Ketchikan BEACH Water Quality Monitoring and Pathogen Detection

July 2017

Updated April 2018

Updated April 2019

Updated February 2020

Updated April 2021

Quality Assurance Project Plan, V. 5

Alaska Department of Environmental Conservation

Division of Water

A. Project Management Elements

A.1 Title and Approvals

Title: Tier 2 Quality Assurance Project Plan for Water Quality Monitoring Sampling and Analysis Activities

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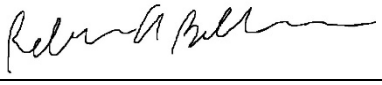
Signature:  Date: 5-14-21

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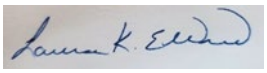
Signature:  Date: 5-13-21

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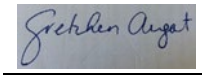
Signature:  Date: 5-13-21

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Distribution List

This list includes the names and addresses of those who receive copies of the approved QAPP and subsequent revisions.

Table 1: Distribution List

NAME	POSITION	AGENCY/ Company	DIVISION/BRANCH/SECTION	CONTACT INFORMATION
Gretchen Augat	DEC Project Manager	DEC	Division of Water/ Water Quality Standards/Beach Grant	907-465-5023 gretchen.augat@alaska.gov
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A.2 Project Task/Organization

Duties and responsibilities of key individuals are listed below:

A.2.1 Southeast Alaska Watershed Coalition Staff

- **Project Manager/Project QA Officer** – Responsible for overall technical and contractual management of the project. If SAWC staff have direct responsibility for sample collection and analysis of data results, the SAWC Project Manager assumes the responsibilities of the Lead Field Sampler/Project Manager.

  Responsible to ensure all monitoring complies with the QAPP specified criteria. This is accomplished through routine technical assessments of the sample collection, analysis and data

reporting process. Assessments may include but are not limited to activities such as: on-site field audits, data audits, QA review of blind lab performance evaluation samples, and lab audits. These assessments are performed independent of overall project management.

- **Laboratory Manager** – Responsible for the overall review and approval of contracted laboratory analytical work, responding to sample result inquiries and method specific details. Responsible for QA/QC of laboratory analysis as specified in the QAPP and reviews and verifies the validity of sample data results as specified in the QAPP and appropriate EPA approved analytical methods.

A.3.2 KIC Staff:

- **Lead Field Sampler** – Responsible for sampling preparation, sample collection, sample preservation, transportation of samples to laboratory for analysis, receipt of data and transmittal of data to Project Manager. The individual will procure personal equipment of field personnel, coordinate with laboratories in planning sampling equipment needs, obtain supplies for and prepare daily sampling kits prior to departure for field location, travel to the field location, prepare necessary preservatives while in the field, perform site reconnaissance, collect site specific parameters, collect water samples, prepare samples for shipping, transport samples to laboratory, alert laboratory of successful sampling event, receive data from laboratory, verify sample result data is reliable and submit the data and all applicable QA/QC results to the SAWC and DEC Project Managers.
- **Field Support Personnel** - Responsible for accompanying Lead Field Sampler into the field and supporting Lead Field Sampler during sampling. The individual will travel with the Lead Field Sampler to the field location, accompany the Lead Field Sampler to sampling sites, and support Lead Field Sampler in sampling tasks.

A.2.2 DEC Staff:

- **DEC Project Manager** – Responsible for overall technical and contractual management of the project. If DEC staff have direct responsibility for sample collection and analysis of data results, the DEC Project Manager/s assume the responsibilities of the Lead Field Sampler/Project Manager.
- **DEC Water Quality Assurance Officer (WQAO)** – Responsible for QA review and approval of plan and oversight of QA activities ensuring collected data meets project's stated data quality goals. If DEC staff have direct responsibility for sample collection and analysis of data results, the DEC WQAO assumes the responsibilities of the Project QA Officer.

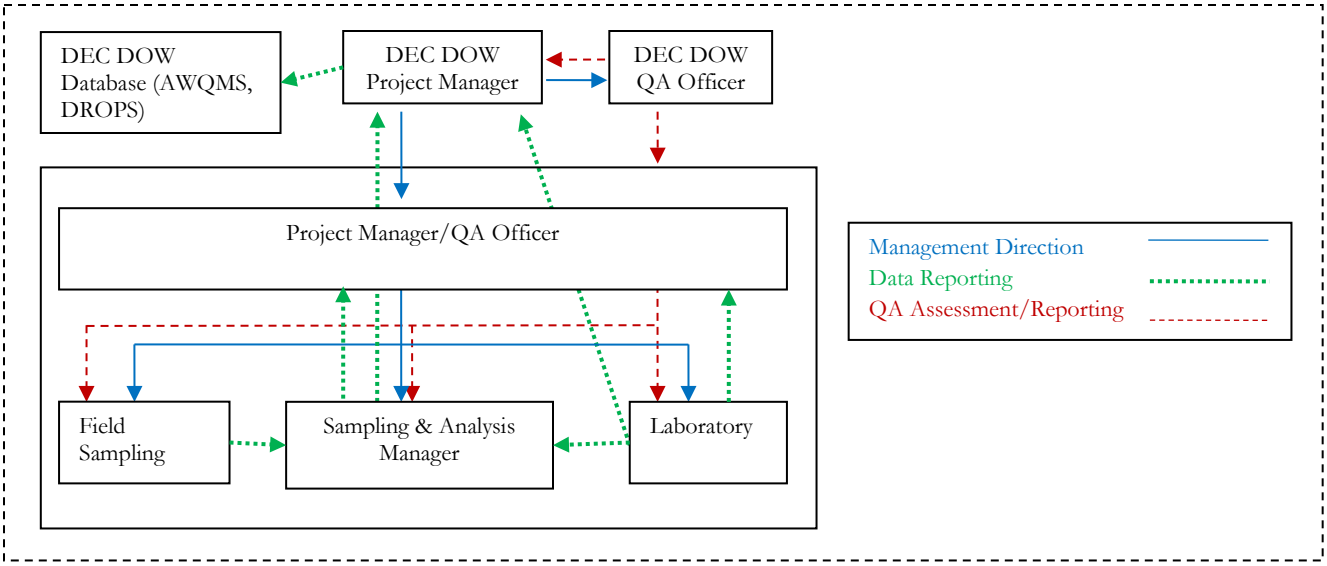


Figure 1: BEACH Project Organizational Structure

A.3 Problem Definition/Background and Project Objectives

A.3.1 Problem Definition

DEC identified the following beaches through a public nomination process; the Recreational Beach Survey is available at: http://dec.alaska.gov/water/wqsar/wqs/beachprogram.htm. The qualifying Ketchikan Beaches are listed below. [1, 2]

- Herring Cove (55° 19' 34.57" N 131° 31' 22.13" W; 55.32627, -131.52278)
- Mountain Point Cultural Food (55° 17' 34.05" N 131° 32' 21.08" W; 55.29279, -131.53917)
- Mountain Point Surprise Beach (55° 17' 36.72" N 131° 32' 51.49" W; 55.29353, -131.54750)
- Rotary Park Beach (55° 18' 31.50" N 131° 34' 39.34" W; 55.30875000, -131.57777778)
- Rotary Park Pool (55° 18' 35.34" N 131° 34' 49.27" W; 55.30981667, -131.58027778)
- Seaport Beach (55° 18' 52.63" N 131° 35' 35.68" W; 55.31461944, -131.59333333)
- Thomas Basin (55° 20' 28.49" N 131° 38' 30.45" W; 55.34124722, -131.64166667)
- South Refuge Cove State Recreation Site (55° 24' 26.62" N 131° 45' 19.77" W; 55.40739444, -131.75555556)
- Beach at Sunset Drive (55° 24' 45.40" N 131° 45' 54.19" W; 55.41261111, -131.76500000)
- Beach at Shull Road (55° 26' 7.57" N 131° 47' 54.62" W; 55.43543611, -131.79861111)
- South Point Higgins Beach (55° 26' 55.12" N 131° 49' 52.90" W; 55.44864444, -131.83138889)
- Knudson Cove (55° 28' 19.47" N 131° 47' 46.76" W; 55.47207500, -131.79638889)

[1] One replicate of each analysis will be taken each at sampling event.
[2] Lat/long coordinates may be revised based on specific field sample location.

Based on the information provided by respondents, DEC ranked these beaches as Tier 1. Tier 1 includes high priority beaches that pose the greatest threat of human contact with contaminated waters during recreational use. Contact with waters containing fecal contamination increases the risk of becoming ill due to pathogens contained in feces.

A.3.2 Project Background

DEC has and continues to implement a Beach Grant monitoring model which partners with local interested organizations and the general public to monitor levels of fecal contamination and evaluate the potential risks associated with recreational beach use. While this model is effective in providing support to communities monitoring marine water quality adjacent to high use beaches, it has not been successful in monitoring all high priority, Tier 1, beaches in Alaska on a desirable basis. Data associated with monitoring efforts at these beaches are on file and can be obtained by contacting the Project Manager.

A.3.3 Project Objective(s)

The primary objective of this DEC BEACH Monitoring Program project is to sample identified beaches for fecal indicator organisms (fecal coliforms and enterococci bacteria) that signify the presence of fecal contamination. This information will be used to notify the public in the event an exceedance of allowable levels of indicator organisms in accordance to Alaska Water Quality Standards (WQS).

A.4 Project/Task Description and Schedule

A.4.1 Project Description

SAWC/ KIC will collect water samples from twelve (12) Tier 1 beaches along the coast of Ketchikan. Samples will be analyzed in a DEC-approved laboratory for presence of fecal coliforms by SM 9222 D, and Enterococci by ASTM D6503. The goal of this project is to gather enough data to determine whether these beaches are meeting the water quality standards for fecal coliforms and enterococci based on single sample and/or geometric mean calculations. A list of DEC-approved microbiological laboratories is available at: Laboratories Certified to Perform Microbiological Analyses of Drinking Water (alaska.gov).

A.4.2 Project Implementation Schedule

Table 2: Project Implementation Schedule				
Product	**Measurement/ Parameter(s)**	**Sampling Site**	**Sampling Frequency**	**Time Frame**
Field Sampling	Ambient air temperature, Hanna handheld tester (pH, conductivity, temperature), and turbidity	All sites	See sample schedule based on tides	May -September 2021
Lab Analysis	Fecal coliforms and Enterococci	All sites	Analyses within sample holding time requirements	May -September 2021
Lab Analysis	Microbial Source Tracking (MST)	All sites	See sample schedule based on tides	June – August 2021
Field Audit	Audit of field monitoring operations	All sites	< 30 days of project start-up	1/project

A.5 Data Quality Objectives and Criteria for Measurement Data

A.5.1 Data Quality Objectives (DQOs)

Data Quality Objectives (DQOs, EPAQA/G4). DQOs are qualitative and quantitative statements derived from the DQO Process that:

- Determine ambient beach water concentrations of indicator organisms (fecal coliforms and enterococci) and compare these values to water quality standards regulatory limits for fecal coliform bacteria in marine waters.
- The data needed for this project is indicator organism concentrations. The goal of the project is to intensively monitor beaches that are currently considered Tier I to determine if there truly is a problem with fecal contamination. If so, beaches may be listed as impaired waters. If not, beaches will be down-tiered to a lower priority level. To accomplish the monitoring objectives, the appropriate type of data needed is defined by the WQS for bacteria (fecal coliform and enterococci). For WQS pollutants, compliance with the WQS is determined by specific measurement requirements. The measurement system is designed to produce water pollutant concentration data that are of the appropriate quantity and quality to assess compliance.

A.5.2 Measurement Quality Objectives (MQOs)

Measurement Quality Objectives (MQOs) are a subset of DQOs. MQOs are derived from the monitoring project's DQOs. MQOs are designed to evaluate and control various phases (sampling, preparation, and analysis) of the measurement process to ensure that total measurement uncertainty is within the range prescribed by the project's DQOs. MQOs define the acceptable quality (data validity) of field and laboratory data for the project. MQOs are defined in terms of the following data quality indicators:

- Detectability
- Precision
- Bias/Accuracy
- Completeness
- Representativeness
- Comparability

Detectability is the ability of the method to reliably measure a pollutant concentration above background. DEC DOW uses two components to define detectability: method detection limit (MDL) and practical quantification limit (PQL) or reporting limit (RL).

