample collection activities will be conducted according to the methods described in CWBMON009. SOPs that describe calibration, operation, and maintenance of field instruments that are used during beach monitoring are listed in Table 3.

Table 3. List of Standard Operating Procedures Relevant for Beach Monitoring.

Title	Document No.
Beach Sampling Protocol	CWBMON009
Hydrolab Quanta Protocol	CWBMON003
Hach 2100p Turbidimeter	CWBMON011
Garmin etrex GPS	CWBMON005
Photodocumentation of Sites Using a Digital Camera	CWBMON006

2.7.2 Field Documentation and Forms

All field activities must be documented using the approved data collection procedures described in this QAPP and in the sample collection SOP (*Beach Sampling Protocol* [CWBMON009]).

EHSs conducting beach monitoring must use the Monitoring Section's field data sheets (Appendix C) to document all aspects of sample and data collection, as well as chain of custody (COC) details.

General requirements are listed in Section A.8.2 of the CWB QAPrgP (HIDOH, 2011).

The CWB Monitoring and Analysis Section's field data sheets (Appendix C) also serve as chain of custody (COC) forms with spaces provided to indicate who relinquished and who received the samples and when.

When the samples are delivered to the State Laboratory (or to the contract lab performing the analyses), a photocopy of the field data sheet is made. The original field data sheet is retained by the field personnel, and the copy will be given to the appropriate lab personnel.

Outside contractors are not typically used by the Monitoring and Analysis Section for field sampling purposes. However, if another organization were contracted to collect data or samples for CWB decision-making then it is the responsibility of the CWB to verify that the field documentation procedures of those organizations are consistent with the requirements detailed above.

2.7.3 Laboratory Documentation

Laboratory documentation requirements are stated in Section A.8.2.2 of the CWB QAPrgP (HIDOH, 2011).

2.7.4 Documentation Standards

The CWB Monitoring and Analysis Section, the SLD, and any contracted entity that is collecting or analyzing samples must have written procedures for all methods and procedures related to the collection, processing, analysis, reporting, and tracking of environmental data. This documentation must be in either the organization's QA Manual or in SOPs and must be readily available to field and laboratory personnel. For analytical procedures, references to EPA methods are not enough; written SOPs must describe how analytical methods are implemented at a specific facility, and must be readily available to laboratory personnel.

All data generated during the course of this project must be able to withstand challenges to their validity, accuracy, and legibility. To meet this objective, data are recorded in standardized formats and in accordance with prescribed procedures. The documentation of all environmental data collection activities must meet the following minimum requirements:

- Data must be documented directly, promptly, and legibly. All reported data must be uniquely traceable to the raw data. All data reduction formulas must be documented.
- Handwritten data must be recorded in ink. All original data records include, as appropriate, a description of the data collected, units of measurement, unique sample identification (ID) and station or location ID (if applicable), name (signature or initials) of the person collecting the data, and date of data collection.

- Any changes to the original (raw data) entry must not obscure the original entry. The reason for the change must be documented, and the change must be initialed and dated by the person making the change, and approved.
- The use of pencil, correction fluid, and erasable pen is prohibited.

2.7.4.1 Changes and Deviations

While the Beach Monitoring Program is being conducted, it may be necessary to modify the planned activities. Modifications that are anticipated prior to field or laboratory work will be reported to the CWB Monitoring and Analysis Section Supervisor, who will assess the potential impact and contact the CWB QAO if the changes are major (*e.g.*, those that would impact the study objectives, design, or data quality). All modifications will be described in the final reports. The Monitoring and Analysis Section Supervisor and the CWB QAO will determine whether modifications are significant enough to either update this QAPP or prepare an addendum to this document.

Changes that are not anticipated prior to the planned activities are deviations and must be communicated and documented. Documentation should include an assessment of any impact that the deviation has on the study design and data quality, and any corrective action implemented. Minor deviations (*e.g.*, those that would not impact the study objectives, design, or data quality) will be reported to and approved by the Monitoring and Analysis Section Supervisor. Major deviations (*e.g.*, those that could impact the study objectives, design, or data quality) will be reported to the CWB Monitoring and Analysis Section Supervisor and the CWB QAO. A discussion of major deviations and potential impact on the project objectives will be included in the final reports.

2.7.4.2 Definition of Raw Data

Raw data are defined as any original factual information from a measurement activity or study recorded in a laboratory notebook, worksheets, records, memoranda, notes, or exact copies thereof that are necessary for the reconstruction and evaluation of the report of the activity or study. Raw data may include photography, microfilm or microfiche copies, computer printouts, magnetic media, including dictated observations, and recorded data from automated instruments. If exact copies of raw data have been prepared (and verified accurate by signature) then the exact copy or exact transcript may be substituted.

2.7.5 Reporting

The Monitoring and Analysis Section develops two major annual reports: (1) the Beach Annual Report and (2) the Annual Beach Notification Report. Both are submitted to EPA as summaries of the year's activities. The Beach Annual Report details the specifics of the Monitoring Section's Beach Monitoring program, including which beaches were sampled that year, the number of samples taken, general programmatic developments within the program (*e.g.*, website updates, database maintenance), changes in a decision rule (see Section 2.5.1), outreach

activities, and a general description of spill events. The Annual Beach Notification Report includes any instances of bacterial exceedances during the previous year, beach advisories or warnings, changes to the public notification and risk communication plan, and changes in staff or monitoring activities. These two reports are prepared by the Monitoring and Analysis Section Supervisor or his designee and are reviewed by the CWB QAO prior to submittal to EPA.

3.0 DATA GENERATION AND ACQUISITION

3.1 Sampling Process Design

The CWB Monitoring and Analysis Section has completed an inventory of Hawaii's 385 beaches. Monitoring every one of Hawaii's 385 beaches on a regular basis would be inefficient and costly. Therefore, to prioritize the high-use beaches that are most likely to be impacted by pollution, the CWB Monitoring Section divides the 385 Hawaiian beaches into Tier 1, Tier 2, and Tier 3 beaches according to the Performance Criteria of the Hawaii BEACH Grant application. The Tier 1 "Core" Beaches are monitored three times per week, while a subset of Tier 2 beaches are monitored once or twice per week for a six-month period. The breakdown of Tier 1 and Tier 2 monitoring stations by island are presented in Table 4. Recent State budget cuts, reduction-in-force and employee furloughs have drastically affected the monitoring of Oahu beaches. For the foreseeable future, only Tier 1 beaches will be monitored on Oahu. Tier 2 beaches will be added as manpower becomes available.

Table 4. Monitoring Stations for Calendar Year 2011 and 2012 Oahu

Storet #	Name	Tier
153	Ala Moana-Center	1
154	Ala Moana-DH	1
155	Kahanamoku Beach	1
161	Kuhio Beach	1
162	Public Bath (Queen's)	1
172	Waimea Bay Shoreline	1
185	Makaha Beach	1
187	Nanakuli Beach Park	1
189	Ewa Beach Park	1
193	Kailua Beach Park	1
197	Waimanalo Beach	1
200	Sandy Beach	1
201	Hanauma Bay	1
208	Kualoa Beach Park	1
216	Makapuu Beach	1
218	Chun's Reef	1
221	Malaekahana	1
222	Ala Moana Lagoon	1
224	Pokai Bay	1
225	Sunset Beach	1

228	Sans Souci	1
236	White Plains Beach	1
238	Moana Beach, Waikiki	1

Maui

Storet #	Name	Tier
693	Hanakaoo	1
654	Hukilau	1
681	Kamaole 1	1
683	Kamaole 3	1
677	Kanaha	1
676	Kihei South	1
694	Launiupoko	1
687	Maalaea Condos	1
700	Sprecklesville	1
691	Wailea	1
695	Airport (Kahekili)	2
689	Baldwin Park	2
703	Cove Park	2
674	Fleming Beach (North)	2
650	Fleming Beach (South)	2
710	Hale Nanea	2
652	Hana	2
725	Honokowai	2
707	Honolua Bay	2
653	Honomanu	2
688	Hookipa Beach Park	2
655	Kaa Shoreline, Paia	2
712	Kalepolepo	2
682	Kamaile Beach #2	2
692	Kaopala Bay	2
711	Kealia Pond	2
704	Keawakapu (2)	2
685	Keawekapu Beach	2
671	Kihei (North)	2
676	Kihei (South)	2
701	Kihei Landing	2
726	Lahaina Town (#202)	2
702	Mai Ponia Oe lau	2
661	Makena Beach Shoreline	2
717	Makena Landing	2

709	Maliko Bay	2
718	Maluaka	2
714	Mokapu	2
721	Mokuleia	2
723	Napili	2
690	Nehe Point	2
663	Olowalu Shore Front	2
722	Oneloa	2
719	Oneuli	2
664	Paia Outfall, Shoreline	2
715	Palauea	2
728	Papaalaua	2
724	Pohaku	2
705	Polo Beach	2
716	Poolenalena	2
727	Puamana	2
720	Puu Olai (Small Beach)	2
696	Puunoa (Baby) Beach	2
708	Stables	2
697	Teen Challenge (Mile 14)	2
698	Ukumehame Beach	2
686	Ulua Beach	2
678	Wahikuli Beach	2
729	Waianapanapa	2
667	Waiehu Stream Mouth	2
668	Waihee Farm Shoreline	2
669	Wailuku Breakwater	2
713	Waipulani	2

Kauai

Storet #	Name	Tier
804	Hanalei Bay Landing	1
805	Hanalei Bay Pavilion	1
808	Hanapepe Salt Pond	1
809	Kalapaki Beach	1
819	Poipu Beach Pavilion	1
825	Lydgate Park	1
801	Anini Park	2
803	Haena Beach	2
806	Hanamaulu	2
811	Kalihiwai Bay Beach Park	2

812	Kapaa Pavilion	2
813	Kealia Beach Park	2
814	Kekaha	2
820	Polihale	2
833	Waioli Pavilion	2
835	Kee Beach	2
836	Lawai Beach Park	2
839	End of Weke Road	2
841	Keoniloa Bay	2

Hawaii

Storet #	Name	Tier
1107	Hilo Bay Lighthouse	1
1110	Honolii Cove	1
1114	Keaukaha 4 mile	1
1126	Onekahakaha Beach Park	1
1130	Puhi Bay #3	1
1136	Richardson Ocean Center	1
1138	Hilo Bay Canoe Beach	1
1143	Ahalanui (Pualaa) Park	1
1203	Kahaluu Beach	1
1205	Kailua Pier A-1	1
1208	Kailua Pier D	1
1222	Puako Middle	1
1236	Anaehoomalu Bay	1
1101	Coconut Island	2
1102	Exit Ice Pond	2
1106	Hilo Bay (Boat Landing)	2
1113	Kapoho Beach Lots	2
1117	Kolele Gulch (Ocean)	2
1120	Laupahoehoe Point	2
1121	Leleiwi Beach Park	2
1127	Pohoiki Isaac Hale	2
1129	Puhi Bay #2	2
1142	Vacation Land	2
1145	Kapoho Champagne Pond	2
1146	Hakalau County Park	2
1147	Lehia County Park	2
1148	Radio Bay	2
1149	Kehena Beach	2
1150	Kalapana New Black Sand	2

