# Why Effluent from the Kailua WWTP is NOT a threat to Kailua Beach

## And

## STORM WATER

## IS !

January, 2025
Bob Bourke
rebourke2003@yahoo.com

# 35 years ago….

A nurse from Castle Hospital was enjoying her morning walk down Kailua Beach when, down near flagpoles she came across:

- Raw FECES <u>on</u> the beach!
  - And
- Obviously `contaminated` GREEN Sand.

## SOMETHING HAD TO BE DONE!

# Public Outrage instigated the $5M Kailua Bay Study

- Currents and outfall effluent tracking in Kailua Bay
  UH Prof. Hans Krock, and others.
- Bacterial Studies nearshore and streams
  UH Prof. Roger Fujioka, and others.

# A summary paper was published

**KAILUA BAY BACTERIOLOGICAL WATER QUALITY AND CIRCULATION ASSESSMENT REPORT (KB-6)**

Hans-Jürgen Krock
Roger S. Fujioka

**Project Report PR-94-09**

October 1993

# Summarizing 7 separate studies

## REFERENCES CITED


Ahuna, L., and R. Fujioka. 1993. Impact of Kawainui Canal on the recreational water quality of Kailua Bay (KB-4). Project Rep. PR-94-07, Water Resources Research Center, University of Hawaii at Manoa, Honolulu.

Charoenca, N., and R. Fujioka. 1993. Assessment of *Staphylococcus* bacteria in Hawaii Marine recreational waters. *Water Sci. Tech.* 27:283–289.

Fujioka, R.S., and N. Charoenca. 1991. Establishing the concentrations of staphylococcus, vibrio, pseudomonas bacteria and phosphate in Hawaii's recreational waters. WRRC project completion report to Department of Health, State of Hawaii. 115 pp.

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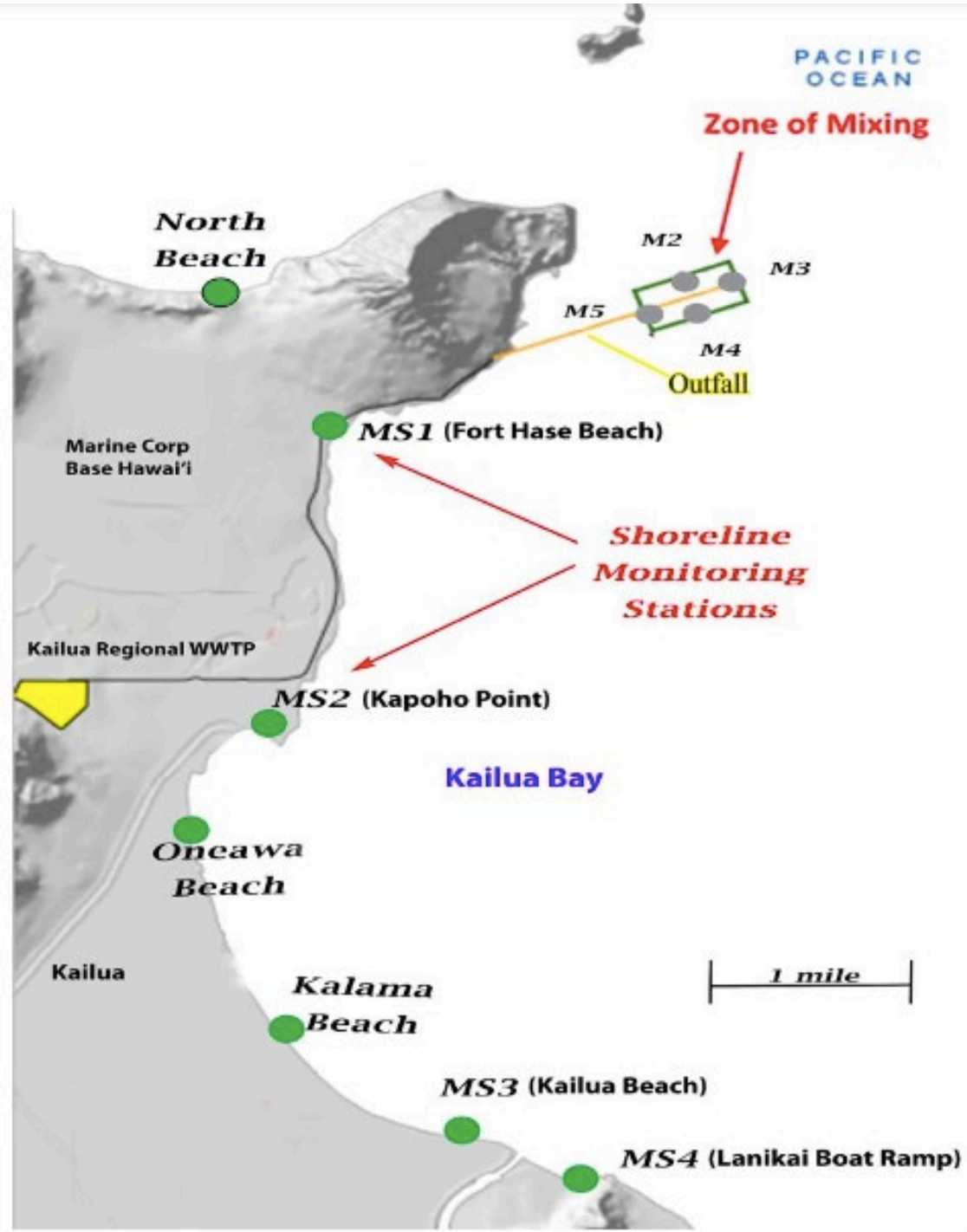
Krock, H.-J., and H. Sundararaghavan. 1993. Kailua Bay circulation (KB-5). Project Rep. PR-94-08, Water Resources Research Center, University of Hawaii at Manoa, Honolulu.

Moravcik, P., and L. Heitz. 1993. Kailua Bay studies: Community interaction (KB-1). Project Rep. PR-94-04, Water Resources Research Center, University of Hawaii at Manoa, Honolulu.

