AGUA HEDIONDA 2021 ANNUAL REPORT

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We would also like to acknowledge the time and effort of our field volunteers who make this all possible: Janell Cannon, Scott Engel, Jan Neff-Sinclair and Karen Merrill .

Background

In the spring of 2019 Preserve Calavera created the North San Diego County Watershed Monitoring Program (NSDCWMP) to carry on the decade-long work of San Diego Coastkeeper (SDCK) to assess the health of local surface waters. The three watersheds of Carlsbad's lagoons, all of which are part of the Carlsbad Hydrologic Unit, are evaluated for a variety of physical, chemical and biological parameters on a bimonthly basis.

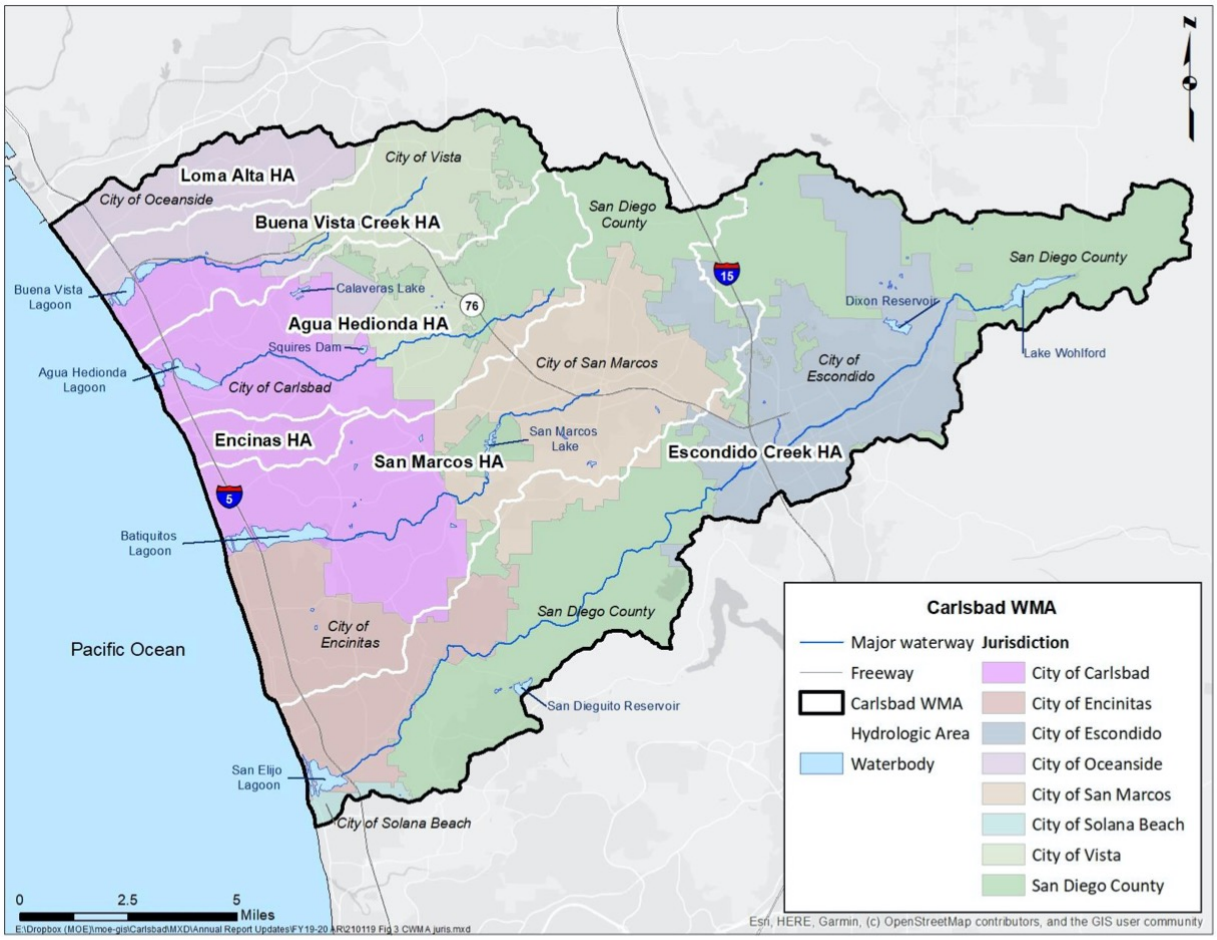


Figure ES-1: Carlsbad Watershed Management Area

***Figure 1**: The Carlsbad Watershed Management Area. Source: CWMA-Water Quality Improvement Plan page ES-2*

NSDCWMP is an all-volunteer citizen science effort with a leadership management team comprised of one Preserve Calavera board member (also leader of the Buena Vista Creek monitoring team) and one representative from and leader of the Batiquitos Lagoon team. Our technical advisors are from the CA Waterboard and the San Diego Regional Water Quality Control Board (SDRWCB). Data is posted at www.preservecalavera.org. Monitoring data for the Carlsbad Watershed can also be accessed through the California Environmental Data Exchange Network (CEDEN) www.ceden.org or the WQIP Annual Reports. The program began testing in July 2019.

The Agua Hedionda Watershed begins along the southwestern slopes of the San Marcos Mountains and flows over 10 miles until discharging into the Pacific Ocean at the Agua Hedionda Lagoon in Carlsbad and is about 18,800 acres in area. Most of the hydrologic area is in the City of Carlsbad (41%); the remainder is in Vista (24%) and San Diego County (24%) and there are also small portions in Oceanside and San Marcos. The Lagoon extends inland for about 1.7 miles and it is 0.5 miles wide at its widest point. As a result of Highway 101, Interstate 5 and Highway 101, the lagoon has been split into 3 waterway sections as you move inland from the coast: the outer, middle and inner lagoon.

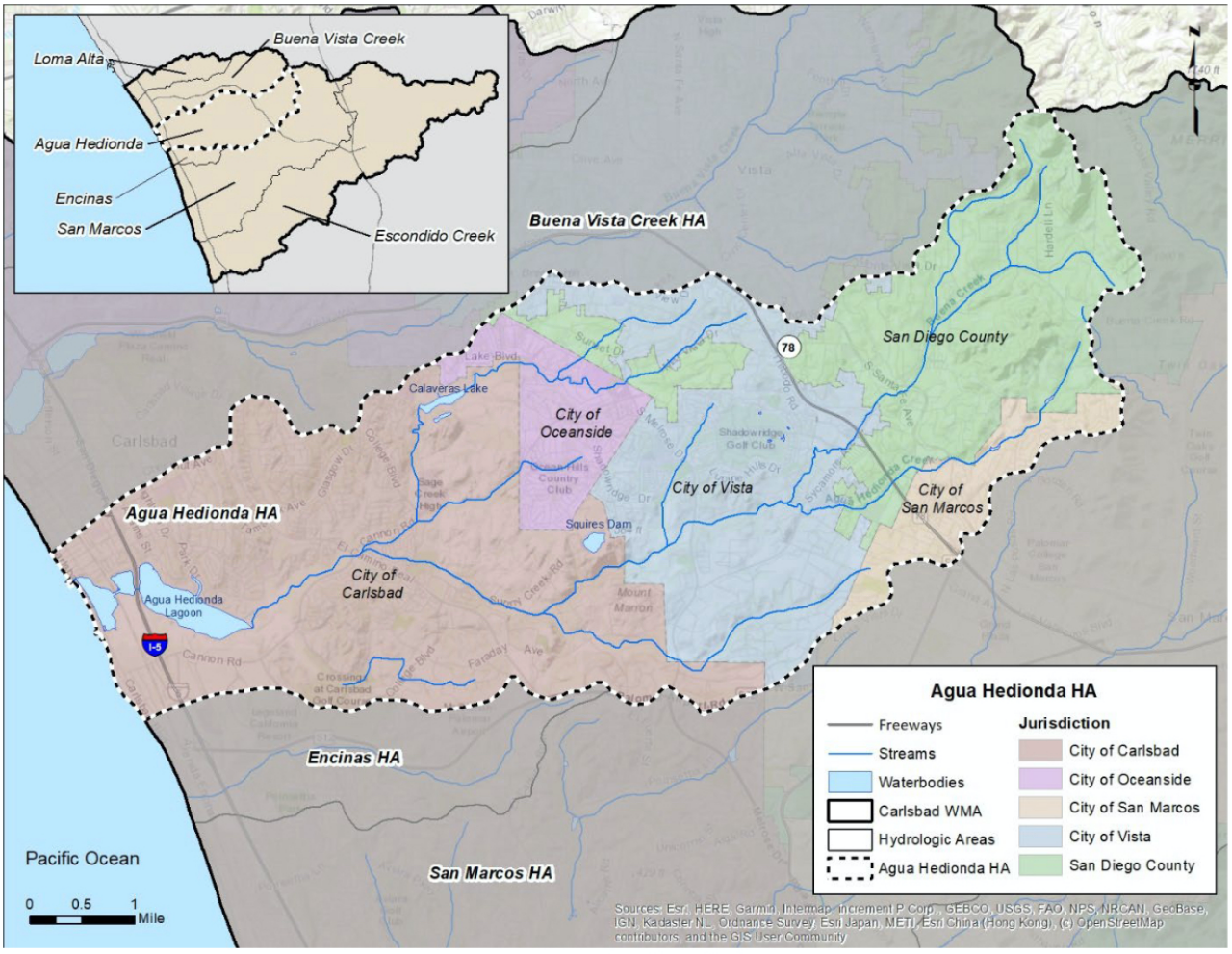


Figure 2: Agua Hedionda Hydrologic Unit (Source: Carlsbad Watershed Management Area-Annual Report p.A-HAA 14)

