Agenda Item 8

STATE OF THE OCEAN REPORT
Oceanside Ocean Outfall

Michael R. Welch, Ph.D., P.E.

Summary of Receiving Water Reports Required Under:

Order No. R9-2019-0166
NPDES CA0107433
City of Oceanside

Order No. R9-2019-0167
NPDES CA0109347
U.S. Marine Corps Base Camp Pendleton

Order No. R9-2019-0169
NPDES CA0108031
Fallbrook Public Utility District

Today's Discussion Elements Follow the RWQCB Question-Based Monitoring Approach

Four Categories of Monitoring are Addressed in the OOO NPDES Discharge Permits	Core Monitoring	Regional Monitoring	Special Studies
1. Treatment Performance/Effluent Monitoring	✓		
2. Plume Tracking			✓
3. Receiving Water Monitoring	✓	✓	
4. Sediment/Habitat Monitoring	✓	✓	

The Oceanside Ocean Outfall (OOO) NPDES permits establish monitoring requirements within each of these four monitoring categories to address specific monitoring questions.

Today's Objective:
Review the monitoring data collected to date and provide answers to each of the monitoring questions posed in the OOO NPDES permits.

Outline of Today's Presentation

1. Discharge overview
2. Review treatment performance and effluent data
3. Review plume tracking results
4. Review receiving water data
5. Review sediment & habitat data
6. Present conclusions on ocean conditions and the OOO outfall discharge

Oceanside Ocean Outfall (OOO) Characteristics

Parameter	Description
Outfall Length	9080 feet
Diffuser Length	230 feet
Discharge Depth	100-110 feet
Discharge Ports	14 five-inch & 10 four-inch ports (one port every 10 feet, alternating sides)

1. Discharge Overview

Four NPDE permits regulate discharges to the Oceanside Ocean Outfall (OOO):

- City of Oceanside (R9-2019-0166)
- U.S. Marine Corps Base Camp Pendleton (R9-019-0167)
- Genentech, Inc. (R9-2019-0168)
- Fallbrook Public Utility District (R9-2019-0169)

Eight facilities discharge to the outfall:

- 4 wastewater or recycled water facilities
- 3 groundwater treatment facilities
- 1 industrial facility (potable water treatment)

Effluent quality is monitored at 11 different monitoring locations

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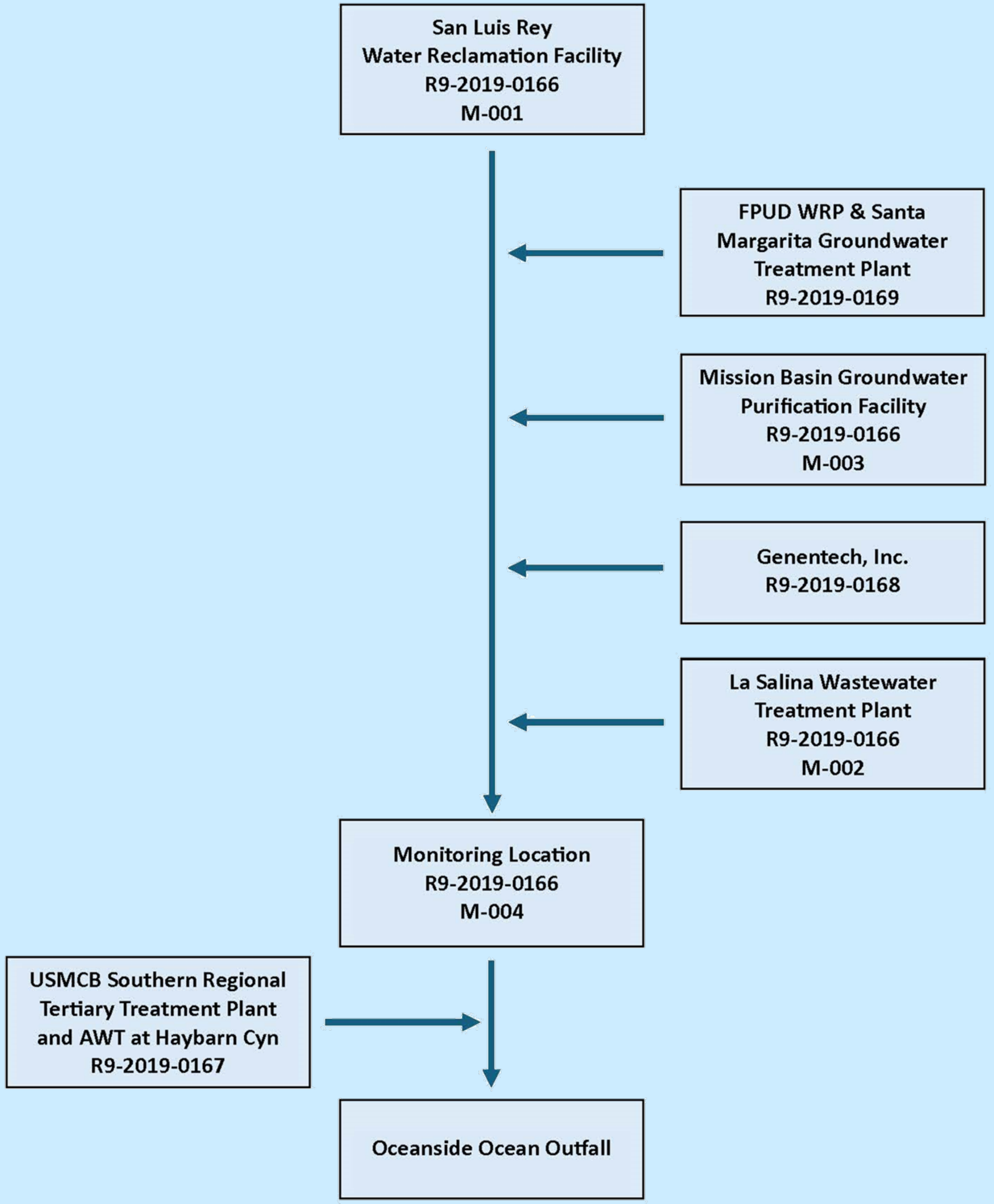
Facilities Discharging to the Oceanside Ocean Outfall

Discharger & RWQCB Order	Facility	Type of Facility	Type of Discharge	Permitted Flow (Ave month, mgd)	2023 Discharge Flow (mgd)
City of Oceanside R9-2019-0166	San Luis Rey Water Reclamation Plant	POTW	Secondary Effluent	13.5	6.84
	La Salina Wastewater Treatment Plant	POTW	Secondary Effluent	5.5	2.87
	Mission Basin Groundwater Purification Facility	Groundwater Treatment	Brine	2.0	0.55
Fallbrook Public Utility District R9-2019-0169	Fallbrook Water Reclamation Plant	POTW	Secondary Effluent	2.7 (May-Oct) 3.6 (Nov-Apr)	1.43
	Santa Margarita Groundwater Treatment Plant	Groundwater Treatment	Brine		
Genentech R9-2019-0168	Genentech Inc.	Industrial	Brine	0.155	0.05
U.S. Marine Corps Base Camp Pendleton R9-2019-0167	Southern Regional Tertiary Treatment Plant	POTW	Tertiary Recycled Water	3.6	2.67
	Advanced Water Treatment Plant at Haybarn Canyon	Groundwater Treatment	Brine		
Totals				41.5 / 28.355	14.21

Discharge Schematic & Monitoring Locations



Combined Discharges (Except from USMCB Camp Pendleton Facilities) are Monitored at M-004

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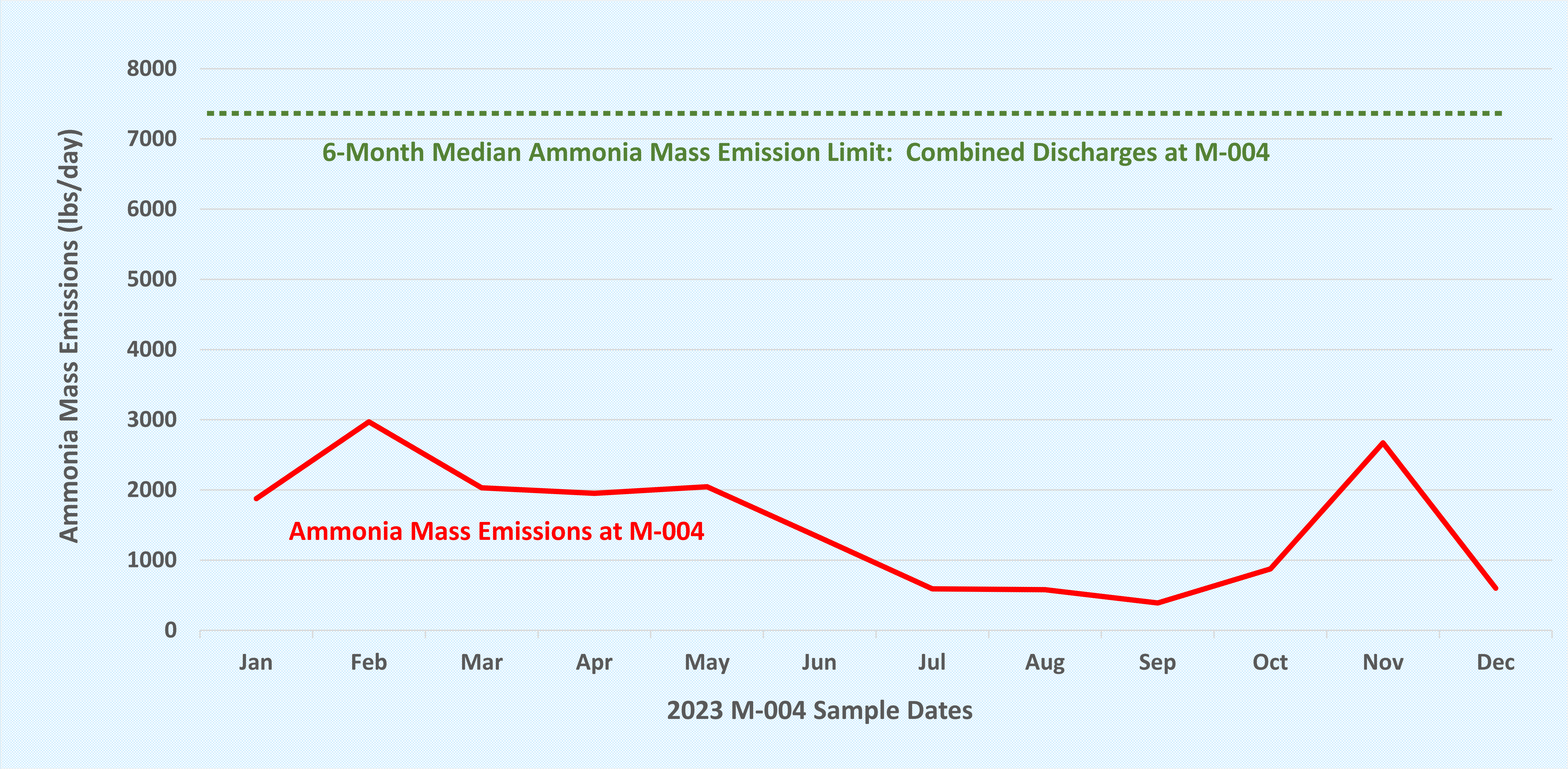
2. Treatment Performance and Effluent Compliance

OOO Effluent Quality – Physical/Chemical Parameters, 2023 Average Values

Parameter	Total Suspended Solids (mg/L)	CBOD (mg/L)	Settleable Solids (ml/L)	Grease & Oil (mg/L)	Turbidity (NTU)
San Luis Rey Water Reclamation Facility	5.6	3.7	< 0.1	0.5	2.7
La Salina Wastewater Treatment Plant	9.1	7.8	< 0.1	0.8	5.5
USMCB Southern Regional Tertiary Plant	< 1	< 3	< 0.1	< 0.5	< 3
FPUD Fallbrook Water Reclamation Plant	< 5	< 5	< 0.1	< 0.5	< 3
Monthly Average Limit	30	30	1.0	25	75
Weekly Average Limit	45	45	1.5	40	100

Ammonia Mass Emission are Significantly Below NPDES Limits



Toxic Inorganic Compounds Detected in the OOO Discharge at M-004 (Combined City of Oceanside discharges plus FPUD), 2023

Parameter	Concentration (µg/L)			
	Maximum Observed Daily 2023 Value: Combined Discharge at Monitoring Location M-004	NPDES Permit Performance Goal		
		Maximum Daily	Monthly Average	6-Month Median
Arsenic	1.0	**2,560**	No standard	**443**
Antimony	2.3	No standard	**106,000**	No standard
Chromium VI	0.9	**704**	No standard	**176**
Copper	16	**882**	No standard	**90**
Nickel	0.2	**4440**	No standard	**440**
Selenium	3.8	**5280**	No standard	**1320**
Silver	0.1	**232**	No standard	**47.7**
Zinc	28	**6340**	No standard	**1060**

Volatile Organic Compounds (VOCs) Detected in the OOO Discharge at M-004 (Combined City of Oceanside discharges plus FPUD), 2023

Parameter	Concentration (µg/L)			
	Maximum Observed Daily 2023 Value: Combined Discharge at Monitoring Location M-004	NPDES Permit Performance Goal		
		Maximum Daily	Monthly Average	6-Month Median
Bromoform	0.5	No standard	**11,400**	No standard
Chloroform	4.0	No standard	**11,400**	No standard
Chloromethane	0.2	No standard	**11,400**	No standard
Chlorodibromomethane	0.8	No standard	**11,400**	No standard
Dichlorobromomethane	0.8	No standard	**11,400**	No standard
Total halomethanes	0.7	No standard	**11,400**	No standard
Methylene chloride	0.2	No standard	**39,600**	No standard

Acid Extractable Compounds (Phenolics) Detected in the OOO Discharge at M-004 (Combined City of Oceanside discharges plus FPUD), 2023

Parameter	Concentration (µg/L)			
	Maximum Observed Daily 2023 Value: Combined Discharge at Monitoring Location M-004	NPDES Permit Performance Goal		
		Maximum Daily	Monthly Average	6-Month Median
4-chloro-3-methylphenol	1.8	**352**	No standard	**88**
2,4-Dimethylphenol	1.5	**10,600**	No standard	**2,640**
4,6-Dinitro-2-methylphenol	1.2	No standard	**19,400**	No standard
2-Nitrophenol	1.2	**10,600**	No standard	**2,640**
Pentachlorophenol	1.6	**352**	No standard	**88**
Phenols, Non-chlorinated	3.9	**10,600**	No standard	**2,640**
Phenols, Chlorinated	1.8	**352**	No standard	**88**

Base Neutral Compounds and Pesticides/PCBs Detected in the OOO Discharge at M-004 (Combined City of Oceanside discharges plus FPUD), 2023

Parameter	Concentration (µg/L)			
	Maximum Observed Daily 2023 Value: Combined Discharge at Monitoring Location M-004	NPDES Permit Performance Goal		
		Maximum Daily	Monthly Average	6-Month Median
Base Neutral Compounds				
Bis (2-ethylhexyl) phthalate	1.3	No standard	308	No standard
Pesticides and PCBs				
None Detected	None Detected	Not Applicable	Not Applicable	Not Applicable

“Whole Effluent Toxicity” (WET) Testing

- Multi-day toxicity tests are conducted to identify any adverse effects of the combined discharges (Monitoring Location M-004) on living organisms
- WET tests evaluate effects on organism health, growth and reproduction
- WET tests are a “catch all” that can identify any adverse effects due to:
    - Known, regulated and monitored compounds
    - Unknown, unregulated or unmonitored compounds
    - Aggregate, combined, synergistic or antagonistic effects from multiple pollutants

“Whole Effluent Toxicity” (WET) Testing

- Periodic screening is performed to identify the most sensitive species
- Tests implement the “Test of Significant Toxicity” (TST) methodology based on the principle that effluent is “toxic” unless proven through conservative statistical methodology to be non-toxic
- Test results are expressed in terms of “Pass” or “Fail”

100% of the Effluent Toxicity Samples during 2020-2024 at M-004 Pass TST Statistical Testing to Demonstrate No Toxicity

Test Species	Test Endpoint	Number of Whole Effluent Toxicity (WET) Tests, Combined Discharge at Monitoring Location M-004 2020-2024	Percent of Tests that Achieve "Pass"
Macrocystis pyrifera (giant kelp)	Germination	6	100 %
	Tube Length Growth	6	100 %
Atherinops affinis (Pacific topsmelt)	Growth	24	100 %
	Survival	24	100 %
Strongylocentrotus purpuratus (purple sea urchin)	Fertilization	6	100 %

Key Monitoring Questions

Treatment Performance and Effluent Quality

1. Are discharge limits and performance goals being met?

   Yes.

2. Is the discharge changing over time?

   Discharge quality is better and discharge flows are lower.

3. Are treatment facilities being properly operated?

   Yes.