Roll, B.M., and R.S. Fujioka. 1993. Microbiological assessment of Kaelepulu Stream and the impact of discharge in Kailua Bay (KB-3). Project Rep. PR-94-06, Water Resources Research Center, University of Hawaii at Manoa, Honolulu.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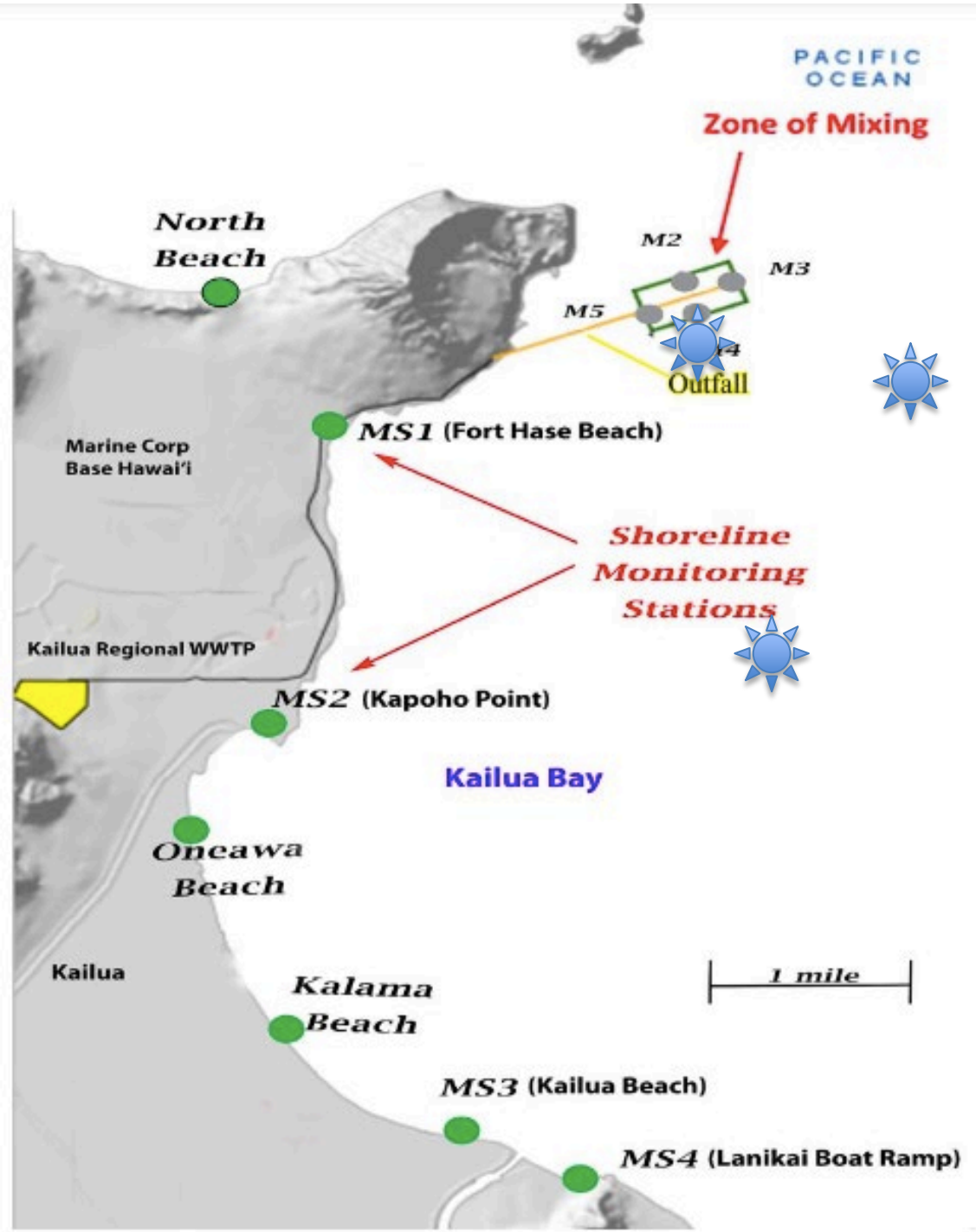
Zone of Mixing
North Beach
M2
M3
M5
M4
Outfall
MS1 (Fort Hase Beach)
Marine Corp Base Hawai'i
Shoreline Monitoring Stations
Kailua Regional WWTP
MS2 (Kapoho Point)
Kailua Bay
Oneawa Beach
Kailua
1 mile
Kalama Beach
MS3 (Kailua Beach)
MS4 (Lanikai Boat Ramp)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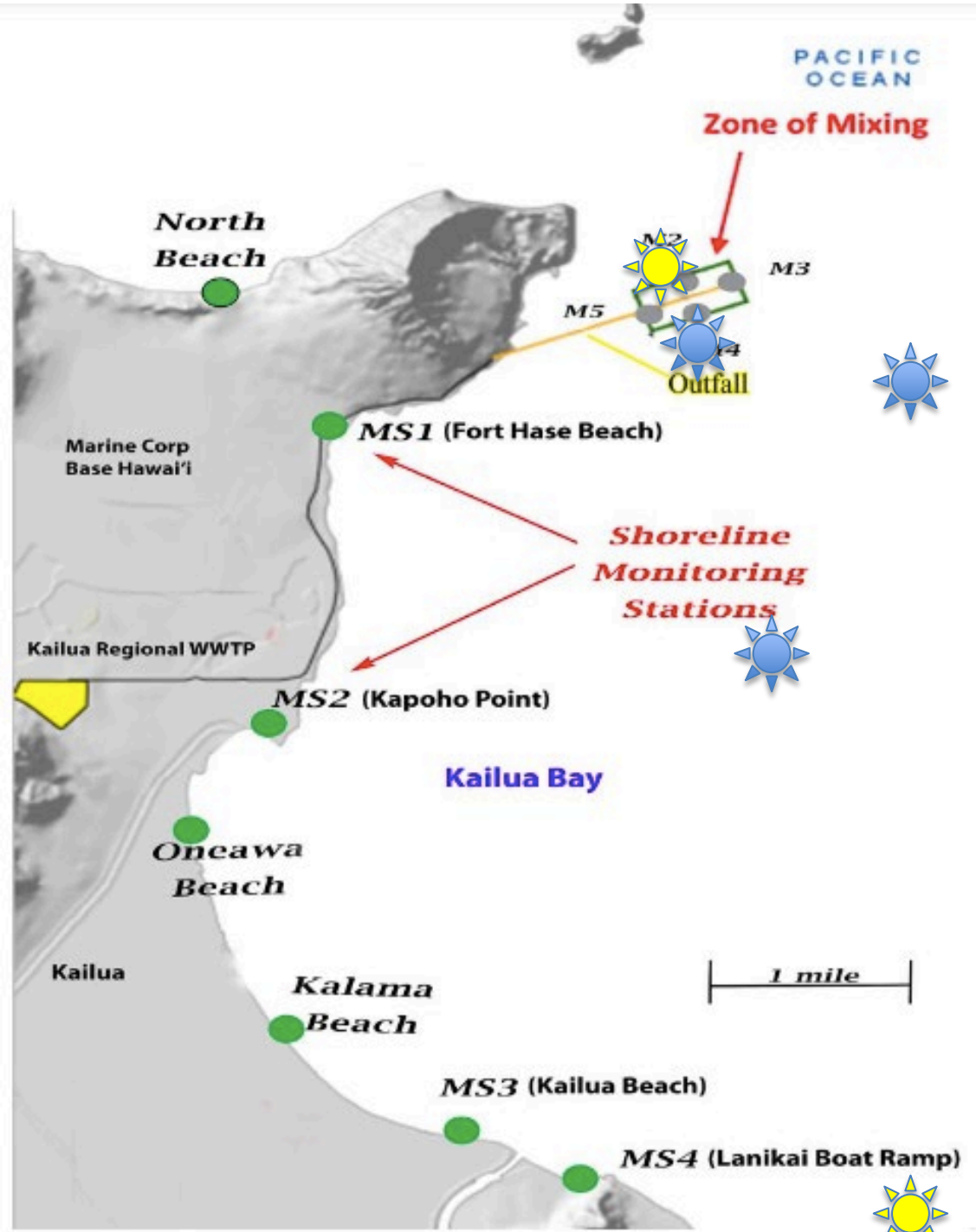
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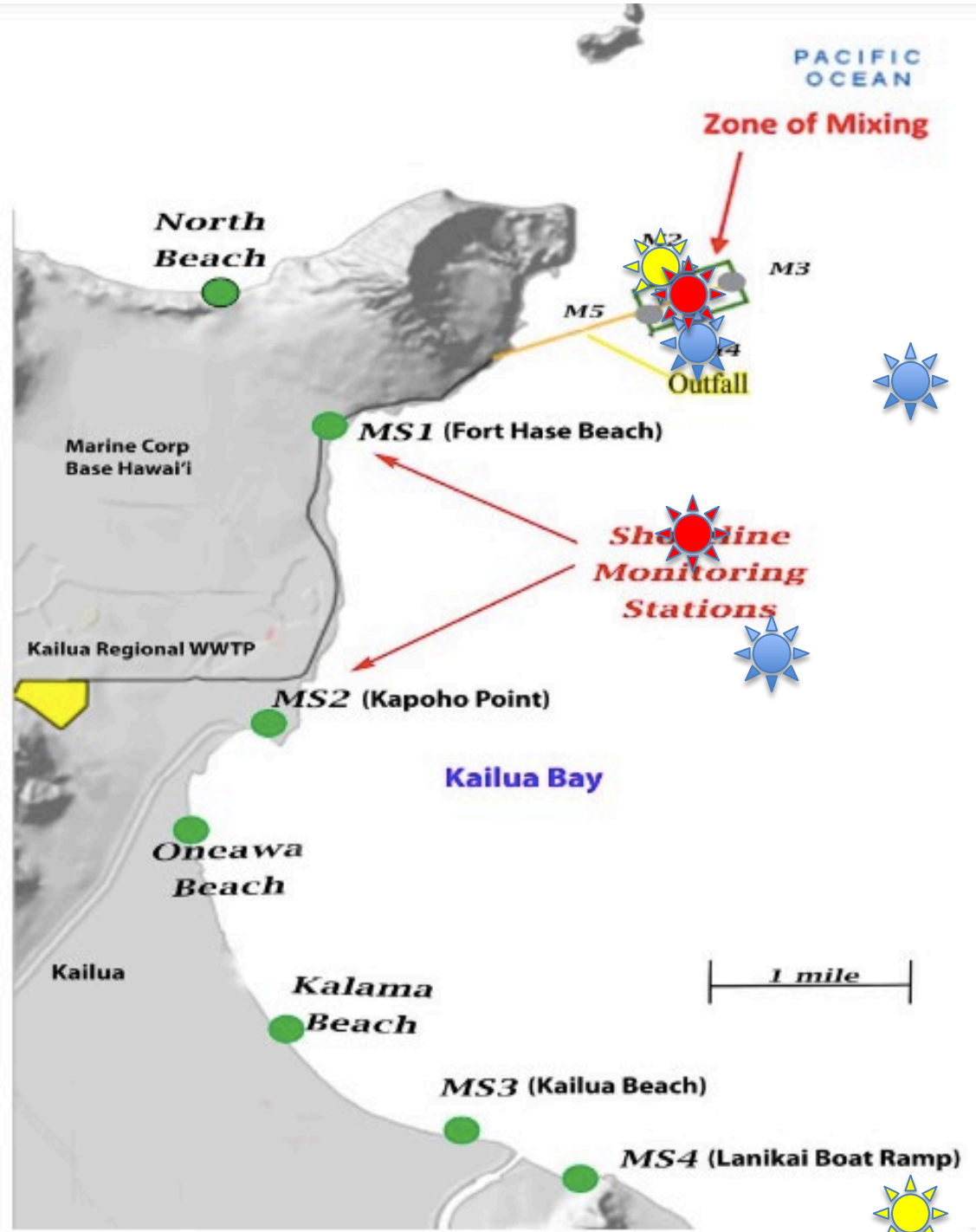
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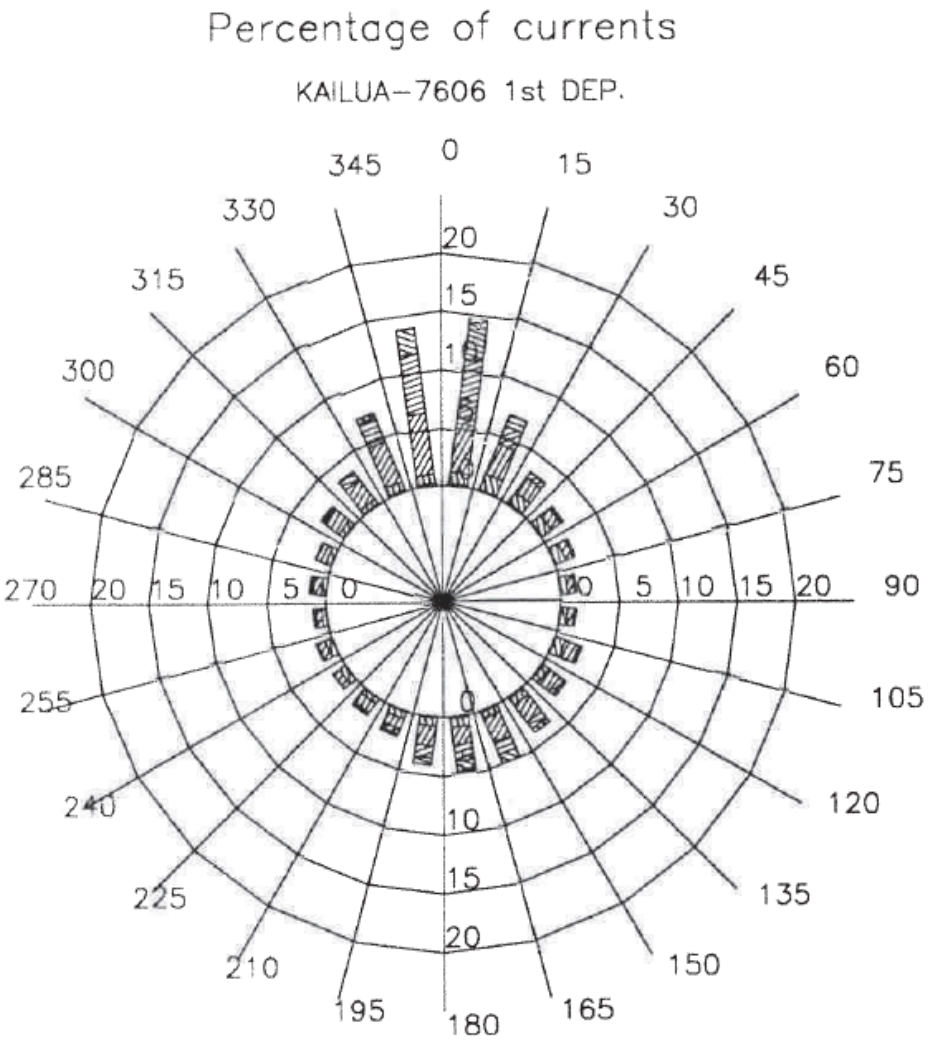
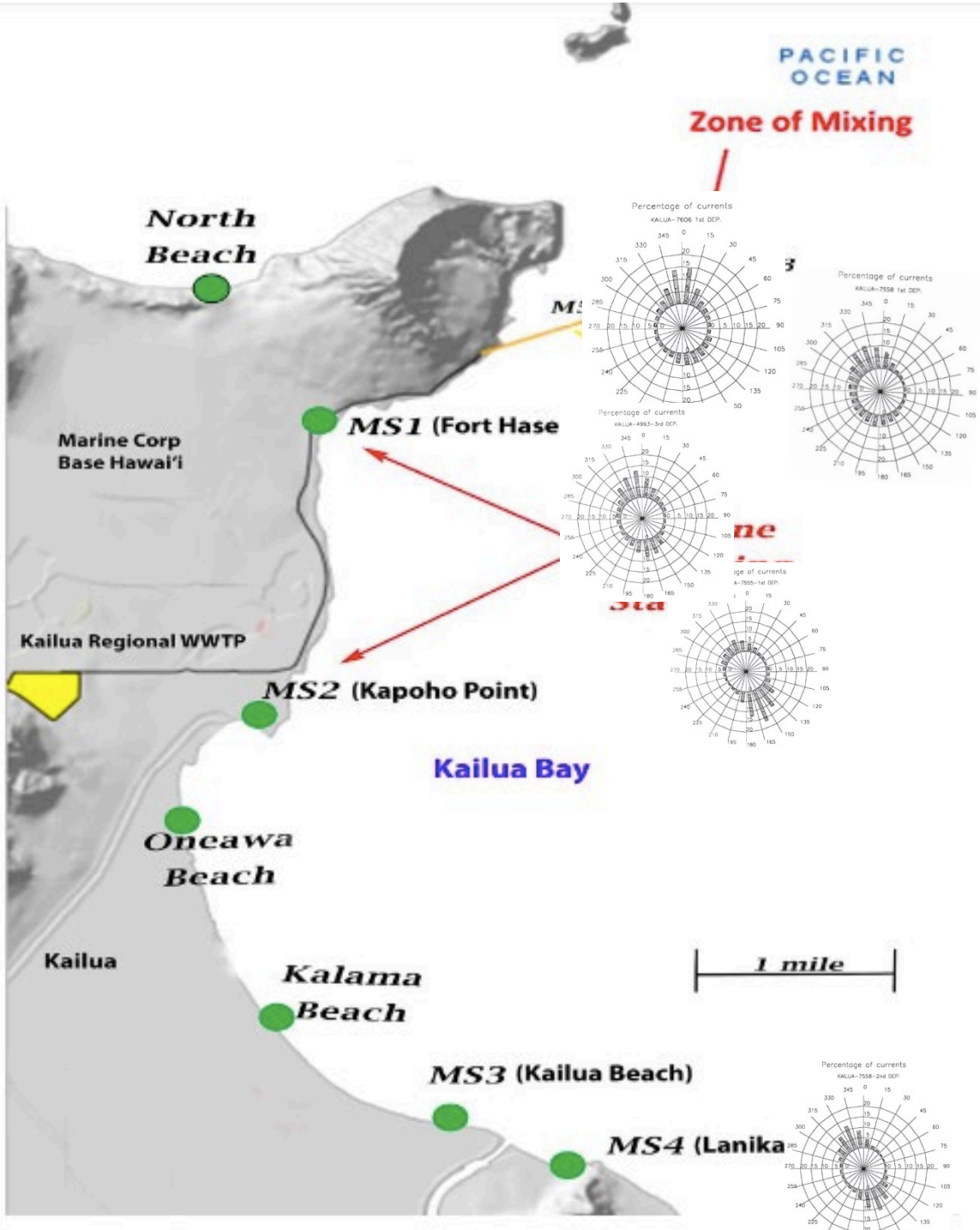
# Each current meter deployment resulted in a current “rose”

