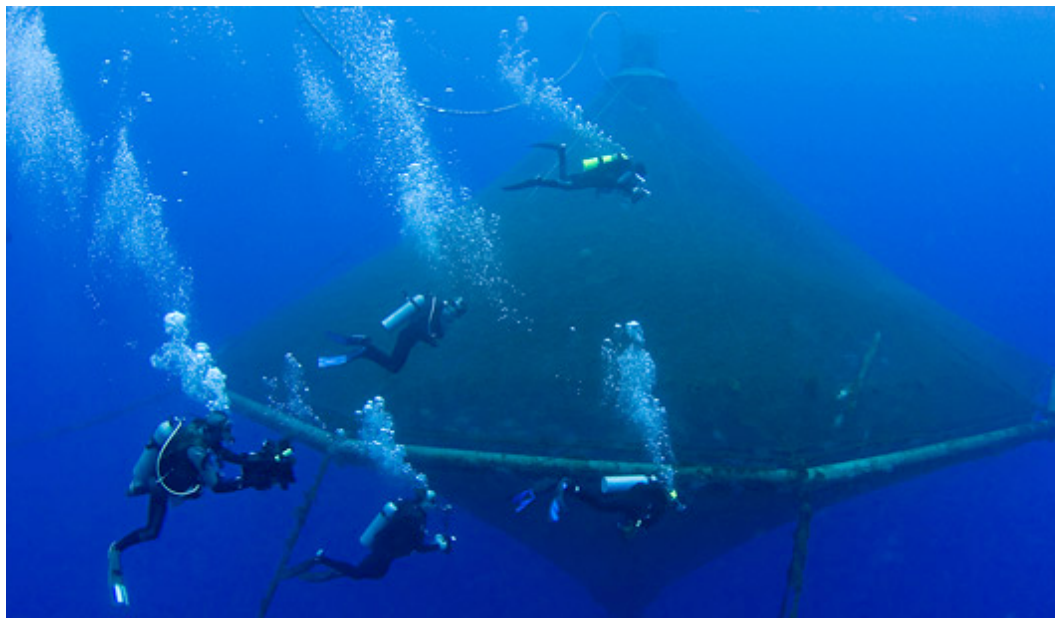




BLUE OCEAN MARICULTURE



7/20/2025

Water Quality Monitoring – July 2025

Prepared by



MEGA Lab
UHH – CNHS
200 W. Kawili St.
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BLUE OCEAN MARICULTURE

WATER QUALITY MONITORING – JULY 2025

SAMPLING REPORT

Survey Date: 7/20/2025

Client: Blue Ocean Mariculture

Current: North

Log Number: BOM-WQ-JULY-2025

Environmental Conditions

Effluent samples were collected adjacent to the net pen containing the highest biomass of fish. Sample collection occurred approximately 2-hours after a feeding event at a distance of 3-meters from the pen. The pen was partially raised prior to sampling. The water was clear with no evidence of high turbidity, discoloration, visible sheen, foam, solids, or floating debris near the pen during the sampling event.

Samples were collected during a rising tide (-0.1ft to 2.1ft) influenced by a 19% waning moon. Conditions consisted of 3-4kt Southwest winds that stayed consistent throughout the sampling duration. A 2-3ft South swell was present during sampling and stayed consistent throughout the entire sampling event. Overall, sea conditions were calm with mild winds. Skies over the ocean were clear with rainclouds moving over the coastline at the end of the sampling. The air had light levels of vog from the Kilauea geological activity. There were visible slicks at all sampling stations with high amounts visible particulates in the water. There were schools of baitfish observed at the Effluent site.

A mild North current was evident during the time of sampling.