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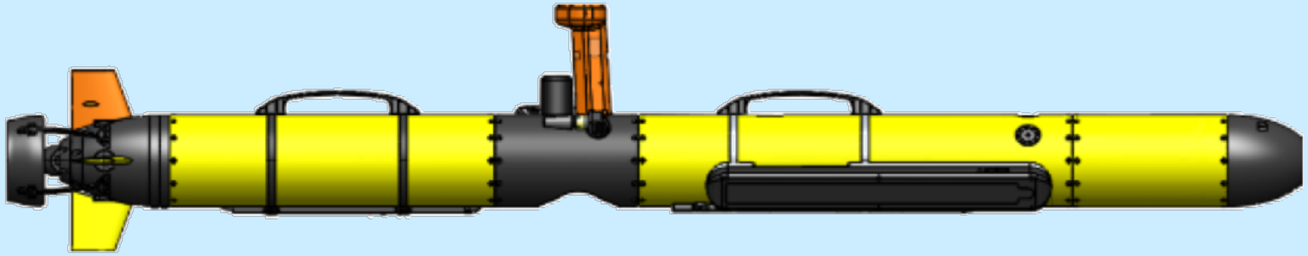
3. Plume Tracking Study

Study Objective: Assess the Fate of Discharged Water

- Use of fDOM (fluorescent dissolved organic matter) as a tracer
- fDOM sensors mounted on an Autonomous Underwater Vehicle (AUV)
- AUV deployments assess typical and atypical conditions under both flow and ebb tidal cycles
- Supplemental boat-based ocean monitoring is conducted to support AUV deployments



AUV = Autonomous Underwater Vehicle

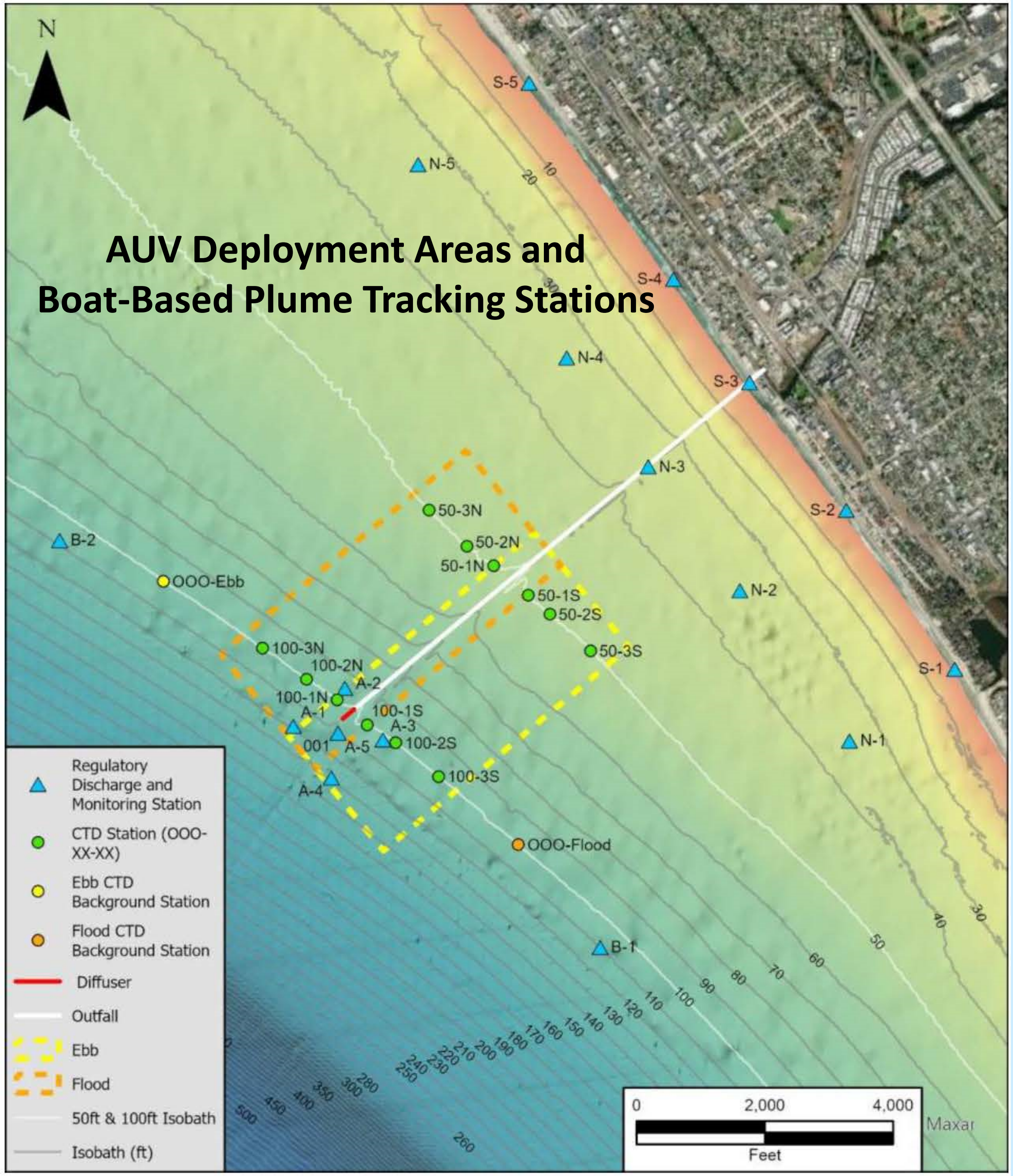
Boat-Based Plume Tracking Tools

CTD = Conductivity, Temperature, Depth Sensor

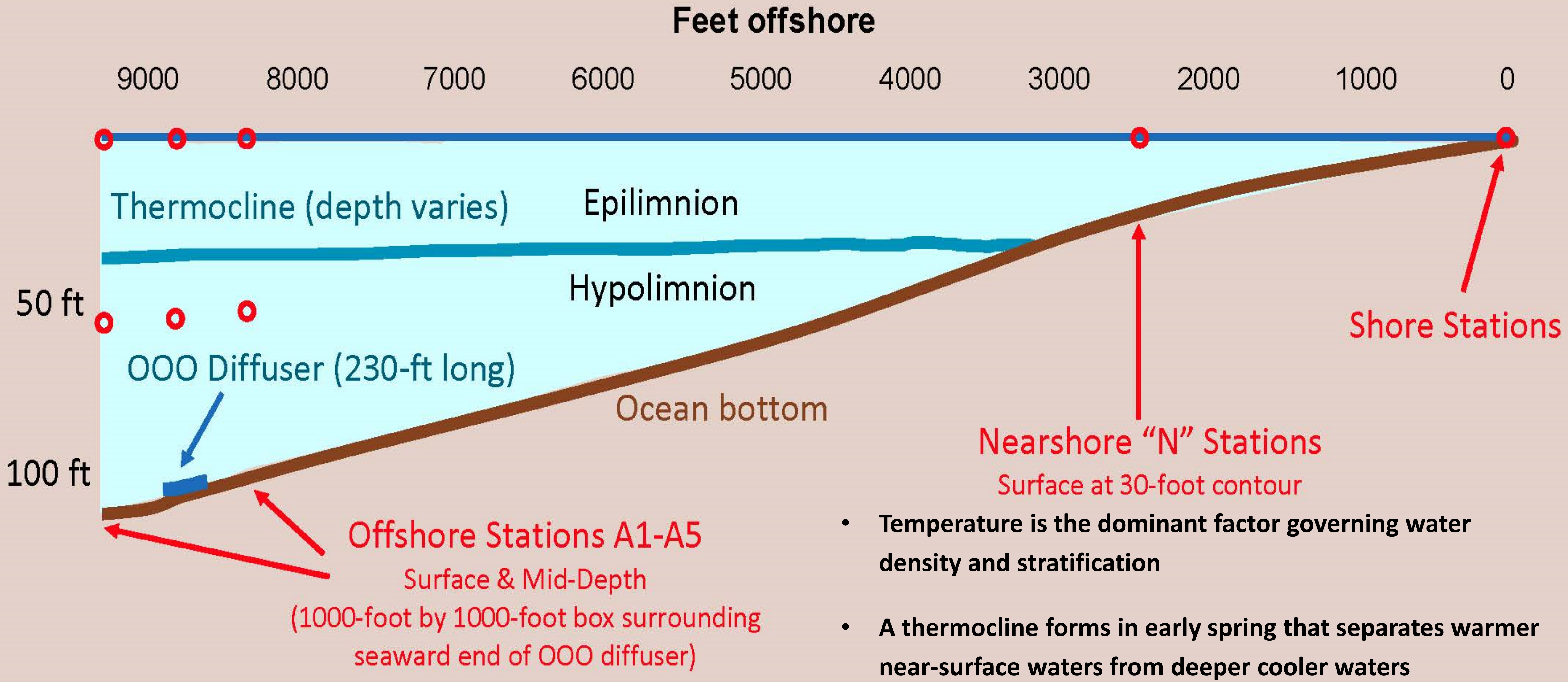
ADCP = Acoustic Doppler Current Profiler

Plume Tracking Challenges

- Receiving water fDOM concentrations are not homogeneous and can vary significantly with oceanographic conditions
- The OOO discharge is comprised of clear water with low levels of solids and low turbidity
- The OOO achieves high degree of dilution
- After initial dilution, fDOM concentrations in the diluted discharge can be similar to receiving water fDOM concentrations
- “Signal to Noise” analysis is used to make sense of collected fDOM data



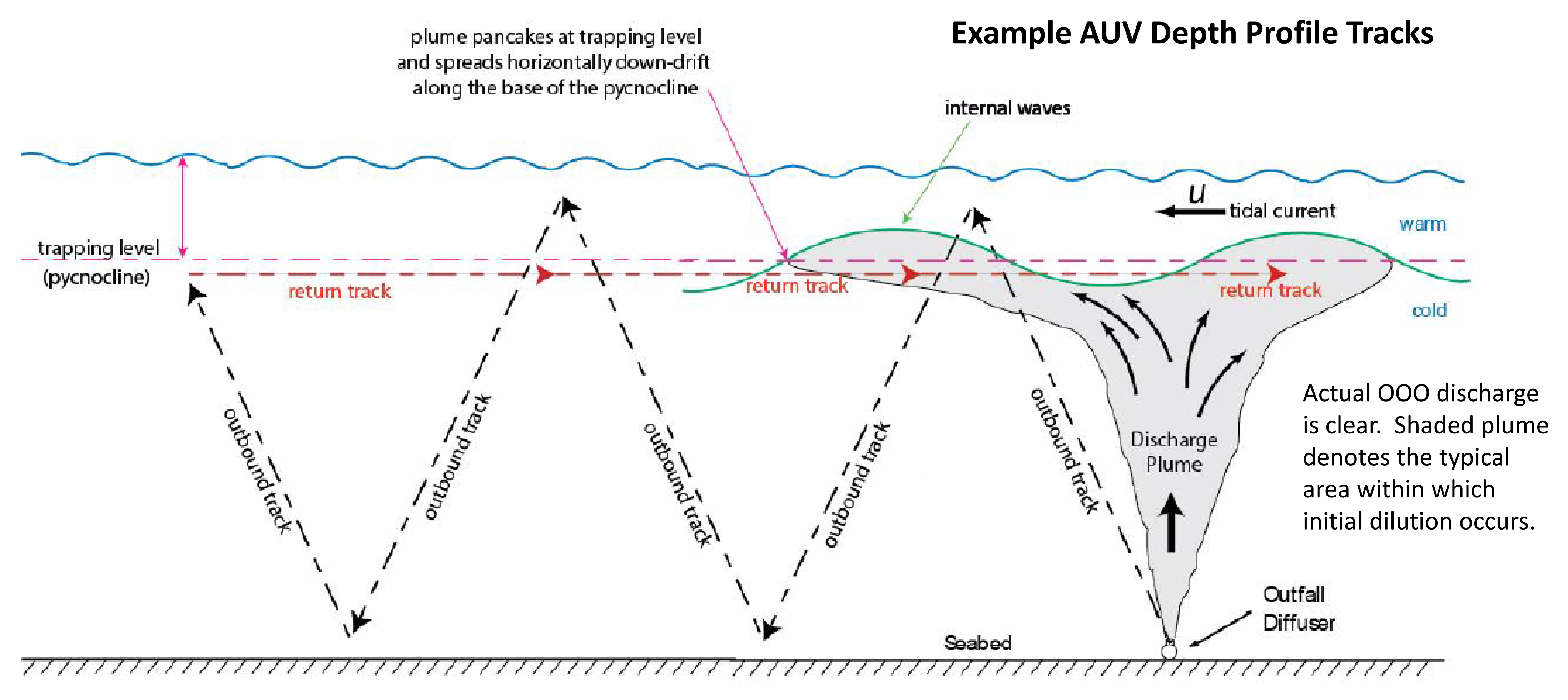
AUV Tracks are Programmed to Address Ocean Stratification Conditions

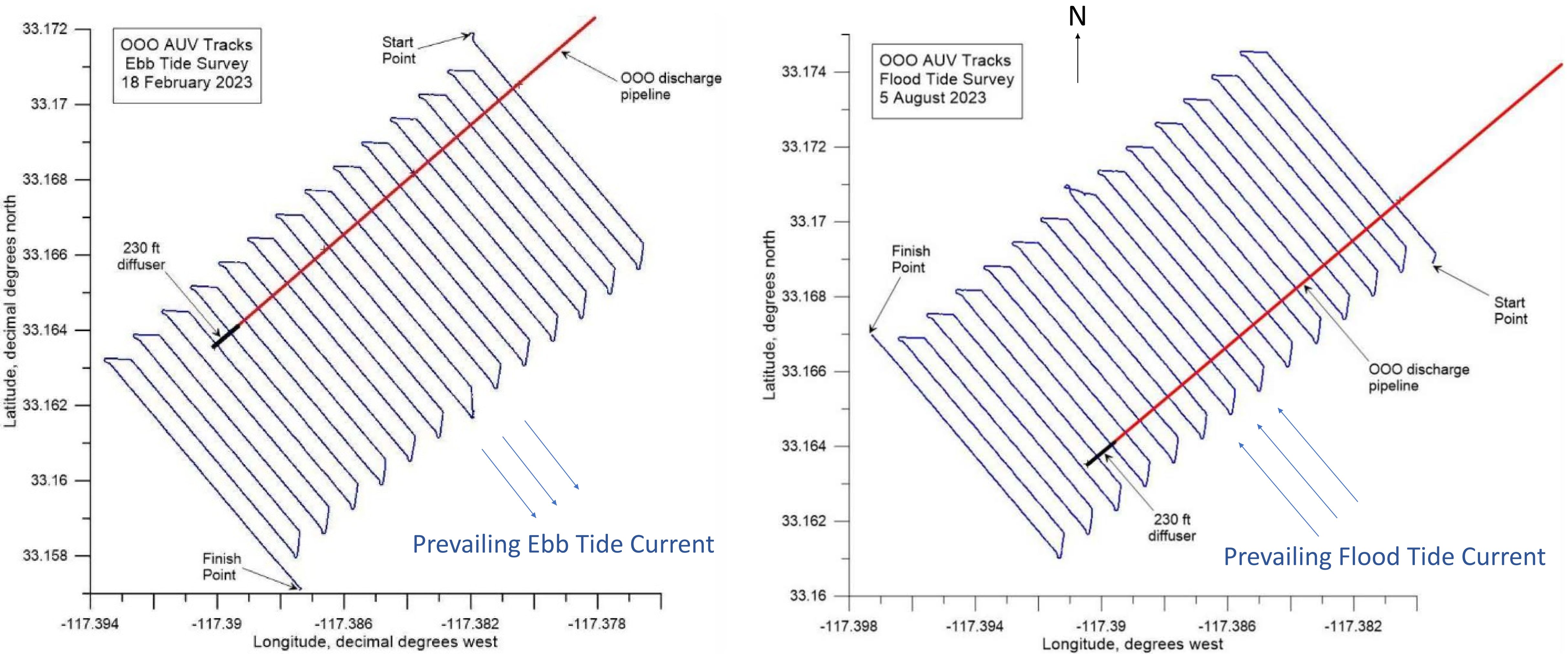


- **Temperature is the dominant factor governing water density and stratification**
- **A thermocline forms in early spring that separates warmer near-surface waters from deeper cooler waters**

Three Monitoring Events Were Selected with Input from RWQCB:

- January 2023: Typical winter conditions, minimum stratification
- February 2023: Atypical conditions, post-storm, high discharge flows and runoff
- August 2022: Typical autumn conditions, maximum stratification





