City of Kenai
Kenai River Beach Sampling
FY 2012 Final Report

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Watershed
Forum

The Kenai Watershed Forum is dedicated to successfully identifying and addressing the needs of the region by providing high quality EDUCATION, RESTORATION, and RESEARCH programs.

Our mission is "working together for healthy watersheds on the Kenai Peninsula".

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Executive Summary

The City of Kenai and the Kenai Watershed Forum (KWF) teamed up for their second year with the Alaska Department of Environmental Conservation (DEC) to monitor the presence of indicator bacteria before and during the personal use dipnet fishery at the mouth of the Kenai River in Kenai, Alaska. With funding and guidance from DEC, KWF monitored levels of fecal coliform bacteria and enteroccoci on a weekly basis starting from 6/25/12 to 8/12/12. The majority of samples from both beaches sampled were below state and federal exceedance levels for enterococci and fecal coliform. When exceedances did occur either a replicate sample or other samples collected on the same beach during the same sampling event were below exceedance levels. In addition, samples collected a few days after the exceedance event were once again, below exceedance levels. The South Beach was the only beach to exceed the geometric mean standard for Enterococci.

Introduction

A large number of Alaskans participate in the personal use dipnet fishery at the mouth of the Kenai River each year. The personal use dipnet fishery opens on July 10th and closes on July 31st unless modified by the Alaska Board of Fish through emergency order. As requested by the Environmental Protection Agency as part of their national beach monitoring project, the Alaska DEC monitored levels of fecal coliform bacteria (Escherichia coli or E. coli) and enteroccoci at the mouth of the Kenai River in July of 2010 and found exceedances at the north and south beaches near the mouth of the Kenai River; however, acceptable levels of bacteria were found at the Warren Ames Bridge 5 miles upstream. A large number of birds, primarily *Laridae* (gulls), were observed on the beaches during the dipnet fishery. The birds are attracted by fish waste left on the beaches by fisherman during the dipnet fishery and are considered a likely bacteria source. While adequate sanitary facilities, including portable toilets and fish waste disposal containers, were available on both the north and south beaches for dipnet fishers to use, improper waste disposal remains an issue each year and can contribute to high levels of fecal coliform and enterococci (Figure 1).

Figure 1. The South Kenai Beach during the personal use dipnet fishery, 2012.

Since 2010, the DEC has awarded the City of Kenai each year with a grant to monitor levels of enterococci and fecal coliform bacteria during the personal use dipnet fishery near the mouth of the Kenai River. The City of Kenai hired KWF, as a contractor, to monitor and test for bacteria at two

locations at the mouth of the Kenai River (one site on the north beach and one site on the south beach) and a third location near the Warren Ames Bridge (RM 5) to be used as a control.

The following details the methods and results of monitoring during the 2012 personal use dipnet fishery conducted by KWF.

Methods

Prior to beginning the sampling the DEC BEACH Water Quality Monitoring and Pathogen Detection Quality Assurance Project Plan (QAPP) was revised for sampling the Kenai River beaches.
In June of 2012, KWF employees and interns were trained in the proper sampling technique using the methods outlined in the QAPP.

Sampling Design

Twice-weekly sample collection commenced on July 8th and occurred until August 10th of 2012, once on a weekday and once on a weekend. In total, 12 monitoring events were conducted under this grant: eight events in July that included the entire personal use dipnet fishery period of July 10th-31st (one was a duplicate due to the first sample exceeding holding time) and four during the first half of August. As a side note, under the 2011 grant, sampling also occurred prior to the opening of the 2012 personal use dipnet fishery on June 25th and 27th, 2012 to obtain baseline conditions.

During each sampling event typically two samples were collected from each beach along with one from Warren Ames Bridge. A minimum of one replicate sample was collected during each sampling event, alternating between the north and south beach.

A cursory sanitary survey was also conducted during every sampling event to document conditions and any potential sources of bacteria present while the sampling team was on the beach. Specific conductance, pH, water temperature, and turbidity were measured using a Hydrolab MS5 during each sampling event and at each sampling location. Air temperature and weather were also noted.