1151	Ninole	2
1152	Kalae, South Point	2
1155	Waipio Bay	2
1200	Hapuna	2
1201	Honaunau	2
1202	Honuapo Landing	2
1204	Kailua Pier A	2
1209	Hookena	2
1213	Keauhou Bay	2
1215	Magic Sands	2
1220	Milolii	2
1224	Punaluu Beach Park	2
1225	Spencer Beach Park	2
1237	OTEC	2
1238	Kawaihae LST Landing	2
1240	Kealakekua	2
1241	Kona Coast State Park	2
1243	Mauna Kea South	2
1246	Pelekane	2
1247	Waiulaula	2
1249	Holoholokai Beach	2
1250	Pauoa Bay	2
1251	Hualalai Four Seasons	2
1252	Kua Bay	2
1253	Pine Trees	2

The CWB Monitoring and Analysis Section Supervisor is responsible for developing the sampling process design and for modifying the schedule as necessary in response to emergency situations, special events, practical limitations and/or other unique scheduling conflicts. The evaluation and classification of beaches were accomplished using the following factors:

- Year-round primary contact recreation
- Stream that flows through a residential, agriculture, urban, or industrial area discharge nearby
- Urban non-point sources
- History of sewage spills in the area and monitoring data
- Heavy beach/recreational water use
- Importance of beach to local economy and community use
- Prior monitoring data

If a beach possessed five or more factors out of seven of the above factors, the beach was given a Tier 1 designation. If less than 5 factors, the beach was given a Tier 2 designation. Tier 2

beaches are evaluated to determine whether additional monitoring is required. If the beach is determined to be unthreatened using the above criteria, and if prior monitoring history reveals no evidence of excessive levels of bacterial indictors, additional monitoring will not be required and the beach will be designated a Tier 3 beach. Tier 3 beaches will not be monitored; however, they will be subject to annual review. If the CWB receives complaints on the water quality of a Tier 3 beach, sampling will resume for that beach until the nature of the complaint is resolved. Because Hawaii has 385 beaches, it is not practical to monitor all the beaches in a year's time. Therefore, the DOH kept the classification of beaches to a minimum to focus its attention, manpower, and funds on the more important and threatened Tier 1 beaches.

Given that there are far more Tier 2 beaches than Tier 1 beaches, the list of Tier 2 beaches being monitored weekly is rotated every six months on Maui, Kauai and Hawaii. Due to budget cuts and staffing shortage, only Tier 1 beaches are currently being monitored on Oahu. A Tier 1 beach can be redesignated as Tier 2 (and vice versa) if information indicates that the characteristics defining it as a Tier 1 (or Tier 2) have changed. If a Tier 2 beach shows consistently low bacterial concentrations (30-day running geometric mean of <35 cfu/100 mL for the past six months and no exceedance of the SSM), low human traffic as noted by the sample collector, or is difficult to access, the beach may be reassigned as Tier 3. No quantitative criteria has been established for determining "low human traffic", rather this criteria is left up to the professional judgment and local knowledge of the sample collector (EHS). Unusually high traffic observed by the sampler is noted on the field data sheet. Tier 3 beaches receive no monitoring, although their general status as Tier 3 beaches is reviewed by the CWB Monitoring Section annually. No monitoring is currently conducted on Kahoolawe and Niihau due to the inaccessibility of these islands by the general public. No monitoring is also conducted on Molokai or Lanai due to the relatively low traffic on those beaches, historically low indicator bacteria levels and the logistical cost involved in collecting those samples.

Beaches may be removed from the list of actively monitored sites if a review of the data demonstrates minimal risk to swimmers (*e.g.*, consistently low bacteria concentrations, light use of the specific beach, and somewhat inaccessible). Beaches may also be removed at the discretion of the Monitoring Section supervisor due to unforeseen developments (*e.g.*, health and safety issues, budget cuts and administrative actions that impact staffing). Beaches may also be added to the Tier 1 category from the Tier 2 category if data and use suggest that the beach in question has gained additional factors qualifying its move to the Tier 1 classification.

Remotely-located EHSs (*i.e.*, those that are not based at the main Oahu office) are responsible for scheduling, planning, and conducting any Beach Monitoring activities required on their particular island. Oahu Beach Monitoring is scheduled by each EHS located in the CWB main office. Generally, every staff member is responsible for monitoring between four and six beaches for the six month timeframe.

3.2 Field Sampling Methods

The CWB Monitoring and Analysis Section collects discrete samples and performs *in situ* measurements at each sampling location. The field sampling method used for the Beach

Sampling Program is discussed in detail in the SOP entitled, *Beach Sampling Protocol* (CWBMON009), which is included in Appendix B of this QAPP. All sample and data collection organizations (CWB or non-CWB) must use the sampling methods discussed in this section. If the exact sampling method cannot be used, a comparable method must be chosen. The comparability and appropriateness of alternative methods will be assessed by the CWB QAO during review of the QAPP. Any *in situ* field analyses not performed directly by CWB must be detailed in SOPs or this QAPP. The CWB QAO must evaluate the usability, comparability, and appropriateness of the procedures during document review.

All general field information, including sample locations, field personnel, date/time, and sampling locations, will be recorded on the field data sheets/COC forms (Appendix C) which are maintained in a binder (see Section 2.7.2) and are entered into the CWB monitoring database (see Section 3.8). All field sampling elements will be implemented in strict accordance with this QAPP.

Project requirements specify that if sampling requirements cannot be met due to sampling or measurement system failure, field conditions or other factors that cannot be controlled, the Monitoring and Analysis Section Supervisor and QAO will be contacted. A corrective action will be agreed upon based on the nature of the problem, documented in the field log, and communicated to the sampling team. The QAO will review corrective actions to assess their effectiveness. The documentation and communication of any deviations from the QAPP or the field SOPs is discussed in Section 2.7.4.1.

3.2.1 Field Measurements

In situ monitoring parameters and methods are defined in Table 5. Field measurements for this study consist of those that directly support station or sample characterization.

Table 5. Methods for In Situ Monitoring and Observations.

***In situ* Parameter/Observation**	**Units**	**Instrument**	**Method SOPs**
Station location	NAD83 DMS	*Garmin etrex GPS*	CWBMON005
Photographic Documentation	N/A	Digital Camera	CWBMON006
Temperature	°C	Hydrolab Quanta	CWBMON003
Salinity	ppt	Hydrolab Quanta	CWBMON003
Dissolved Oxygen	mg/L and %	Hydrolab Quanta	CWBMON003
pH	N/A	Hydrolab Quanta	CWBMON003
Turbidity	NTU	HACH 2100p	CWBMON011

3.2.2 Water Sample Collection

Water samples will be collected according to the SOP *Beach Sampling Protocol* (CWBMON009). Collection methods, sample containers, volumes, preservation details, and holding times for the Beach Monitoring bacteria samples are listed in Table 6.

Table 6. Field Sample Handling and Preservation Requirements.

Constituents	SOP	Bottle	Volume	Filtered	Field Preservation	Holding Time (days)
Enterococcus/ *C. perfringens*	CWBMON009	500mL sterile Nalgene	As marked on bottle	No	Cool 4ºC	6 hours*

*hold time only applies to *Enterococcus*; *C. perfringens* is an anaerobic bacterium that reverts to a dormant state when exposed to oxygen. In the dormant state, *C. perfringens* can remain viable well beyond the 6 hour hold time applied to *Enterococcus*. While no hold time has been established for *C. perfringens*, since it is measured at the same time, from the same sample as *Enterococcus*, in practice, it is subject to the same 6 hour hold time.

3.2.3 Field Quality Control

Field quality control procedures for beach monitoring sampling consist of temperature control blanks. The temperature blank will be created by the field sampling crew by filling 500mL Nalgene bottles with site water at the first sampling location (Temperature Control Blank Beginning [TCB]) and the last sampling location (Temperature Control Blank End [TCE]) of each day. The preparation of TCBs and TCEs is described in detail in the Beach Sampling Protocol SOP (CWBMON009). Upon receipt at the lab, the temperature of the blanks will be recorded to document the temperature of the samples during transport.

A field replicate sample (two samples collected from the same sample site at approximately the same time) is collected for every 10-20 samples. Each field replicate will be analyzed as a separate sample. Replicate data will be used to quantify the uncertainty and variability in indicator organism density. Field replicate samples will be given unique sample identification numbers and treated as discrete samples.

The manufacturer's performance specifications for field instruments used by the Monitoring Section during beach monitoring are defined in Table 7. In general, QC for field instruments is provided through the performance of field checks that verify instrument measurements are within 5% of the calibrated values. Further details on field instrument QC criteria can be found in the user's manuals for the various instruments and the CWB SOPs (CWBMON003 and CWBMON011).

Table 7. Beach Monitoring Field Instrument Performance Specifications.

Instrument	Range	Accuracy	Precision
Hydrolab Quanta			
Temperature	-5 to 50°C	±0.2 °C	0.01 °C

Instrument	Range	Accuracy	Precision
Salinity	0 to 70 PSS	±1% of reading; or ±0.01 PSS	0.01PSS
DO	0 to 50 mg/L	±0.2 mg/L ≤ 20 mg/L ±0.6 mg/L > 20 mg/L	0.01mg/L
pH	2 to 12 units	±0.2 units	0.01 units
Hach 2100P Turbidimeter			
Turbidity	0 - 1000 NTU	±2% of reading between 0-500 NTU ±3% of reading between 500-1000 NTU	0.01 NTU

3.2.4 Maintenance and Inspection of Field Equipment

All field instruments used for the collection of water samples or data for the Beach Monitoring Program will be maintained according to the instrument SOPs (Appendix B) and the manufacturers' instructions (*i.e.*, operating manuals). CWB Monitoring and Analysis Section staff utilize field instruments that conduct self-checks when initially powered on. Physical inspections are conducted prior to use. A spare parts inventory or back-up equipment is maintained to ensure that beach monitoring sampling schedules are not impacted by equipment "down time." Further details on field instrument maintenance and inspection can be found in the user's manuals for the various instruments and the CWB SOPs (CWBMON003 and CWBMON011). The requirements also apply to other entities that may collect data in support of the beach monitoring program.

3.2.5 Calibration of Field Equipment

Field equipment and instruments that generate measurement data for beach monitoring purposes must be calibrated prior to use in order to demonstrate that the equipment and instruments are in control. Furthermore, the on-going control of field and laboratory equipment must be demonstrated through periodic secondary (or field) checks. These requirements also apply to other entities that may collect data in support of CWB programs.