Plan View of Typical AUV Tracks – Ebb and Flood Tides

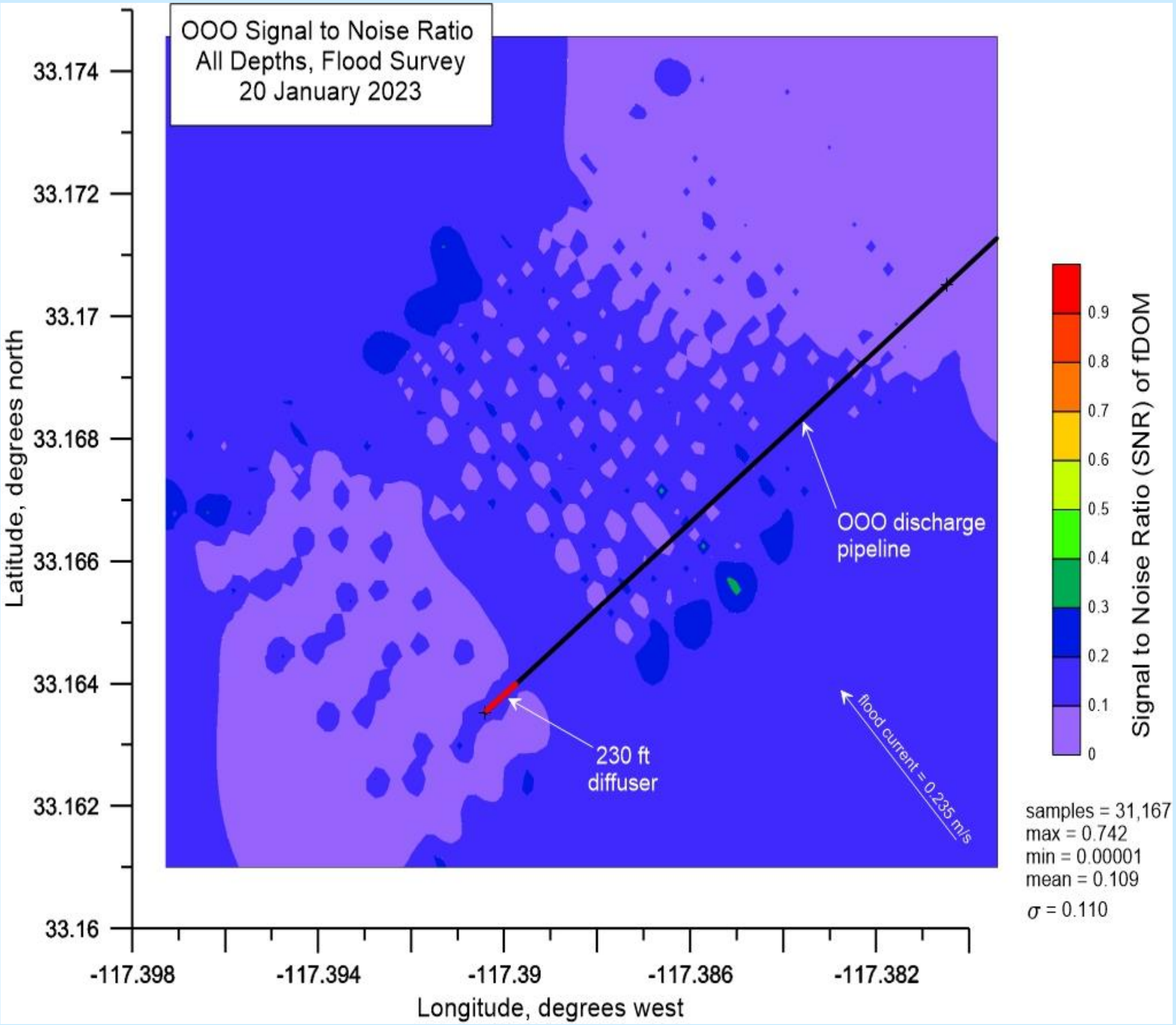
January 20, 2023 AUV Survey

Typical Winter Unstratified Conditions

- Post-storm conditions – high winds
- Minimal temperature vs. depth differences
- Well mixed depth-profile
- Minimal stratification and high initial dilution
- Extremely low concentrations of fDOM in the OOO discharge

fDOM Signal to Noise Ratio
January 20, 2023

No Spatially Coherent fDOM Patterns
OOO Discharge Plume is too Dilute and Dispersed to be Observed

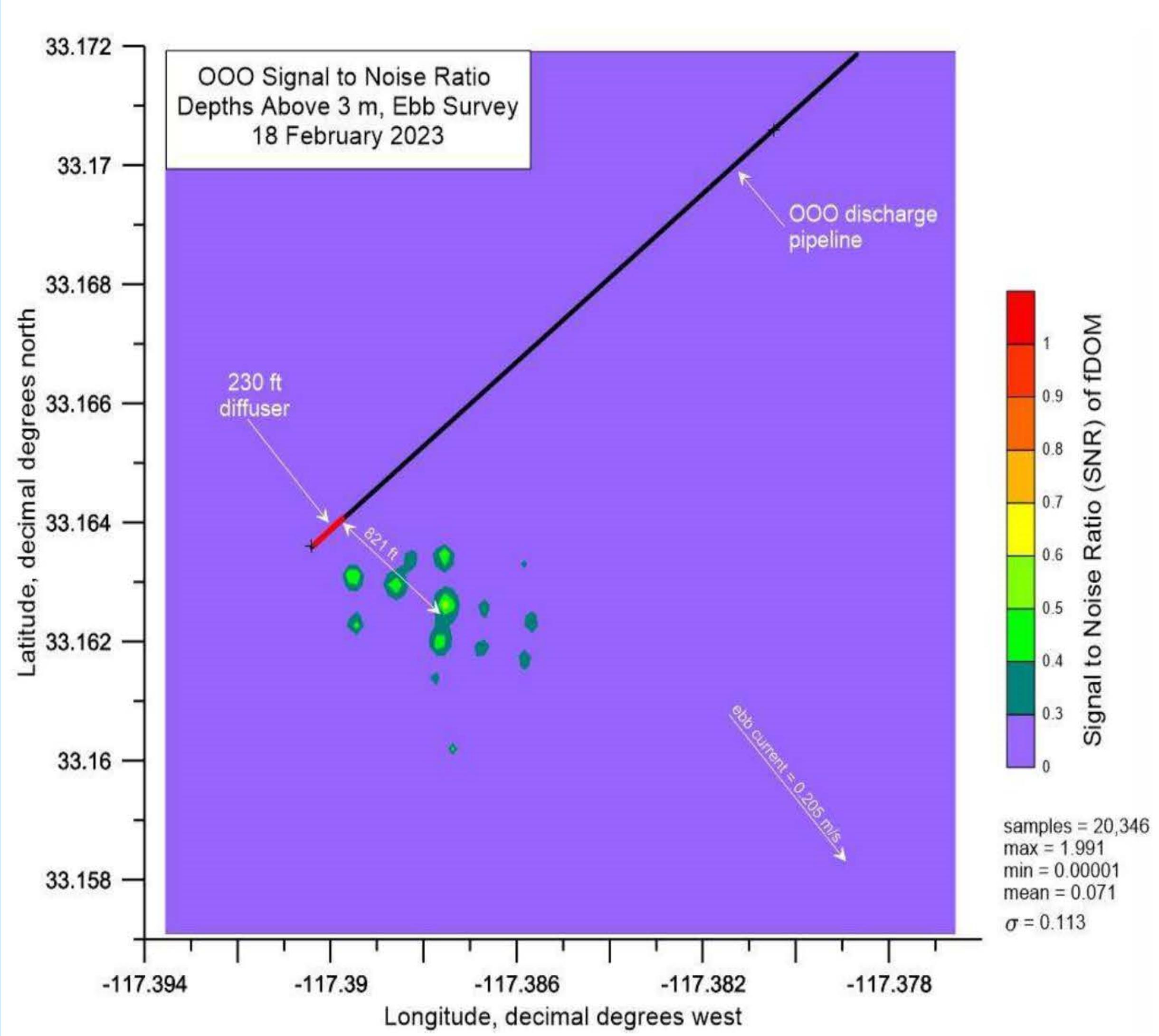


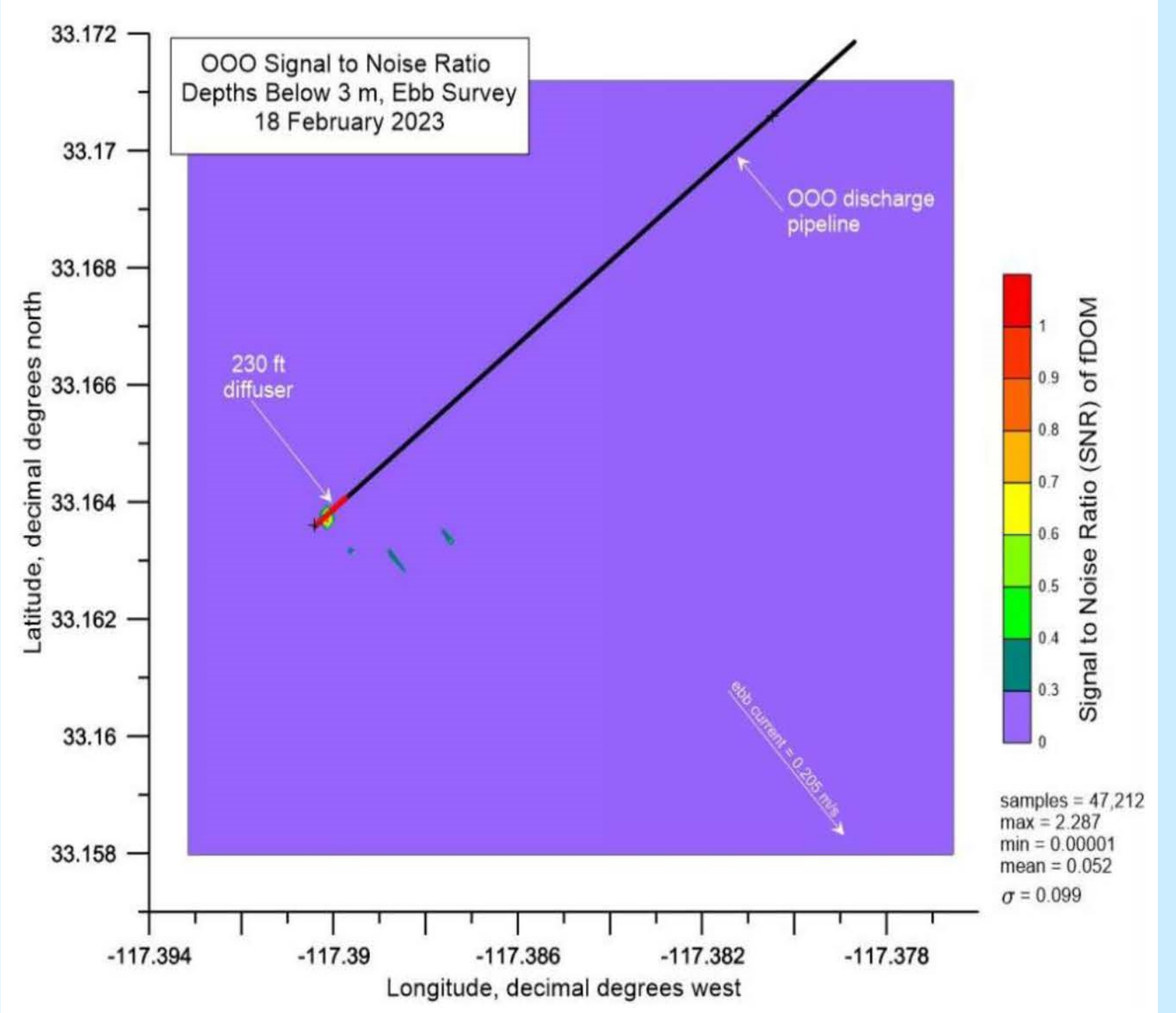
February 18, 2023 AUV Survey

Typical Winter Unstratified Conditions following Heavy Rainfall

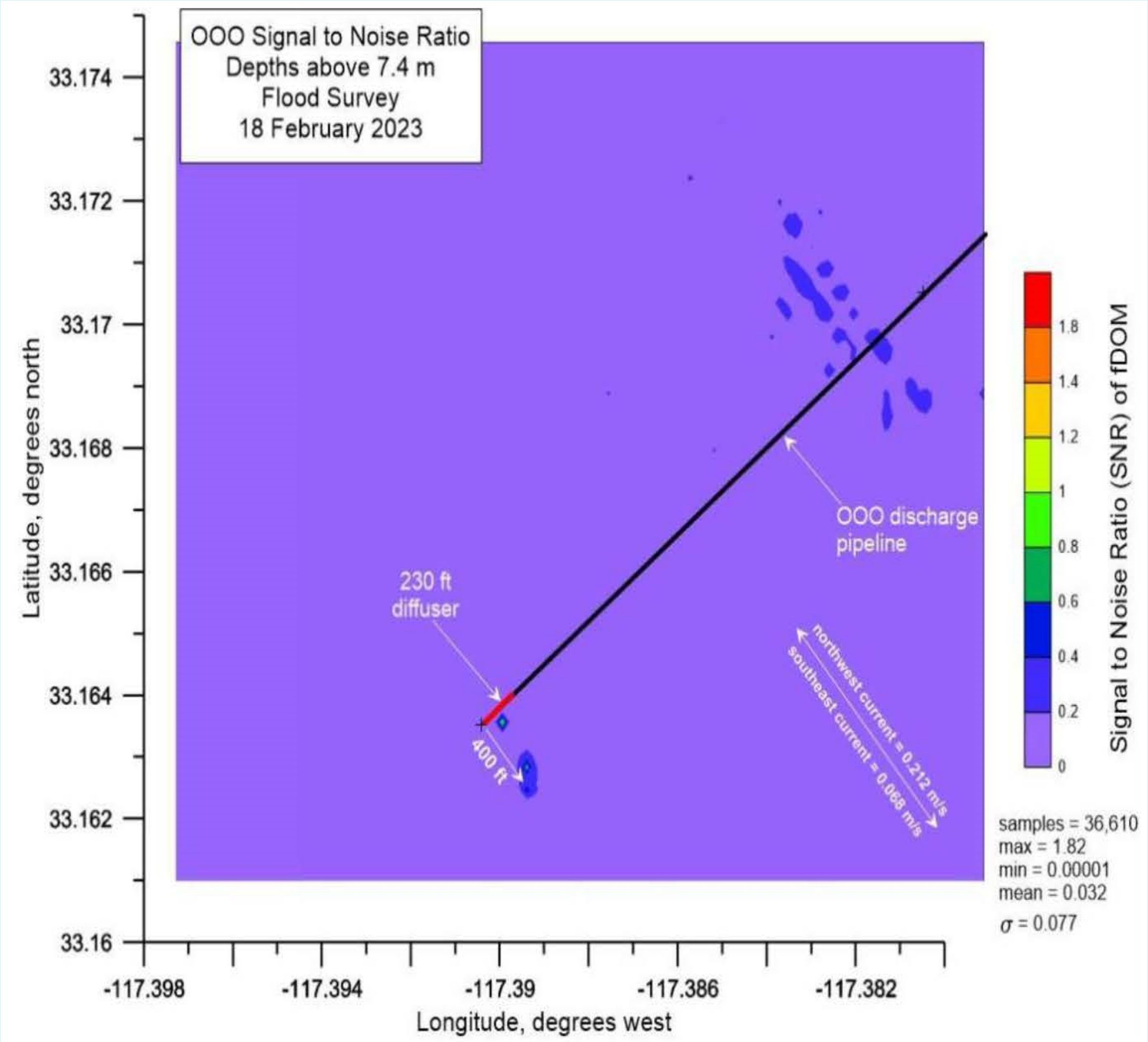
- Conditions following heavy storms
- Minimal temperature vs. depth differences
- Well-mixed depth profile
- Minimal stratification and high initial dilution
- High concentrations of fDOM in the OOO discharge

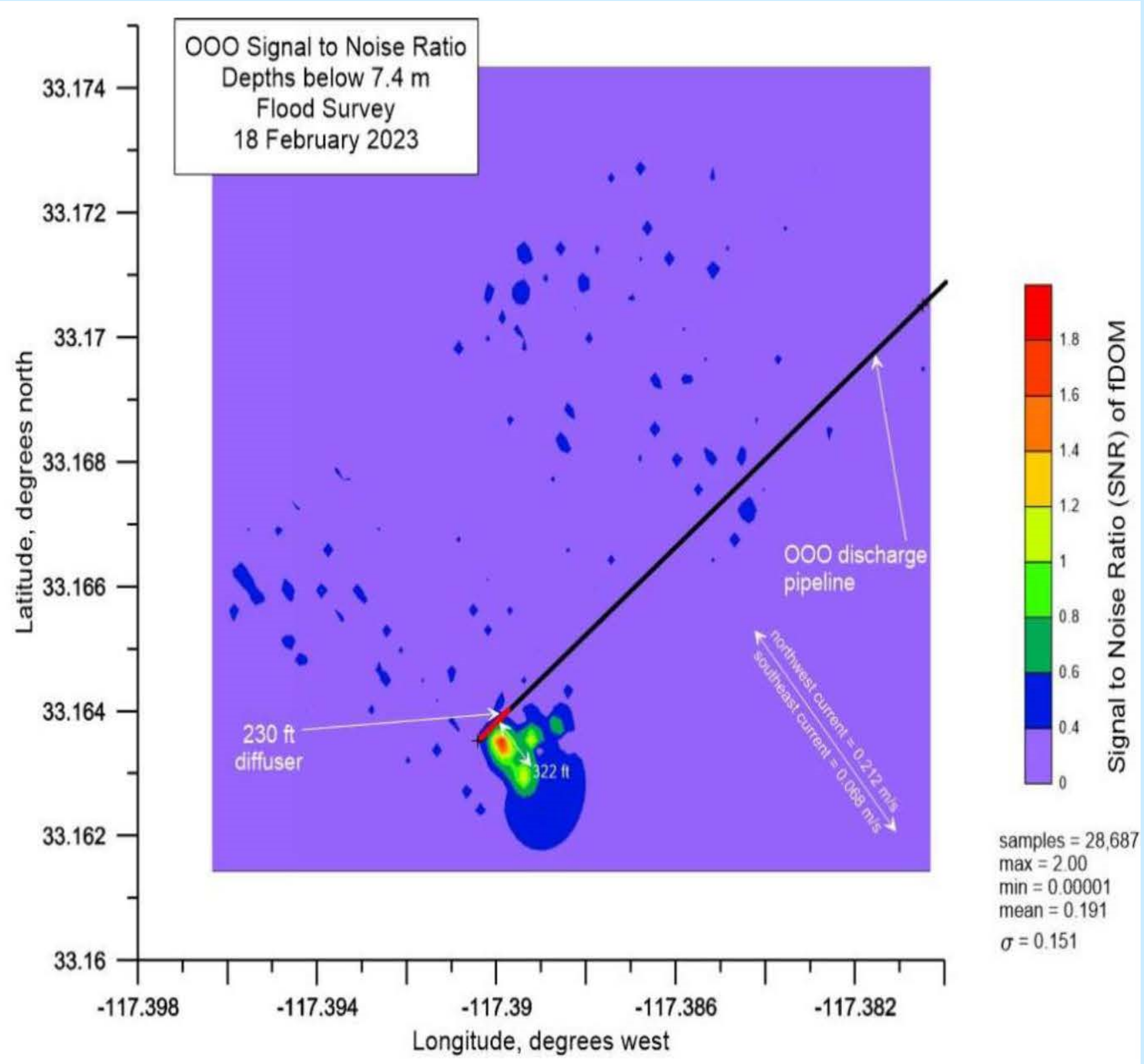
fDOM Signal to Noise Ratio:
Ebb Tide Conditions
February 18, 2023