Samples were typically collected in the mornings, shipped via commercial air carrier to a DEC certified laboratory in Anchorage. The laboratory, Analytica Group (Analytica) provided results to KWF and DEC within 24-48 hours of receiving the samples and KWF notified the DEC immediately of any exceedances of Alaska Water Quality Standards within 24 hours of receiving results.

Monitoring Parameters

The monitoring plan included analyzing water samples for two types of bacteria typically used as indicators of potential fecal contamination: fecal coliform and enterococci. Fecal coliform bacteria colonies were measured with analytical method ID SM9222-D Fecal Coliform by Membrane Filtration. Enterococci were measured with analytical method ID ASTMD-6503-99 Enterococci by Most Probable Number. The State of Alaska has beach water quality criteria for both fecal coliform and enterococci (Appendix A).

Water Quality Standards

According to the State of Alaska's Water Quality Standards, the geometric mean of samples for fecal coliform bacteria for marine waters is not to exceed 100 FC/100mL in a 30-day period. In addition,

not more than one sample, or more than10% of the samples if there are more than 10 samples may exceed 200 FC/100mL.

Following Federal Beach (Marine) Water Quality Standards, enterococci single sample maximum allowable density may not exceed 276 MPN/100mL. In addition, the steady state geometric mean indicator density should not exceed 35 MPN/100mL.

Data Analysis

Upon return from the field, field observation data was entered into an MS Excel spreadsheet (a template created by DEC), field forms were scanned, and information was sent to DEC. When lab results returned, all lab results were checked for adherence to the approved QAPP. This data was then entered into the previous DEC template.

Due to the length of sampling, two rolling 30-day geometric means were taken for each beach; one from July 9th to August 7th and another from July 15th to July 12th. The highest geometric mean out of the two was reported. This information is then later used by DEC to aid in the reevaluation of these beaches as Tier 1-high priority beach (standards for fecal coliform: 100 FC/100mL, enterococci: 35 MPN/100mL).

Results

North Kenai Beach

Samples for fecal coliform bacteria at the North Kenai Beach ranged from ND (not detected; which may also include 0) to 60 FC/100mL. There was not an exceedance of the 30-day geometric mean (9.4 FC/100mL), nor for the single sample standard (Table 1, Appendix B).

Enterococci ranged from ND to 3800 MPN/100mL. There was an exceedance of the 30-day geometric mean (51 MPN/100mL) as well as an exceedance of the single sample standard (3800 MPN/100mL; Table 1, Appendix B).

South Kenai Beach

Samples for fecal coliform bacteria ranged from 8.6 to 290 FC/100mL. There was not an exceedance of the 30-day geometric mean (75.9 FC/100mL), but there were two exceedances of the single sample standard (290 FC/100mL, 230 FC/100mL; Table 1, Appendix C).

Enterococci ranged from ND to 330 MPN/100mL. There was an exceedance of the 30-day geometric mean (47.0 MPN/100mL) and there was one exceedance of the single sample standard (330 MPN/100mL; Table 1, Appendix C).

Warren Ames Bridge

Samples for fecal coliform bacteria ranged from ND to 40 FC/100mL. There was not an exceedance of the 30-day geometric mean (10.8 FC/100mL) and there were no exceedances of the single sample standard at BRG1 (Table 1, Appendix D).

Enterococci ranged from ND to 10 MPN/100mL. There was not an exceedance of the 30-day geometric mean (10 MPN/100mL) and there were no exceedances of the single sample standard at BRG1 (Table 1, Appendix D).

Table 1. Standards and total exceedances of fecal coliform bacteria and enterococci for all samples taken during the 2012 personal use dipnet fishery on the Kenai River of Alaska.

Site	Fecal Coliform Bacteria				Enterococci			
	Single Sample Standard: 200 FC/100mL		30 Day Geometric Mean Standard: 100 FC/100mL		Single Sample Standard: 276 MPN/100mL		30 Day Geometric Mean Standard: 35 MPN/100mL	
	# of Single Sample Exceedances	Value/s of Exceedances	Geometric Mean Value	Exceedance? Y/N	# of Single Sample Exceedances	Value/s of Exceedances	Geometric Mean Value	Exceedance? Y/N
North Kenai Beach	0	NA	9.4	N	1	3800	51	Y
South Kenai Beach	2	290, 230	75.9	N	1	330	10.8	N
Warren Ames Bridge	0	NA	10.8	N	0	NA	10	N

Samples Prior to Personal Use Fishery

Samples for fecal coliform bacteria taken prior to the opening of the Personal Use Fishery, including all locations ranged from 5.7 to 160 FC/100mL. None of the samples exceeded the single sample standard.

