Alaska Department of Environmental Conservation
Draft Waterbody Determination Paper
Ketchikan Beaches, Alaska
Pathogens Determination

Recommendation

Waterbody: Ketchikan Beaches

Category Recommendation: 5

Water Quality Standard Affected: Pathogens

Designated Uses Affected: See waterbody specific appendices A-K

Pollutant: Pathogens in marine coastal water

Executive Summary

The purpose of this document is to describe the data collection, data analysis, and conclusions reached in evaluating Ketchikan beaches for the 2020 Integrated Report (IR). These beaches were not included in previous IRs, and are located along the coastline near Ketchikan Alaska.

Based on the data analysis below, 11 beaches (Table 1) are found to be impaired for the marine pathogens standard for several designated uses and are recommended for inclusion in Category 5 of the 2020 IR. Two beaches were analyzed and found to be attaining the marine pathogens standard, Rotary Park Beach and Mountain Point Surprise Beach. Figures 1 and 2 show locations of the Ketchikan beaches.

Table 1: Ketchikan beaches

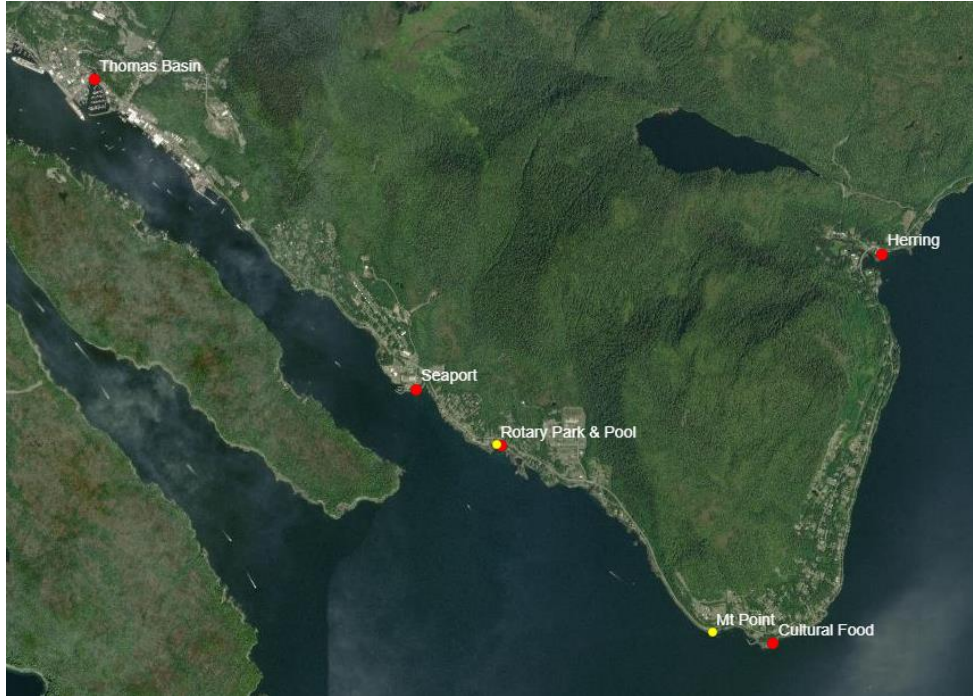| Impaired Ketchikan Area Beaches		
Knudson Cove	Beach off Sunset Cove	Rotary Park Pool
Beacon Hill	Refuge Cove	Mountain Point Cultural Food
South Point Higgins Beach	Thomas Basin	Herring Cove
Beach at Shull Road	Seaport Beach	

Figure 1 Beach locations south of Ketchikan, Mountain Point Surprise Beach and Rotary Park Beach, which were attaining water quality standards, are shown in yellow.

Figure 2 Beach locations north of Ketchikan

Impairment Evaluation

Data Sources

The Alaska Beach Monitoring program is part of a nationwide effort to decrease the incidence of water-borne illness at public beaches under the federal Beaches Environmental Assessment and Coastal Health (BEACH) Act. Marine water samples were collected weekly at recreational beaches to evaluate potential health risks indicated by fecal coliform and enterococci bacteria, and to notify the public when levels exceeded state standards. Nine sites were sampled during the recreational season in 2017, 13 sites in 2018[1], and 12 sites in 2019.

Table 2. Data Sources

Date	Data Source	Type
July – Sept 2017	DEC, Ketchikan Indian Community	Grab
May - Sept 2018	DEC, Ketchikan Indian Community	Grab
May - Sept 2019	Southeast Watershed Coalition, Ketchikan Indian Community	Grab

Data used in pathogens impairment determination

The most recent two full recreation season datasets (2018 and 2019) were used for evaluating each beach for the 2020 IR determination; the 2017 dataset consists of half a recreation season and is included for reference. Fecal coliform and enterococci colony forming units (CFU) results were compared to applicable criteria in 18 AAC 70.020 (14)[2], see Table 3.

Table 3. Alaska's Water Quality Standards at 18 AAC 70(14), fecal coliform for marine water uses[2]

Use	Criteria
(A) Water Supply (i) aquaculture	For products normally cooked, the geometric mean of samples taken in a 30-day period may not exceed 200 fecal coliform/100 ml, and not more than 10% of the samples may exceed 400 fecal coliform/100 ml. For products not normally cooked, the geometric mean of samples taken in a 30-day period may not exceed 20 fecal coliform/100 ml, and not more than 10% of the samples may exceed 40 fecal coliform/100 ml.
(A) Water Supply (ii) seafood processing	In a 30-day period, the geometric mean of samples may not exceed 20 fecal coliform/100 ml, and not more than 10% of the samples may exceed 40 fecal coliform/100 ml.
(A) Water Supply (iii) industrial	Where worker contact is present, the geometric mean of samples taken in a 30-day period may not exceed 200 fecal coliform/100 ml, and not more than 10% of the samples may exceed 400 fecal coliform/100 ml.
(B) Water Recreation (ii) secondary	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.

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[1] The Beacon Hill monitoring location was discontinued in 2019 due to sampler safety issues; data was collected for 2017 and 2018.

[2] Alaska Department of Environmental Conservation. 2020. 18 AAC 70.020(14) Water Quality Standards. Amended as of March 5, 2020.

recreation	
(D) Harvesting for Consumption of Raw Mollusks or Other Raw Aquatic Life	The geometric mean of samples may not exceed 14 fecal coliform/100ml; and not more than 10% of the samples may exceed; - 43 MPN per 100ml for a five-tube decimal dilution test; - 49 MPN per 100ml for a three-tube decimal dilution test; - 28 MPN per 100ml for a twelve-tube single dilution test; - 31 CFU per 100ml for a membrane filtration test (see note 14[3]).

Table 4. Alaska's Water Quality Standards at 18 AAC 70(14) enterococci for marine water uses[2]

Use	Criteria
(B) Water Recreation (i) contact recreation	In a 30-day period, the geometric mean of samples may not exceed 35 enterococci Colony Forming Unit (CFU)/100 ml, and not more than 10% of the samples may exceed a statistical threshold value (STV) of 130 enterococci CFU/100 ml.

Data Evaluation

Methods

The Pathogen Listing Methodology[4] was used to evaluate and assess fecal bacteria impairment on the Ketchikan beaches; data met minimum requirements as outlined in methodology. Bacteria testing included fecal coliform (EPA Standard Methods 9222D), enterococci (Method ASTM D6503-99 by MPN), and microbial source tracking for bacteria genetic identification (human, dog and gull).

Hypothesis Tests

Fecal coliform

- The individual sample result for fecal coliform (duration)
- may not exceed 31 (CFU) per 100mL (magnitude)
- during more than 10% of the time (frequency).

- The 30-day geometric mean for fecal coliform (duration)
- may not exceed 14 CFU/100mL (magnitude)
- more than once in a two year period (frequency).

Enterococci

- The individual sample result for enterococci (duration)
- may not exceed 130 CFU/100mL (magnitude)
- during more than 10% of the time (frequency).

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[3] Note 14. When fecal coliform are monitored in waters designated as state approved shellfish harvesting and growing waters, these waters are also subject to 18 AAC 34.010(19).

[4] Alaska Department of Environmental Conservation. 2019. Listing Methodology for Determining Water Quality Impairments from Pathogens. Amended as of June 11, 2019.

- The 30-day geometric mean for enterococci (duration)
- may not exceed 35 CFU/100mL (magnitude)
- more than once in a two year period (frequency).

A waterbody is considered impaired when <u>at least one</u> 30-day sampling period per water year demonstrates an exceedance of one <u>or</u> both parts of the criterion (i.e., 30-day geometric mean; or not more than 10% may exceed provision) during both years of sampling. Both years considered must be within a five year period, see Table 4.

Table 4. Null and alternate hypothesis tests

Null Hypothesis	Waterbody is not impaired	≤ 10% exceedance of samples, 30-day period geometric mean
Alternative Hypothesis	Waterbody is impaired	> 10% exceedance of samples, 30-day period geometric mean

Results

Eleven Ketchikan beaches have persistent bacteria exceedances in marine coastal waters, and meet criteria for impairment as outlined in the Pathogens Listing Methodology[4]. See appendices A-K for waterbody specific results and evaluation.

Potential Pollutant Sources

Numerous potential bacteria sources are present along the Ketchikan coast, including private and/or public sewer treatment system outfalls, public sewer treatment system emergency bypass discharges, sewer collection system deficiencies, individual septic tanks, wildlife, pet feces, boats in harbor and launch areas, and private watercraft, ferries, and cruise ships. Waterbody specific potential pollutant sources are listed by individual beach in the appendices. Data collected to date are not sufficient to determine which bacteria sources are negatively affecting marine water uses at specific beaches.

Microbial Source Tracking testing was conducted for to identify potential sources of bacteria, however there are no state criteria for comparison. Samples were collected during one sampling event per recreation season (August 2018 and 2019). Human identifiers were quantifiable, while dog and gull identifiers were detected but not quantifiable.

Conclusion

Eleven Ketchikan beaches are recommended for placement in Category 5 for Pathogens in marine coastal waters. See appendices A-K for waterbody specific results and evaluation.

Appendices A-K

Appendix A: Knudson Cove

Appendix B: *Beacon Hill*

Appendix C: *South Point Higgins Beach*

Appendix D: *Beach at Shull Road (Shull Beach)*

Appendix E: *Beach off Sunset Drive (Sunset Beach)*

Appendix F: *Refuge Cove*

Appendix G: *Thomas Basin Harbor*

Appendix H: *Seaport Beach*

Appendix I: *Rotary Park Pool*

Appendix J: *Mountain Point Cultural Food*

Appendix K: *Herring Cove*

Appendix A
Knudson Cove, Ketchikan, Alaska
Pathogens Determination

Knudson Cove, located in Ketchikan within the southern end of Clover Pass (Figure 1), is recommended for inclusion as impaired in Category 5 in the 2020 IR for exceedance of the pathogens criteria for marine coastal waters. Knudson Cove was not included in previous IRs. Based on data collected in 2018 and 2019, Knudson Cove does not meet the pathogen criteria for 4 of the 6 designated uses (Tables 2 and 3).

Basic waterbody information

Table 1. Basic waterbody information

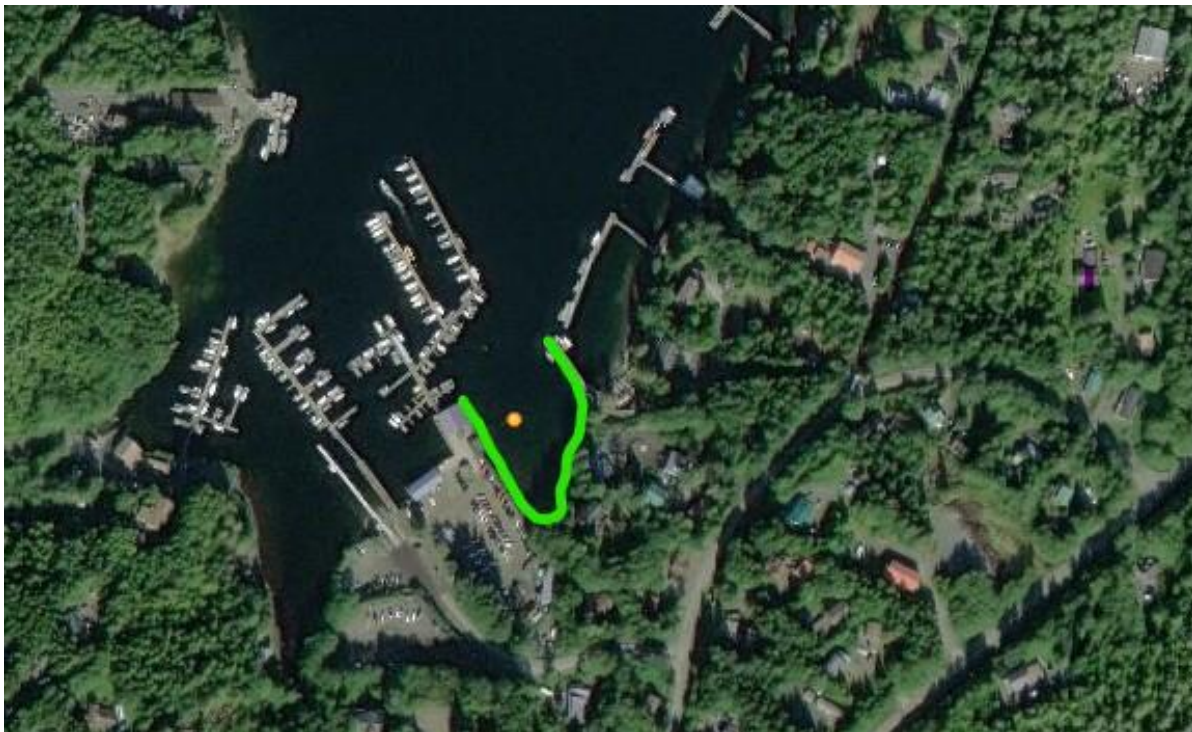|	
Assessment Unit ID	AK_B_1010203_001 (21AKBCH - AK406019)
Assessment Unit Name	Knudson Cove Beach
Location description	Northwest of Ketchikan within Clover Pass; HUC 1901010203
Water Type	Bay
Water Size	42 acres
Area of impairment	0.12 miles of coastline
Time of impairment	Year round
Latitude/Longitude	55.4720, -131.7963

Figure 1. Knudson Cove monitoring site and impaired beach segment

Pollutant status

Table 2. Alaska's Water Quality Standards at 18 AAC 70(14), fecal coliform for marine water uses[2]

Use	Status
(A) Water Supply (i) aquaculture	Supporting normally cooked; Not supporting not normally cooked
(A) Water Supply (ii) seafood processing	Not supporting
(A) Water Supply (iii) industrial	Supporting
(B) Water Recreation (ii) secondary recreation	Supporting
(D) Harvesting for Consumption of Raw Mollusks or Other Raw Aquatic Life	Not supporting

Table 3. Alaska's Water Quality Standards at 18 AAC 70(14) enterococci for marine water uses[2]

Use	Status
(B) Water Recreation (i) contact recreation	Not supporting

Results

Knudson Cove has persistent bacteria exceedances in marine coastal waters, and meets criteria for impairment as outlined in the [Pathogen Listing Methodology](#)[3.] The following tables and graphs present the 2018-2019 data with the pathogen marine water designated uses.

Table 4 summarizes the most recent 2 years of data with criteria exceedences. Figures 3 and 4 show fecal results, and Figures 5 and 6 show enterococci results compared to the single sample percent criteria. Tables 5 and 6 show sample results compared to fecal coliform and enterococci geometric means. Tables 7 and 8 show impairment frequency summaries.