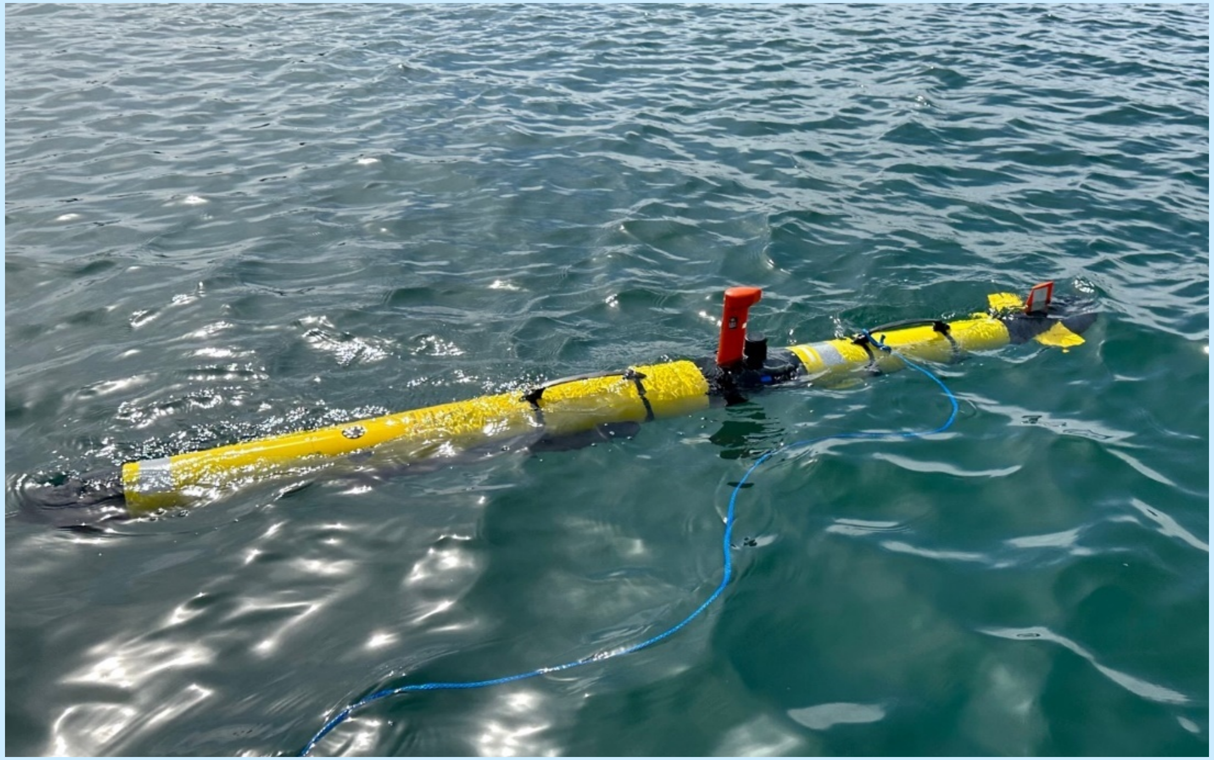
fDOM Signal to Noise Ratio:
Flood Tide Conditions
February 18, 2023



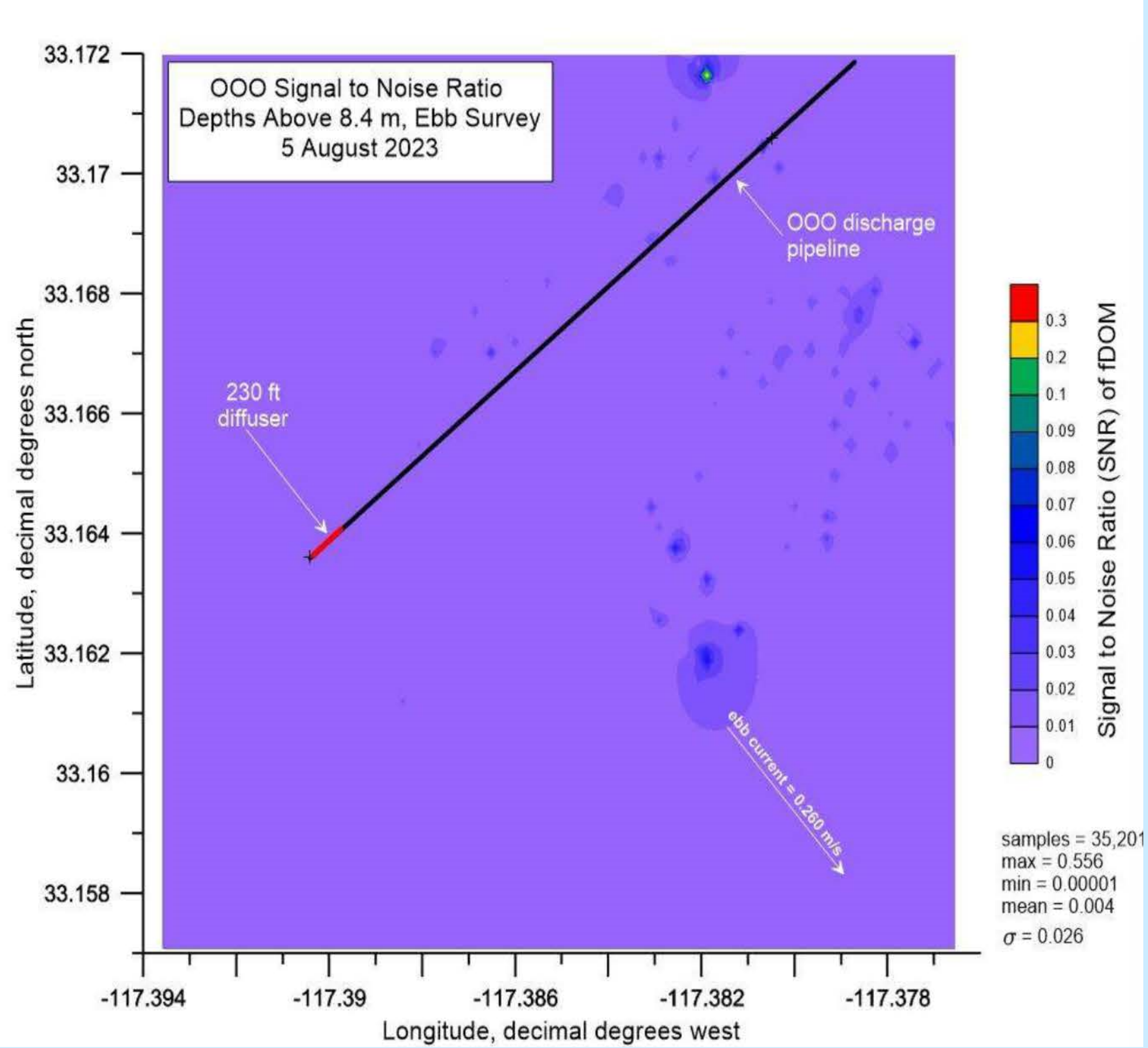


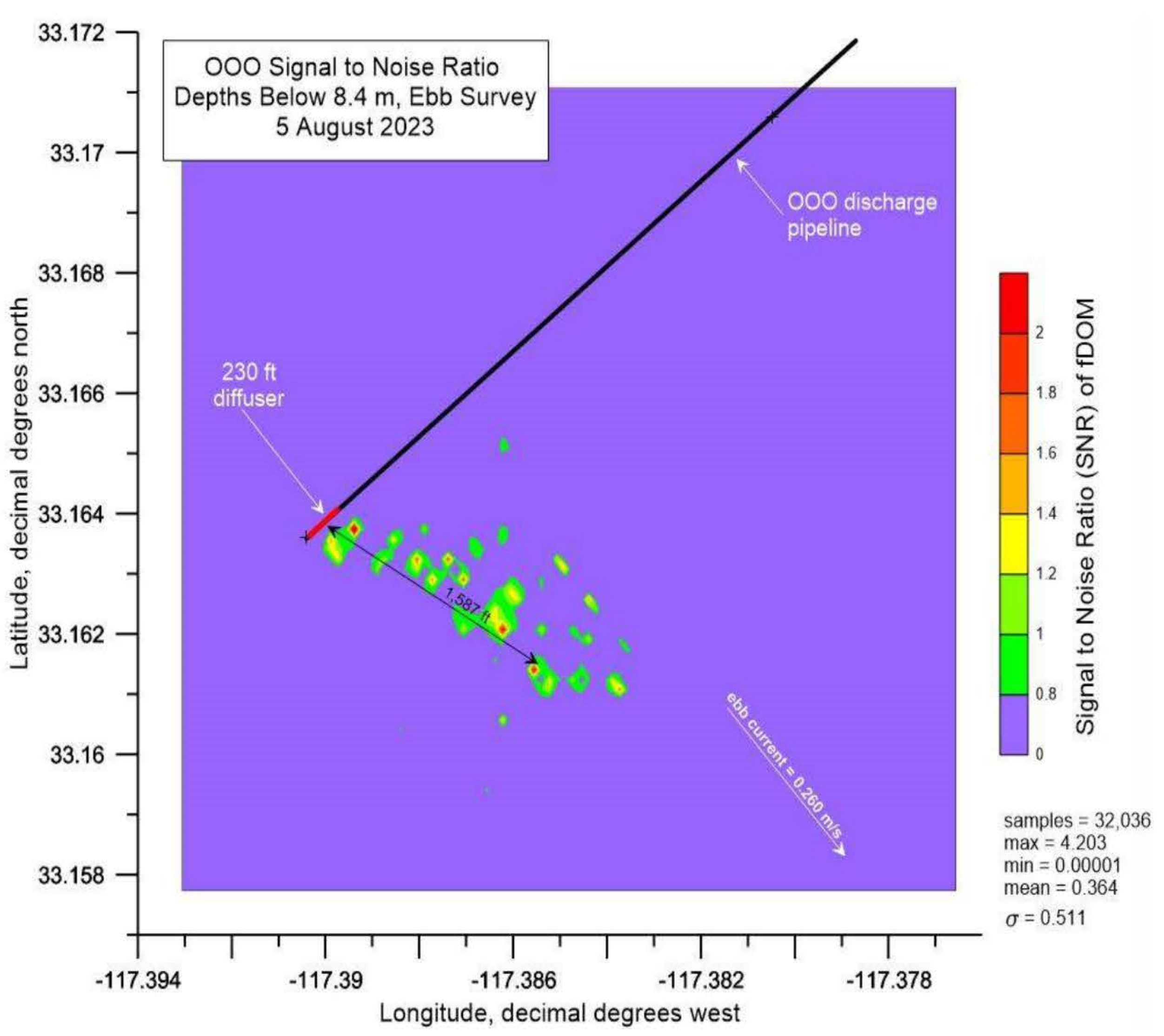
August 5, 2023 AUV Survey
Typical Fall Conditions of Maximum Stratification

- Typical maximum stratification conditions
- Strongest annual thermocline trapping and lowest dilution conditions
- Moderate concentrations of fDOM in the OOO discharge

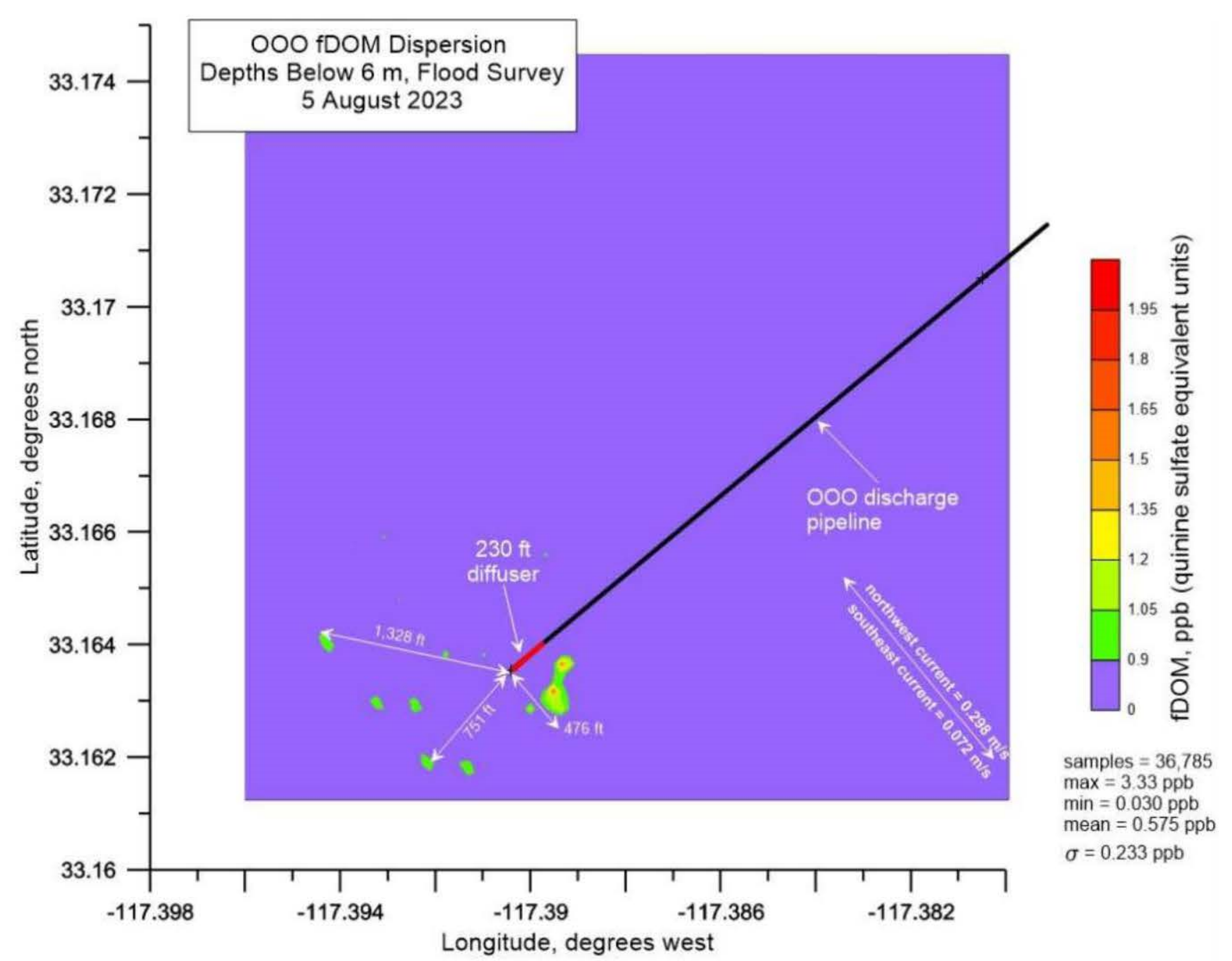


fDOM Signal to Noise Ratio: Ebb Tide Conditions August 5, 2023





fDOM Signal to Noise Ratio:
Flood Tide Conditions
Below 6 meters (20 feet)
August 5, 2023



Key Monitoring Questions
Plume Tracking Study

1. What direction does discharged water go?
   - Discharged water flows with prevailing ebb and flood tide ocean currents parallel to the coast - not onshore or offshore.

2. How quickly is the outfall discharge diluted?
   - Despite the relatively short diffuser, the OOO discharge is efficiently and quickly diluted.
   - A discharge "plume" *per se* does not exist, as the OOO discharge is rapidly broken into fragments by short-term current oscillations, and the fragments are quickly dispersed over a large area.

Key Monitoring Questions
Plume Tracking Study

3. How much dilution occurs?
   - Dilution is consistently better than the 97:1 dilution factor assigned by the RWQCB and frequently is better than 1000:1.

4. Where is the discharge indistinguishable from ambient ocean waters?
   - Under typical conditions, the OOO discharge can become indistinguishable from ambient ocean waters immediately after discharge. Under worst observed conditions, the discharge becomes indistinguishable from ambient water prior before travelling approximately 1600 feet beyond the Zone of Initial Dilution (ZID).

Key Monitoring Questions
Plume Tracking Study

5. Are the existing receiving water monitoring stations adequate?
   - The existing receiving water monitoring stations are adequate.
   - The more remote stations can be eliminated.
6. Does the plume tracking work tell us anything we didn't already know?
   - The plume tracking results confirm our long-standing understanding of the outfall discharge, but emphasize the rapidity at which the discharge is fragmented into small remnants.