Description of sampling methods

Water samples are collected at the monitoring sites monthly throughout the year. Monitoring sites are at the effluent discharge location near the pen containing the highest biomass of fish, four zone of mixing sites, and two control sites. Effluent samples are collected down current from the net pen containing the highest biomass at the surface, mid-pen, and bottom of the receiving water two hours after feeding. Surface samples are collected no less than 1 meter or more than 5 meters below the surface, and no farther than 10 meters down current from the net pen. Mid-pen samples are collected at the mid-pen depth no farther than one 1 meter down current from the net pen. Bottom samples are collected no less than 1 meter or more than five 5 meters above the sea floor, and no farther than 10 meters down current from the net pen. Zone of Mixing (ZOM) samples are collected down-current from the facility at the boundaries of the ZOM. Samples are collected at the north or south locations depending on the dominant current during the day of sampling. Samples are collected at the surface, mid-pen depth, and bottom of the receiving waters. Surface samples are collected not less than 1 meter or more than 5 meters below the surface. Bottom samples are collected not less than 1 meter nor more than 5 meters above the sea floor.

Water samples collected from the monitoring sites are filtered through pre-combusted (500° C, 6h) GF/F (Whatman) filters (pore size 0.7-µm), as well as directly collected for RAW samples. These water samples are transported to the laboratory on ice and stored at -20°C until analysis. Samples are analyzed for nitrate + nitrite (NO₃- + NO₂-), ammonium (NH₄+), phosphate (PO₄3-), total dissolved phosphorus (TDP), and total dissolved nitrogen (TDN). The nutrient values are measured using standard autoanalyzer methods. Inorganic nitrogen and phosphorus will be considered indirect measure of terrigenous effluents. Values recorded below the minimum detection limit (MDL) are presented as '<MDL.'. The MDL is calculated with analysis of seven of the same samples (Gravimetric Standard C4, 10, 100, 10, 10 ug/L for NH₃, Si, PO₄, NO₃, and NO₂ respectively). These samples are analyzed in order to determine the standard deviation, which is multiplied by the degree of freedom in order to calculate the precise MDL. The gravimetric standards are analyzed throughout the runs to determine calibration drift. Copper values are determined with inductively coupled plasma—mass spectrometry (ICP-MS). Analytical mass and instrumental parameters are selected to ensure accurate and precise determination of copper by using known standards. Turbidity is measured for all samples collected from these locations using a turbidimeter. The turbidimeter is calibrated with known standards prior to analyzing the collected samples to ensure accuracy.

To characterize the conditions at each monitoring station during sampling events, physiochemical parameters (temperature, salinity, conductivity, dissolved oxygen concentration, dissolved oxygen percent saturation, pH) are measured on site using multi-parameter YSI and pH meters. The multi-parameter sonde sensors are calibrated prior to taking measurements using known standards.

LABORATORY TEST RESULTS

<u>ID</u>	<u>DATE</u>	<u>LAB ID</u>	Reported in µg/L				TDN
			NO₂+ NO₃	NH₃+ NH₄	PO₄	TDP	
		MDL	0.4	1.6	0.9	0.9	0.4
Z1B	7/20/25	31	1.10	6.10	<MDL	6.00	90.50
Z1M	7/20/25	34	2.40	5.30	<MDL	5.80	94.40
Z1S	7/20/25	35	1.10	4.90	<MDL	5.60	93.90
Z2B	7/20/25	36	1.30	2.20	<MDL	6.30	96.70
Z2M	7/20/25	37	1.50	5.80	<MDL	6.60	104.00
Z2S	7/20/25	38	1.30	10.30	<MDL	6.50	100.10
Z3B	7/20/25	43	1.10	5.30	1.20	7.20	96.60
Z3M	7/20/25	44	1.20	3.80	<MDL	5.80	89.40
Z3S	7/20/25	45	1.20	4.90	<MDL	5.90	98.10
Z4B	7/20/25	46	1.40	4.50	<MDL	6.00	85.90
Z4M	7/20/25	47	1.40	2.60	1.10	6.20	91.80
Z4S	7/20/25	50	1.20	3.10	0.90	6.00	89.40
EB	7/20/25	59	1.50	3.20	<MDL	6.60	107.20
EM	7/20/25	60	1.40	4.40	<MDL	6.60	107.60
ES	7/20/25	61	1.50	4.00	<MDL	6.40	92.30
C1B	7/20/25	51	1.10	5.30	1.20	6.10	106.40
C1M	7/20/25	52	1.60	6.20	0.90	6.30	96.00
C1S	7/20/25	53	1.20	9.90	1.20	6.40	98.30
C2B	7/20/25	54	1.10	3.90	0.90	6.40	110.80
C2M	7/20/25	57	2.40	4.50	<MDL	6.60	111.20
C2S	7/20/25	58	1.30	3.00	<MDL	6.70	105.60



