



Hawaii Department of Health
 Clean Water Branch
 Water Quality Monitoring - Special Report

On October 15, 2019, the Department of Health (DOH), Clean Water Branch (CWB) collected surface water samples within the Ala Wai Small Boat Harbor to assess water quality and potential sources of pollution within the harbor. Water quality results do not suggest discrete point sources of water pollution within the harbor. However, results confirm that the Ala Wai Canal and surrounding watershed heavily influence the water quality within Ala Wai Small Boat Harbor. Based on the results, the CWB does not recommend additional sampling or advisories at this time. Additional recommendations are included at the end of the report.



View of the Ala Wai Small Boat Harbor from the Ala Moana Magic Island, South sampling point facing north east. Photograph by R. Tubal on October 15, 2019.

Waterbody Information

Site Name: Ala Wai Small Boat Harbor

Site Address: 1651 ALA MOANA BLVD., HONOLULU, HAWAI'I 96815

Owner: Hawaii Department of Land and Natural Resources, Division of Ocean and Boating Recreation

Receiving Water(s): Mamala Bay

Watershed: Ala Wai Canal

Sampling Information

Sampling Date: October 15, 2019

Weather: Sunny

Time In: 8:48 AM

Time Out: 11:02 AM

Sampling Team: Gavin Nagaue and Randee Tubal (Enforcement Section, DOH CWB); Jade Licudine, Sierra Payne, Troy Maeda (Monitoring Section, DOH CWB)