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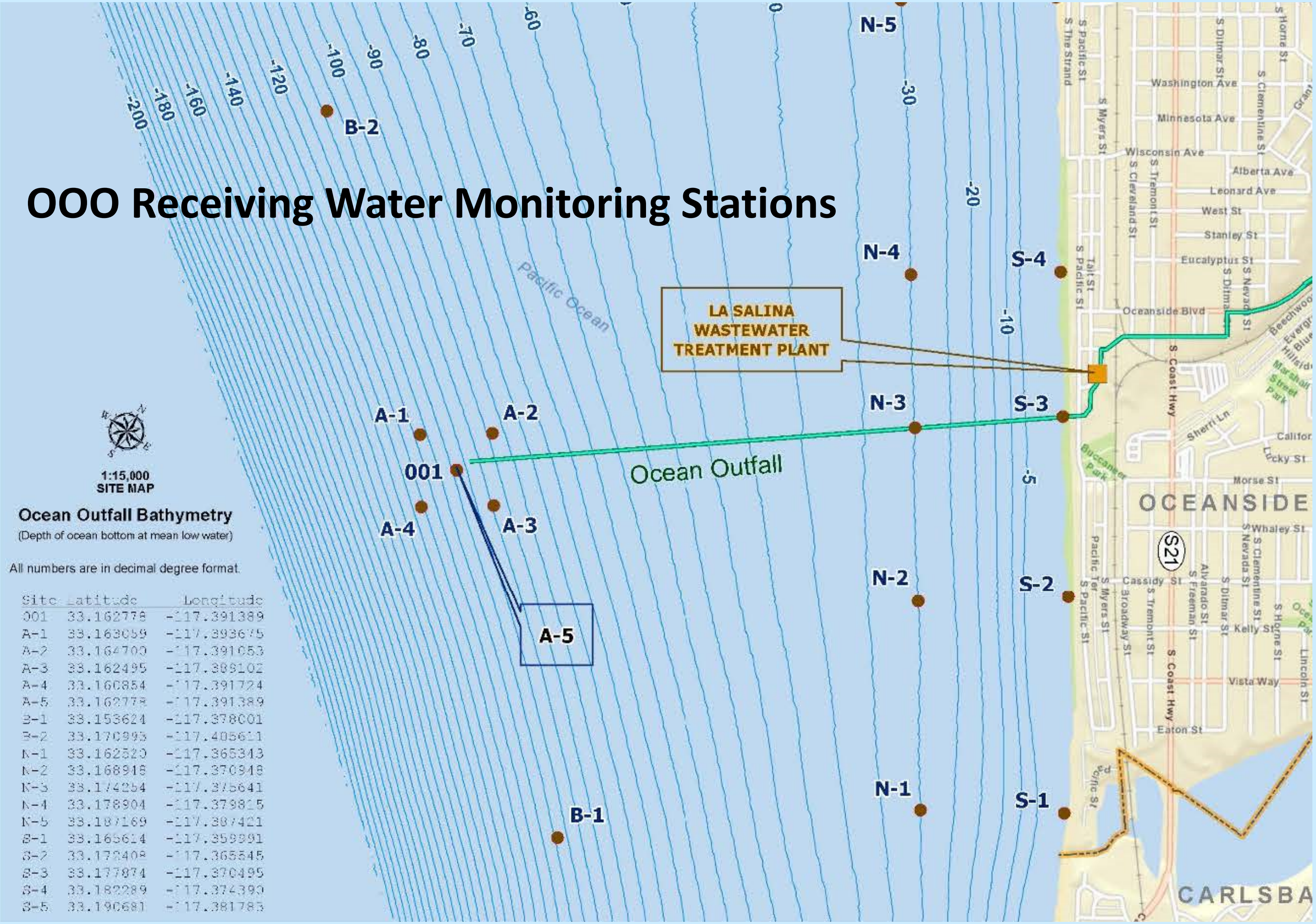
4. RECEIVING WATER QUALITY

OOO Receiving Water Monitoring Locations:

- **Offshore “A” Stations (95 - 105-ft depth)**
- **Offshore “B” Stations (100-ft depth)**
- **Nearshore “N” Stations (30-ft depth)**
- **Shore “S” Stations (shoreline)**

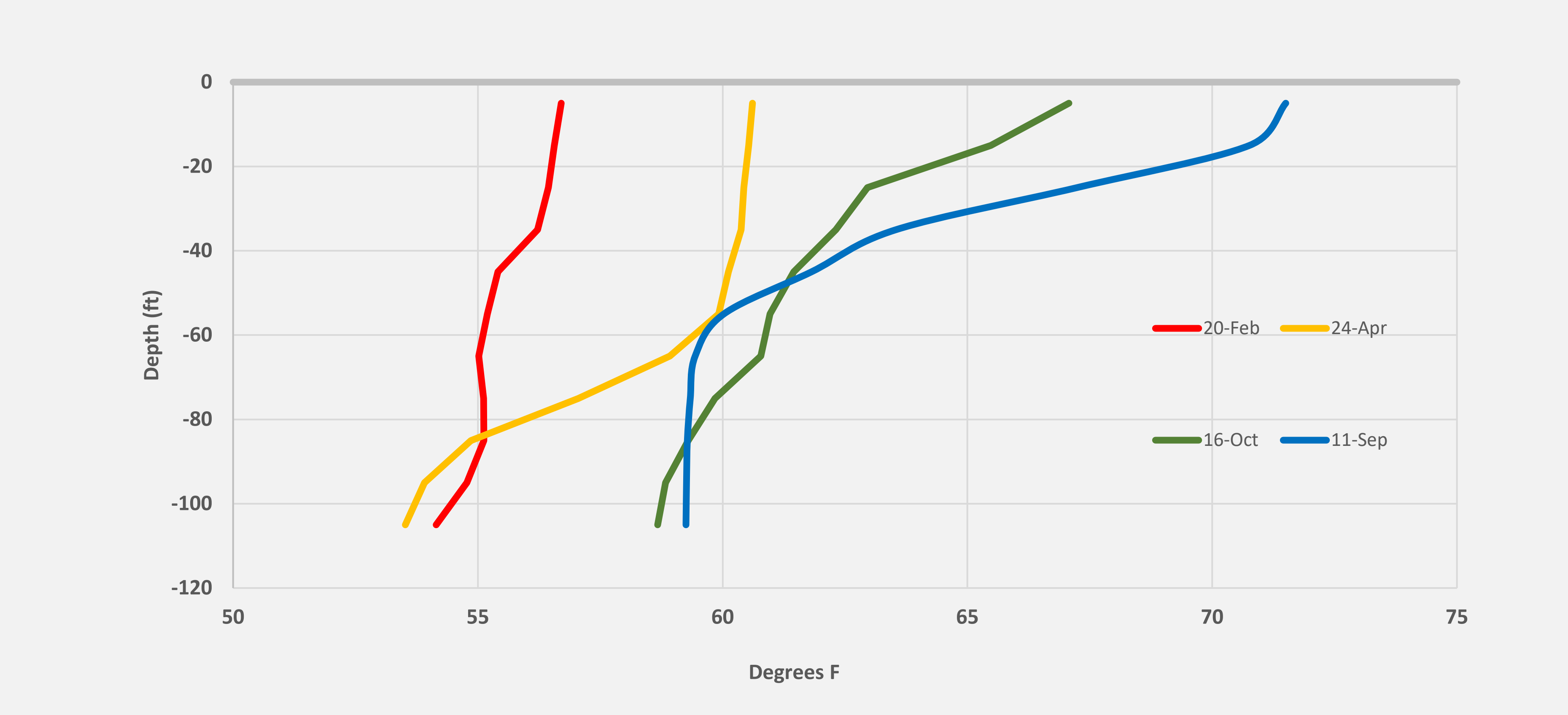


Receiving Water Quality

Nearshore and Offshore Receiving Water Monitoring Conducted by the City of Oceanside

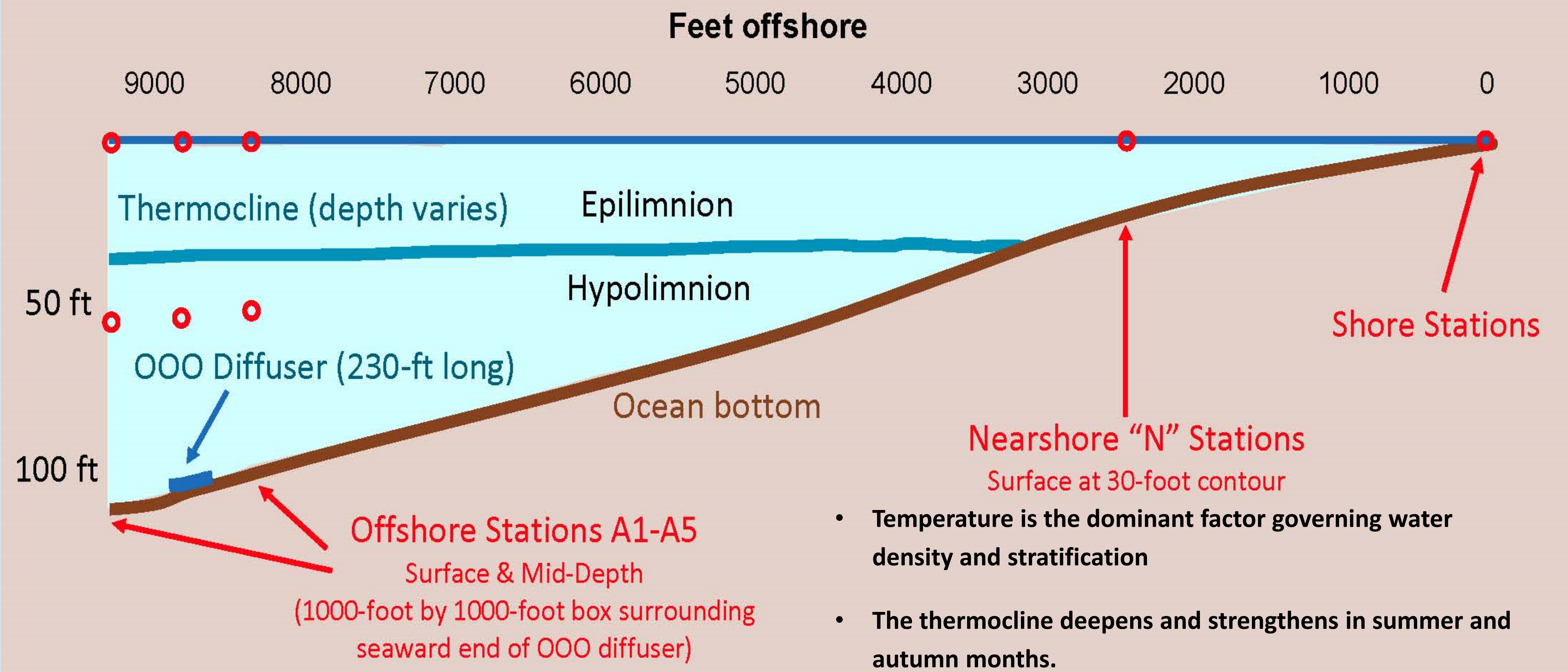
Category	Receiving Water Monitoring	Depth
Physical Parameters	• Visual Observations	Surface Conditions
	• Temperature • Dissolved Oxygen • Light Transmittance • pH • Salinity	Continuous Depth Profile
Bacteriological Parameters	• Total Coliform • Fecal Coliform • Enterococcus • HF 183 Human DNA Marker	Surface and Mid-Depth

Monitoring of Physical Parameters



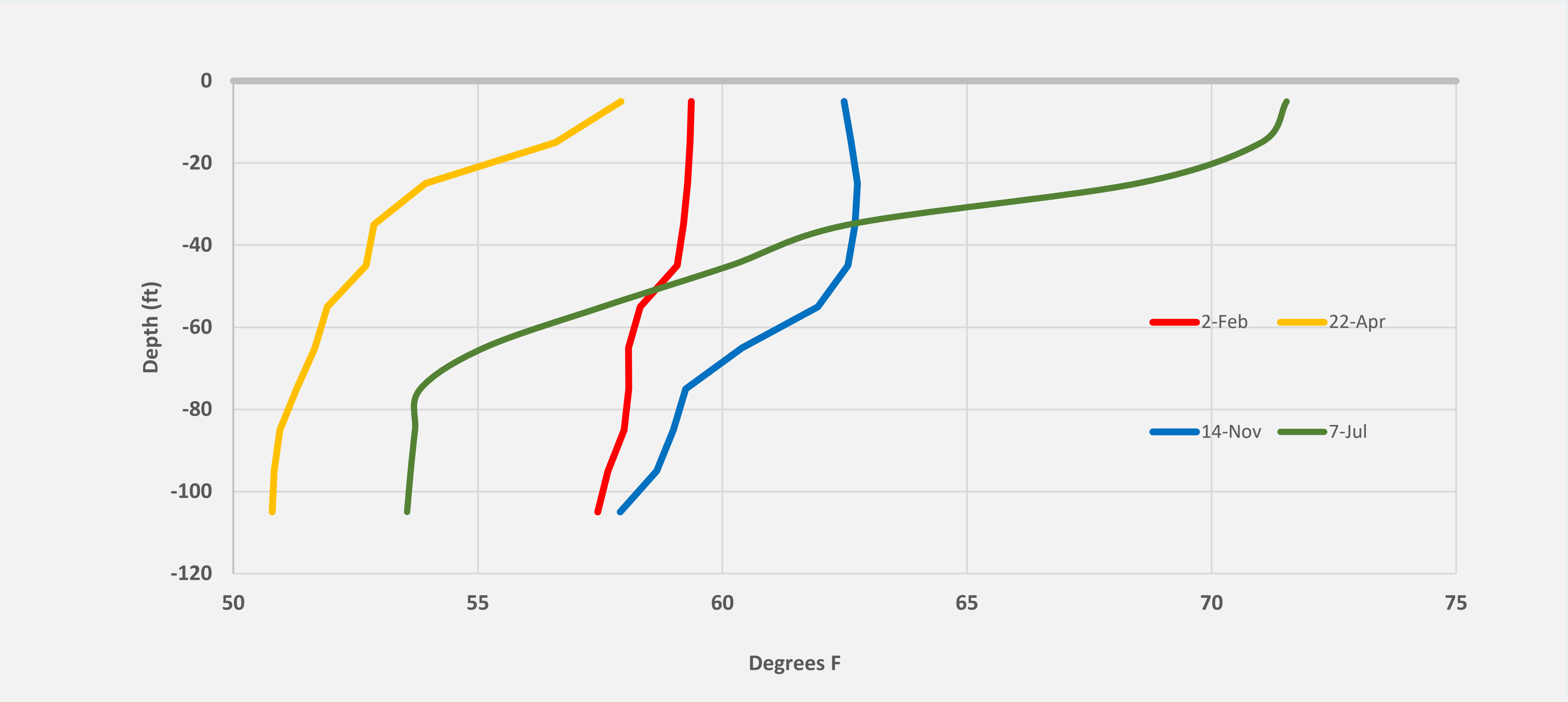
Temperature vs. Depth
Station A-5, 2023

A thermocline (pycnocline) forms in early spring that separates warmer near-surface waters from deeper cooler waters



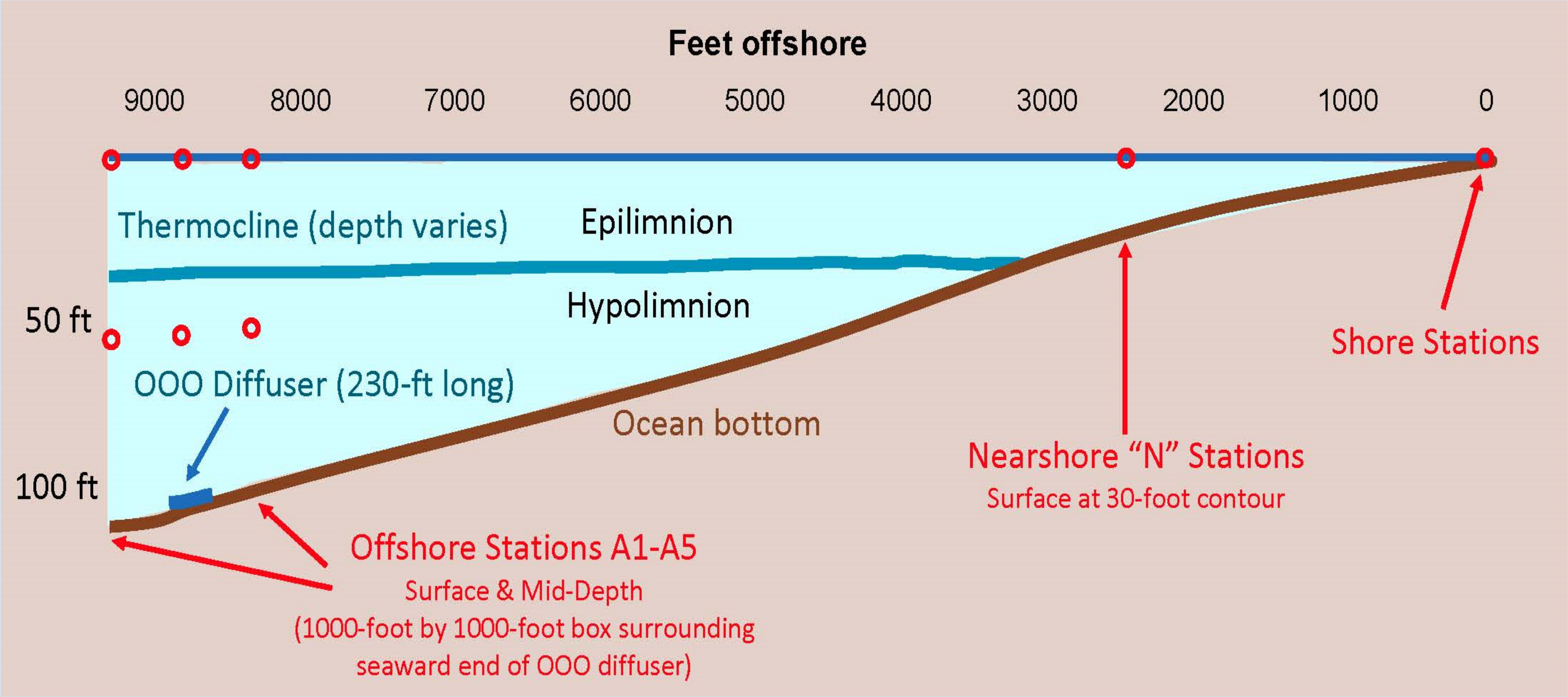
- **Temperature is the dominant factor governing water density and stratification**
- **The thermocline deepens and strengthens in summer and autumn months.**