Procedures for field instrument calibration are detailed in the SOPs for the individual instruments (Appendix B). Field instruments are calibrated individually, as needed for each instrument and parameter, unless otherwise specified in the SOP. The calibration requirements for *in situ* field equipment are summarized in Table 8.

Procedures for field instrument secondary (or field) checks are detailed in the SOPs for the individual instruments (Appendix B). Secondary checks are performed on the instruments that measure salinity, pH, temperature, and turbidity to determine that a probe is reading correctly between calibrations. Secondary checks are made at a value that is close to the readings expected in the field, and near zero (or 7 for the pH meter). The field check values and acceptance criteria are presented in Table 9. These checks are recorded on the field data sheets/COC forms (Appendix C of the Beach Sampling Protocol, CWBMON009) which are maintained in binders.

Table 8. Calibration Procedures for Field Equipment.

Equipment/ Instrument (SOP No.)	Calibration Schedule	Calibration Acceptance Criteria	Field Check Acceptance Criteria
Hydrolab Quanta (CWBMON003)	**Temperature:** NA	N/A Calibration set by the manufacturer.	+/- 1°C of NIST traceable thermometer checked annually
Hydrolab Quanta (CWBMON003)	**pH:** Monthly or as needed	N/A Instrument automatically establishes calibration from a 2-point initial calibration.	± 5% of calibration solution
Hydrolab Quanta (CWBMON003)	**Dissolved Oxygen:** Daily	N/A Instrument is calibrated using saturated DO.	+/- 5% of earlier reading for pre and post check
Hydrolab Quanta (CWBMON003)	**Salinity/Conductivity:** Quarterly or as needed	N/A Instrument automatically establishes calibration from a 1-point initial calibration.	± 5% of calibration solution
Hach 2100p turbidimeter (CWBMON011)	Yearly or as needed	N/A Instrument automatically establishes regression from 4-point initial calibration. Gelex standards values determined immediately after the initial calibration.	Prior to first sample and as a post check: 3 Gelex standards (5, 50 and 500 NTUs): must fall within 5% of the established value. Blank (deionized or other turbidity-free water): must not exceed 0.25 NTU

Table 9. Field Check Values and Acceptance Criteria.

Parameter	Field Check Value (Near Field Conditions)	Zero or Neutral Check Value	Field Check Acceptance Criteria
Salinity	~35 PPT	0 – 1	± 5% of field check solution
DO	Perform DO calibration	N/A	N/A Instrument is calibrated using a saturated DO solution.
pH	~8	7	± 5% of field check solution
Temperature	Ambient temperature (compared to NIST thermometer)	N/A	± 1°C of NIST thermometer

Turbidity	5, 50, and 500 NTU	<0.5 NTU	± 5% of secondary check standards

3.3 Sample Handling and Custody

All samples collected in support of beach monitoring activities must be handled and preserved in a consistent manner to assure sample integrity. The sample preservation, handling, labeling, and custody requirements for water samples collected by the Monitoring and Analysis Section are detailed in the sample collection SOP (*Beach Sampling Protocol* [CWBMON009]). Samples collected by contracted organizations in support of beach monitoring activities must implement comparable procedures.

3.3.1 Sample Handling

Sample handling in the field must ensure the integrity of the samples. Table 6 defines the bottles, preservation requirements, and holding times for field-collected samples. The sample collection SOP (*Beach Sampling Protocol* [CWBMON009]) also describes sample handling requirements.

The SLD laboratories are provided with copies of the sampling schedule; the field staff will notify the laboratory of changes in the sample schedule (*e.g.*, sampling event cancelled, extra samples collected). Table 5 of the CWB QAPrgP (HIDOH, 2011) lists the various SLD laboratories to which samples can be shipped or delivered, along with the contact information of the laboratory staff that should be notified of changes in the sampling schedule.

The lab contact information is specified in Table 5 of the CWB QAPrgP (HIDOH, 2011).

All samples will be shipped in a cooler, which provides protection, insulation, and containment in case of breakage or spillage. In addition, samples in glass or other breakable containers will be wrapped in bubble wrap (or similar cushioning material) to further minimize possibility of breakage. When directly transporting samples that require chilling, adequate quantities of crushed ice or ice cubes will be packed with the samples to maintain a temperature of approximately 4°C. Coolers shipped to the laboratory on Oahu will be securely fastened with duct or packing tape to ensure they do not accidentally open. Two temperature control samples are added to the cooler (Section 3.2.3). Upon receipt at the lab, the temperature of both temperature control samples will be recorded by the laboratory custodian.

3.3.2 Sample Preservation

As described in SOP CWBMON009, physical preservation techniques used for all water quality samples include cooling and keeping the samples out of direct sunlight. Specific requirements for the field preservation of the samples are provided in Table 6.

3.3.3 Sample Custody

A COC form must accompany each set of water samples to the lab. The COC must be signed and dated by the field person who has maintained custody of the samples during collection and who

is relinquishing them to the laboratory for analysis. If samples require shipment via an air carrier, the coolers must be securely fastened with tape, but must be easily opened for inspection by the airline. Appendix C provides copies of the Monitoring Section COC form. Because the COC form doubles as a field data sheet, the procedures associated with the COC forms are identical to the field data sheet procedures, as described in Section 2.7.2.

Upon receipt at the laboratory, the sample custodian (receiver) inspects the contents of the cooler, verifies that it agrees with the COC, and signs the COC form to indicate receipt of the samples (both the relinquisher and the receiver of the samples must sign the COC form and provide the date and time of relinquishing and receipt). If any discrepancies are noted, or if laboratory acceptance criteria or project-specific criteria are not met, the laboratory must contact the Monitoring and Analysis Section Supervisor for resolution of the problem. The discrepancy, its resolution, and the identity of the person contacted must be documented by the laboratory. The following conditions may cause sample data to be unusable and must be communicated to Monitoring and Analysis Section Supervisor:

- The integrity of the samples is compromised (*e.g.*, leaks, cracks, grossly contaminated container exteriors or shipping cooler interiors, obvious odors, etc.);
- The identity of the container cannot be verified;
- The proper preservation of the container cannot be established (*e.g.*, outside of required temperature range);
- Incomplete sample custody forms (*e.g.*, the sample collector is not documented or the custody forms are not signed and dated by the person who relinquished the samples);
- The sample collector did not relinquish the samples; or,
- Required sample temperatures were not maintained during transport based on temperature of temperature blanks in coolers. Note that samples collected in close proximity to the laboratory and delivered and relinquished soon thereafter may not necessarily attain a temperature of 4^{o}C. It is expected that laboratory personnel and/or EHS responsible for the sample collection use professional judgment to determine whether the temperature of the sample at the time of receipt is acceptable and will not unreasonably affect the analytical results considering the distance traveled and the time differential from sample collection to receipt in the laboratory.

The custodian must verify that sample conditions, amounts, and containers meet the requirements for the sample and matrix. A unique sample identifier must be assigned to each sample container received at the laboratory, including multiple containers of the same sample.

At the laboratory, a photocopy of the COC form is made. The original COC form is kept by the field personnel and remains with the field records. The photocopy of the COC is maintained at the laboratory. It is critical that the field identification numbers on the printed sample labels (see

Beach Sampling Protocol CWBMON009, 9.1.5, Figure 1) are properly recorded on the field data sheets/COC forms.

3.4 Analytical Methods

This section identifies and describes the laboratory-based analytical methods and equipment appropriate to support CWB beach monitoring activities. Table 10 lists the parameters of interest to the CWB Beach Monitoring Program that are analyzed by the SLD laboratories, as well as the analytical method and quality control acceptance criteria. Only data that are generated by these methods or comparable methods may be used by the CWB for decision-making. Details of the microbiology analytical methods, including inoculation, incubation, reading, verification, calculation, and reporting procedures, are discussed in detail in the respective SLD laboratory QA and SOP Manuals.

Table 10. Acceptable Analytical Methods and Quality Control Acceptance Criteria.

Water Quality Parameter	Method Number or Description	Target Accuracy	Target Precision	Detection Limit (*)
Enterococcus	Enterolert (enzyme substrate method) ASTM D6503-99	100%	95%	1 colony forming unit per 100 mL
Clostridium perfringens	Modified membrane filtration method (Armon and Payment, 1988)	100%	95%	1 colony forming unit per volume filtered

(*) The Membrane Filtration procedure expresses concentration units as cfu/100 mL. Defined Substrate Methods (Enterolert) utilize MPN/100 mL. Although not technically equivalent, both methods (and therefore the resulting units) are acceptable for the monitoring purposes described in this document.

For the analysis of *Enterococcus*, the Enterolert™ method is used. Enterolert™ is a commercially available test that utilizes a medium containing the fluorogenic substrate 4-methylumbelliferyl-ß-D-glucoside (MUG) to determine *Enterococcus* concentrations. This compound, when hydrolyzed by *Enterococcus* β- glucosidase, releases 4-methylumbelliferone which exhibits fluorescence under a long-wave (365 – 366 nm) lamp. During sample processing, marine water samples are diluted 1 to 10. The Enterolert reagent is added to 100 mL of the diluted water sample, which is then poured into quantification trays. The trays are sealed and incubated for 24 hours at 41 ± 0.5°C. After incubation, the presence of blue/white fluorescence is a positive result for *Enterococcus*. The concentration in most probable number (MPN) per 100 mL is then calculated from the number of positive tubes or wells using MPN tables provided by the manufacturer.

For the analysis of *Clostridium perfringens*, a minimum of three different water sample volumes are filtered through a sterile, 0.45µm pore cellulose filter that retains bacteria present in the sample. The filter is plated on mCP agar and incubated in an anaerobic chamber for 24 hours at

45 ± 0.5°C using a medium modified by Armon and Payment (1988) from Bisson and Cabelli (1979). *Clostridium perfringens* selectively grows on the membrane filter as yellow colonies that turn pink when exposed to ammonium hydroxide. *Clostridium perfringens* membrane filtration test results are reported as number of colonies per 100 mL. Negative test results are reported as <0.2 colony forming units per 100 mL.

Currently, all water samples collected by the CWB Monitoring and Analysis Section for *C. perfringens* or *Enterococcus* analysis are sent to the HIDOH SLD Environmental Health Analytical Services Branch (EHASB) Environmental Microbiology Section. The Environmental Microbiology Section is governed by a Quality Assurance Plan (QAP) (HIDOH, 2006). If the SLD cannot analyze a required parameter, CWB may need to send samples to a contract lab. If this occurs, the contract lab must be selected by a competitive bid process and demonstrate their ability to provide data of comparable quality as those provided by the State Laboratories as described in the CWB QAPrgP (HIDOH, 2011).