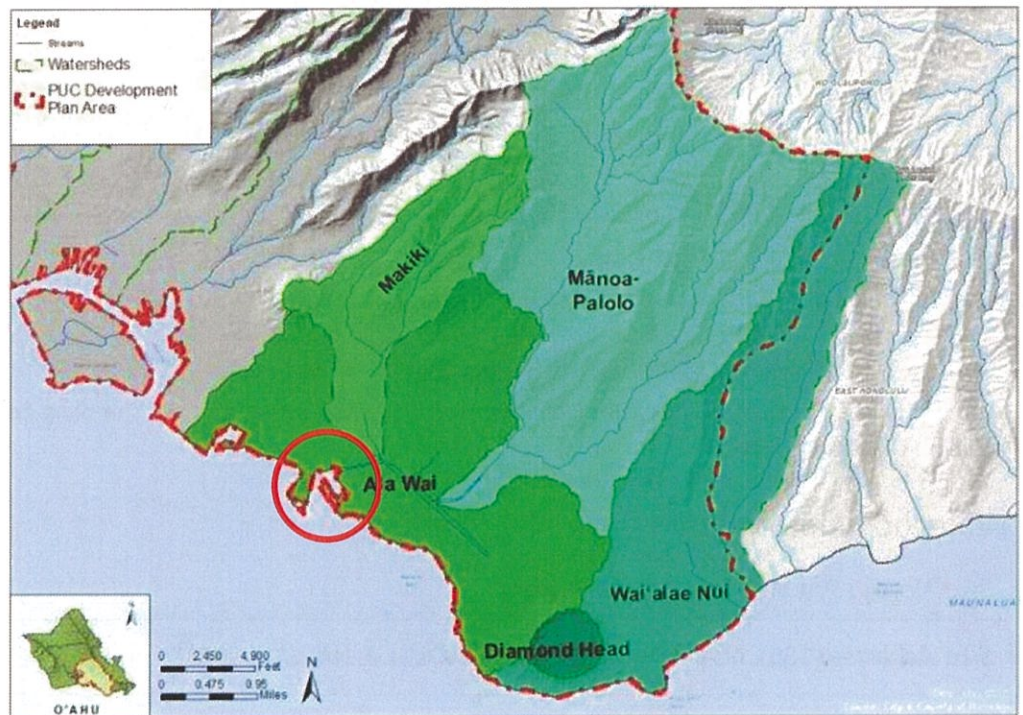


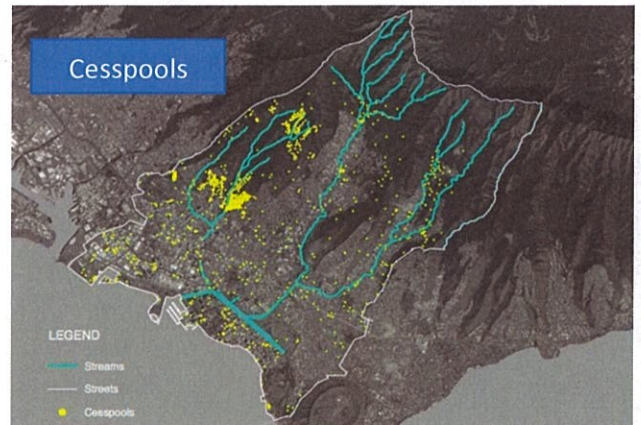
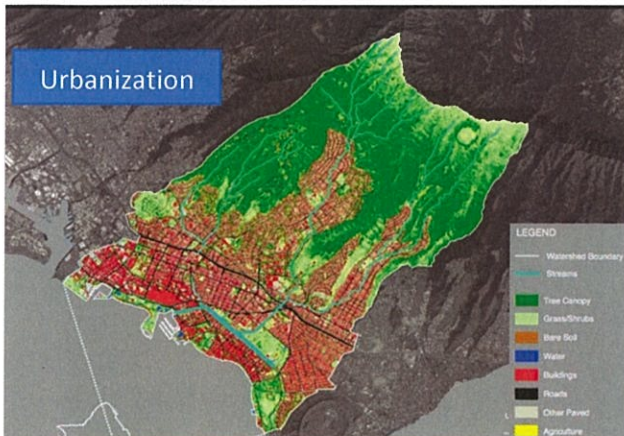
Purpose

The water quality sampling and analyses discussed in this report were conducted in response to a request by Senator Moriwaki's office to determine if there was wastewater within the harbor waters. CWB protocols used to measure the impact of sewage spills were implemented as there were concerns that wastewater discharges may be occurring within the harbor. Sampling locations and conditions were selected to represent different areas within the harbor under typical environmental conditions.