2022 Upwelling Event

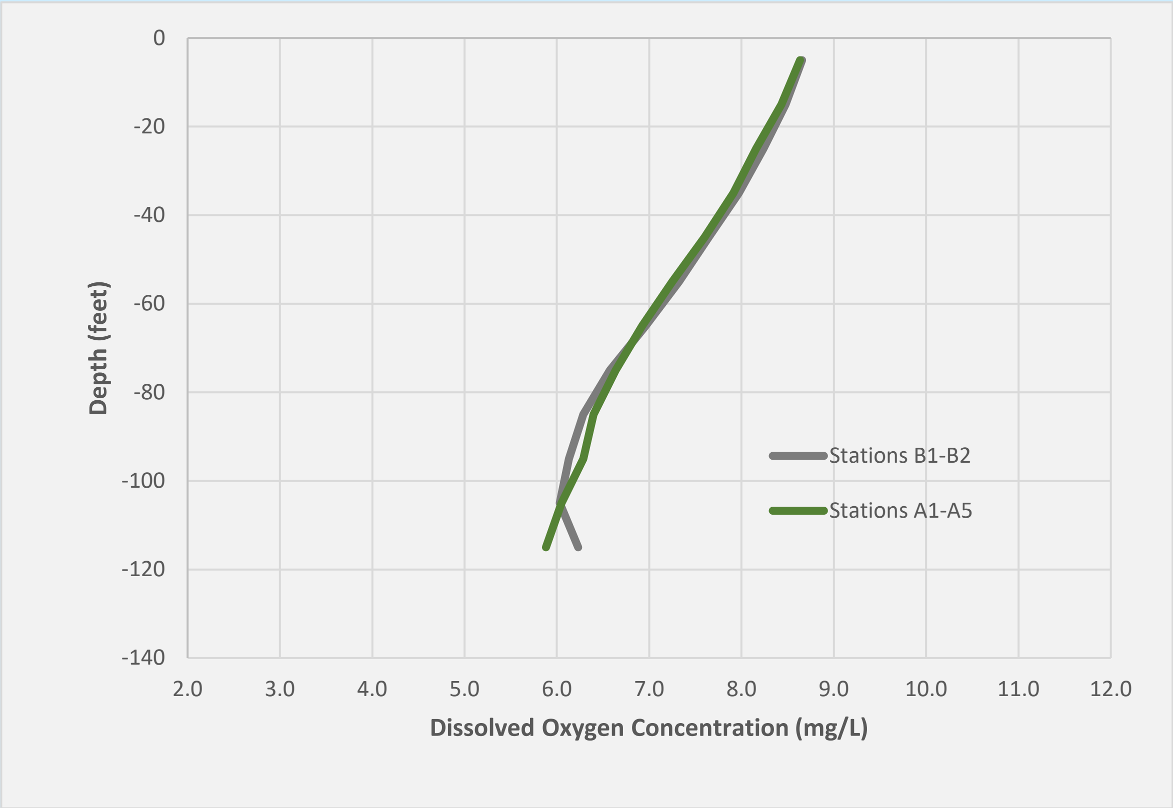


Temperature vs. Depth
Station A-5, 2022
(Showing April 2022 upwelling event)

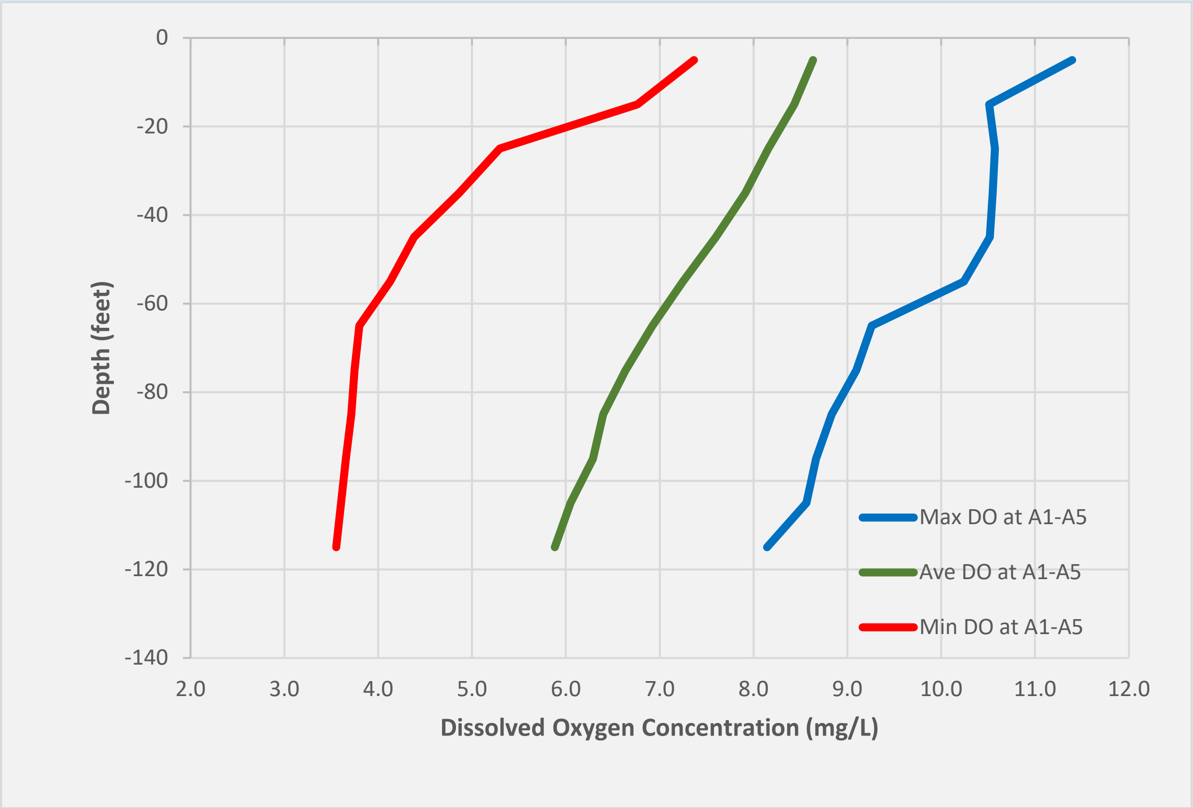
The thermocline (pycnocline) can limit dissolved oxygen transfer to deeper waters for much of the year



Dissolved Oxygen Values in Deeper Waters Consistently Remain High Despite the Presence of the Thermocline

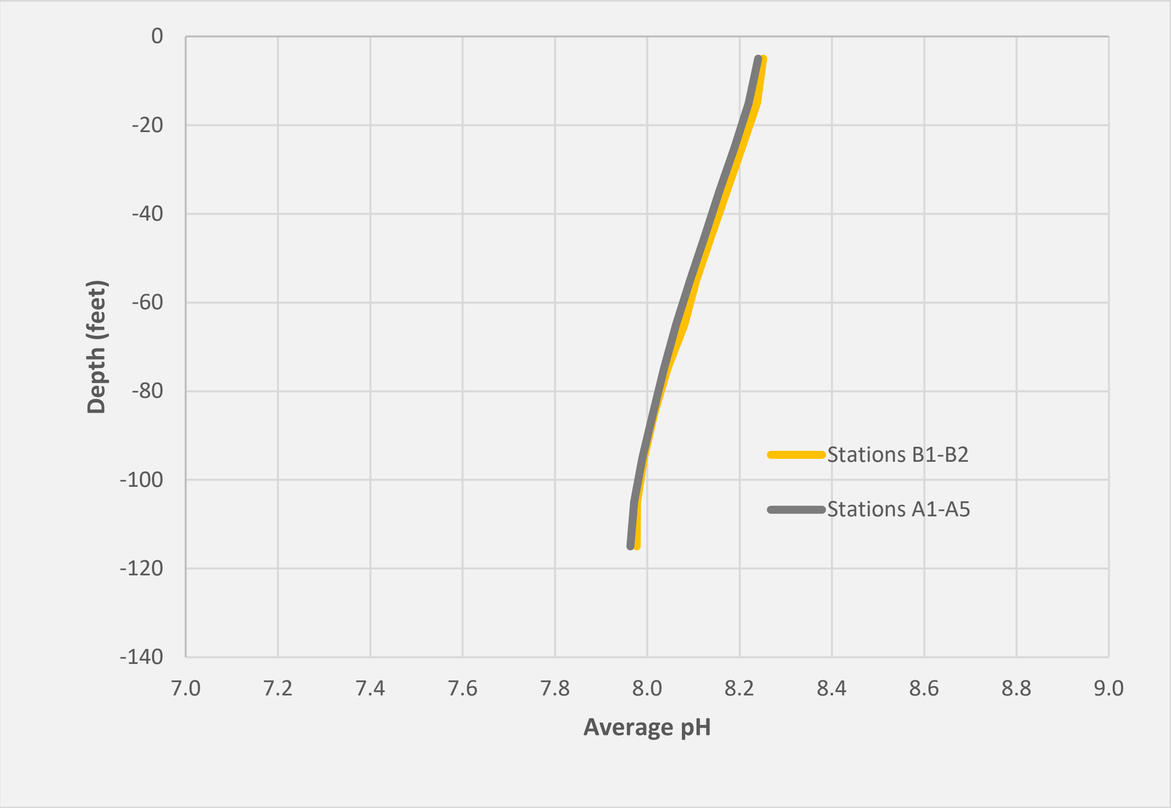


Comparison of DO at Outfall and Reference Stations, 2021-2024



Minimum, Average and Maximum DO, 2021-2024

The OOO Achieves 100% Compliance with Receiving Water pH Standards



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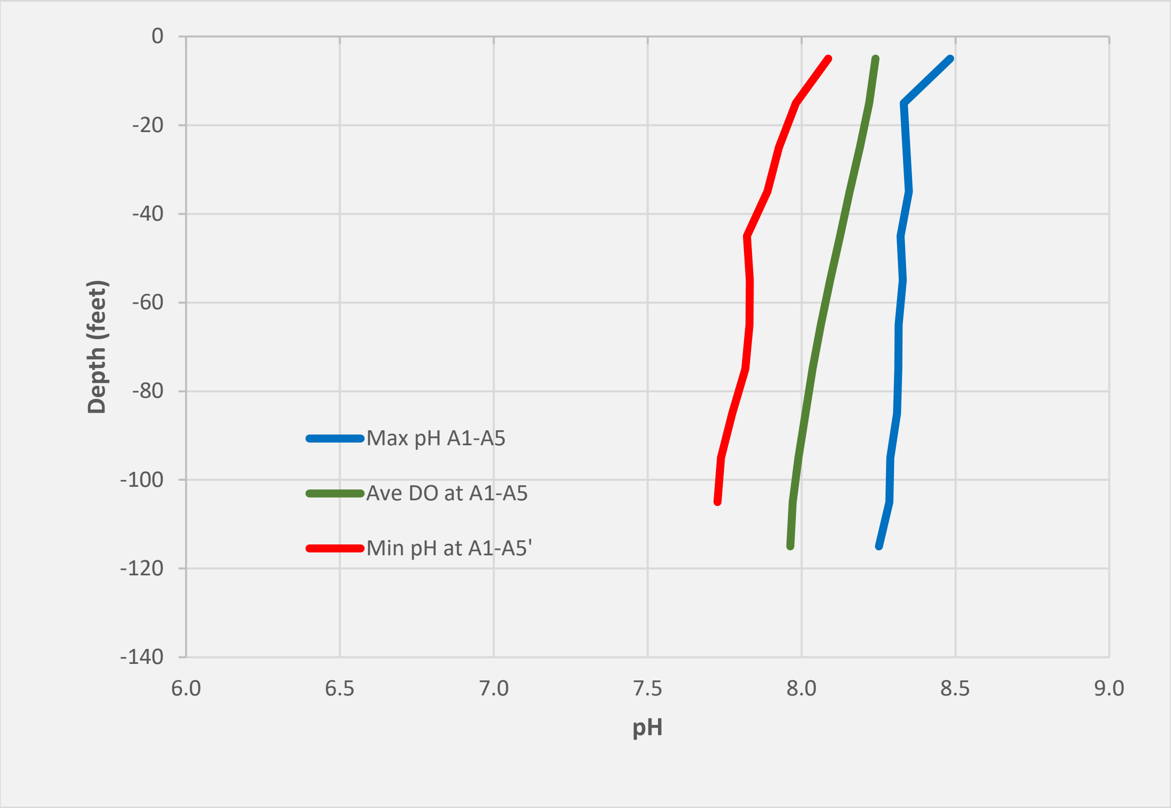
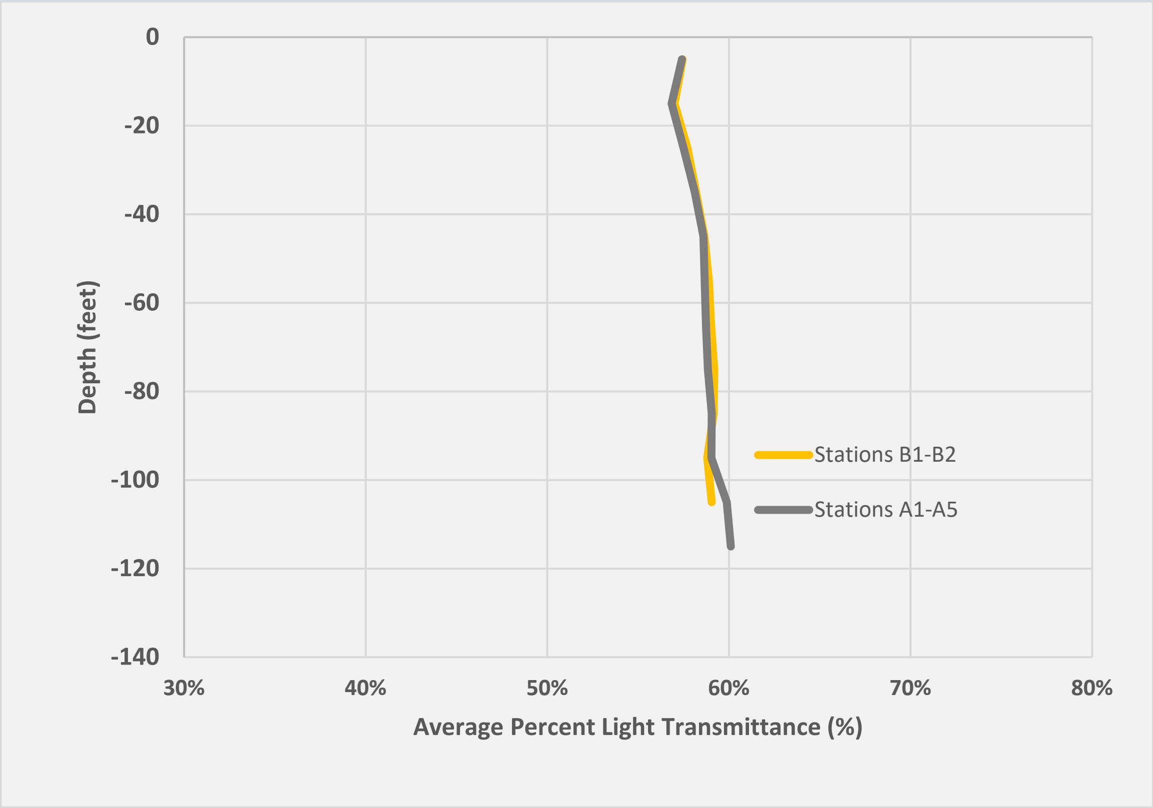
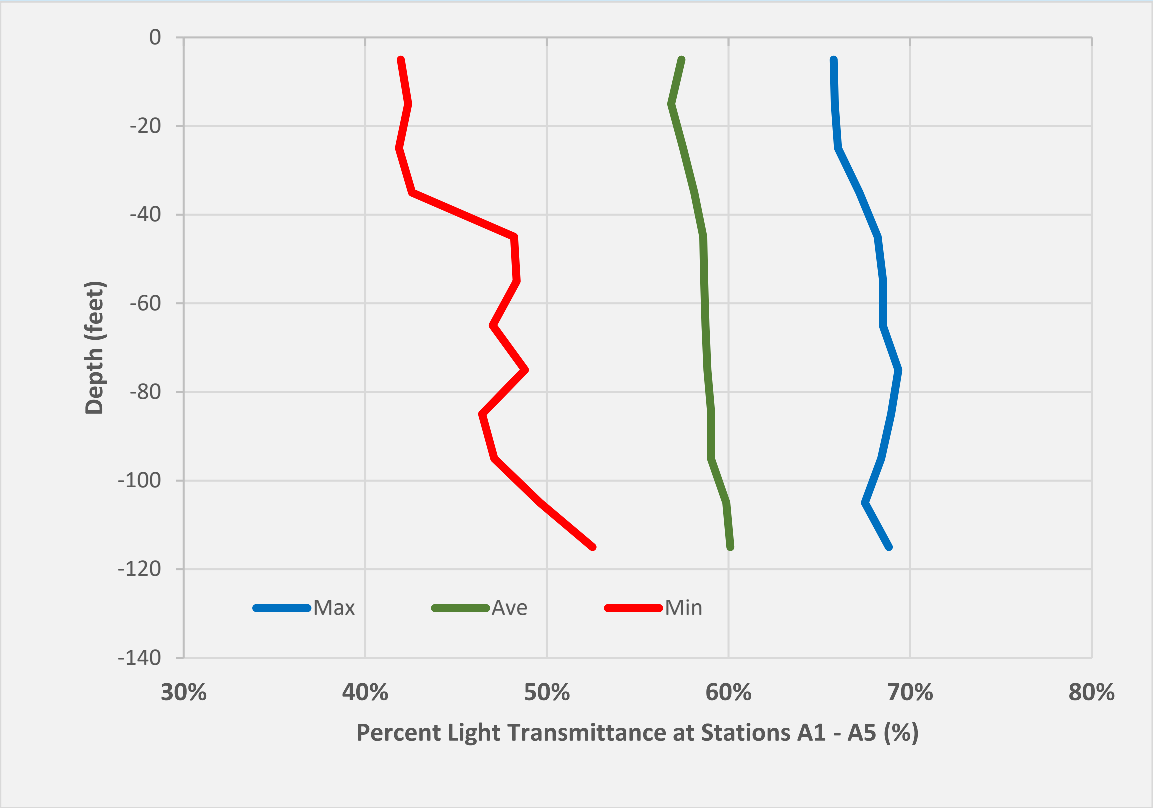