LAB QUALITY CONTROL AND QUALITY ASSURANCE

FASPac II

Run date: 7/23/25

Configuration: BOM Offshore

Run Name: BOM Offshore July 2025 R2

								Total
					Si	PO4	NO ₃ & NO ₂	NH ₃ & NH ₄
	Position	Identifier	Type		µg/l	µg/l	µg/l	µg/l
	22	2:54	GravStd C4	Unknown	89.2	10.1	11.0	9.1
	23	2:55	GravStd C4	Unknown	89.3	9.7	10.8	9.8
	24	2:56	GravStd C4	Unknown	89.5	9.8	11.0	9.9
	27	2:57	GravStd C4	Unknown	90.1	9.9	11.0	9.0
	28	2:58	GravStd C4	Unknown	90.1	10.0	11.1	8.4
	29	2:59	GravStd C4	Unknown	89.3	10.5	10.9	9.5
	30	0.125	GravStd C4	Unknown	89.8	10.3	10.8	9.2
Mean					89.6	10.0	10.9	9.3
std dev					0.385	0.282	0.113	0.515
MDL					1.2	0.9	0.4	1.6
	18	SR:19	GravStd C3	Check Cal	247.0	24.0	26.6	23.7
	39	SR:19	GravStd C3	Check Cal	248.0	24.2	27.1	24.6
	62	SR:19	GravStd C3	Check Cal	261.2	24.2	27.5	25.1
	85	SR:19	GravStd C3	Check Cal	262.2	24.3	27.9	25.9
	108	SR:19	GravStd C3	Check Cal	284.2	24.2	28.0	25.0
Mean					260.5	24.2	27.4	24.9
std dev					15.030	0.110	0.581	0.802

MDL Calculations: Analysis of seven of the same samples (Gravimetric Standard C4 10, 100, 10, 10 ug/L for NH₃, Si, PO₄, NO₃ & NO₂ respectively), determine Std Dev, multiply Std Dev by degree of freedom (3.14)

Gravimetric standards (different from the calibration standards) are analyzed throughout the run to determine calibration drift.

GRAB SAMPLE RESULTS

<u>Sample ID</u>	<u>Time</u>	<u>Date</u>	<u>Dissolved Oxygen</u>	<u>Dissolved Oxygen</u>	<u>Temperature</u>
Z1B	9:28	7/20/25	6.30	96.86	80.78
Z1M	9:36	7/20/25	6.47	95.02	80.78
Z1S	9:38	7/20/25	6.77	93.82	80.96
Z2B	9:47	7/20/25	6.34	95.56	80.78
Z2M	9:52	7/20/25	6.26	93.96	80.78
Z2S	9:53	7/20/25	6.46	96.45	80.96
Z3B	9:59	7/20/25	6.48	93.74	80.78
Z3M	10:04	7/20/25	6.46	97.49	80.78
Z3S	10:07	7/20/25	6.19	97.37	80.96
Z4B	10:14	7/20/25	6.31	96.25	80.78
Z4M	10:18	7/20/25	6.22	94.51	80.78
Z4S	10:21	7/20/25	6.16	94.81	80.96
EB	10:36	7/20/25	6.81	95.17	80.78
EM	10:43	7/20/25	6.43	93.57	80.78
ES	10:48	7/20/25	6.50	94.11	80.96
C1B	11:02	7/20/25	6.30	95.68	80.78
C1M	11:09	7/20/25	6.85	94.57	80.78
C1S	11:11	7/20/25	6.52	95.99	80.96
C2B	11:22	7/20/25	6.12	98.61	80.78
C2M	11:25	7/20/25	6.81	98.56	80.78
C2S	11:27	7/20/25	6.76	96.96	80.96
Units			mg/mL	% Saturation	Fahrenheit
DL			0.01	0.01	0.01