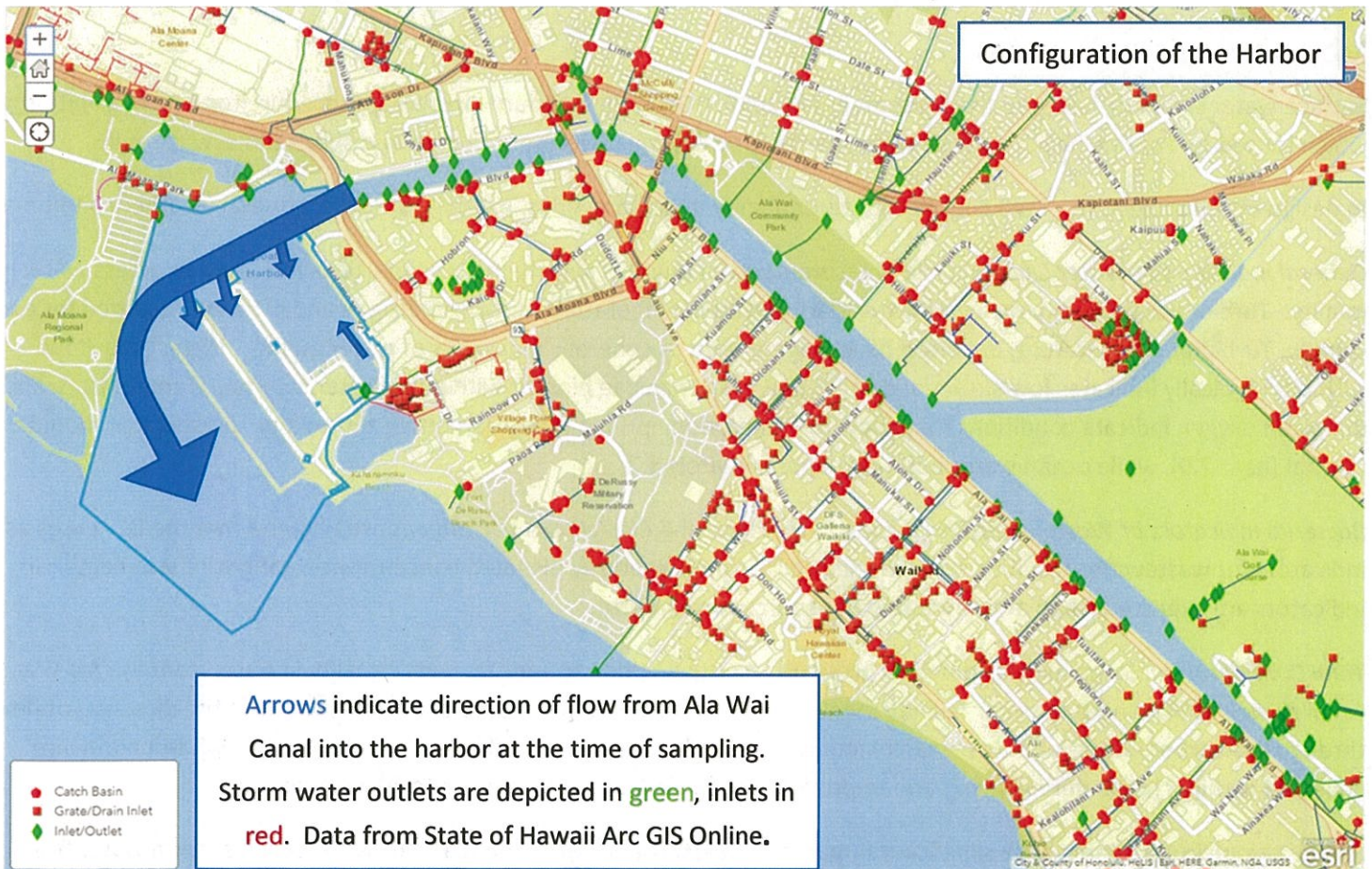
Background

Ala Wai Small Boat Harbor (Red Circle) is located on the south shore of Oahu between Waikiki and Ala Moana beaches. The manmade harbor is owned and managed by the Department of Land and Natural Resources (DLNR), Division of Ocean and Boating Recreation (DOBOR). The harbor includes areas used by the Hawai'i Yacht Club, the Waikiki Yacht Club and the Royal Hawaiian Ocean Racing Club. The harbor can accommodate vessels up to 85 feet in length. [Ala Wai Harbor](#) has 699 berths with dock, 1 ramp, 22 dry storage spaces, a vessel washdown station, an Marine Sanitation Device pumpout station, a harbor office, restrooms and showers. The Harbor is a manmade, heavily modified quasi-estuarine environment. The presence of boats, Magic Island and a break wall, as well as the urbanization in the Ala Wai Watershed heavily impact water quality in the harbor and immediate nearshore area. The [Ala Wai Canal](#), the predominant non-ocean water source to the harbor, was built in 1927 by the Army Corps of Engineers to control the flooding of the Makiki, Manoa, and Palolo Streams on the south shore of the island of Oahu.





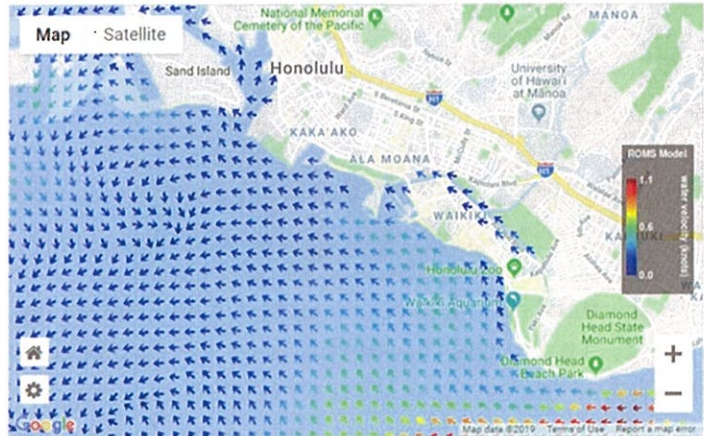
The Ala Wai watershed is actually comprised of multiple sub-watersheds. When the Palolo, Manoa, and Makiki streams were redirected to drain to the Ala Wai Canal, the associated wetlands and their beneficial functions were removed from the system. Today, these areas are heavily urbanized with impervious surfaces, separate storm water systems and cesspools. The Ala Wai Watershed contributes significant pollution to nearshore waters through both point and nonpoint sources of pollution. Point sources include urban storm sewer systems. Nonpoint sources include runoff from non-urbanized areas in the upper watershed.





Ala Wai Small Boat Harbor has an average tide range of 1.5 feet. On the day of sampling high tide was 2 feet at 4:56 am and low tide was 0.44 feet at 11:23 am. Sampling was scheduled to correspond to outgoing tide to determine baseline conditions within the harbor.

Waikiki, Oahu, Hawaii Tides Tuesday, October 15, 2019 Sunrise at 6:28 AM -- Sunset at 6:09 PM		
Time	Height	
4:56am	2 ft	High
11:23am	0.44 ft	Low
4:39pm	1.27 ft	High
10:35pm	0.1 ft	Low



Sampling locations were chosen to capture the range of conditions within the harbor from the Ala Wai Canal to the nearshore coastal area including two nearby beaches on either side of the harbor.

Method and Considerations

Surface water sampling followed the September 18, 2018, DOH CWB Standard Operating Procedure for Beach Monitoring which is used for routine beach monitoring as well as for water quality samples taken in response to sewage spills.

In design of the project, the CWB considered water quality indicators, tides, precipitation, and general weather conditions.

General Indicators of Water Quality: Field measurements of physical and chemical properties were used to assess water quality. Turbidity was used to measure water clarity. Water temperature, dissolved oxygen and pH were recorded for each sample. Turbidity, temperature, dissolved oxygen were used as generally indicators of water quality. High clarity (low turbidity) typically indicates low suspended solids and a lack of algae blooms within the water column. Temperature and dissolved oxygen indicate conditions that allow for respiration. pH is a measurement of the acidity. Freshwater should be neutral (near 7.0), while ocean water buffers at approximately 8.2.