Minimum, Average and Maximum pH, 2021-2024

The OOO Does Not Adversely Affect Receiving Water Light Transmittance



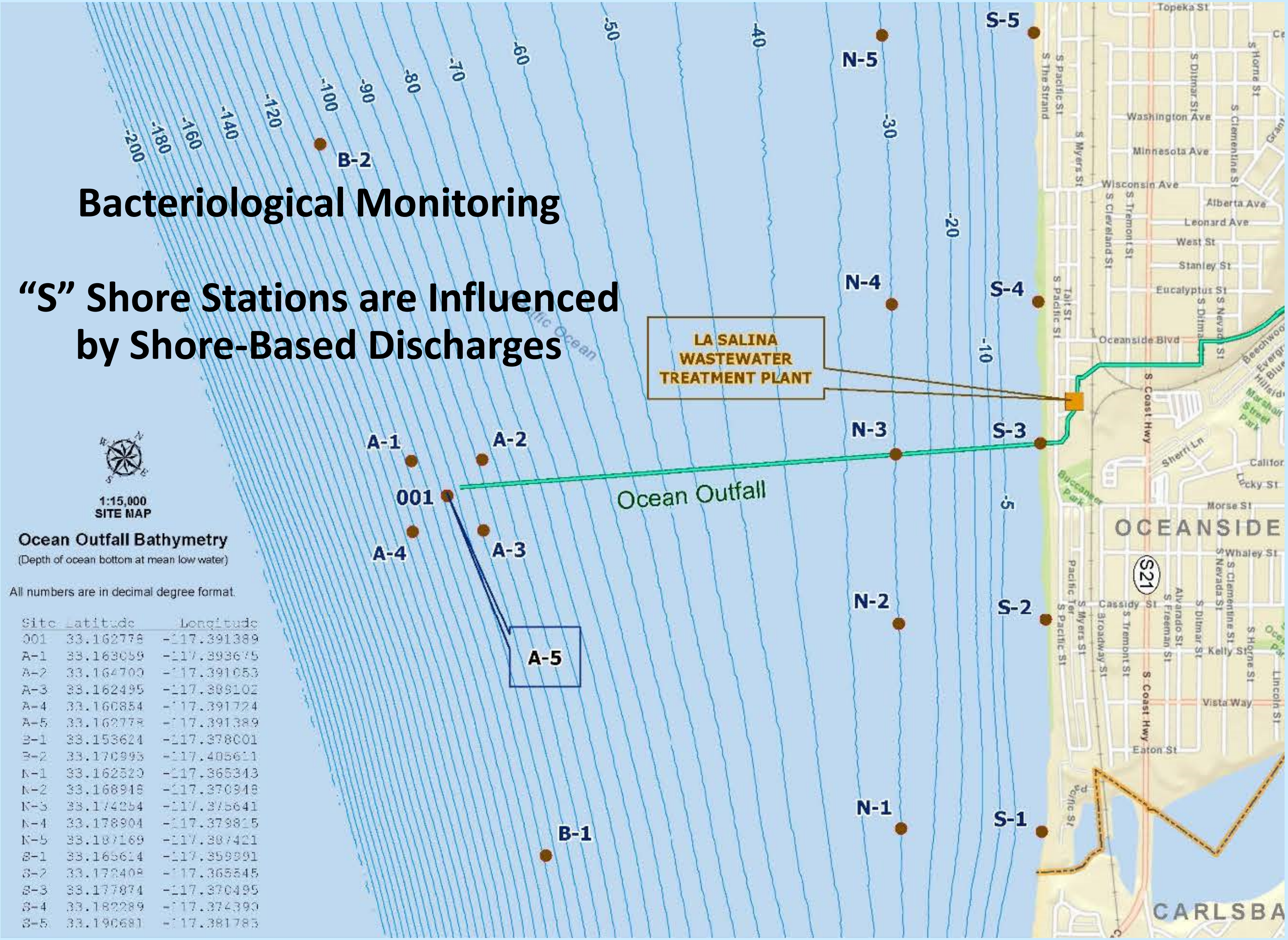
Comparison of % Light Transmittance at Outfall and Reference Stations 2021-2024



Minimum, Average and Maximum % Light Transmittance 2021-2024

Bacteriological Monitoring

"S" Shore Stations are Influenced by Shore-Based Discharges



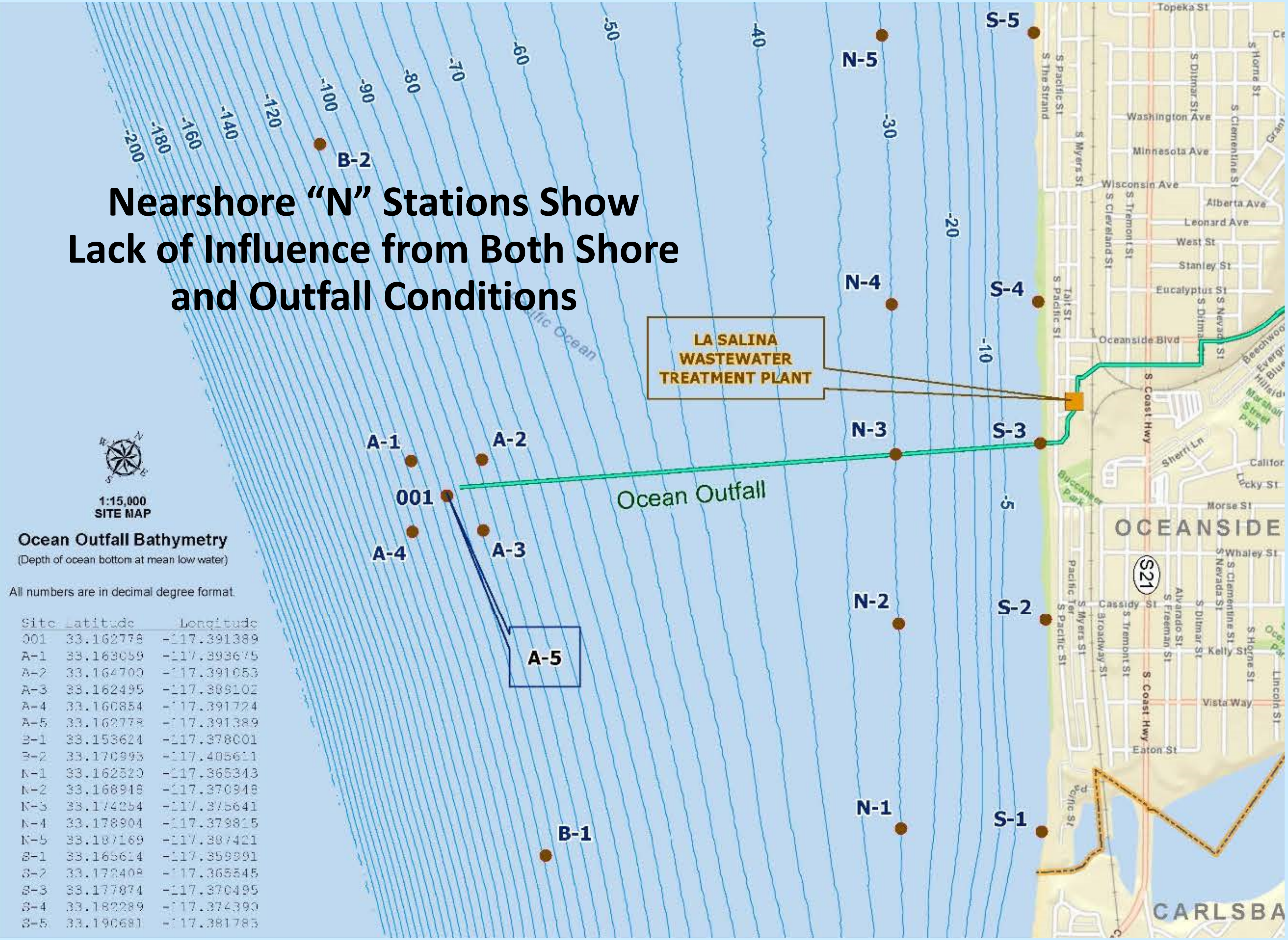
Site	Latitude	Longitude
001	33.162778	-117.391389
A-1	33.163059	-117.393675
A-2	33.164700	-117.391053
A-3	33.162495	-117.389102
A-4	33.160854	-117.391724
A-5	33.162778	-117.391389
B-1	33.153624	-117.378001
B-2	33.170993	-117.405611
N-1	33.162520	-117.365343
N-2	33.168918	-117.370948
N-3	33.174254	-117.375641
N-4	33.178904	-117.379815
N-5	33.187169	-117.387421
S-1	33.165614	-117.359991
S-2	33.172408	-117.365545
S-3	33.177874	-117.370495
S-4	33.182289	-117.374390
S-5	33.190681	-117.381783

Receiving Water Quality at Shore Stations, 2021-2024

Biological Parameter	Statistical Parameter	Observed Concentration at Shore "S" Stations, 2021-2024				
		S1	S2	S3	S4	S5
Fecal Coliform	Number of samples, 2021-2024	219	224	225	221	221
	Median value (CFU/100 ml)	< 2	2	2	< 2	2
	Percent of Samples < 400 CFU/100 ml	99%	98%	98%	97%	99%
Enterococcus	Number of samples, 2021-2024	221	225	223	220	216
	Median value (CFU/100 ml)	< 2	< 2	< 2	< 2	< 2
	Percent of Samples < 110 CFU/100 ml	100%	99%	99%	100%	100%
Heal the Bay Report Card 2023-2024	Dry conditions	A	A	A	A	A
	Storm conditions	A+	D	F	A	A+

CFU = colony forming units

Nearshore “N” Stations Show Lack of Influence from Both Shore and Outfall Conditions



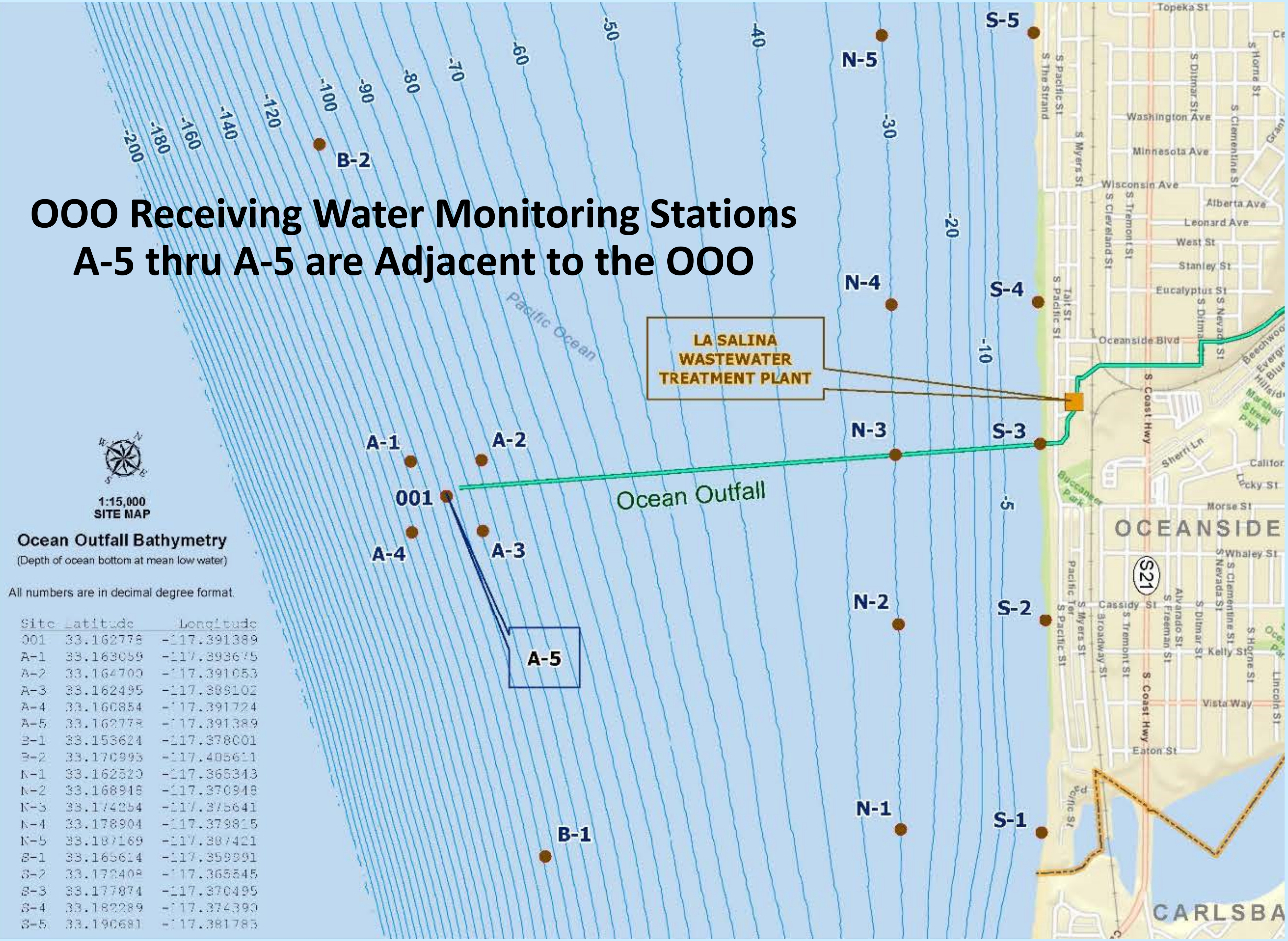
Site	Latitude	Longitude
001	33.162778	-117.391389
A-1	33.163059	-117.393675
A-2	33.164700	-117.391053
A-3	33.162495	-117.389102
A-4	33.160854	-117.391724
A-5	33.162778	-117.391389
B-1	33.153624	-117.378001
B-2	33.170993	-117.405611
N-1	33.162520	-117.365343
N-2	33.168918	-117.370948
N-3	33.174254	-117.375641
N-4	33.178904	-117.379815
N-5	33.187169	-117.387421
S-1	33.165614	-117.359991
S-2	33.172408	-117.365545
S-3	33.177874	-117.370495
S-4	33.182289	-117.374393
S-5	33.190681	-117.381783

Receiving Water Quality at Nearshore “N” Stations, 2021-2024

Biological Parameter	Statistical Parameter	Observed Concentration at Nearshore “N” Stations Along 30-foot Depth Contour, 2021-2024				
		N1	N2	N3	N4	N5
Fecal Coliform	Number of samples, 2021-2024	15	15	15	15	15
	Median value (CFU/100 ml)	2	< 1.8	< 1.8	4.5	1.8
	Percent of Samples < 400 CFU/100 ml	100%	100%	100%	100%	100%
Enterococcus	Number of samples, 2021-2024	15	15	15	15	15
	Median value (CFU/100 ml)	< 1	< 1	< 1	< 1	< 1
	Percent of Samples < 110 CFU/100 ml	100%	100%	100%	100%	100%

CFU = colony forming units

OOO Receiving Water Monitoring Stations
A-5 thru A-5 are Adjacent to the OOO



Site	Latitude	Longitude
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A-4	33.160854	-117.391724
A-5	33.162778	-117.391389
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B-2	33.170993	-117.405611
N-1	33.162520	-117.365343
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N-4	33.178904	-117.379815
N-5	33.187169	-117.387421
S-1	33.165614	-117.359991
S-2	33.172408	-117.365545
S-3	33.177874	-117.370495
S-4	33.182289	-117.374390
S-5	33.190681	-117.381783