Table 4. 2018-2019 Fecal coliform and enterococci summary

Analytical test	No. of Samples	Maximum Result	% Exceedances		Geometric Mean	
			2018	2019	2018	2019
Fecal coliform (CFU/100mL)	36	456[1]	22	44	13	22
Enterococci (MPN/100mL)	36	2603	17	11	54	39

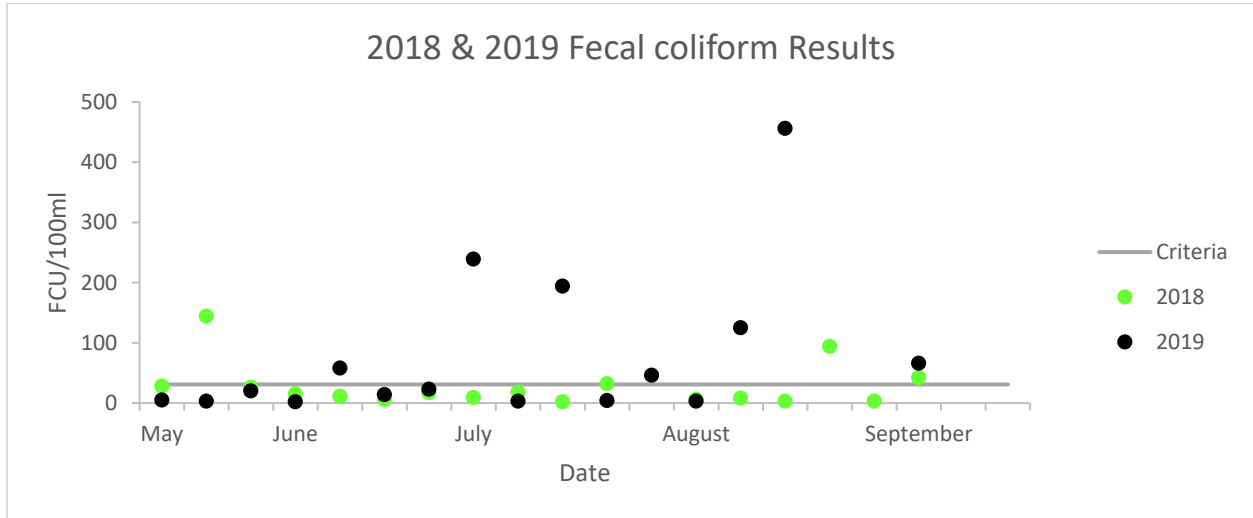[1] Bold red font indicates exceedance of criteria

Figure 2. 2018-2019 Fecal coliform sample results

Table 5. 2018-2019 Fecal coliform geometric means

Sample Season	Rolling 30-day Period	Geometric Mean
2018	5/17/2018 to 9/12/2018	**22**
2019	5/15/2019 to 9/18/2019	13

[1] Bold red font indicates exceedance of criteria
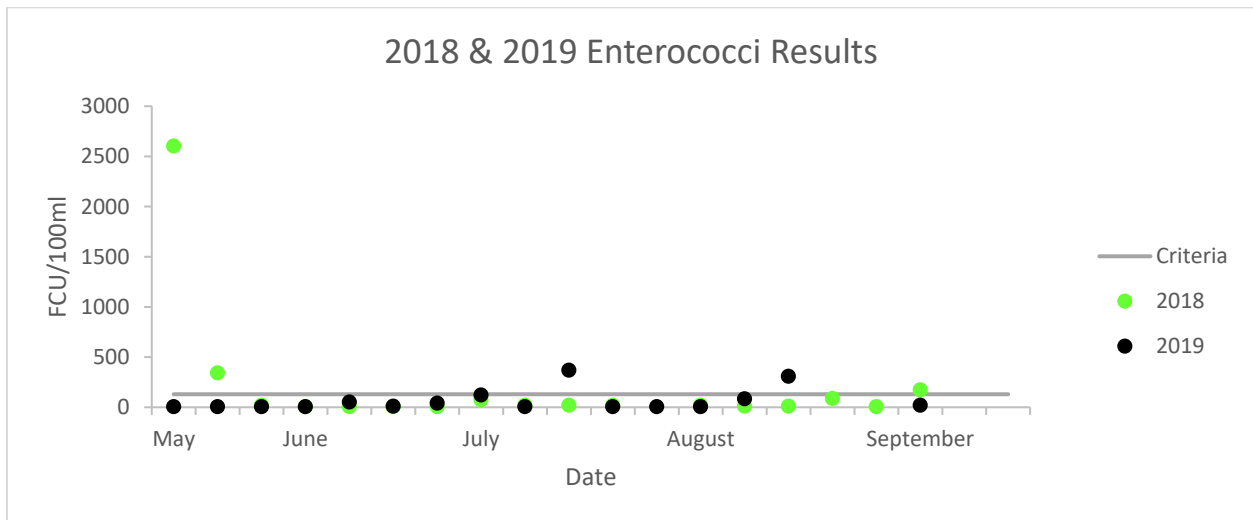
Figure 3. 2018-2019 enterococci sample results

Table 6. 2018-2019 enterococci geometric means

2018		2019	
Rolling 30-day Period	**Geometric Mean**	**Rolling 30-day Period**	**Geometric Mean**
06-14-2018 to 05-15-2018	**54**[1]	06-11-2019 to 05-12-2019	8
06-20-2018 to 05-21-2018	15	06-19-2019 to 05-20-2019	9
06-27-2018 to 05-28-2018	7	06-25-2019 to 05-26-2019	14
07-02-2018 to 06-02-2018	9	07-02-2019 to 06-02-2019	26
07-12-2018 to 06-12-2018	11	07-10-2019 to 06-10-2019	26
07-18-2018 to 06-18-2018	15	07-17-2019 to 06-17-2019	**39**
07-26-2018 to 06-26-2018	20	07-23-2019 to 06-23-2019	34
08-01-2018 to 07-02-2018	26	07-29-2019 to 06-29-2019	22
08-09-2018 to 07-10-2018	17	08-07-2019 to 07-08-2019	12
08-16-2018 to 07-17-2018	15	08-13-2019 to 07-14-2019	21
08-23-2018 to 07-24-2018	20	08-21-2019 to 07-22-2019	20
08-30-2018 to 07-31-2018	15	[1] Bold red font indicates exceedance of criteria	
09-05-2018 to 08-06-2018	24		
09-12-2018 to 08-13-2018	21		
06-27-2018 to 05-28-2018	7		
07-02-2018 to 06-02-2018	9		

Table 7. Fecal coliform impairment frequencies summary

18AAC70(14)(D) Harvesting for Consumption of Raw Mollusks or Other Raw Aquatic Life	Geometric mean of samples may not exceed 14 fecal coliform/100 ml (seasonal sample set)		Not more than 10% of the samples may exceed 31 fecal coliform CFU/100ml	
Metric or Parameter	**2018**	**2019**	**2018**	**2019**
Target Type 1 Error	0.2	0.2	0.2	0.2
Allowed Exceedance Frequency	>1	>1	10%	10%
Total Exceedances	0	1	4	8
Total Trials	1	1	18	18
Raw Exceedance Frequency	0%	100%	22%	44%
Is Criteria Exceeded	No	**Yes**	**Yes**	**Yes**

Table 8. Enterococci impairment frequencies summary

18AAC70(14)(D)(B) Contact Recreation	In a 30-day period, the geometric mean of samples may not exceed 35 Enterococci CFU/100ml		Not more than 10% of the samples may exceed a STV of 130 Enterococci CFU/100ml	
Metric or Parameter	**2018**	**2019**	**2018**	**2019**
Target Type 1 Error	0.2	0.2	0.2	0.2
Allowed Exceedance Frequency	>1	>1	10%	10%
Total Exceedances	1	1	3	2
Total Trials	14	11	18	18
Raw Exceedance Frequency	14%	18%	17%	11%
Is Criteria Exceeded	**Yes**	**Yes**	**Yes**	**Yes**

Potential Pollutant Sources

Knudson Cove includes beach and residential areas, and a small boat harbor. Potential pathogen sources along the marine coast consists of individual septic systems, private sewer treatment system outfalls, wildlife and pet feces, private watercraft, and boats at boat launches and in harbor areas.

Waterbody Specific Conclusion

Knudson Cove is recommended for inclusion as impaired in Category 5 in the 2020 IR for exceedance of the pathogens criteria for marine coastal waters. Data from two recreation seasons of pathogen monitoring within Knudson Cove marine waters indicate that the waterbody is not meeting criteria for 4 designated uses:

- aquaculture for products not normally cooked
- seafood processing
- harvesting for consumption of raw mollusks or other raw aquatic life
- contact recreation

Knudson Cove marine waters do meet criteria for 2 designated uses[5]:

- industrial
- secondary recreation

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[5] Knudson Cove marine waters does meet one part of (A) Water Supply (i) aquaculture which is for products normally cooked.

Table 9: 2018-2019 fecal coliform and enterococci data summary

2018 Sample Date	Fecal coliform CFU/100ml	Enterococci MPN/100ml	2019 Sample Date	Fecal coliform CFU/100ml	Enterococci MPN/100ml
May 17	28	**2603**[1]	May 15	5	<10
May 22	**144**	**341**	May 22	3	<10
May 31	26	20	May 29	20	<10
Jun 6	15	<10	Jun 5	2	31
Jun 14	11	<10	Jun 11	**58**	52
Jun 20	6	<10	Jun 19	14	10
Jun 27	17	<10	Jun 25	23	41
Jul 2	9	74	Jul 2	**239**	121
Jul 12	18	20	Jul 10	3	<10
Jul 18	2	20	Jul 17	**194**	**369**
Jul 26	**32**	20	Jul 23	4	<10
Aug 1	6	20	Jul 29	**46**	<10
Aug 9	8	10	Aug 7	3	<10
Aug 16	3	10	Aug 13	**125**	84
Aug 23	**94**	86	Aug 21	**456**	**309**
Aug 30	3	<10	Sep 4	**66**	20
Sep 5	**42**	**173**	Sep 10	**44**	<10
Sep 12	3	<10	Sep 18	12	121
Seasonal Geometric Mean	13			**22**	
Maximum Geometric Mean		**54**			**44**

[1] Bold red font indicates exceedance of criteria

Appendix B
Beacon Hill, Ketchikan, Alaska
Pathogens Determination

Beacon Hill, located in Ketchikan on the northern end of South Higgins Point (Figure 1), is recommended for inclusion as impaired in Category 5 in the 2020 IR for exceedance of the pathogens criteria for marine coastal waters. Beacon Hill was not included in previous IRs. Based on data collected in 2017 and 2018, Beacon Hill does not meet the pathogen criteria for 3 of the 6 designated uses (Table 2 and 3).

Basic waterbody information

Table 1. Basic waterbody information

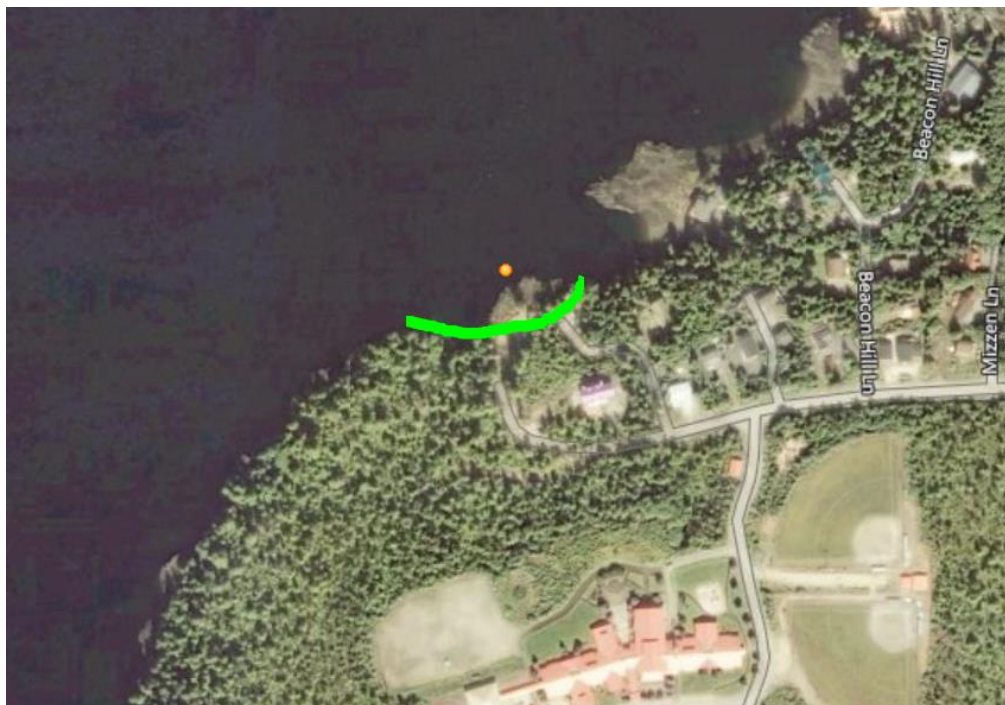| Assessment Unit ID	AK_B_1010203_002 (21AKBCH - AK301573)
Assessment Unit Name	Beacon Hill Beach
Location description	Northwest of Ketchikan on South Higgins Point; HUC 1901010203
Water Type	Open coast
Water Size	NA
Area of impairment	0.07 miles of coastline
Time of impairment	Year round
Latitude/Longitude	55.47228, -131.82305

Figure 1. Beacon Hill monitoring site and impaired beach segment

Pollutant status

Table 2. Alaska's Water Quality Standards at 18 AAC 70(14), fecal coliform for marine water uses[2]

Use	Status
(A) Water Supply (i) aquaculture	Supporting normally cooked; Not supporting not normally cooked
(A) Water Supply (ii) seafood processing	Not supporting
(A) Water Supply (iii) industrial	Supporting
(B) Water Recreation (ii) secondary recreation	Supporting
(D) Harvesting for Consumption of Raw Mollusks or Other Raw Aquatic Life	Not supporting

Table 3. Alaska's Water Quality Standards at 18 AAC 70(14) enterococci for marine water uses[2]

Use	Status
(B) Water Recreation (i) contact recreation	Supporting

Results

Beacon Hill has persistent bacteria exceedances in marine coastal waters, and meets criteria for impairment as outlined in the [Pathogen Listing Methodology](#)[3]. The following tables and graphs present the 2017-2018 data with the pathogen marine water designated uses.

Table 4 summarizes the most recent 2 years of data with criteria exceedences. Figures 3 and 4 show fecal results, and Figures 5 and 6 show enterococci results compared to the single sample percent criteria. Tables 5 and 6 show sample results compared to fecal coliform and enterococci geometric means. Tables 7 and 8 show impairment/exceedance frequency summaries.

Table 4. 2017-2018 Fecal coliform and enterococci summary

Analytical test	No. of Samples	Maximum Result	% Exceedances		Geometric Mean	
			2017	2018	2017	2018
Fecal coliform (CFU/100mL)	27	**66**[1]	**11**	**17**	10	12
Enterococci (MPN/100mL)	27	**579**	**11**	6	**45**	21

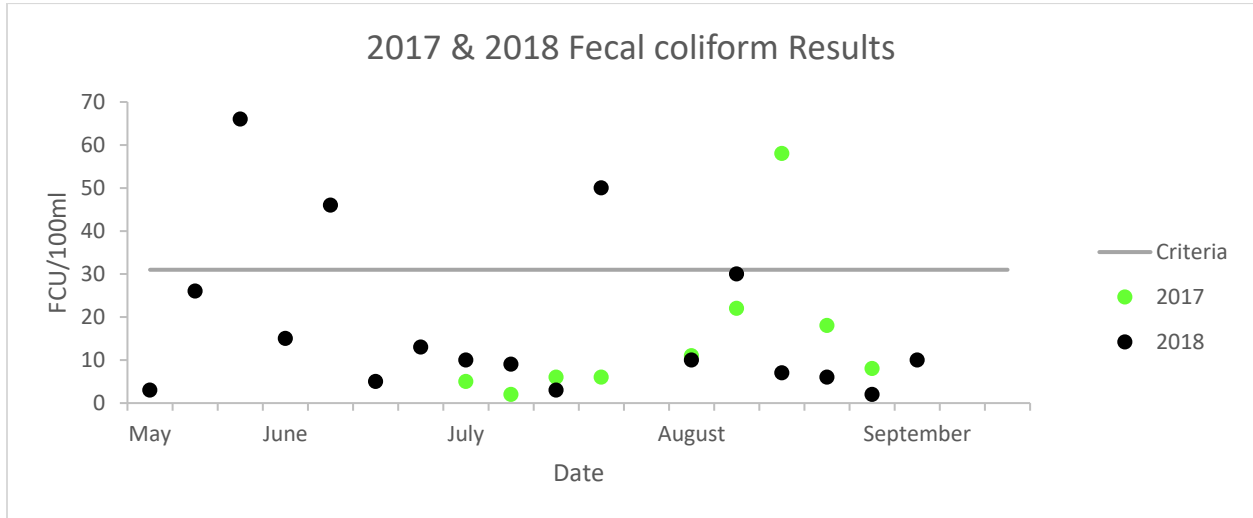[1] Bold red font indicates exceedance of criteria

Figure 2. 2017-2018 fecal coliform sample results

Table 5. 2017-2018 fecal coliform geometric means

Sample Season	Rolling 30-day Period	Geometric Mean
2017	7/18/2017 to 9/13/2017	10
2018	5/17/2018 to 9/12/2018	12
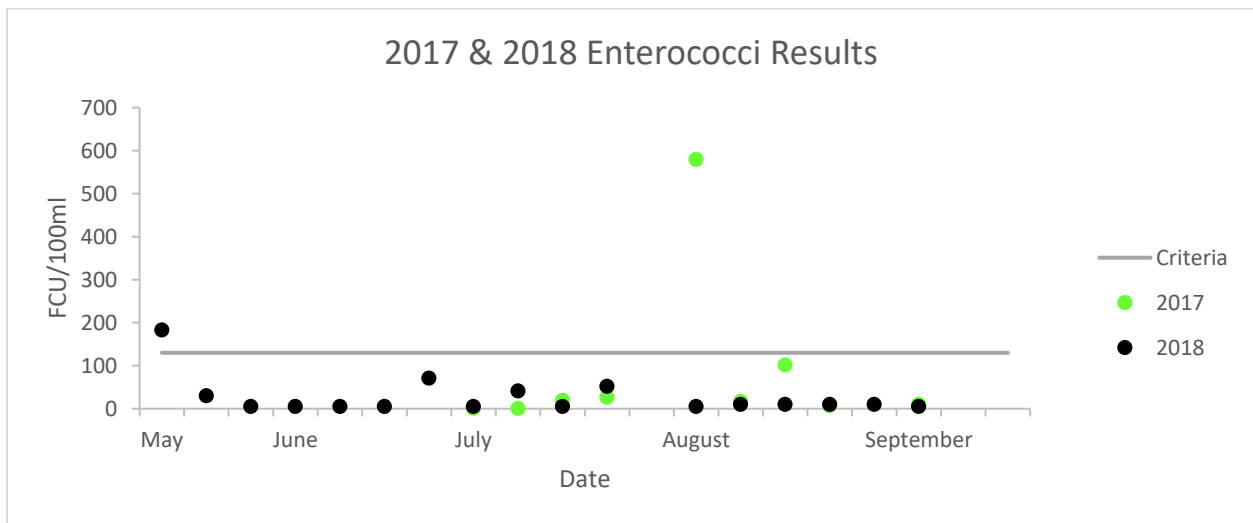
Figure 3. 2017-2018 enterococci sample results

Table 6. 2017-2018 enterococci geometric means

2017		2018	
Rolling 30-day Period[1]	**Geometric Mean**	**Rolling 30-day Period**	**Geometric Mean**
08-09-2017 to 07-10-2017	11	06-14-2018 to 05-15-2018	15
08-15-2017 to 07-16-2017	12	06-20-2018 to 05-21-2018	7
08-23-2017 to 07-24-2017	25	06-27-2018 to 05-28-2018	9
08-29-2017 to 07-30-2017	**45[1]**	07-02-2018 to 06-02-2018	9
[1] Bold red font indicates exceedance of criteria		07-12-2018 to 06-12-2018	13
		07-18-2018 to 06-18-2018	13
		07-26-2018 to 06-26-2018	21
		08-01-2018 to 07-02-2018	12
		08-09-2018 to 07-10-2018	14
		08-16-2018 to 07-17-2018	11
		08-23-2018 to 07-24-2018	12
		08-30-2018 to 07-31-2018	9
		09-05-2018 to 08-06-2018	9
		09-12-2018 to 08-13-2018	9

Table 7. Fecal coliform impairment frequencies summary

18AAC70(14)(D) Harvesting for Consumption of Raw Mollusks or Other Raw Aquatic Life	Geometric mean of samples may not exceed 14 fecal coliform/100 ml (seasonal sample set)		Not more than 10% of the samples may exceed 31 fecal coliform CFU/100ml	
	2017	**2018**	**2017**	**2018**
Target Type 1 Error	0.2	0.2	0.2	0.2
Allowed Exceedance Frequency	>1	>1	10%	10%
Total Exceedances	0	0	1	3
Total Trials	1	1	9	18
Raw Exceedance Frequency	0%	0%	11%	17%
Is Criteria Exceeded?	No	No	**Yes**	**Yes**

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Table 8. Enterococci exceedance frequencies summary

18AAC70(14)(D)(B) Contact Recreation	In a 30-day period, the geometric mean of samples may not exceed 35 Enterococci CFU/100ml		Not more than 10% of the samples may exceed a STV of 130 Enterococci CFU/100ml	
	2017	**2018**	**2017**	**2018**
Target Type 1 Error	0.2	0.2	0.2	0.2
Allowed Exceedance Frequency	>1	>1	10%	10%
Total Exceedances	1	0	1	1
Total Trials	4	14	9	18
Raw Exceedance Frequency	25%	0%	11%	6%
Is Criteria Exceeded?	**Yes**	No	**Yes**	No

Potential Pollutant Sources

Beacon Hill includes beach and residential areas, and a small boat harbor. Potential pathogen sources along the marine coast consists of individual septic systems, private sewer treatment system outfalls, wildlife and pet feces, and private watercraft.