Bacterial Indicators of Wastewater Discharges: *Enterococci* and *Clostridium perfringens* are bacteria that the DOH uses as indicators for wastewater resulting from sewage spills. Simultaneously elevated concentrations of both these bacterial indicators are expected when active wastewater sources are present.

Tidal Consideration: Sampling was timed to occur on an outgoing tide to capture water quality impacts from the Ala Wai canal as well as from harbor users. Salinity measurements taken during the time of sampling confirm the direction of flow through the harbor. Areas of lowest salinity indicate fresh or brackish water flowing into the harbor. All samples were collected within 2 hours during falling tide to provide a snap-shot of the Harbor's baseline conditions.

Precipitation: Storm events have significant impacts on nearshore waters. The Ala Wai Canal receives storm water from multiple highly urbanized Honolulu watersheds, then transports that water into the harbor. In order to avoid the overwhelming impacts of storm events on water quality, samples were collected during non- storm conditions.



General weather conditions: Samples were taken at surface depths under normal trade wind conditions. Samples were taken in the AM hours and reflected the dominant condition on the south shore of Oahu.

Data/Results

Samples were measured for temperature, salinity, dissolved oxygen, pH, turbidity, enterococci and clostridium. Data for each sample site are provided in the figures labeled Results 1-12. Overall, water quality was good and consistent with what is expected at the mouth of a canal. Two sites had significantly elevated enterococci values, but no site had high clostridium values (Figure Below).

The two locations where significant enterococci levels (Red Arrows) were observed correspond to the mouth of a local storm drain system (Ala Wai Harbor Interior, Results-10), and along Magic Island, on a shallow flat directly in-line with the mouth of the Ala Wai Canal (Ala Moana Magic Island East, Results-4). Neither location had exceeded DOH decision levels for Clostridium. The Ala Wai Harbor Interior location is at the mouth of a storm drain system. The Ala Moana Magic Island East location is located on a shallow landing along Magic Island. Water samples from the 10 other locations did not exceed DOH Beach Action Values (BAVs) for enterococci nor action levels for clostridium.

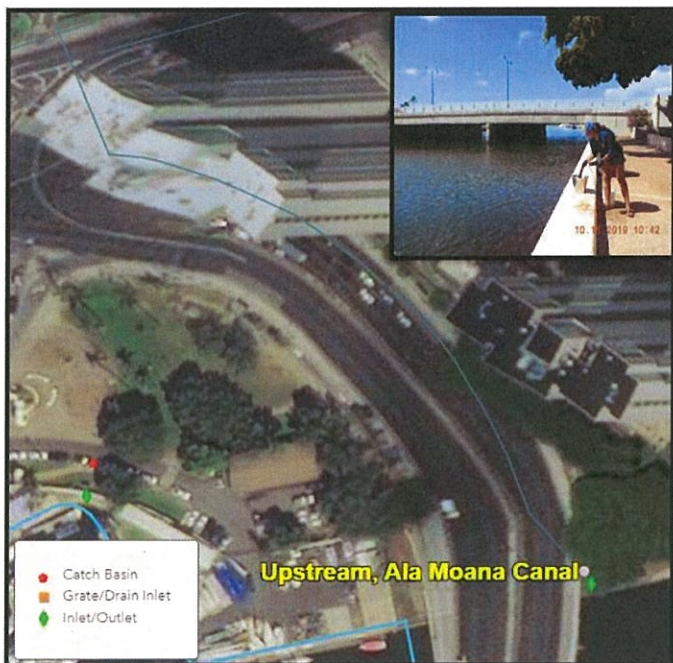


A more detailed discussion of the results is provided below in the *Discussion* section.



Descriptions of the sample locations as well as results from the water quality analyses are arranged in Results 1-12 below.

Results-1: Ala Moana Canal, Upstream



Temperature (°C)	Salinity (PPT)	DO (mg/L)	DO (%)	pH	Turbidity	Enterococcus	Clostridium
28.7	25.93	6.52	97.4	8.1	2.03	158	8

The weather was Sunny, the water was murky green, fish were present. There was some current. Salinity was lower as is to be expected for the most upstream inland location, though not fresh. While enterococci was above the BAV, Clostridium was very low indicating no influence of sewage at this location. The elevated enterococci level is expected within the Ala Wai Canal.