Enterococci ranged from ND to 170 MPN/100mL and none of the samples exceeded the single sample standard.

Discussion

After monitoring the mouth of the Kenai River for a span of 49 days which included the entire personal use dipnet fishery, the majority of samples were below exceedance levels with the exception of a few.

The North Beach had one sample exceed the enteococci single sample standard. The beach was sampled four days later, and enterococci levels were again below the enterococci single sample standard.

The South Beach exceeded the enterococci single sample standard once, yet a second sample collected at the South Beach on the same day, but a different location was below exceedance levels, as were samples collected two days later from the same location as where the exceedance was originally found.

In regards to fecal coliform, the North Beach did not have any exceedances while the South Beach exceeded the fecal coliform single sample standard twice. However, on both sample days additional samples collected at the South Beach were below the exceedance level as well as samples collected two and five days later from the same location as the original exceedance.

Recognizing the variability among samples results reveals the importance of taking additional samples at each location to gain a representative sample of water quality with each sampling event.

Any exceedances of standards that occurred happened to be on the first day of the personal use fishery as well as the week following the close of the fishery and were not correlated to specific types of days (weekday/weekend).

Conclusion

Sample results of fecal coliform and enterococci from 2012 revealed an overall decrease in the number of single sample exceedances compared to samples collected in 2011. In 2011 there were 20 single sample exceedances of either fecal coliform or enterococci out of a total of 53 samples, while in 2012 there were 4 single sample exceedances out of a total of 63 samples. This reveals about a 30% decrease in the number of single sample exceedances compared to the previous year.

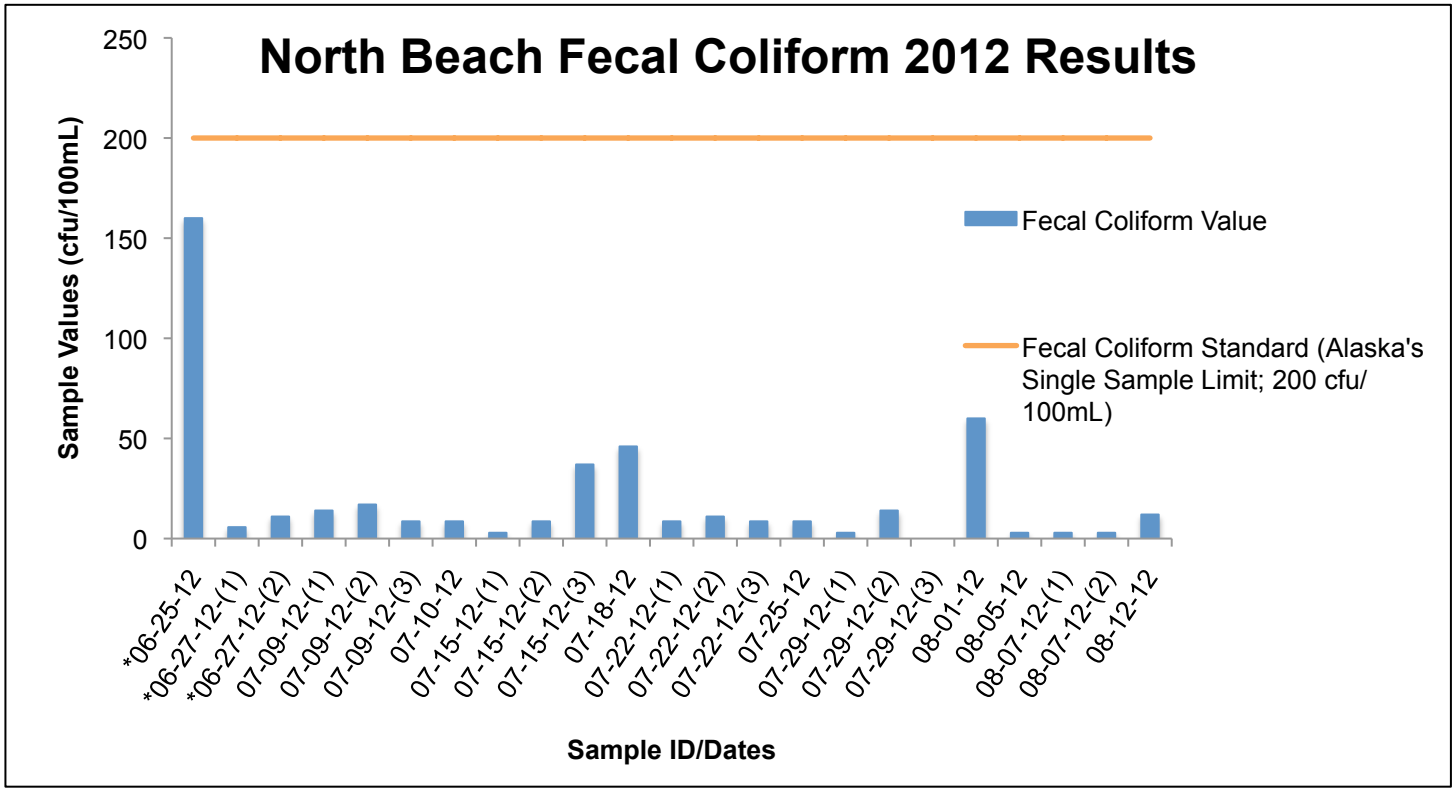
Due to high human usage of the mouth of the Kenai River during the personal use fishery, it's important to continue monitoring efforts for contamination to alert the public if bacteria exceed the safe limits in an effort to help prevent cases of human illness that may occur as a result. Working closely in collaboration with DEC and KWF will help the City of Kenai provide a safe and fun recreational opportunity to the many residents and visitors on the Kenai River each year (Figure 2).