***Figure 3**: Agua Hedionda Lagoon; It's three sections are visible (Source: Google Maps)*

Agua Hedionda is the only lagoon in San Diego County which supports commercial and recreational uses. Carlsbad Desalinization Plant, Hubbs Seaworld fish hatchery and Carlsbad Aquafarm are at the west end; Ecke Family YMCA Aquatic Park, California Watersports and boat ramps are in the center section and a state ecological reserve and nature center are at the east end. The inner lagoon is designated REC-1 beneficial use (water sports) and the outer lagoon SHELL-1 for the aquafarm.
In June of 2020, installation of new fish-friendly seawater intake pumps at the Carlsbad Desalination Plant was completed. The three intake pumps are part of a broader effort to ensure the long-term health of the marine environment near the Desalination Plant. And in September of 2020, AB-1949 Fisheries: California Ocean Resources Enhancement and Hatchery Program was passed. The Bill strengthens and expands the marine fish hatchery program at the lagoon's fish hatchery and aquafarm— allowing additional breeding of the native California species that have been depleted by commercial and recreational fishing.

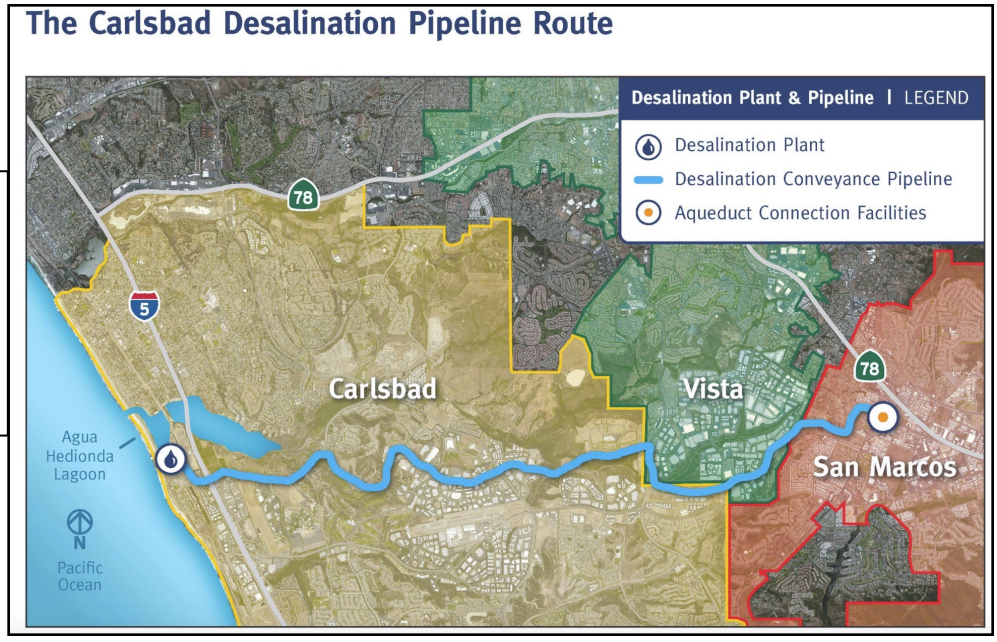


***Figure 4:** Poseidon Water assumed stewardship of the lagoon in 2019. (Source: [Carlsbad Desalination])*

Water Quality Conditions reported in the Carlsbad Watershed Management Area (WMA) Water Quality improvement Plan (WQIP) for 2021[1]:

Priority Water Quality Conditions are pollutants, stressors and/or receiving water conditions that have been identified through the Carlsbad WMA WQIP assessment process. The Annual Report for 2021 identified pollutants or stressors for the Agua Hedionda Hydrologic Area.

Table 30: Agua Hedionda HA Priority Water Quality Conditions

Waterbody	Hydrologic Area	Basin Number	Pollutant, Stressor or Condition	Beneficial Uses	Temporal Extent	Responsible Agencies Tributary to Waterbody
All water bodies within the Carlsbad WMA	All	All	Trash	All	Dry and Wet Weather	Oceanside, Vista, San Diego County, Carlsbad, Escondido, Encinitas, San Marcos, Solana Beach[1]
All water bodies within the Carlsbad WMA[2]	All	All	Riparian Habitat	WARM; REC-1	Dry and Wet Weather	Oceanside, Vista, San Diego County, Carlsbad, Escondido, Encinitas, San Marcos, Solana Beach[1]
Agua Hedionda Lagoon	Agua Hedionda	904.31	Fecal Indicator Bacteria[3]	SHELL	Wet Weather	Carlsbad, Oceanside, San Marcos, Vista, San Diego County
Agua Hedionda Lagoon	Agua Hedionda	904.31	Enterococcus[4]	REC-1	Dry and Wet Weather	Carlsbad, Oceanside, San Marcos, Vista, San Diego County
Agua Hedionda Creek	Agua Hedionda	904.30	Indicator Bacteria	REC-1	Dry and Wet Weather	Carlsbad, Oceanside, San Marcos, Vista, San Diego County
Agua Hedionda Creek	Agua Hedionda	904.30	Toxicity	WARM	Wet Weather	Carlsbad, Oceanside, San Marcos, Vista, San Diego County
Agua Hedionda Creek	Agua Hedionda	904.30	Nutrients Category[5]	WARM	Dry and Wet Weather	Carlsbad, Oceanside, San Marcos, Vista, San Diego County
Agua Hedionda Creek	Agua Hedionda	904.30	Sediment - Erosion – Hydromodification	-	Wet Weather	Carlsbad, Oceanside, San Marcos, Vista, San Diego County
Buena Creek	Agua Hedionda	904.30	Nitrate and Nitrite	Municipal & Domestic Water Supply (MUN)	Dry Weather	Vista, San Diego County

[1] This is a watershed-wide PWQC and all jurisdictions are listed. However, only the Cities of Carlsbad, Oceanside, San Marcos, and Vista and County of San Diego are located within the Agua Hedionda HA.

[2] Encinas HA does not have riparian habitat degradation as a priority water quality condition.

[3] Available data were collected by CDPH for the protection of public health related to commercial shellfish harvesting in the Lagoon. CDPH water quality benchmarks are established by the National Shellfish Sanitation Program and exist for fecal coliform only. These data were the basis for the evaluation. However, the Water Quality Control Plan for the San Diego Basin establishes a water quality objective for total coliform, for which no data exists. Due to this conflict and identified data gap, the pollutant is listed as fecal indicator bacteria, rather than a specific indicator.

[4] Data was collected by CDPH throughout the Lagoon for the protection of public health related to commercial shellfish harvesting. CDPH water quality benchmarks are established by the National Shellfish Sanitation Program and exist for fecal coliform only. In the absence of other information, these fecal coliform data were the basis for the REC-1 evaluation. However, the Bacteria Provisions adopted by the State Water Resources Control Board establish water quality objectives for enterococcus only in saline waters (e.g., lagoons, ocean), for which no recent data exists in the Lagoon. The evaluation of fecal coliform data does not indicate impairments to REC-1 in the Lagoon. However, due to concerns from the public and the RB, the condition was elevated to a priority. Consistent with the most recent statewide policy, monitoring will be performed for enterococcus, therefore the targeted pollutant is listed as such.

[5] Based on 2011 LTEA, nutrients category includes at least two or more of the following pollutants: Dissolved Phosphorous; Orthophosphate; Total Phosphorous; Total Kjeldahl Nitrogen; Total Nitrogen; Eutrophication; or Benthic Algae

Lagoon Dredging:

As a result of accumulated sedimentation, and the absence of significant tidal flushing, the lagoon was becoming an increasingly restricted salt water marsh. The entire lagoon was dredged and permanently opened to the sea between 1952 to1954 to provide a tidal prism adequate enough to supply cooling water for the San Diego Gas and Electric Company's Encina Power Plant located on the south side of the outer lagoon. The resultant deepening and tidal flushing created a new deepwater bay environment.