Results-2: Waikiki Yacht Club



Temperature (°C)	Salinity (PPT)	DO (mg/L)	DO (%)	pH	Turbidity	Enterococcus	Clostridium
27.6	27.31	5.98	88.4	8.1	1.43	134	6

The weather was sunny, the water had some discoloration. While enterococci was above the BAV, Clostridium was very low indicating no influence of sewage at this location. The enterococci is likely due to the proximity of the sampling location to the to the mouth of the Ala Wai. Note the brackish salinity level.



Results-3: Canoe Launch Steps



Temperature (°C)	Salinity (PPT)	DO (mg/L)	DO (%)	pH	Turbidity	Enterococcus	Clostridium
28.2	32.06	6.09	93.4	8.11	1.55	84	3

The weather was sunny with a light wind. The water was shallow with debris, fishermen, and a dead juvenile hammerhead shark present. Salinity levels suggest this area was largely influenced by nearshore coastal waters, as opposed to the Ala Wai Canal, as were other sampling locations with lower salinities.

Results-4: Ala Moana Magic Island, East

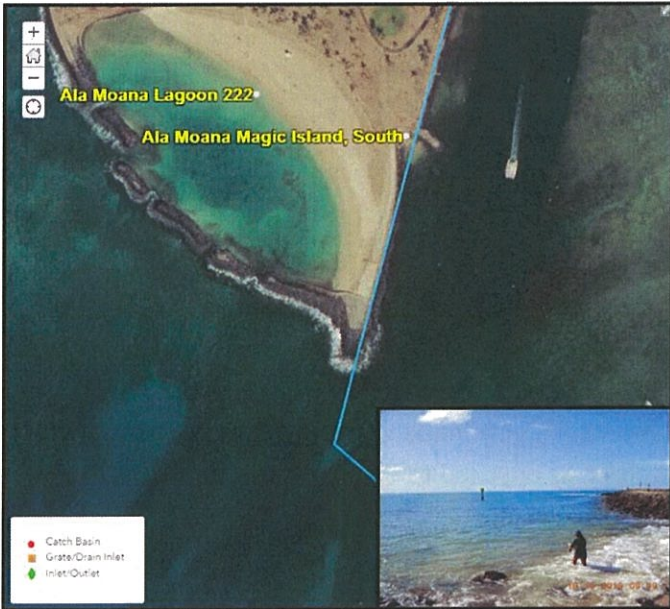


Temperature (°C)	Salinity (PPT)	DO (mg/L)	DO (%)	pH	Turbidity	Enterococcus	Clostridium
27.5	30.62	6.89	103.8	8.17	2.08	292	18

The weather was sunny with a light wind. The sampling location was rocky and shallower with fish and organic debris present. Enterococci was above the BAV, however Clostridium was very low indicating no influence of sewage at this location. The Enterococci is like due to the influence of the Ala Wai Canal given the lower salinity level measured.



Results-5: Ala Moana Magic Island, South



Temperature (°C)	Salinity (PPT)	DO (mg/L)	DO (%)	pH	Turbidity	Enterococcus	Clostridium
27.9	34.3	6.31	97.3	8.18	3.14	20	<1

The weather was sunny with a light wind. The water in the cove was shallow with organic debris present. Water quality of good at this location.

Results-6: Ala Moana Lagoon 222



Temperature (°C)	Salinity (PPT)	DO (mg/L)	DO (%)	pH	Turbidity	Enterococcus	Clostridium
28	35.18	6.3	98	8.2	2.51	10	1

The weather was sunny with a light wind. The water in the cove was shallow with organic debris present. Water quality was good at this location.



Results-7: Harbor, Upstream

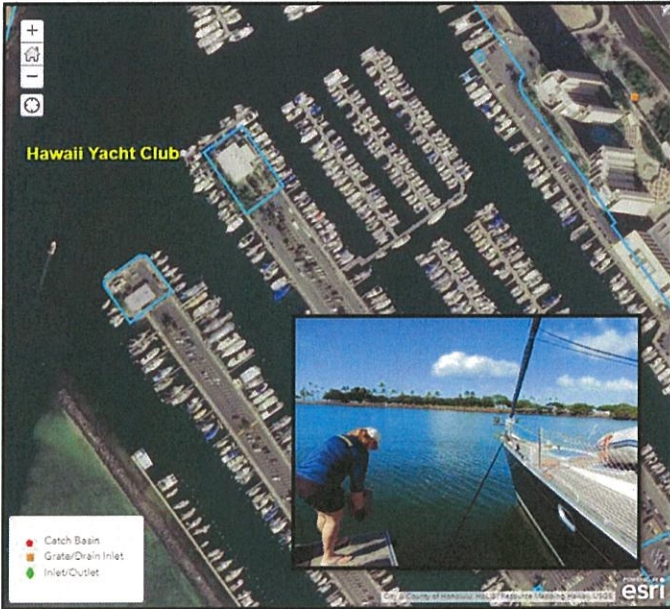


Temperature (°C)	Salinity (PPT)	DO (mg/L)	DO (%)	pH	Turbidity	Enterococcus	Clostridium
27.9	23.23	7.63	110.7	8.18	2.86	134	10

The weather was sunny with a light wind. While enterococci levels were above the BAV, Clostridium was very low indicating no influence of sewage at this location. The elevated enterococci levels are likely due to the influence of Ala Wai Canal. A trash boom adjacent to the sampling location captures materials from the Ala Wai Canal including debris floating down the Ala Wai Canal.