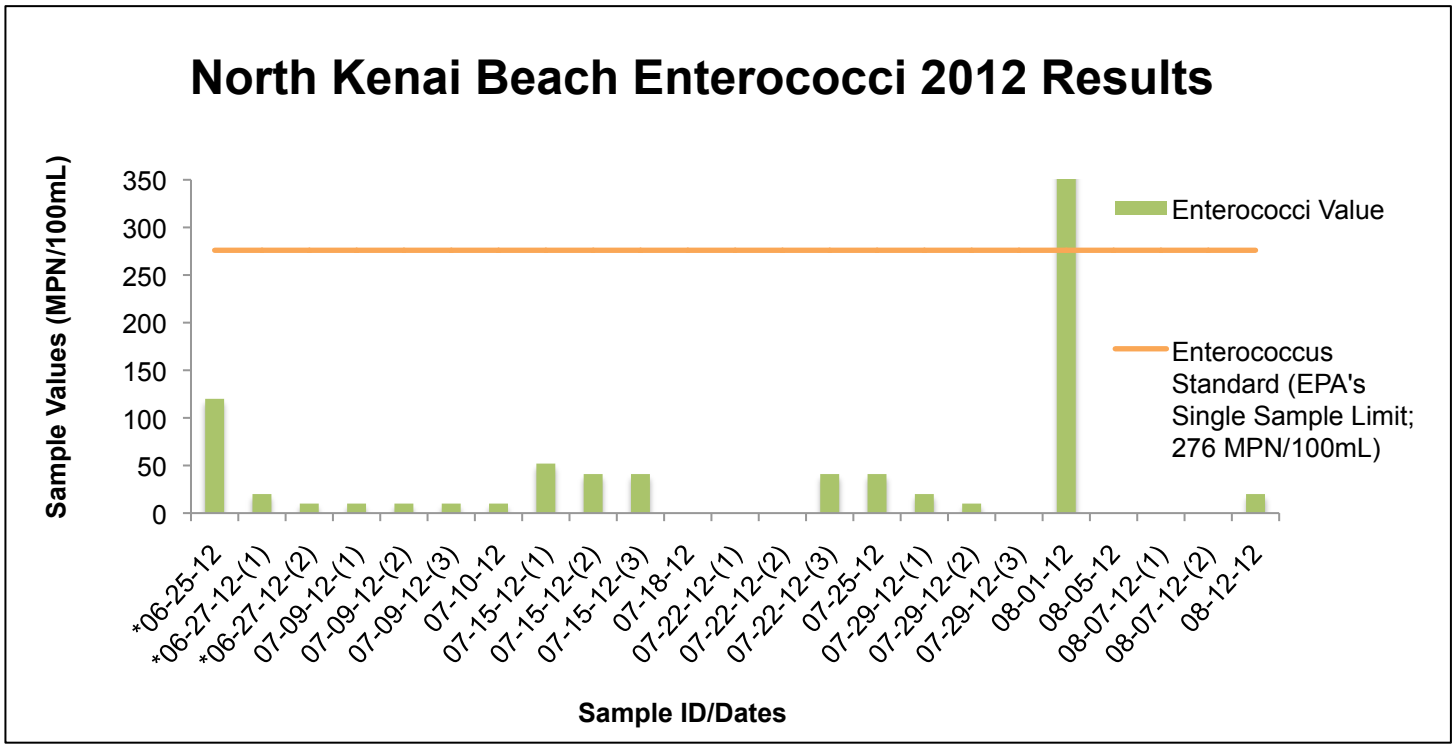
Figure 2. Dipnetting on the South Beach of the Kenai River during the 2012 personal use dipnet fishery.