3.5 Analytical Quality Control Requirements

3.5.1 Laboratory Quality Control

Laboratory quality control procedures for beach monitoring sampling consist of sterility checks, control organisms, and performance evaluation samples. Laboratory QC procedures for bacterial analyses are described in detail in the EHASB Environmental Microbiology Section QAP (HIDOH, 2006) and are summarized in Table 11.

Sterility checks demonstrate that the filtration equipment and filters, sample containers, media and reagents have not been contaminated through improper handling or preparation, inadequate sterilization, or environmental exposure. Positive culture controls demonstrate that the medium can support the growth of the target organism(s), and that the medium produces the specified or expected reaction to the target organism(s). Negative culture controls demonstrate that the medium does not support the growth of non-target organisms or does not demonstrate the typical positive reaction of the target organism(s). For the *Enterococcus* test, *Enterococcus faecalis* is used as a positive control. For the *Clostridium perfringens* test, *Clostridium perfringens* is used as a positive control, and *Clostridium bifermentans* or *C. sordelii* is used as a negative control. The results of PE samples can be used to evaluate the ability of the laboratory to produce acceptable data. Sample sets are provided to the laboratories that contain bacteria that produce verification of target organisms, and bacterial contaminates which shall not verify as target organisms. The target accuracy of 100 percent noted in Table 10 is based on the analysis of positive, negative and sterility controls. All of these parameters must perform as expected and any deviation from the expected control results will invalidate the data produced from that analytical series. The target precision is based on the analysis of field duplicates. The results of field duplicates should be within the 95 percent confidence interval of its pair. Field duplicates not meeting this should be flagged and all samples from that batch should be rejected. In the MPN test (Enterolert), very low counts may lead to duplicate samples which may fall outside of the 95% confidence interval. In these instances, it is expected that the laboratory personnel use professional judgment to determine whether the target precision is within acceptable tolerances.

EHASB laboratories implement formal QA/QC programs and have on staff, dedicated QA Officers for both Chemistry and Microbiology who oversee the QA/QC program.

Laboratory QC data will be reviewed by the Microbiology QA Officer to determine the usability of the measurement data. If data do not meet these criteria, or the associated QC data reports are not available, then the process defined in Section B.9.0 of the CWB QAPrgP (HIDOH, 2011) will be used to evaluate the usability of the data. If such data are used in official reporting documents, the CWB will discuss relative measures of confidence and reasons for inclusion in the report narrative.

Table 11. Laboratory QC Samples, Frequency, and Acceptance Criteria.

QC Sample	Frequency	Acceptance Criteria
Membrane filtration sterility checks	At the beginning and end of each filtration series	No growth
Control Organisms	At least one filtration series daily; must be included in each incubator, waterbath, or anaerobic jar used.	Growth of positive control organisms, No growth of negative control organisms
Performance Evaluation (PE) Samples	Annually	Correct identification and quantity of target organisms

3.5.2 Maintenance and Inspection of Laboratory Equipment

The maintenance and inspection of laboratory equipment is described in Section B.6.2 of the CWB QAPrgP (HIDOH, 2011).

3.5.3 Calibration of Laboratory Equipment

Laboratory equipment that generate measurement data or support the generation of environmental data must be calibrated prior to use in order to demonstrate that the equipment and instruments are in control. Further, the on-going control of laboratory equipment must be demonstrated through periodic calibration checks. These requirements apply to the SLD laboratories that analyze samples in support of the program and are described in detail in the EHASB Environmental Microbiology Section Water Microbiology QAP (HIDOH, 2006). Calibration procedures for laboratory equipment are summarized in Table 12. All laboratory calibration records will be reviewed by laboratory task leaders and maintained in laboratory notebooks. Analysis may not proceed until the equipment calibration acceptance criteria are met.

Table 12. Calibration Procedures for Laboratory Equipment.

Equipment	Calibration Procedure	Frequency	Acceptance Criteria
Balances	Professional calibration	Annually	Within manufacturer's specifications.

Equipment	Calibration Procedure	Frequency	Acceptance Criteria
	Verify calibration with ≥ 1 NIST-traceable weight within the range.	Monthly calibration with NIST Class S or S-1 weight(s).	≤ 1-2% of certified standard weight
Freezers/Refrigerators and thermometers within	Measure temperature	Every week day (routine storage) 3X weekly (archive units)	Freezers: < - 20°C Refrigerators: 4 ±2°C
	Calibrate thermometer	Annually vs. NIST	
Thermometers (glass)	Check using NIST-traceable thermometer	Annually	±0.1°C. Correction factors are marked on each unit
pH Meter	Calibrate pH meter	Before each use	95 – 102% slope
Conductivity Meter	Calibrate conductivity meter or determine the cell constant	Monthly	< 1% or 1 micromhos/cm.
Waterbaths (main temperature control)	Measure temperature	Twice daily, with at least 4 hours between readings	44 – 46°C
	Calibrate thermometer	Annually vs. NIST	
Incubators (main temperature control)	Measure temperature	Twice daily, with at least 4 hours between readings	41± 0.5°C for *Enterococcus* 45± 0.5°C for C. perfringens
	Calibrate thermometer	Annually vs. NIST	
Autoclave	Temperature: Checked with a maximum-temperature registering thermometer Time: checked with a stopwatch Sterilization performance: spore strips or spore suspensions of *B. subtilis* (mandatory) and *B. stearothermophilus* (optional) spores.	Temperature: With each use Time: Quarterly Sterilization: Weekly	Temperature: 120 ± 1°C Time: Autoclave must reach 120 °C in less than 15 minutes Sterilization: No growth
	Calibrate thermometer	Annually vs. NIST	

3.6 Inspection/Acceptance for Supplies and Consumables

Acceptability of supplies and consumables is initiated by ordering material of the required sterility, purity, or sensitivity. Consumables include calibration solutions, reagents, sampling bottles, membrane filters, culture media, and control organisms. CWB staff are responsible for the purchase of the field supplies and to ensure that they are viable. EHASB Environmental

Microbiology Section staff are responsible for the purchase of laboratory supplies and consumables.

Upon receipt, all supplies and consumables are checked or verified by the laboratory or field collection leader to ensure that they meet the requirements of the respective SOP. All reagents and chemicals should be Analytical Reagent Grade or higher. Calibration standards and solutions are purchased from commercial suppliers or equipment manufacturers. Where practicable, such solutions are NIST traceable and have expiration dates. The acceptability of laboratory supplies will be verified prior to use according to the EHASB Environmental Microbiology Section Water Microbiology QAP (HIDOH, 2006). Verification includes sterility testing of pre-sterilized supplies (filters and sample bottles) and commercially prepared reagents and culture media. Any supplies or consumables that do not meet the performance or sterility requirements of the respective SOPs, or that appear damaged or compromised, will be clearly tagged and returned to the supplier. Certificates of analysis should be maintained by the analytical laboratories. Expiration dates should be assigned by the analyst either according to the manufacturer's specification or according to the requirements given in the respective analysis SOP.

3.7 Non-Direct Measurements

Non-direct measurements are data or information used for CWB decision-making which were compiled from outside sources, were originally collected for some other purpose, or were obtained from non-measurement sources (*e.g.*, historical databases, literature files). The CWB Monitoring and Analysis Section collects all water quality data used in their decision-making processes. This does not preclude the use of outside sources of information to enhance the quality of the information produced (*e.g.*, using Bryan's maps, USGS maps, or GIS maps to help document the location of sampling sites). However, CWB will not utilize external data sources for decision making purposes.

3.8 Data Management

Field collection data obtained by the CWB Monitoring and Analysis Section are transmitted to the laboratory via field data sheets/COC forms (Attachment C of the Beach Sampling Protocol, CWBMON009), as described in Section 2.7.2. Originals of the field data sheets/COC forms are retained by Monitoring Section personnel and copies are retained by the laboratory. The information on the field data sheet/COC is used to enter the field data into the CWB monitoring database. Field data is independently entered into the system by sample collectors (CWB EHS) and the laboratory staff from the information provided on the field data sheets/COC. This system is automatically set up to immediately notify the sample collector if there is a discrepancy between the two entries. Any discrepancy is investigated and corrected by the sample collector. Because this information is entered twice for every sample by two independent users, there is a 100% accuracy verification of this data. This system also notifies the sample collector if field data is outside of the expected range and if the secondary check values vary by more than +/- 5% of the expected range. Once the water samples are processed and analyzed, the lab analysts enters the results into the CWB monitoring database. The results are reviewed by the Laboratory QA Officer or Supervisor (or a designee) before being released and made available for use by

CWB staff. This web-based system ensures that the data from the various DOH laboratories as well as contract laboratories are entered in a consistent manner. The laboratory data reports and QC results are available to the CWB Monitoring staff immediately upon release by the laboratory. A final review of the data is conducted by the CWB Monitoring and Analysis Section staff and the CWB QAO before they are uploaded into EPA's STORET online database. The data is also uploaded to the CWB website (http://emdweb.doh.hawaii.gov/cwb/wqd/viewer/Map.aspx) where it is made available to the public. Hard copies of the field data sheet/COC form are kept in the central filing system at the CWB main office.

More information on CWB's data management system can be found in the CWB QAPrgP (HIDOH, 2011).

4.0 ASSESSMENTS/OVERSIGHT

4.1 Assessments and Response Actions

This section presents the internal and external checks (assessments) that will be used to assure the following:

- Elements of this QAPP have been implemented correctly;
- The quality of the data generated is adequate and satisfies the DQOs;
- Corrective actions, when needed, are implemented in a timely manner and their effectiveness is confirmed; and,
- All deviations from this plan and the supporting rationale for such deviation shall be documented in the appropriate report.

Assessment activities may include inspection, peer review, data audits, and data quality assessment.

4.1.1 Assessments

Assessments assure that the objectives identified above are attained for field and laboratory operations. Assessments (audits) evaluate the capability and performance of a measurement system or its components and identify problems warranting correction. The CWB QA Program Plan (HIDOH, 2011) identifies three types of technical assessment activities: data, field, and quality systems assessments.

The CWB data entry system automatically performs data audits for 100% of the Beach Monitoring field data that is entered into it. Audits are conducted by comparing data entered by the field team and the laboratory to automatically identify discrepancies. When errors or questionable results are identified, the system notifies the appropriate sample collector who must address the error and take the appropriate corrective action.

Field assessments will be conducted by the sample collector for each sampling batch using the CWB Field Data Verification Checklist (Appendix D). The results will be documented on the

CWB Monitoring database. Quality systems assessments not conduct at this time. A strategy to perform QSAs of critical CWB Monitoring operations will be developed and implemented.