The lagoon has been dredged every one to four years since 1954. This began as part of the Encina power plant operations. Now that the Encina plant has been retired, Poseidon Water has taken over the dredging, as part of an agreement when the seawater desalination plant was built and came online in 2015.[2] Regular dredging is needed to remove sand that slowly enters the lagoon and forms a large sand bar in the western-most part of the lagoon.

[1] *CarlsbadWatershedManagementAreaWQIP Agua Hedionda HA (904.3) p.128*

[2] *https://www.carlsbadca.gov/news/displaynews.asp?NewsID=2277&TargetID=1*

Figure 5: Project Location Map for Dredging and Sand Replacement. Red outline indicates dredging area. (Source: Agua Hedionda Lagoon - Outer Basin 2020-21 Maintenance Dredge/ Beach Nourishment Cycle Sand Deposition Plan)

Dredging was most recently conducted from February of 2021 through mid-April of 2021. The project was completed during this time to minimize disruption of wildlife and beach visitors. Maintenance dredging was required to remove a flood-tide shoal in the Agua Hedionda Lagoon - Outer Basin in order to maintain the tidal exchange between the Lagoon and the ocean and provide seawater to support the operation of the Carlsbad Desalination Plant, which provides approximately 10% of the county's water supplies. During dredging operations, approximately 300,000 cubic yards(cy) of sand was removed from the lagoon – outer basin. In keeping with past operations, the dredged sand will be placed on adjacent beaches: North Beach, Middle Beach, and South Beach. The amount of sand placed on each of the receiver beaches was optimized based on computations of equilibrium beach profiles using current conditions and maximizing recreational beach widths in proportion to use (i.e. North Beach is more heavily recreated than Middle or South Beaches), while avoiding impact to sensitive hard bottom habitat. Using composite analysis, North Beach received 66% of dredged sand (approximately 200,00 cy), Middle and South Beach received 34% of the dredged material (approximately 100,00 cy) with an approximate distribution of 42% and 58%, respectively.[3]

[3] *Agua Hedionda Lagoon - Outer Basin 2020-21 Maintenance Dredge/Beach Nourishment Cycle Sand Deposition Plan*

Ongoing Restoration Projects within the Agua Hedionda Hydrologic Area:

The restoration projects have been identified in the CWMA WQIP 2021 Annual Report as goals to address riparian habitat degradation and hydromodification impact in order to support a healthy watershed. The Table[4] below shows goal progress based on advancing specific project implementation.

Table 5: Agua Hedionda HA Progress toward Interim and Final Numeric Goals

Goals			Baseline	Reporting Period Results	Goal Achieved or In Progress?
Dry and Wet Weather (City of Carlsbad)					
Riparian Habitat Degradation	2023 Interim Goal (2018-2023)	*50% of the Agua Hedionda Creek Restoration project schedule complete*	*0% of Agua Hedionda Creek Restoration Project Completed*	*The City of Carlsbad issued a request for qualifications to extend College Boulevard. As part of this long-term project, creek restoration would be completed. Progress details are provided in the strategy highlighted below (Section 3.2.2.).*	*In Progress*
	2028 Final Goal (2023-2028)	Completion of Agua Hedionda Creek Restoration project (8.81 acres of mitigated riparian and upland habitat) and long-term preservation through the City of Carlsbad's Habitat Management Plan			In Progress
Dry and Wet Weather (City of Vista)					
Hydromodification Impacts	2020 Interim Goal (2018-2020)	*10% of wetland creation completed adjacent to 700 feet of Roman Creek*	*0% of wetland creation adjacent to Roman Creek*	*0% of wetland creation. Required environmental studies for permits and CEQA were completed, a habitat management plan was developed, and project design was further refined. Agency review of application materials and preparation of permits is anticipated to continue through FY21-22.*	*In Progress[1]*
	2023 Interim Goal (2020-2023)	50% of wetland creation completed adjacent to 700 feet of Roman Creek			In Progress
	2026 Final Goal (2023-2026)	Completion/creation of approximate 2-acre wetlands adjacent to Roman Creek in the City of Vista's Buena Vista Park area			In Progress

Shaded italicized text denotes the selected compliance method to demonstrate progress for the approaching interim goal.

[1] Project completion is expected before the 2023 interim goal and 2026 final goal.

[4] https://projectcleanwater.org/watersheds/carlsbad-wma/ Agua Hedionda Hydrologic Unit p. 15

Purpose

The purpose of this annual report is to provide the water testing data for Agua Hedionda Creek Watershed that was collected during 2021(Appendices A and B). Each parameter will be evaluated for anomalies and the overall trends of the watershed will be summarized based upon this data. Monitoring was carried out in January, March, July,September and November of 2021. The data will also be compared with our previous years of data from 2020 and 2019 (Appendices C and D) as well as 2018 and 2017 data (Appendix E) that was collected by San Diego Coastkeeper.

Sampling Sites

The Agua Hedionda Creek team sampled the sites AH010, AH020 and AH030 identified by the yellow pins in the map shown in Figure 5. A photograph of each site can be viewed in Appendix F:

- AHL010-Samples the convergence of Calavera Creek, Agua Hedionda Creek, and other tributaries. This site is located at the eastern end of lagoon before recreational areas; close to the intersection of Cannon Rd and El Camino Real. There is no public access in the sample area.
- AHL020-Samples Calavera Creek in the Lake Calavera Preserve in Carlsbad. This site is protected open space.
- AHL030-Samples Agua Hedionda Creek under south Melrose in Vista under the 78 Freeway bridge. This site is at the very eastern most edge of Buena Vista Park. There is residential development to the east and undeveloped lands to the west.

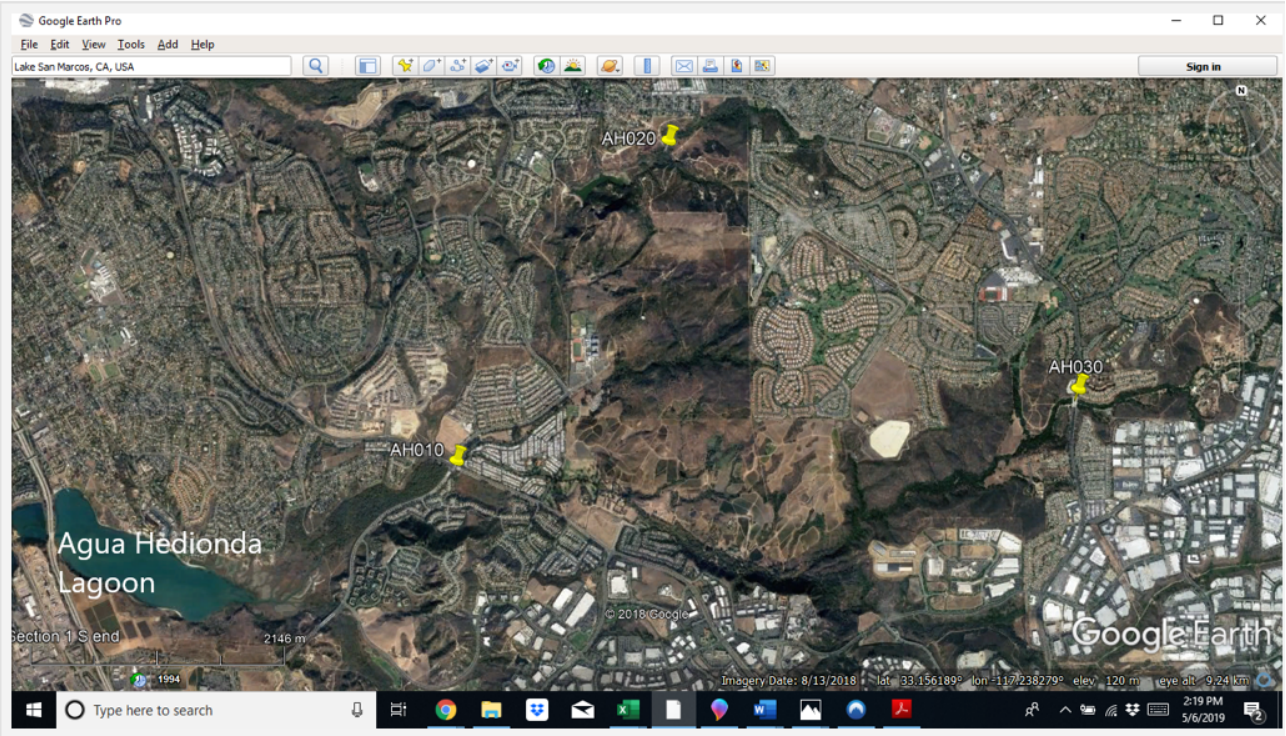
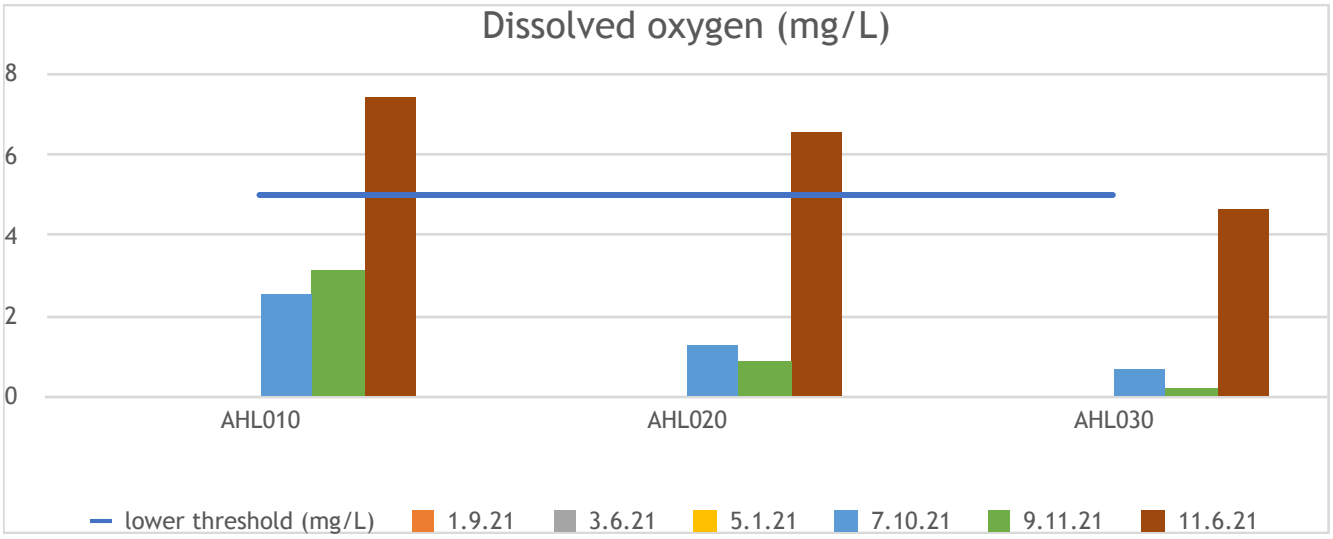