Appendix A: State and Federal Water Quality Standards

State Water Quality Standards; Fecal Coliform Bacteria for Marine Waters	
Water Recreation, Contact Recreation	In a 30-day period, the geometric mean of samples may not exceed 100 FC/100 mL, and not more than one sample, or more than 10% of the samples if there are more than 10 samples, may exceed 200 FC/100 mL
Federal Beach (Marine) Water Quality Standards; Enterococci	
Single sample maximum allowable density	No single sample may exceed 276 MPN/100 mL
Steady state geometric mean indicator density	35 MPN/100 mL

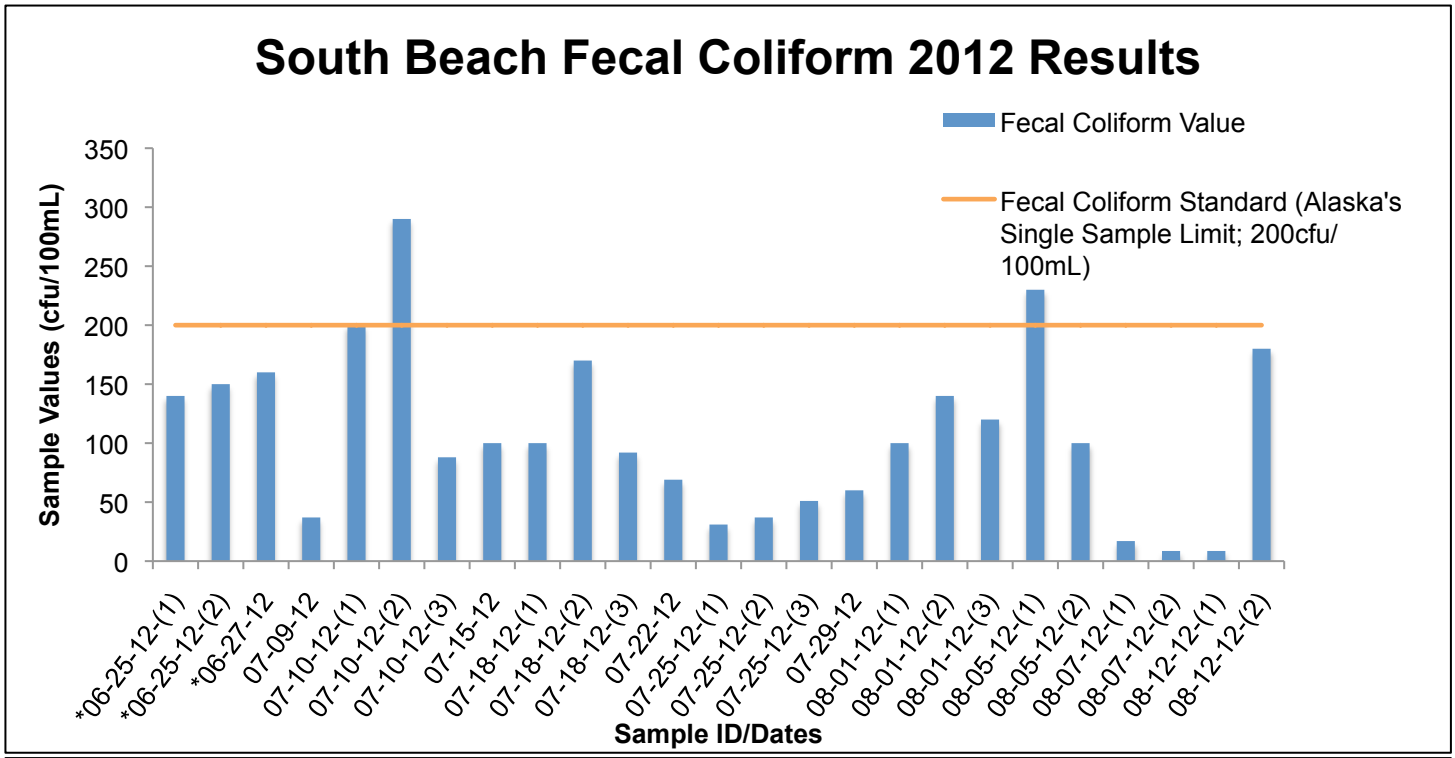
Appendix B: North Kenai Beach 4 (NKB4) – Results