No audits of the SLD will be performed by the CWB. The EHASB of the SLD maintains a formal QA program including an internal audit system. However, if laboratory work is contracted to private laboratories, at least an initial desk audit will be performed to assess the laboratory's documentation and QA/QC procedures. At a minimum, the laboratory's Standard Operating Procedures (SOP) and Quality Assurance Plan (QAP) will be reviewed with particular attention paid to how the laboratory addresses and documents sample holding times, chain of custody, analytical methods, analytical results and data reporting. Quality Control (QC) records including temperature charts, calibration documents, equipment maintenance schedules and protocols and the use of positive and negative controls should be reviewed. Analytical proficiency should be assessed using commercial Proficiency Testing samples if available, or by the analysis of split samples with a laboratory of known proficiency.

4.1.2 Response Actions

An effective QA program requires prompt and thorough correction of non-conformance conditions that can affect quality. Rapid and effective corrective action minimizes the possibility of questionable data or documentation. The QAO is responsible for maintaining a tracking system for corrective actions.

Two types of corrective actions exist: immediate and long-term. Immediate corrective actions include correction of documentation deficiencies or errors, repair of faulty instruments, or correction of inadequate procedures. Oftentimes, the source of the problem is obvious and can be corrected at the time it is observed. Long-term corrective actions are designed to eliminate the sources of problems. Examples of long-term corrective actions are correction of systematic errors in sampling and correction of procedures producing questionable results. Corrections can be made through additional personnel training, instrument replacement, or procedural improvements. One or more corrections may be necessary. Problems and corrective actions will be documented to provide a complete, traceable record of issues and actions.

4.2 Reports to Management

The results of beach monitoring assessments conducted by the QAO or designee will be reported to the Monitoring and Analysis Section Supervisor and the CWB Chief within two weeks of the assessment. Issues requiring immediate corrective action are reported immediately. In addition, the Monitoring and Analysis Section Supervisor shall prepare a report to management on an annual basis. This report shall summarize the data collected in the Beach Monitoring Program, such as the number of samples taken, the range of values, the number of stations monitored, and the geometric mean of the samples.

5.0 DATA VALIDATION AND USABILITY

5.1. Validation and Verification

This section of the QAPP provides a description of the data review activities that will occur after the data collection phase of the beach monitoring project is completed. The purpose of data verification and validation is to assess the final project data to verify that the data and products conform to the project's objectives and to estimate the effect of any deviations. The data verification process includes the initial review of the data to ensure that the MQOs have been achieved. Data validation is the process of reviewing data and accepting, qualifying, or rejecting data on the basis of sound criteria using established guidelines and best professional judgment.

5.1.1 Data Verification Elements and Criteria

Data verification elements and criteria are specified in Section D.1.1 of the CWB QAPrgP (HIDOH, 2011). The CWB Field Data Verification checklist is provided in Appendix D. This is the same checklist that is provided on the CWB Monitoring database application.

5.1.2 Data Validation Elements and Criteria

Formal data validation is not required by the beach monitoring program. However, informal validation is performed by the CWB QAO for both field and laboratory data. The following elements are assessed during this validation: see CWB Data Validation checklist in Appendix E. This checklist is also available on the CWB Monitoring database.

- Field samples are collected according to the methods (gear types, sampling procedures) defined in the QAPP. If the methods defined in the QAPP were not followed exactly, the methods will be compared to determine if the resulting data will be compatible.
- Field sample collection meets the temporal requirements of the QAPP (*e.g.*, year, season, time of day, tide cycle).
- Field sample collection meets the spatial requirements of the QAPP (*e.g.*, water body, station, depth).
- Field records agree with the reported data.
- Field QC samples (*i.e.*, temperature control blanks) were collected as defined in the QAPP.
- Field QC data (*i.e.*, field checks, temperature control blanks) supports the data integrity.
- Initial and continuing calibrations indicate that the analysis is in control.
- Deviations from field procedures are documented and do not impact data quality and usability.
- The number and type of samples were collected as specified in the QAPP.

The following elements should be assessed during validation of laboratory data from contract labs (SLD maintains a system of internal audits and validations):

- Technical holding times were achieved.
- Sample preservation methods were appropriate.
- Sample custody was maintained.
- Analytical method was appropriate.
- Data were received for all samples.
- Data are reasonable vs. historical data.
- Data report is complete, including method, and units.
- Quality control samples meet the measurement quality objectives defined in the QAPP.

5.2 Verification and Validation Methods

Monitoring and Analysis Section staff perform data verification checks defined in Section 5.1.2. Staff check their own field records for completeness and accuracy. Field records and laboratory reports are reviewed vs. the final data to ensure that sampling handling requirements and holding times were met and that the MQO were achieved. Data verification is carried out for each sampling batch by the CWB QAO using the CWB Field Data Verification checklist in Appendix D. The results will be documented on the CWB Monitoring database. Staff work together to address issues and flag data, if needed.

The purpose of data validation is to evaluate the usability of the data. If data quality has been compromised during sampling or analysis, if quality control or calibration data indicate that the process was not in control, or if the data appear suspect, then the data may be rejected for use. Data shall be validated by the CWB QA Officer or the Monitoring and Analysis Section Supervisor prior to the public release of the data or prior to its use in decision making.

The EHASB Laboratory maintains an in-house data validation protocol. Data not meeting their usability requirements or those that are otherwise deemed invalid are not entered into the CWB Monitoring database. These samples are flagged and comments are noted in the database. The lab staff also calls the CWB staff (either the EHS or Section Supervisor) to notify them of the invalid sample and reasons for the invalidation.

5.3 Reconciliation with User Requirements

Data quality assessment (DQA) is a data analysis and interpretation process involving scientific and statistical evaluation of data sets to determine if the data are sufficient to support the DQOs. To implement the DQA process, the CWB Program Manager and the appropriate technical coordinator (lead EHS for beach and marine water quality monitoring) assess data usability and confidence for each report. CWB staff compare the laboratory data to the decision rules (Tables 1 and 2) in order to determine beach compliance or alerts. These evaluations shall be made on a week to week basis as new data are acquired. The results of the DQA are documented in the final

report in adequate detail for the decision-maker and peer reviewers to evaluate the effect of these results on decision-making.

6.0 REFERENCES

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APPENDIX A
TO
CWBMONQAPP002

BEACH MONITORING SAMPLING LOCATIONS

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Island	BEACH ID	Beach name	Tier	Storet
HAWAII	HI326172	Anaeho'omalu Bay	1	1236
HAWAII	HI707059	Analani Pond (Puala'a)	1	1143
HAWAII	HI315019	Hilo Bayfront	1	1107 1108 1135 1138 1144
HAWAII	HI857411	Honoli'i Beach Co. Park	1	1110 1111
HAWAII	HI670254	James Kealoha Park	1	1114 1115
HAWAII	HI013290	Kahalu'u Beach Co. Pk.	1	1203
HAWAII	HI261474	Kamakaokahonu	1	1206 1207 1208
HAWAII	HI540868	Leleiwi Beach Co. Pk.	1	1121 1136 1139
HAWAII	HI862286	Onekahakaha Beach Co. Pk.	1	1124 1125 1126 1130
HAWAII	HI668132	Puako	1	1221 1222 1223
HAWAII	HI616452	2nd Beach (Next to Mahaiula)	2	1241
HAWAII	HI977673	Coconut Island Park	2	1101
HAWAII	HI138086	Hakalau Co. Pk.	2	1146
HAWAII	HI621002	Hapuna Beach St. Rec. Area	2	1200 1219
HAWAII	HI582331	Holoholokai Beach	2	1249
HAWAII	HI246645	Honaunau Bay	2	1244
HAWAII	HI152572	Ho'okena	2	1209
HAWAII	HI659453	Ice Pond (single point)	2	1102
HAWAII	HI107517	Ka Lae (South Point)	2	1152
HAWAII	HI753566	Kailua Bay	1	1204 1205 1214
HAWAII	HI542822	Kalapana Beach (new) (Harry K. Brown Beach Co. Pk.)	2	1103 1104 1105 1137 1150
HAWAII	HI391407	Kapoho Bay	2	1145
HAWAII	HI122881	Kapoho Tidepools (Vacationland)	2	1142
HAWAII	HI261869	Kauna'oa Beach	2	1243
HAWAII	HI978783	Kawaihae Harbor	2	1210 1238
HAWAII	HI713293	Keahou Bay (Kona)	2	1213
HAWAII	HI849313	Keaukaha Beach Park	2	1129
HAWAII	HI459942	Kehena	2	1149
HAWAII	HI693485	Kolekole Beach Co. Park	2	1117 1118
HAWAII	HI380623	Laupahoehoe Beach Co. Park	2	1120
HAWAII	HI691720	Lehia Beach Co. Pk.	2	1147

HAWAII	HI720408	Manini'owali	2	1252

Island	BEACH ID	Beach name	Tier	Storet
HAWAII	HI470112	Miloli'i Beach	2	1220
HAWAII	HI124561	Ninole	2	1151
HAWAII	HI738158	Pelekane Bay	2	1246
HAWAII	HI320616	Pine Trees	2	1253
HAWAII	HI316864	Pohoiki Beach	2	1127
HAWAII	HI224651	Punalu'u	2	1224
HAWAII	HI478461	Pu'uhonua Pt. (Pu'u o Honaunau)	2	1201
HAWAII	HI425303	Radio Bay	2	1148
HAWAII	HI936372	Spencer Beach Co. Pk.	2	
HAWAII	HI534434	Waipi'o Bay	2	1155
HAWAII	HI934020	Waiulaula	2	1247
HAWAII	HI436267	White Sands Beach Co. Pk. (Magic Sands)	2	1215
HAWAII	HI720900	Whittington Beach Co. Pk.	2	1202
HAWAII	HI713314	Banyan's Surfing Area	3	1235
HAWAII	HI315174	Honokohau Beach	3	1227
HAWAII	HI831766	Honomalino Bay	3	
HAWAII	HI670326	Isaac Hale Beach Co. Pk.	3	
HAWAII	HI377322	Kalahiki Beach	3	
HAWAII	HI602472	Kamoa Pt.	3	
HAWAII	HI871399	Kapa'a Beach Co. Pk.	3	
HAWAII	HI627359	Kapu'a Bay	3	
HAWAII	HI770607	Ka'upulehu	3	1251
HAWAII	HI535602	Kawa Bay	3	1153
HAWAII	HI514168	Kealia Beach	3	
HAWAII	HI929053	Keawaiki	3	
HAWAII	HI858729	Ke'ei	3	
HAWAII	HI784200	Keokea Beach Co. Pk.	3	1116
HAWAII	HI331785	Kiholo Bay	3	
HAWAII	HI887804	Kuki'o	3	
HAWAII	HI490010	Lapakahi St. Hist. Park	3	
HAWAII	HI694255	Mahai'ula Bay	3	
HAWAII	HI273526	Mahukona Beach Co. Pk.	3	1216
HAWAII	HI901744	Makalawena	3	
HAWAII	HI223059	Makole'a Beach	3	
HAWAII	HI379764	Manini Point Co. Pk.	3	1212
HAWAII	HI647110	Manuka Bay	3	
HAWAII	HI890924	Mauna Lani (Kalahuipua'a)	3	1250
HAWAII	HI120357	Mau'umae Beach	3	
HAWAII	HI588578	Napo'apo'o Beach Co. Pk.	3	
HAWAII	HI143737	Ohai'ula Beach	3	1225