- The MDL is the minimum value which the instrument can discern above background but no certainty to the accuracy of the measured value. For field measurements the manufacturer's listed instrument detection limit (IDL) can be used.
- The PQL or RL is the minimum value that can be reported with confidence (usually some multiple of the MDL).

Note: The measurement method of choice should at a minimum have a practical quantification limit or reporting limit 3 times more sensitive than the respective DEC WQS and/or permitted pollutant level (for permitted facilities).

Sample data measured below the MDL is reported as ND or non-detect. Sample data measured ≥ MDL but ≤ PQL or RL is reported as estimated data. Sample data measured above the PQL or RL is reported as reliable data unless otherwise qualified per the specific sample analysis.

Precision is the degree of agreement among repeated measurements of the same parameter and provides information about the consistency of methods. Precision is expressed in terms of the relative percent difference (RPD) between two measurements (A and B).

For field measurements, precision is assessed by measuring replicate (paired) samples at the same locations and as soon as possible to limit temporal variance in sample results. Field and laboratory precision is measured by collecting blind (to the laboratory) field replicate or duplicate lab samples. For paired and small data sets project precision is calculated using the following formula:

$$Precision = \frac{(A - B)}{((A + B)/2)} \times 100$$

For larger sets of paired precision data sets (e.g., overall project precision) or multiple replicate precision data, the following formula may be used:

RSD = 100*(standard deviation/mean)

Note: Precision assessed only when both paired values ≥:

- 5 times PQL (fecal coliforms SM 9222D)
- 2 times PQL (enterococci D-6503-99)

- 5 times PQL (fecal coliforms SM 9221 E (2) with A-1 media)

Bias (Accuracy) is a measure of confidence that describes how close a measurement is to its "true" value. Methods to determine and assess accuracy of field and laboratory measurements include, instrument calibrations, various types of QC checks (e.g., sample split measurements, sample spike recoveries, matrix spike duplicates, continuing calibration verification checks, internal standards, sample blank measurements (field and lab blanks), external standards), performance audit samples (DMRQA, blind Water Supply or Water Pollution PE samples from A2LA certified, etc., Bias/Accuracy is usually assessed using the following formula:

$$Accuracy = \frac{Measured\ Value}{True\ Value} \times 100$$

Completeness is a measure of the percentage of valid samples collected and analyzed to yield sufficient information to make informed decisions with statistical confidence. As with representativeness, data completeness is determined during project development and specified in the QAPP. Project completeness is determined for each pollutant parameter using the following formula:

$$\frac{T - (I + NC)}{T} \times 100\% = Completness$$

Where: T = Total number of expected sample measurements.
I = Number of invalid sample measured results.
NC = Number of sample measurements not produced (e.g., spilled sample, etc).

This project has a goal of 80% data completeness. Completeness will be assessed on an individual basis for every beach. For comparison with the geometric mean standard, ten individual sampling events are planned and a minimum of five unique and valid samples (per sample location) are required to assess compliance with the beach monitoring water quality indicator standards.

Representativeness is determined during project development and specified in the QAPP. Representativeness assigns what parameters to sample for, where to sample, type of sample (grab, continuous, composite, etc.) and frequency of sample collection.

Comparability is a measure that shows how data can be compared to other data collected by using standardized methods of sampling and analysis.

Each sampling station is fixed and located by reference to a permanent landmark at each beach. The stations do not change throughout the sampling season, but may vary with tidal stage. Sampling is conducted in accordance with Alaska Beach Grant Program's Standard Operating Procedures. The SOP's are contained within the Sample Handbook available at:

http://www.dec.state.ak.us/water/wqsar/wqs/beachprogram.htm

Standardized EPA-approved analytical procedures methods are used by state certified microbiological laboratories. Fecal coliform bacteria colony forming units are enumerated using EPA Method 9222D. Enterococci colony forming units are enumerated using Standard Test Method D6503-99.

Table 3: Project Measurement Quality Objectives (MQOs)

Group	Analyte	Method	MDL	PQL	Alaska Water Quality Standards for Marine Water Uses[3]			Precision (RPD)	Accuracy
					Aquatic Life	Recreation Water	Harvesting for Consumption of Raw Mollusks or Other Raw Aquatic Life		
	Temperature	In situ (electronic probe) EPA 170.1	NA	0.1°C	May not cause the weekly average temperature to increase more than 1o C. The maximum rate of change may not exceed 0.5o C per hour. Normal daily temperature cycles may not be altered in amplitude or frequency.	Not applicable.	May not cause the weekly average temperature to increase more than 1o C. The maximum rate of change may not exceed 0.5o C per hour. Normal daily temperature cycles may not be altered in amplitude or frequency.	±0.2°C	±0.2°C
	pH	In situ (electronic probe) EPA 150.2			May not be less than 6.5 or greater than 8.5 and may not vary more than 0.2 pH unit outside of the naturally occurring range.	May not be less than 6.0 or greater than 8.5. If the natural pH condition is outside this range, substances may not be added that cause any increase in buffering capacity of the water.	May not be less than 6.0 or greater than 8.5.		±0.05 pH
	Turbidity	EPA 180.1, ASTM D1889, SM 2130 B			May not reduce the depth of the compensation point for photosynthetic activity by more than 10%. May not reduce the maximum secchi disk depth by more than 10%.	May not exceed 25 nephelometric turbidity units (NTU).	May not reduce the depth of the compensation point for photosynthetic activity by more than 10%. May not reduce the maximum secchi disk depth by more than 10%.		

[3] 18 AAC 70 Water Quality Standards amended as of March 5, 2020.

Fecal Indicator Organisms	Fecal coliforms	SM 9222D, membrane filtration (MF)	1cfu/100mL	1cfu/100mL	NA	In a 30-day period, the geometric mean of samples may not exceed 200 fecal coliform/100ml, and not more than 10% of the samples may exceed 400 fecal coliform/100ml.	The geometric mean of samples may not exceed 14 fecal coliform/100 ml; and not more than 10% of the samples may exceed 31 CFU per 100 ml for a membrane filtration test	+/- 60%	NA
	Fecal Coliforms	SM9221 E (2) with A-1 media, MPN, marine growing waters method	2-1600 MPN/ 100mL	2-1600 MPN/ 100mL	NA			+/- 60%	NA
	Enterococci	D6503-99 (Enterococci by Enterolert)	10cfu/ 100mL	10cfu/ 100mL	NA	In a 30-day period, the geometric mean of samples may not exceed 35 enterococci CFU/100 ml, and not more than 10% of the samples may exceed a statistical threshold value (STV) of 130 enterococci CFU/100 ml.	NA	+/- 60%	NA
	Microbial Source Tracking	Polymerase Chain Reaction	NA	NA	NA	No human or human related sources	NA	NA	NA

A.6 Special Training Requirements/Certification

The DEC Project Managers currently serve as DEC DOW's BEACH Grant coordinator and have experience in administrating BEACH Grant Monitoring Program grants. The experience associated with their duties allows them to be effective in carrying out duties as Project Manager.

For BEACH monitoring projects, the entity is responsible to provide a knowledgeable and competent grant manager, project QA Officer and Lead Field Sampler.

For BEACH monitoring projects conducted by DEC staff, the Project QA Officer is the DEC DOW's Quality Assurance Officer. His training and experience allows him to successfully fulfill his duties as Project QA Officer.

Sub-contracted laboratories performing analytical work must have the requisite knowledge and skills in execution of the analytical methods being requested. Information on laboratory staff competence is usually provided in each lab's Quality Management (QMP) and/or Quality Assurance Plan (QAP). The laboratory to be used during the 2019 field season, R&M Engineering, Inc., is an Alaska Drinking Water certified microbiological laboratory. It is the responsibility of the contracted lab to maintain a current copy of the laboratory's QA Plan and attendant method specific SOPs on file with the Project Manager/ QA Project Manager and DEC DOW QA Officer during the duration of laboratory use.

DEC Project Manager: Gretchen Augat

DEC QA Officer: John Clark

SAWC Project Manager/QA Officer: Rebecca Bellmore, Science Director; Rob Cadmus, Executive Director

KIC Project Lead Field Sampler: Jesse Endert, Environmental Specialist

KIC Field Support Personnel: TBA

Table 4: Training					
Specialized Training/Certification	Field Staff	Project Manager	Lab Staff	Lab Supervisor	Project QA Officer
Safety training	X	X	X	X	X
Water sampling techniques	X	X			X
Instrument calibration and QC activities for field measurements	X	X			X
Instrument calibration and QC activities for laboratory measurements			X	X	X
QA principles				X	X
Chain of Custody procedures for samples and data	X	X	X	X	X
Specific EPA Approved Field Measurement Method Training	X	X			X
DEC Microbiological Drinking Water Certification	Certification for microbiological analysis is limited to the individually certified analyst.				
Specific EPA Approved Lab Analytical Method Training			X	X	X

A.7 Documents and Records

The EPA's Marine Sanitary Survey app will be used to record field and sanitary survey information (Sanitary Surveys for Recreational Waters | Technical Resources about Beaches | US EPA). A field logbook/field data sheets may also be used to store individual field information. Please see the Appendix for an example of logbook documents. The lead field sampler is responsible for ensuring that the all field data forms are correct.

Field activities and observations will be noted in a sanitary survey and field logbook/field data sheets (if needed) during fieldwork. The descriptions will be clearly written with enough detail so that participants can reconstruct events later if necessary. Sanitary survey, field logbook/field data sheets will describe any changes that occur at the site personnel and responsibilities or deviations from the QAPP/SAP as well as the reasons for the changes. Requirements for logbook entries will include the following:

- Pages will be numbered at the outset of the sampling season.
- Removal of any pages, even if illegible, will be prohibited.
- Entries will be made legibly with black (or dark) waterproof ink.
- Unbiased, accurate language will be used.
- Entries will be made while activities are in progress or as soon afterward as possible (the date and time that the notation is made should be noted, as well as the time of the observation itself). Each consecutive day's first entry will be made on a new, blank page.
- The date and time will appear on each page.
- When field activity is complete, the logbook will be entered into the project file.

In addition to the preceding requirements, the person recording the information must initial and date each page of the field logbook. If more than one individual makes entries on the same page, each recorder must initial and date each entry. The bottom of the page must be signed and dated by the individual who makes the last entry. The field team and task leader, after reading the day's entries, also must sign and date the last page of each daily entry in the field logbook. Logbook corrections will be made by drawing a single line through the original entry allowing the original entry to be read. The corrected entry will be written alongside the original. Corrections will be initialed and dated and may require a footnote for explanation. The type of information that may be included in the field logbook and/or field data forms includes the following:

- Names of all field staff
- A record of site health and safety meetings, updates, and related monitoring
- Station name and location
- Date and collection time of each sample
- Observations made during sample collection, including weather conditions, environmental conditions, complications, and other details associated with the sampling effort
- Sample description
- Any deviation from the sampling plan

Field logbooks/field data sheets and sample chain-of-custody forms will be completed for all samples and kept in the project file. Laboratory data results from the laboratories are recorded on laboratory data sheets, bench sheets and/or in laboratory logbooks for each sampling event. These records as well as control charts, logbook records of equipment maintenance records, calibration and quality control checks, such as preparation and use of standard solutions, inventory of supplies and consumables, check in of equipment, equipment parts and chemicals are kept on file at the laboratory.

Any procedural or equipment problems are recorded in the field notebooks. Any deviation from this Quality Assurance Project Plan will also be noted in the field notebooks. Data results will include information on field and/or laboratory QA/QC problems and corrective actions.

In addition to any written report, data collected for the project will be provided electronically in an AQWMS compatible format, which will be provide by DEC.

All records will be retained according to state records retention schedule.

Table 5: Project Documents and Records			
Categories	**Record/Document Types**	**Location**	**Retention Time**
Site Information	Site maps	With KIC and SAWC	Five Years
	Site pictures	With KIC and SAWC	
Environmental Data Operations	QA Project Plan	DEC	
	Field Method SOPs	With KIC and SAWC	
	Field Notebooks	With KIC	
	Sample collection/measurement records	KIC, SAWC and DEC	
	Sample Handling & Custody Records	KIC, SAWC and DEC	
	Inspection/Maintenance Records	KIC, SAWC and DEC	
Raw Data	Lab data (sample, QC and calibration) including data entry forms	SAWC and DEC	
	Sanitary Survey Forms	KIC, SAWC and DEC	
Data Reporting	Progress reports	N/A	
	Project data/summary reports	N/A	
	Lab analysis reports	DEC	
Data Management	Data quality assessments	DEC	
	Site audits	DEC	
	Lab audits	DEC	
	QA reports/corrective action reports	DEC	
	Corrective Action Response	DEC	

In addition to any written report, data collected for a project will be submitted electronically to DEC via a CD ROM or email ZIP file. All dates are to be formatted as "**MM-DD-YYYY**".