Waterbody Specific Conclusion

Beacon Hill is recommended for inclusion as impaired in Category 5 in the 2020 IR for exceedance of the pathogens criteria for marine coastal waters. Data from two recreation seasons of pathogen monitoring within Knudson Cove marine waters indicate that the waterbody is not meeting criteria for 3 designated uses:

- aquaculture for products not normally cooked
- seafood processing
- harvesting for consumption of raw mollusks or other raw aquatic life

Beacon Hill marine waters do meet criteria for 3 designated uses[6]:

- industrial
- contact recreation
- secondary recreation

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[6] Beacon Hill marine waters does meet part of (A) Water Supply (i) aquaculture for products normally cooked.

Table 9: 2017-2018 fecal coliform and enterococci data summary

2017 Sample Date	Fecal coliform CFU/100ml	Enterococci MPN/100ml	2018 Sample Date	Fecal coliform CFU/100ml	Enterococci MPN/100ml
Jul 18	5	**2603**[1]	May 17	3	**183**
Jul 25	2	**341**	May 22	26	30
Jul 27	6	20	May 31	**66**	5
Jul 31	6	<10	Jun 6	15	5
Aug 9	11	<10	Jun 14	**46**	5
Aug 15	22	<10	Jun 20	5	5
Aug 23	**58**	<10	Jun 27	13	71
Aug 29	18	74	Jul 2	10	5
Sep 13	8	20	Jul 12	9	41
[1] Bold red font indicates exceedance of criteria			Jul 18	3	5
			Jul 26	**50**	52
			Aug 1	10	5
			Aug 9	30	10
			Aug 16	7	10
			Aug 23	6	10
			Aug 30	2	10
			Sep 5	10	5
			Sep 12	26	10
Seasonal Geometric Mean	10			12	
Maximum Geometric Mean		**55**			21

Appendix C
South Point Higgins Beach, Ketchikan, Alaska
Pathogens Determination

South Point Higgins Beach, located in Ketchikan on the southern portion of Port Higgins (Figure 1), is recommended for inclusion as impaired in Category 5 in the 2020 IR for exceedance of the pathogens criteria for marine coastal waters. South Point Higgins Beach was not included in previous Irs. Based on data collected in 2018 and 2019, South Point Higgins Beach does not meet the pathogen criteria for 3 of the 6 designated uses (Table 2 and 3).

Basic waterbody information

Table 1. Basic waterbody information

Assessment Unit ID	AK_B_1010204_001 (21AKBCH - AK909574)
Assessment Unit Name	South Point Higgins Beach
Location description	Southern end of Port Higgins; HUC 1901010204
Water Type	Open coast
Water Size	NA
Area of impairment	0.48 miles of coastline
Time of impairment	Year round
Latitude/Longitude	55.44864, -131.83136

Figure 1 South Point Higgins Beach monitoring site and impaired beach segment

Pollutant status

Table 2. Alaska's Water Quality Standards at 18 AAC 70(14), fecal coliform for marine water uses[2]

Use	Status
(A) Water Supply (i) aquaculture	Supporting normally cooked; Not supporting not normally cooked
(A) Water Supply (ii) seafood processing	Not supporting
(A) Water Supply (iii) industrial	Supporting
(B) Water Recreation (ii) secondary recreation	Supporting
(D) Harvesting for Consumption of Raw Mollusks or Other Raw Aquatic Life	Not supporting

Table 3. Alaska's Water Quality Standards at 18 AAC 70(14) enterococci for marine water uses[2]

Use	Status
(B) Water Recreation (i) contact recreation	Supporting

Results

South Point Higgins Beach has persistent bacteria exceedances in marine coastal waters, and meets criteria for impairment as outlined in the [Pathogen Listing Methodology](#)[3]. The following tables and graphs present the 2018-2019 data with the pathogen marine water designated uses.

Table 4 summarizes the most recent 2 years of data with criteria exceedences. Figures 3 and 4 show fecal results, and Figures 5 and 6 show enterococci results compared to the single sample percent criteria. Tables 5 and 6 show sample results compared to fecal coliform and enterococci geometric means. Tables 7 and 8 show impairment/exceedance frequency summaries.

Table 4. 2018-2019 Fecal coliform and enterococci summary

Analytical test	No. of Samples	Maximum Result	% Exceedances		Geometric Mean	
			2018	2019	2018	2019
Fecal coliform (CFU/100mL)	36	**236**[1]	**39**	**50**	**21**	**35**
Enterococci (MPN/100mL)	36	**410**	**60**	0	**70**	26

[1] Bold red font indicates exceedance of criteria
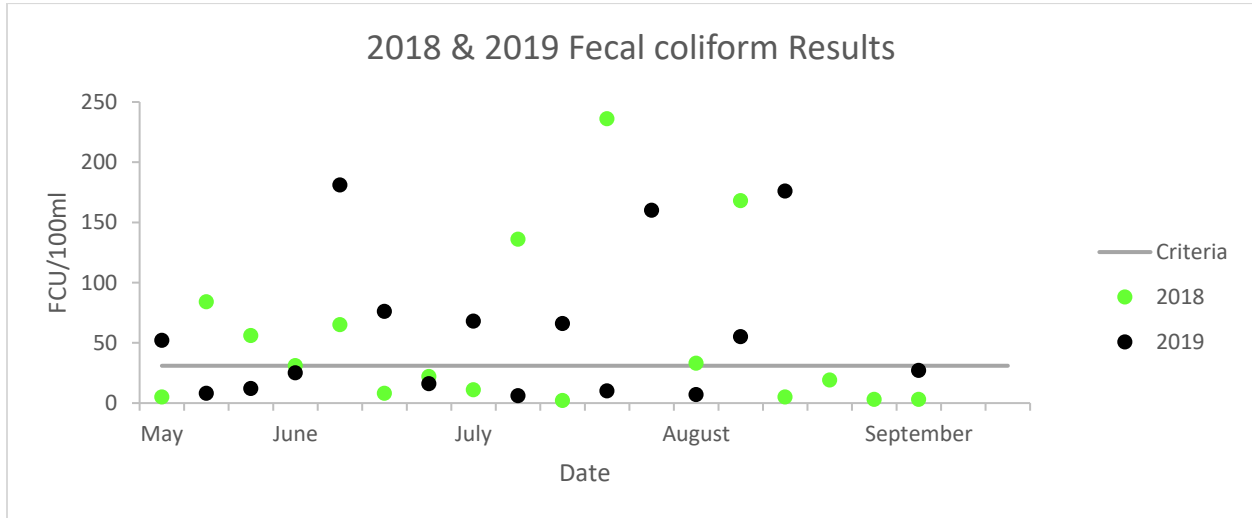
Figure 2. 2018-2019 fecal coliform sample results

Table 5. 2018-2019 Fecal coliform geometric means

Sample Season	Rolling 30-day Period	Geometric Mean
2018	5/17/2018 to 9/12/2018	**21**[1]
2019	5/15/2019 to 9/18/2019	**35**

[1] Bold red font indicates exceedance of criteria

Figure 3. 2018-2019 enterococci sample results

Table 6. 2018-2019 enterococci geometric means

2018		2019	
Rolling 30-day Period[1]	**Geometric Mean**	**Rolling 30-day Period**	**Geometric Mean**
06-14-2018 to 05-15-2018	**67[1]**	06-11-2019 to 05-12-2019	11
06-20-2018 to 05-21-2018	33	06-19-2019 to 05-20-2019	13
06-27-2018 to 05-28-2018	20	06-25-2019 to 05-26-2019	13
07-02-2018 to 06-02-2018	12	07-02-2019 to 06-02-2019	23
07-12-2018 to 06-12-2018	28	07-10-2019 to 06-10-2019	23
07-18-2018 to 06-18-2018	12	07-17-2019 to 06-17-2019	16
07-26-2018 to 06-26-2018	23	07-23-2019 to 06-23-2019	14
08-01-2018 to 07-02-2018	32	07-29-2019 to 06-29-2019	14
08-09-2018 to 07-10-2018	**70**	08-07-2019 to 07-08-2019	8
08-16-2018 to 07-17-2018	30	08-13-2019 to 07-14-2019	9
08-23-2018 to 07-24-2018	**43**	[1] Bold red font indicates exceedance of criteria	
08-30-2018 to 07-31-2018	26		
09-05-2018 to 08-06-2018	18		

Table 7. Fecal coliform impairment frequencies summary

18AAC70(14)(D) Harvesting for Consumption of Raw Mollusks or Other Raw Aquatic Life	Geometric mean of samples may not exceed 14 fecal coliform/100 ml (seasonal sample set)		Not more than 10% of the samples may exceed 31 fecal coliform CFU/100ml	
	2018	**2019**	**2018**	**2019**
Target Type 1 Error	0.2	0.2	0.2	0.2
Allowed Exceedance Frequency	>1	>1	10%	10%
Total Exceedances	1	1	7	9
Total Trials	1	1	18	18
Raw Exceedance Frequency	100%	100%	39%	50%
Is Criteria Exceeded?	**Yes**	**Yes**	**Yes**	**Yes**

Table 8. Enterococci exceedance frequencies summary

18AAC70(14)(D)(B) Contact Recreation	In a 30-day period, the geometric mean of samples may not exceed 35 Enterococci CFU/100ml		Not more than 10% of the samples may exceed a STV of 130 Enterococci CFU/100ml	
	2018	**2019**	**2018**	**2019**
Target Type 1 Error	0.2	0.2	0.2	0.2
Allowed Exceedance Frequency	>1	>1	10%	10%
Total Exceedances	3	0	6	0
Total Trials	14	11	18	18
Raw Exceedance Frequency	21%	0%	33%	0%
Is Criteria Exceeded?	**Yes**	No	**Yes**	No

Potential Pollutant Sources

South Point Higgins Beach includes beaches and residential areas. Potential pathogen sources along the marine coast consists of individual septic systems, private sewer treatment system outfalls, wildlife and pet feces, private watercraft, and cruise ships and ferries.

Waterbody Specific Conclusion

South Point Higgins Beach is recommended for inclusion as impaired in Category 5 in the 2020 IR for exceedance of the pathogens criteria for marine coastal waters. Data from two recreation seasons of pathogen monitoring within South Point Higgins Beach marine waters indicate that the waterbody is not meeting criteria for 3 designated uses:

- aquaculture for products not normally cooked
- seafood processing
- harvesting for consumption of raw mollusks or other raw aquatic life

Knudson Cove marine waters do meet criteria for 3 designated uses[7]:

- industrial
- contact recreation
- secondary recreation

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[7] South Point Higgins marine waters does meet part of (A) Water Supply (i) aquaculture for products normally cooked.

Table 9: 2018-2019 fecal coliform and enterococci data summary

2018 Sample Date	Fecal coliform CFU/100ml	Enterococci MPN/100ml	2019 Sample Date	Fecal coliform CFU/100ml	Enterococci MPN/100ml
May 17	5	**183**	May 15	**52**	5
May 22	**84**[1]	61	May 22	8	10
May 31	**48**	60	May 29	12	5
Jun 6	31	5	Jun 5	25	5
Jun 14	**65**	**410**	Jun 11	**181**	130
Jun 20	8	5	Jun 19	**76**	10
Jun 27	22	5	Jun 25	16	10
Jul 2	11	5	Jul 2	**68**	97
Jul 12	**136**	**350**	Jul 10	6	5
Jul 18	2	5	Jul 17	**66**	20
July 26	**236**	**134**	Jul 23	10	5
Aug 1	**33**	30	Jul 29	**160**	10
Aug 9	**168**	**241**	Aug 7	7	5
Aug 16	5	5	Aug 13	**55**	10
Aug 23	19	31	Aug 21	**176**	74
Aug 30	3	10	Sep 4	27	10
Sep 5	3	5	Sep 10	**187**	10
Sep 12	28	**279**	Sep 18	12	63
Seasonal Geometric Mean	**21**			**35**	
Maximum Geometric Mean		**70**			23

[1] Bold red font indicates exceedance of criteria

Appendix D
Beach at Shull Road, Ketchikan, Alaska
Pathogens Determination

Beach at Shull Road (Shull Beach), located in Ketchikan on the southern portion of Port Higgins (Figure 1), is recommended for inclusion as impaired in Category 5 in the 2020 IR for exceedance of the pathogens criteria for marine coastal waters. Shull Beach was not included in previous IRs. Based on data collected in 2018 and 2019, Shull Beach does not meet the pathogen criteria for 4 of the 6 designated uses (Table 2 and 3).

Basic waterbody information

Table 1. Basic waterbody information

Assessment Unit ID	AK_B_1010204_002 (21AKBCH - AK466549)
Assessment Unit Name	Shull Beach
Location description	South of Whipple Creek mouth; HUC 1901010204
Water Type	Open coast
Water Size	NA
Area of impairment	0.20 miles of coastline
Time of impairment	Year round
Latitude/Longitude	55.43544, -131.79851

Figure 1. Shull Beach monitoring site and impaired beach segment

Pollutant status

Table 2. Alaska's Water Quality Standards at 18 AAC 70(14), fecal coliform for marine water uses[2]

Use	Status
(A) Water Supply (i) aquaculture	Supporting normally cooked; Not supporting not normally cooked
(A) Water Supply (ii) seafood processing	Not supporting
(A) Water Supply (iii) industrial	Supporting
(B) Water Recreation (ii) secondary recreation	Supporting
(D) Harvesting for Consumption of Raw Mollusks or Other Raw Aquatic Life	Not supporting

Table 3. Alaska's Water Quality Standards at 18 AAC 70(14) enterococci for marine water uses[2]

Use	Status
(B) Water Recreation (i) contact recreation	Not supporting

Results

Shull Beach has persistent bacteria exceedances in marine coastal waters, and meets criteria for impairment as outlined in the [Pathogen Listing Methodology](#)[3]. The following tables and graphs present the 2018-2019 data with the pathogen marine water designated uses.

Table 4 summarizes the most recent 2 years of data with criteria exceedences. Figures 3 and 4 show fecal results, and Figures 5 and 6 show enterococci results compared to the single sample percent criteria. Tables 5 and 6 show sample results compared to fecal coliform and enterococci geometric means. Tables 7 and 8 show impairment frequency summaries.