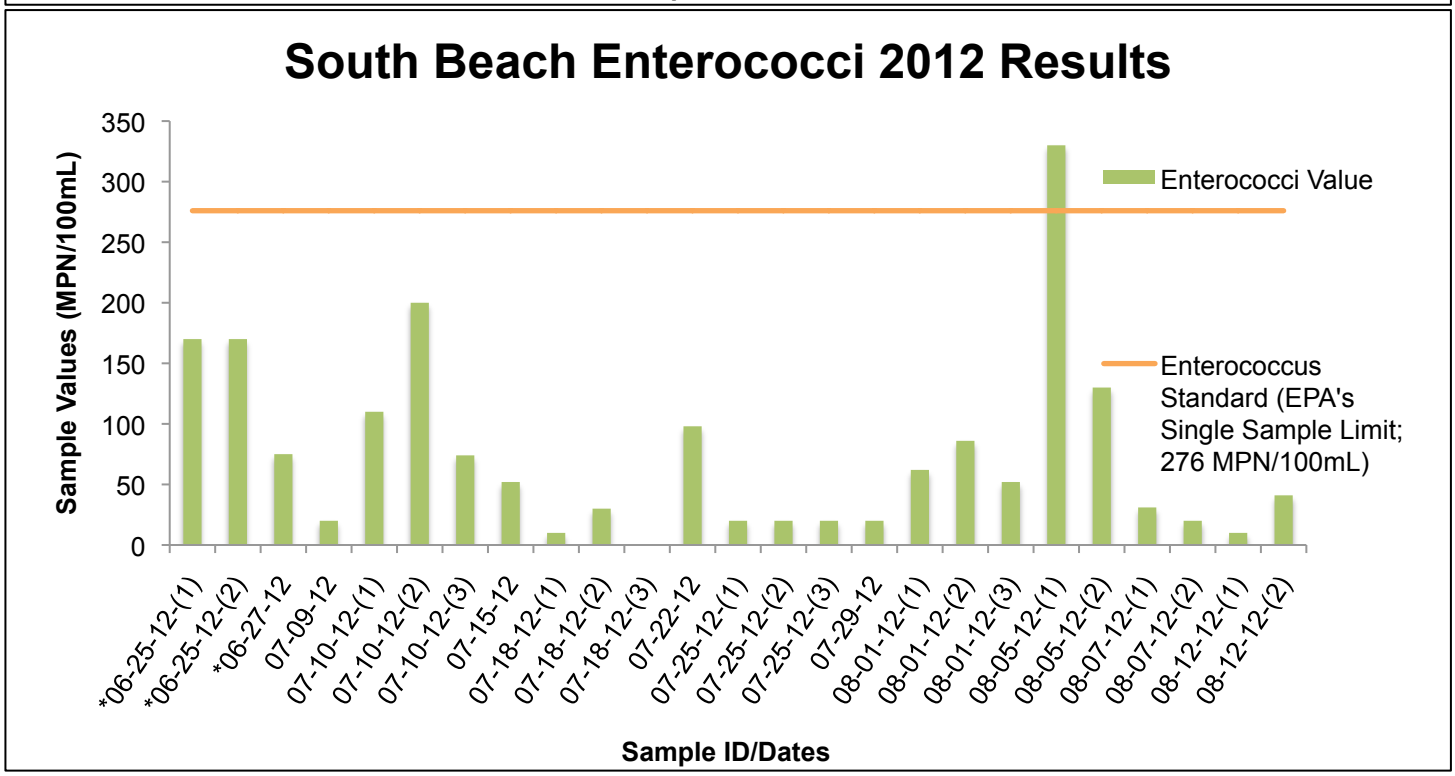




* Samples taken prior to the opening of the personal use dipnet fishery.