***Figure 6**- Agua Hedionda Creek sampling sites (Source: Google maps)*

Test Data and Results: Testing was conducted bimonthly during 2021 beginning in January on the following dates: January 9, March 6, May 1, July 10, September 11 and November 6. COVID procedures continued to impact some field parameter readings. Trash continues to be noted in and around some test site locations during the summer; most prominently AHL010. (See Appendix A for spreadsheet data.)

Field Parameters

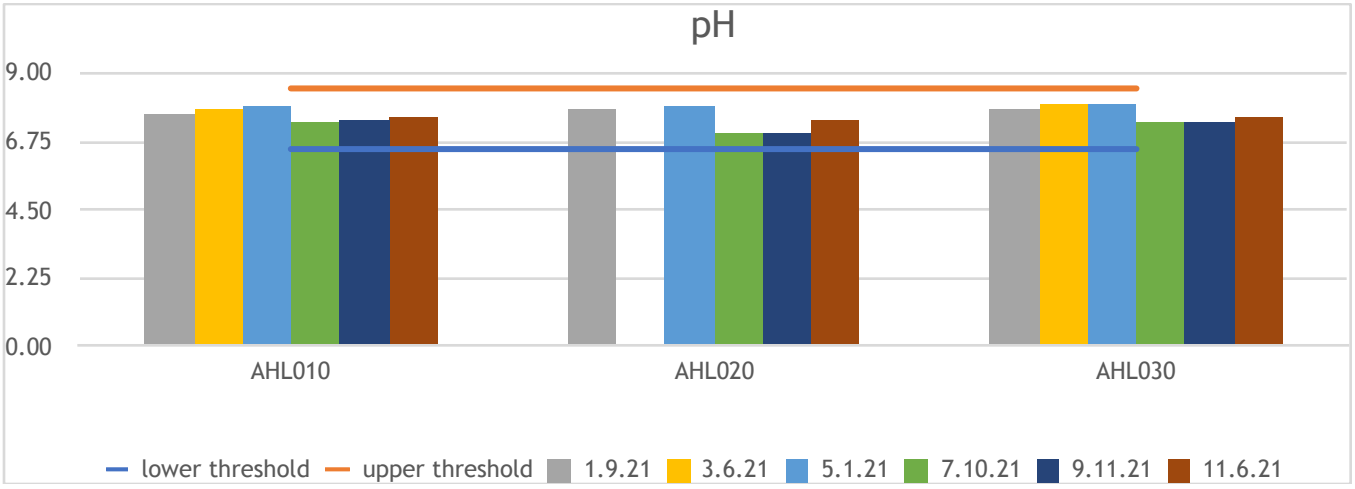
Dissolved Oxygen (DO): San Diego Basin Plan[5] threshold level for dissolved oxygen is 5.0 mg/L.or above. COVID procedures prevented DO reading during January, March and May field testing. Dissolved oxygen was well below the threshold level all sites during July and September. In November, DO was above threshold at sites AHL010 and AHL020, which represents a sufficient amount of oxygen in



the water for a healthy ecosystem, while site AHL030 was slightly below the threshold level.

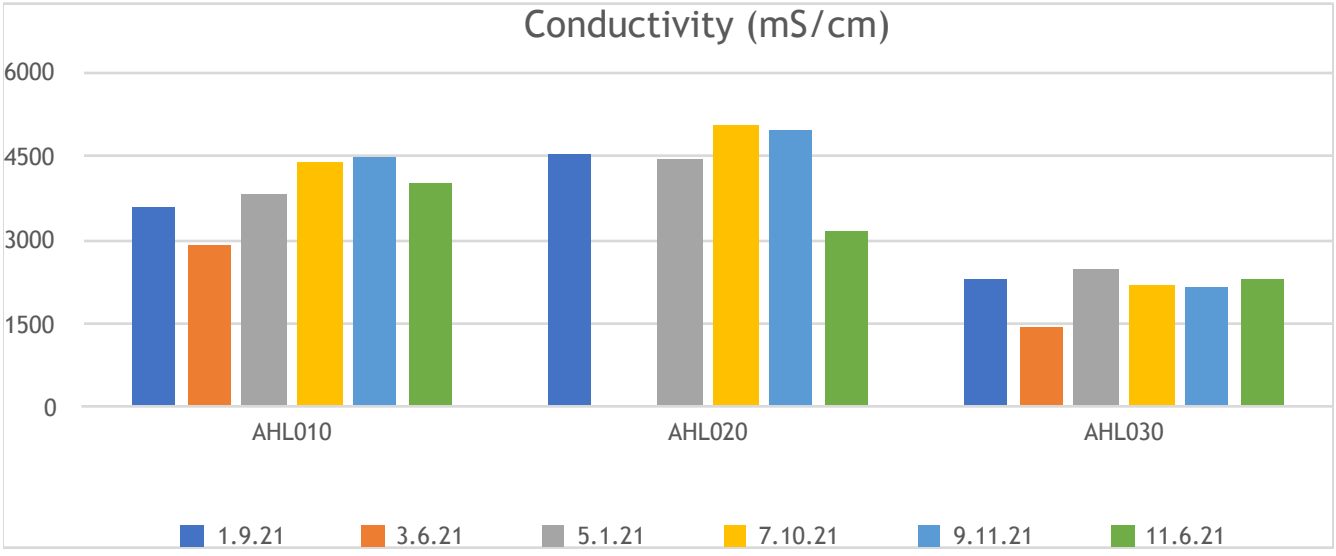
[5] https://www.waterboards.ca.gov/sandiego/water_issues/programs/basin_plan/docs/R9_Basin_Plan.pdf ; Appendix C

pH: The pH ranged from 7.01 to 8.5 for all sites. Data is missing for March at AHL020. All values fall within the acceptable range for the San Diego Basin Plan of 6.5-8.5.



Conductivity: Conductivity fluctuated between 1437 - 5053 µS/cm. There is no threshold for conductivity, it merely reflects the amount of dissolved minerals in the water, however, the California Waterboard typically sees levels between 100-2000 µS/cm in freshwater streams (*Electrical Conductivity/ Salinity Fact Sheet*).