Table 4. 2018-2019 Fecal coliform and enterococci Summary

Analytical test	No. of Samples	Maximum Result	% Exceedances		Geometric Mean	
			2018	2019	2018	2019
Fecal coliform (CFU/100mL)	36	276[1]	28	44	20	30
Enterococci (MPN/100mL)	36	754	40	50	37	73

[1] Bold red font indicates exceedance of criteria
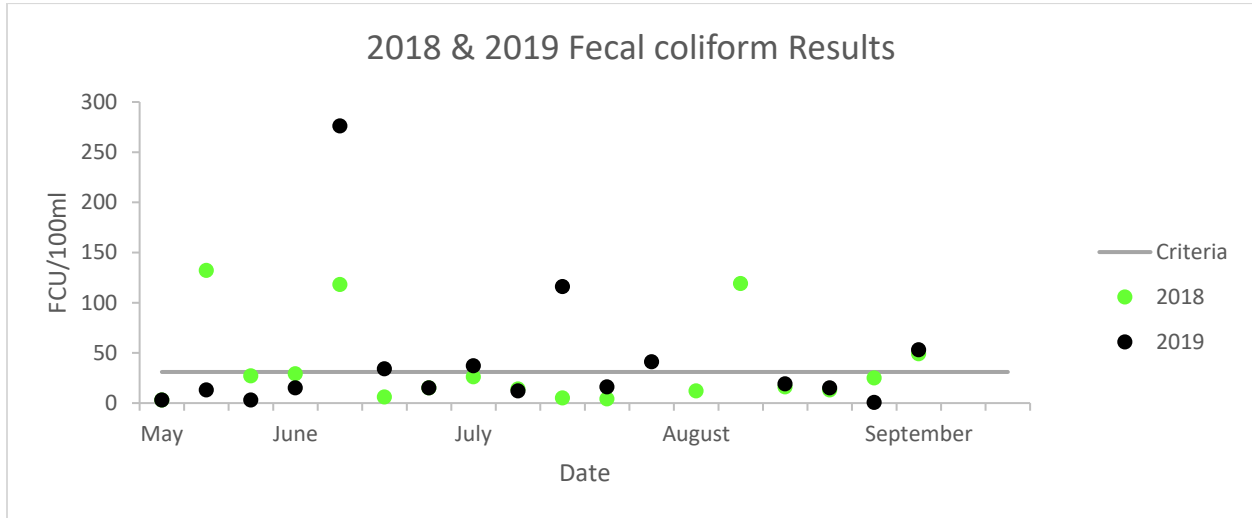
Figure 2. 2018-2019 fecal coliform sample results

Table 5. 2018-2019 Fecal coliform geometric means

Sample Season	Rolling 30-day Period	Geometric Mean
2018	5/17/2018 to 9/12/2018	**20**[1]
2019	5/15/2019 to 9/18/2019	**19**

[1] Bold red font indicates exceedance of criteria
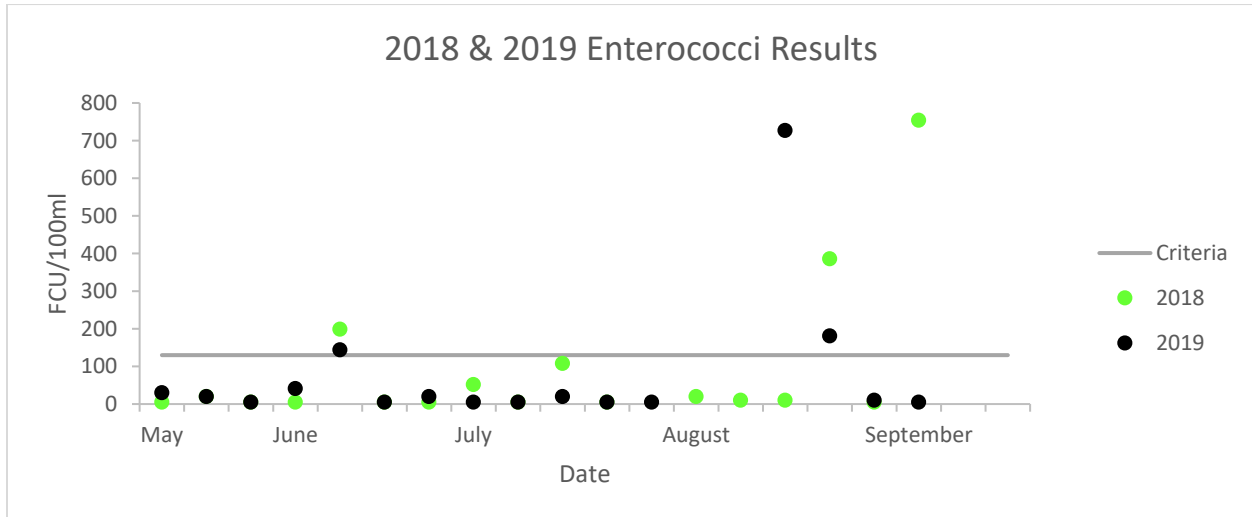
Figure 3. 2018-2019 enterococci sample results

Table 6. 2018-2019 enterococci geometric means

2018		2019	
Rolling 30-day Period[1]	Geometric Mean	Rolling 30-day Period	Geometric Mean
06-14-2018 to 05-15-2018	14	06-11-2019 to 05-12-2019	28
06-20-2018 to 05-21-2018	14	06-19-2019 to 05-20-2019	20
06-27-2018 to 05-28-2018	10	06-25-2019 to 05-26-2019	20
07-02-2018 to 06-02-2018	17	07-02-2019 to 06-02-2019	20
07-12-2018 to 06-12-2018	17	07-10-2019 to 06-10-2019	13
07-18-2018 to 06-18-2018	15	07-17-2019 to 06-17-2019	9
07-26-2018 to 06-26-2018	15	07-23-2019 to 06-23-2019	9
08-01-2018 to 07-02-2018	19	07-29-2019 to 06-29-2019	7
08-09-2018 to 07-10-2018	14	08-07-2019 to 07-08-2019	18
08-16-2018 to 07-17-2018	16	08-13-2019 to 07-14-2019	**37**
08-23-2018 to 07-24-2018	21	[1] Bold red font indicates exceedance of criteria	
08-30-2018 to 07-31-2018	21		
09-05-2018 to 08-06-2018	**43**[1]		
09-12-2018 to 08-13-2018	**49**		

Table 7. Fecal coliform impairment frequencies summary

18AAC70(14)(D) Harvesting for Consumption of Raw Mollusks or Other Raw Aquatic Life	Geometric mean of samples may not exceed 14 fecal coliform/100 ml (seasonal sample set)		Not more than 10% of the samples may exceed 31 fecal coliform CFU/100ml	
	2018	2019	2018	2019
Target Type 1 Error	0.2	0.2	0.2	0.2
Allowed Exceedance Frequency	>1	>1	10%	10%
Total Exceedances	1	1	5	7
Total Trials	1	1	18	18
Raw Exceedance Frequency	100%	100%	28%	39%
Is Criteria Exceeded?	**Yes**	**Yes**	**Yes**	**Yes**

Table 8. Enterococci impairment frequencies summary

18AAC70(14)(D)(B) Contact Recreation	In a 30-day period, the geometric mean of samples may not exceed 35 Enterococci CFU/100ml		Not more than 10% of the samples may exceed a STV of 130 Enterococci CFU/100ml	
	2018	**2019**	**2018**	**2019**
Target Type 1 Error	0.2	0.2	0.2	0.2
Allowed Exceedance Frequency	>1	>1	10%	10%
Total Exceedances	2	1	3	3
Total Trials	14	11	18	18
Raw Exceedance Frequency	14%	9%	17%	17%
Is Criteria Exceeded?	**Yes**	**Yes**	**Yes**	**Yes**

Potential Pollutant Sources

Shull Beach includes beaches and residential areas. Potential pathogen sources along the marine coast consists of individual septic systems, private sewer treatment system outfalls, wildlife and pet feces, private watercraft, and cruise ships and ferries.

Waterbody Specific Conclusion

Shull Beach is recommended for inclusion as impaired in Category 5 in the 2020 IR for exceedance of the pathogens criteria for marine coastal waters. Data from two recreation seasons of pathogen monitoring within Shull Beach marine waters indicate that the waterbody is not meeting criteria for 4 designated uses:

- aquaculture for products not normally cooked
- seafood processing
- contact recreation
- harvesting for consumption of raw mollusks or other raw aquatic life

Shull Beach marine waters do meet criteria for 2 designated uses[8]:

- industrial
- secondary recreation

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[8] Shull Beach marine waters does meet part of (A) Water Supply (i) aquaculture for products normally cooked.

Table 9: 2018-2019 Fecal coliform and enterococci data summary

2018 Sample Date	Fecal coliform CFU/100ml	Enterococci MPN/100ml	2019 Sample Date	Fecal coliform CFU/100ml	Enterococci MPN/100ml
May 17	3	5	May 15	3	30
May 22	**132**[1]	20	May 22	13	20
May 31	27	5	May 29	3	5
Jun 6	29	5	Jun 5	15	41
Jun 14	**118**	**199**	Jun 11	**276**	**144**
Jun 20	6	5	Jun 19	**34**	5
Jun 27	15	5	Jun 25	15	20
Jul 2	26	52	Jul 2	**37**	5
Jul 12	14	5	Jul 10	12	5
Jul 18	5	108	Jul 17	**116**	20
July 26	4	5	Jul 23	16	5
Aug 1	12	20	Jul 29	**41**	5
Aug 9	**119**	10	Aug 7	19	**727**
Aug 16	16	10	Aug 13	15	**181**
Aug 23	13	**386**	Aug 21	0.5	10
Aug 30	25	5	Sep 4	**53**	5
Sep 5	**49**	**754**	Sep 10	**95**	10
Sep 12	**33**	20	Sep 18	19	20
Seasonal Geometric Mean	**20**			**19**	
Maximum Geometric Mean		**49**			**37**

[1] Bold red font indicates exceedance of criteria

Appendix E
Beach off Sunset Drive, Ketchikan, Alaska
Pathogens Determination

Beach off Sunset Drive (Sunset Beach), located in Ketchikan South of Mud Bay on Sunset Peninsula (Figure 1), is recommended for inclusion as impaired in Category 5 in the 2020 IR for exceedance of the pathogens criteria for marine coastal waters. Sunset Beach was not included in previous IRs. Based on data collected in 2018 and 2019, Sunset Beach does not meet the pathogen criteria for 4 of the 6 designated uses (Table 2 and 3).

Basic waterbody information

Table 1. Basic waterbody information

Assessment Unit ID	AK_B_1010204_003 (21AKBCH - AK212340)
Assessment Unit Name	Sunset Beach
Location description	South of Mud Bay on Sunset Peninsula; HUC 1901010204
Water Type	Open coast
Water Size	NA
Area of impairment	0.33 miles of coastline
Time of impairment	Year round
Latitude/Longitude	55.41261, -131.76505

Figure 1. Sunset Beach monitoring site and impaired beach segment

Pollutant status

Table 2. Alaska's Water Quality Standards at 18 AAC 70(14), fecal coliform for marine water uses[2]

Use	Status
(A) Water Supply (i) aquaculture	Supporting normally cooked; Not supporting not normally cooked
(A) Water Supply (ii) seafood processing	Not supporting
(A) Water Supply (iii) industrial	Supporting
(B) Water Recreation (ii) secondary recreation	Supporting
(D) Harvesting for Consumption of Raw Mollusks or Other Raw Aquatic Life	Not supporting

Table 3. Alaska's Water Quality Standards at 18 AAC 70(14) enterococci for marine water uses[2]

Use	Status
(B) Water Recreation (i) contact recreation	Not supporting

Results

Sunset Beach has persistent bacteria exceedances in marine coastal waters, and meets criteria for impairment as outlined in the [Pathogen Listing Methodology](#)[3]. The following tables and graphs present the 2018-2019 data with the pathogen marine water designated uses.

Table 4 summarizes the most recent 2 years of data with criteria exceedences. Figures 3 and 4 show fecal results, and Figures 5 and 6 show enterococci results compared to the single sample percent criteria. Tables 5 and 6 show sample results compared to fecal coliform and enterococci geometric means. Tables 7 and 8 show impairment frequency summaries.

Table 4. 2018-2019 Fecal coliform and enterococci summary

Analytical test	No. of Samples	Maximum Result	% Exceedances		Geometric Mean	
			2018	2019	2018	2019
Fecal coliform (CFU/100mL)	36	196[1]	**33**	**33**	**20**	**21**
Enterococci (MPN/100mL)	36	301	**20**	**75**	30	28

[1] Bold red font indicates exceedance of criteria
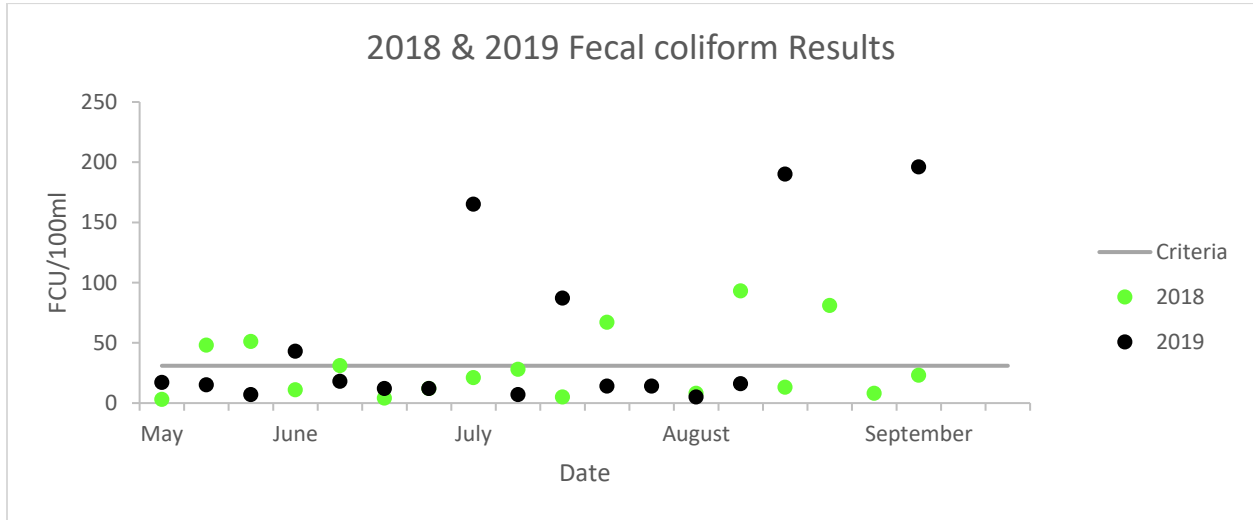
Figure 2. 2018-2019 fecal coliform sample results

Table 5. 2018-2019 Fecal coliform geometric means

Sample Season	Rolling 30-day Period	Geometric Mean
2018	5/17/2018 to 9/12/2018	**20**[1]
2019	5/15/2019 to 9/18/2019	**21**

[1] Bold red font indicates exceedance of criteria

Figure 3. 2018-2019 enterococci sample results

Table 6. 2018-2019 enterococci geometric means

2018		2019	
Rolling 30-day Period[1]	**Geometric Mean**	**Rolling 30-day Period**	**Geometric Mean**
06-14-2018 to 05-15-2018	**67[1]**	06-11-2019 to 05-12-2019	11
06-20-2018 to 05-21-2018	33	06-19-2019 to 05-20-2019	13
06-27-2018 to 05-28-2018	20	06-25-2019 to 05-26-2019	13
07-02-2018 to 06-02-2018	12	07-02-2019 to 06-02-2019	23
07-12-2018 to 06-12-2018	28	07-10-2019 to 06-10-2019	23
07-18-2018 to 06-18-2018	12	07-17-2019 to 06-17-2019	16
07-26-2018 to 06-26-2018	23	07-23-2019 to 06-23-2019	14
08-01-2018 to 07-02-2018	32	07-29-2019 to 06-29-2019	14
08-09-2018 to 07-10-2018	**70**	08-07-2019 to 07-08-2019	8
08-16-2018 to 07-17-2018	30	08-13-2019 to 07-14-2019	9
08-23-2018 to 07-24-2018	**43**	08-21-2019 to 07-22-2019	11
08-30-2018 to 07-31-2018	26	[1] Bold red font indicates exceedance of criteria	
09-05-2018 to 08-06-2018	18		

Table 7. Fecal coliform impairment frequencies summary

18AAC70(14)(D) Harvesting for Consumption of Raw Mollusks or Other Raw Aquatic Life	Geometric mean of samples may not exceed 14 fecal coliform/100 ml (seasonal sample set)		Not more than 10% of the samples may exceed 31 fecal coliform CFU/100ml	
	2018	**2019**	**2018**	**2019**
Target Type 1 Error	0.2	0.2	0.2	0.2
Allowed Exceedance Frequency	>1	>1	10%	10%
Total Exceedances	1	1	6	5
Total Trials	1	1	18	18
Raw Exceedance Frequency	100%	100%	33%	28%
Is Criteria Exceeded?	**Yes**	**Yes**	**Yes**	**Yes**

Table 8. Enterococci impairment frequencies summary

18AAC70(14)(D)(B) Contact Recreation	In a 30-day period, the geometric mean of samples may not exceed 35 Enterococci CFU/100ml		Not more than 10% of the samples may exceed a STV of 130 Enterococci CFU/100ml	
	2018	**2019**	**2018**	**2019**
Target Type 1 Error	0.2	0.2	0.2	0.2
Allowed Exceedance Frequency	>1	>1	10%	10%
Total Exceedances	3	0	1	3
Total Trials	14	11	18	18
Raw Exceedance Frequency	21%	0%	6%	17%
Is Criteria Exceeded?	**Yes**	No	No	**Yes**

Potential Pollutant Sources

Sunset Beach includes beaches and residential areas. Potential pathogen sources along the marine coast consists of individual septic systems, private sewer treatment system outfalls, wildlife and pet feces, private watercraft, and cruise ships and ferries.

Waterbody Specific Conclusion

Sunset Beach is recommended for inclusion as impaired in Category 5 in the 2020 IR for exceedance of the pathogens criteria for marine coastal waters. Data from two recreation seasons of pathogen monitoring within Sunset Beach marine waters indicate that the waterbody is not meeting criteria for 4 designated uses:

- aquaculture for products not normally cooked
- seafood processing
- contact recreation
- harvesting for consumption of raw mollusks or other raw aquatic life

Sunset Beach marine waters do meet criteria for 2 designated uses[9]:

- industrial
- secondary recreation

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[9] Sunset Beach marine waters does meet part of (A) Water Supply (i) aquaculture for products normally cooked.