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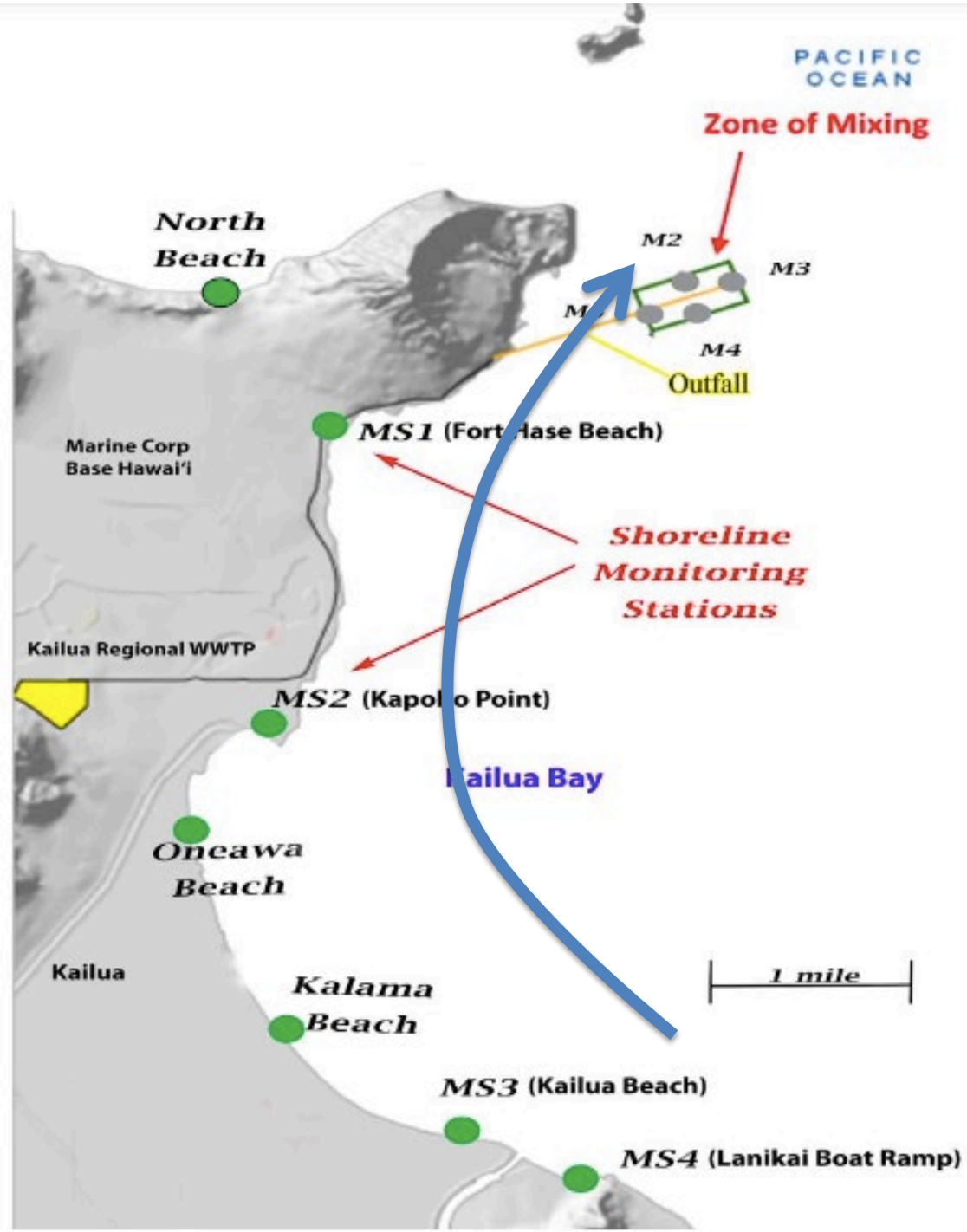
Percentage of currents
KAILUA-7606 1st DEP.
Percentage of currents
KAILUA-7558 1st DEP.
Percentage of currents
KAILUA-4993-3rd DEP.
Percentage of currents
KAILUA-7558-2nd DEP.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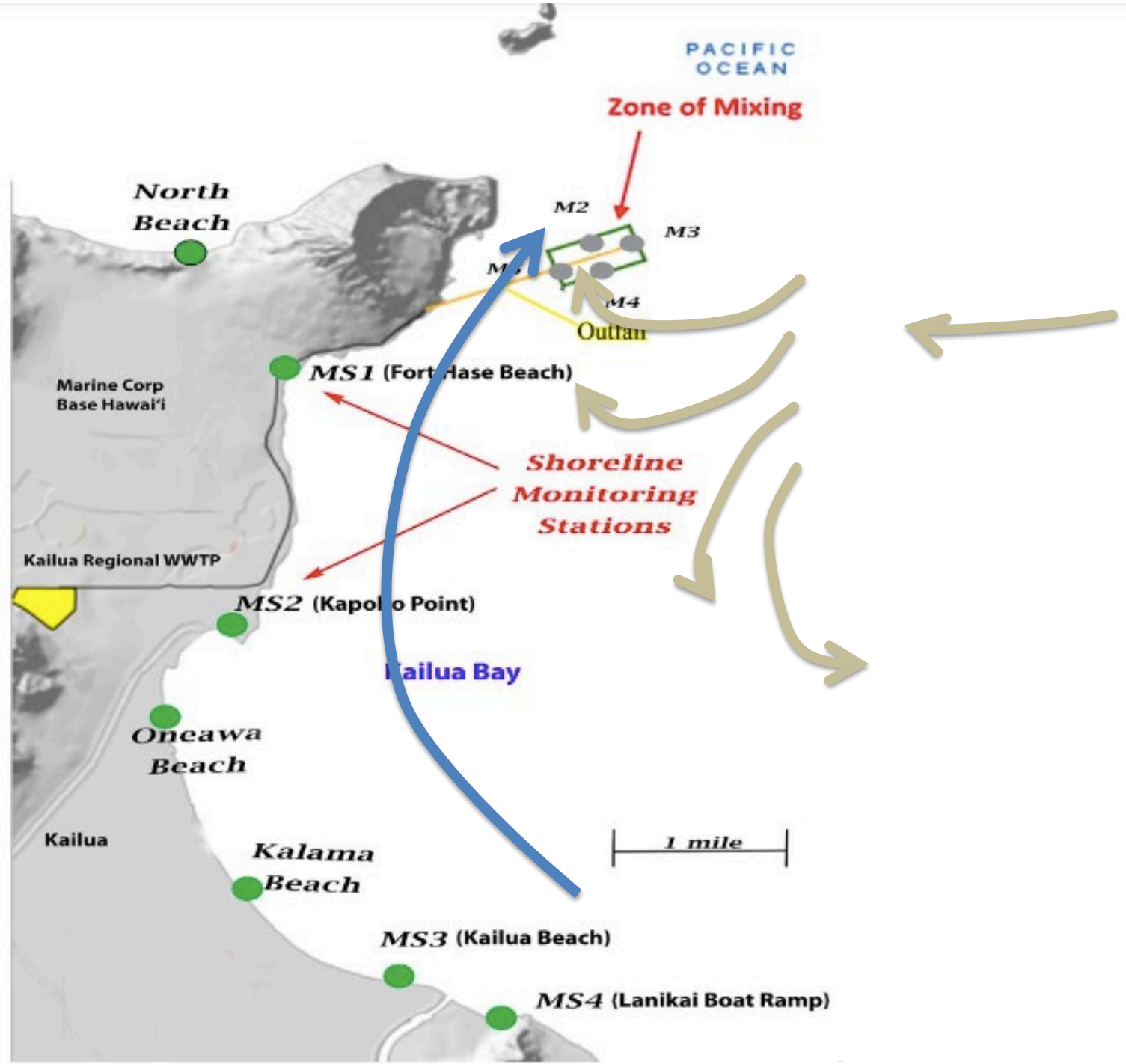