Fecal Coliform at Offshore Stations, 2021-2024

Sample Depth	Statistical Parameter	Fecal Coliform at Offshore Stations, 2021-2024						
		A1	A2	A3	A4	A5	B1	B2
Surface	Number of samples, 2021-2024	15	15	15	15	15	15	15
	Median value (CFU/100 ml)	< 1.8	< 1.8	< 1.8	< 1.8	< 1.8	< 1.8	< 1.8
	Number of Samples > 400 CFU/100 ml	0	1	1	0	1	0	0
Mid-Depth (50 feet)	Number of samples, 2021-2024	15	15	15	15	15	15	15
	Median value (CFU/100 ml)	< 1.8	23	1.8	< 1.8	2	< 1.8	< 1.8
	Number of Samples > 400 CFU/100 ml	1	4	0	0	0	0	0

CFU = colony forming units

Enterococcus at Offshore Stations, 2021-2024

Sample Depth	Statistical Parameter	Enterococcus at Offshore Stations, 2021-2024						
		A1	A2	A3	A4	A5	B1	B2
Surface	Number of samples, 2021-2024	15	15	15	15	15	15	15
	Median value (CFU/100 ml)	< 1.8	< 1.8	< 1.8	< 1.8	< 1.8	< 1.8	< 1.8
	Number of Samples > 110 CFU/100 ml	0	0	0	0	0	0	0
Mid-Depth (50 feet)	Number of samples, 2021-2024	15	15	15	15	15	15	15
	Median value (CFU/100 ml)	< 1.8	< 1.8	< 1.8	< 1.8	< 1.8	< 1.8	< 1.8
	Number of Samples > 110 CFU/100 ml	0	2	0	0	0	0	0

CFU = colony forming units

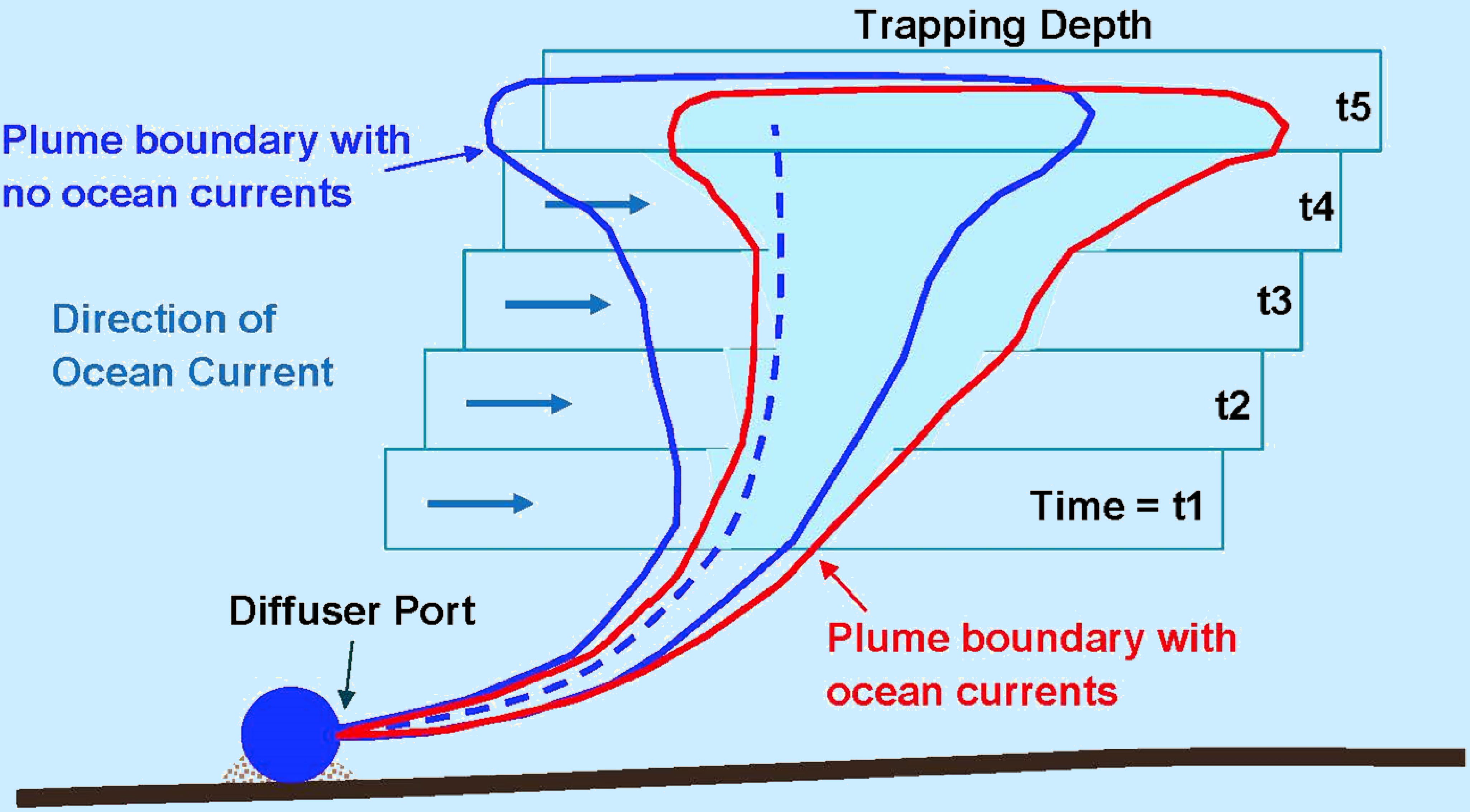
HF 1983 Testing

HF 183 human DNA marker testing was conducted on all four Station A-2 samples that showed fecal coliform exceedances during 2020-2024.

Number of HF 183 Samples	Number of Samples with Detected Concentrations of HF 183	Number of HF 183 Sample Results with Concentrations Below the Quantification Limit	Number of HF 183 Sample Results with Concentrations Above the Quantification Limit
4	4	4	0

CONCLUSION:

Despite the fact that HF 183 concentrations were below the quantification limit, the positive monitoring results (combined with plume tracking results) indicate that observed fecal coliform and enterococcus exceedances at mid-depth at Station A-2 are outfall-related



TYPICAL PLUME PROFILE
with OCEAN CURRENTS

Mitigating Factors for REC-1 Exceedances at A-2

- The exceedances are largely limited to mid-depth at Station A-2
- No observed REC-1 uses occur at mid-depth near Station A-2
- A specific combination of ocean current and thermocline depth conditions is required to cause elevated bacteriological concentrations at Station A-2
- The issue will be resolved with the planned shutdown of La Salina plant

Note: The application of REC-1 standards to all State Regulated ocean waters is unique to the San Diego Region and results from an EPA's interpretation of a regulatory quirk implanted in 1994 within the San Diego Region Basin Plan

Key Monitoring Questions
Receiving Water Quality

1. Are receiving water standards being met?

   Yes, except for occasional bacteriological exceedances at mid-depth at Station A-2.

2. Are receiving waters changing over time?

   No.

3. What are the effects of the discharge on receiving waters?

   No discernible effects other than occasional higher bacteriological concentrations at mid-depth at Station A-2.

Outline of Today's Presentation

1. Discharge overview
2. Review treatment performance and effluent data
3. Review plume tracking results
4. Review receiving water data
5. Review sediment & habitat data
6. Present conclusions on ocean conditions and the OOO outfall discharge

5. Sediment/Habitat Monitoring

- Sediment chemistry
- Sediment toxicity
- Benthic community parameters (diversity, populations)
- Fish/macroinvertebrate trawl surveys (diversity, populations)
- Bioaccumulation monitoring

Toxic Inorganic Compounds in Sediments Near the OOO

Toxic Inorganic Compound	Station B23-B1 115-ft deep (0.9 nautical miles upcoast from the OOO) [Preliminary 2023 Data]	Station B18-10875 80-ft deep (1.0 nautical miles upcoast from the OOO) [2018 Data]	Station B18-10268 270-ft deep (3.8 nautical miles downcoast from the OOO) [2018 Data]	Station B18-10269 240-ft deep (4.9 nautical miles downcoast from the OOO) [2018 Data]	Mean Value from Bight '18 SCB Stations 100 - 400 ft deep
Antimony	ND	1.17	1.62	1.59	1.2
Arsenic	ND	2.31	3.57	2.86	4.4
Cadmium	ND	ND	0.077	0.064	0.56
Chromium	ND	16.4	21.7	21.2	28
Copper	ND	2.03	4.09	4	6.8
Lead	ND	1.1	3.3	3.31	6.4
Mercury	ND	ND	ND	0.01	0.05
Nickel	ND	4.83	7.29	7.17	12
Selenium	ND	ND	0.556	0.686	0.75
Silver	ND	ND	ND	ND	0.08
Zinc	ND	31.6	36.7	36.5	45

ND = Not Detected

Toxic Organic Compounds in Sediments Near the OOO

Toxic Organic Compound	Station B23-B1 115-ft deep (0.9 nautical miles upcoast from the OOO) [Preliminary 2023 Data]	Station B18-10875 80-ft deep (1.0 nautical miles upcoast from the OOO) [2018 Data]	Station B18-10268 270-ft deep (3.8 nautical miles downcoast from the OOO) [2018 Data]	Station B18-10269 240-ft deep (4.9 nautical miles downcoast from the OOO) [2018 Data]	Mean Value from Bight '18 SCB Stations 100 - 400 ft deep
Total Chlordanes	ND	ND	ND	ND	ND
Total DDT	ND	0.0945	0.256	0.408	13
Total PAHs	ND	ND	ND	56	67
Total PCBs	ND	ND	ND	ND	4.3

ND = Not Detected

Sediment Toxicity at Offshore Stations, 2018-2023

10-day survival of *Eohaustorius estuaries* (Sand Burrowing Amphipod)

Data Collected/Reported by SCCWRP

Station	Number of Samples	Percent Survival over 10-Day Test	
		80^{th} Percentile Value	Minimum Observed Value
Station B23-B1 115-ft deep (0.9 nautical miles upcoast from the OOO) [Preliminary 2023 Data]	5	95 %	95 %
Station B18-10875 80-ft deep (1.0 nautical miles upcoast from the OOO) [2018 Data]	5	99 %	95 %
Station B18-10268 270-ft deep (3.8 nautical miles downcoast from the OOO) [2018 Data]	5	97.5 %	95 %
Sediment Toxicity Categorization Values (Statistically significant) (From *Sediment Quality Provisions, Water Quality Control Plan for Enclosed Bays and Estuaries*, SWRCB, 2018)		**90-100% = Non-Toxic 82-89% = Low Toxicity 59-81 = Moderate Toxicity**	

Benthic Community Sampling

(small organisms living on or in seabed sediments)

- Sediment samples collected 0.1 square meter Van Veen grab sampler
- Samples sieved using 1 mm mesh screen
- Marine biologists identify collected organisms to the lowest possible taxon
- Results are reported in terms of number of species, abundance and diversity indices

Benthic Species Data Indicate a Health and Diverse Benthic Environment

Analysis of Benthic Data Collected by SCCWRP, 2018-2023

Benthic Species Monitoring Parameter	Station B23-B1 115-ft deep (0.9 nautical miles upcoast from the OOO) [Preliminary 2023 Data]	Station B18-10875 80-ft deep (1.0 nautical miles upcoast from the OOO) [2018 Data]	Station B18-10268 270-ft deep (3.8 nautical miles downcoast from the OOO) [2018 Data]	Station B18-10269 240-ft deep (4.9 nautical miles downcoast from the OOO) [2018 Data]
Number of Species (0.1 m^2 sediment sample)	86	75	89	69
Number of Phyla (major taxonomic groups)	5	8	7	8
Total number of organisms in the sample	302	193	568	431
Maximum number of organisms of any species	19	22	69	49
Shannon-Weiner Diversity Index (H') (Values > 3.5 indicate "very high" species diversity)	3.99	3.84	3.58	3.5
Pielou Evenness Evenness Index (J') (Values near 1.0 indicate a diverse community)	0.7	0.89	0.79	0.83
Swartz Dominance Index (SDI) (High values indicate a diverse community)	33	31	20	18

Fish Trawl Data Indicate a Healthy and Diverse Benthic Environment

Analysis of Fish Data Collected by SCCWRP, 2018-2023

Fish Species Monitoring Parameter	Station B23-B1 115-ft deep (0.9 nautical miles upcoast from the OOO) [Preliminary 2023 Data]	Station B18-10875 80-ft deep (1.0 nautical miles upcoast from the OOO) [2018 Data]	Station B18-10269 240-ft deep (4.9 nautical miles downcoast from the OOO) [2018 Data]
Number of Species Observed	7	9	17
Total Abundance (observed population)	65	317	1724
Total Biomass (kilograms)	3.3	10.7	9.4
Maximum number of organisms of any species	33	149	836
Number of Anomalies	0	0	7 *
Most Abundant Species	Longfin Sanddab California Lizardfish	Speckled Sanddab California Lizardfish	Northern Anchovy Pacific Sanddab

* 3 Dover sole with tumors, 3 dover sole with fin erosion, 1 hornyhead turbot with a parasite

Macroinvertebrate Trawl Data Indicate a Healthy and Diverse Benthic Environment

Analysis of Benthic Data Collected by SCCWRP, 2018-2023

Macroinvertebrate Monitoring Parameter	Station B23-B1 115-ft deep (0.9 nautical miles upcoast from the OOO) [Preliminary 2023 Data]	Station B18-10875 80-ft deep (1.0 nautical miles upcoast from the OOO) [2018 Data]	Station B18-10269 240-ft deep (4.9 nautical miles downcoast from the OOO) [2018 Data]
Number of Species Observed	5	6	9
Total Abundance (observed population)	6 *	11	151
Total Biomass (kilograms)	0.3	0.4	9.4
Maximum number of organisms of any species	2 *	5	81
Most Abundant Species	Spiny Sand Star Ostrich Plume	Spiny Sand Star	Ridgeback Prawn East Pacific Octopus Painted Urchin

* Ostrich plume not quantitatively enumerated at B23-21

Fish Bioaccumulation: Bight '18 Data

Fishing Zone 7: La Jolla to San Onofre

Species	Observed Tissue Concentration (nanograms per gram)			
	Mercury	Selenium	PCBs	DDT
Barred Sand Bass	52.8	389	0.17	7.7
Kelp Bass	133	378	--	1.0
Pacific Chub Mackerel	28.3	374	--	4.6
Yellowfin Croaker	34.5	318	--	12.8

Parameter	Annual number of servings of 8-ounces of sportfish that may be safely consumed throughout a lifetime			
	Mercury	Selenium	PCBs	DDT
Children under 17; women of childbearing age	104	> 365	> 365	> 365
Men and women above childbearing age	208	> 365	> 365	> 365

Key Monitoring Questions
Sediment/Habitat Monitoring

1. Is the discharge degrading sediment quality?

   No.*

2. Is sediment quality changing over time?

   No.*

3. Is the discharge degrading benthic communities?

   No.*

* Based on available data. Data from additional OOO benthic, trawl and rig fishing stations has not yet been collected.

Key Monitoring Questions
Sediment/Habitat Monitoring

4. Are fish and marine organisms healthy?

   Yes.*

5. Are pollutants bioaccumulating in fish or marine organisms to levels harmful to the organisms or humans?

   No.*

* Based on available data. Data from additional OOO benthic, trawl and rig fishing stations has not yet been collected.

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6. "State of the Ocean" Conclusions

Discharge Quality

“State of the Ocean” Conclusions

Outfall Performance

- Discharged water flows with prevailing ebb and flood tide ocean currents parallel to the coast - not onshore or offshore.
- The OOO discharge is trapped below the ocean surface throughout a significant majority of the year by thermal stratification.
- During and after the initial dilution process, shear currents can transform the discharge into small fragments which are quickly dispersed and diluted, significantly increasing the overall degree of dilution.
- Dilution is consistently better than the 97:1 dilution factor assigned by the RWQCB and frequently is better than 1000:1.

"State of the Ocean" Conclusions
Receiving Water Quality

- The OOO discharge does not adversely impact body contract recreation (REC-1) beneficial uses. While several fecal coliform exceedances were observed at mid-depth at Station A-2, these exceedances are likely due to ocean current transport which can warp the Zone of Initial Dilution (ZID) toward Station A-2 where samples may not be representative of completion of initial dilution.

- The OOO discharge is unlikely to directly contribute to algae blooms. Nutrient concentrations in the discharge quickly become indistinguishable from ambient concentrations. During months when algal blooms are most likely, thermal stratification is strongest and plume trapping depths are greatest, preventing the OOO discharge from contributing nutrients to the epilimnion.

- The OOO discharge does not discernibly affect receiving water dissolved oxygen, pH or light transmittance.

"State of the Ocean" Conclusions

Sediment Quality

"State of the Ocean" Conclusions
Biological Community

- Benthic communities in the vicinity of the OOO show a high degree of species diversity, species richness, abundance and evenness. The OOO discharge has no discernible adverse effects on benthic species populations or diversity.
- Fish populations in the vicinity of the OOO are abundant, diverse and healthy, and are comprised of species common to the Southern California Bight.
- Megabenthic invertebrate populations are abundant in the vicinity of the OOO discharge, and include common mid-shelf invertebrates such as tunicates, shrimp, sea urchins, crabs and sea stars.
- Anomalies in fish (tumors, lesions, etc.) are rare and occur on a percentage basis that is consistent with anomalies found throughout the Southern California Bight.

"State of the Ocean" Conclusions
Monitoring

- The existing OOO monitoring program is adequate for assessing receiving water quality, sediment quality and receiving water habitats, but some existing effluent or receiving water monitoring may be superfluous and unnecessary, including:
  - ✓ Shoreline monitoring at Stations S6 and S7
  - ✓ Nearshore monitoring at Stations N6 and N7
  - ✓ HF 183 testing
  - ✓ Further plume tracking studies

QUESTIONS