Table 9: 2018-2019 Fecal coliform and enterococci data summary

2018 Sample Date	Fecal coliform CFU/100ml	Enterococci MPN/100ml	2019 Sample Date	Fecal coliform CFU/100ml	Enterococci MPN/100ml
May 17	3	20	May 15	17	10
May 22	48	63	May 22	15	5
May 31	51	5	May 29	7	5
Jun 6	11	5	Jun 5	43	5
Jun 14	31	31	Jun 11	18	5
Jun 20	4	10	Jun 19	12	5
Jun 27	12	5	Jun 25	12	10
Jul 2	21	5	Jul 2	165	**301**
Jul 12	28	5	Jul 10	7	5
Jul 18	5	5	Jul 17	87	31
July 26	67	61	Jul 23	14	5
Aug 1	8	10	Jul 29	14	10
Aug 9	93	**187**	Aug 7	5	5
Aug 16	13	5	Aug 13	16	5
Aug 23	81	41	Aug 21	190	**156**
Aug 30	8	10	Sep 4	196	5
Sep 5	23	10	Sep 10	9	5
Sep 12	50	5	Sep 18	9	**148**
Seasonal Geometric Mean	**20**[1]			**21**	
Maximum Geometric Mean		**70**			23

[1] Bold red font indicates exceedance of criteria

Appendix F
Refuge Cove, Ketchikan, Alaska
Pathogens Determination

Refuge Cove, located in Ketchikan within the Refuge Cove Recreation Site (Figure 1), is recommended for inclusion as impaired in Category 5 in the 2020 IR for exceedance of the pathogens criteria for marine coastal waters. Refuge Cove Beach was not included in previous IRs. Based on data collected in 2018 and 2019, Refuge Cove Beach does not meet the pathogen criteria for 3 of the 6 designated uses (Table 2 and 3).

Basic waterbody information

Table 1. Basic waterbody information

Assessment Unit ID	AK_B_1010204_004 (21AKBCH - AK544485)
Assessment Unit Name	Refuge Cove Beach
Location description	South Refuge Cove State Recreation Site; HUC 1901010204
Water Type	Open coast
Water Size	NA
Area of impairment	0.42 miles of coastline
Time of impairment	Year round
Latitude/Longitude	55.40739, -131.75549

Figure 1. Refuge Cove monitoring site and impaired beach segment

Pollutant status

Table 2. Alaska's Water Quality Standards at 18 AAC 70(14), fecal coliform for marine water uses[2]

Use	Status
(A) Water Supply (i) aquaculture	Supporting normally cooked; Not supporting not normally cooked
(A) Water Supply (ii) seafood processing	Not supporting
(A) Water Supply (iii) industrial	Supporting
(B) Water Recreation (ii) secondary recreation	Supporting
(D) Harvesting for Consumption of Raw Mollusks or Other Raw Aquatic Life	Not supporting

Table 3. Alaska's Water Quality Standards at 18 AAC 70(14) enterococci for marine water uses[2]

Use	Status
(B) Water Recreation (i) contact recreation	Supporting

Results

Refuge Cove has persistent bacteria exceedances in marine coastal waters, and meets criteria for impairment as outlined in the Pathogen Listing Methodology[3]. The following tables and graphs present the 2018-2019 data with the pathogen marine water designated uses.

Table 4 summarizes the most recent 2 years of data with criteria exceedences. Figures 3 and 4 show fecal results, and Figures 5 and 6 show enterococci results compared to the single sample percent criteria. Tables 5 and 6 show sample results compared to fecal coliform and enterococci geometric means. Tables 7 and 8 show impairment frequency summaries.

Table 4. 2018-2019 Fecal coliform and enterococci summary

Analytical test	No. of Samples	Maximum Result	% Exceedances		Geometric Mean	
			2018	2019	2018	2019
Fecal coliform (CFU/100mL)	36	**184**[1]	**33**	**22**	**17**	**15**
Enterococci (MPN/100mL)	36	**3448**	0	**20**	27	27

[1] Bold red font indicates exceedance of criteria
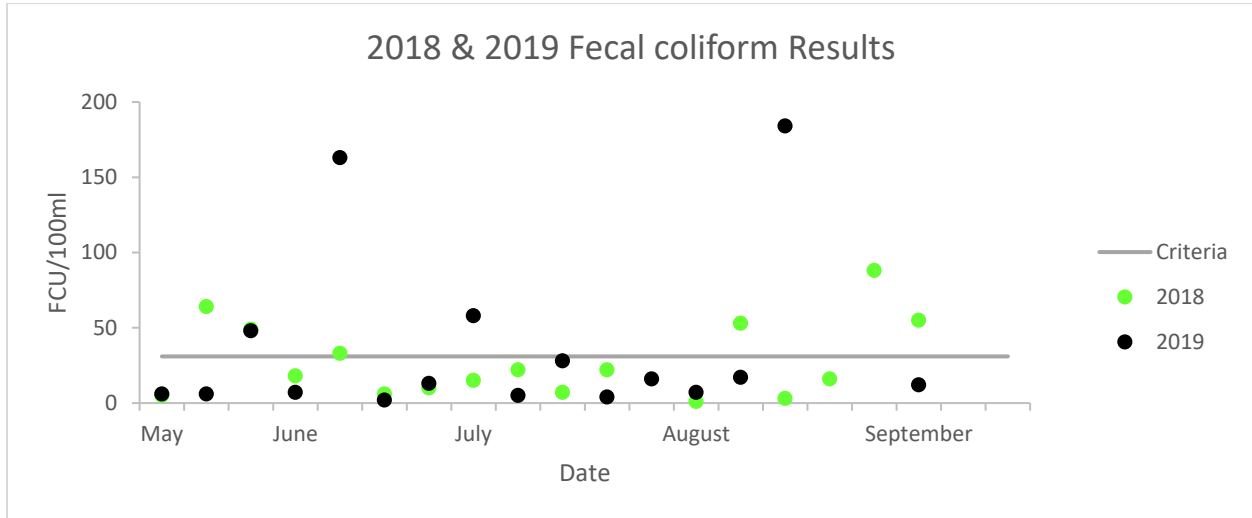
Figure 2. 2018-2019 Fecal coliform Sample Results

Table 5. 2018-2019 Fecal coliform geometric means

Sample Season	Rolling 30-day Period	Geometric Mean
2018	5/17/2018 to 9/12/2018	**17**[1]
2019	5/15/2019 to 9/18/2019	**15**

[1] Bold red font indicates exceedance of criteria
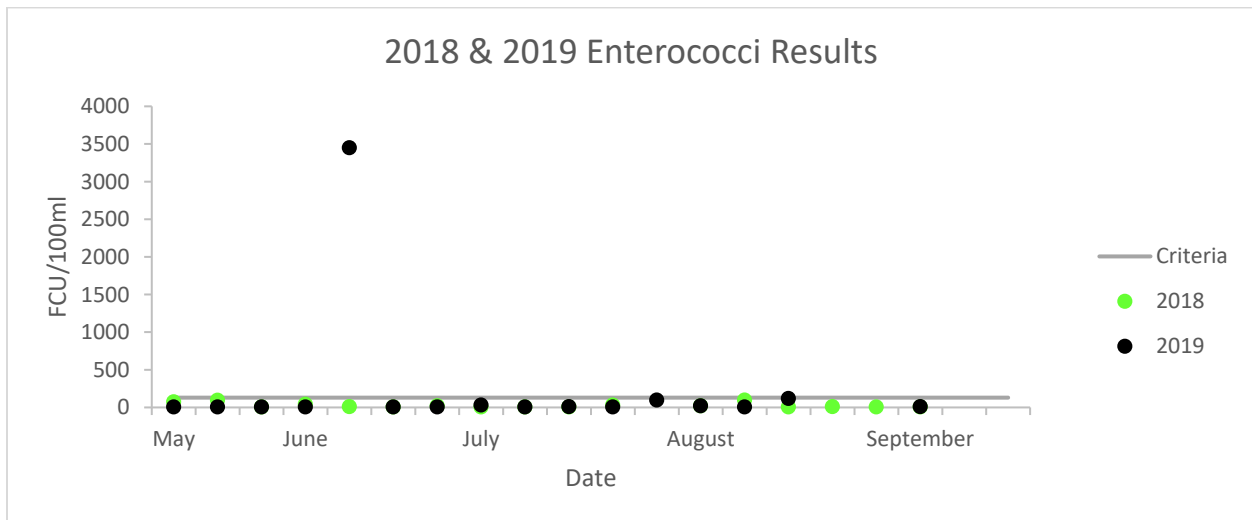
Figure 3. 2018-2019 enterococci sample results

Table 6. 2018-2019 enterococci geometric means

2018		2019	
Rolling 30-day Period[1]	**Geometric Mean**	**Rolling 30-day Period**	**Geometric Mean**
06-14-2018 to 05-15-2018	27	06-11-2019 to 05-12-2019	18
06-20-2018 to 05-21-2018	16	06-19-2019 to 05-20-2019	18
06-27-2018 to 05-28-2018	12	06-25-2019 to 05-26-2019	18
07-02-2018 to 06-02-2018	12	07-02-2019 to 06-02-2019	27
07-12-2018 to 06-12-2018	8	07-10-2019 to 06-10-2019	27
07-18-2018 to 06-18-2018	7	07-17-2019 to 06-17-2019	8
07-26-2018 to 06-26-2018	10	07-23-2019 to 06-23-2019	8
08-01-2018 to 07-02-2018	10	07-29-2019 to 06-29-2019	15
08-09-2018 to 07-10-2018	17	08-07-2019 to 07-08-2019	14
08-16-2018 to 07-17-2018	17	08-13-2019 to 07-14-2019	14
08-23-2018 to 07-24-2018	20	08-21-2019 to 07-22-2019	22
08-30-2018 to 07-31-2018	14		
09-05-2018 to 08-06-2018	10		
09-12-2018 to 08-13-2018	9		

Table 7. Fecal coliform impairment frequencies summary

18AAC70(14)(D) Harvesting for Consumption of Raw Mollusks or Other Raw Aquatic Life	Geometric mean of samples may not exceed 14 fecal coliform/100 ml (seasonal sample set)		Not more than 10% of the samples may exceed 31 fecal coliform CFU/100ml	
	2018	**2019**	**2018**	**2019**
Target Type 1 Error	0.2	0.2	0.2	0.2
Allowed Exceedance Frequency	>1	>1	10%	10%
Total Exceedances	1	1	6	4
Total Trials	1	1	18	18
Raw Exceedance Frequency	100%	100%	33%	22%
Is Criteria Exceeded?	**Yes**	**Yes**	**Yes**	**Yes**

Table 8. Enterococci exceedance frequencies summary

18AAC70(14)(D)(B) Contact Recreation	In a 30-day period, the geometric mean of samples may not exceed 35 Enterococci CFU/100ml		Not more than 10% of the samples may exceed a STV of 130 Enterococci CFU/100ml	
	2018	**2019**	**2018**	**2019**
Target Type 1 Error	0.2	0.2	0.2	0.2
Allowed Exceedance Frequency	>1	>1	10%	10%
Total Exceedances	0	0	0	1
Total Trials	14	11	18	18
Raw Exceedance Frequency	0%	0%	0%	6%
Is Criteria Exceeded?	No	No	No	No

Potential Pollutant Sources

Refuge Cove includes beaches and residential areas. Potential pathogen sources along the marine coast consists of individual septic systems, private sewer treatment system outfalls, wildlife and pet feces, private watercraft, and cruise ships and ferries.

Waterbody Specific Conclusion

Refuge Cove is recommended for inclusion as impaired in Category 5 in the 2020 IR for exceedance of the pathogens criteria for marine coastal waters. Data from two recreation seasons of pathogen monitoring within South Refuge Cove marine waters indicate that the waterbody is not meeting criteria for 3 designated uses:

- aquaculture for products not normally cooked
- seafood processing
- harvesting for consumption of raw mollusks or other raw aquatic life

Refuge Cove marine waters do meet criteria for 2 designated uses[10]:

- industrial
- contact recreation
- secondary recreation

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[10] South Refuge Cove marine waters does meet part of (A) Water Supply (i) aquaculture for products normally cooked.

Table 9: 2018-2019 Fecal coliform and enterococci data summary

2018 Sample Date	Fecal coliform CFU/100ml	Enterococci MPN/100ml	2019 Sample Date	Fecal coliform CFU/100ml	Enterococci MPN/100ml
May 17	5	74	May 15	6	5
May 22	**64**[1]	95	May 22	6	5
May 31	**49**	5	May 29	**48**	5
Jun 6	18	41	Jun 5	7	5
Jun 14	**33**	10	Jun 11	**163**	**3448**
Jun 20	6	5	Jun 19	2	5
Jun 27	10	20	Jun 25	13	5
Jul 2	15	5	Jul 2	**58**	31
Jul 12	22	5	Jul 10	5	5
Jul 18	7	5	Jul 17	28	10
July 26	22	31	Jul 23	4	5
Aug 1	1	20	Jul 29	16	97
Aug 9	**53**	97	Aug 7	7	20
Aug 16	3	5	Aug 13	17	5
Aug 23	16	10	Aug 21	**184**	118
Aug 30	**88**	5	Sep 4	12	10
Sep 5	**55**	5	Sep 10	22	5
Sep 12	25	41	Sep 18	6	52
Seasonal Geometric Mean	**17**			**15**	
Maximum Geometric Mean		27			27

[1] Bold red font indicates exceedance of criteria

Appendix G
Thomas Basin Harbor, Ketchikan, Alaska
Pathogens Determination

Thomas Basin Harbor, located in Ketchikan within the South Refuge Cove Recreation Site (Figure 1), is recommended for inclusion as impaired in Category 5 in the 2020 IR for exceedance of the pathogens criteria for marine coastal waters. Thomas Basin Harbor was not included in previous IRs. Based on data collected in 2018 and 2019, Thomas Basin Harbor does not meet the pathogen criteria for 4 of the 6 designated uses (Table 2 and 3).

Basic waterbody information

Table 1. Basic waterbody information

Assessment Unit ID	AK_B_1010204_005 (21AKBCH - AK508635)
Assessment Unit Name	Thomas Basin Harbor
Location description	Small boat harbor at mouth of Ketchikan Creek; HUC 1901010204
Water Type	Harbor/Bay
Water Size	13.1 acres
Area of impairment	0.47 miles of coastline
Time of impairment	Year round
Latitude/Longitude	55.34125, -131.64179

Figure 1. Thomas Basin Harbor monitoring site and impaired beach segment

Pollutant status

Table 2. Alaska's Water Quality Standards at 18 AAC 70(14), fecal coliform for marine water uses[2]

Use	Status
(A) Water Supply (i) aquaculture	Supporting normally cooked; Not supporting not normally cooked
(A) Water Supply (ii) seafood processing	Not supporting
(A) Water Supply (iii) industrial	Supporting
(B) Water Recreation (ii) secondary recreation	Supporting
(D) Harvesting for Consumption of Raw Mollusks or Other Raw Aquatic Life	Not supporting

Table 3. Alaska's Water Quality Standards at 18 AAC 70(14) enterococci for marine water uses[2]

Use	Status
(B) Water Recreation (i) contact recreation	Not supporting

Results

Thomas Basin Harbor has persistent bacteria exceedances in marine coastal waters, and meets criteria for impairment as outlined in the Pathogen Listing Methodology[3]. The following tables and graphs present the 2018-2019 data with the pathogen marine water designated uses.

Table 4 summarizes the most recent 2 years of data with criteria exceedences. Figures 3 and 4 show fecal results, and Figures 5 and 6 show enterococci results compared to the single sample percent criteria. Tables 5 and 6 show sample results compared to fecal coliform and enterococci geometric means. Tables 7 and 8 show impairment frequency summaries.