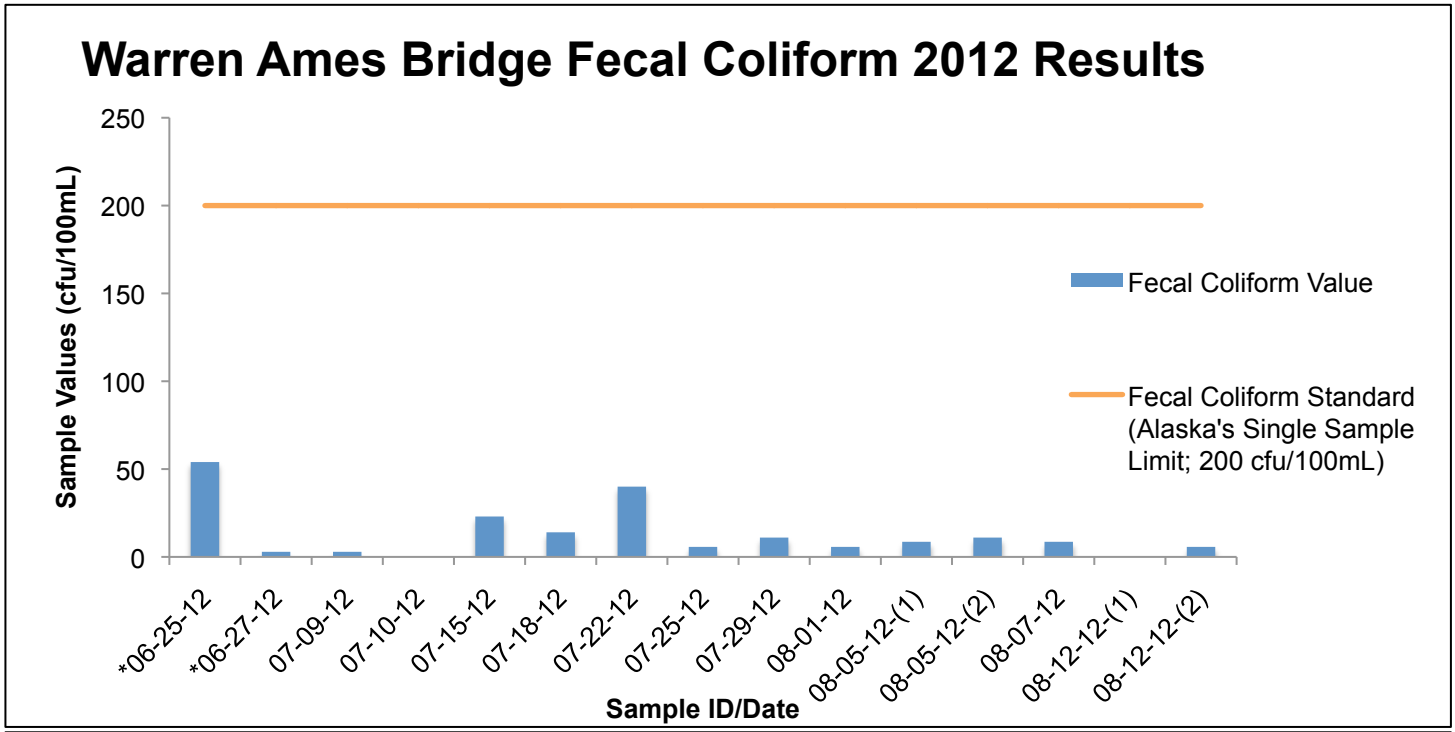
Appendix C: South Kenai Beach (SKB2) – Results