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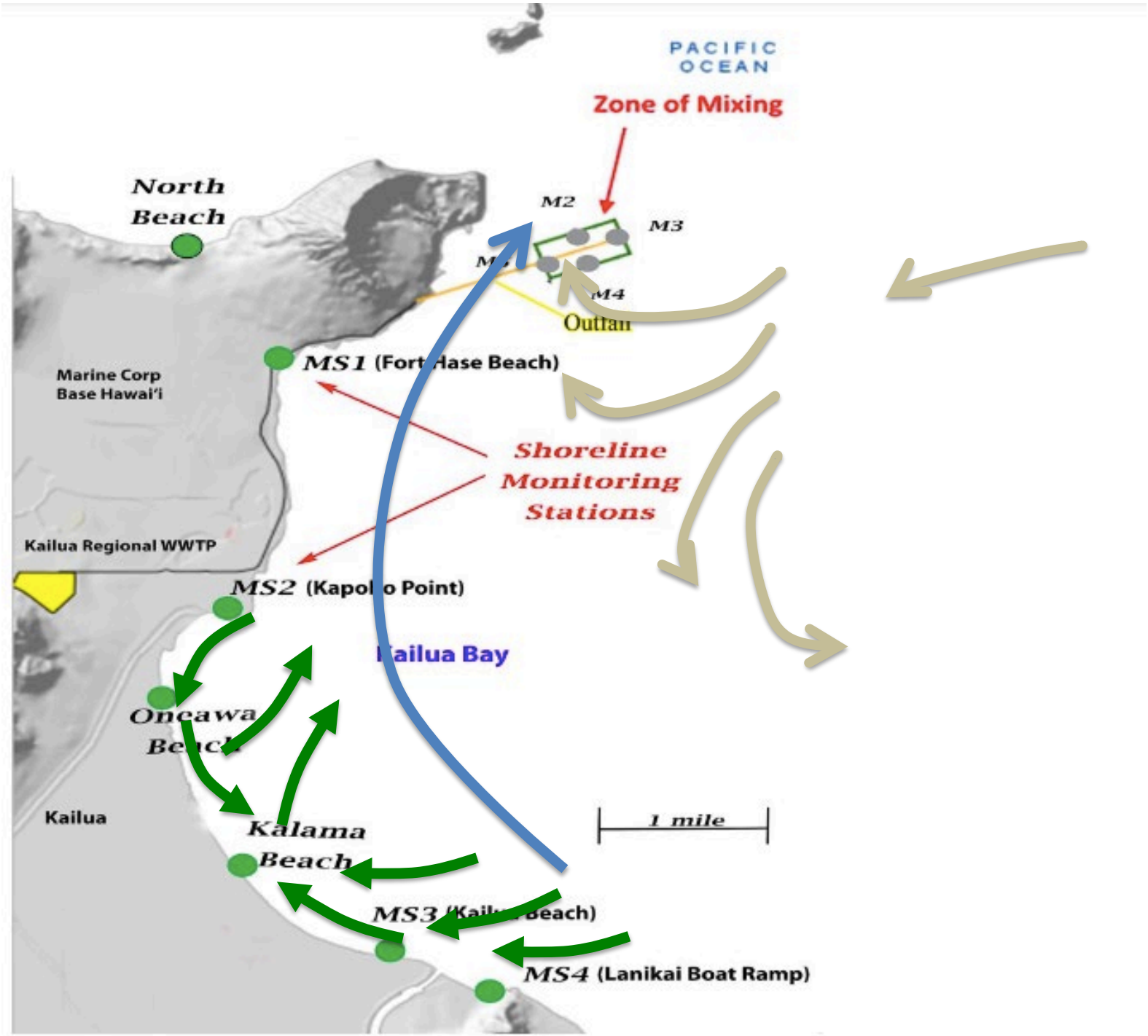
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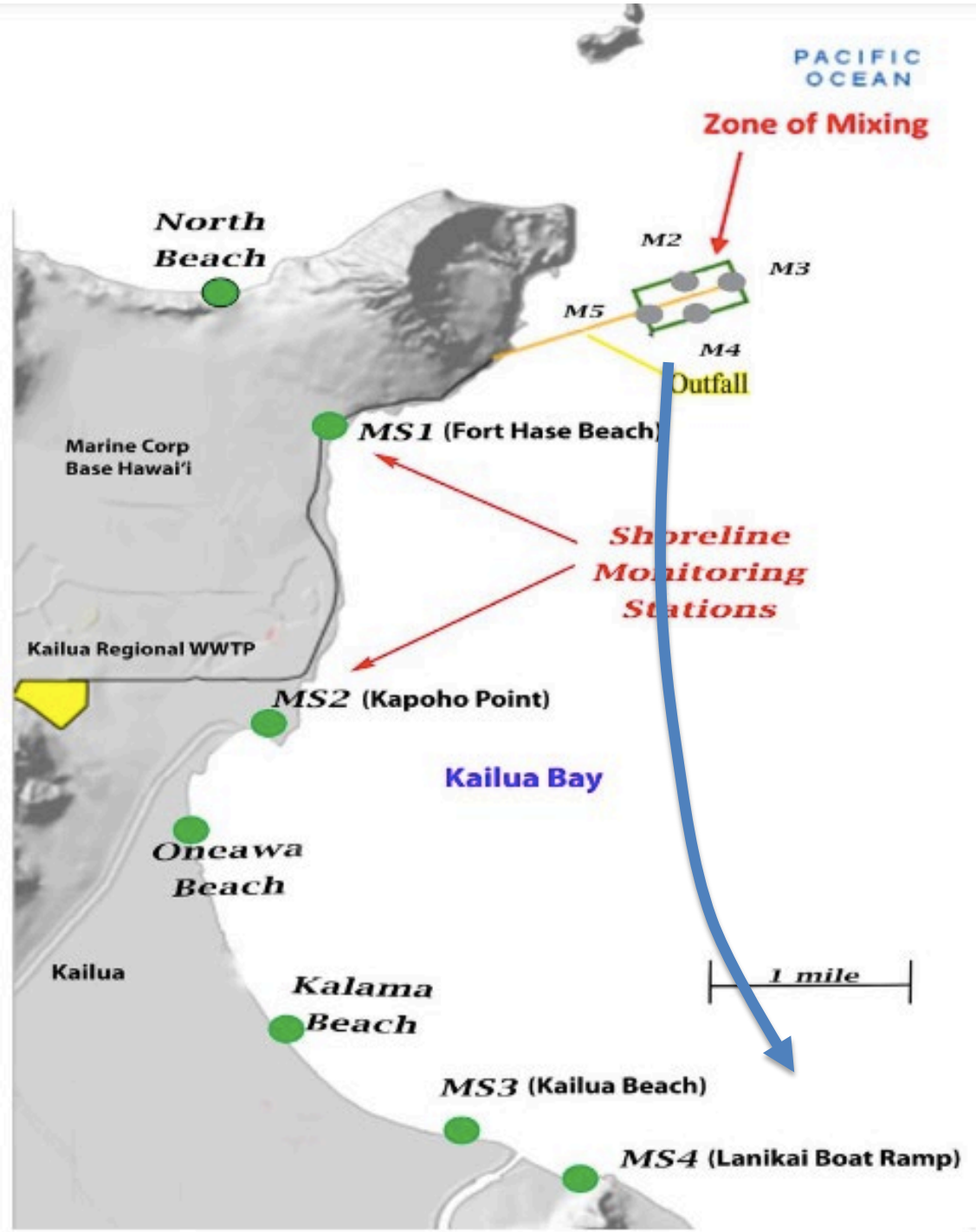
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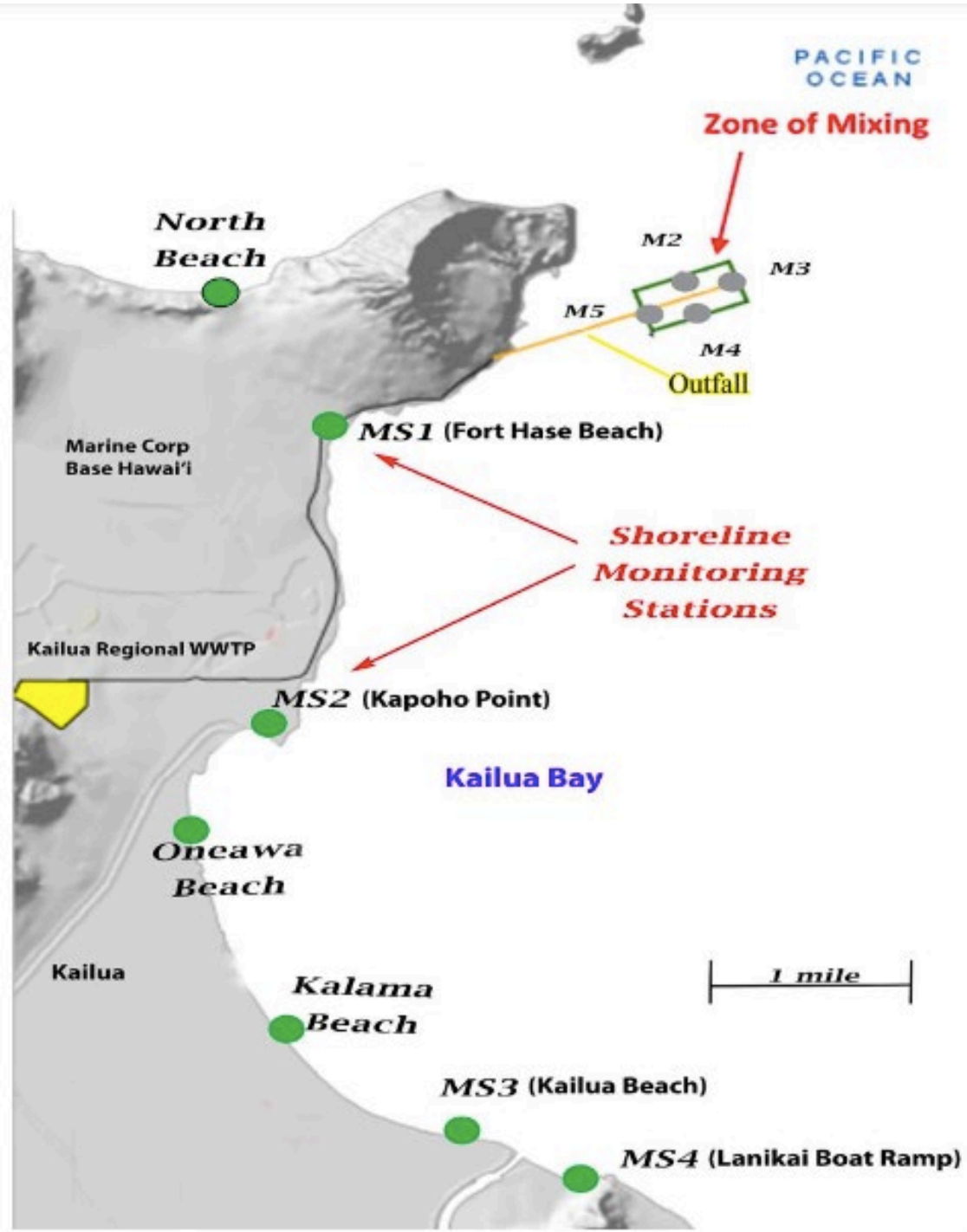
By 1995 it had been determined that the feces seen on the beach in 1990 by the nurse was from a turtle…..