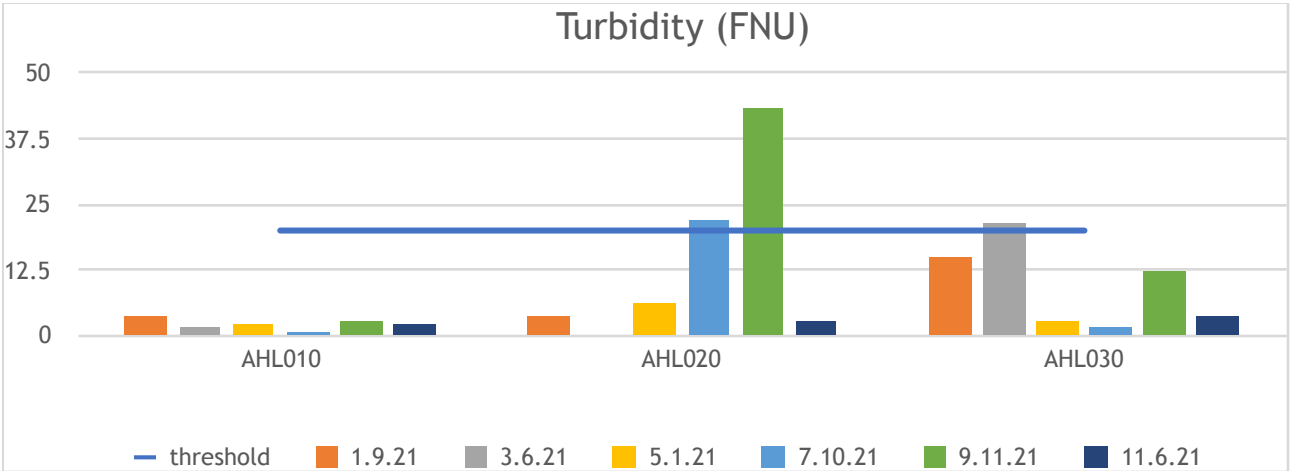
Conductivity was lower at site AHL 030 but all sites showed higher values than those typically seen in other freshwater streams in California; with one exception being March 6 value at AHL030 which was below 2000 µS/cm. There was no data available site AHL020 on March 6.



Laboratory Tests-Turbidity (cloudiness), total coliform, *Escherichia coli (E. coli)*, nitrates, total phosphorus, reactive phosphorus and ammonia are measured in the lab using 'grabbed' samples transported from the field.

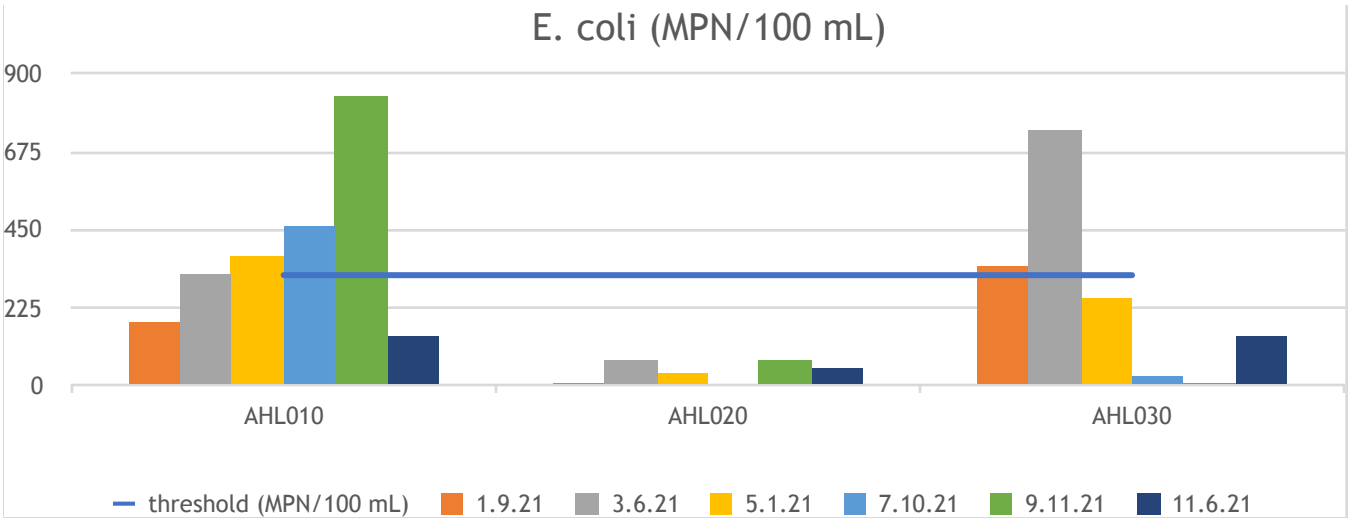
Turbidity: High turbidity can hinder the quantity light penetrating water which may affect photosynthesis. The threshold is 20 FNU.

Site AHL010 turbidity values were well below threshold throughout the year. Site AHL020 had the largest range; from well below threshold, to just above threshold and in September about double the threshold level. AHL020 turbidity sample was lost for March 6. Site AHL030 turbidity values were below threshold except for March 6 which was slightly above.



E. coli: Coliforms are a group of bacteria found in the digestive tracts of animals, including humans and their waste products. They are also found in plant and soil material. They may or may not indicate pathogenic bacteria. There is no threshold for these bacteria due to the wide types of sources. *E. coli*, however, is much more indicative of potential concern as many strains are pathogenic. The test we run, using IDEXX Quanti-tray/Colilert, measures all *E. coli*, pathogenic or not. The threshold for this bacteria is 320 MPN/100 mL^3.

There was a lot of fluctuation of *E. coli* levels within sites AHL 010 and 030. Site AHL 010 showed the highest levels of *E.Coli* overall and had values above the threshold on three test dates. Site AHL 020 was consistently well below the threshold level on all testing dates. Site AHL 020 had a value of zero in July which should be noted. Site AHL 030 had a value well above threshold in March and just above threshold in January.

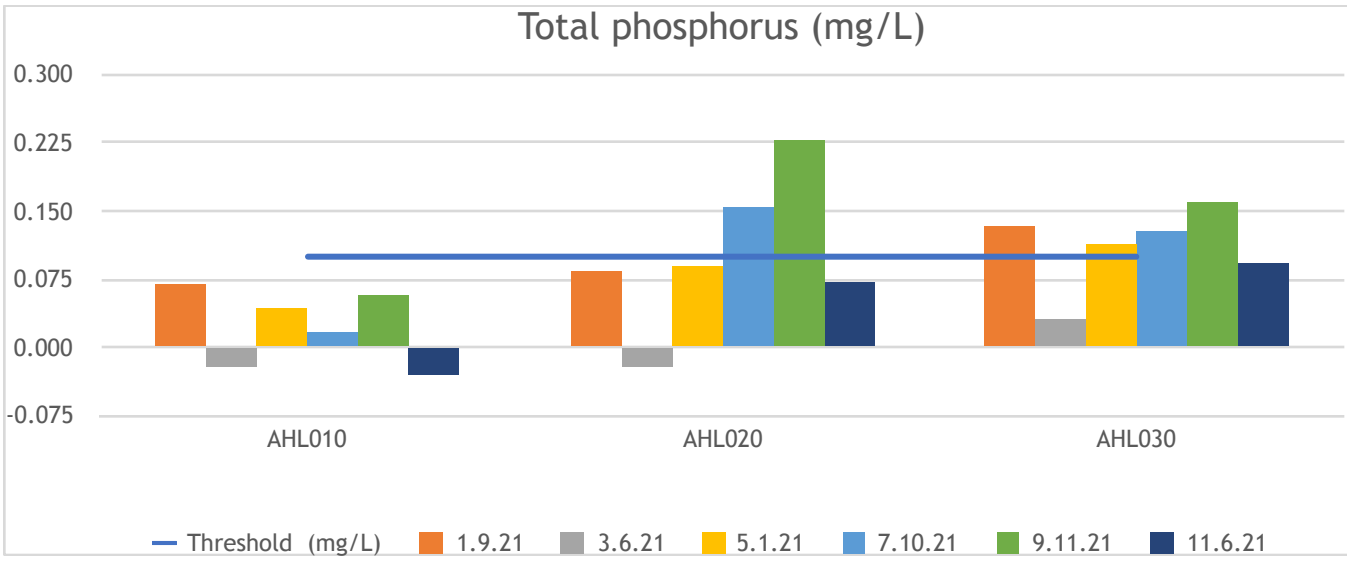


<u>Total Phosphorus</u>: Elevated phosphorus is often the result of fertilizer runoff and can lead to algal blooms. The threshold for San Diego watersheds is 0.1 mg/L[3].