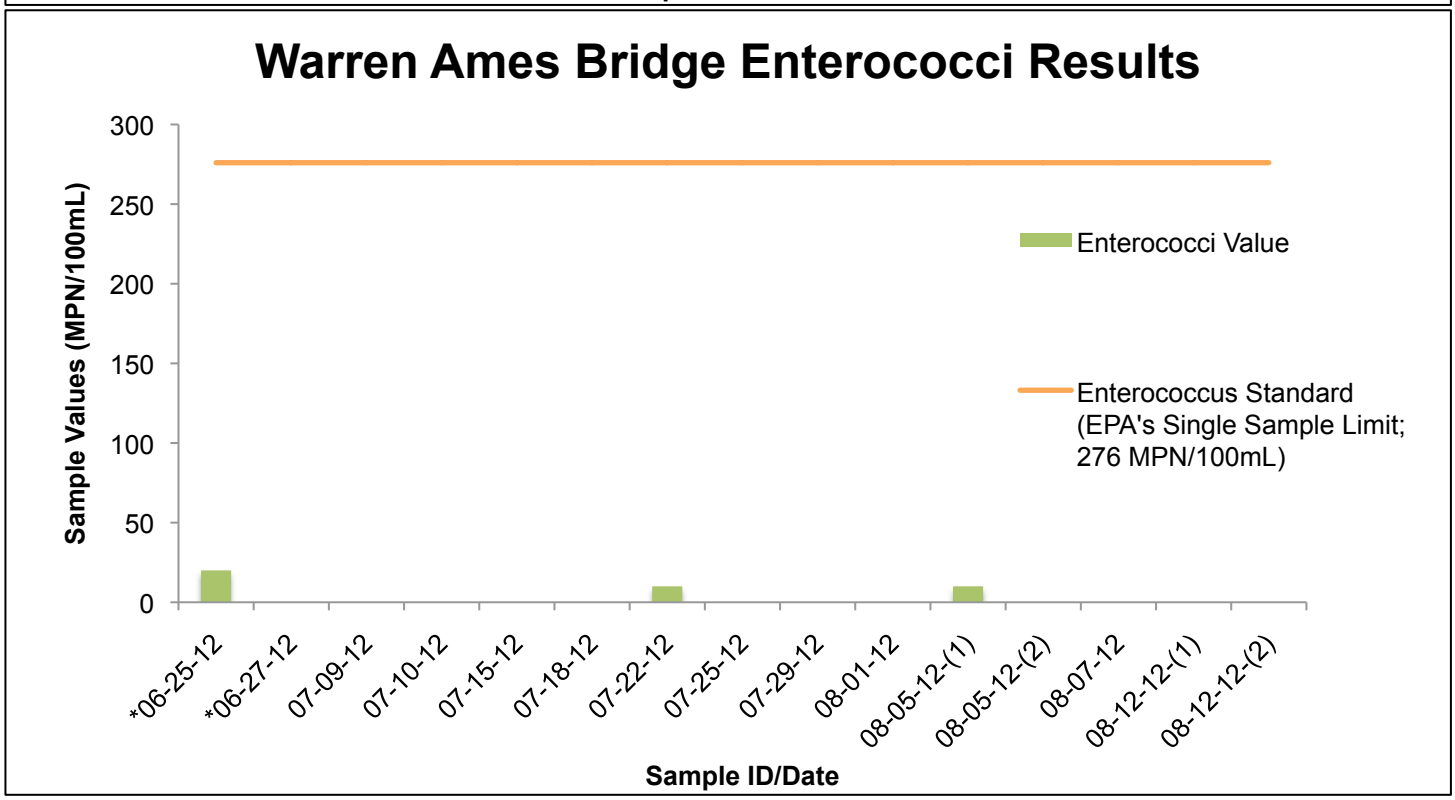




* Samples taken prior to the opening of the personal use dipnet fishery.

Appendix D: Warren Ames Bridge (BRG1) – Results





* Samples taken prior to the opening of the personal use dipnet fishery.