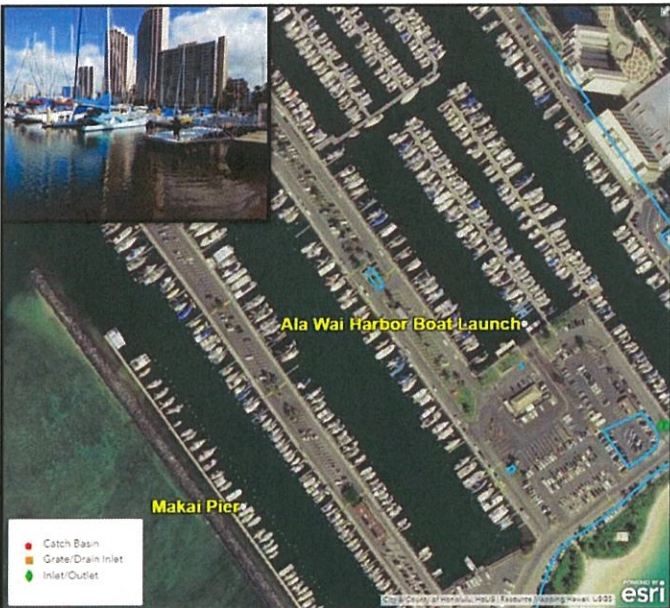
Results-8: Hawaii Yacht Club



Temperature (°C)	Salinity (PPT)	DO (mg/L)	DO (%)	pH	Turbidity	Enterococcus	Clostridium
27.5	30.5	5.77	86.6	8.12	1.53	85	3

The weather was sunny with a light wind.

Results-9: Ala Wai Harbor Boat Launch



Temperature (°C)	Salinity (PPT)	DO (mg/L)	DO (%)	pH	Turbidity	Enterococcus	Clostridium
27.1	31.1	5.72	85.5	8.1	0.74	31	2

The weather was sunny with a light wind.



Results-10: Ala Wai Harbor Interior



The photo at the bottom left is from after a rainstorm the previous week just before the 8:34am low tide. The photos below are from the time of sample collection.



Temperature (°C)	Salinity (PPT)	DO (mg/L)	DO (%)	pH	Turbidity	Enterococcus	Clostridium
25.7	31.44	2.7	39.6	7.6	4.71	1145	20

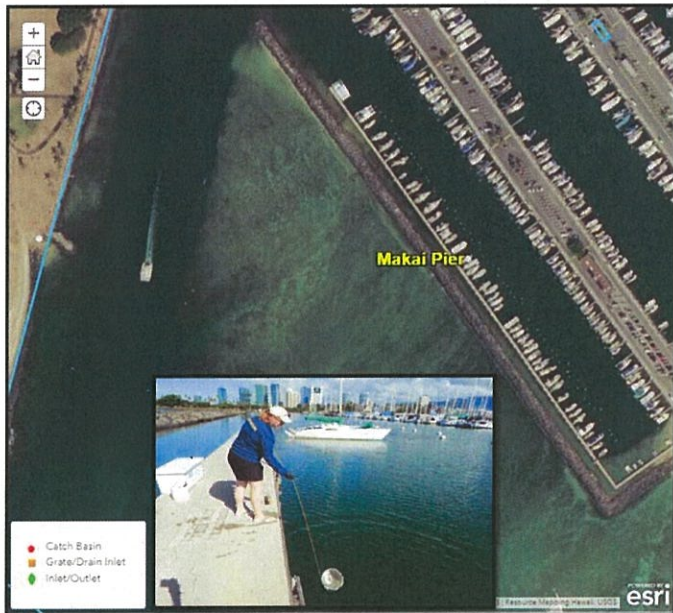
The weather was sunny and the water was clear with accumulated plant debris. While enterococci was above the BAV and the highest measured on that day, Clostridium was low indicating no influence of sewage at this location. The enterococci is likely due to the storm drain outfalls framing the sampling location.



Inside the storm drain.



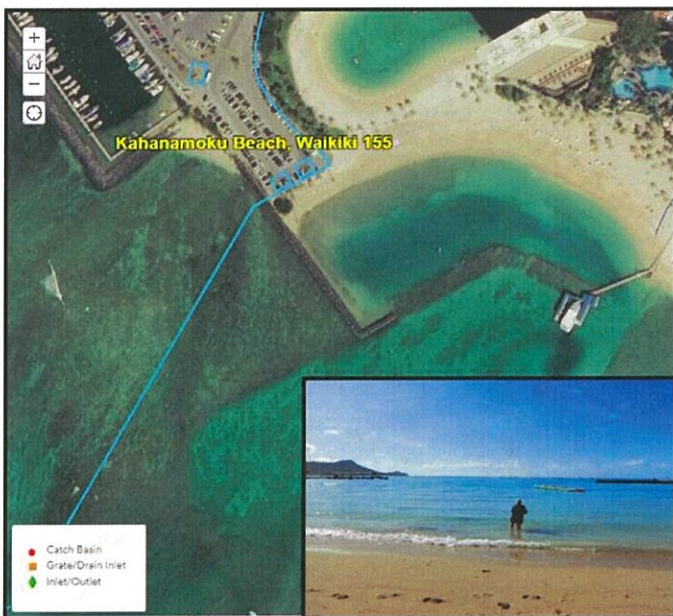
Results-11: Makai Pier



Temperature (°C)	Salinity (PPT)	DO (mg/L)	DO (%)	pH	Turbidity	Enterococcus	Clostridium
27.8	34.16	6.41	98.7	8.17	0.9	2.3	3

The weather was sunny with a light wind.

Results-12: Kahanamoku Beach, Waikiki 155



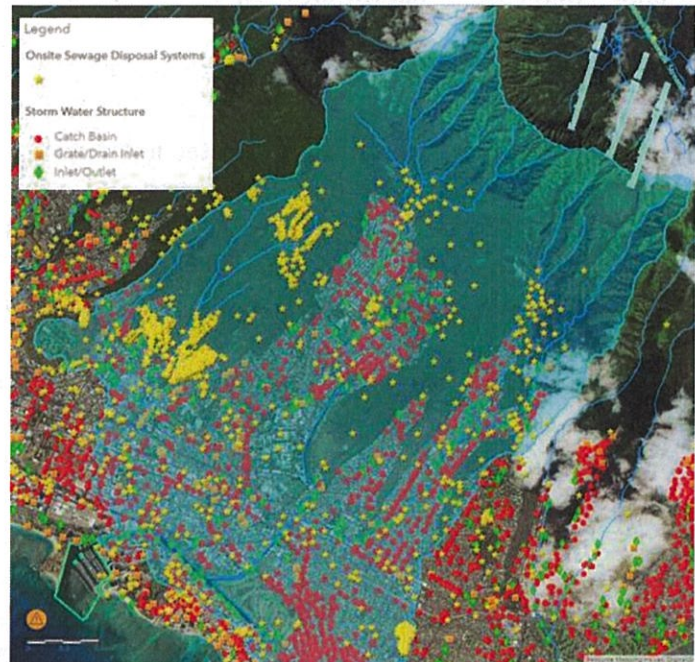
Temperature (°C)	Salinity (PPT)	DO (mg/L)	DO (%)	pH	Turbidity	Enterococcus	Clostridium
27.5	35.11	6.48	99.8	8.15	18.3	20	5

The weather was sunny with a light wind.



Discussion

The Ala Wai Watershed (blue shaded area in map) includes both upper conservation areas as well highly urbanized areas lower in the watershed. Heavy rainfall in the upper watershed areas is known to mobilize and transport sediment through the urban corridor and deposit the sediment loads into the Ala Wai Canal. Prior to urbanization, the Ala Wai watershed included coastal wetlands (now Waikiki and surrounding areas) which allowed for natural desiltation and filtration of ground and surface waters. The removal of coastal wetlands and modification of the natural stream systems result in degradation of the surface water quality within the Ala Wai Canal. As poor water quality within the Ala Wai Canal is widely recognized, the DOH posts permanent warning signs along the Ala Wai Canal.



Overall, sampling results are consistent with expectations. At the transition between the Ala Wai Canal to the Ala Wai Small Boat Harbor (Results-1 and Results-7), salinity was between 23-26 ppt, reflecting the brackish Ala Wai Canal environment. Dissolved oxygen levels were normal, suggesting good mixing and an absence of a large bacterial loads. While enterococci levels were elevated, Clostridium levels were low. The combination of elevated enterococci levels along with low Clostridium levels are consistent with the DOH understanding of brackish stream mouths where there are inputs from the upper watersheds and the accumulation of sediment and background levels of enterococci within canals. In situations where enterococci levels are elevated but clostridium levels are low, the DOH rules out significant ongoing wastewater overflows/sources. As such, while water quality within the Ala Wai Canal is poor, there does not appear to be wastewater flowing into the Ala Wai Small Boat Harbor.

Samples taken at the Waikiki Yacht Club (Results -2), Ala Moana Beach Park Canoe Launch (Results-3), on the East side of Magic Island (Results-4), and at the Ala Moana Magic Island, South, sites produced results that are consistent with the observed flow of water out of the Ala Wai Canal to nearshore waters. Salinity increases from brackish within the Ala Wai Canal (Results-1) to more saline at the Ala Moana Magic Island, South (Results-5) site. The levels of enterococci decrease as salinity increases. Of note, water quality data from the Ala Moana Canoe Launch (Results-3) suggest that as brackish water flows out of the Ala Wai Canal, the brackish plume from the Ala Wai Canal bypasses the Ala Moana Canoe Launch. The higher salinity and lower bacteria levels at the Ala Moana Canoe Launch indicates that water quality at this location is generally better than waters in the canal due to mixing with nearshore waters. Based on results from the Ala Moana Lagoon 222 (Results-6, aka Magic Island Lagoon), there does not appear to be any influence from the Ala Wai Canal or Ala Wai Small Boat Harbor on lagoon waters where the beach is heavily used.

Samples taken at the Hawaii Yacht Club (Results-8), Ala Wai Harbor Boat Launch (Results-9), Ala Wai Harbor Interior (Results-10), and Ala Wai Harbor Makai Pier (Results-11) represent water quality within the Ala Wai Small Boat Harbor near docks managed by the DLNR, DOBOR. As with results from the west side of the boat harbor, enterococcus



concentrations decreased as the sample sites moved away from the mouth of the canal, and as salinity increased. The one exception to the trend was results from the Ala Wai Harbor Interior (Results-10).

The Ala Wai Harbor Interior sample location was located at a corner within the Ala Wai Small Boat Harbor. The sample location fronted an outfall from a storm sewer system that discharges a mixture of surface, storm and groundwater from a municipal separate storm sewer system located in the nearby area. During sample collection, water was observed flowing out of the storm sewer system. Results indicated there were elevated Enterococci levels and low dissolved oxygen levels. As the Clostridium value was low, there does not appear to be a wastewater discharge but water quality at this location is likely most influenced by discharges from the storm sewer system. By nearby Kahanamoku Beach, Waikiki 155 (Results-12), all values reflected what are expected for nearshore waters and showed good water quality.

The presence of boats, some with people living aboard, raises the possibility of unauthorized wastewater discharges should a boat owner choose to illegally discharge. While this remains a potential, based on the results from the samples taken, there does not appear to be ongoing sewage contamination within the Ala Wai Boat Harbor under normal representative conditions.

The major influence to water quality within the Ala Wai Boat Harbor is the Ala Wai Canal. During outgoing tides, water from the canal appears to be fully mixed with nearshore waters near the harbor the opening. Based on sample results, it appears that there are no elevated risk levels due to the Ala Wai Canal or the boat harbor at nearby beaches (Results-6, and Results-12) under normal environmental conditions. Further, due to the general movement of water from the Ala Wai Canal out of the harbor, water quality at the Ala Moana Canoe Launch (Results-3) is generally good. It should be noted that during and following storm events, water quality within the harbor will likely be compromised due to the transport of pollutants through the Ala Wai Canal. It is expected that when water clarity is poor, overall water quality will likely be poor as well.



Recommendations

- No additional water quality sampling or advisories under normal (non-sewage spill) conditions.
- Continue practice of brown water advisories when heavy runoff conditions occur.
- Support DOBOR's existing water pollution prevention program with recognition that harbor users have the potential to impact water quality.
- Maintain rinse off (i.e beach showers) and comfort station facilities for harbor users.
- Continue both point (principally MS4) and non-point source pollution prevention programs to improve State waters (particularly the Ala Wai Canal) within the Ala Wai Watershed.

Note: While conducting water quality sampling, DOH personnel noted existing signage prohibiting fishing and swimming. The signs were posted at different locations around the boat harbor including at the Waikiki Yacht Club and at the Ala Wai Small Boat Harbor office. While the sign that was posted at the harbor office was provided by the DOH and included images of the prohibited activities, most of the signs cited DLNR Administrative Rules in text only. Given the diverse population using the harbor, signage included depictions of the prohibited activities should be considered.





Sampling Report Certification

I certify that the technical statements made in this sampling report are, to the best of my knowledge, a true and accurate representation of what was observed 10/15/2019 in Ala Wai Small Boat Harbor.

Matthew Kurano
Supervisor, Enforcement Section

Nov. 21, 2019

Date

Myron Honda
Supervisor, Monitoring Section

11/21/2019

Date