HAWAII	HI256093	Old Kona Airport St. Rec. Area	3	1226 1242

Island	BEACH ID	Beach name	Tier	Storet
HAWAII	HI935352	Pahoehoe Beach Co. Pk.	3	
HAWAII	HI227694	Pohue Bay	3	
HAWAII	HI183806	Pololu Valley	3	1154
HAWAII	HI930479	Pueo Bay	3	
HAWAII	HI254097	Reeds Bay Park	3	
HAWAII	HI754307	Wai'ahukini	3	
HAWAII	HI381812	Waialea Bay	3	
HAWAII	HI643938	Wawaloli Beach	3	1237
KAUAI	HI385259	Hanalei Beach Co. Park	1	804 805 839
KAUAI	HI758685	Kalapaki Beach	1	809
KAUAI	HI798758	Lydgate State Park	1	825
KAUAI	HI396850	Po'ipu Beach Co. Park	1	819
KAUAI	HI701008	Salt Pond Beach Co. Park	1	808
KAUAI	HI338804	Anini Beach	2	872 801
KAUAI	HI156238	Beach House Beach	2	836
KAUAI	HI554189	Ha'ena Beach Co. Park	2	803
KAUAI	HI352580	Hanama'ulu Beach Co. Park	2	806 870?
KAUAI	HI264001	Kalihiwai Bay	2	811
KAUAI	HI402035	Kealia	2	813
KAUAI	HI124511	Ke'e Beach	2	835
KAUAI	HI247403	Polihale State Park	2	820
KAUAI	HI358435	Shipwreck Beach	2	841
KAUAI	HI836118	Wai'oli Beach Park	2	833
KAUAI	HI710019	Aliomanu Beach	3	
KAUAI	HI270737	Anahola Beach	3	800
KAUAI	HI922249	Anahola Beach Co. Park	3	800
KAUAI	HI418744	Anini Beach Park	3	801
KAUAI	HI891354	Black Pot Beach Park	3	891
KAUAI	HI166521	Brennecke Beach	3	802
KAUAI	HI853903	Donkey Park	3	
KAUAI	HI976083	Gillin's Beach	3	847
KAUAI	HI949505	Glass Beach	3	855
KAUAI	HI277808	Haula Beach	3	845
KAUAI	HI533519	Kahili Beach	3	
KAUAI	HI972832	Kapa'a Beach Co. Park	3	812
KAUAI	HI669328	Kaupea Beach (Secret Beach)	3	
KAUAI	HI698776	Kawailoa Beach	3	846
KAUAI	HI530569	Kekaha Beach Co. Pk.	3	814 843

KAUAI	HI344813	Kepuhi Beach	3	866
KAUAI	HI119207	Kikiaola Beach	3	858
KAUAI	HI471488	Kilauea Pt. Nat. Wildlife Ref.	3	
KAUAI	HI266627	Kipu Kai	3	
KAUAI	HI955435	Koloa Landing	3	837
KAUAI	HI619039	Kukui'ula Bay	3	888
KAUAI	HI860960	Larsens Beach	3	
KAUAI	HI434882	Lawa'i Kai	3	852
KAUAI	HI862821	Lucy Wright Beach Co. Park	3	857
KAUAI	HI889639	Lumaha'i Beach	3	868
KAUAI	HI547745	Moloa'a Bay	3	
KAUAI	HI709808	Na Pali Coast State Park	3	
KAUAI	HI953916	Niumalu Beach Park	3	
KAUAI	HI502794	Nukoli'I Beach Park	3	829
KAUAI	HI176480	Pacific Missile Range Facility	3	842
KAUAI	HI468251	Pakala (Makaweli)	3	856
KAUAI	HI665178	Palama Beach (Nomilu)	3	853
KAUAI	HI130639	Papa'a Bay	3	
KAUAI	HI363048	Pila'a Beach	3	
KAUAI	HI646762	Port Allen	3	821
KAUAI	HI742228	Prince Kuhio Park	3	849
KAUAI	HI520271	Princeville	3	871
KAUAI	HI542569	Sheraton Beach	3	838
KAUAI	HI951651	Spouting Horn Beach Co. Park	3	851
KAUAI	HI936087	Tunnels Beach	3	865
KAUAI	HI179708	Wahiawa Bay	3	854
KAUAI	HI505816	Waiakalua Iki Beach	3	
KAUAI	HI371632	Waiakalua Nui Beach	3	
KAUAI	HI330114	Waikoko Bay	3	869
KAUAI	HI606168	Wailua Beach	3	818
KAUAI	HI245235	Waimea Rec. Pier St. Pk.	3	823 840
KAUAI	HI417823	Wainiha Bay	3	867
KAUAI	HI392082	Wai'ohai Beach	3	848
KAUAI	HI682678	Waipouli	3	824
LANAI	HI297944	Halepalaoa Beach	3	
LANAI	HI126591	Hulopo'e Beach Park	3	
LANAI	HI801428	Kahemano Beach	3	
LANAI	HI923988	Kaunolu Bay	3	
LANAI	HI854690	Keomuku Beach	3	
LANAI	HI735036	Lopa Beach	3	
LANAI	HI615699	Manele Bay	3	630

LANAI	HI225961	Naha Beach	3	
LANAI	HI845453	Polihua Beach	3	
LANAI	HI579345	Pu'u Pehe Cove	3	
LANAI	HI362906	Shipwreck Beach	3	

Island	BEACH ID	Beach name	Tier	Storet
MAUI	HI797917	Hanaka'o'o Beach Co. Pk.	1	693
MAUI	HI280920	Kahalui Harbor	1	654 680 706
MAUI	HI761092	Kama'ole Beach 1	1	681
MAUI	HI496115	Kama'ole Beach 3	1	683 684
MAUI	HI797225	Kanaha Beach Co. Park	1	655 677 710
MAUI	HI558359	Launiupoko St. Wayside	1	694
MAUI	HI058731	Ma'alaea Beach	1	659 687 711
MAUI	HI519980	Mokulau	3	
MAUI	HI789952	Spreckelsville	1	700 708
MAUI	HI278988	Wailea Beach Park	1	691
MAUI	HI253548	Fleming Beach North	2	674
MAUI	HI846900	H.P. Baldwin Beach Co. Pk.	2	689
MAUI	HI996835	Hana Bay	2	652
MAUI	HI553820	Hata's	2	669
MAUI	HI412391	Honokowai Beach Co. Pk.	2	725
MAUI	HI280286	Honolua Bay	2	707
MAUI	HI984456	Honomanu Bay	2	653
MAUI	HI985873	Ho'okipa Beach Co. Pk.	2	688
MAUI	HI385800	Huakini Bay	2	675
MAUI	HI643627	Ka'anapali	2	666 670 695 733 734
MAUI	HI160433	Kahana	2	660 692 724
MAUI	HI705118	Kalama Beach Co. Park	2	679 703
MAUI	HI647373	Kalepolepo Beach	2	712
MAUI	HI097179	Kama'ole Beach 2 (Ili'iliholo Beach)	2	682
MAUI	HI607763	Keawakapu Beach	2	685 704
MAUI	HI276573	Ku'au Bay	2	699
MAUI	HI407363	Lahaina Beach	2	726
MAUI	HI864937	Lower Pa'ia	2	664
MAUI	HI715975	Mai Poina Oe lau Beach Co. Pk.	2	671 701 702
MAUI	HI245556	Makena Landing Beach	2	717
MAUI	HI423064	Maliko Bay	2	709
MAUI	HI847607	Malu'aka Beach	2	718

MAUI	HI861961	Mokapu Beach Park	2	714
MAUI	HI977299	Mokule'ia Beach	2	721
MAUI	HI764060	Napili Bay	2	723
MAUI	HI491359	Olowalu	2	663 697
MAUI	HI740710	Oneloa Bay Beach	2	722

Island	BEACH ID	Beach name	Tier	Storet
MAUI	HI279887	Oneloa Beach (Big Beach)	2	661
MAUI	HI756040	Oneuli Beach	2	719
MAUI	HI997014	Palauea Beach Park	2	715
MAUI	HI462219	Papalaua	2	728
MAUI	HI339656	Polo Beach Park	2	705
MAUI	HI684864	Po'olenalena Beach	2	716
MAUI	HI167153	Puamana Beach Co. Park	2	727
MAUI	HI157533	Pu'u ola'i (Small Beach)	2	720
MAUI	HI373055	Pu'unoa Beach	2	662 696
MAUI	HI765340	St. Theresa's	1	676
MAUI	HI814309	Ukumehame Beach Co. Pk.	2	698
MAUI	HI588333	Ulua Beach Park	2	686
MAUI	HI169380	Wahikuli State Wayside Park	2	678
MAUI	HI118874	Wai'anapanapa State Park	2	729
MAUI	HI916183	Waiehu Beach Co. Park	2	667 690
MAUI	HI343702	Waihe'e Beach Co. Park	2	668
MAUI	HI284036	Waipulani	2	713
MAUI	HI879646	Ahihi-kina'u Natural Area Reserve	3	
MAUI	HI616569	Alaeloa Beach	3	
MAUI	HI839739	Awalua Beach	3	
MAUI	HI525524	Father Jules Papa	3	
MAUI	HI287670	Hamoa	3	
MAUI	HI229021	Honokeana Bay	3	
MAUI	HI432902	Honokohau Bay	3	
MAUI	HI901232	H-Poko Papa	3	
MAUI	HI432263	Kaihalulu Bay	3	
MAUI	HI641844	Ka'ili'ili Beach	3	
MAUI	HI404881	Kanaio Beach	3	
MAUI	HI391006	Kapalua (Fleming's) Beach	3	650
MAUI	HI599968	Kapoli Beach Co. Park	3	
MAUI	HI593477	Kea'a Beach	3	
MAUI	HI959746	Ke'anae	3	
MAUI	HI199865	Keonenui Beach	3	
MAUI	HI650469	Koki Beach Park (VFW)	3	
MAUI	HI852861	Kuiaha Bay	3	
MAUI	HI674004	La Perouse Bay	3	