and the green beach sand was revealed to be olivine, a naturally occurring dense sand occasionally exposed by heavy surf.

The bacterial studies by Fujioka and others (another presentation another day) concluded that the source of the bacteria was from ducks and other wild animals in the streams and estuaries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| | Shoreline Stations | | | | | | | Zone of Mixing Stations | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | Fort Hase Beach (MS1) Enterococci CFU/100ml | Kapoho Point (MS2) Enterococci CFU/100ml | Kailua Beach (MS3) Enterococci CFU/100ml | Lanikai Boat Ramp (MS4) Enterococci CFU/100ml | Kalama Beach Enterococci CFU/100ml | North Beach Enterococci CFU/100ml | Oneawa Beach Enterococci CFU/100ml | ZOM (M2) Enterococci CFU/100ml Daily Geomean | ZOM (M3) Enterococci CFU/100ml Daily Geomean | ZOM (M4) Enterococci CFU/100ml Daily Geomean | ZOM (M5) Enterococci CFU/100ml Daily Geomean |
| 05/15/24 | 10 | 41 | 13 | 2300 | 15 | 0.9 | 29 | <2.78 | <2.71 | 2.35 | <2.57 |
| 05/14/24 | 450 | 10000 | 1000 | 2900 | 1400 | 29.5 | 2800 | | | | |
| 05/13/24 | 9 | 440 | 74 | 28 | 36 | 1.45 | 1500 | | | | |
| 05/12/24 | 94 | 2300 | 170 | 510 | 4 | 35 | 2 | | | | |
| 05/11/24 | 720 | 63 | 6 | 55 | 14 | 7 | 3 | | | | |
| 05/10/24 | 14 | 57 | 2 | 22 | 0.9 | 4 | 3 | | | | |
| 05/09/24 | 4 | 14 | 5 | 17 | 8 | 7 | 37 | <2.21 | 2.76 | 0.9 | <1.59 |
| 05/08/24 | <0.90 | 4 | 4 | 0.9 | 3 | <0.90 | 7 | <1.59 | <0.90 | <1.48 | <1.17 |
| 05/03/24 | <0.90 | 8 | 5 | 4 | 2 | 3.5 | 5 | | | | |
| 04/27/24 | 0.9 | 2 | 10 | 17 | 3 | 17.5 | 6 | | | | |
| 04/21/24 | 5 | 5 | 2 | 3 | 0.9 | <0.90 | 3 | | | | |
| 04/15/24 | 11 | 3600 | 0.9 | 51 | 12 | 6 | 3 | | | | |
| 04/09/24 | 10 | 7 | 0.9 | 6 | 3 | <0.90 | 2 | | | | |
| 04/03/24 | <0.90 | 5 | 17 | 42 | 10 | <0.90 | 6 | | | | |
| 03/28/24 | 2 | 14 | 0.9 | 5 | <0.90 | <0.90 | 0.9 | | | | |
| 03/22/24 | 6 | 39 | 19 | 2 | <0.90 | <0.90 | 6 | | | | |
| 03/16/24 | 5 | 51 | 0.9 | 11 | 7 | <0.90 | 13 | | | | |
| 03/10/24 | 6 | 30 | 15 | 17 | 2 | 1.45 | 11 | | | | |
| 03/04/24 | <0.90 | 24 | 19 | 13 | 5 | <0.90 | 9 | | | | |
| 02/27/24 | 7 | 14 | 19 | 38 | 25 | <0.90 | 10 | | | | |
| 02/21/24 | 0.9 | 22 | 0.9 | 17 | 2 | <0.90 | 4 | | | | |
| 02/14/24 | 0.9 | 160 | 3 | 0.9 | 5 | <0.90 | 0.9 | | | | |
| 02/09/24 | 15 | 62 | 19 | 39 | 20 | 25 | 5 | | | | |
| 02/03/24 | 6 | 24 | 83 | 25 | 44 | 9.5 | 10 | | | | |
| 01/28/24 | 3 | 350 | 21 | 5 | <0.90 | 1 | 4 | | | | |
| 01/22/24 | 12 | 610 | 29 | 21 | 22 | 1 | 6 | | | | |
| 01/16/24 | 8 | 300 | 49 | 90 | 39 | 1.95 | 94 | | | | |
| 01/10/24 | 10 | 880 | 6 | 13 | 20 | 1.5 | 31 | | | | |