GRAB SAMPLE RESULTS

<u>Sample ID</u>	<u>Time</u>	<u>Date</u>	<u>pH</u>	<u>Salinity</u>	<u>Turbidity</u>
Z1B	9:28	7/20/25	8.10	35.21	0.14
Z1M	9:36	7/20/25	8.10	35.53	0.13
Z1S	9:38	7/20/25	8.10	35.50	0.13
Z2B	9:47	7/20/25	8.10	35.38	0.18
Z2M	9:52	7/20/25	8.10	35.39	0.15
Z2S	9:53	7/20/25	8.10	35.44	0.15
Z3B	9:59	7/20/25	8.10	35.24	0.10
Z3M	10:04	7/20/25	8.10	35.60	0.13
Z3S	10:07	7/20/25	8.10	35.25	0.18
Z4B	10:14	7/20/25	8.10	35.27	0.13
Z4M	10:18	7/20/25	8.10	35.43	0.18
Z4S	10:21	7/20/25	8.10	35.09	0.17
EB	10:36	7/20/25	8.10	35.16	0.12
EM	10:43	7/20/25	8.10	35.33	0.17
ES	10:48	7/20/25	8.10	35.53	0.23
C1B	11:02	7/20/25	8.10	35.70	0.15
C1M	11:09	7/20/25	8.10	35.08	0.17
C1S	11:11	7/20/25	8.10	35.43	0.16
C2B	11:22	7/20/25	8.10	35.52	0.14
C2M	11:25	7/20/25	8.10	35.57	0.11
C2S	11:27	7/20/25	8.10	35.34	0.13
Units				PPT	NTU
DL			0.01	0.01	0.01



ICP RESULTS

Laboratory Test Results

Description: July 2025, 4 water samples for copper, zinc, selenium, silver, chromium, and arsenic.

Job 2347

Site	Month	UHH Lab ID	mg/L					
			Cu	Zn	Se	Ag	Cr	As
ES	July	2347-1	ND	ND	ND	ND	ND	ND
ES duplicate	July	2347-1d	ND	ND	ND	ND	ND	ND
EM	July	2347-2	ND	ND	ND	ND	ND	ND
EM duplicate	July	2347-2d	ND	ND	ND	ND	ND	ND
EB	July	2347-3	ND	ND	ND	ND	ND	ND
EB duplicate	July	2347-3d	ND	ND	ND	ND	ND	ND
Control	July	2347-4	ND	ND	ND	ND	ND	ND
Control duplicate	July	2347-4d	ND	ND	ND	ND	ND	ND
Method Blank			ND	ND	ND	ND	ND	ND
Detection Limit			0.01	0.01	0.01	0.50	0.01	0.01

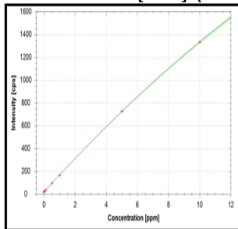
Method used: EPA 200.8



ICP QA/QC

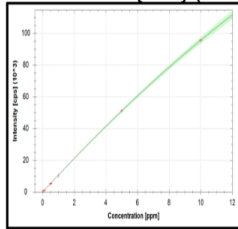
QC Curves

Cu 327.396 {103} (Radial)



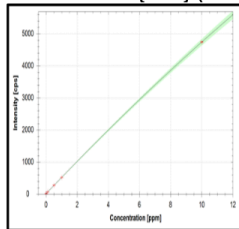
R² = 1.0000

Zn 213.856 {457} (Axial)



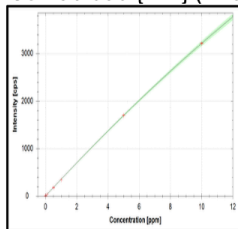
R² = 1.0000

As 189.042 {478} (Axial)