B. Data Generation and Acquisition

B.1 Sampling Process Design (Experimental Design)

Beach water quality monitoring will be conducted at Tier I beaches designated by DEC, and sample locations should be chosen to represent the most likely pathogen exposure scenario for recreational beach users. Water samples will be analyzed to determine the population densities of microbes that indicate the presence of fecal contamination; microbes to be enumerated will be enterococci and fecal coliforms, with the results reported per 100 mL marine water.

Samples will be collected in accordance with the sampling SOP (Appendix A-1) at locations where primary contact recreation is likely to affect beach users. Sample collection information specific to this project is included in the Appendix A-1.

The sample will be collected in nearshore water 3 feet deep, approximately one foot below the water surface. Replicate samples for fecal coliform and enterococcus will be collected for each batch.

Enterococcus and fecal coliform population densities will be determined using the EPA or DEC approved protocols yielding the most rapid results. Those protocols were selected so decisions regarding issuance of beach advisories may be made without undue delay, minimizing the potential for public health risks associated with ongoing pathogen exposure.

B.1.1 Define Monitoring Objectives(s) and Appropriate Data Quality Objectives

Description and Purpose: Monitor Ketchikan area beaches every other week during the 2021 recreation season to evaluate the magnitude, frequency and duration of the fecal coliform and enterococci levels in the Ketchikan coastal marine waters, whether bacteria levels exceed bacteria standards. These data will be used to notify recreational beach users of marine water bacteria levels and to develop and validate the predictive model (EPA's Virtual Beach model). Prepare final report including a comparison of data from 2017-2021. Conduct outreach following the recreational season on the Ketchikan Beach Program.

Environmental Results: Beach Program monitoring allows for the evaluation of potential health risks by fecal coliform and enterococci bacteria and provides the opportunity to notify the public when levels exceeded state recreation standards. The environmental results include an increase in local government and tribal group awareness of best management practices (BMPs) to reduce bacteria in the watersheds and marine environments. In addition, predictive modeling has great potential to allow for more frequent and timely notification to the public and reduce future monitoring cost by requiring fewer sampling events.

Task	Deliverable Narrative and Format	Due Date
1	Comments/revisions on DEC-provided SAP/QAPP and Handbook	March 31, 2021
1	Final QAPP and Beach Monitoring Handbook signed by all parties	May 1, 2021
2	Sanitary surveys from EPA mobile app (Excel and csv)	Within 36 hours of sampling event from May-September
2	Site photos (JPEG or another DEC-approved format)	
2	Chain of Custody form copies (PDF)	
2	Copy of other data information upon request (e.g. calibration records)	As requested
2	Land access permission documentation (if necessary)	
3	Post-sampling outreach materials developed (electronic copies of draft presentations, press releases, etc.)	October 2021
3	Post-sampling outreach materials approved by DEC and communicated to the public (electronic copies of released material, list of attendees at presentations)	November 2021

4	Monitoring data and results in DEC-provided electronic template (Excel workbook)	October 2021
4	GIS geodatabase and map	December 2021
5	Analyze results of beach monitoring	December 2021
5	Draft Beach Monitoring Report (Word)	January 2022
5	Final Beach Monitoring Report (Word and PDF)	February 2022

PROJECT TASKS

TASK 1: Review 2020 Ketchikan Beach Sampling Plan and Quality Assurance Project Plan (SAP/QAPP) and Beach Monitoring Handbook

Deliverable(s) and Permits: Review and comment on the DEC-provided Beach Sampling Plan and Quality Assurance Project Plan (SAP/QAPP) and Beach Monitoring Handbook. SAWC will work with the DEC project manager to update the 2020 Ketchikan Beach SAP/QAPP and Beach Monitoring Handbook and have signed by the relevant parties.

Deliverable	Due Date:
Comments/revisions on DEC-provided QAPP and Handbook (Word track changes)	March 31, 2021
Final QAPP and Beach Monitoring Handbook signed by all parties	May 1, 2021

TASK 2: Monitor Beach Water Quality

Deliverable(s) and Permits: SAWC will conduct marine water quality monitoring eight times during the 2021 recreational use season (mid-May to mid-September) for bacteria at recreational beaches using the DEC-approved SAP/QAPP.

During each sampling event SAWC will collect one (1) marine water sample at each beach location for fecal coliform bacteria (SM 9222D) and enterococci (ASTM D6503-99) using the DEC- approved SAP/QAPP and submit to a DEC-approved laboratory within the six (6) hour holding time. Collect one (1) replicate sample for each bacteria analytical test per sampling event for quality assurance. Through previous beach monitoring efforts, the microbial source has been identified and therefore additional MST sampling is not needed for the Ketchikan beach monitoring locations during this recreational season.

The bacteria samples will be collected and submitted to the DEC-approved R&M Engineering Ketchikan Inc. laboratory in Ketchikan (R&M lab) for analytical testing. SAWC may collect the samples directly or contract with the Ketchikan Indian Community, City of Ketchikan, or another qualified entity to collect samples. Samples will be taken from the locations outlined in the SAP/QAPP, tentatively the 12 beaches monitored will include: Knudson Cove, South Point Higgins Beach, Shull Road Beach, Sunset Drive Beach, South Refuge Cove State Recreation Site, Thomas Basin, Seaport Beach, Rotary Park Beach, Rotary Park Pool, Mountain Point Surprise Beach, Mountain Point Cultural Food, and Herring Cove along with one (1) QA laboratory sample per analyte per sampling event (alternating between sampling locations). SAWC will work with property owner(s) to secure permission to access land for sampling

purposes. The field tech will complete the EPA Marine Beach Sanitary Survey App, chain-of-custody forms, and site photos at each monitoring location for each monitoring event.

Field technicians will record observations listed in EPA's Marine Beach Sanitary Survey and EPA's Virtual Beach model, such as type/number of wildlife presence, water clarity, turbidity, wind speed and direction, wave height (using a wave rod recorded in feet during sampling), field parameters collected by a DEC-provided portable meter, and air temperature. Field technicians will complete the sanitary survey spreadsheet (provided by DEC) or directly into the EPA Sanitary Survey mobile

app in the field at each sampling location during each sampling event. Field technicians will take photos at each site during each sampling round to capture beach conditions.

R&M lab will analyze marine water samples collected by SAWC from the 12 monitoring sites for fecal coliform bacteria (SM 9222D) and enterococci (ASTM D6503-99). One (1) replicate sample for each analytical test per sampling event will be analyzed for quality assurance. Approximately 104 samples will be analyzed for fecal coliform bacteria and enterococci. R&M lab will submit analytical results via email directly to DEC, SAWC and sample collection group. If a confirmed exceedance occurs, DEC will issue a beach advisory (formats include press release, DEC website, social media, list serv, radio and/or newspaper), and SAWC will conduct notification outreach, as necessary.

Sample collection should target low tides to assess worst case bacteria scenarios. Specifically sampling collection should occur three hours prior to and during low tide at the outgoing tides (ebb tide), and during low tide up to three hours after incoming tides (flood tide). Sampling events should alternate site collection between these ebb and flood tide cycles to capture various tidal scenarios at each site location.

Deliverable	**Due Date:**
Sanitary surveys from EPA mobile app (Excel and csv)	Within 36 hours of sampling event from May-September
Site photos (appropriate digital format)	
Chain of Custody form copies (PDF)	
Copy of other data information upon request (e.g. calibration records)	As requested
Land access permission documentation (if necessary)	

TASK 3: Educational Outreach

Deliverable(s) and Permits: Conduct educational outreach event to communicate the beach program findings following the recreational season. The typical prior recreational season outreach will be fulfilled in February 2021 (ACWA-B10-A3) during the 2020 monitoring outreach which will include a discussion of 2021 recreational season plans and next steps for the program.

At the completion of sampling, SAWC will develop outreach material to communicate the beach program and sampling results to the Ketchikan Community. Outreach material will be approved by DEC. SAWC will conduct outreach communication to the Ketchikan community. Outreach will include public service announcements via radio, local newspaper and/or social media, and one area- appropriate presentation to the community.

Deliverable	**Due Date:**

Post-sampling outreach materials developed (electronic copies of draft presentations, press releases, etc.)	October 2021
Post-sampling outreach materials approved by DEC and communicated to the public (electronic copies of released material, list of attendees at presentations)	November 2021

TASK 4: Project Data Submission

Deliverable(s) and Permits: SAWC will compile and enter all monitoring data (e.g., analytical results, field parameters, weather, wave height, wind speed and direction) into DEC-provided

template which DEC will submit to three databases: Ambient Water Quality Monitoring System (AWQMS), Water Quality Portal (WQP), and Beach Advisory and Closing On-line Notification (Beacon). SAWC will create and submit a GIS geodatabase and map showing the spatial relationship between residential/public waste treatment and septic, topographic contours, surface water hydrology, potential pollution sources, and beach survey data; and provide the data in NAD83/Alaska Albers.

Deliverable	**Due Date:**
Monitoring data and results in DEC-provided electronic template (Excel workbook)	October 2021
GIS geodatabase and map	December 2021

TASK 5: Project Report

Deliverable(s) and Permits: SAWC will evaluate all sample results and submit a draft and final report of findings and conclusions. Report design must follow 2017-2020 Ketchikan Beach monitoring report prepared by SAWC for the 2020 recreational season.

The report will include background information, and the project need, objectives, and approach taken to meet the project objectives. The report will evaluate and describe project accomplishments, the environmental benefit and suggest future actions. Water quality analysis will use the DEC's Listing Methodology for Determining Water Quality Impairments from Pathogens guidance, to compare results to the Marine Water Quality Indicator Criteria for bacteria. The report will include narrative description and tabular/graphical formats to evaluate the monitoring results. The report will include a quality assurance review describing the integrity of the reported analytical results as presented in the QAPP and data quality objectives. Appendices will incorporate all project data or refer to a web link and appropriate references.

Deliverable	**Due Date:**
Analyze results of beach monitoring	December 2021
Draft Beach Monitoring Report (Word)	January 2022
Final Beach Monitoring Report (Word and PDF)	February 2022

B.1.2 Characterize the General Monitoring Location/s

In 2002 and 2003, an Alaska Beach Survey was conducted to collect information about recreational-use beaches in the state. The survey was designed to obtain information regarding the locations of recreational-use beaches, the types of recreational activities that occur there, and the levels and seasons of beach use. In addition, information regarding the types of pollution sources near these recreation areas was collected. The collected information was entered into a database and was used to rank beaches according to their relative potential pathogen-exposure risk to beach users. The results of this survey were used to create the Alaska Beach Database, which is updated as additional surveys are received.

Table 6: Site Location and Rationale			
Site ID	**Latitude**	**Longitude**	**Site Description**
KB-HerringCove	55° 19' 34.57" N	131° 31' 22.13" W	Herring Cove Beach
KB-MtnPointSurprise Beach	55° 17' 36.72" N	131° 32' 51.49" W	Mountain Point Beach
KB-MtnPointCulturalFood	55° 17' 34.05" N	131° 32' 21.08" W	Mountain Point Cultural Food
KB-RotaryBeach	55° 18' 35.34" N	-131° 34' 49.27" W	Rotary Park Beach (aka Bugges Beach)
KB-RotaryPool	55° 18' 31.50" N	-131° 34' 39.34" W	Rotary Park Pool (aka Bugges Beach)
KB-Seaport	55° 18' 52.63" N	-131° 35' 35.68" W	Seaport Beach
KB-ThomasBasin	55° 20' 28.49" N	-131° 38' 30.45" W	Thomas Basin Harbor
KB-RefugeCove	55° 24' 26.62" N	-131° 45' 19.77" W	South Refuge Cove State Recreation Site
KB-Sunset	55° 24' 45.40" N	-131° 45' 54.19" W	Beach of Sunset Drive
KB-Shull	55° 26' 7.57" N	-131° 47' 54.62" W	Beach at Shull Road
KB-SPHiggins	55° 26' 55.12" N	-131° 49' 52.90" W	South Point Higgins Beach
KB-KnudsonCove	55° 28' 19.47" N	-131° 47' 46.76" W	Knudson Cove
Note: GIS Maps of sampling locations (large scale as well as site specific) are to be in the Appendix as part of the sampling plan.			

B.1.3 Identify the Site-Specific Sample Collection Location/s, Parameters to be Measured and Frequencies of Collection

Specific sampling sites will not be known until field reconnaissance has been performed. It is likely that sampling will occur at the point of greatest ease of public access. It will be assumed that the greatest use will occur at the point of greatest ease of public access.

An area within short walking distance of the public access point will most likely be sampled at each beach. The sites depicted in the topographic maps found in Appendix B.4 are tentative.

The following table details parameters to be taken at each site, the sampling frequency, and the sampling dates.

Table 7: Site-Specific Sample Parameters to be Measured and Collection Frequency			
Measurement/ Parameter(s)	Sampling Site	Sampling Frequency	Sampling Dates
Grab: Fecal Coliforms, Enterococci and MST (MST one event). In situ ambient air temperature, wildlife count, water temperature, pH, conductivity, turbidity.[4]	All sample locations	Bi-weekly	May-September 2021

[4] 2020 Ketchikan Beach Sanitary Survey data field sheets will be used at each monitoring locations for each sampling event.

B.2 Sampling Method Requirements

Specific sampling methods are detailed in the Sampling SOP, included in the Appendix of this QAPP.

B.2.1 Sample Types

Samples will be listed as "grab" on the Chain-of- Custody and in field data sheets.

B.2.2 Sample Containers and Equipment

The following general guidelines are listed to provide consistency among the samples collected from Alaskan beaches:

- Collect one sample for each recreational-use area. A sample will consist of one sample container filled with water from one location. The container will be analyzed to determine fecal coliform population densities and enterococcus populations.
- Wear hip-waders, elbow-length gloves and a life vest during sampling.
- Collect samples in areas of greatest use by recreational users, where water is about 3 feet deep, at about knee-depth or one foot below the surface.
- Collect a field replicate sample with a minimum of one replicate per analytical test per sampling day. A field replicate consists of one additional sample container filled with water at the same location where the primary water sample set was collected.
- All sample bottles will be pre-cleaned and sterilized and will not require rinsing with sample.
- Remove the sample container cap carefully, avoid touching the inside of the cap or the lip of the sampling container, and face into the waves or the current to avoid sample container contamination.
- Minimize sediment or debris in the sample; this may require waiting for sediment to settle after wading out to the sample collection location. If sediment or debris are present throughout the sample area, note this fact on the Beach Sampling Data Sheet.
- Grasping the open sampling container at the bottom with one hand, plunge the bottle mouth downward into the water to avoid introducing any material on the water surface. Position the mouth of the bottle into the current while standing downstream of the sample bottle. Tip the bottle upward to allow air to exit and the bottle to fill and remove the bottle from the water. Pour out a small portion of the sample from the bottle to allow airspace of about 1 inch for proper mixing before analysis. Replace the cap on the bottle and assure it is tightly closed. Label the sample bottle with sample identifier, date, and time.
- List samples as "grab" on the laboratory's chain of custody (COC) form. Note on the COC form that the laboratory needs to send the bacterial data to four recipients: to the local beach monitor, to the SAWC project Manager, and to the DEC Project Manager.

- Place samples into a cooler containing frozen blue ice to maintain a chilled temperature below 10° C. The cooler should be pre-chilled before sampling begins to ensure that samples are kept cold from the time of sampling until they are analyzed. A temperature blank must be included in each cooler.
- Measure and record water temperature to 0.1°C at the time of sample collection. A note of the temperature of the cooler contents will be made upon arrival at the laboratory.
- Record observations listed on the sanitary survey and/or field logbook/field data sheets. Some of these observations are type/number of wildlife presence, water clarity, turbidity, wave height (using a wave rod recorded in feet during sampling), field parameters collected by a DEC-provided portable meter (Hanna Combo pH/EC testers), and air temperature. SAWC/KIC field technicians will take photos at each site during each sampling round to capture beach conditions.

The sample container, preservation, and holding time requirements are tabulated below:

Table 8: Preservation and Holding Times for the Analysis of Samples

Analyte	Matrix	Container	Necessary Volume	Preservation and Filtration	Maximum Holding Time
Temperature	Surface Water	N/A, direct measurement	N/A, Direct Measurement	N/A, direct measurement	N/A, direct measurement
Fecal Coliform	Surface Water	G, PA	100 mL	Cool <10°C; do not freeze, 0.0008% Na_2S2O_3	6 hours (field) 2 hrs lab prep (**note:** time not additive)
Enterococci	Surface Water	G, PA	100 mL	Cool <10°C; do not freeze, 0.0008% Na_2S2O_3	6 hours (field) 2 hrs lab prep (**note:** time not additive)
MST	Surface Water	PC	500 mL	Cool <10°C; do not freeze, unpreserved	48 hours

Notes:
G = glass,
PA = autoclavable plastic
PC = polycarbonate

B.2.3 Sampling Methods

Sampling Standard Operating Procedures (SSOP) are located within the Sample Handbook available at: http://www.dec.state.ak.us/water/wqsar/wqs/beachprogram.htm. A copy of the SSOP is located in the appendix.

Beach Grab Samples – Sample bottles will be filled sequentially, normally being filled to the shoulder of the bottle, leaving a small space for expansion and mixing. The laboratory will provide sampling instructions with the sample bottles.

B.3 Sample Handling and Custody Requirements

B.3.1 Sampling Procedures

See Section B.2 of this QAPP – Sampling Method Requirements SOP.

B.3.2 Sample Custody Procedures

Samples and sample containers will be maintained in a secure environment from the time the bottles leave the laboratory until the samples are received at the laboratory. The laboratories will maintain custody of bottles and samples using their normal custody procedures.

Samples must be in the sampler's possession. Transfer of samples will be accomplished using the laboratory's Chain-of-Custody (COC) form. When samples are transferred between personnel, such transfer will be indicated on the COC form with signature, date, and time of transfer. The contractor lab will provide a copy of the signed, final COC; a blank COC is shown at the end of this QAPP (Appendix A-2).

B.3.3 Shipping Requirements

Packaging, marking, labeling, and shipping of samples will comply with all regulations promulgated by the U. S. Department of Transportation in 49 CFR 171-177. Staff should receive the necessary training for shipping samples or consult with the contracted laboratory for shipping instructions.

Samples will be individually packaged in sealed plastic bags. The sealed plastic bags will be placed into a bag-lined cooler with ice sealed in plastic bags or "blue-ice" to maintain a temperature of less than four degrees C. A temperature blank, 250 or 500 mL in size, will be placed in the cooler. Temperature will be measured prior to shipment and upon receipt at the lab. The chain of custody (COC) form will be placed in a plastic bag within the cooler. The cooler will be taped closed securely using packing tape at the last sampling site.

The six-hour holding time limitation for the bacteria samples must be met. To accomplish this, this project will use a combination of transportation to get the samples from beach to laboratory within the specified hold time. For those projects without laboratories in their communities, samples will be packaged at the sampling site, driven by car to the nearest airport, picked up by a courier, and then delivered to the laboratory. Other projects will deliver samples directly to the contracted laboratory.

Table 9: Sample Transport Chain Information

Business Type	Name	Address	Hours	Contact Information	Transport Leg	Estimated Transit Time
Deliver directly to laboratory	R&M Engineering, Inc.	7180 Revilla Road, Suite 300	8:00 am – 3:00 pm	(907) 225-7917	Motor Vehicle	30 minutes

		Ketchikan AK 99901				

B.4 Analytical Methods and Requirements

Water quality analytical methods that will be used throughout this project are outlined below. All analysis methods used for this program are EPA-approved. The contracted laboratory will be a currently DEC Drinking Water -certified laboratory, though the lab will be using methods specified for water/wastewater analysis. The contracted laboratory's current Quality Assurance Plan will be on file with DEC Division of Water Quality Assurance Office detailing their quality assurance procedures. Laboratory turnaround time is 36 hours. Any issues regarding analytical data quality will be resolved by the DEC project manager in consultation with any or all the following: DEC QA Officer, sampling staff and the laboratory project manager.

B.4.1 Sampling Parameters

Temperature will be reported in °C and will be measured using a YSI 650 MDS multiprobe meter or an equivalent meter (minimum resolution of 0.1 degree C or better). The thermometer will have current NIST traceable certification.

pH, Conductivity will be collected using a HANNA handheld meter or similar device. Equipment must be calibrated prior to sampling season.

Turbidity will be measured using a portable turbidimeter provided by ADEC. Fill provided vial following the manufactures instructions. Device must be calibrated prior to sampling event.

Fecal Coliform Standard Method 9222D will be used to determine the fecal coliform concentration in surface water. Filter sample through a membrane filter. Place membrane on mFC agar containing aniline blue as indicator. Incubate at 44.5°C for 22-24 h. Colonies that are various shades of blue are positive for fecal coliforms. The blue color indicates the capability to ferment lactose to acid.

Enterococci ASTM Method D6503-99 will be used to determine the most probable number enterococci concentration in surface water. Add reagent to the sample, pour into Quanti-Tray® or Quanti-Tray® /2000, seal in Quanti-Tray® Sealer and incubated for 24 hours at 41°C. Count fluorescent wells and refer to most probable number table.

Fecal Coliform Standard Method 9221A SM9221 E (2) with A-1 media, MPN, marine growing waters method. This method describes multiple-tube fermentation procedures [also called the most probable number (MPN) procedure] for the detection and enumeration of fecal coliform bacteria in biosolids. These methods use culture-specific media and elevated temperature to isolate and enumerate fecal coliform organisms.

Monitoring shall be conducted in accordance with EPA-approved analytical procedures and in compliance with 40 CFR Part 136, Guidelines Establishing Test Procedures for Analysis of Pollutants. Reference the Project's MQO Table 3(section A.6.2) of this QAPP for list of parameters of concern, approved analytical methods, method-specific detection and reporting limits, accuracy and precision values applicable to this

project. 40 CFR, Part 136.6 lists other regulated pollutant parameters not listed in the MQO Table 3(section A.6.2).

An expedited reporting turnaround time after sampling will be required for laboratory microbiological analyses to obtain results quickly for decision-making purposes. As pathogen exposure remains a risk to beach users during the period between sample analysis and reporting sample results, a short reporting time is recommended; a period of 36 hours following sample submission should be used for reporting results to the QAO, the BPM, and local community point of contact.

B.5 Quality Control Requirements

Table 10 lists the percent of field and laboratory replicates to be used for quality control (See section A.6.2 for discussion on calculation of precision and accuracy). The precision of field and laboratory measures will be calculated using the equation in section A.6.2. Data measurements that do not meet the limits described in A.6.2 may or may not be used in the final report depending on degree to which limits are not met. However, the report will clearly flag all data of questionable value along with a brief description of the problem and any justification why data should be considered for use.

Field sample replicates will be collected at a count of one sample per analyte per sampling event (alternating between sampling locations). Each sampling event requires one sample per analyte, resulting in two samples per analyte per sampling round. They will be analyzed for enterococci and fecal coliform (both methods, SM 9222 D and SM 9221 E with A1 media) population densities. The purpose of the field sample replicates is to assess sampling and laboratory precision and overall method variability for each BEACH monitoring project.

For laboratory analyses, contract laboratories will submit quality control results along with sample analytical results. Laboratory Quality Control will include duplicates, holding times, sample temperatures upon receipt of sample at lab and blanks. Laboratory precision criteria should be within BEACH MQO criteria provided in Section A.6.

B.5.1 Field Quality Control (QC)

Measures Quality control activities in the field will include adherence to documented procedures and the comprehensive documentation of sample collection information included in the field notebooks. A rigidly enforced chain-of-custody program will ensure sample integrity and identification. The chain-of-custody procedure documents the handling of each sample from the time the sample was collected to the arrival of the sample at the laboratory.

Quality Control measures in the field include but are not limited to:

- Proper cleaning of sample containers and sampling equipment.
- Maintenance, cleaning, and calibration of field equipment/ kits per the manufacturers and/or laboratory's specifications, and field Standard Operating Procedures (SOPs).
- Chemical reagents and standard reference materials are used prior to expiration dates.

- Proper field sample collection and analysis techniques.
- Correct sample labeling and data entry.
- Proper sample handling and shipping/transport techniques.
- Field replicate measurements at a minimum of one sample for each analyte per sampling event.

Analytical methods used on the project have been approved and documented by EPA, Standard Methods, or ASTM. These methods will be used as project-specific protocols to document and guide analytical procedures. Adherence to these documented procedures will ensure that analytical results are properly obtained and reported.

Table 10: Field Quality Control Samples

Field Quality Control Sample	Measurement Parameter/s	Frequency		QC Acceptance Criteria Limits
		Frequency of Occurrence	Total # of QC Type Samples	
Temperature blank	fecal coliforms, enterococci, fecal coliforms (marine waters growing method)	1/ Cooler		Rec'd at lab ≤10°C
Project samples (QC samples, blanks, samples)		All		Analyzed within holding times

B.5.2 Laboratory Quality Control (QC) Measures

Laboratories detail QC procedures used in their laboratory Quality Assurance Plan and method specific SOPs Quality Control in laboratories includes the following:

- Laboratory instrumentation calibrated with the analytical procedure.
- Laboratory instrumentation maintained in accordance with the instrument manufacturer's specifications, the laboratory's QAP and Standard Operating Procedures (SOPs).
- Specific QC activities prescribed in the project's QAPP.
- Laboratory data verification and validation prior to sending data results to DEC.

Contracted and sub-contracted laboratories will provide analytical results after verification and validation by the laboratory QA Officer. The laboratory must provide all relevant QC information with its summary of data results so that the project manager and project QA officer can perform field data verification and validation and review the laboratory reports. The project manager reviews these data to ensure that the

required QC measurement criteria have been met. If a QC concern is identified in the review process, the Project Manager and Project QA Officer will seek additional information from the sub-contracted laboratory to resolve the issue and take appropriate corrective action/s.

B.6 Instrument/Equipment Testing, Inspection and Maintenance Requirements

Contracted and sub-contracted laboratories will follow the testing, inspection and maintenance procedures required by EPA Clean Water Act approved methods and as stated in the respective laboratory's QAP and SOPs.

B.7 Instrument Calibration and Frequency

Field instruments shall be calibrated where appropriate prior to using the instruments. If equipment and/or kits require calibration immediately prior to the sampling event, the calibration date will be recorded in the operator's field logbook or field data sheets. When field instruments require only periodic calibration, the record of this calibration should be kept with the instrument. The project manager will delegate a field project team member to ensure that instruments are calibrated correctly, and appropriate documents recorded and retained.

Thermometers will be calibrated annually against a currently certified NIST traceable thermometer at a minimum of two (2) temperatures that bracket temperatures expected in the field (e.g., 0°C and 20°C). The NIST traceable thermometer must be certified over the expected field measurement range and should have greater accuracy and measurement resolution than the field thermometer.

Contracted and sub-contracted laboratories will follow the calibration procedures found in its QAP and the laboratory's Standard Operating Procedures (SOPs). Specific calibration procedures for regulated pollutants will agree with the respective "EPA Approved" Clean Water Act Pollutant methods of analysis. Field and/or Laboratory calibration records will be made available to DEC upon request.

B.8 Inspection/Acceptance of Supplies and Consumables

All reagents, calibration standards, and kit chemicals are to be inspected to ensure that expiration dates have not been exceeded prior to use in the monitoring project.

Pre-cleaned sample containers will be obtained from the lab with the appropriate preservation method included. Coolers, gel ice, temperature blanks, and chain-of-custody forms will be provided by the contract laboratory prior to field mobilization. Qualified staff will check all field equipment and supplies to ensure that their technical specifications have been met before use. Any deviances during inspection procedures will be remedied by the project manager and recorded in the field notebook. If re-sampling becomes necessary, replacements will be made.

No standards, solutions, buffers, or other chemical additives will be used if the expiration date has passed. It is the responsibility of the sampling manager or his/her designee to keep appropriate records, such as logbook entries or field data sheets, to verify the inspection/acceptance of supplies and consumables and restock these supplies and consumables when necessary.

Contracted and sub-contracted laboratories will follow procedures in their laboratory's QAP and SOPs for inspection/acceptance of supplies and consumables.

B.9 Data Acquisition Requirements (Non-Direct Measurements)

Topographic non-direct measurements (e.g., maps, charts) will be conducted using USGS derived materials. All geographical materials will be listed according to their source, year, and scale. GPS information will be documented by including collection device make and model number, geographic coordinate system, degree of accuracy (minimum of three satellite signals), and calibration information. GIS information will include GIS software program and model, source information, and geographic coordinate system.

B.10 Data Management

The success of a monitoring project relies on data and their interpretation. It is critical that data be available to users and that these data are:

- Of known quality,
- Reliable,
- Aggregated in a manner consistent with their prime use, and
- Accessible to a variety of users.

Quality Assurance/Quality Control (QA/QC) of data management begins with the raw data and ends with a defensible report, preferably through the computerized messaging of raw data.

Data management encompasses and traces the path of the data from their generation to their final use or storage (e.g., from field measurements and sample collection/recording through transfer of data to computers (e.g., laptops, data acquisition systems), laboratory analysis, data validation/verification, QA assessments and reporting of data of known quality to the respective DEC Division of Water Program Office. It also includes/discusses the control mechanism for detecting and correcting errors. Please include a flow chart (see example at end of section) as well as a detailed narrative of the monitoring project's data management process.

Various people are responsible for separate or discrete parts of the data management process:

- The field samplers are responsible field measurements/sample collection and recording of data and subsequent shipment of samples to laboratories for analyses. They assemble data files, which includes raw data, calibration information and certificates, QC checks (routine checks), data flags, sampler comments and metadata where available. These files are assembled and forwarded for secondary data review by the sampling supervisor.

- Laboratories are responsible to comply with the data quality objectives specified in the QAPP and as specified in the laboratory QAP and method specific SOPs. Validated sample laboratory data results are reported to the sampling coordinator/supervisor/project supervisor.

- Secondary reviewers (sampling coordinator/supervisor/project supervisor) are responsible for the QC the review, verification and validation of field and laboratory data and data reformatting as appropriate for reporting to AWQMS and reporting validated data to the project manager.
- The project QA officer is responsible for performing routine independent reviews of data to ensure the monitoring projects data quality objectives are being met. Findings and recommended corrective actions (as appropriate) are reported directly to project management.
- The project manager is responsible for final data certification.
- DEC DOW project manager and QA Officer AQS data entry staff conducts a final review (tertiary review) and submits the validated data to AWQMS.

An example Data Management Flow Chart (Figure 2) provides a visual summary description of the data flow/management process for environmental data collected in support of DEC's Division of Water decision making processes. Please revise as appropriate for the monitoring project.

Daily field records (a combination of field and core logbooks data sheets) will make up the main documentation for field activities. As soon after collection as possible, field notes, data sheets, core logs, and chain-of-custody forms will be scanned to create an electronic record. Field data will be hand-entered into the database. One hundred percent of the transferred data will be verified based on hard copy records. Electronic QA checks to identify anomalous values will also be conducted following entry.

Data obtained during sampling activities will be entered into field notebooks.

The following is a list of data information that will be kept and submitted to DEC:

- Field equipment and chemicals maintenance, cleaning and calibration records
- Field notebooks
- Sample Data Sheets
- Photographs of sampling stations and events
- Chain-of-Custody forms
- Laboratory equipment maintenance, cleaning, and calibration records
- Laboratory bench sheets, control charts, and SOPs
- Records of QA/QC problems and corrective actions (field and/or laboratory)
- Laboratory data QC records
- Records of data review sheets
- Replicate, performance evaluation records and other QA/QC control records (field and laboratory)
- Data review, verification, and validation records

Data handling equipment will include computer software applications Microsoft Excel. Data will be entered by the DEC project manager into a database in a form compatible with requirements of the statewide database entry into AWQMS. Requirements for data entry can be found at http://dec.alaska.gov/water/wqsar/awq_data_info.htm#2.

Sample Numbering

All samples will be assigned a unique identification code based on a sample designation scheme designed to suit the needs of the field personnel, data management, and data users. Sample identifiers will consist of two components separated by dashes. The first component is used to identify the area to which the sample originated, for example: KB = Ketchikan Beach.

Laboratory Data

The contract laboratory will submit data in electronic format to DEC. Written documentation will be used to clarify how field replicates and laboratory duplicates and QA/QC samples were recorded in the data metatables and to provide explanations of other issues that may arise. The data management task will include keeping accurate records of field and laboratory QA/QC samples so that project managers and technical staff who use the data will have appropriate documentation. Data management files will be stored on a secure computer or on a removable hard drive that can be secured. All records will be retained by the contract laboratory for five years.

Data Storage and Retention

Data management files will be stored on a secure computer or on a removable hard drive that can be secured. Laboratory Records will be retained by the contract laboratory for a minimum of five years. Project records will be retained by the lead organization conducting the monitoring operations for a minimum of five years, preferably longer. Site location and retention period for the stored data will be specified in each QAPP.

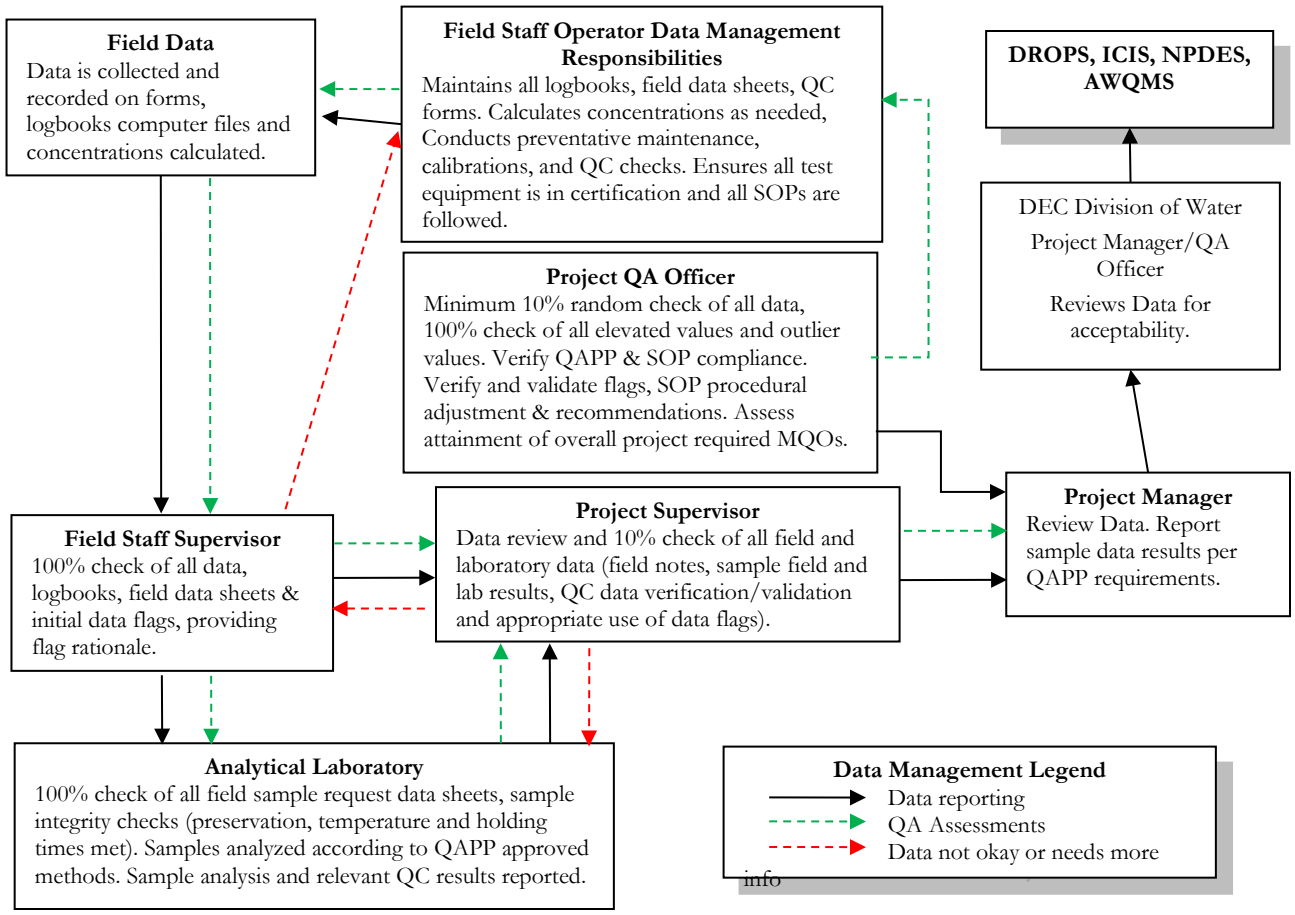


Figure 2: Data Management Flow Chart

C. Assessment and Oversight

C.1 Assessments and Response Actions

Assessments are independent evaluations of the monitoring project that are performed by the Project's QA Officer or his/her designee. Assessments may include (but are not limited to) any of the following: on-site field surveillance, on-site laboratory audits, performance evaluation samples, blind sample duplicates/replicates (precision samples), field split samples, data quality audits, data reviews. The number and types of assessments are dependent upon the monitoring project's intended data uses.

C.1.1 Lab Assessments to be performed under the BEACH Monitoring Program

Blind 3rd party lab performance evaluation (PE samples also called Performance Test, PT samples) for microbial analytes/methods of interest. PT water/wastewater sample participation is at a frequency of 1/year from a NELAC certified vendor (http://www.nelac-institute.org). Microbiological samples must be analyzed by a current DEC EH Drinking Water certified lab Laboratories Certified to Perform Microbiological Analyses of Drinking Water (alaska.gov) for the methods of interest. For those

microbiological methods not covered under the DEC EH Lab DW certification program, the microbiological lab will enroll in an approved PT study for the microbiological method of interest (see above link for approved NELAC PT vendors). Laboratory 3rd party microbiological PT samples results will be submitted directly to the DEC Water QA Officer and the Monitoring Project's QA Officer.

Note 1: It is the responsibility of the laboratory to enroll itself in these blind PT studies with the results mailed/emailed directly to the DEC DOW Water Quality Assurance Office and the Monitoring Project's QA Officer. Routine laboratory performance in the blind PT sample studies will be used to assess overall laboratory data quality as well as monitoring project data quality.

Note 2: It is the responsibility of the Project Manager and project QA Officer to ensure the selected laboratory is self-enrolled in a NELAC certified PT water/wastewater study at a frequency of 1/year.

C.1.2 On-Site assessments to be performed under the BEACH Monitoring Program

- One on-site field audit/BEACH monitoring operation (contractor) of sample collection procedures (each pollutant/method). Audit evaluates whether procedures used for sample collection, preservation, shipping and hold times and sample receipt at lab are in compliance with QAPP requirements.

C.1.3 Project Data Assessments

- Audits of Monitoring Data for reproducibility of results from recalculation/reconstruction of field/lab data.
- Calculation of monitoring project's overall achieved precision, accuracy and data completeness compared to QAPP defined precision, accuracy and data completeness goals. Method specific precision, accuracy and data completeness criteria are specified in the Project MQO Table 3 of section A.6.2.
- End of monitoring project QA summary report. Describes whether project data quality objectives and measurement quality objectives were obtained. Identifies whether exceedances of Alaska's Water Quality Standards were measured, water quality monitoring problems encountered and corrective actions that were taken.

C.2 Revisions to QAPP

Annually the QAPP will be reviewed and revised as needed. Minor revisions may be made without formal comment. Such minor revisions may include changes to identified project staff, QAPP distribution list and/or minor editorial changes.

Revisions to the QAPP that affect stated monitoring Data Quality Objectives, Method Quality Objectives, method specific data validation "critical" criteria and/or inclusion of new monitoring methods must solicit input/ and pre-approval by DEC DOW QA Officer/DEC Project Management before being implemented.

C.3 QA Reports to Management

Use the following table to describe assessment types, frequency, content, responsible individual/s, and distribution of assessment reports to management and other recipients and actions to be taken.

Table 11: QA Reports to Management

QA Report Type	Contents	Presentation Method	Report Issued by	Reporting Frequency	
				As Required	Year
On-site Field Inspection Audit Report	Description of audit results, audit methods and standards/equipment used and any recommendations	Written text and tables, charts, graphs displaying results	Project QA Officer/auditor	✔	1/BEACH contract project
3rd Party PT (e.g., DMRQA) Audit Report	Description of audit results, methods of analysis and any recommendations	Written text and charts, graphs displaying results	Project QA Officer/auditor	✔	1/year
Corrective Action Recommendation	Description of problem(s); recommended action(s) required; time frame for feedback on resolution of problem(s)	Written text/table	QA Officer/auditor	✔	
Response to Corrective Action Report	Description of problem(s), description/date corrective action(s) implemented and/or scheduled to be implemented	Written text/table	Project Manager overseeing sampling and analysis	✔	
Data Quality Audit	Independent review and recalculation of sample collection/analysis (including calculations, etc) to determine sample result. Summary of data audit results; findings; and any recommendations	Written text and charts, graphs displaying results	Project QA Officer	✔	
Quality Assurance Report to Management	Project executive summary: data completeness, precision, bias/accuracy	Written text and charts, graphs displaying results	Project QA Officer	✔	✔

D. Data Validation and Usability

D.1 Data Review, Verification and Validation Requirements

The purpose of this section is to define the criteria that will be used to review and validate—that is, accept, reject or qualify data in an objective and consistent manner. It is a way to decide the degree to which each data item has met its quality specifications as described in Element B above.

D.1.1 Data Validation means determining if data satisfy QAPP-defined user requirements; that is, that the data refer back to the overall data quality objectives. Data validation is an analyte and sample-specific process that extends the evaluation of data beyond method, procedural, or contractual compliance (i.e., data verification) to determine the analytical quality of a specific data set to ensure that the reported data values meet the quality goals of the environmental data operations (method specific data validation criteria).

D.1.2 Data Verification is the process of evaluating the completeness, correctness, and conformance/compliance of a specific data set against the method, procedural, or contractual requirements.

D.1.3 Data Review is the process that evaluates the overall data package to ensure procedures were followed and that reported data is reasonable and consistent with associated QA/QC results.

D.2 Verification and Validation Methods

D.2.1 Validation Methods

Data validation determines whether the data sets meet the requirements of the project-specific intended use as described in the QAPP. That is, were the data results of the right type, quality, and quantity to support their intended use? Data validation also attempts to give reasons for sampling and analysis anomalies, and the effect that these anomalies have on the overall value of the data.

All data generated shall be validated in accordance with the QA/QC requirements specified in the methods and the technical specification outlined in this QAPP. Raw field data will be maintained by the Program staff who collect it. Raw laboratory data shall be maintained by the laboratory. The laboratory may archive the analytical data into their laboratory data management system. All data will be kept a minimum of 3 years.

The summary of all laboratory analytical results will be reported to the Project supervisor/manager staff. Data validation will be performed by the laboratory for all analyses prior to the release of data. All laboratory data will be validated according to the laboratory's QAP and SOPs and as specified in the Monitoring Project's QAPP. The rationale for any anomalies in the QA/QC of the laboratory data will be provided to the Project Manager with the data results. Completed Chain-of-Custody or Transmission forms (if required) will be sent back from the laboratory to the Project Manager.

Data will be qualified as necessary. Sampling may need to be repeated. Unacceptable data (i.e., data that do not meet the QA measurement criteria of precision, accuracy, representativeness, comparability and completeness) will not be used or if used, the problems with the data will be clearly defined, flagged appropriately and data use clearly delimited and justified. Any actions taken to correct QA/QC problems in sampling, sample handling, and analysis must be noted. Under the direction of the project manager, project staff will document any and all QA/QC problems and QA/QC corrective actions taken.

The Project Manager/monitoring supervisor or his/her designee is responsible for reviewing field log notebooks and field data sheets for accuracy and completeness within 48 hours of each sample collection

activity, if possible. Sample results provided by the laboratory, will be verified, and validated by the laboratory QA Officer prior to issuing the laboratory report, and will become part of the permanent file for the monitoring project. The Project Manager or his/her designee will compare the sample information in the field log notebooks and/or data field sheets with the laboratory analytical results to ensure that no transcription errors have occurred, and to verify project QC criteria have been met (e.g., samples preserved and sample hold times met as required by QAPP and method, relative percent difference (RPD) results for blind sample replicates).

The Project QA Officer or his/her designee will calculate the Relative Percent Difference (RPD) between field replicate samples.

Laboratories calculate and report the RPD and percent analyte recovery of analytical duplicate samples.

RPD's greater than the project requirements will be noted. The Project Manager, along with supervisors and/or the Project QA Officer, if necessary, will decide if any QA/QC corrective action will be taken if the precision, accuracy (bias) and data completeness values exceed the project's MQO goals.

Estimated Quantitation Limits

The estimated quantitation limits (EQLs) are the lowest concentration that can be reliably achieved within specified limits of precision and accuracy for field and lab measurement methods. Estimated quantitation limits should be equal to or below the reporting limit (RL) but above the method detection limit (MDL). These method and analyte specific limits are provided in the MQO Table 3 (section A.6.2).

D.2.2 Verification Methods

The primary goal of verification is to document that applicable method, procedural and contractual requirements were met in field sampling and laboratory analysis. Verification checks to see if the data were complete, if sampling and analysis matched QAPP requirements, and if Standard Operating Procedures (SOPs) were followed.

Verification of data is the responsibility of the Project QA Officer. The Project QA Officer should verify at least 10% of generated project data.

D.3 Reconciliation with User Requirements

The Project Manager and the Project QA Officer will review and validate data against the Project's defined MQOs prior to final reporting stages. If there are any problems with quality sampling and analysis, these issues will be addressed immediately, and methods will be modified to ensure that data quality objectives are being met. Modifications to monitoring will require notification to DEC and subsequent edits to the approved QAPP.

Only data that have been validated and qualified, as necessary, shall be provided to DEC Division of Water and entered into the applicable database (AWQMS, ICI-NPDES, DROPS, WQPortal).

E. Decision Criteria

Beach Advisories, Closures or other emergency actions may only be taken by municipalities in conjunction with the Department of Environmental Conservation.

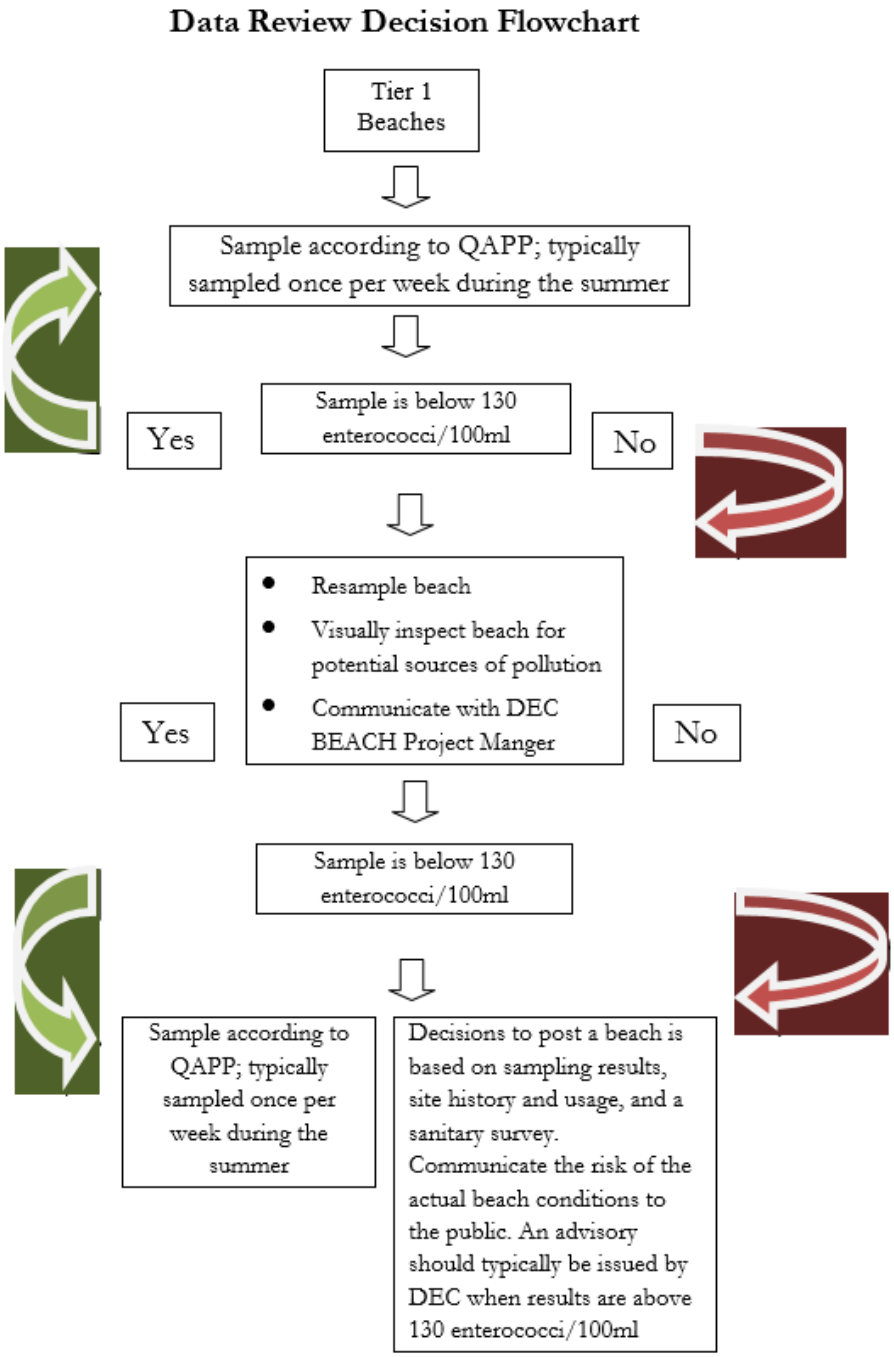
The BEACH Program's decision criteria are based on EPA's ambient water quality criteria (EPA, 1986) for two reasons:

Enterococci have a better correlation between indicator levels and illness rates than fecal coliform.

Alaska's marine Bacteria Indicator Water Quality Standards protect for the consumption of shellfish. Protection from human illness due to primary marine water contact. Closing a beach or advising against water contact based on a not more than 10% of the samples may exceed 31 fecal coliform colonies/100mL and having a geometric mean of samples may not exceed 14 fecal coliform colonies/100mL [18AAC70(14)(D) harvesting for consumption of raw mollusks or other raw aquatic life] could result in excessive advisories. A financial hardship on local communities could result from unnecessary and excessive postings. Public confidence in the Beach Program could also drop resulting in a human health hazard due to future postings being ignored.

Management decisions for public health and safety at recreational beaches should be based on specific data (e.g., activities, sanitary surveys) including identification of possible impacts from pollution sources. To make the necessary decision, data must be indicative of water quality conditions to adequately assess sanitary conditions of the beach. Due to inherent uncertainty involved with sampling and analytical determination of bacteria levels, decisions will be made when there is no reason to doubt the accuracy of the sample.

Figure 3: Data Review Decision Flowchart



Appendix A-1: Water Sampling Collection Protocols

A.1 Water Sample Collection

Water sampling involves wading into the water adjacent to a beach commonly used for water recreation to collect water from below the surface into sample jars. The sample should be collected in the general recreational beach area, or near locations expected to be influenced by fecal contamination (e.g., adjacent to sewage lagoons, near small boat harbors, etc.). The BEACH Manager will complete sampling after the following steps have been accomplished:

- Each sample jar is filled with water.
- Each sample jar is labeled.
- Each sample jar is placed in a cooler kept chilled with artificial ice.
- The Ketchikan Beach Sanitary Survey field data sheet is filled out.
- A chain-of-custody form is filled out.
- The cooler is transported to the laboratory responsible for determining fecal coliform and enterococcus populations.
- A copy of the Ketchikan Beach Sanitary Survey field data sheet is sent to DEC BEACH Manager.

Detailed directions for collecting good water samples, shipping the samples to the laboratory, and providing beach assessment information to the DEC are given in the following subsections.

A.2 Sample Collection Method

A good water sample is collected by avoiding cross-contamination, which can happen when the sampler inadvertently contaminates the sample. To reduce the potential for cross-contamination the sampler must follow a standard sample-collection method. Step-by-step sample-collection instructions are provided below:

1. Request a sample kit from the laboratory. The kit should include:
    - A cooler.
    - The appropriate sample containers for marine water-quality sampling (enterococcus and fecal coliform bacteria).
    - Artificial ice to keep the cooler chilled to the appropriate temperature.
    - Temperature blank.
    - Chain-of custody form.
    - Custody seals.
    - Sample jar labels.
    - An extra set of Sample bottles.
    - An extra set of sample bottles for a duplicate sample.
    - Shipping labels.

- Packing material.

2. **Call the laboratory prior to sampling** to make sure there will be someone at the laboratory to receive and process the samples within 6 hours of sampling.
3. **If necessary, consult flight schedules** to make sure there will be a flight that can get the samples to the laboratory within 6 hours of sampling.
4. Write the beach sampling location on the bottle label and Beach Sampling Data Sheet.
5. Put on clean waders, gloves and life vest. Wade into the water to a depth of approximately 3 feet. Try to avoid kicking up sediment or wait until any sediment that has been kicked up settles. Stand downstream of the water current and wait for sediment to clear.
6. Remove the bottle cap just before collecting the sample. Protect the cap from contamination. Do not to touch the inside of the bottle, or the inside of the cap.
7. Open the sampling bottle and hold onto the base with one hand. Plunge the top of the bottle downward into the water. Avoid introducing surface scum. Point the mouth of the bottle into the current. Hold the bottle about 1 foot below the water surface and tip it slightly upward to allow air to exit and the bottle to fill.
8. Remove the bottle from the water. Pour out a little water to leave airspace at the top of the jar. Fill one 100-mL bottle at each sampling location.
9. Tightly close each bottle.
10. Collect in-situ field measurements using a handheld probe or similar. Collect in-situ samples immediately after collecting grab samples. Face upstream or into the current, allow any disturbed sediment to settle before submerging the probe to the manufactures suggested depth. Swirl the probe gently to allow good contact with the sensors. Wait for numbers to stabilize. Record results on sanitary survey and/or field datasheets. Note that handheld probes must be calibrated prior to use in the field.

Collect one replicate for each analyte per sampling event. To collect a replicate sample, you must first have requested extra jars from the laboratory. Repeat Steps 2 through 9 at the same location.

11. Complete bottle labels and attach them to each sample jar. Labels should be clean, waterproof, non-smearing, and large enough for all the information. Information on the label should include:

- Sample identifier (e.g., "city-date-sample" = "KET-051707-01")
- Sample location (e.g., beach name, KB-Rotary)
- Sampling date and time
- Name of sampler

12. Wash your hands and arms with soap and water or waterless antimicrobial cleanser, or disinfectant lotion to reduce exposure to potentially harmful bacteria or microorganisms.

A.3 Sample Handling

Sample handling involves packing the samples in a cooler and shipping them to the laboratory. After sample collection is complete the samples must be handled with care so that they arrive to the laboratory in good condition. Step-by-step sample handling instructions are provided below:

1. Place the sample(s) in a pre-chilled cooler containing artificial ice to maintain a temperature from 1° to 10°C. Ask the laboratory ahead of time how much ice will be needed. **Do not allow the samples to freeze. Samples must remain below 10°C until receipt by qualified staff at the laboratory, otherwise samples are determined invalid so ensure sufficient cold artificial ice is added.**
2. Place enough packing material inside the cooler to protect the sample jars from breaking during transport to the laboratory.
3. Complete and provide contractor lab with the chain-of-custody form.
    - Write a note in the "Special Instructions" box requesting that the laboratory results be sent without delay (within 36 hours of sampling) to three people: DEC BEACH Project Manager, and you.
4. Always keep cooler in sampler possession.
5. Hand deliver cooler DEC-certified laboratory R&M Engineering-Ketchikan, Inc. (907) 225-7917.

Remember that samples must be collected, shipped and received by the laboratory in 6 hours. Samples that exceed the 6-hour holding time will not be analyzed. If necessary, consult flight schedules, and call the laboratory prior to sampling to make sure there will be a flight that can get the samples to the laboratory within 6 hours of sampling, and that there will be someone at the laboratory to receive the samples.

Appendix B: Supporting Documentation

Appendix B.1: Beach Sampling Field Forms examples

BEACH Sampling Field Datasheet

Name of Beach	Nearest Town	Lat	Long	Sampling Date	Collection Time	Sample ID(s)	Time	Replicate ID	Time	Field blank ID	Time	

Describe sampling location (note location on map and attach)

Rainfall				Air Temp	Marine water temp	Weather	Wind			Tide		
										Elev (ft/m), time (am/pm)		Current Phase
<24 hr	<48 hr	<72 hr	>72 hr				Direction	Speed	on/off shore?	Low	High	
						Sunny & Clear						Low Tide

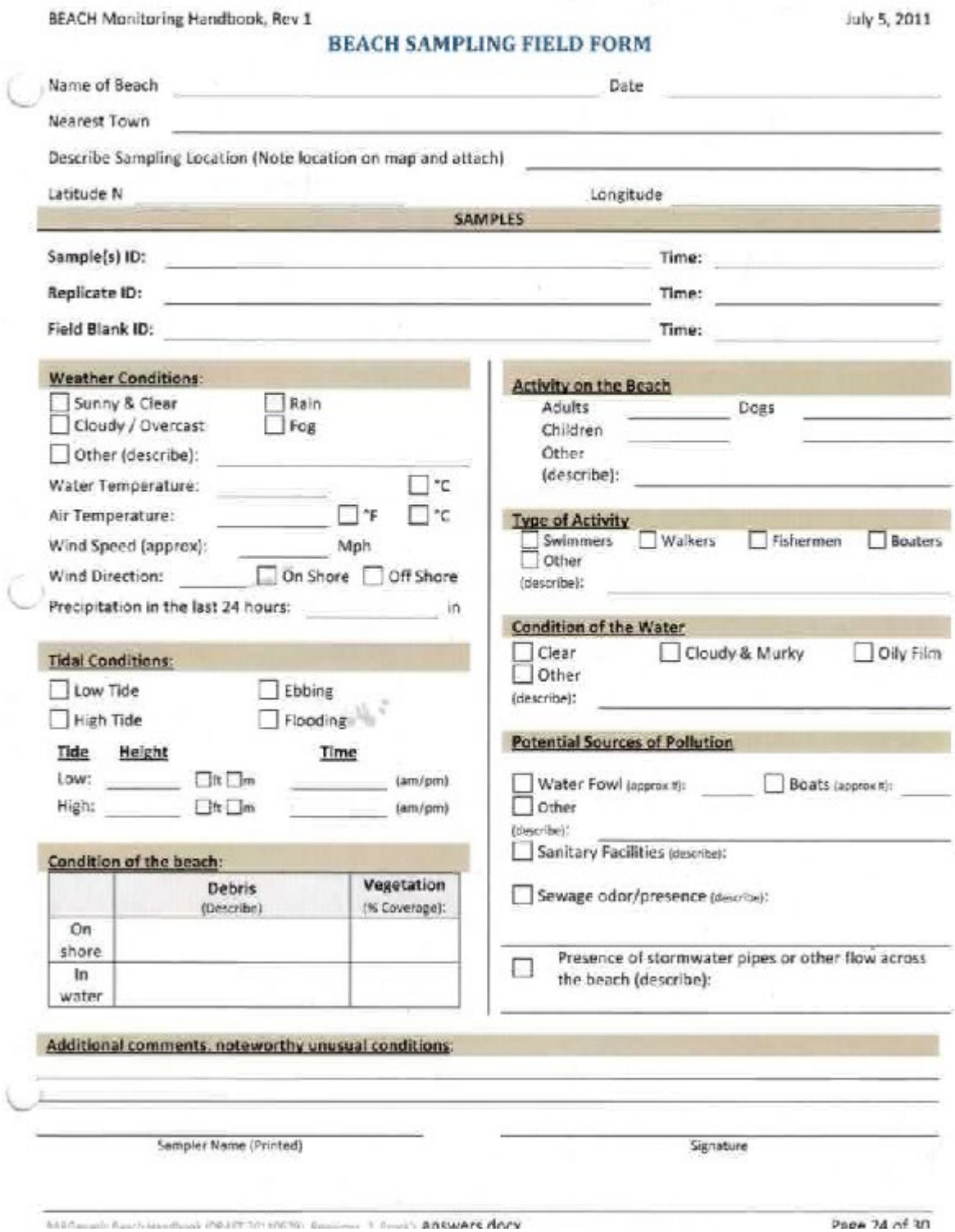
Beach Conditions					# People at beach		Beach Activity				Wildlife, Domestic Animal Presence	
Debris		% Vegetation										
Onshore	In water	Onshore	In water	Visual Turbidity	Adults	Children	# Boats	Swim-ming	Walking	Boating	# water fowl	# dogs
				Other								

Sanitary Facilities? (describe)	Sewage odor/presence? (describe)	Presence of stormwater pipes or other flow across the beach? (describe)

Additional comments, noteworthy unusual conditions:

Surveyor(s)	Affiliation(s)	Signature

Alternative Field Forms:



BEACH Monitoring Handbook, Rev 1 July 5, 2011

BEACH SAMPLING FIELD FORM

Name of Beach _____ Date _____

Nearest Town _____

Describe Sampling Location (Note location on map and attach) _____

Latitude N _____ Longitude _____

SAMPLES

Sample(s) ID: _____ Time: _____

Replicate ID: _____ Time: _____

Field Blank ID: _____ Time: _____

Weather Conditions:

☐ Sunny & Clear ☐ Rain
☐ Cloudy / Overcast ☐ Fog
☐ Other (describe): _____

Water Temperature: _____ ☐ °C

Air Temperature: _____ ☐ °F ☐ °C

Wind Speed (approx): _____ Mph

Wind Direction: _____ ☐ On Shore ☐ Off Shore

Precipitation in the last 24 hours: _____ in

Tidal Conditions:

☐ Low Tide ☐ Ebbing
☐ High Tide ☐ Flooding

Tide	Height		Time	
Low:	_____	☐ft ☐m	_____	(am/pm)
High:	_____	☐ft ☐m	_____	(am/pm)

Condition of the beach:

	Debris (Describe)	Vegetation (% Coverage):
On shore		
In water		

Activity on the Beach

Adults _____ Dogs _____
Children _____ _____
Other
(describe): _____

Type of Activity

☐ Swimmers ☐ Walkers ☐ Fishermen ☐ Boaters
☐ Other
(describe): _____

Condition of the Water

☐ Clear ☐ Cloudy & Murky ☐ Oily Film
☐ Other
(describe): _____

Potential Sources of Pollution

☐ Water Fowl (approx #): _____ ☐ Boats (approx #): _____
☐ Other
(Describe): _____
☐ Sanitary Facilities (describe):

☐ Sewage odor/presence (describe):

☐ Presence of stormwater pipes or other flow across the beach (describe):

Additional comments, noteworthy unusual conditions:

_____

_____

Sampler Name (Printed) _____ Signature _____

answers.docx Page 24 of 30

EPA United States Environmental Protection Agency

MARINE BEACH ROUTINE ON-SITE SANITARY SURVEY METHODS

PART I – GENERAL BEACH CONDITIONS

Air Temperature: ☐ Liquid-in-glass thermometer ☐ Electronic thermometer ☐ Weather report from local airport
☐ Weather report from local weather station ☐ Other (describe): _____

Wind Speed and Direction:
☐ Wind vane for direction ☐ Wind sock for direction and speed ☐ Anemometer for wind speed
☐ Aerovane for wind direction and speed ☐ Weather report from local airport ☐ Weather report from local weather station
☐ Other (describe): _____
☐ Distance from station: (ft / mi)

Weather Conditions: ☐ Visual observations ☐ Other (describe): _____

Rainfall: ☐ Rain gauge ☐ Weather report ☐ Other (describe): _____

☐ Distance from station or gauge: (ft / mi)

Longshore Current Speed: ☐ Stick with fishing reel with water balloon on end ☐ Ball and tether
☐ Other (describe): _____

Wave Height: ☐ Visual examination of wave height ☐ Graduated stick and ranging pole
☐ Other (describe):
Tidal Phase: ☐ Visual examination ☐ Weather report (source:) ☐ Other (describe):

Rip Currents: ☐ Visual examination ☐ Weather report (source:) ☐ Other (describe):

PART II – WATER QUALITY

Water Temperature: ☐ Multiprobe ☐ Electronic meter ☐ Graduated thermometer ☐ Report from local radio station
☐ Report from NOAA weatherband radio ☐ Other (describe): _____

Turbidity: ☐ Simple visual observation ☐ Visual test kit ☐ Titrimetric test kit ☐ Nephelometer/Turbidimeter
☐ Other (describe): _____
Salinity: ☐ Multiprobe ☐ Salinity meter ☐ Conductivity meter Other (describe): _____

DO: ☐ DO meter ☐ Multiprobe ☐ Other (describe:) _____

PART III – BATHER LOAD

Numbers of People Participating in Various Activities: ☐ Counting by surveyor ☐ Counting by lifeguards ☐ Photos
☐ Turnstyles ☐ Other (describe): _____

EPA United States Environmental Protection Agency

MARINE BEACH ROUTINE ON-SITE SANITARY SURVEY METHODS (continued)

PART IV – POTENTIAL POLLUTION SOURCES

Sources of Discharge:

(a) Source identification: ☐ Visual observation ☐ WWTP Notification/Report ☐ Other (describe): _____

(b) Flow/velocity or Volume measured: ☐ Mechanical flow meter ☐ Electric flow meter ☐ USGS Gauging Station ☐ WWTP Notification/Report ☐ Orange (float) and stopwatch ☐ Other (describe): _____

Tide Pools: Describe how size was estimated: _____

Floatables Present: ☐ Visual observation ☐ Cleanup event results ☐ Other (describe): _____

Amount and Type of Beach Debris/Litter on Beach: ☐ Visual observation ☐ Cleanup event results ☐ Other (describe): _____

Harmful Algal Bloom: ☐ Visual observation ☐ Other (describe or list source):

Algae in Nearshore Water and Beach:

(a) Amount and Color: ☐ Visual observation ☐ Other (describe): _____

(b) Identification: ☐ Field guide or internet site for taxonomic identification (describe): _____ ☐ Other (describe): _____

Presence of Wildlife and Domestic Animals: ☐ Counting using hand-held counter, and if necessary, binoculars ☐ Other (describe): _____

Dead birds:

(a) Number: ☐ Visual observation ☐ Other (describe): _____

(b) Identification: ☐ Field guide or internet site for taxonomic identification (describe): _____ ☐ Other (describe): _____

Dead fish:

(a) Number: ☐ Visual observation ☐ Other (describe): _____

(b) Identification: ☐ Field guide or internet site for taxonomic identification (describe): _____ ☐ Other (describe): _____

B.2: Chain of Custody Form

R&M ENGINEERING-KETCHIKAN, INC.
355 Carlanna Lake Road, Ketchikan AK 99901
phone 907-2257917 / fax 907-225-3441

Chain of Custody

Report Attention: Nicole Forbes	Phone Number: 907-465-5023
Company Name: DEC Div of Water	Fax Number:
Address: 410 Willoughby Avenue	Sampler Name (Print): Nicole Forbes
City, State, Zip Juneau, AK 99811	Sampler Signature: Nicole Forbes

Sample Information

Sample Location	Sample Matrix (waste, drinking, storm)	Date	Time	Grab/Comp	Analysis Requested
KB-Knudson	marine	7/31/17	10:52 am	grab	FC SM 9222D
"	"	"	"	"	Entero D6503-99
KB-Beacon	"	"	11:12 am	"	FC
"	"	"	"	"	Entero
KB-SP Higgins	"	"	11:37 am	"	FC
"	"	"	"	"	Entero
KB-Shull	"	"	11:55 am	"	FC
"	"	"	"	"	Entero
KB-Sunset	"	"	12:13 pm	"	FC
"	"	"	"	"	Entero

Wastewater samples are accepted Mon-Thurs 8:00-3:00 and must be received within 6 hours of collection. If more than 2 hours elapses between collection and receipt, the samples must be refrigerated or stored in a cooler with blue ice. If bottle contains preservative, take caution not to overfill; otherwise, simply fill bottles with representative sample, leaving a 1-inch air space for laboratory homogenization. It's important that this form is properly completed by the sampler, if you have questions feel free to contact the lab.

KB-Settlers " " 12:30 pm " FC Entero

FIELD NOTES:

FC @ 1750
ENTL @ 1830

Tracking Information

Relinquished By:	Date	Time	Received By:	Date	Time
Nicole Forbes	7/31/17	2:10 pm		7/31/17	1410

Chain Of Custody Record

Source Molecular Corporation
Leader in Genetic Microbial Source Tracking

SHIPPING ADDRESS:
4985 SW 74th Court, Miami, FL 33155 USA
Tel: (1) 786-220-0379 Fax: (1) 786-513-2733
Email: info@sourcemolecular.com

Company Name:	
Contact Name(s):	
E-mail Address(es):	
Phone:	
Address:	
City/State/Zip:	
Country:	

Sample ID	Media	Sample Date	Sample Time	# of Containers	Analysis Requested (see pg. 2) Mark boxes with "X"						Quantification (Yes, No, If Positive)	Comments

Completed by Client:
SAMPLES DELIVERED BY _____
SAMPLER NAME _____
SAMPLE SITE _____
SIGNATURE _____

Completed by Source Molecular:
SAMPLES RECEIVED BY _____
RECEIVED DATE/TIME _____
TEMPERATURE _____
CONDITION _____
SIGNATURE _____

B.3: Statement of Qualifications

B .4: Sampling Location Maps

B .5: Monitoring locations and site descriptions

Site ID	Latitude	Longitude	Site description	Years Monitored
Knudson Cove	55° 28' 19.47" N 55.47208	-131° 47' 46.76" W -131.79632	Beach and small boat harbor in Knudson Cove in southern end of Clover Pass, approx. 10 miles north of downtown.	2017, 2018, 2019, 2020
Beacon Hill	55° 28' 20.21" N 55.47228	-131° 49' 22.98" W -131.82305	South of Clover Passage, approx. 9.4 miles north of downtown.	2017, 2018
South Point Higgins Beach	55° 26' 55.12" N 55.44864	-131° 49' 52.90" W -131.83136	South of South Point Higgins Beach, approx. 8.3 miles north of downtown.	2017, 2018, 2019, 2020
Beach at Shull Road	55° 26' 7.57" N 55.43544	-131° 47' 54.62" W -131.79851	South of Whipple Creek mouth, approx. 6.7 miles north of downtown.	2017, 2018, 2019, 2020
Beach at Sunset Drive	55° 24' 45.40" N 55.41261	-131° 45' 54.19" W -131.76505	On Sunset Peninsula approx. 4.7 miles north of downtown. South of Mud Bay.	2017, 2018, 2019, 2020
South Refuge Cove State Recreation Site	55° 24' 26.62" N 55.40739	-131° 45' 19.77" W -131.75549	South of state recreation site approx. 4 north miles of downtown.	2017, 2018, 2019, 2020
Thomas Basin Harbor	55° 20' 28.49" N 55.34125	-131° 38' 30.45" W -131.64179	Small boat harbor at mouth of Ketchikan Creek, approx. 2.5 miles south of downtown.	2017, 2018, 2019, 2020
Seaport Beach	55° 18' 52.63" N 55.31462	-131° 35' 35.68" W -131.5932	Local shellfish gathering beach approx. 5 miles south of downtown. Commercial area in Saxman.	2017, 2018, 2019, 2020
Rotary Park Beach (aka Bugges Beach)	55° 18' 35.34" N 55.30982	-131° 34' 49.27" W -131.58028	Highly used recreation beach approx. 6 miles south of downtown. Open coastal beach.	2018, 2019, 2020
Rotary Park Pool (aka Bugges Beach)	55° 18' 31.50" N 55.30981667	-131° 34' 39.34" W -131.58027778	Highly used recreation beach approx. 6 miles south of downtown. Concrete enclosure at outlet, marine water flows over enclosure.	2017, 2018, 2019, 2020
Mountain Point Surprise Beach	55° 17' 36.72" N 55.29353	-131° 32' 51.49"W -131.54750	Local recreation beach used for tourist group snorkeling, near Mountain Point boat launch, approx. 8 miles south of downtown.	2018, 2019, 2020
Mountain Point Cultural Food	55° 17' 34.05" N 55.29279	-131° 32' 21.08" W -131.53917	Local cultural food gathering beach, near Mountain Point boat launch, approx. 8 miles south of downtown.	2018, 2019, 2020

Site ID	Latitude	Longitude	Site description	Years Monitored
Herring Cove	55° 19" 34.57" N 55.32627	-131° 31' 22.13" W -131.52278	Local recreation beach used for tourist groups, northern end of Herring Cove, approx. 10.5 miles south of downtown.	2018, 2019, 2020