| | Shoreline Stations | | | | | | | Zone of Mixing Stations | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | Fort Hase Beach (MS1) Enterococci CFU/100ml | Kapoho Point (MS2) Enterococci CFU/100ml | Kailua Beach (MS3) Enterococci CFU/100ml | Lanikai Boat Ramp (MS4) Enterococci CFU/100ml | Kalama Beach Enterococci CFU/100ml | North Beach Enterococci CFU/100ml | Oneawa Beach Enterococci CFU/100ml | ZOM (M2) Enterococci CFU/100ml Daily Geomean | ZOM (M3) Enterococci CFU/100ml Daily Geomean | ZOM (M4) Enterococci CFU/100ml Daily Geomean | ZOM (M5) Enterococci CFU/100ml Daily Geomean |
| 05/15/24 | 10 | 41 | 13 | 2300 | 15 | 0.9 | 29 | <2.78 | <2.71 | 2.35 | <2.57 |
| 05/14/24 | 450 | 10000 | 1000 | 2900 | 1400 | 29.5 | 2800 | | | | |
| 05/13/24 | 9 | 440 | 74 | 28 | 36 | 1.45 | 1500 | | | | |
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| 05/03/24 | <0.90 | 8 | 5 | 4 | 2 | 3.5 | 5 | | | | |
| 04/27/24 | 0.9 | 2 | 10 | 17 | 3 | 17.5 | 6 | | | | |
| 04/21/24 | 5 | 5 | 2 | 3 | 0.9 | <0.90 | 3 | | | | |
| 04/15/24 | 11 | 3600 | 0.9 | 51 | 12 | 6 | 3 | | | | |
| 04/09/24 | 10 | 7 | 0.9 | 6 | 3 | <0.90 | 2 | | | | |
| 04/03/24 | <0.90 | 5 | 17 | 42 | 10 | <0.90 | 6 | | | | |
| 03/28/24 | 2 | 14 | 0.9 | 5 | <0.90 | <0.90 | 0.9 | | | | |
| 03/22/24 | 6 | 39 | 19 | 2 | <0.90 | <0.90 | 6 | | | | |
| 03/16/24 | 5 | 51 | 0.9 | 11 | 7 | <0.90 | 13 | | | | |
| 03/10/24 | 6 | 30 | 15 | 17 | 2 | 1.45 | 11 | | | | |
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| 02/27/24 | 7 | 14 | 19 | 38 | 25 | <0.90 | 10 | | | | |
| 02/21/24 | 0.9 | 22 | 0.9 | 17 | 2 | <0.90 | 4 | | | | |
| 02/14/24 | 0.9 | 160 | 3 | 0.9 | 5 | <0.90 | 0.9 | | | | |
| 02/09/24 | 15 | 62 | 19 | 39 | 20 | 25 | 5 | | | | |
| 02/03/24 | 6 | 24 | 83 | 25 | 44 | 9.5 | 10 | | | | |
| 01/28/24 | 3 | 350 | 21 | 5 | <0.90 | 1 | 4 | | | | |
| 01/22/24 | 12 | 610 | 29 | 21 | 22 | 1 | 6 | | | | |
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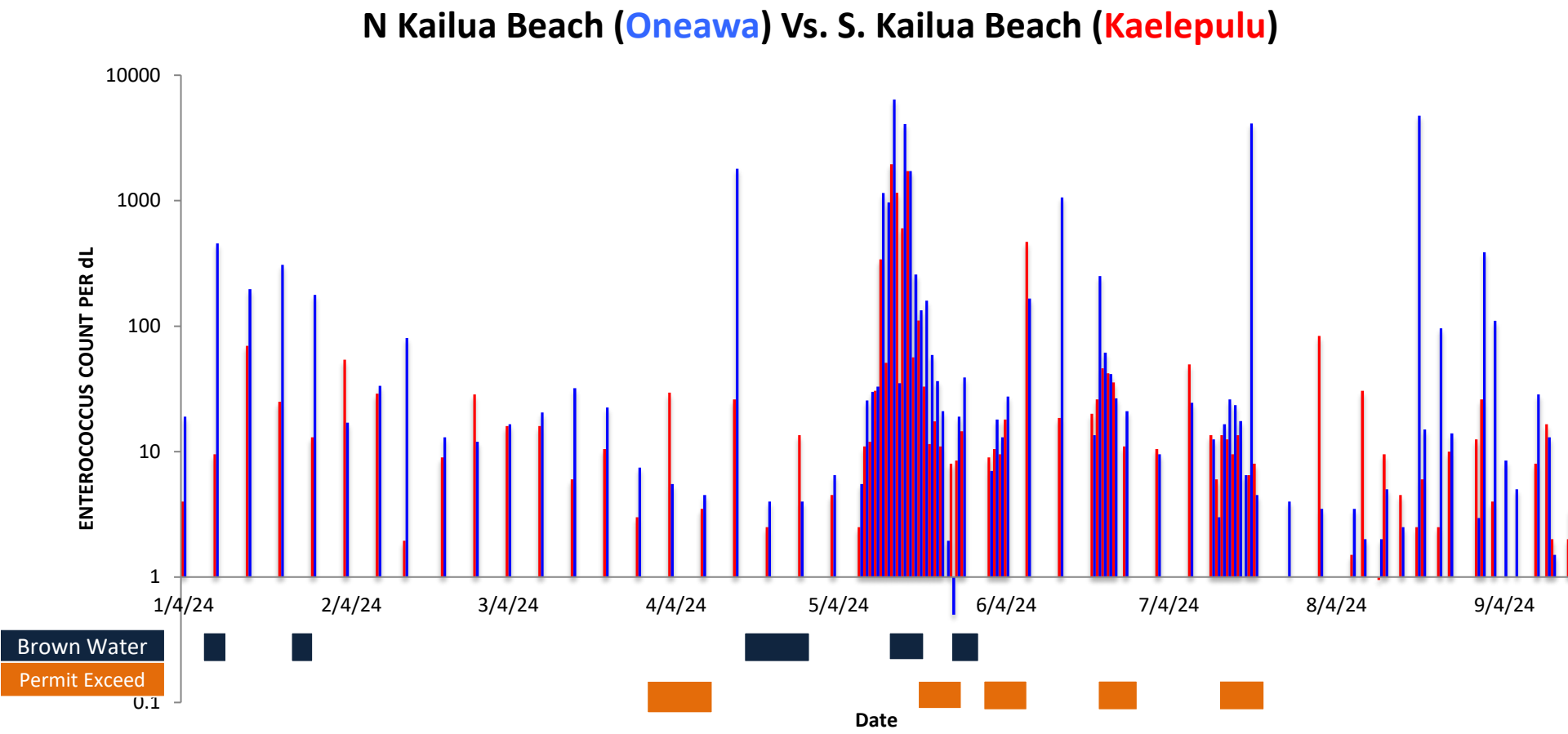
| 01/10/24 | 10 | 880 | 6 | 13 | 20 | 1.5 | 31 | | | | |