Table 4. 2018-2019 Fecal coliform and enterococci summary

Analytical test	No. of Samples	Maximum Result	% Exceedances		Geometric Mean	
			2018	2019	2018	2019
Fecal coliform (CFU/100mL)	36	431[1]	44	61	32	38
Enterococci (MPN/100mL)	36	2755	80	75	451	254

[1] Bold red font indicates exceedance of criteria
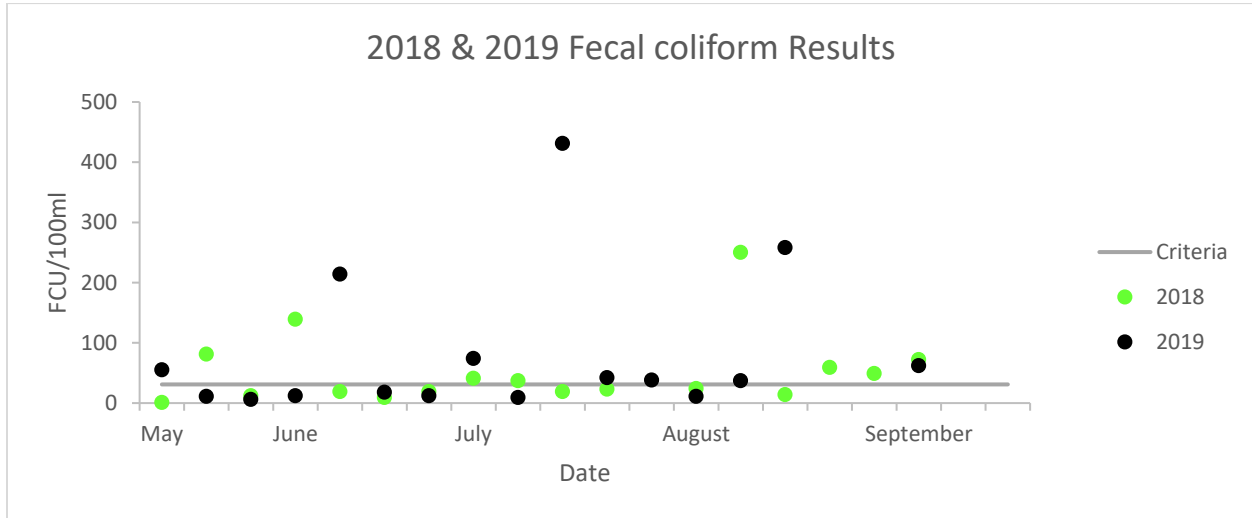
Figure 2. 2018-2019 fecal coliform sample results

Table 5. 2018-2019 Fecal coliform geometric means

Sample Season	Rolling 30-day Period	Geometric Mean
2018	5/17/2018 to 9/12/2018	**28**[1]
2019	5/15/2019 to 9/18/2019	**38**

[1] Bold red font indicates exceedance of criteria
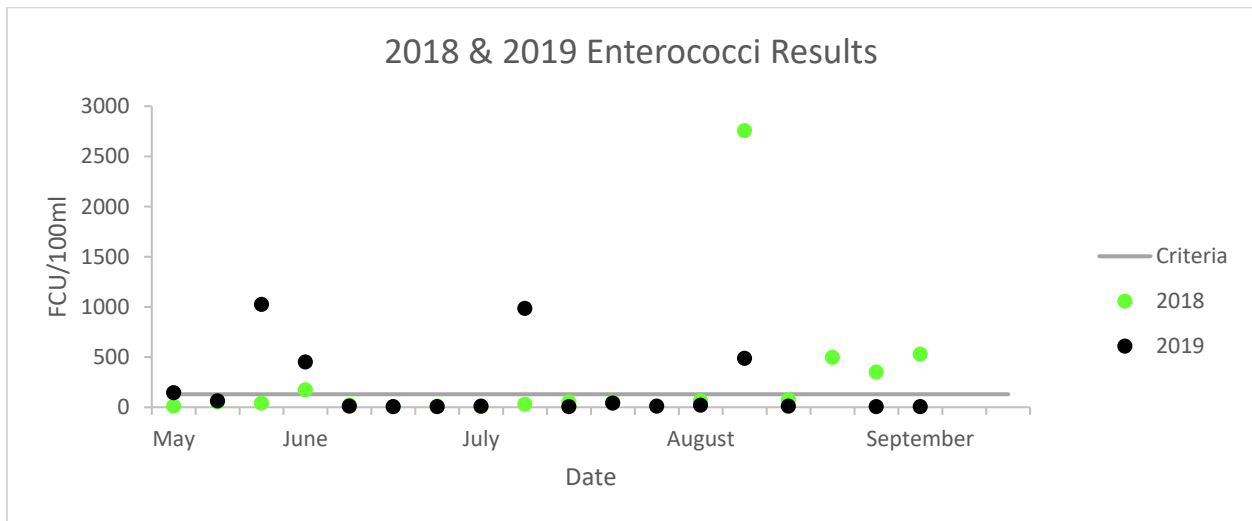
Figure 3. 2018 & 2019 enterococci sample results

Table 6. 2018-2019 enterococci geometric means

2018		2019	
Rolling 30-day Period[1]	**Geometric Mean**	**Rolling 30-day Period**	**Geometric Mean**
06-14-2018 to 05-15-2018	37	06-11-2019 to 05-12-2019	**133[1]**
06-20-2018 to 05-21-2018	32	06-19-2019 to 05-20-2019	**68**
06-27-2018 to 05-28-2018	23	06-25-2019 to 05-26-2019	**41**
07-02-2018 to 06-02-2018	15	07-02-2019 to 06-02-2019	16
07-12-2018 to 06-12-2018	11	07-10-2019 to 06-10-2019	19
07-18-2018 to 06-18-2018	13	07-17-2019 to 06-17-2019	17
07-26-2018 to 06-26-2018	21	07-23-2019 to 06-23-2019	25
08-01-2018 to 07-02-2018	30	07-29-2019 to 06-29-2019	29
08-09-2018 to 07-10-2018	**107**	08-07-2019 to 07-08-2019	33
08-16-2018 to 07-17-2018	**128**	08-13-2019 to 07-14-2019	29
08-23-2018 to 07-24-2018	**201**	08-21-2019 to 07-22-2019	33
08-30-2018 to 07-31-2018	**295**	[1] Bold red font indicates exceedance of criteria	
09-05-2018 to 08-06-2018	**451**		
09-12-2018 to 08-13-2018	**245**		

Table 7. Fecal coliform impairment frequencies summary

18AAC70(14)(D) Harvesting for Consumption of Raw Mollusks or Other Raw Aquatic Life	Geometric mean of samples may not exceed 14 fecal coliform/100 ml (seasonal sample set)		Not more than 10% of the samples may exceed 31 fecal coliform CFU/100ml	
	2018	**2019**	**2018**	**2019**
Target Type 1 Error	0.2	0.2	0.2	0.2
Allowed Exceedance Frequency	>1	>1	10%	10%
Total Exceedances	1	1	11	8
Total Trials	1	1	18	18
Raw Exceedance Frequency	100%	100%	61%	44%
Is Criteria Exceeded?	**Yes**	**Yes**	**Yes**	**Yes**

Table 8. Enterococci impairment frequencies summary

18AAC70(14)(D)(B) Contact Recreation	In a 30-day period, the geometric mean of samples may not exceed 35 Enterococci CFU/100ml		Not more than 10% of the samples may exceed a STV of 130 Enterococci CFU/100ml	
	2018	**2019**	**2018**	**2019**
Target Type 1 Error	0.2	0.2	0.2	0.2
Allowed Exceedance Frequency	>1	>1	10%	10%
Total Exceedances	7	3	5	6
Total Trials	14	11	18	18
Raw Exceedance Frequency	50%	27%	28%	33%
Is Criteria Exceeded?	**yes**	**yes**	**yes**	**yes**

Potential Pollutant Sources

Thomas Basin Harbor includes beaches, and industrial, business and residential areas. Potential pathogen sources along the marine coast consists of wildlife and pet feces, private watercraft, sewer collection system deficiencies, Charcoal Point sewer Treatment System (and emergency bypass discharge), and boats at boat launches and in harbor areas.

Waterbody Specific Conclusion

Thomas Basin Harbor is recommended for inclusion as impaired in Category 5 in the 2020 IR for exceedance of the pathogens criteria for marine coastal waters. Data from two recreation seasons of pathogen monitoring within Thomas Basin Harbor marine waters indicate that the waterbody is not meeting criteria for 4 designated uses:

- aquaculture for products not normally cooked
- seafood processing
- contact recreation
- harvesting for consumption of raw mollusks or other raw aquatic life

Thomas Basin Harbor marine waters do meet criteria for 2 designated uses[11]:

- industrial
- secondary recreation

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[11] Thomas Basin Harbor marine waters does meet part of (A) Water Supply (i) aquaculture for products normally cooked.

Table 9: 2018-2019 Fecal coliform and enterococci data summary

2018 Sample Date	Fecal coliform CFU/100ml	Enterococci MPN/100ml	2019 Sample Date	Fecal coliform CFU/100ml	Enterococci MPN/100ml
May 17	1	10	May 15	**55**	**144**
May 22	**81**[1]	51	May 22	11	63
May 31	12	41	May 29	6	**1024**
Jun 6	**139**	**173**	Jun 5	12	**450**
Jun 14	19	20	Jun 11	**214**	10
Jun 20	9	5	Jun 19	18	5
Jun 27	19	10	Jun 25	12	5
Jul 2	**41**	5	Jul 2	**74**	10
Jul 12	**37**	30	Jul 10	9	**984**
Jul 18	19	52	Jul 17	**431**	5
July 26	23	52	Jul 23	**42**	41
Aug 1	24	63	Jul 29	**38**	10
Aug 9	**250**	**2755**	Aug 7	11	20
Aug 16	14	74	Aug 13	**37**	**487**
Aug 23	**59**	**496**	Aug 21	**258**	10
Aug 30	**49**	**350**	Sep 4	**62**	5
Sep 5	**72**	**528**	Sep 10	**76**	5
Sep 12	26	130	Sep 18	**48**	**256**
Seasonal Geometric Mean	**28**			**38**	
Maximum Geometric Mean		**451**			**131**

[1] Bold red font indicates exceedance of criteria

Appendix H
Seaport Beach, Ketchikan, Alaska
Pathogens Determination

Seaport Beach, located in Saxman within Ketchikan (Figure 1), is recommended for inclusion as impaired in Category 5 in the 2020 IR for exceedance of the pathogens criteria for marine coastal waters. Seaport Beach was not included in previous IRs. Based on data collected in 2018 and 2019, Seaport Beach does not meet the pathogen criteria for 3 of the 6 designated uses (Table 2 and 3).

Basic waterbody information

Table 1. Basic waterbody information

Assessment Unit ID	AK_B_1010204_006 (21AKBCH - AK495900)
Assessment Unit Name	Seaport Beach
Location description	South Saxman; HUC 1901010204
Water Type	Open coast
Water Size	NA
Area of impairment	0.22 miles of coastline
Time of impairment	Year round
Latitude/Longitude	55.31462, -131.5932

Figure 1. Seaport Beach monitoring site and impaired beach segment

Pollutant status

Table 2. Alaska's Water Quality Standards at 18 AAC 70(14), fecal coliform for marine water uses[2]

Use	Status
(A) Water Supply (i) aquaculture	Supporting normally cooked; Not supporting not normally cooked
(A) Water Supply (ii) seafood processing	Not supporting
(A) Water Supply (iii) industrial	Supporting
(B) Water Recreation (ii) secondary recreation	Supporting
(D) Harvesting for Consumption of Raw Mollusks or Other Raw Aquatic Life	Not supporting

Table 3. Alaska's Water Quality Standards at 18 AAC 70(14) enterococci for marine water uses[2]

Use	Status
(B) Water Recreation (i) contact recreation	Supporting

Results

Seaport Beach has persistent bacteria exceedances in marine coastal waters, and meets criteria for impairment as outlined in the Pathogen Listing Methodology[3]. The following tables and graphs present the 2018-2019 data with the pathogen marine water designated uses.

Table 4 summarizes the most recent 2 years of data with criteria exceedences. Figures 3 and 4 show fecal results, and Figures 5 and 6 show enterococci results compared to the single sample percent criteria. Tables 5 and 6 show sample results compared to fecal coliform and enterococci geometric means. Tables 7 and 8 show impairment frequency summaries.

Table 4. 2018-2019 Fecal coliform and enterococci summary

Analytical test	No. of Samples	Maximum Result	% Exceedances		Geometric Mean	
			2018	2019	2018	2019
Fecal coliform (CFU/100mL)	36	163[1]	17	22	7	11
Enterococci (MPN/100mL)	36	173	0	25	13	17

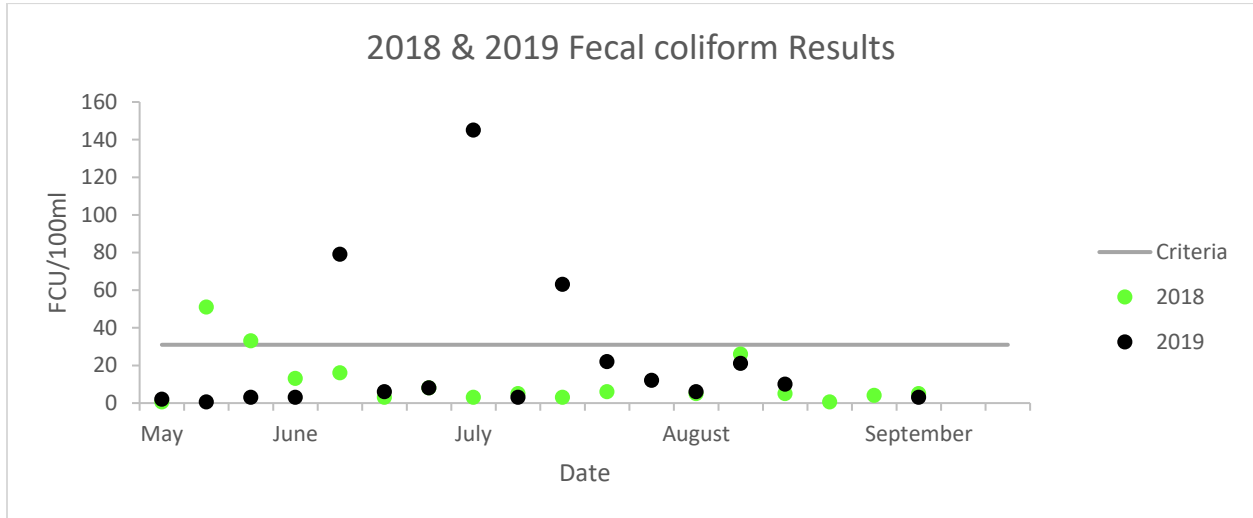[1] Bold red font indicates exceedance of criteria

Figure 2. 2018-2019 fecal coliform sample results

Table 5. 2018-2019 Fecal coliform geometric means

Sample Season	Rolling 30-day Period	Geometric Mean
2018	5/17/2018 to 9/12/2018	7
2019	5/15/2019 to 9/18/2019	11
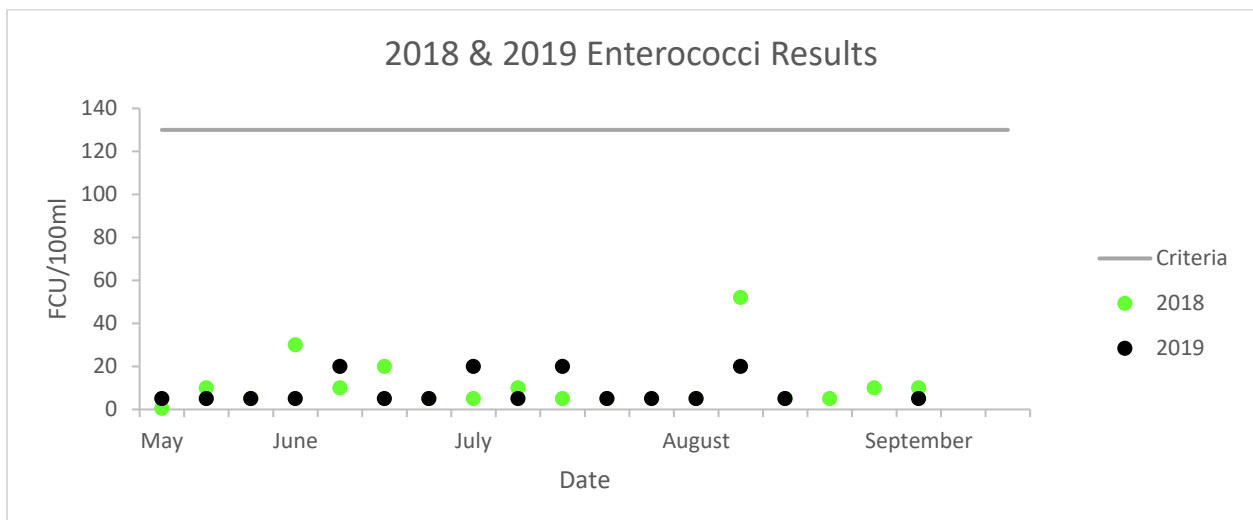
Figure 3. 2018-2019 enterococci sample results

Table 6. 2018-2019 enterococci geometric means

2018		2019	
Rolling 30-day Period[1]	**Geometric Mean**	**Rolling 30-day Period**	**Geometric Mean**
06-14-2018 to 05-15-2018	6	06-11-2019 to 05-12-2019	7
06-20-2018 to 05-21-2018	12	06-19-2019 to 05-20-2019	7
06-27-2018 to 05-28-2018	11	06-25-2019 to 05-26-2019	7
07-02-2018 to 06-02-2018	11	07-02-2019 to 06-02-2019	9
07-12-2018 to 06-12-2018	9	07-10-2019 to 06-10-2019	9
07-18-2018 to 06-18-2018	8	07-17-2019 to 06-17-2019	9
07-26-2018 to 06-26-2018	6	07-23-2019 to 06-23-2019	9
08-01-2018 to 07-02-2018	6	07-29-2019 to 06-29-2019	9
08-09-2018 to 07-10-2018	9	08-07-2019 to 07-08-2019	7
08-16-2018 to 07-17-2018	8	08-13-2019 to 07-14-2019	9
08-23-2018 to 07-24-2018	8	08-21-2019 to 07-22-2019	7
08-30-2018 to 07-31-2018	9		
09-05-2018 to 08-06-2018	11		
09-12-2018 to 08-13-2018	7		

Table 7. Fecal coliform impairment frequencies summary

18AAC70(14)(D) Harvesting for Consumption of Raw Mollusks or Other Raw Aquatic Life	Geometric mean of samples may not exceed 14 fecal coliform/100 ml (seasonal sample set)		Not more than 10% of the samples may exceed 31 fecal coliform CFU/100ml	
	2018	**2019**	**2018**	**2019**
Target Type 1 Error	0.2	0.2	0.2	0.2
Allowed Exceedance Frequency	>1	>1	10%	10%
Total Exceedances	0	0	3	4
Total Trials	1	1	18	18
Raw Exceedance Frequency	0%	0%	17%	22%
Is Criteria Exceeded?	No	No	**Yes**	**Yes**

Table 8. Enterococci exceedance frequencies summary

18AAC70(14)(D)(B) Contact Recreation	In a 30-day period, the geometric mean of samples may not exceed 35 Enterococci CFU/100ml		Not more than 10% of the samples may exceed a STV of 130 Enterococci CFU/100ml	
	2018	**2019**	**2018**	**2019**
Target Type 1 Error	0.2	0.2	0.2	0.2
Allowed Exceedance Frequency	>1	>1	10%	10%
Total Exceedances	0	0	0	1
Total Trials	14	11	18	18
Raw Exceedance Frequency	0%	0%	0%	6%
Is Criteria Exceeded?	No	No	No	No

Potential Pollutant Sources

Seaport Beach is situated in commercial area in Saxman, and includes a local shellfish gathering beach and residential areas. Potential pathogen sources along the marine coast consists of wildlife and pet feces, private watercraft, and cruise ships and ferries, sewer collection system deficiencies, and Charcoal Point sewer treatment system (and emergency bypass discharge).