MAUI	HI884223	Leho'ula Beach	3	
MAUI	HI978171	Maka'alae Pt.	3	
MAUI	HI482300	Mantokuji Bay	3	
MAUI	HI227321	McGregor Pt.	3	
MAUI	HI983172	Nahiku	3	
MAUI	HI176594	Nu'u Bay	3	
MAUI	HI463097	Paukukalo Beach	3	
MAUI	HI136430	Pepeiaolepo Bay	3	665
MAUI	HI641109	Punalau	3	
MAUI	HI796679	Waikoloa Beach	3	
MAUI	HI236756	Waimaha'ihai Beach	3	
MOLOKAI	HI702920	Awahua Beach	3	
MOLOKAI	HI571680	Fagans Beach	3	
MOLOKAI	HI928793	Halawa Beach Park	3	
MOLOKAI	HI417163	Halena Beach	3	
MOLOKAI	HI783671	Honouli Malo'o	3	
MOLOKAI	HI376731	Honouli Wai	3	
MOLOKAI	HI618345	Iliopi'i Beach	3	
MOLOKAI	HI191374	Kahalepohaku Beach	3	
MOLOKAI	HI939514	Kakahai'a Beach Park	3	
MOLOKAI	HI923737	Kamaka'ipo Beach	3	
MOLOKAI	HI559049	Kanalukaha Beach	3	
MOLOKAI	HI941577	Kapukahehu Beach	3	
MOLOKAI	HI565164	Kapukuwahine Beach	3	
MOLOKAI	HI726225	Kaunala Beach	3	
MOLOKAI	HI481092	Kaupoa Beach	3	
MOLOKAI	HI384043	Kawa'aloa Bay	3	
MOLOKAI	HI114962	Kawakiu Bay (Nui)	3	
MOLOKAI	HI287930	Kepuhi Beach	3	
MOLOKAI	HI206014	Kiowea Park (Kamehameha Coconut Grove)	3	641
MOLOKAI	HI928768	Kolo Wharf	3	
MOLOKAI	HI934213	Lighthouse Beach	3	
MOLOKAI	HI204811	Mo'omomi Beach	3	
MOLOKAI	HI138494	Murphy Beach Park	3	
MOLOKAI	HI904462	Oneali'I Beach Park	3	
MOLOKAI	HI301825	Papaloa Beach	3	
MOLOKAI	HI556777	Papohaku Beach	3	
MOLOKAI	HI443237	Pelekunu	3	
MOLOKAI	HI268134	Pohaku Mauliuli Beach	3	
MOLOKAI	HI454004	Po'olau Beach	3	
MOLOKAI	HI665969	Puko'o	3	

MOLOKAI	HI329518	Sandy Beach	3	
MOLOKAI	HI603285	Wailau	3	
OAHU	HI473893	Ala Moana Beach Co. Park	1	152 153 154
OAHU	HI950962	Chun's Reef	1	218
OAHU	HI451471	Hanauma Bay	1	201
OAHU	HI366432	Kahanamoku Beach	1	155

Island	BEACH ID	Beach name	Tier	Storet
OAHU	HI482719	Kailua Beach Co. Pk.	1	193
OAHU	HI848207	Kualoa Co. Regional Park	1	208
OAHU	HI681782	Kuhio Beach Park	1	161
OAHU	HI529142	Magic Island Beach	1	222
OAHU	HI627464	Ma'ili Beach Co. Park	1	186
OAHU	HI632106	Makaha Beach Co. Park	1	185
OAHU	HI723399	Makapu'u Beach Co. Park	1	216
OAHU	HI137325	Malaekahana Bay	1	221
OAHU	HI467413	Nanakuli Beach Co. Pk.	1	187
OAHU	HI659533	Poka'i Bay Beach Co. Pk.	1	224
OAHU	HI851298	Queen's Surf Beach Park	1	162
OAHU	HI898947	Royal-Moana Beach	1	238
OAHU	HI776760	Sandy Beach Co. Park	1	199 200
OAHU	HI617815	Sans Souci St. Rec. Area	1	228
OAHU	HI860544	Sunset Beach	1	225
OAHU	HI471097	Waimanalo Beach Co Park	1	196 197
OAHU	HI696599	Waimea Bay Beach Co. Pk.	1	172
OAHU	HI267023	White Plains Beach	1	236
OAHU	HI544313	Diamond Head	2	217 231
OAHU	HI045715	Fort DeRussy Beach	2	158 312
OAHU	HI555850	Fort DeRussy Beach Park	2	158
OAHU	HI941499	Gray's Beach	2	159
OAHU	HI132946	Halona Blowhole	2	257
OAHU	HI854492	Hau'ula Beach Co. Park	2	176
OAHU	HI580360	Ka'a'awa Beach Co. Park	2	179
OAHU	HI253930	Ka'alawai Beach	2	275
OAHU	HI548986	Kahe Pt. Beach Co. Pk.	2	309
OAHU	HI446787	Kailua Beach Middle	2	
OAHU	HI787959	Kaipapa'u Beach	2	286
OAHU	HI410842	Kaluanui Beach	2	243
OAHU	HI733929	Kapi'olani Park	2	307
OAHU	HI698581	Kawela Bay	2	173
OAHU	HI757588	Ke'ehi Lagoon	2	237 342
OAHU	HI767708	Kokololio Beach	2	253

OAHU	HI930562	Laenani Beach Co. Park	2	260
OAHU	HI596989	Lanikai	2	194
OAHU	HI800877	Lualualei Beach Co. Park	2	181 182
OAHU	HI943325	Outrigger Canoe Club Beach	2	256
OAHU	HI575467	Pahipahi'alua Beach	2	306
OAHU	HI478834	Papa'iloa Beach	2	299
OAHU	HI148836	Punalu'u Beach Co. Park	2	177
OAHU	HI248913	Tongg's Beach	2	239

Island	BEACH ID	Beach name	Tier	Storet
OAHU	HI784010	Ulehawa Beach Co. Park	2	250
OAHU	HI109657	Waiale'e	2	297
OAHU	HI244505	Waikiki Beach Center	2	160
OAHU	HI145110	Aukai Beach Co. Park	3	285
OAHU	HI908378	Banzai	3	245
OAHU	HI593573	Barbers Point Beach Co. Pk.	3	213
OAHU	HI531535	Ehukai Beach Co. Pk.	3	266
OAHU	HI767464	Ewa Beach	3	270
OAHU	HI410735	Fort Hase Beach	3	
OAHU	HI767754	Fort Kamehameha Beach	3	
OAHU	HI451176	Hale'iwa Ali'i Beach Co. Pk.	3	247
OAHU	HI994019	Hale'iwa Beach Co. Pk.	3	171
OAHU	HI646411	Hanaka'ilio Beach	3	
OAHU	HI628972	Hawaiian Electric Beach Park	3	188
OAHU	HI927925	Heeia (changed to HI927925)	3	362
OAHU	HI815093	Ihilani Honu	3	269
OAHU	HI515191	Ihilani Kohola	3	252
OAHU	HI685981	Ihilani Naia	3	268
OAHU	HI550240	Ihilani Ulua	3	296
OAHU	HI412839	Iroquois Pt.	3	311
OAHU	HI645485	Ka'ena Pt.	3	292
OAHU	HI759491	Kahana Bay	3	178 230
OAHU	HI989341	Kahuku Golf Course	3	174
OAHU	HI585092	Kaiaka	3	170
OAHU	HI668562	Kaihalulu Beach	3	288
OAHU	HI234342	Kaiona Beach Co. Park	3	227
OAHU	HI302297	Kakaako Waterfront	3	235
OAHU	HI860454	Kalae'o'io Beach Co. Park	3	242
OAHU	HI353985	Kaloko (Queens) Beach	3	308
OAHU	HI391176	Kaluahole Beach	3	255
OAHU	HI196120	Kanenelu Beach	3	241
OAHU	HI272280	Kane'ohe Bay	3	190-192 261

OAHU	HI622160	Kaunala Beach	3	264
OAHU	HI791127	Kaupo Beach Co. Park	3	198
OAHU	HI312049	Kawailoa Beach	3	267
OAHU	HI730738	Kea'au Beach Co. Park	3	272
OAHU	HI484535	Kualoa Sugar Mill Beach	3	281
OAHU	HI431723	Kuilei Cliffs Beach Park	3	254
OAHU	HI412224	Kuilima Cove	3	244
OAHU	HI472847	Laie Beach Co. Park	3	175
OAHU	HI201901	Laniloa Peninsula (Beach)	3	287

Island	BEACH ID	Beach name	Tier	Storet
OAHU	HI739818	Laukinui Beach	3	293
OAHU	HI280966	Maipalaoa Beach	3	249
OAHU	HI147212	Makao Beach	3	284
OAHU	HI542752	Makaua Beach Co. Park	3	283
OAHU	HI915061	Makua Beach	3	184
OAHU	HI717740	Manner's Beach	3	274
OAHU	HI639551	Mauna Lahilahi Beach Co. Pk.	3	251
OAHU	HI423413	Maunalua Bay	3	279
OAHU	HI908786	Mokule'ia Beach	3	169 291
OAHU	HI504242	Nanaikapono Beach	3	233
OAHU	HI682233	Nimitz Beach	3	212
OAHU	HI426406	North Beach	3	
OAHU	HI731423	Ohikilolo Beach(Barking Sands)	3	271
OAHU	HI825419	One'ula Beach Co. Park	3	211
OAHU	HI990625	Papaoneone Beach	3	294
OAHU	HI197311	Point Panic Beach Park	3	234
OAHU	HI587568	Pounders Beach	3	262
OAHU	HI193495	Pupukea Beach Co. Pk.	3	265
OAHU	HI437024	Pu'uiki	3	298
OAHU	HI960731	Pu'uohulu Beach	3	273
OAHU	HI714359	Sand Island	3	164-168, 305, 317
OAHU	HI151343	Swanzy Beach Co. Park	3	282
OAHU	HI776670	Turtle Bay	3	263
OAHU	HI944962	Wai'anae Kai Military Reservation Beach	3	315
OAHU	HI668527	Wai'anae Regional Park	3	183
OAHU	HI329454	Wawamalu Beach Park	3	280
OAHU	HI269028	Yokohama Bay	3	215

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APPENDIX B
TO
CWBMONQAPP002

BEACH MONITORING SAMPLING AND INSTRUMENT SOPS:

Beach Sampling Protocol SOP (CWBMON009)
Hydrolab Quanta Protocol SOP (CWBMON003)
Hach 2100P Turbidimeter Protocol SOP (CWBMON011)

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APPENDIX C
TO
CWBMONQAPP002

NOTIFICATION GUIDELINES

NOTIFICATION GUIDELINES updated 4/7/2011

When a Brown Water, High Indicator Bacteria, or a Sewage Spill Advisory is issued by the DOH, the following agencies and groups will be notified by phone, email, or web link by the CWB. The following agencies and groups have agreed to accept and announce our advisories to their respective groups.