# Kailua Beach Bacterial Data



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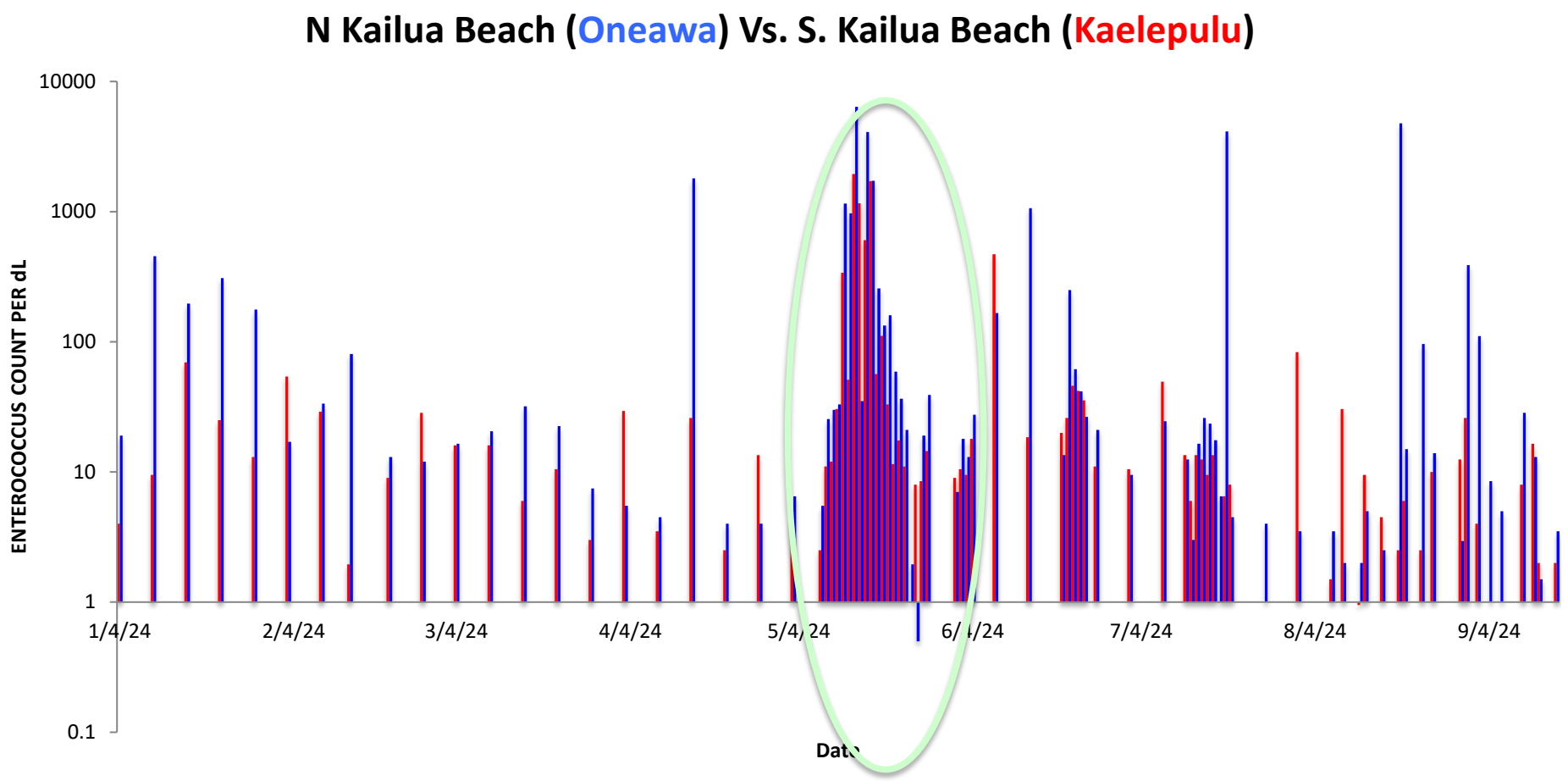

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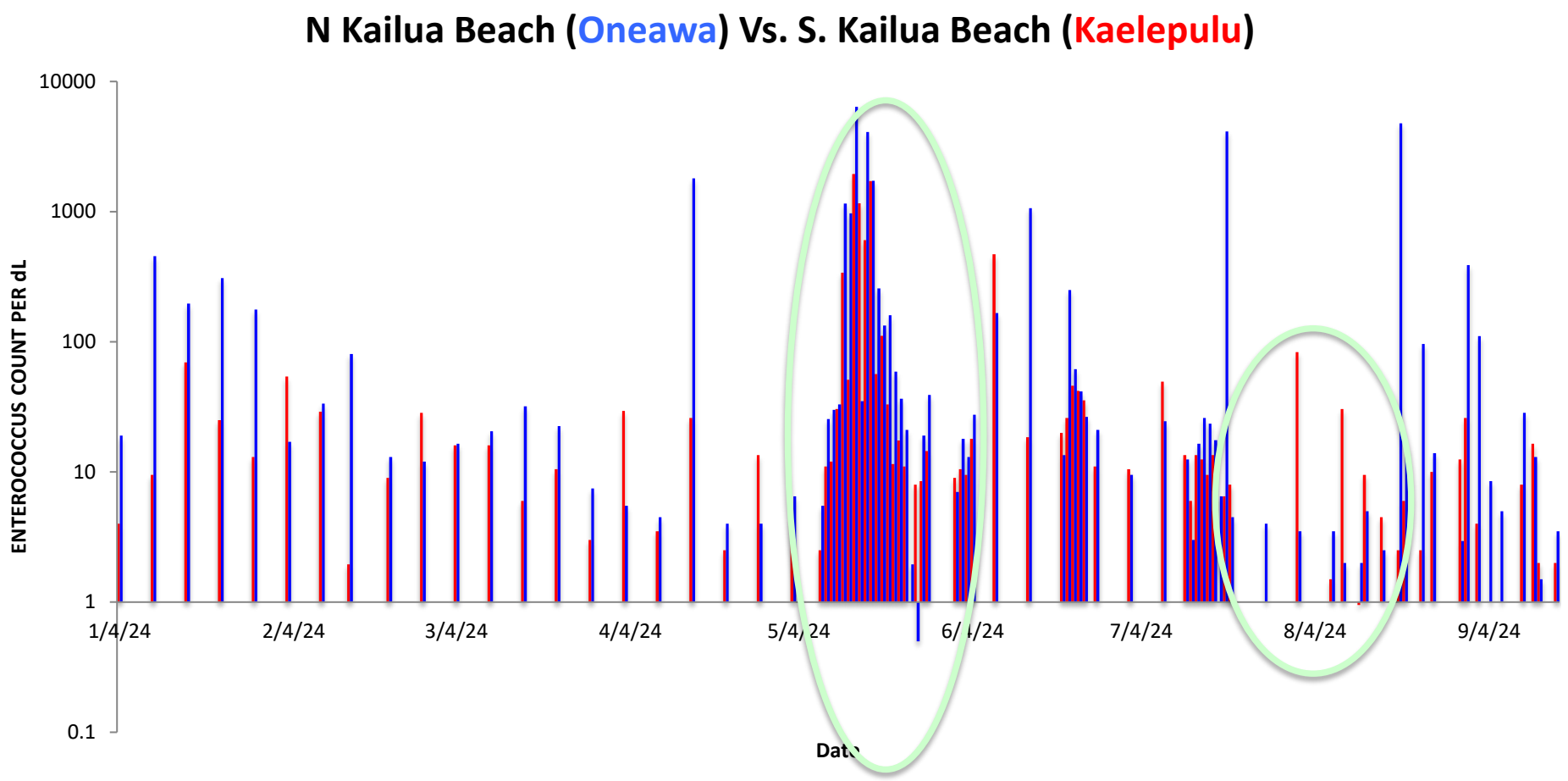
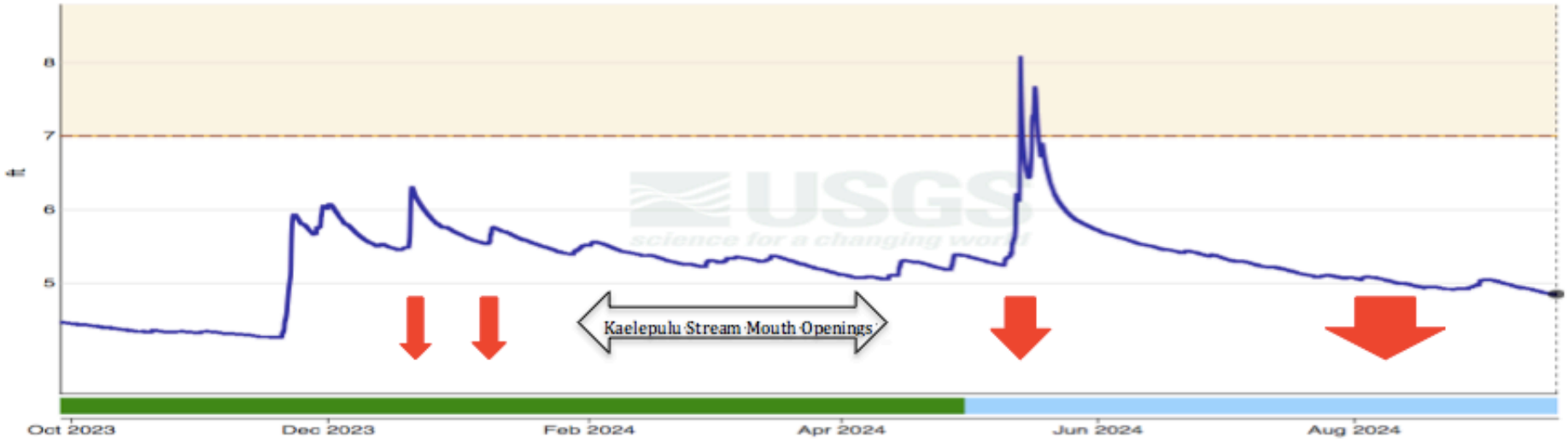


