

THE **WATER QUALITY LAB**

AT THE


VIRGINIA AQUARIUM & MARINE SCIENCE CENTER



WITH WATER QUALITY LAB MANAGER ALLIE HOBGOOD



OUTLINE

- ABOUT ME
 - ABOUT THE AQUARIUM'S WATER QUALITY LAB
 - ABOUT OUR CITIZEN SCIENCE PROGRAM
 - PROGRAM BASICS
 - REPORTING DATA
 - OTHER INTERESTING INFORMATION
 - IMPORTANCE, NEW SERVICES, COST, DATA USE
- 

ABOUT ME

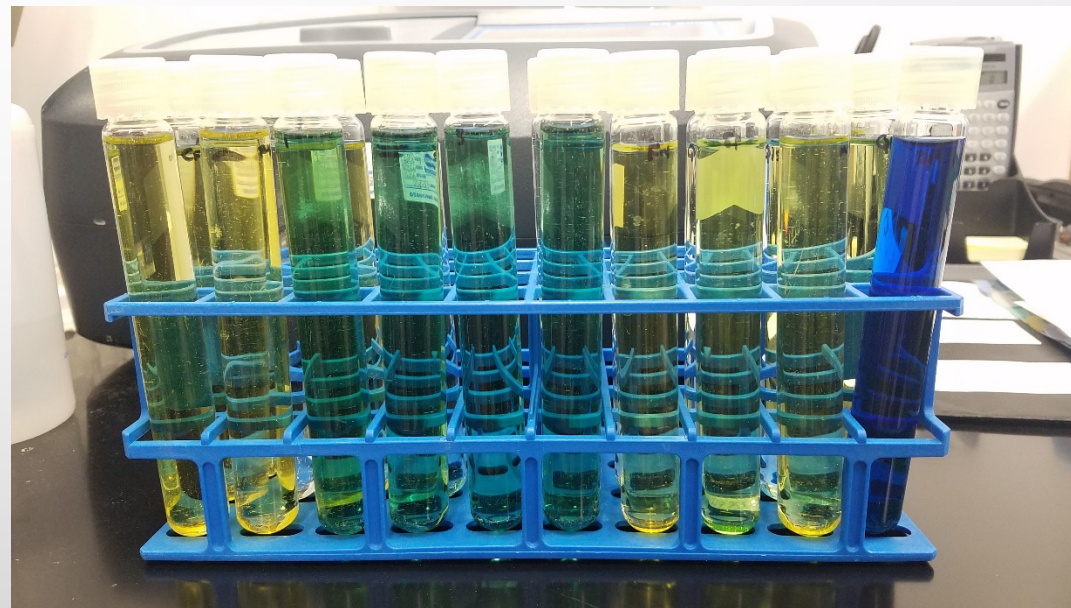
I AM A HAMPTON ROADS NATIVE FROM GLOUCESTER, VIRGINIA. I RECEIVED MY B.S. IN BIOLOGY FROM CHRISTOPHER NEWPORT UNIVERSITY IN 2011 AND COMPLETED MY M.S. IN ENVIRONMENTAL SCIENCE IN 2015.

AFTER BRIEF INTERNSHIPS WITH THE VIRGINIA INSTITUTE OF MARINE SCIENCE AND THE ELIZABETH RIVER PROJECT, I TOOK A JOB AT HAMPTON ROADS SANITATION DISTRICT IN THEIR CENTRAL ENVIRONMENTAL LAB WHERE I ACQUIRED THE BULK OF MY CHEMISTRY LAB KNOWLEDGE.

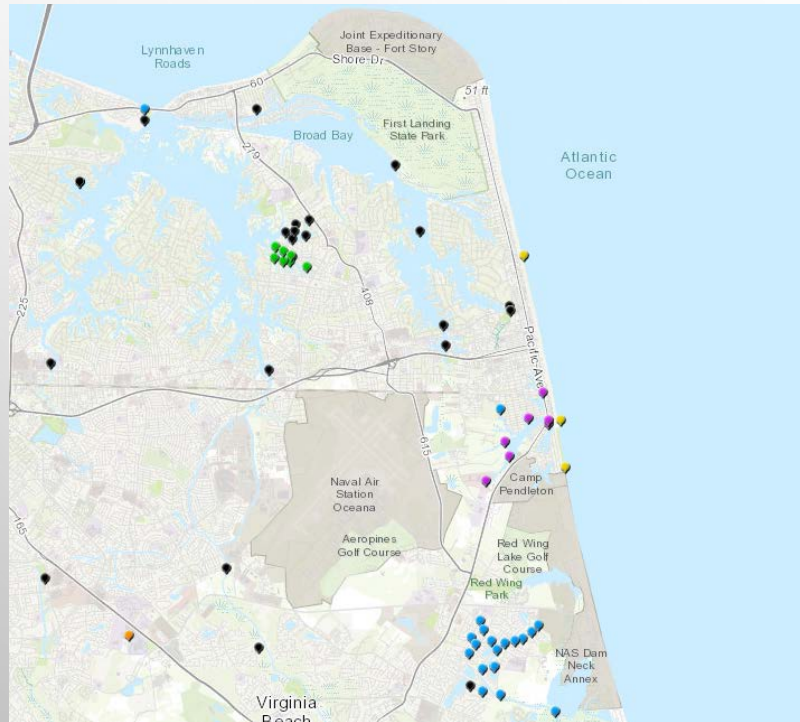
AFTER 4 YEARS WITH HRSD I DECIDED PRODUCTION LAB WORK WASN'T EXCITING AND CREATIVE ENOUGH FOR ME (SURPRISE, SURPRISE!) SO I CAME ON BOARD WITH THE AQUARIUM AS THEIR WQL MANAGER. NOW I GET TO WORK WITH A WIDE VARIETY OF PEOPLE ON MANY DIFFERENT AND INTERESTING PROJECTS.

ABOUT THE AQUARIUM'S WQL

- 104 SAMPLES A WEEK
- NEARLY 700 TESTS A WEEK
- pH, ALKALINITY, SALINITY, NH_3 , NO_2 , NO_3 , Br^- , PO_4^{3-} , Ca, Mg, TURBIDITY, COLOR, TOTAL COLIFORM, AND *E. coli*



ABOUT OUR CITIZEN SCIENCE PROGRAM



- 25 WATERBODIES MONITORED
- 9 MONITORING ORGANIZATIONS
- 50 PARTICIPATING VOLUNTEERS
- 340 SAMPLES COLLECTED
- 3408 TESTS PERFORMED

PROGRAM BASICS

- BASIC PACKAGES OR CUSTOM PLANS
- STANDARD OPERATING PROCEDURES
- FIELD EQUIPMENT
- SITE INSPECTIONS



REPORTING DATA

REPORT OF ANALYSIS

CLIENT: Sierra Hildebrandt SAMPLED BY: Sierra Hildebrandt
TYPE OF SAMPLE: Grab

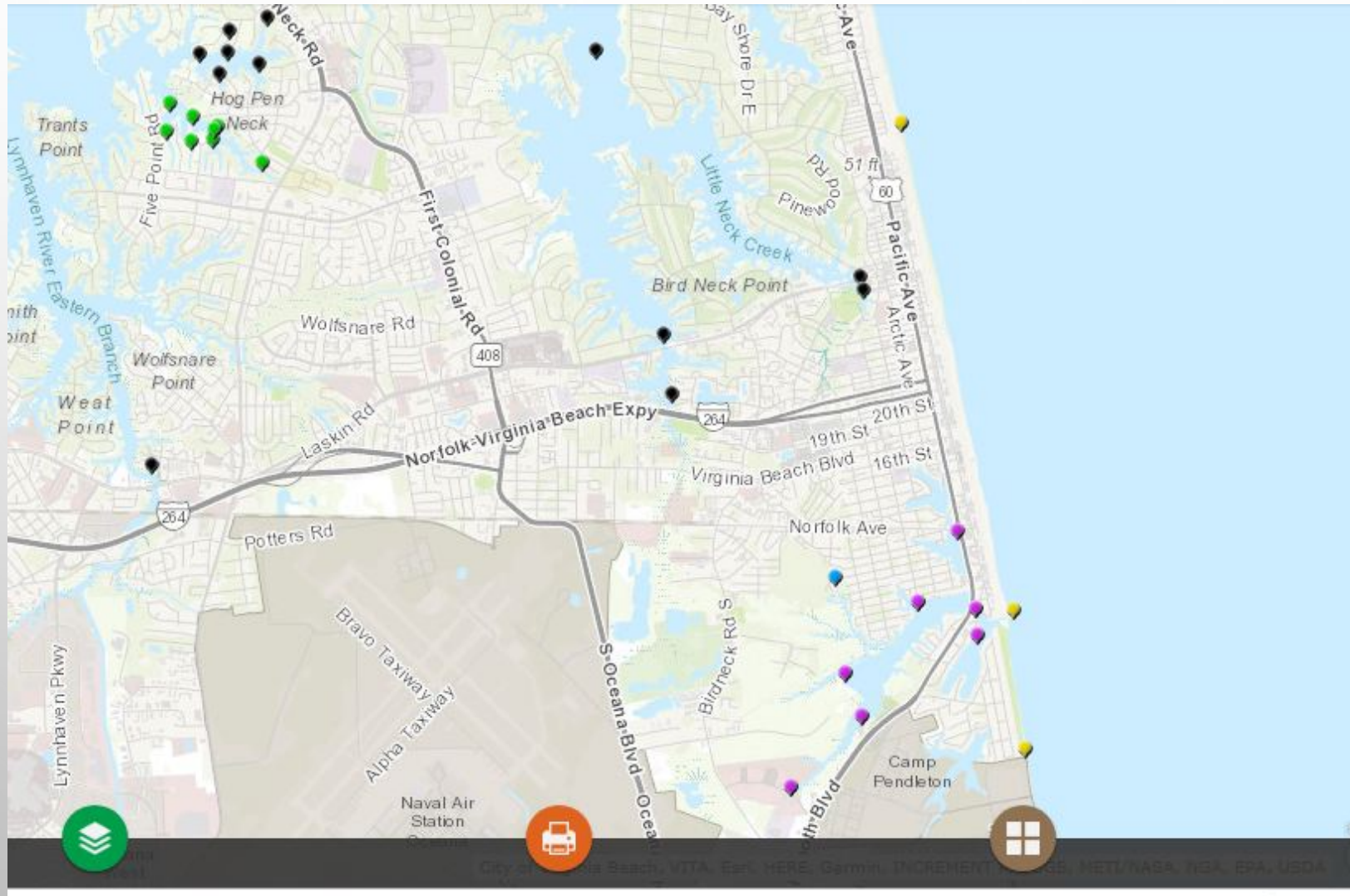
CONTACT: sierra.hildebrandt@gmail.com DATE: 04/04/19 TIME: 10:05
SPECIAL NOTES: 757 771 8522
Hampton University Project

SAMPLE RECEIPT: Allie Hobgood
DATE: 04/04/19 TIME: 12:00

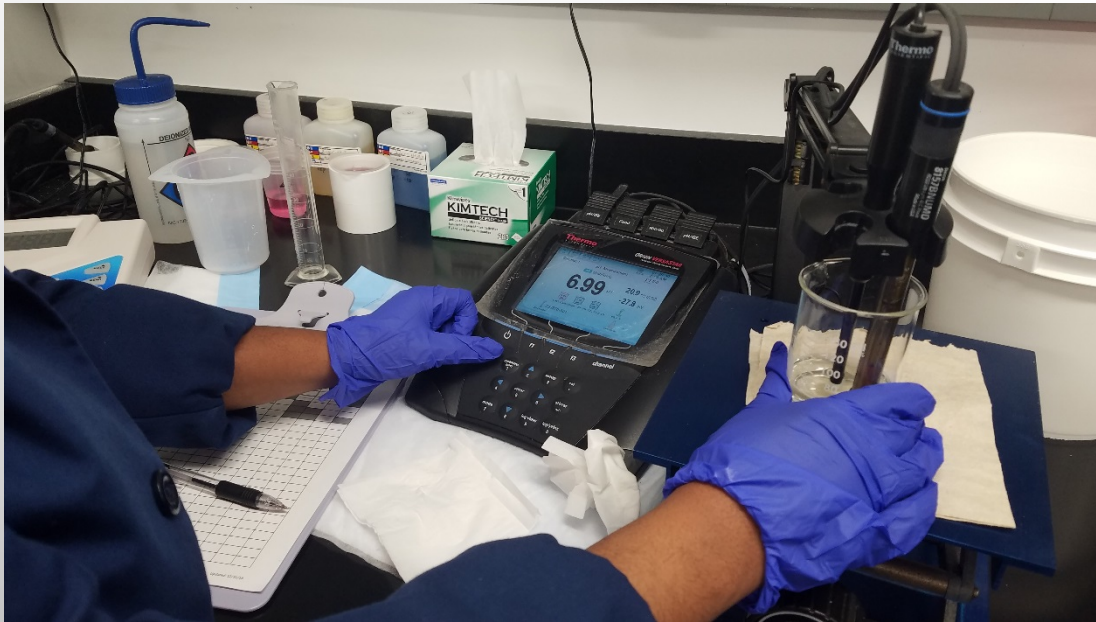
SAMPLE ID: 2019-030
SAMPLE LOCATION: HU

PARAMETER	RESULTS	UNIT	METHOD NUMBER	QL	ANALYST	DATE	TIME
Nitrogen-Ammonia	0.010	mg/L	STM 4500-NH ₃ F	0.010	AH	04/05/19	8:00
Nitrogen-Nitrite	0.005	mg/L	STM 4500-NO ₂ ⁻ B	0.003	AH	04/05/19	8:00
Nitrogen- (Nitrate+Nitrite)	0.065	mg/L	STM 4500-NO ₃ ⁻	0.500	AH	04/05/19	8:00
Orthophosphate	0.04	mg/L	HACH 8048	0.02	AH	04/05/19	8:00
Total Copper	<0.020	mg/L	HACH	0.04	AH	04/05/19	8:00
Enterococcus	<10	MPN/ 100mL	Enterolert	1	AH	04/04/19	12:05
Total Coliform	8,664.0	MPN/ 100mL	Colilert	1	AH	04/04/19	12:05
<i>E. Coli</i>	20.0	MPN/ 100mL	Colilert	1	AH	04/04/19	12:05

REPORTING DATA



OTHER INTERESTING INFORMATION



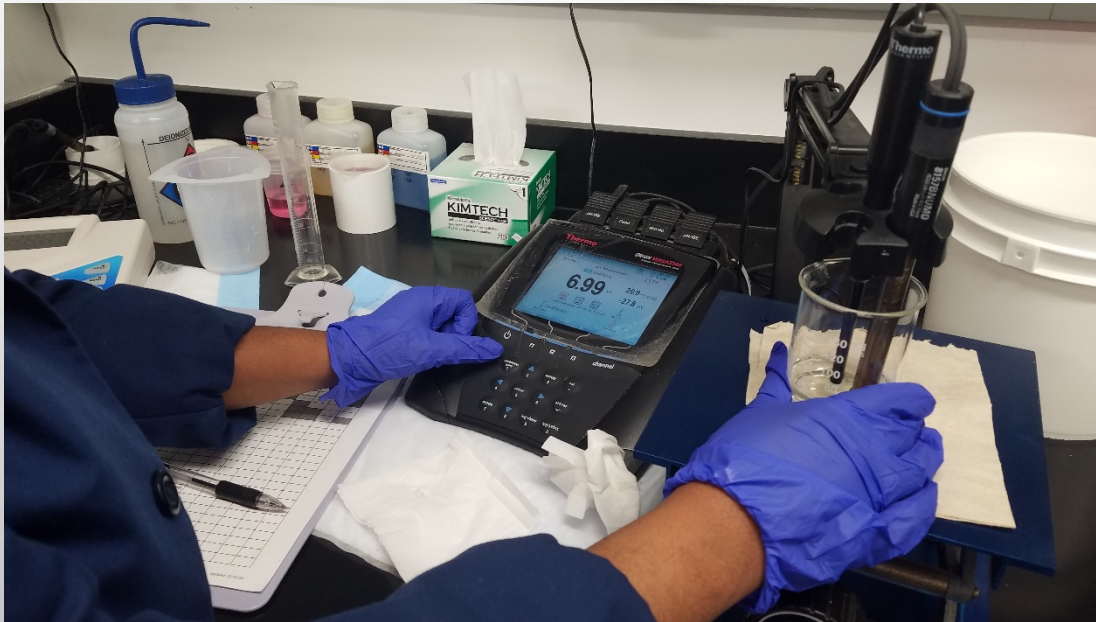
- WHY IS THIS IMPORTANT
- NEW ANALYTICAL SERVICES FOR 2019
- COST FOR THE LAB AND COST FOR OUR PARTICIPANTS
- DATA USE



Water Quality Parameters Explained

Parameter	What is it?	General Ranges	Parameter	What is it?	General Ranges
pH	A measure of water acidity. Specifically, pH is a measure of the concentration of H ⁺ ions in the water. (-log[H ⁺]). pH is measured on a scale of 0-14.	6.5-8.5 (Higher salinity water is associated with higher pH, seawater is usually 8-8.5). pH can vary throughout the day and with rainfall, tidal changes, and bio-load.	Nitrate-N	Measure of the Nitrogen present as Nitrate (NO ₃ ⁻ N). Bacteria convert Ammonia to Nitrite and Nitrite to Nitrate as part of the nitrogen cycle. Nitrate is not generally immediately toxic to most aquatic organisms except at extremely high levels, and it is a necessary nutrient for plants and algae. High nitrate levels in water are usually an indicator of contamination from fertilizer run-off or waste water and can be associated with algal blooms, excessive plant growth, and oxygen dead zones.	Maximum level for drinking water set by the EPA is 10 mg/L. Levels vary in natural water systems, and Nitrate is usually taken up quickly by algae and aquatic plants. Spikes in Nitrate levels can indicate contamination from run-off and can cause algal blooms and alter other water chemistry.
Alkalinity	A measure of the buffering capacity of the water. Measured as the concentration of carbonate ions in the water (mg/L). Carbonate ions (with bicarbonate and a small mixture of other ions) react with H ⁺ ions, removing the free H ⁺ from the water - the higher the alkalinity, the more the water is able to absorb excess H ⁺ (acidity) without a visible pH change.	Approximately 30mg/L (fresh water) to 200+ mg/L (seawater). Dependent on many environmental factors.			
Salinity	Concentration of dissolved salts in the water. Measured in ppt NaCl (concentration of sodium chloride).	0 (fresh water) - 35 (full seawater)	Orthophosphate	Measure of the orthophosphate form of phosphorus (mg/L PO ₄ ³⁻). Orthophosphate is a necessary nutrient for plant and animal life, but increased levels can result in algal blooms and oxygen dead zones. Fertilizer run-off, wastewater, soil, and manure can all contribute to increased	Depends on the water parameters, sediment load, and location. Spikes can indicate contamination from run-off and can lead to algal blooms and other biological issues.
Ammonia-N	Measure of the Nitrogen present as Ammonia (NH ₃ -N) and Ammonium (NH ₄ ⁺ -N). Ammonia can be added to the water via animal waste and decaying organic matter. Low levels in soil are normal, and it is a necessary nutrient source, but high ammonia in water can be toxic to fish and other aquatic organisms. Ammonia is naturally removed by bacteria that convert it to Nitrite as part of the nitrogen cycle.	Dependent on pH, watershed type, and other factors; EPA and many biologists recommend a chronic level below 2.0 mg/L.	Free Copper	Measure of free copper ions in the water (mg/L Cu ²⁺). Copper is a necessary nutrient in small quantities. High levels can be toxic to aquatic organisms and are usually a result of contamination from industrial operations or corrosion of copper pipes.	EPA level for copper in drinking water is set at 1.3 mg/L. Toxicity in the environment depends on the organisms present, the water parameters (such as pH and alkalinity), and the form of the copper.
Nitrite-N	Measure of the Nitrogen present as Nitrite (NO ₂ ⁻ N). As part of the nitrogen cycle, bacteria first convert Ammonia to Nitrite before other bacteria convert Nitrite to Nitrate. Nitrite in high levels is toxic to aquatic organisms and usually indicate contamination from fertilizer run-off.	Maximum level for drinking water is set by the EPA at 1.0 mg/L. Nitrites can be extremely toxic to fish and other aquatic organisms.	Enterococcus	<i>Enterococcus</i> is a genus of bacteria whose members are found naturally in human and animal digestive tracts. Presence in water often indicates fecal contamination, usually from human or animal waste entering the water directly or via run-off, and can be an indicator of the presence of other potentially harmful organism in the waters. Enterococci measurement is the US federal standard for bacterial water quality assessments at saltwater beaches.	Bacteria levels can change quickly and drastically in any location based on a number of factors, including tides, rainfall, water temperature, and human/animal activity. In Virginia, swimming advisories are issued when levels exceed 104cfu / 100mL.

OTHER INTERESTING INFORMATION

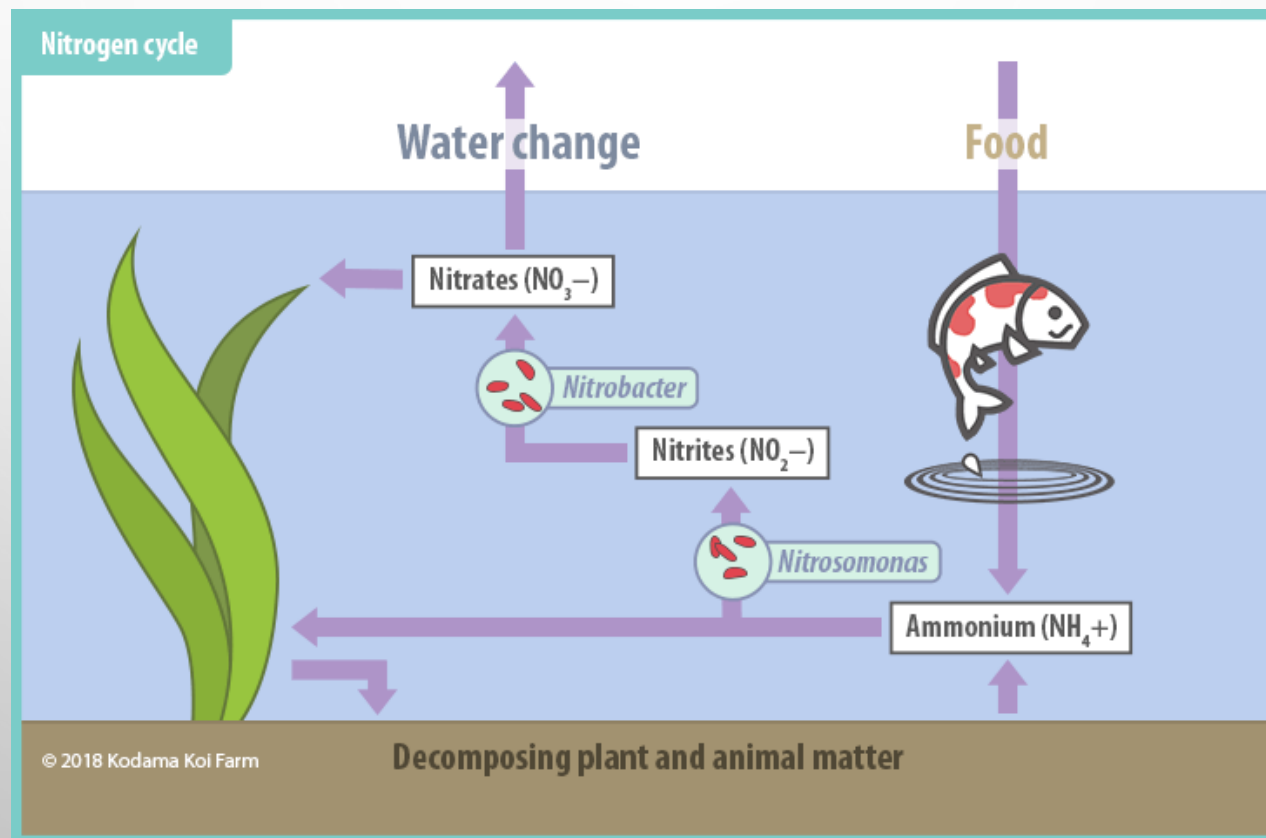


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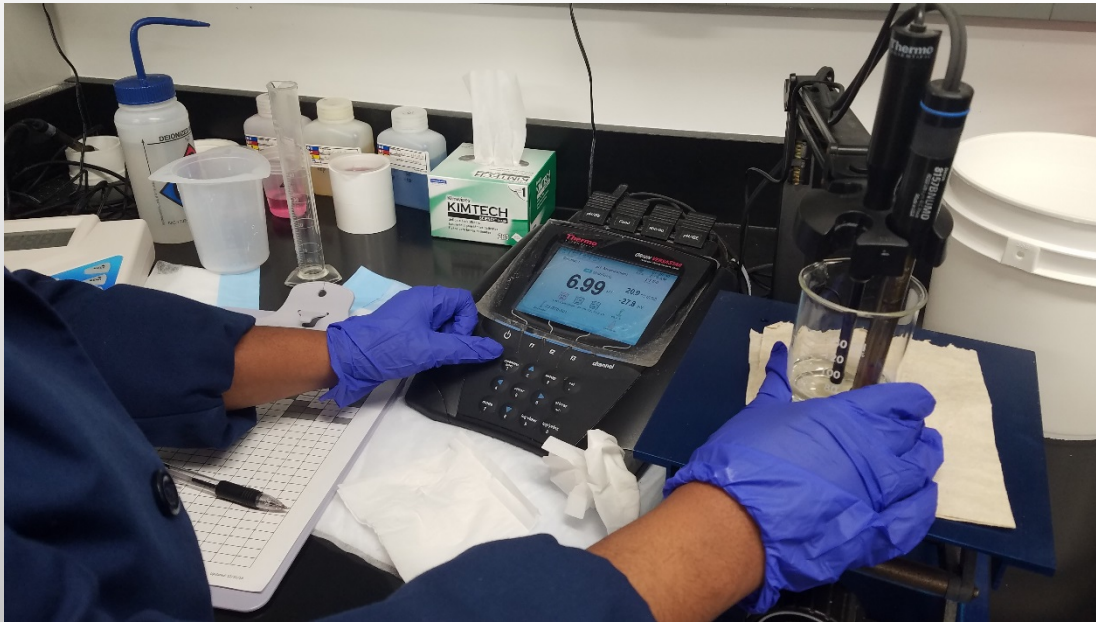
NEW ANALYTICAL SERVICES



NEW ANALYTICAL SERVICES



OTHER INTERESTING INFORMATION



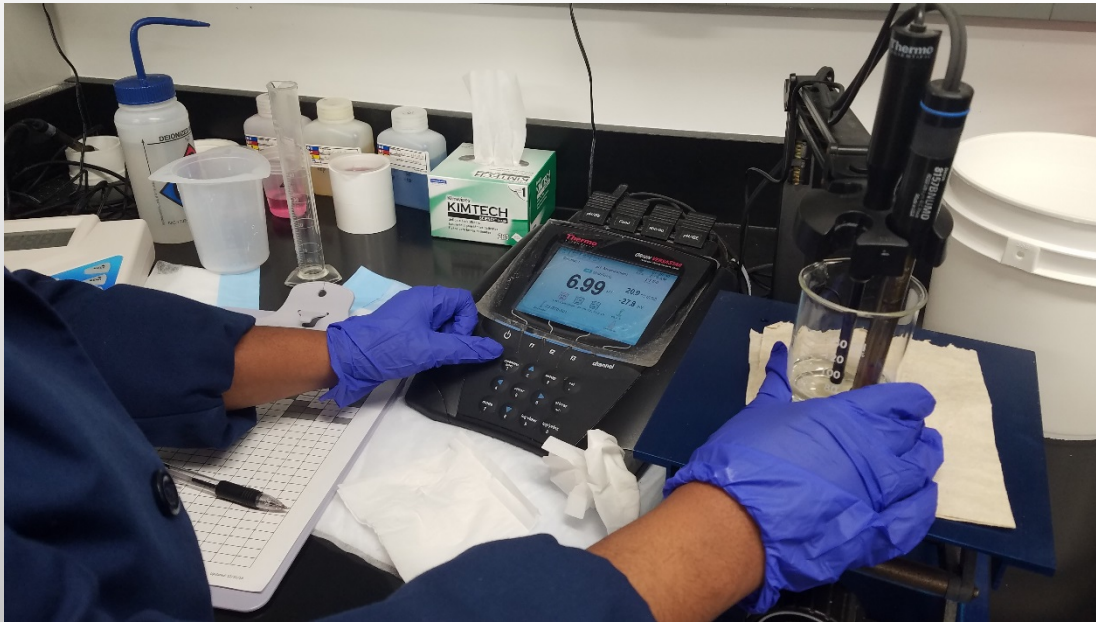
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COST

Enterococcus: IDEXX Enterolert Method	Resource	Reagent Units/Test	Reagent Cost/Unit	Reagent Cost/Test	Tests/ Month	Cost/ Month	Cost/Year
	Enterolert Tests	1	\$ 5.05	\$ 5.05	25	\$ 126.35	\$ 1,516.22
	Quanti-Trays	1	\$ 2.26	\$ 2.26	25	\$ 56.45	\$ 677.40
	Labor (Operations Specialist)			\$ 1.512	10	\$ 15.12	\$ 786.24
	Labor (Abacus)			\$ 1.236	15	\$ 18.54	\$ 964.08
	Total Annual Cost			\$ 8.69			\$ 3,943.94

**we only charge our citizen scientists \$8 for bacterial testing*

OTHER INTERESTING INFORMATION



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WHAT DO WE DO WITH ALL THIS DATA?



WHAT DO WE DO?
Test water samples collected from local waterways.

WHAT DO WE TEST?



- pH
- Alkalinity
- Salinity
- Total Nitrogen
Ammonia, Nitrite & Nitrate
- Total Phosphorus
- Copper
- Enterococcus

WHAT CAN YOU DO?
Purchase a kit
Collect samples
Bring it back to us
Find out what's in your water!

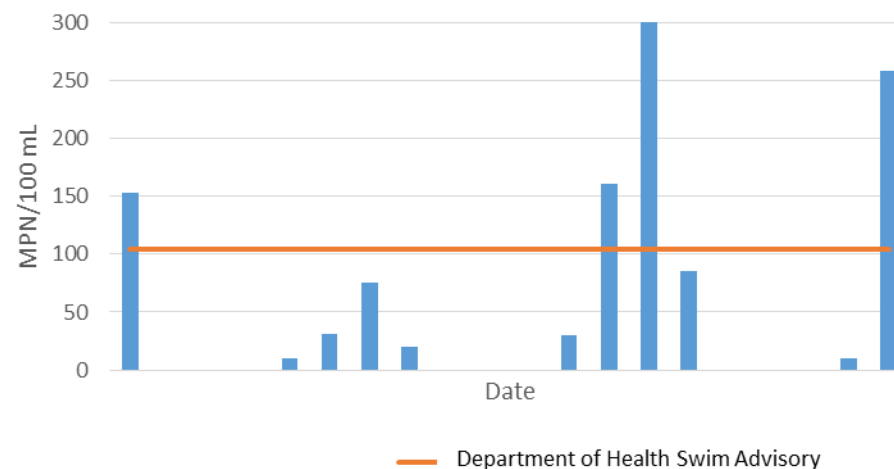


VIRGINIA AQUARIUM
A MARINE SCIENCE CENTER

DATA PRESENTATION

Location: Site 4 - Rudee Marina						
Collection Date	6/5/2018	6/7/2018	6/11/2018	6/12/2018	6/13/2018	6/14/2018
Collection Time	10:08	8:16	9:00	8:17	9:20	9:23
Initials	AMT	MGP	AMT	AMT	MGP	MGP
Air Temp (°C)	27.6	23.2	25.7	21.4	23.9	30.8
Water Temp (°C)	25.1	23.4	25.5	22.2	23.8	26.2
Depth (m)	2.8	2.36	2.61	3.02	2.97	2.26
Turbidity - Secchi Disk (cm)	97	123.5	94.5	75.5	93	115
pH	7.75	7.97	7.8	7.75	7.75	7.99
Field Salinity (ppt NaCl)	20.1	18.4	19.7	20.7	20.4	21.3
% DO	98	94.6	87.7	83.5	91	101.8
DO (mg/L)	8.07	8.04	7.19	7.21	7.71	8.25
Barometric Pressure (mb)	1010.5		1011			
Rainfall within 48 hours prior to sampling	0	0	0.66	0.15	0.4	0
Water surface:	Calm					
	Ripple					
	Waves	X	X	X	X	X
	White Caps					
	High					
Stream flow:						
Additional Comments:						
Received Date	6/5/2018	6/7/2018	6/11/2018	6/12/2018	6/13/2018	6/14/2018
Received Time	11:27	9:36	9:58	9:06	10:19	10:29
Received Temp (°C)	6.7	8.9	7.1	9	8.2	6.9
Initials	AMT	AMT	MGP	MGP	MGP	AMT
pH	7.81	7.85	7.84	7.82	7.77	7.84
Alkalinity (mg/L CaCO ₃)	90	86	91	90	90	92
Salinity (ppt NaCl)	20.2	18.9	19.9	20.7	20.5	20.7
Nitrogen, Ammonia (mg/L)	0.033	0.026	0.058	0.107	0.053	0.086
Nitrogen-Nitrite (mg/L)	0.004	0.003	0.006	0.005	0.005	0.006
Nitrogen-Nitrate+Nitrite (mg/L)	<0.02	<0.02	0.022	0.0288	0.024	0.02
Orthophosphate (mg/L)	0.05	<0.02	0.11	0.14	0.14	0.11
Free Copper (mg/L)	<0.020	0.028	0.043	0.051		
Turbidity (FAU)	5	5	11	8	11	16
Color (Pt-Co)	56	40	67	57	70	80
Enterococcus (MPN/100 mL)	20	86	118	52	187	<10

Enterococcus in Owls Creek



Salinity in Rudee Marina



QUESTIONS?

**WHAT'S IN
YOUR WATER?**

FIND OUT AT THE VIRGINIA AQUARIUM

Thank you!