DOH Communications Office	Janice Okubo or staff 586-4442 janice.okubo@doh.hawaii.gov Judy Kern judy.kern@doh.hawaii.gov Alice Silbanuz alice.silbanuz@doh.hawaii.gov Sherri (Jody) Akeo sherri.akeo@doh.hawaii.gov Judy Strait-Jones judy.strait-jones@doh.hawaii.gov
DOH Medical Services and Injury Prevention System	Linda Rosen 733-9210 linda.rosen@doh.hawaii.gov
	Barbara Yamashita 733-9210 barbara.yamashita@doh.hawaii.gov
DOH All Hazards Preparedness Coordinator	Kate Gaynor 587-5879 kate.gaynor@doh.hawaii.gov
Office of the Governor Director of Communications	Josh Levinson 586-0043 josh.levinson@hawaii.gov

	Donalyn.delacruz@hawaii.gov Laurie.Au@hawaii.gov
Tourism	
Hawaii Visitors and Convention Bureau	Barbara Okamoto 924-0265 bokamoto@hvcb.org
Hawaii Tourism Authority	Momi Akimseu 973-2278 makimseu@hawaiitourismauthority.org
Kauai Visitors Bureau	Susan Kanoho 245-3971 skanoho@hvcb.org
Maui Visitors Bureau	Terryl Vencl terryl@mauivb.com
State	
Deputy Director, Environmental Health	Gary Gill 586-4424 gary.gill@doh.hawaii.gov
Division Chief, Environmental Management	Stuart Yamada 586-4305 stuart.yamada@doh.hawaii.gov
Clean Water Branch	
Branch Chief	Alec Wong 586-4309 alec.wong@doh.hawaii.gov
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	Sara Roser (415) 972-3513 Roser.Sara@epamail.epa.gov Joann Cola Cola.joann@epamail.epa.gov
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Public Communications Officer	Markus Owens 768-3454 mowens@honolulu.gov
C&C Ocean Safety &Lifeguard Services	Ralph Goto 922-3888

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Dispatcher	Dispatcher 922-3888 Lifeguards@aloha.com Benjamin Studer ben@hawaiibeachsafety.org
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US Navy, Pearl Harbor, NAVFAC	Capt. Clifford M. Maurer Clifford.maurer@navy.mil Denise Emsley Denise.emsley@navy.mil

	Ralph Wakumoto ralph.wakumoto@navy.mil Julie Muraoka julie.muraoka@navy.mil
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Hawaii Thousand Friends	Donna Wong htf@lava.net Fred Madlener spud@lava.net
Our Children's Earth Foundation	Mike Costa

	mike@ocefoundation.org
Canoe Groups	
Oahu Hawaiian Canoe Racing Association	Hannie Anderson 259-7112 president@ohcra.com
Na Ohana O Na Hui Waa	Tambry Young 271-7833 tambry@hawaii.rr.com
Na Opio Canoe Racing Association	Kalani Kaanaana kalanikaanaana@yahoo.com Margaret 676-4164; Cell 699-8534 cbush@hawaiiantel.net Lokahi lokahipath@hotmail.com
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Kauai Mayor Office	Mary Daubert 241-6300 mdaubert@kauai.gov
Mayor Hawaii County	cohmayor@co.hawaii.hi.us
Mayor Maui	mayor.office@mauicounty,gov
Rep. Kahikina	lkahikina@honolulu.gov
Others	
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APPENDIX D
TO
CWBMONQAPP002

CWB Field Verification Checklist

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CWB Field Data Verification Checklist

Sampling Location(s):_____

Sampling Date(s):_____

Mark each topic "Yes," "No," or "NA" (not applicable), and comment as appropriate.

Yes/No/NA	Topic	Comments
	All required information was entered onto field datasheets/chain of custody forms in ink, and were signed & dated.	
	Deviations from SOPs, along with any corrective actions taken, were documented on the field datasheet/COC form.	
	Samples that may be affected by deviations from SOPs were flagged appropriately.	
	Field calibration standards were not expired and were in the correct concentrations.	
	Field checks were performed and results were within QAPP specified limits for all parameters (pH, Dissolved Oxygen, Conductivity, and Turbidity).	Checked by software
	Calibration data for field instruments were recorded in the appropriate logbook(s).	
	Field Analysis data were recorded in the database.	Checked by software
	Samples were collected at the correct sites.	
	The correct number of samples for each type of analysis and the correct volume was collected.	
	Certified clean sample containers, appropriate for the intended analysis were used.	
	Requested/required field quality control (QC) samples (Field blanks and field duplicates) were collected, and at the correct frequency (one for every ten samples).	
	Samples were stored and/or shipped at the proper temperature.	
	Chain-of-custody documents were	

	completed properly.	
	Sample holding times were not exceeded during field operations	Checked by software

Reviewer's name (print):
Reviewer's signature:
Reviewer's title:
Date of review:

Additional comments:

APPENDIX E
TO
CWBMONQAPP002

CWB Data Validation Checklist

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CWB Data Validation Checklist

Sampling
Date(s):_____

Mark each topic "Yes," "No," or "NA" (not applicable), and comment as appropriate.

Yes/No/NA	Topic	Comments
	Field Data	
	Field samples are collected according to the methods (gear types, sampling procedures) defined in the QAPP. If the methods defined in the QAPP were not followed exactly, were the methods compared to determine if the resulting data will be compatible?	
	Field sample collection meets the temporal requirements of the QAPP (*e.g.*, year, season, time of day, tide cycle).	
	Field sample collection meets the spatial requirements of the QAPP (*e.g.*, water body, station, depth).	
	Field records agree with the reported data.	
	Field QC samples (*i.e.*, temperature control blanks) were collected as defined in the QAPP.	
	Field QC data (*i.e.*, field checks, temperature control blanks) supports the data integrity.	
	Initial and continuing calibrations indicate that the analysis is in control.	
	Deviations from field procedures are documented and do not impact data quality and usability.	
	The number and type of samples were collected as specified in the QAPP	
	Laboratory Data (contract labs only)	
	Technical holding times were achieved.	
	Sample preservation methods were appropriate	
	Sample custody was maintained	
	Analytical method was appropriate	
	Data were received for all samples	

	Data are reasonable vs. historical data.	
	Data report is complete, including method, and units	
	Quality control samples meet the measurement quality objectives defined in the QAPP.	

Reviewer's name (print):
Reviewer's signature:
Reviewer's title:
Date of review:

Additional comments:

APPENDIX F
TO
CWBMONQAPP002

CWB On-Site Sanitary Survey Form

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State of Hawaii Department of Health Clean Water Branch
On-Site Sanitary Survey Form

Name of Beach:	Date of Survey:
Beach ID:	Time of Survey:
STORET No.:	Surveyor Name:

PART I – GENERAL BEACH CONDITIONS

Air Temperature: ^{o}C or ^{o}F	Wind: Speed (mph)	Direction: (From which direction is wind coming?)
Rainfall: ☐ <24 hours ☐ <48 hours ☐ <72 hours ☐ >72 hours since last rain event and		☐ inches ☐ cm rainfall measured
Rain Intensity: ☐ Misting ☐ Light Rain ☐ Steady Rain ☐ Heavy Rain ☐ Other		

Weather Conditions – Visual Assessment

Sky Condition	☐ Sunny	☐ Mostly Sunny	☐ Partly Sunny	☐ Mostly Cloudy	☐ Cloudy
Cloud Coverage	No Clouds	1/8 to 1/4	3/8 to 1/2	5/8 to 7/8	Total Coverage

Wave Intensity:

☐ Calm	☐ Normal	☐ Rough	Wave Height ft. ☐ Estimated or ☐ Actual
Longshore current speed and direction (cm/sec, S or 180^{o})			

Comments/Observations:

PART II – WATER QUALITY

List bacterial samples collected from beach water and potential pollution sources, if applicable, on CWB Beach Monitoring Field Data/Chain of Custody sheet and attach to this form.

Number of Samples Collected:_____ ☐ *Enterococcus* ☐ *Clostridium perfringens* ☐ Other

Parameters measured (record results on Field Data/Chain of Custody sheet):

☐ Water Temperature ☐ Salinity ☐ Dissolved O_2 ☐ pH ☐ Turbidity

Other parameters:

Change in water color? ☐ No ☐ Yes – Describe:_____

Odor: ☐ None ☐ Septic ☐ Algae ☐ Sulfur ☐ Other – Describe:_____

Comments/ Observations:

PART III – BATHER LOAD – VISUAL ASSESSMENT

Total number of people in the water:_____ Total number of people out of the water:_____

Total number of people at the beach:_____

List of Activities Seen (optional):

Type of Activity				
Number of People				

Comments/Observations:

State of Hawaii Department of Health Clean Water Branch
On-Site Sanitary Survey Form (page 2)

PART IV – POTENTIAL POLLUTION SOURCES – VISUAL ASSESSMENT

Source of Discharge:

Type	River(s)/Stream(s)	Pond(s)	Wetland(s)	Outfall(s)	Other (specify)
Name(s) of Source(s)					
Amount (H, M, L)					
Flow Rate (M/sec)					
Volume					
Characteristics					

Bacteria samples collected from potential pollution sources? ☐ Yes ☐ No

If "Yes", were they listed on the Field Data/Chain of Custody sheet? ☐ Yes ☐No

Floatables present: ☐ Yes ☐ No Circle the following floatables, if found:

Type	Street litter	Food-related	Medical items	Sewage-related	Building materials	Fishing related	Household waste	Other:
Example	Cigarette filters	Food packing, beverage containers	Syringes	Condoms, tampons	Pieces of wood, siding	Fishing line, nets, lures	Household trash, plastic bags	

Amount of Debris/Litter on Beach: ☐ None ☐ Low (1-20%) ☐ Moderate (21-50%) ☐ High (>50%)

Type of Debris/Litter Found (please circle):

Type	Street litter	Food-related	Medical items	Sewage-related	Building materials	Fishing related	Household waste	Tar	Oil/ Grease	Other:
Example	Cigarette filters	Food packing, beverage containers	Syringes	Condoms, tampons	Pieces of wood, siding	Fishing line, nets, lures	Household trash, plastic bags	Tar balls	Oil Slick	

Amount of Algae in Nearshore Water: ☐ None ☐ Low (1-20%) ☐ Moderate (21-50%) ☐ High (>50%)

Amount of Algae on Beach: ☐ None ☐ Low (1-20%) ☐ Moderate (21-50%) ☐ High (>50%)

Circle the types of algae found:

Type	Periphyton	Globular	Free Floating	Other
Description	Attached to rocks, stringy	Blobs of floating materials	No obvious mass of materials	Describe:

Indicate the color of algae found

☐ Light Green	☐ Bright Green	☐ Dark Green	☐ Yellow	☐ Brown	☐ Other (describe)

Presence of Wildlife and Domestic Animals

Type	Monk Seal	Turtle	Birds	Dogs	Other
Number					

Number of dead birds found on the beach:_____

Identification (list each species found):

Note: photographs may be used to confirm final identification

Number of dead fish found on the beach:_____

Identification (list each species found):

Note: photographs may be used to confirm final identification

Comments/ Observations: