

# Ketchikan Beach Monitoring 2017-2018 Field Report

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Alaska Department of Environmental Conservation



## Acknowledgements

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Work was completed in cooperation with EPA, Ketchikan Indian Community, several DEC programs (Water Quality Standards, Assessment and Restoration (WQSAR), Compliance, Cruise Ship, and Wastewater Discharge Authorization), the City of Ketchikan, and the Ketchikan Gateway Borough.

Report cover photo was taken by Ketchikan Indian Community at Surprise Beach.

## Project Summary

The Alaska BEACH program was initiated along the Ketchikan coastline to monitor fecal waste contamination during the 2017 recreation season, and continued during the 2018 recreation season. Marine water samples were collected weekly at nine monitoring locations from July through September 2017, and at 13 monitoring locations from May through September 2018 to evaluate potential health risks indicated by fecal coliform and enterococci bacteria, and to notify the public when levels exceeded state standards. To address additional community and tribal concerns in southern Ketchikan, the 2018 monitoring program included two alternating locations at Rotary Beach (Rotary Pool and Rotary Beach) and Mountain Point (Mountain Point Surprise Beach and Mountain Point Cultural Foods), and a new location at Herring Cove. Figure 1 shows the 13 monitoring locations. Table 1 provides specific site locations and descriptions, and Table 2 provides rationale for selecting the specific site locations.

The 2017/2018 analytical tests for enterococci revealed that 11 of the 13 monitoring sites failed to meet the Alaska water quality standard (WQS) statistical threshold value (STV) criterion for recreation use, and 11 of the 13 sites failed to meet the Alaska WQS 30-day geometric mean criterion for recreation use.

The 2017/2018 analytical tests for fecal coliform bacteria revealed that 11 of the 13 of the monitoring sites failed to meet the Alaska WQS single sample criteria for aquaculture, seafood processing, and harvesting for consumption uses, while 10 of the 13 sites failed to meet the Alaska WQS geometric mean criterion for harvesting for consumption use.

In addition to bacteria testing, the Alaska Department of Environmental Conservation (DEC) conducted a source investigation of the pollution using microbial source testing for bacteria genetic identification. The human host marker and the gull host marker were detected at all 11 monitoring locations<sup>1</sup>. Nine of the 11 monitoring locations also had dog host markers detected. Tables 3 through 6 provide analytical results in summary tables and individual sample tables for the 2017 and 2018 recreation seasons.

Numerous potential bacteria sources are present along the Ketchikan coast, including: private and/or public sewer treatment system outfall(s), public treatment system emergency bypasses, sewer line breaks, individual septic tanks, wildlife, pet feces, boats in harbor and launch areas, and private watercraft, ferries, and cruise ships. The data collected to date are not sufficient to determine which bacteria sources are negatively affecting the marine water.

This document does not evaluate whether the coastal waters are impaired under Clean Water Act section 303(d), although the data summarized in this report may be used in a future impairment determination when preparing the 2020 Integrated Report. Prior to making a decision on impairment DEC will issue a public notice and comment period for the community, agencies, and local and tribal governments, and other interested stakeholders.

## Next Steps

DEC Beach program has been working with other DEC programs, the Ketchikan Borough, City of Ketchikan and other stakeholders to collect concurrent samples from various potential pollutant sources in the area. A comprehensive, more detailed report is in development, and planned for release in early 2019.

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<sup>1</sup> Only 11 of 13 monitoring sites were tested for genetic markers. The Pool and Cultural Food sites were the alternating monitoring locations at Rotary Park and Mountain Point, respectively, and were analyzed for microbial source testing.

The comprehensive report will be posted on the Beach website <http://dec.alaska.gov/water/water-quality/beach-program/> and Water Quality Reports website at <http://dec.alaska.gov/water/water-quality/reports>.

Further bacteria and microbial source testing is planned for the 2019 Ketchikan BEACH Monitoring Program which will help determine local bacteria pollution sources, support the development of solutions, and the implementation of bacteria source reduction in these areas.

In addition, DEC's Alaska Clean Water Actions (ACWA) Grants Program plans to fund the development of a Watershed Management Plan which is designed to address the current pollution sources in Ketchikan and protect high quality waters. The plan evaluates storm water management options for reducing the pollutants (especially bacteria) entering Ketchikan freshwater watersheds and coastal marine waters from known diverse point and nonpoint bacteria discharges and sources. The plan will follow the Environmental Protection Agency's (EPA) 9-element watershed planning process.

### About Alaska's Beach Program

In response to increased occurrences of water-borne illnesses U.S. Congress passed the Beaches Environmental Assessment and Coastal Health (BEACH) Act in 2002. The U.S. Environmental Protection Agency (EPA) administers grant funds to states, tribes and territories under the Act to establish monitoring and public notification programs. The BEACH program has established national marine water quality monitoring and reporting standards for fecal waste contamination and notifies the public when levels exceed state standards.

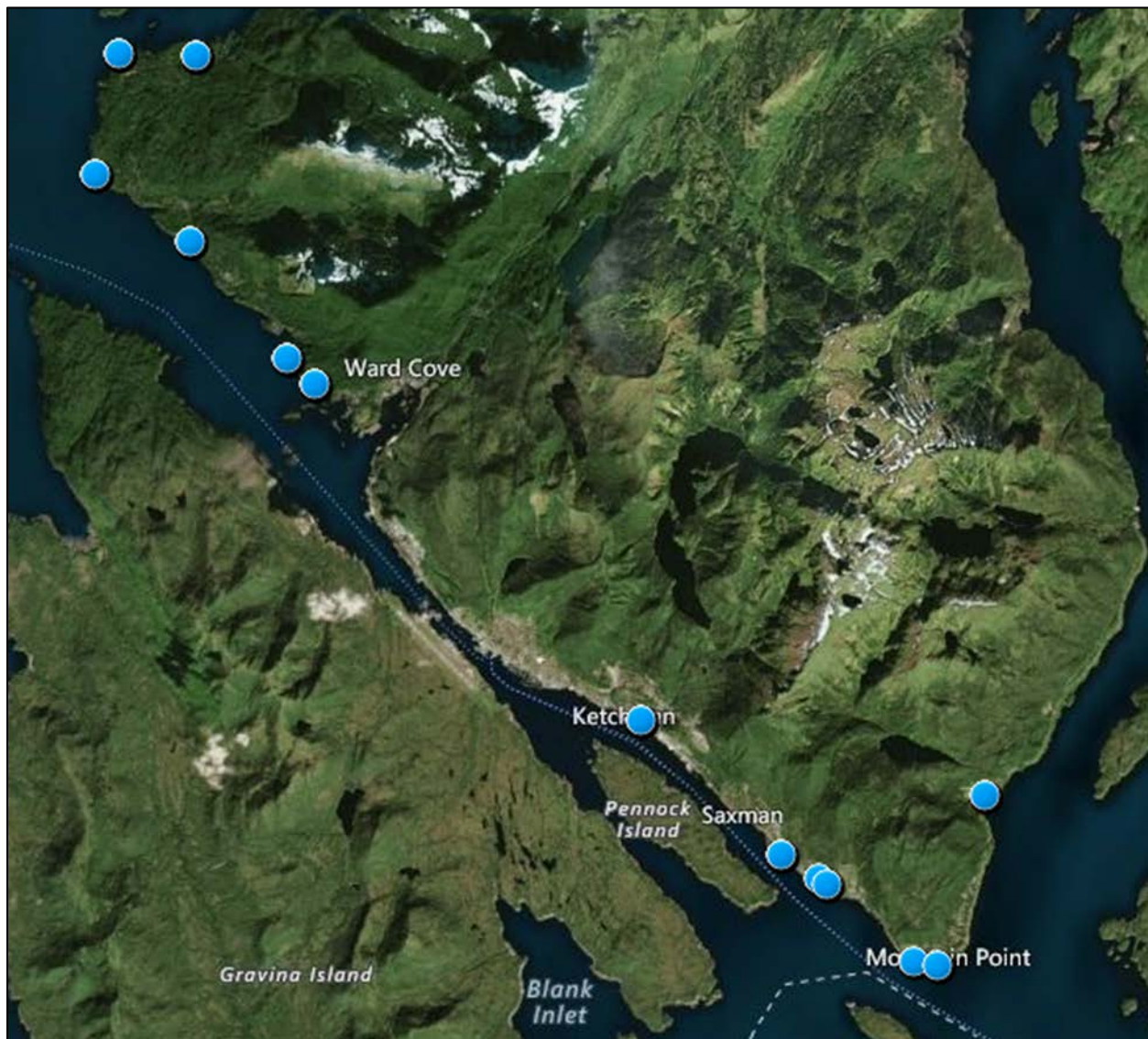
Congress passed the BEACH Act because pathogens in recreational waters can be naturally occurring, or they can be introduced through contamination events with the feces of humans and other warm-blooded animals. Two groups of bacteria, fecal coliform and enterococci, are measured as indicators of fecal waste contamination in marine waters. Commonly documented health issues from swimming in contaminated recreational waters include gastrointestinal illness, respiratory illnesses, skin rashes, and ear, eye, and wound infections. People who get an illness from swimming in contaminated water do not always associate their illness with swimming because the onset of the illness is delayed. For example, viral gastrointestinal illness is often mild, short-lived, and self-limiting, and symptoms usually take up to 24 hours to appear. Outbreaks of disease are usually documented when many people seek medical assistance because of a similar illness or the severity of the illness. However, people with mild illness often do not seek medical assistance. Therefore, disease outbreaks are often inconsistently recognized and the outbreak information in the literature is likely underestimated<sup>2</sup>.

In Alaska, the Alaska DEC's Division of Water uses EPA grant funds for the Alaska BEACH program. Alaska's BEACH program provides funds to municipalities, watershed organizations, and tribal groups to conduct water quality monitoring on high-priority public beaches. BEACH programs have been set up in 15 Alaskan communities including Ketchikan. The Ketchikan BEACH program was developed in collaboration with the Ketchikan Indian Association (KIC), City of Ketchikan, and Ketchikan Gateway Borough. In 2017 and 2018, KIC performed the monitoring activities at the nine and 11 beaches in Ketchikan, respectively.

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<sup>2</sup> EPA National Beach Guidance and Required Performance Criteria for Grants, 2014 Edition (EPA-823-B-14-001).

**Figure 1 – 2018 Ketchikan BEACH Monitoring Program; 13 beach monitoring locations depicted as blue circles.**



**Table 1. Monitoring Locations and Site Descriptions**

Site ID	Latitude	Longitude	Site description
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.
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.
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.
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.
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.
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.
Thomas Basin	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.
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.
Rotary Park Pool (aka Bugges Beach)	55° 18' 31.50" N	-131° 34' 39.34" W	Highly used recreation beach approx. 6 miles south of downtown. Concrete enclosure at outlet, marine water flows over enclosure.
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.
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.
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.
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.

**Table 2. Monitoring Site Selection Rationale**

Site ID	Potential point and nonpoint sources <sup>3</sup> present in coastal marine waters (as indicated by ✓)								
	Individual septic tanks	Private sewer treatment system outfall(s)	Wildlife Pet feces	Private watercraft	Cruise ships, Ferries	Public sewer treatment system outfall(s)	Sewer line breaks	Public treatment system emergency bypasses	Boats at boat launches & in harbor areas
Knudson Cove	✓	✓	✓	✓					✓
Beacon Hill	✓	✓	✓	✓					
South Point Higgins	✓	✓	✓	✓	✓			✓	
Shull	✓	✓	✓	✓	✓			✓	
Sunset	✓	✓	✓	✓	✓			✓	
South Refuge Cove	✓	✓	✓	✓	✓			✓	
Thomas Basin			✓	✓			✓	✓	✓
Seaport			✓	✓	✓		✓	✓	
Rotary Pool & Beach			✓	✓	✓		✓		
Mountain Point Surprise Beach & Cultural Food			✓	✓	✓	✓	✓		✓
Herring Cove	✓	✓	✓	✓			✓		

<sup>3</sup> Sources vary in volume and bacterial level.

**Table 3. Summary of Enterococci Bacteria Results for 2017 and 2018**

<b>2017-2018 Enterococci Bacteria Results Summary</b>						
<b>Monitoring Locations</b>	<b>Total # of Samples</b>	<b>Maximum (MPN/100 mL)<sup>4</sup></b>	<b>% of 2017 Samples &gt; 130 STV<sup>5 6</sup></b>	<b>% of 2018 Samples &gt; 130 STV</b>	<b>Maximum Rolling 30-Day Geometric Mean of 2017 Data<sup>7 7</sup></b>	<b>Maximum Rolling 30-Day Geometric Mean of 2018 Data</b>
Knudson Cove	27 <sup>8</sup>	<b>2603<sup>9</sup></b>	<b>22</b>	<b>17</b>	<b>87</b>	<b>54</b>
Beacon Hill	27 <sup>8</sup>	<b>579</b>	<b>11</b>	5	<b>55</b>	21
South Point Higgins Beach	27 <sup>8</sup>	<b>1120</b>	<b>11</b>	<b>28</b>	<b>67</b>	<b>70</b>
Beach at Shull Road	27 <sup>8</sup>	<b>727</b>	0	<b>17</b>	<b>44</b>	<b>37</b>
Beach at Sunset Drive	27 <sup>8</sup>	<b>248</b>	<b>11</b>	5	<b>42</b>	30
South Refuge Cove State Recreation Site	27 <sup>8</sup>	<b>1300</b>	<b>11</b>	0	<b>60</b>	27
Thomas Basin	27 <sup>8</sup>	<b>2755</b>	<b>33</b>	<b>28</b>	<b>106</b>	<b>451</b>
Seaport Beach	27 <sup>8</sup>	<b>250</b>	<b>33</b>	0	<b>83</b>	13
Rotary Park Pool	20 <sup>10</sup>	<b>1120</b>	<b>44</b>	<b>27</b>	<b>437</b>	30
Rotary Park Beach	7 <sup>11</sup>	10	NA <sup>12</sup>	0	NA	8
Mountain Point – Cultural Food	11 <sup>13</sup>	<b>414</b>	NA	<b>18</b>	NA	<b>43</b>
Mountain Point – Surprise Beach	7 <sup>14</sup>	51	NA	0	NA	8
Herring Cove	18 <sup>15</sup>	<b>457</b>	NA	<b>22</b>	NA	<b>113</b>

<sup>4</sup> MPN – Most Probable Number is the measurement unit for enterococci bacteria (ASTM Method D6503).

<sup>5</sup> STV - Statistical Threshold Value.

<sup>6</sup> Not more than 10% of samples in a 30-day period may exceed 130 enterococci CFU/100 ml in Alaska Water Quality Standards (WQS) (18 AAC 70.020(b)(14)(B)(i)) for the Water Recreation, Contact Recreation designated use.

<sup>7</sup> Using the 30-day Geometric Mean for Alaska WQS (18 AAC 70.020(b)(14)(B)(i)) may not exceed 35 enterococci CFU/100 ml for the Water Recreation, Contact Recreation.

<sup>8</sup> 9 samples were collected in 2017, and 18 samples were in 2018 at Knudson Cove, Beacon Hill, South Point Higgins Beach, Beach at Shull Road, Beach at Sunset Drive, South Refuge Cove State Recreation Site, Thomas Basin and Seaport Beach.

<sup>9</sup> Bolded red font results exceed the Alaska Water Quality Standards (18 AAC 70.020(b)(14)(B)(i), either the 30-day geomean OR the 10% criteria provision).

<sup>10</sup> 9 samples were collected in 2017, and 11 samples were in 2018 at Rotary Park Pool.

<sup>11</sup> 7 samples were collected in 2018 at Rotary Park Pool, this was a new monitoring location in 2018.

<sup>12</sup> NA – beach not sampled in 2017.

<sup>13</sup> 11 samples were collected in 2018 at Mountain Point – Cultural Food, this was a new monitoring location in 2018.

<sup>14</sup> 7 samples were collected in 2018 at Mountain Point – Surprise Beach, this was a new monitoring location in 2018.

<sup>15</sup> 18 samples were collected in 2018 at Herring Cove, this was a new monitoring location in 2018.



**Table 4. Summary of Fecal Coliform Bacteria Results for 2017 and 2018**

2017-2018 Fecal Coliform Bacteria Results Summary						
Monitoring Locations	Total # of Samples	Maximum (CFU/100 mL) <sup>16</sup>	% of 2017 Samples >31 WQS <sup>17</sup>	% of 2018 Samples >31 WQS <sup>17</sup>	Geometric Mean of 2017 Data <sup>18</sup>	Geometric Mean of 2018 Data <sup>18</sup>
Knudson Cove	27 <sup>19</sup>	<b>200</b> <sup>20</sup>	<b>33</b>	<b>22</b>	<b>20</b>	13
Beacon Hill	27 <sup>19</sup>	<b>66</b>	<b>11</b>	<b>17</b>	10	12
South Point Higgins Beach	27 <sup>19</sup>	<b>236</b>	<b>22</b>	<b>39</b>	6	<b>21</b>
Beach at Shull Road	27 <sup>19</sup>	<b>167</b>	<b>22</b>	<b>28</b>	<b>15</b>	<b>20</b>
Beach at Sunset Drive	27 <sup>19</sup>	<b>142</b>	<b>33</b>	<b>33</b>	14	<b>20</b>
South Refuge Cove State Recreation Site	27 <sup>19</sup>	<b>88</b>	<b>11</b>	<b>33</b>	10	<b>17</b>
Thomas Basin	27 <sup>19</sup>	<b>Confluent Growth (&gt;250)</b>	<b>33</b>	<b>44</b>	13	<b>28</b>
Seaport Beach	27 <sup>19</sup>	<b>Confluent Growth (&gt;250)</b>	<b>33</b>	<b>17</b>	<b>16</b>	7
Rotary Park Pool	20 <sup>21</sup>	<b>200</b>	<b>33</b>	<b>36</b>	<b>24</b>	<b>16</b>
Rotary Park Beach	7 <sup>22</sup>	26	NA <sup>23</sup>	0	NA <sup>23</sup>	9
Mountain Point – Cultural Food	11 <sup>24</sup>	<b>118</b>	NA	<b>45</b>	NA	<b>18</b>
Mountain Point – Surprise Beach	7 <sup>25</sup>	23	NA	0	NA	7
Herring Cove	18 <sup>26</sup>	<b>318</b>	NA	<b>72</b>	NA	<b>47</b>

<sup>16</sup> CFU – Colony Forming Unit is the measurement unit for fecal coliform bacteria (APHA Method 9222D).<sup>72</sup>

<sup>17</sup> Not more than 10% of samples may exceed 31 CFU/100 ml in Alaska Water Quality Standards (WQS) (18 AAC 70 (14)(D) for the designated use of harvesting for consumption of raw mollusks or other raw aquatic life.

<sup>18</sup> The most stringent WQS (18 AAC 70.020(b)(14)(D)) is for the designated use of harvesting for consumption of raw mollusks or other raw aquatic life; the geometric mean may not exceed 14 fecal coliform/100 ml. The fecal geometric mean is calculated for the entire recreation season.

<sup>19</sup> 9 samples were collected in 2017, and 18 samples were in 2018 at Knudson Cove, Beacon Hill, South Point Higgins Beach, Beach at Shull Road, Beach at Sunset Drive, South Refuge Cove State Recreation Site, Thomas Basin and Seaport Beach.

<sup>20</sup> Bolded red font results exceed the Alaska Water Quality Standards (18 AAC 70.020(b)(14)(D)).

<sup>21</sup> 9 samples were collected in 2017, and 11 samples were in 2018 at Rotary Park Pool.

<sup>22</sup> 7 samples were collected in 2018 at Rotary Park Pool, this was a new monitoring location in 2018.

<sup>23</sup> NA – beach not sampled in 2017.

<sup>24</sup> 11 samples were collected in 2018 at Mountain Point – Cultural Food, this was a new monitoring location in 2018.

<sup>25</sup> 7 samples were collected in 2018 at Mountain Point – Surprise Beach, this was a new monitoring location in 2018.

<sup>26</sup> 18 samples were collected in 2018 at Herring Cove, this was a new monitoring location in 2018.

**Table 5. 2017 Ketchikan BEACH Monitoring Results**

2017 Ketchikan BEACH Monitoring  
 Analytical Data Results

Sample Date	Knudson Cove			Beacon Hill			S Pt Higgins			Shull			Sunset			S Refuge Cove			Thomas Basin			Seaport			Rotary Pool		
	FC	Enteroc	MST	FC	Enteroc	MST	FC	Enteroc	MST	FC	Enteroc	MST	FC	Enteroc	MST	FC	Enteroc	MST	FC	Enteroc	MST	FC	Enteroc	MST	FC	Enteroc	MST
Jul 18/19	16	5.1		5	1.0		<1	1.0		8	6.2		<1	4.1		11	2.0		5	2.0		3 (<1)	3 (3.1)		6	3.0	
Jul 24/25	5	3.0		2	<1		8	4.1		167	124.6		16	8.5		11 (7)	6.1		9	4.1		7	2.0		68	45.7	
Jul 26/27	9	12.2		6	19.3		16 (2)	7.4		12	27.5		13	10.9		8	12.1		14	>2419.6		3	7.3		99	980.4	
Jul 31/Aug 1	167	15.6		6	26.6		<1	13.1		6	20.6		41	34.1		7	26.6		7	3.0		4 (7)	3.1		9	47.4	
Aug 8/9	98	1986.3	Human 1.38E <sup>+03</sup>	11	579.4	Human 1.60E <sup>+02</sup>	7 (3)	1119.9	Human DNQ	4	75.9	Human 1.68E <sup>+02</sup>	142	248.1	Human DNQ	8 (15)	1299.7	Human 1.53E <sup>+02</sup>	42	86.2	Human 1.38E <sup>+02</sup> Gull DNQ	21	204.6	Human 1.18E <sup>+03</sup>	27	980.4	Human DNQ Dog DNQ Gull 1.46E <sup>+02</sup> Goose ND
Aug 14/15	6 (9)	26.9	(26.3)	22	16.6		161	82.3		27	50.4		15	22.5		6	21.3		36	156.5		37	21.1		21	69.7	
Aug 22/23	>200	488.4		58	101.7		37	46.2		33	28.1		51	33.7		69	81.6		CONF	137.4		CONF	250.0		>200	1119.9	
Aug 29/	2	1.0		18	7.2		5	24.3		16	3.0		3 (2)	<1 (8.5)		7	13.0		<1	14.5		41	135.4		9	69.3	
Sep 13/	12	14.5		8	9.7		2	9.5		9	8.4		17	9.5		4	13.5		13	70.3		21	12		6	26.2	
Maximum Enteroc Geometric Mean		87			55			67			44			42			60			106			83			437	
Seasonal Fecal Geometric Mean	20			10			6			15			14			10			13			16			24		

**18 AAC 70 Alaska Water Quality Standards (amended as of April 6, 2018) - (14) Bacteria, For Marine Water Uses**

- (B) Water Recreation (i) contact recreation 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 STV of 130 enterococci CFU/100 ml.
- (B) Water Recreation (ii) secondary recreation In a 30-day period, the geometric mean of samples may not exceed 200 fecal coliform/100 ml, and not more than 10% of the samples may exceed 400 fecal coliform/100 ml.
- (D) Harvesting for Consumption of Raw Mollusks or Other Raw Aquatic Life (most stringent) 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.

Tides focus is on either side of low tide, using ebb and flow stages

- FC = fecal coliform bacteria
- Enteroc = enterococci
- ( ) shows duplicate results
- CFU - colony forming units
- MPN - most probable number
- STV - statistical threshold value
- CONF - Confluent Growth

**Table 6. 2018 Ketchikan BEACH Monitoring Results**

**2018 Ketchikan BEACH Monitoring Analytical Data Results**

Sample Date	Ketchikan Cove			Seaside Hill			SPH Higgin			Shull			Sunset			S for Lagoon Cove			Thomas Basin			Snagport			Robey Pool			Rotary Beach			Mountain Point Cultural Food			Mountain Point Superior Beach			Heating Cove		
	FC	Enteroc	MST	FC	Enteroc	MST	FC	Enteroc	MST	FC	Enteroc	MST	FC	Enteroc	MST	FC	Enteroc	MST	FC	Enteroc	MST	FC	Enteroc	MST	FC	Enteroc	MST	FC	Enteroc	MST	FC	Enteroc	MST						
17 May	28 (26)	2395 (2063)		3	183		5	31		3	30		3	20		5	74		1	10		<1	<10		<1	20		NA	NA	8	10		NA	NA	2	31			
23 May	144	142		36	30		84	61		132	20		48	63		64	95		35	51		51	10		191 (7)	10 (2)		NA	NA	46	106		NA	NA	94	30			
31 May	26	30		46	<10		48 (36)	60 (70)		27	<10		51	<10		49	<10		12	41		33	<10		23	10		NA	NA	21	20		NA	NA	9	<10			
6 Jun	35	<10		35	<10		33	<10		22 (26)	41 (18)		11	<10		18	41		139	173		13	30		36	30		NA	NA	103	121		NA	NA	123	309			
14 Jun	11	<10		46	<10		65	410		118	144		31	31		33	30		19	20		16	10		169	145		NA	NA	9	<10		NA	NA	32 (26)	10 (<10)			
20 Jun	6	<10		5	<10		8	<10		6	<10		4	10		6	<10		9	<10		3	20		NA	NA		13	10	NA	NA		15 (11)	<10 (<10)	67	<10			
27 Jun	17	<10		13	71		22	<10		15	20		12	<10		10	30		19	10		8 (8)	<10 (<10)		NA	NA		26	10	NA	NA		23	<10	13	<10			
2 Jul	9	76		30	<10		11	<10		26	<10		2 (17)	<10 (<10)		15	<10		41	<10		3	<10		NA	NA		8	<10	NA	NA		9	<10	18	10			
12 Jul	38	20		9	41		136	350		14	<10		28	<10		22 (29)	<10 (10)		37	30		5	10		NA	NA		8	<10	NA	NA		3	<10	33	41			
18 Jul	2	20		3	<10		2	<10		5	20		5	<10		7	<10		19	52		3	<10		NA	NA		4	10	NA	NA		2	<10	32 (31)	20 (30)			
26 Jul	21	20		30	52		235	134		4	<10		67	62		22 (19)	20 (13)		23	52		6	<10		NA	NA		13	<10	NA	NA		9	<10	45	<10			
3 Aug	6	20		30	<10		33	30		12 (8)	<10 (<10)		8	10		1	20		21 (24)	63 (52)		5	<10		NA	NA		5	10	NA	NA		5	51	18	20			
9 Aug	8	30	Human DNQ Dog ND Gull DNQ	30	10	Human DNQ Dog DNQ Gull DNQ	308	241	Human 2.99E+03 Dog 9.91E+03 Gull DNQ	119	727	Human 1.50E+03 Dog 2.99E+03 Gull 3.07E+03	93	367	Human 2.16E+03 Dog 1.86E+03 Gull DNQ	33	87	Human 7.71E+03 Dog ND Gull DNQ	220	2735	Human 2.87E+03 Dog 3.59E+03 Gull 9.94E+03	26	32	Human DNQ Dog DNQ Gull 7.84E+03	131	386	Human DNQ Dog 3.72E+03 Gull 2.42E+03	NA	NA	43	51	Human 8.77E+03 Dog DNQ Gull DNQ	NA	NA	210	201	Human 5.88E+03 Dog 1.23E+03 Gull 1.19E+03		
16 Aug	3 (2)	<10 (10)		7	10		5	<10		16	181		13	<10		3	<10		14	74		5	<10		9	10		NA	NA	4	10		NA	NA	81	31			
23 Aug	94	86		6	10		19	31		13	10		81	41		16	30		39	406		<1	<10		24	31		NA	NA	<1 (<1)	<10 (<10)		NA	NA	246	156			
30 Aug	3	<10		3	10		3	10		25	<10		8	10		38	<10		49	350		4	10		4 (6)	30 (<10)		NA	NA	4	40		NA	NA	56	20			
5 Sep	42 (37)	173 (131)		30	<10		3	<10		49	10		23	10		55	<10		72	528		5	10		3	<10		NA	NA	118	414		NA	NA	318	457			
12 Sep	3	<10		26	10		28	279		33	20		30	<10		25	41		26	180		63	<10		25	309		NA	NA	180 (136)		NA	NA	213	414				
Maximum Enteric Geometric Mean	94			21			70			37			30			27			451			13			30			8		43			8		113				
Seasonal Fecal Geometric Mean	33			12			21			20			20			17			28			7			16			9		18			7		47				

**3) AAC 70 Alaska Water Quality Standards (amended as of April 6, 2018) - (14) Bacteria, For Marine Water Uses**

**8) Water Recreation (1) contact recreation**  
 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 STV of 130 enterococci CFU/100 mL.

**9) Water Recreation (1) secondary recreation**  
 In a 30-day period, the geometric mean of samples may not exceed 200 fecal coliform/100 mL, and not more than 10% of the samples may exceed 400 fecal coliform/100 mL.

**(12) Swimming for Consumption of Raw Shell Bivalve or Other Raw Aquatic Life (except sponges)**  
 The geometric mean of samples may not exceed 14 fecal coliform/100 mL, and not more than 10% of the samples may exceed 30 CFU per 100 mL for a membrane filtration test.

Take focus 1's on either side of low tide, using 400 and flow stage.

FC = fecal coliform bacteria  
 Enter = enterococci  
 [ ] = below detection results  
 CFU = colony forming units  
 MPN = most probable number  
 STV = statistical threshold value  
 CONF = Confident Growth