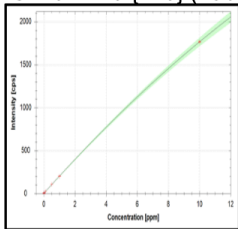
R² = 1.0000

Se 196.090 {472} (Axial)



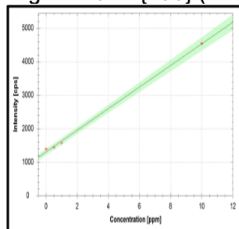
R² = 1.0000

Cr 267.716 {126} (Radial)



R² = 1.0000

Ag 224.641 {450} (Axial)



R² = 0.9984

QC utilized MTL 62 + 200.8*

Quality control samples

	mg/L					
	<u>Cu</u>	<u>Zn</u>	<u>As</u>	<u>Cr</u>	<u>Se</u>	<u>Ag*</u>
Quality Control (QC) Sample	0.102	0.142	0.009	0.076	0.039	0.507
Accepted Range of QC	0.087-0.113	0.107-.143	0.007-0.013	0.059-.091	0.026-0.044	0.450-0.550



Please call if you have any questions regarding the water quality monitoring report.

Sincerely,

A handwritten signature in black ink, appearing to read 'John Burns', with a stylized flourish extending to the right.

John Burns, Ph.D.
Associate Professor - Marine Science and Data Science
University of Hawai'i at Hilo
200 W. Kawili St.
Hilo, HI 96720



73-4450 Queen Kaahumanu Hwy, #101, Kailua-Kona, HI 96740
808-327-9585 <http://nelha.hawaii.gov>

Project Information:	Monthly water quality monitoring
Project Location:	Keahole Point
Turn-Around Time:	5-10days
Notes:	

Relinquished By:	Date/Time	Received By:	Date/Time	Temp °C:	Matrix Key:
J. Burns	7/20/25 13:29	[Signature]	7/22/25 0824	fr. 8.8	E = effluent GW = groundwater O = ocean water X = other/unknown

Clear Form



UNIVERSITY
of HAWAII
HILO

University of Hawai'i at Hilo Analytical Lab Sample Submission/Analysis Request Form

Lab information: 200 W. Kawili St. Hilo, HI 96720 – Marine Science Building – Room 109

Hours: 8am – 4pm; M-F, closed most state and federal holidays

Email: analytic@hawaii.edu **Website:** <https://hilo.hawaii.edu/analytic/> **Phone:** (808) 932-7590

Client Information		Billing Information	
Client Name	John Burns	Name/ Organization	MEGA Lab - BOM
Project Title	BOM	Phone number	
Phone number		Email address	
Email address		Funding type	<input type="checkbox"/> Private <input type="checkbox"/> Non-profit <input type="checkbox"/> Federal <input type="checkbox"/> State <input type="checkbox"/> County

Sample Information			
Number of Samples	Sample Type	Sample Date	Analyses Requested
4	Seawater	7/20/25	HM (Cu, Zn, Se) plus all quarterly metals
	Select		
	Select		
Example 4	Fresh Water	3/17/25	Total Phosphorus, NO ₃ , NH ₄ , pH

Email Sample Sheet with Sample IDs to analytic@hawaii.edu

Chain of Custody	
Samples Relinquished by (Client):	J. Burns <i>[Signature]</i> Date: 7/21/25
By relinquishing the sample(s) to the UH Hilo Analytical Lab, I indicate that the information provided is accurate and complete and the samples are in the best quality for analysis. By submitting these samples, I agree to pay for all services rendered. I understand that the samples will be disposed of 30 days after the final report is completed, unless otherwise arranged.	
Samples Received by (Technician):	<i>[Signature]</i> Date: 7/21/25

For Lab Use Only	
Sample Received Condition	1. <u>Drop off</u> Mail 2. <u>Fresh</u> Frozen Dried Other
Water Type	Fresh Brackish <u>Sea</u> Filtered? Y <u>N</u>
Sample location post arrival	<u>fridge</u> Comments
Job Number	<u>2347</u>