Waterbody Specific Conclusion

Seaport Beach is recommended for inclusion as impaired in Category 5 in the 2020 IR for exceedance of the pathogens criteria for marine coastal waters. Data from two recreation seasons of pathogen monitoring within Seaport Beach marine waters indicate that the waterbody is not meeting criteria for 3 designated uses:

- aquaculture for products not normally cooked
- seafood processing
- harvesting for consumption of raw mollusks or other raw aquatic life

Seaport Beach Harbor marine waters do meet criteria for 3 designated uses[12]:

- industrial
- contact recreation
- secondary recreation

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[12] Seaport Beach marine waters does meet part of (A) Water Supply (i) aquaculture for products normally cooked.

Table 9: 2018-2019 fecal coliform and enterococci data summary

2018 Sample Date	Fecal coliform CFU/100ml	Enterococci MPN/100ml	2019 Sample Date	Fecal coliform CFU/100ml	Enterococci MPN/100ml
May 17	1	0.5	May 15	2	5
May 22	**51**[1]	10	May 22	1	5
May 31	**33**	5	May 29	3	5
Jun 6	13	30	Jun 5	3	5
Jun 14	16	10	Jun 11	**79**	20
Jun 20	3	20	Jun 19	6	5
Jun 27	8	5	Jun 25	8	5
Jul 2	3	5	Jul 2	**145**	20
Jul 12	5	10	Jul 10	3	5
Jul 18	3	5	Jul 17	**63**	20
July 26	6	5	Jul 23	22	5
Aug 1	5	5	Jul 29	12	5
Aug 9	26	52	Aug 7	6	5
Aug 16	5	5	Aug 13	21	20
Aug 23	1	5	Aug 21	10	5
Aug 30	4	10	Sep 4	3	5
Sep 5	5	10	Sep 10	**163**	20
Sep 12	**63**	5	Sep 18	17	**173**
Seasonal Geometric Mean	7			11	
Maximum Geometric Mean		12			9

[1] Bold red font indicates exceedance of criteria

Appendix I
Rotary Park Pool, Ketchikan, Alaska
Pathogens Determination

Rotary Park Pool, located in southern Ketchikan (Figure 1), is recommended for inclusion as impaired in Category 5 in the 2020 IR for exceedance of the pathogens criteria for marine coastal waters. Rotary Park Pool was not included in previous IRs. Based on data collected in 2018 and 2019, Rotary Park Pool does not meet the pathogen criteria for 4 of the 6 designated uses (Table 2 and 3).

Basic waterbody information

Table 1. Basic waterbody information

Assessment Unit ID	AK_B_1010204_007 (21AKBCH - AK365539)
Assessment Unit Name	Rotary Pool
Location description	South Ketchikan; HUC 1901010204
Water Type	Lagoon
Water Size	0.92 acres
Area of impairment	0.14 miles of coastline
Time of impairment	Year round
Latitude/Longitude	55.30982, -131.58028

Figure 1. Rotary Park Pool monitoring site and impaired beach segment

Pollutant status

Table 2. Alaska's Water Quality Standards at 18 AAC 70(14), fecal coliform for marine water uses[2]

Use	Status
(A) Water Supply (i) aquaculture	Supporting normally cooked; Not supporting not normally cooked
(A) Water Supply (ii) seafood processing	Not supporting
(A) Water Supply (iii) industrial	Supporting
(B) Water Recreation (ii) secondary recreation	Supporting
(D) Harvesting for Consumption of Raw Mollusks or Other Raw Aquatic Life	Not supporting

Table 3. Alaska's Water Quality Standards at 18 AAC 70(14) enterococci for marine water uses[2]

Use	Status
(B) Water Recreation (i) contact recreation	Not supporting

Results

Rotary Park Pool has persistent bacteria exceedances in marine coastal waters, and meets criteria for impairment as outlined in the Pathogen Listing Methodology[3]. The following tables and graphs present the 2018-2019 data with the pathogen marine water designated uses.

Table 4 summarizes the most recent 2 years of data with criteria exceedences. Figures 3 and 4 show fecal results, and Figures 5 and 6 show enterococci results compared to the single sample percent criteria. Tables 5 and 6 show sample results compared to fecal coliform and enterococci geometric means. Tables 7 and 8 show impairment frequency summaries.

Table 4. 2018-2019 fecal coliform and enterococci summary

Analytical test	No. of Samples	Maximum Result	% Exceedances		Geometric Mean	
			2018	2019	2018	2019
Fecal coliform (CFU/100mL)	36	390[1]	36	33	16	21
Enterococci (MPN/100mL)	36	2851	20	25	30	71

[1] Bold red font indicates exceedance of criteria
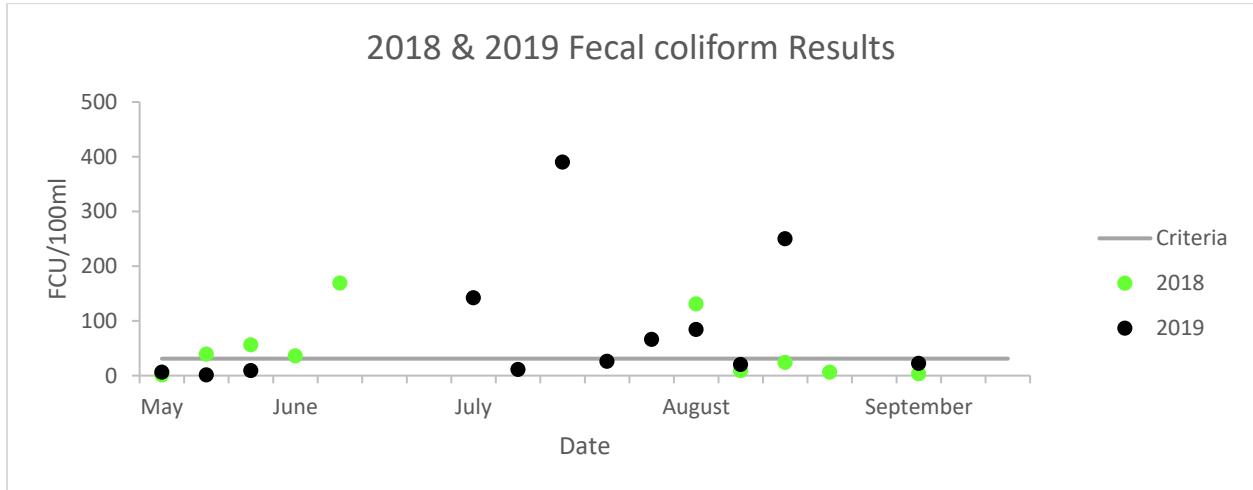
Figure 2. 2018-2019 Fecal coliform sample results

Table 5. 2018-2019 Fecal coliform geometric means

Sample Season	Rolling 30-day Period	Geometric Mean
2018	5/17/2018 to 9/12/2018	**20**[1]
2019	5/15/2019 to 9/18/2019	**20**

[1] Bold red font indicates exceedance of criteria
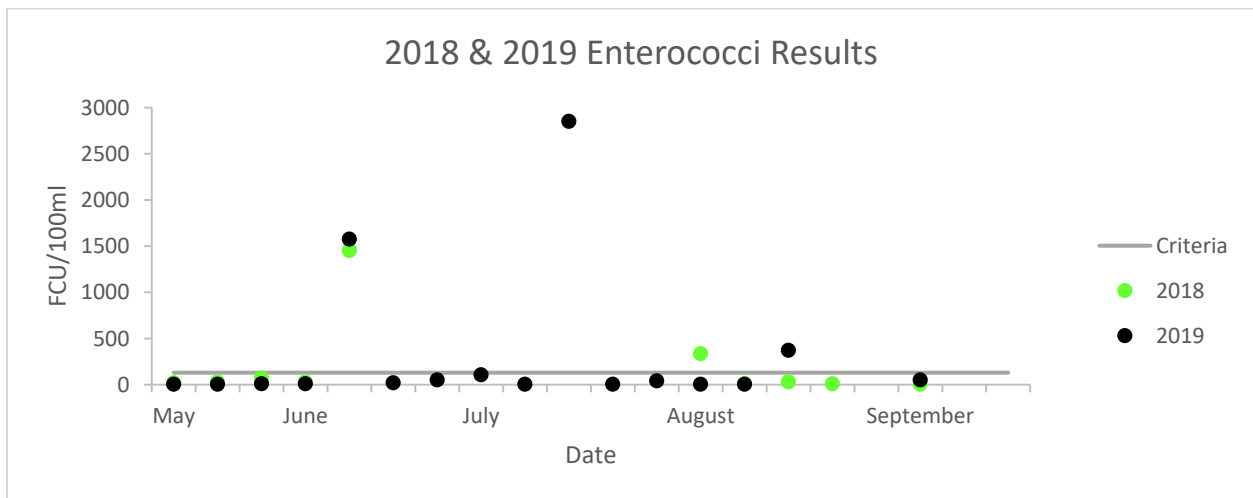
Figure 3. 2018-2019 enterococci sample results

Table 6. 2018-2019 enterococci geometric means

2018		2019	
Rolling 30-day Period[1]	**Geometric Mean**	**Rolling 30-day Period**	**Geometric Mean**
06-14-2018 to 05-15-2018	**71**[1]	06-11-2019 to 05-12-2019	21
09-05-2018 to 08-06-2018	22	06-19-2019 to 05-20-2019	28
09-12-2018 to 08-13-2018	22	06-25-2019 to 05-26-2019	**44**
[1] Bold red font indicates exceedance of criteria		07-02-2019 to 06-02-2019	**71**
		07-10-2019 to 06-10-2019	**62**
		07-17-2019 to 06-17-2019	**69**
		07-23-2019 to 06-23-2019	**53**
		07-29-2019 to 06-29-2019	**50**
		08-07-2019 to 07-08-2019	27
		08-13-2019 to 07-14-2019	27
		08-21-2019 to 07-22-2019	18

Table 7. Fecal coliform impairment frequencies summary

18AAC70(14)(D) Harvesting for Consumption of Raw Mollusks or Other Raw Aquatic Life	Geometric mean of samples may not exceed 14 fecal coliform/100 ml (seasonal sample set)		Not more than 10% of the samples may exceed 31 fecal coliform CFU/100ml	
	2018	**2019**	**2018**	**2019**
Target Type 1 Error	0.2	0.2	0.2	0.2
Allowed Exceedance Frequency	>1	>1	10%	10%
Total Exceedances	1	1	5	6
Total Trials	1	1	11	18
Raw Exceedance Frequency	100%	100%	45%	33%
Is Criteria Exceeded?	**Yes**	**Yes**	**Yes**	**Yes**

Table 8. Enterococci exceedance frequencies summary

18AAC70(14)(D)(B) Contact Recreation	In a 30-day period, the geometric mean of samples may not exceed 35 Enterococci CFU/100ml		Not more than 10% of the samples may exceed a STV of 130 Enterococci CFU/100ml	
	2018	**2019**	**2018**	**2019**
Target Type 1 Error	0.2	0.2	0.2	0.2
Allowed Exceedance Frequency	>1	>1	10%	10%
Total Exceedances	1	6	3	3
Total Trials	3	11	11	18
Raw Exceedance Frequency	33%	55%	27%	17%
Is Criteria Exceeded?	**Yes**	**Yes**	**Yes**	**Yes**

Potential Pollutant Sources

Rotary Park Pool includes beaches and residential areas. Potential pathogen sources along the marine coast consists of wildlife and pet feces, private watercraft, cruise ships and ferries, and sewer line breaks.

Waterbody Specific Conclusion

Rotary Park Pool is recommended for inclusion as impaired in Category 5 in the 2020 IR for exceedance of the pathogens criteria for marine coastal waters. Data from two recreation seasons of pathogen monitoring within Rotary Park Pool marine waters indicate that the waterbody is not meeting criteria for 4 designated uses:

- aquaculture for products not normally cooked
- seafood processing
- contact recreation
- harvesting for consumption of raw mollusks or other raw aquatic life

Rotary Park Pool marine waters do meet criteria for 2 designated uses[13]:

- industrial
- secondary recreation

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[13] Rotary Park Pool marine waters does meet part of (A) Water Supply (i) aquaculture for products normally cooked.

Table 9: 2018-2019 Fecal coliform and enterococci data summary

2018 Sample Date	Fecal coliform CFU/100ml	Enterococci MPN/100ml	2019 Sample Date	Fecal coliform CFU/100ml	Enterococci MPN/100ml
May 17	1	20	May 15	6	5
May 22	**39**[1]	30	May 22	1	5
May 31	**56**	70	May 29	9	10
Jun 6	**36**	30	Jun 5	6	10
Jun 14	**169**	**1454**	Jun 11	**206**	**1576**
Aug 9	**131**	**336**	Jun 19	2	20
Aug 16	9	10	Jun 25	19	52
Aug 23	24	31	Jul 2	**142**	108
Aug 30	6	10	Jul 10	11	5
Sep 5	3	5	Jul 17	**390**	**2851**
Sep 12	25	**309**	Jul 23	26	5
[1] Bold red font indicates exceedance of criteria			Jul 29	**66**	41
			Aug 7	**84**	5
			Aug 13	20	5
			Aug 21	**250**	**372**
			Sep 4	22	52
			Sep 10	3	5
			Sep 18	5	5
Seasonal Geometric Mean	**20**			**20**	
Maximum Geometric Mean		**71**			**71**

Appendix J
Mountain Point Cultural Food Beach, Ketchikan, Alaska
Pathogens Determination

Mountain Point Cultural Food Beach, located on Mountain Point south of the city of Ketchikan (Figure 1), is recommended for inclusion as impaired in Category 5 in the 2020 IR for exceedance of the pathogens criteria for marine coastal waters. Mountain Point Cultural Food Beach (Cultural Food Beach) was not included in previous IRs. Based on data collected in 2018 and 2019, Cultural Food Beach does not meet the pathogen criteria for 4 of the 6 designated uses (Table 2 and 3).

Basic waterbody information

Table 1. Basic waterbody information

Assessment Unit ID	AK_B_1010208_001 (21AKBCH - AK346845)
Assessment Unit Name	Mountain Point Cultural Food Beach
Location description	Mountain Point south of city of Ketchikan; HUC 1901010208
Water Type	Open coast
Water Size	NA
Area of impairment	0.21 miles of coastline
Time of impairment	Year round
Latitude/Longitude	55.29279, -131.53917

Figure 1. Cultural Food Beach monitoring site and impaired beach segment

Pollutant status

Table 2. Alaska's Water Quality Standards at 18 AAC 70(14), fecal coliform for marine water uses[2]

Use	Status
(A) Water Supply (i) aquaculture	Supporting normally cooked; Not supporting not normally cooked
(A) Water Supply (ii) seafood processing	Not supporting
(A) Water Supply (iii) industrial	Supporting
(B) Water Recreation (ii) secondary recreation	Supporting
(D) Harvesting for Consumption of Raw Mollusks or Other Raw Aquatic Life	Not supporting

Table 3. Alaska's Water Quality Standards at 18 AAC 70(14) enterococci for marine water uses[2]

Use	Status
(B) Water Recreation (i) contact recreation	Not supporting

Results

Cultural Food Beach has persistent bacteria exceedances in marine coastal waters, and meets criteria for impairment as outlined in the Pathogen Listing Methodology[3]. The following tables and graphs present the 2018-2019 data with the pathogen marine water designated uses.

Table 4 summarizes the most recent 2 years of data with criteria exceedences. Figures 3 and 4 show fecal results, and Figures 5 and 6 show enterococci results compared to the single sample percent criteria. Tables 5 and 6 show sample results compared to fecal coliform and enterococci geometric means. Tables 7 and 8 show impairment frequency summaries.