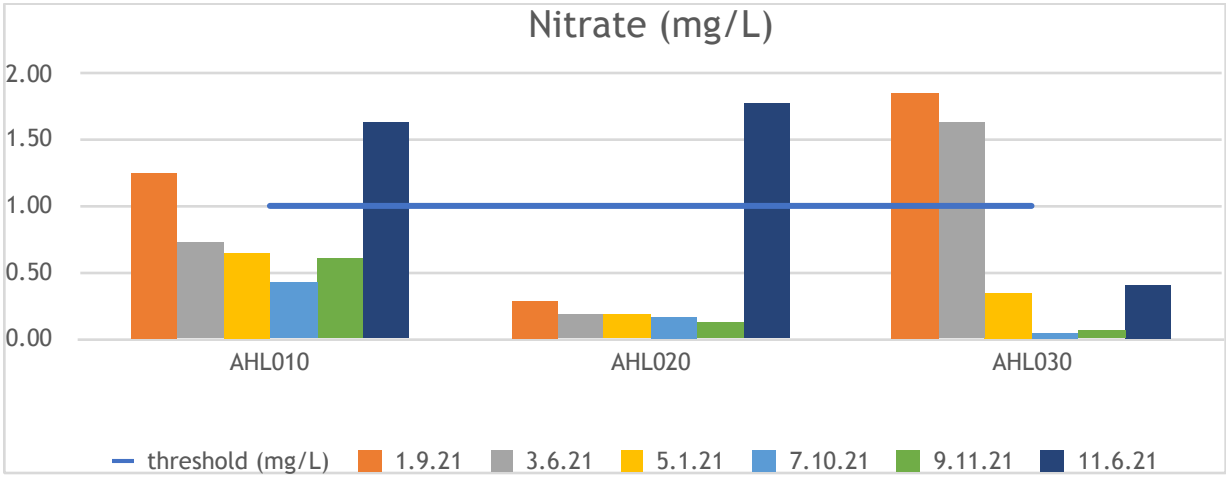
Site AHL010 in March and November had negative values. In May and July values were positive but **low enough to be considered under range**. The other two values were below threshold and within what is considered the normal range.

Site AHL 020 had a negative value in March. Values in July and September were above threshold.

Site AHL030 March value was under testing range. — Confusing as not marked in data sheet. There were four values that were above threshold.

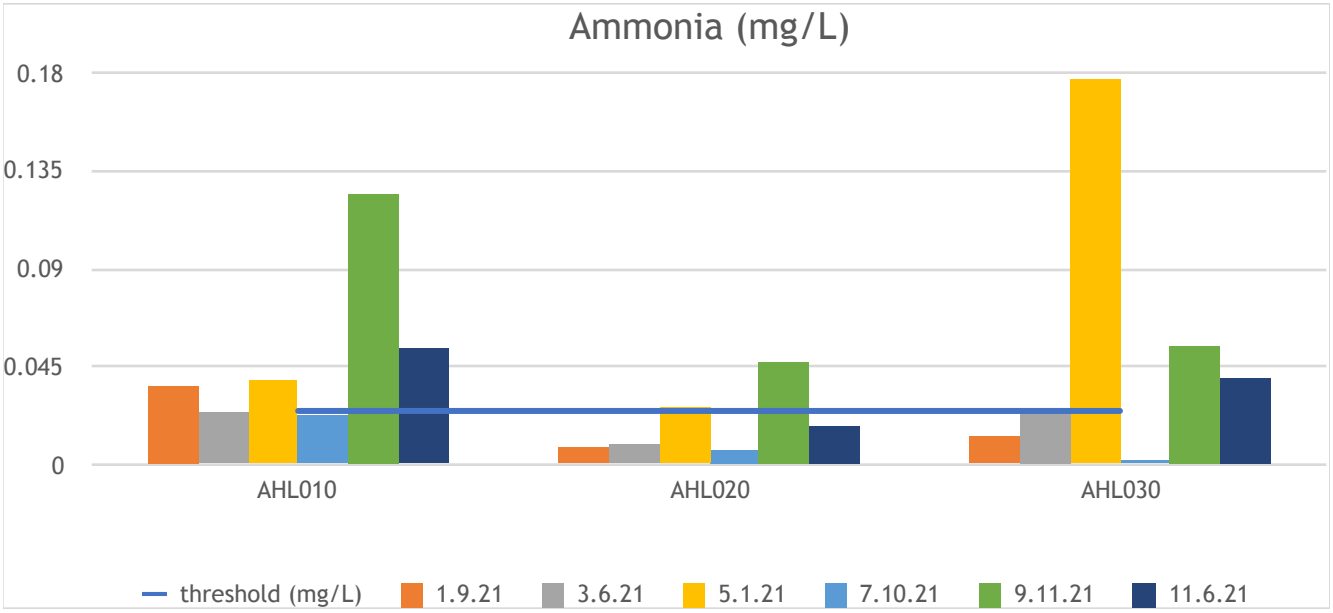


Nitrates: Nitrates generally enter waterways from fertilizer runoff. Threshold level for nitrates is 1.0 mg/L. Values for nitrates fluctuated among the three test sites. Check under-range values



Ammonia- Ammonia is another form of nitrogen. It can cause direct toxic effects on aquatic life. Ammonia can enter waterways through direct means such as municipal effluent discharges and the excretion of nitrogenous wastes from animals, and indirect means such as and runoff from agricultural lands. Ammonia's threshold is 0.025 mg/L. Ammonia measurements fluctuated across all sites and dates with two values well over threshold.The highest ammonia levels were found a site AHL010; four out of five readings were above threshold. Several reading a noted as below range.

New ammonia protocol were implemented in 2021. [6]



[6] *See notes- Appendix C.*

Data Comparison With Previous Years

San Diego Coastkeeper's testing procedures and protocols were followed when the testing was taken over by NSDCWMP but the testing months had been very inconsistent during the previous testing years; 2017-2019 (See Appendix A). Missing and inconsistent testing dates does make data comparison challenging. Going forward, NSDCWMP is working toward completing regular bimonthly testing each year going forward. Volunteers were able to collect data six times in 2021(with the exception of dissolved Oxygen-see below); January, March, May, July, September and November and we hope to continue this trend in the coming years. This will permit us to do more complete data comparison and identify trends.

Dissolved Oxygen

Unfortunately, due to COVID testing procedures, no data was collected during January, March or May this year, As a result, we are not able to make any comparisons with last year because dissolved oxygen measurements in 2020 were only collected in January and March.

In previous years, January and March measurements were well above threshold. In fact, 2020 measurements were highest recorded to date. It should be noted they are cooler temperature months. In 2021 measurement were well below threshold level in August and September at all test sites (hottest temperature during the year). Dissolved oxygen was above threshold at sites AHL010 and AHL020 in November, while site AHL030 was slightly below threshold.

pH

pH continued to fall within the acceptable range for all of 2021; which is consistent with all of the previous four testing years. (There was one exception in 2020 as site AHL 010 had one measurement slightly below the acceptable range in September.)

Turbidity

Turbidity measurements for site AHL010 were consistent with previous years and well below threshold.

Site AHL020 had over threshold levels for July and September—while other months were well below. In previous years, most measurements at site AHL 020 were well under threshold, although the measurements were generally higher than sites AHL010 and AHL030. There were two exception at Site AHL 020, one in 2019 and one in 2020. It should be noted, it is difficult, with limited turbidity data as well as missing water depth data, to discern the effects of low water levels.

Turbidity measurements for sites AHL010 and AHL 030 were well below threshold in 2020. This was generally the case for measurements from 2017-2019. Most measurements at Site AHL 020 were well under threshold, although the measurements were generally higher than Sites AHL 010 and AHL 020.

Volunteers have begun adding data on the collection site depth of the water samples. Addition study needs to be done to understand the significance, if any, of this data.

E. coli

In 2021, site AHL020 follows trends from previous years; *E. coli* levels were well below threshold. There did not appear to be an effect related to time of year nor seasonal temperatures.

E. coli measurements at site AHL010 followed trends from previous years; particularly 2020 where there were five data collections available for comparison. E. coli measurements were higher, and above threshold, during the warmer months and below threshold in cooler months.

.At sites AHL010 and AHL030 during cooler months levels were below threshold but readings tended to rise well above threshold in warmer months.

It should also be noted that although *E. coli* measurements were above threshold at sites AHL010 and AHL030 we are hopeful that *E. coli* found at the sites is trending down. It should also be noted that because of the disparity and inconsistency of earlier testing dates, we will need to rely on further testing in coming years.

Highest E. coli Measure per Year Among All Sites

Year	Highest MPN/100 mL	Site	Month
2021	836	AHL010	Sept
2020	613	AHL010	Sept
2019	1259	AHL010	July
2018	3130	AHL010	Aug
2017	1664	AHL010	Aug

Total Phosphorus

Total phosphorus is difficult to compare time of year and over years. The measurements do not appear to follow consistent trends although AHL010 does generally have lower phosphate and fewer values over threshold.

Nitrates

Although gaps in data from previous years make comparisons difficult, there should be concerns regarding continuing data that shows over threshold measurements. Each site showed at least one over-threshold result for nitrates. As we are able to make consistent bimonthly water samples over the coming years, any trends should become clearer.

Ammonia

Ammonia mirrors nitrates with gaps in data and also continues to show above threshold readings at all sampling sites but with each site showing at least two over-threshold re-

sult for ammonia.

Discussion Points

We were able to gather a complete year of bi-monthy data for 2021; with just a few individual data points missing as a result of COVID protocols or equipment or lab procedure malfunctions. Ask Paige about reporting of E. coli to respesctive organizations.

Need help with this- maybe we can brainstorm.

APPENDIX A: 2021 NSDCWMP DATA COLLECTION SPREADSHEET

Date	Site	Collection time	Avg DO (mg/L)	Avg Conductivity (uS/cm)	Avg pH	Avg Water temp (˚C)	Avg air temp (˚C)	turbidity (FNU)	Total phosphorus (mg/L)	Reactive phosphorus (mg/L)	Nitrate (mg/L)	Ammonia (mg/L)
1/9/21	AHL010	10:58 AM	NA	3587	7.63	NA	NA	3.82	0.069	0.046	1.254	0.036
1/9/21	AHL020	9:58 AM	NA	4517	7.82	NA	NA	3.93	0.085	0.074	0.278	0.008
1/9/21	AHL030	9:10 AM	NA	2267	7.78	NA	NA	14.8	0.135	0.211	1.844	0.013
threshold			5.0		6.5-8.5			20.00	0.100		1.000	0.025
UNDER RANGE												

Date	Site	Total coliform (MPN/100 mL) 1:10	*E. coli* (MPN/100 mL) 1:10	Total coliform (MPN/100 mL)	*E. coli* (MPN/100 mL)	Collection site depth (")	Flow (N,B,M,R,F)	Ppt within 72 hr?
1/9/21	AHL010	866.4	18.5	8664	185	14	3	n
1/9/21	AHL020	43.7	1	437	10	10	2	n
1/9/21	AHL030	816.4	34.5	8164	345	8	3	n
threshold					320			

Appendix A: Continued

Date	Site	Collection time	Avg DO (mg/L)	Avg Conductivity (uS/cm)	Avg pH	Avg Water temp (˚C)	Avg air temp (˚C)	turbidity (FNU)	Total phosphorus (mg/L)	Reactive phosphorus (mg/L)	Nitrate (mg/L)	Ammonia (mg/L)
3/6/21	AHL010	11:46 AM	NA	2930	7.85	NA	NA	1.74	-0.022	0.042	0.726	0.024
3/6/21	AHL020	10:30 AM	NA	NA	NA	NA	NA	NA	-0.02	0.043	0.185	0.01
3/6/21	AHL030	9:11 AM	NA	1437	8.00	NA	NA	21.70	0.031	0.058	1.627	0.026
threshold			5		6.5-8.5			20.00	0.1		1	0.025
UNDER RANGE												

Date	Site	Total coliform (MPN/100 mL) 1:10	*E. coli* (MPN/100 mL) 1:10	Total coliform (MPN/100 mL)	*E. coli* (MPN/100 mL)	Collection site depth (")	Flow (N,B,M,R,F)	Ppt within 72 hr?
3/6/21	AHL010	816.4	32.3	8164	323.0	24	3	yes
3/6/21	AHL020	37.7	7.4	377	74.0	9	2	yes
3/6/21	AHL030	816.4	73.8	8164	738.0	8	3	yes
threshold					320			

Appendix A: Continued

Date	Site	Collection time	Avg DO (mg/L)	Avg Conductivity (uS/cm)	Avg pH	Avg Water temp (˚C)	Avg air temp (˚C)	turbidity (FNU)	Total phosphorus (mg/L)	Reactive phosphorus (mg/L)	Nitrate (mg/L)	Ammonia (mg/L)
5/1/21	AHL 010	10:37AM	NA	3790	7.92	NA	NA	2.11	0.042	0.024	0.636	0.039
5/1/21	AHL 020	9:52am	NA	4410	7.92	NA	NA	6.14	0.091	0.036	0.179	0.027
5/1/21	AHL 030	9:15am	NA	2460	7.96	NA	NA	2.44	0.114	0.094	0.346	0.177
threshold			5		6.5-8.5			20.00	0.100		1.000	0.025
UNDER RANGE												

Date	Site	Total coliform (MPN/100 mL) 1:10	*E. coli* (MPN/100 mL) 1:10	Total coliform (MPN/100 mL)	*E. coli* (MPN/100 mL)	Collection site depth (")	Flow (N,B,M,R,F)	Ppt within 72 hr?	notes
5/1/21	AHL010	1299.7	37.3	12997.0	373.0	32	3	N	
5/1/21	AHL020	51.2	4.1	512.0	41.0	7	2	n	
5/1/21	AHL030	198.9	25.6	1989.0	256.0	20	2	n	
threshold					320				

Appendix A: Continued

Date	Site	Collection time	Avg DO (mg/L)	Avg Conductivity (uS/cm)	Avg pH	Avg Water temp (˚C)	Avg air temp (˚C)	turbidity (FNU)	Total phosphorus (mg/L)	Reactive phosphorus (mg/L)	Nitrate (mg/L)	Ammonia (mg/L)
7/10/21	AHL 010	11:44 AM	2.54	4363	7.33	23.2	28.0	0.73	0.018	0.036	0.421	0.023
7/10/21	AHL 020	10:38 AM	1.27	5053	7.02	19.3	29.3	22.20	0.155	0.059	0.157	0.007
7/10/21	AHL 030	9:29 AM	0.71	2177	7.34	18.9	23.6	1.64	0.129	-0.086	0.044	0.002
threshold			5		6.5-8.5			20.00	0.1		1	0.025
UNDER RANGE												

Date	Site	*E. coli* (MPN/100 mL) 1:10	Total coliform (MPN/100 mL)	*E. coli* (MPN/100 mL)	Collection site depth (")	Flow (N,B,M,R,F)	Ppt within 72 hr?	notes
7/10/21	AHL010	46.4	>24196	464.0	24	2	N	Some trash
7/10/21	AHL020	0.0	7270.0	0.0	6	1	N	stagnant, very shallow
7/10/21	AHL030	3.1	10462.0	31.0	24	1	N	Move a bit downstream from normal location which had more water
Threshold				320				

Appendix A: Continued

Date	Site	Collection time	Avg DO (mg/L)	Avg Conductivity (uS/cm)	Avg pH	Avg Water temp (°C)	Avg air temp (°C)	turbidity (FNU)	Total phosphorus (mg/L)	Reactive phosphorus (mg/L)	Nitrate (mg/L)	Ammonia (mg/L)
9/11/21	AHL010	11:49 AM	3.12	4473	7.49	23.6	27.7	2.48	0.058	0.021	0.612	0.125
9/11/21	AHL020	10:47 AM	0.88	4943	7.01	19.4	22.3	43.60	0.227	0.043	0.127	0.047
9/11/21	AHL030	9:23 AM	0.23	2156	7.39	20.1	22.2	12.30	0.160	0.132	0.073	0.055
threshold			5		6.5-8.5			20.00	0.100		1.000	0.025

Date	Site	Total coliform (MPN/100 mL) 1:10	*E. coli* (MPN/100 mL) 1:10	Total coliform (MPN/100 mL)	*E. coli* (MPN/100 mL)	Collection site depth (")	Flow (N,B,M,R,F)	Ppt within 72 hr?
9/11/21	AHL010	>2419.6	83.6	>24196	836.0	24	3	yes (within watershed)
9/11/21	AHL020	396.8	7.4	3968.0	74.0	6.5	2	yes (within watershed)
9/11/21	AHL030	816.4	1.0	8164.0	10.0	22	1	yes (within watershed)

Appendix A: Continued

Date	Site	Collection time	Avg DO (mg/L)	Avg Conductivity (uS/cm)	Avg pH	Avg Water temp (˚C)	Avg air temp (˚C)	turbidity (FNU)	Total phosphorus (mg/L)	Reactive phosphorus (mg/L)	Nitrate (mg/L)	Ammonia (mg/L)
11/6/21	AHL010	11:59AM	7.43	4010	7.53	17.5	18.9	2.38	-0.029	0.035	1.620	0.053
11/6/21	AHL020	10:34AM	6.59	3147	7.47	15.3	16.4	2.85	0.073	0.050	1.760	0.018
11/6/21	AHL030	9:35AM	4.63	2300	7.56	15.0	15.6	3.54	0.093	-0.104	0.413	0.040
threshold			5		6.5-8.5			20.00	0.100		1.000	0.025

Date	Site	**Total coliform (MPN/100 mL) 1:10**	***E. coli* (MPN/100 mL) 1:10**	Total coliform (MPN/100 mL)	***E. coli* (MPN/100 mL)**	Collection site depth (")	Flow (N,B,M,R,F)	Ppt within 72 hr?
11/6/21	AHL010	2419.6	14.5	24196.0	145.0	26	2	N
11/6/21	AHL020	110.6	5.2	1106.0	52.0	8	2	N
11/6/21	AHL030	387.3	14.6	3873.0	146.0	12	2	N
threshold					320			

Appendix B: Volunteers' Data Collection Notes Throughout 2021

date	Notes
1/9/21	New ammonia protocol: filter in field and pour ~50 mL into a bottle with 0.1 mL 10N HCl (to lower pH to <2). pH adjust back to neutral just before assay in lab.
3/6/21	Used filtered for total P; adjusted pH for ammonia in the field as above.
5/1/21	adjusted pH for ammonia to <2 in field then readjusted to 6.5-7.7 in lab. However, actual assay not run for about 1 hour.
7/9/21	BTQ030 sampled about 20m downstream from normal site where there was more water. AHL030 sampled upstream since normal site was dry. Per Erick this is ok as long as not sampling from different tributary.
9/11/21	Up to this point in time none of the nutrient readings have been corrected for the reagent blank. Can do this automatically on the DR3900. Make sure anyone running these tests knows how to do this. 9/11/21, 7/10/21, 5/1/21, 3/6/21, 1/9/21 have been corrected. Nov. readings were automatically corrected for the lab/reagent blank.

Appendix C:
2020 NSDCWMP DATA COLLECTION SPREADSHEET:

2020-Date	Site	Collection time	Avg DO (mg/L)	Avg Conductivity (uS/cm)	Avg pH	turbidity (FNU)	Total phosphorus (mg/L)	Reactive phosphorus (mg/L)	Nitrate (mg/L)	Ammonia (mg/L)	Total coliform (MPN/100 mL)	*E. coli* (MPN/100 mL)
5/2/20	**no data**											
7/4/20	AHL 010	10:30 AM	ND	3837	7.67	1.63	0.041	0.088	0.930	0.041	53.7	537
7/4/20	AHL 020	11:21 AM	ND	4123	7.57	7.07	0.086	0.771	0.304	0.028	7.5	75
7/4/20	AHL 030	12:13 PM	ND	2457	7.85	1.00	0.068	0.657	1.280	0.030	6.3	63
9/12/20	AHL 010	10:30 AM	ND	3173	6.10	1.56	0.025	-0.046	1.09	0.074	61.3	613
9/12/20	AHL 020	11:27 AM	ND	4907	7.28	21.10	0.152	-0.064	0.385	0.037	4.1	41
9/12/20	AHL 030	12:12 PM	ND	2647	7.77	1.97	0.063	-0.015	0.35	0.022	59.4	594
11/10/20	AHL 010	10:20 AM	ND	ND	ND	2.5	0.061	0.046	1.280	0.061	30.1	301
11/10/20	AHL 020	11:55 AM	ND	ND	ND	3.43	0.081	0.034	0.546	0.019	6.3	63
11/10/20	AHL 030	11:00 AM	ND	ND	ND	3.71	0.162	0.123	1.330	0.06	29.8	298

Appendix D:
2019 NSDCWMP DATA COLLECTION SPREADSHEET:

2019-mo	Site	DO mg/L	Con-duct µS/cm	PH	Tur-bidity FNU	Ttl Phosp mg/L	Reac Phos mg/L	Nitrate mg/L	Ammo-nia mg/L	Total Colif MPN/ 100mL	E. Coli MPN/ 100mL
July	AHL 010	4.59	3980	7.45	3.32	0.015	0.015	0.734	0.039	>24196	1259
	AHL 020	3.22	4778	7.16	27.5	0.01	0.016	0.185	0.018	3968	31
	AHL 030	5.07	2470	7.70	3.05	0.081	0.086	0.136	0.017	4569	860
Sep	AHD 010	3.72	4750	7.48	14.1	0.021	0.02	0.529	0.098	>24196	548
	AHD 020	1.14	4830	6.89	122	0.132	0.127	0.390	0.209	2382	0
	AHD 030-dry										
Nov	AHL 010	6.62	4723	7.65	4.07	0.012	0.01	1.51	0.056	24196	281
	AHL 020 - dry										
	AHL 030-dry										

Appendix D: Continued

Date	Site	Collection time	Collection site depth (")	Flow (N,B,M,R,F)	Ppt within 72 hr?	notes
7/6/19	AHL010	11:56 AM	7	3.5	N	stream wider and deeper since 2018 after dredging
7/6/19	AHL020	10:50 AM	7	2	N	water higher than usual
7/6/19	AHL030	9:30 AM	13	2	N	water higher than usual
7/6/19	AHL020 Field blank					
9/7/19	AHL010	11:59 AM	9	3	y	near homeless encampment, sediment much greater than field duplicate (by eye)
9/7/19	AHL010 FD	12:01 PM	9	3	y	
9/7/19	AHL020	10:28 AM	3.5	1	y	water clearly rust colored
9/7/19	AHL030-dry					
11/2/19	AHL010	10:32 AM	8	2	N	
11/2/19	AHL020 - dry					
11/2/19	AHL030-dry					
11/2/19	AHL010	10:32 AM	8	2	N	
11/2/19	AHL010 lab duplicate	10:32 AM				

Appendix E: San Diego Coastkeeper's

San Diego Coastkeeper's data for Agua Hedionda Creek 2018

2018 -mo	Site	DO mg/L	Con-duct µS/cm	PH	Tur-bidity FNU	Ttl Phosp mg/L	Reac Phos mg/L	Ni-trate mg/L	Am-monia mg/L	Total Colif MPN/ 100mL	E. Coli MPN/ 100mL
Apr	AHL010	5.94	3840	7.71	0.757	0.011	0.013	0.544	0.025	1483	388
	AHL020	5.18	4287	7.52	3.6	0.015	-0.094	0.145	0.011	51	0
	AHL030	6.2	2370	7.87	0.71	0.064	0.065	0.22	0.004	1455	613
June	AHL010	4.82	4077	7.58		0.009	0.012	0.52	0.023	6867	905
	AHL020	3.81	4847	7.31		0.017	0.021	0.135	0.012	72	10
Aug	AHL010	3.32	4500	7.61	0.751	0.042	0.149	0.202	0.116	15531	3130
Oct	AHL010	2.51	4227	7.51	1.14	0.043	0.044	0.506	0.088	15531	1153
	AHL020	2.03	6927	6.36	6.53	0.02	0.03	0.155	0.032	1626	411
Dec	AHL010	7.34	2040	7.85							
Dec	AHL020	5.07	2860	7.25							
Dec	AHL030	6.32	914	7.63							

Appendix E: San Diego Coastkeeper's Data: Continued

San Diego Coastkeeper's Spreadsheet Data 2017

2017-mo	Site	DO mg/L	Conduct µS/cm	PH	Turbidity (FNU)	Ttl Phosp mg/L	Reac Phos mg/L	Nitrate mg/L	Ammonia mg/L	Total Colif MPN/100mL	E Coli MPN/100mL
Aug	AHL010	4.34	3536	7.53	1.2	0.001	0.015	0.477	-0.01	3873	1664
Sept	AHL010	3.62	4273	7.7	1.34	0.012	0.039	0.371	0.057	2247	670
Oct	AHL010	4.57	4345	7.79	0.635	-0.073	0.123	0.271	0.056	2755	109
Nov	AHL010	5.84	4557	7.79	0.797	0.013	0.018	0.727	0.046	224	230
Nov	AHL020	4.36	5601	7.31	7.07	0.026	0.027	0.158	0.025	30	20
Dec	AHL010	7.71	4216	7.89	0.505	0.011	0.008	0.785	0.028	1285	613
Dec	AHL020	5.66	5190	7.47	6.35	0.025	0.015	0.049	0.014	771	98

Appendix F: Site Photos taken April 19, 2021 Karen Merrill and Ellen Bartlett

Site AHL010

Appendix F: Continued

Site AHL 020

AppendixF: Continued

Site AHL 030