KAWAINUI MARSH WATER SURFACE ELEVATION and ¶
KAELEPULU STREAM MOUTH OPENINGS with associated ¶
DOH BEACH SAMPLE BACTERIAL COUNTS ¶
Jan 1 – Sept 15, 2024 ¶

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Upper and lower graphs are aligned by dates. The upper graph shows the elevation of water in Kawainui Marsh – with outflow through the Oneawa canal to the north end of Kailua Beach. The red arrows show the periods when the Kaelepulu Stream was open to flow at the south end of the beach. The lower graph shows the bacterial levels from the two stations at the north (Oneawa) end of Kailua beach in blue and the levels at the south end of the beach in red. ¶

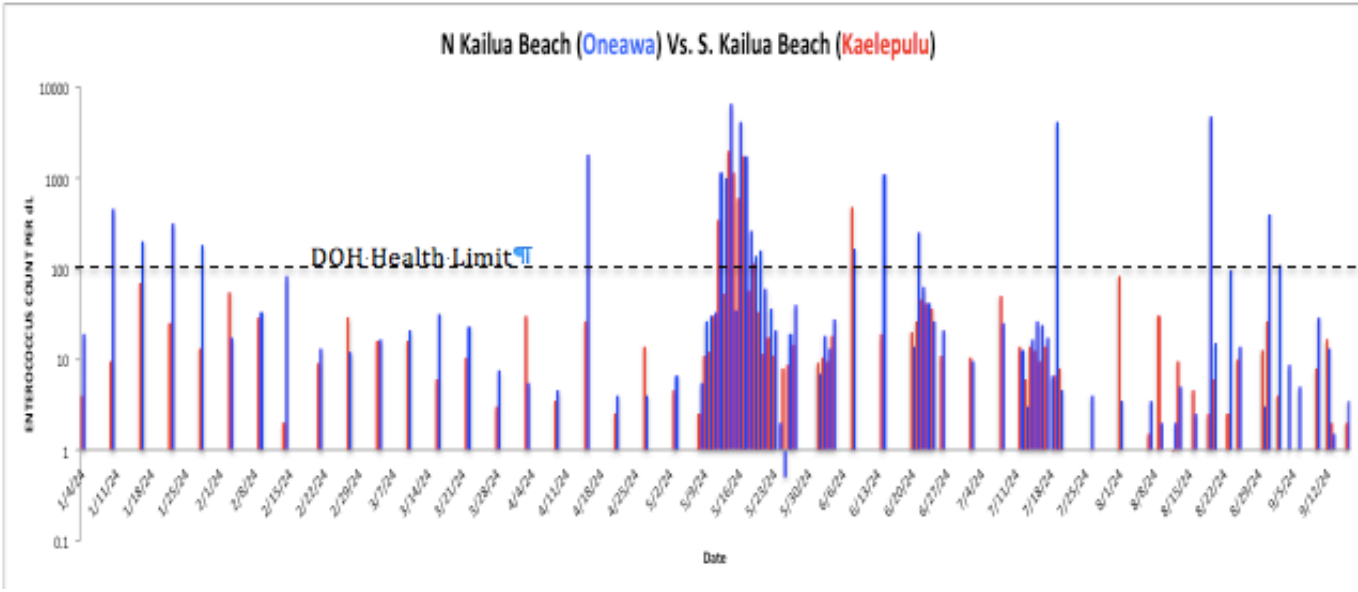


**Figure 19. O'ahu- Mokapu experimental swath.**
The Mokapu experimental swath shows low seaweed $\delta^{15}N$ values (with the exception of one site), moderate predicted wastewater nitrogen flux to the coastline and dense OSDS near the swath.

It is clear that the Kailua WWTP is not a serious threat to water quality in the nearshore Kailua Bay.

Nearshore pollutants in Kailua Bay come primarily from the Oneawa canal, but also from the Kaelepulu Stream when it is open to flow. The primary source of pollutants in the Kaelepulu system is the inflow from City Storm Drains. Pollutant sources to Oneawa are more complicated but undoubtedly relate to the increased amount of mangrove along the canal.

To insure improved water quality in Kailua Bay it is important to focus upon the uncontrolled pollutant loads from City Storm Drains and control of mangrove.

# To improve water quality in Kailua

1. Control pollutant loads from storm drains
   - DOH to complete the TMDL study
   - Street sweeping & appropriate storm system BMPs
   - Control construction site runoff
2. Eradicate mangrove from the system
3. Restore partial historical flow from Kawainui
4. Open stream mouth to monthly flow to the sea
5. Dredge Kaelepulu canal where it blocks seawater flow to the main pond

# Why the City Doesn't Want to Implement TMDL's

| WATER BODY CLASSIFICATION | HAWAII MARINE WATER QUALITY STANDARDS TN u/l | NH3 ug/l | NO3+ NO2 ug/l | TP ug/l | Chl ug/l | Turb ntu |
|---|---|---|---|---|---|---|
| Summer Open Coast GM | 110 | 2.0 | 2.5 | 16 | 0.15 | 0.20 |
| Winter Open Coast GM | 150 | 3.5 | 5 | 20 | 0.30 | 0.50 |
| Estuary GM | 200 | 6.0 | 8 | 25 | 1.50 | 1.50 |

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| Summer Open Coast 10% nte | 180 | 5.0 | 10 | 30 | 0.50 | 0.50 |
| Estuary GM | 200 | 6.0 | 8 | 25 | 1.50 | 1.50 |
| Winter Open Coast 10% nte | 250 | 8.5 | 14 | 40 | 1.50 | 1.0 |
| Summer Open Coast 2% nte | 250 | 9 | 20 | 45 | 1 | 1.0 |
| Estuary 10% nte | 350 | 10 | 25 | 50 | 5 | 3.0 |
| Winter Open Coast 2% nte | 350 | 15.0 | 25 | 60 | 1.75 | 2.0 |
| Estuary 2% nte | 500 | 20 | 35 | 75 | 10 | 5 |

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| Summer Open Coast 2% nte | 250 | 9 | 20 | 45 | 1 | 1.0 |
| Estuary 10% nte | 350 | 10 | 25 | 50 | 5 | 3.0 |
| Winter Open Coast 2% nte | 350 | 15.0 | 25 | 60 | 1.75 | 2.0 |
| Estuary 2% nte | 500 | 20 | 35 | 75 | 10 | 5 |
| Pearl Hbr 2% nte | 750 | 30 | 70 | 200 | 20 | 15 |

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| WATER BODY CLASSIFICATION | TN u/l | NH3 ug/l | NO3+ NO2 ug/l | TP ug/l | Chl ug/l | Turb ntu |
|---|---|---|---|---|---|---|
| | HAWAII MARINE WATER QUALITY STANDARDS | | | | | |
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| Summer Open Coast 2% nte | 250 | 9 | 20 | 45 | 1 | 1.0 |
| Estuary 10% nte | 350 | 10 | 25 | 50 | 5 | 3.0 |
| Winter Open Coast 2% nte | 350 | 15.0 | 25 | 60 | 1.75 | 2.0 |
| Estuary 2% nte | 500 | 20 | 35 | 75 | 10 | 5 |
| Pearl Hbr 2% nte | 750 | 30 | 70 | 200 | 20 | 15 |
| LOCATIONS | STORM DRAIN DATA | | | | | |
| Pearl,Mililani,Manoa,Kaukonahu | 950 | | 150 | 150 | (City data Table 7) | |
| Kaelepulu (Tamura, 2012) | 1700 | 170 | 650 | 190 | 71 | 42 |
| Kaelepulu (Ttech, 2019) | | 55 | 590 | 265 | | |

# Kaelepulu Percent of State WQ Standard