Table 4. 2018-2019 fecal coliform and enterococci summary

Analytical test	No. of Samples	Maximum Result	% Exceedances		Geometric Mean	
			2018	2019	2018	2019
Fecal coliform (CFU/100mL)	36	526[1]	45	67	18	64
Enterococci (MPN/100mL)	36	934	40	60	43	177

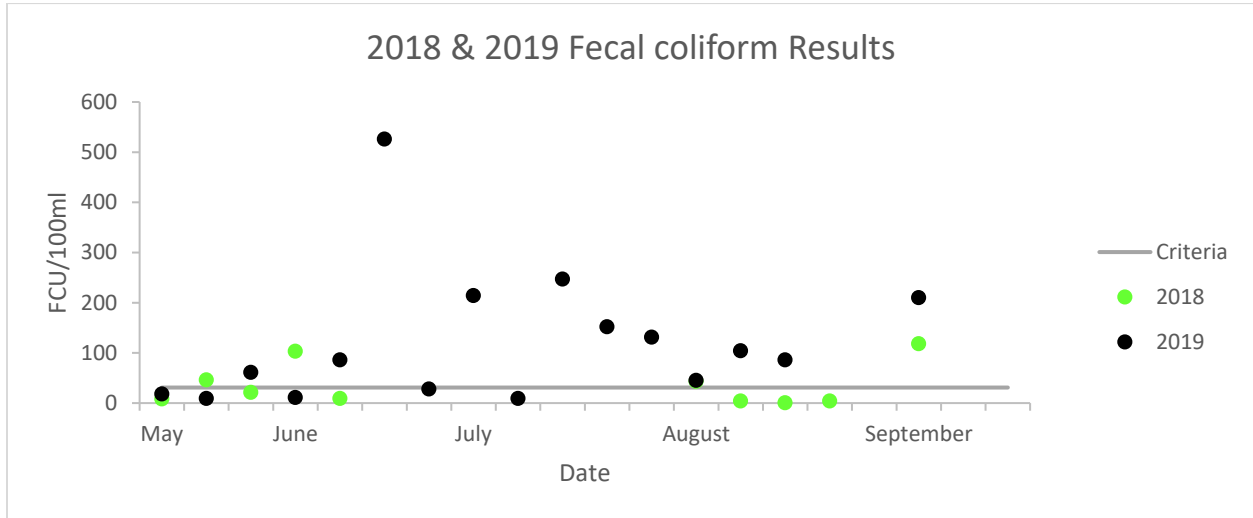[1] Bold red font indicates exceedance of criteria

Figure 2. 2018-2019 Fecal coliform sample results

Table 5. 2018-2019 Fecal coliform geometric means

Sample Season	Rolling 30-day Period	Geometric Mean
2018	5/17/2018 to 9/12/2018	**17**[1]
2019	5/15/2019 to 9/18/2019	**64**

[1] Bold red font indicates exceedance of criteria
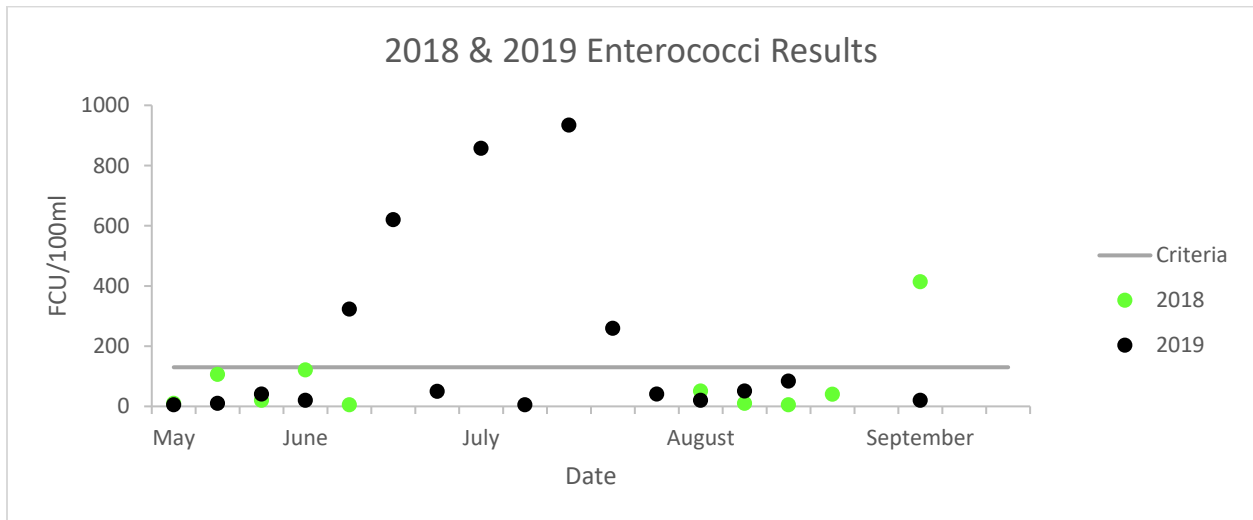
Figure 3. 2018-2019 enterococci sample results

Table 6. 2018-2019 enterococci geometric means

2018		2019	
Rolling 30-day Period[1]	**Geometric Mean**	**Rolling 30-day Period**	**Geometric Mean**
06-14-2018 to 05-15-2018	26	06-11-2019 to 05-12-2019	27
09-05-2018 to 08-06-2018	34	06-19-2019 to 05-20-2019	**70**
09-12-2018 to 08-13-2018	**43**[1]	06-25-2019 to 05-26-2019	**96**
[1] Bold red font indicates exceedance of criteria		07-02-2019 to 06-02-2019	**177**
		07-10-2019 to 06-10-2019	**134**
		07-17-2019 to 06-17-2019	**165**
		07-23-2019 to 06-23-2019	**139**
		07-29-2019 to 06-29-2019	**134**
		08-07-2019 to 07-08-2019	**63**
		08-13-2019 to 07-14-2019	**100**
		08-21-2019 to 07-22-2019	**62**

Table 7. Fecal coliform impairment frequencies summary

18AAC70(14)(D) Harvesting for Consumption of Raw Mollusks or Other Raw Aquatic Life	Geometric mean of samples may not exceed 14 fecal coliform/100 ml (seasonal sample set)		Not more than 10% of the samples may exceed 31 fecal coliform CFU/100ml	
	2018	**2019**	**2018**	**2019**
Target Type 1 Error	0.2	0.2	0.2	0.2
Allowed Exceedance Frequency	>1	>1	10%	10%
Total Exceedances	1	1	5	12
Total Trials	1	1	11	18
Raw Exceedance Frequency	100%	100%	45%	67%
Is Criteria Exceeded?	**Yes**	**Yes**	**Yes**	**Yes**

Table 8. Enterococci exceedance frequencies summary

18AAC70(14)(D)(B) Contact Recreation	In a 30-day period, the geometric mean of samples may not exceed 35 Enterococci CFU/100ml		Not more than 10% of the samples may exceed a STV of 130 Enterococci CFU/100ml	
	2018	**2019**	**2018**	**2019**
Target Type 1 Error	0.2	0.2	0.2	0.2
Allowed Exceedance Frequency	>1	>1	10%	10%
Total Exceedances	1	10	2	5
Total Trials	3	11	11	18
Raw Exceedance Frequency	33%	91%	18%	28%
Is Criteria Exceeded?	**Yes**	**Yes**	**Yes**	**Yes**

Potential Pollutant Sources

Cultural Food Beach includes beaches and residential areas. Potential pathogen sources along the marine coast consists of wildlife and pet feces, private watercraft, cruise ships and ferries, and Mountain Point sewer treatment system outfall, sewer line breaks, boats at boat launches and in harbor areas.

Waterbody Specific Conclusion

Cultural Food Beach is recommended for inclusion as impaired in Category 5 in the 2020 IR for exceedance of the pathogens criteria for marine coastal waters. Data from two recreation seasons of pathogen monitoring within Cultural Food Beach marine waters indicate that the waterbody is not meeting criteria for 4 designated uses:

- aquaculture for products not normally cooked
- seafood processing
- contact recreation
- harvesting for consumption of raw mollusks or other raw aquatic life

Thomas Basin Harbor marine waters do meet criteria for 2 designated uses[14]:

- industrial
- secondary recreation

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[14] Cultural Food Beach marine waters does meet part of (A) Water Supply (i) aquaculture for products normally cooked.

Table 9: 2018-2019 fecal coliform and enterococci data summary

2018 Sample Date	Fecal coliform CFU/100ml	Enterococci MPN/100ml	2019 Sample Date	Fecal coliform CFU/100ml	Enterococci MPN/100ml
May 17	8	10	May 15	18	5
May 22	**46**[1]	106	May 22	9	10
May 31	21	20	May 29	**61**	41
Jun 6	**103**	121	Jun 5	11	20
Jun 14	9	5	Jun 11	**86**	**323**
Aug 9	**43**	51	Jun 19	**526**	**620**
Aug 16	4	10	Jun 25	28	50
Aug 23	1	5	Jul 2	**214**	**857**
Aug 30	4	40	Jul 10	9	5
Sep 5	**118**	**414**	Jul 17	**247**	**934**
Sep 12	**98**	**183**	Jul 23	**152**	**259**
[1] Bold red font indicates exceedance of criteria			Jul 29	**131**	41
			Aug 7	**45**	20
			Aug 13	**104**	51
			Aug 21	**86**	84
			Sep 4	**210**	20
			Sep 10	20	5
			Sep 18	**131**	97
Seasonal Geometric Mean	**17**			**64**	
Maximum Geometric Mean		**43**			**177**

Appendix K
Herring Bay Beach, Ketchikan, Alaska
Pathogens Determination

Herring Bay, located in south of Ketchikan (Figure 1), is recommended for inclusion as impaired in Category 5 in the 2020 IR for exceedance of the pathogens criteria for marine coastal waters. Herring Cove was not included in previous IRs. Based on data collected in 2018 and 2019, Herring Cove does not meet the pathogen criteria for 4 of the 6 designated uses (Table 2 and 3).

Basic waterbody information

Table 1. Basic waterbody information

Assessment Unit ID	AK_B_1010205_001 (21AKBCH - AK549954)
Assessment Unit Name	Herring Bay Beach
Location description	South of Ketchikan; HUC 1901010205
Water Type	Open coast
Water Size	NA
Area of impairment	0.12 miles of coastline
Time of impairment	Year round
Latitude/Longitude	55.32627, -131.52278

Figure 1. Herring Cove monitoring site and impaired beach segment

Pollutant status

Table 2. Alaska's Water Quality Standards at 18 AAC 70(14), fecal coliform for marine water uses[2]

Use	Status
(A) Water Supply (i) aquaculture	Supporting normally cooked; Not supporting not normally cooked
(A) Water Supply (ii) seafood processing	Not supporting
(A) Water Supply (iii) industrial	Supporting
(B) Water Recreation (ii) secondary recreation	Supporting
(D) Harvesting for Consumption of Raw Mollusks or Other Raw Aquatic Life	Not supporting

Table 3. Alaska's Water Quality Standards at 18 AAC 70(14) enterococci for marine water uses[2]

Use	Status
(B) Water Recreation (i) contact recreation	Not supporting

Results

Herring Cove has persistent bacteria exceedances in marine coastal waters, and meets criteria for impairment as outlined in the Pathogen Listing Methodology[3]. The following tables and graphs present the 2018-2019 data with the pathogen marine water designated uses.

Table 4 summarizes the most recent 2 years of data with criteria exceedences. Figures 3 and 4 show fecal results, and Figures 5 and 6 show enterococci results compared to the single sample percent criteria. Tables 5 and 6 show sample results compared to fecal coliform and enterococci geometric means. Tables 7 and 8 show impairment frequency summaries.

Table 4. 2018-2019 fecal coliform and enterococci summary

Analytical test	No. of Samples	Maximum Result	% Exceedances		Geometric Mean	
			2018	2019	2018	2019
Fecal coliform (CFU/100mL)	36	386[1]	72	67	47	64
Enterococci (MPN/100mL)	36	2595	60	75	113	403

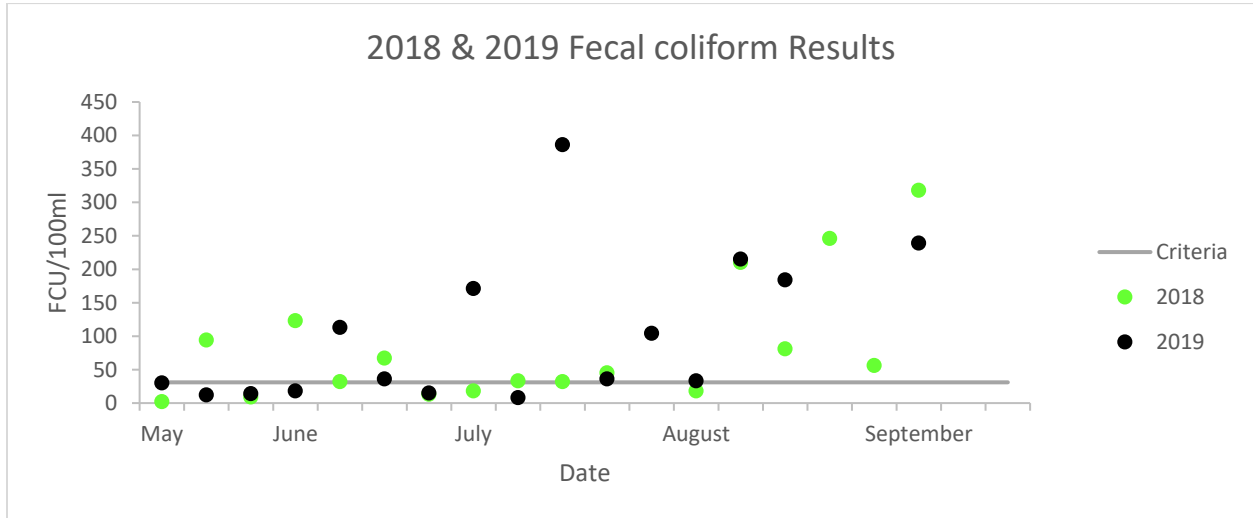[1] Bold red font indicates exceedance of criteria

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Figure 2. 2018-2019 fecal coliform sample results

Table 5. 2018-2019 fecal coliform geometric means

Sample Season	Rolling 30-day Period	Geometric Mean
2018	5/17/2018 to 9/12/2018	**47**[1]
2019	5/15/2019 to 9/18/2019	**44**

[1] Bold red font indicates exceedance of criteria

Figure 3. 2018-2019 enterococci sample results

Table 6. 2018-2019 enterococci geometric means

2018		2019	
Rolling 30-day Period[1]	**Geometric Mean**	**Rolling 30-day Period**	**Geometric Mean**
06-14-2018 to 05-15-2018	**67**[1]	06-11-2019 to 05-12-2019	11
06-20-2018 to 05-21-2018	33	06-19-2019 to 05-20-2019	13
06-27-2018 to 05-28-2018	20	06-25-2019 to 05-26-2019	13
07-02-2018 to 06-02-2018	12	07-02-2019 to 06-02-2019	23
07-12-2018 to 06-12-2018	28	07-10-2019 to 06-10-2019	23
07-18-2018 to 06-18-2018	12	07-17-2019 to 06-17-2019	16
07-26-2018 to 06-26-2018	23	07-23-2019 to 06-23-2019	14
08-01-2018 to 07-02-2018	32	07-29-2019 to 06-29-2019	14
08-09-2018 to 07-10-2018	**70**	08-07-2019 to 07-08-2019	8
08-16-2018 to 07-17-2018	30	08-13-2019 to 07-14-2019	9
08-23-2018 to 07-24-2018	**43**	08-21-2019 to 07-22-2019	11
08-30-2018 to 07-31-2018	26	[1] Bold red font indicates exceedance of criteria	
09-05-2018 to 08-06-2018	18		
09-12-2018 to 08-13-2018	18		

Table 7. Fecal coliform impairment frequencies summary

18AAC70(14)(D) Harvesting for Consumption of Raw Mollusks or Other Raw Aquatic Life	Geometric mean of samples may not exceed 14 fecal coliform/100 ml (seasonal sample set)		Not more than 10% of the samples may exceed 31 fecal coliform CFU/100ml	
	2018	**2019**	**2018**	**2019**
Target Type 1 Error	0.2	0.2	0.2	0.2
Allowed Exceedance Frequency	>1	>1	10%	10%
Total Exceedances	1	1	13	11
Total Trials	1	1	18	18
Raw Exceedance Frequency	100%	100%	72%	61%
Is Criteria Exceeded?	**Yes**	**Yes**	**Yes**	**Yes**

Table 8. Enterococci impairment frequencies summary

18AAC70(14)(D)(B) Contact Recreation	In a 30-day period, the geometric mean of samples may not exceed 35 Enterococci CFU/100ml		Not more than 10% of the samples may exceed a STV of 130 Enterococci CFU/100ml	
	2018	**2019**	**2018**	**2019**
Target Type 1 Error	0.2	0.2	0.2	0.2
Allowed Exceedance Frequency	>1	>1	10%	10%
Total Exceedances	3	0	4	6
Total Trials	14	11	18	18
Raw Exceedance Frequency	21%	0%	22%	33%
Is Criteria Exceeded?	**Yes**	No	**Yes**	**Yes**

Potential Pollutant Sources

Herring Cove includes beaches and residential areas. Potential pathogen sources along the marine coast consists of individual septic systems, private sewer treatment system outfalls, wildlife and pet feces, private watercraft, and sewer collection system deficiencies.

Waterbody Specific Conclusion

Herring Cove is recommended for inclusion as impaired in Category 5 in the 2020 IR for exceedance of the pathogens criteria for marine coastal waters. Data from two recreation seasons of pathogen monitoring within Herring Cove marine waters indicate that the waterbody is not meeting criteria for 4 designated uses:

- aquaculture for products not normally cooked
- seafood processing
- contact recreation
- harvesting for consumption of raw mollusks or other raw aquatic life

Herring Cove marine waters do meet criteria for 2 designated uses[15]:

- industrial
- secondary recreation

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[15] Herring Cove marine waters does meet part of (A) Water Supply (i) aquaculture for products normally cooked.

Table 9: 2018-2019 fecal coliform and enterococci data summary

2018 Sample Date	Fecal coliform CFU/100ml	Enterococci MPN/100ml	2019 Sample Date	Fecal coliform CFU/100ml	Enterococci MPN/100ml
May 17	2	31	May 15	30	5
May 22	**94**[1]	30	May 22	12	5
May 31	9	5	May 29	14	5
Jun 6	**123**	109	Jun 5	18	5
Jun 14	**32**	10	Jun 11	**113**	41
Jun 20	**67**	5	Jun 19	**36**	10
Jun 27	13	5	Jun 25	15	5
Jul 2	18	10	Jul 2	**171**	**213**
Jul 12	**33**	41	Jul 10	8	5
Jul 18	**32**	30	Jul 17	**386**	**565**
July 26	**45**	5	Jul 23	**36**	10
Aug 1	18	20	Jul 29	**104**	20
Aug 9	**210**	**201**	Aug 7	**33**	5
Aug 16	**81**	31	Aug 13	**215**	**613**
Aug 23	**246**	**156**	Aug 21	**184**	63
Aug 30	**56**	20	Sep 4	**239**	**262**
Sep 5	**318**	**457**	Sep 10	0.5	**2595**
Sep 12	**213**	**414**	Sep 18	**216**	**185**
Seasonal Geometric Mean	**47**			**44**	
Maximum Geometric Mean		**70**			23

[1] Bold red font indicates exceedance of criteria