

**Redwood Shores Lagoon
February 2017
Monthly Water Quality Monitoring Report**



Prepared for

**Redwood City
Public Works Services Department
1400 Broadway
Redwood City, CA 94063-2594**

Prepared by

**Clean Lakes, Inc.
P. O. Box 3186
Martinez, CA 94553**

March 2017

RESULTS - Water quality results for each site is provided below in Table format for 2017 to allow comparison of results from month to month.

SITE R-1

	Ortho		Fecal		Dissolved							
	Phosphate	Nitrate as N	Coliform	Fecal	Water	Oxygen	DO		PH	PH		
Months	mg/l	mg/l	MPN/100 ml	MPN/100 ml	Temp	(DO)	mg/l	PH	Lower	Upper	Salinity	Turbidity
				Limit	C°	mg/l	Limit		Limit	Limit	ppt	NTU
1.17	ND	ND	ND	1,000	11.4	17.72	5	9	6.5	8.5	21.47	6.73
2.17	0.12	ND	2	1,000	16.1	20.52	5	9.1	6.5	8.5	22.43	10.2
3.17				1,000			5		6.5	8.5		
4.17				1,000			5		6.5	8.5		
5.17				1,000			5		6.5	8.5		
6.17				1,000			5		6.5	8.5		
7.17				1,000			5		6.5	8.5		
8.17				1,000			5		6.5	8.5		
9.17				1,000			5		6.5	8.5		
10.17				1,000			5		6.5	8.5		
11.17				1,000			5		6.5	8.5		
12.17				1,000			5		6.5	8.5		

SITE R-2

	Ortho		Fecal		Dissolved							
	Phosphate	Nitrate as N	Coliform	Fecal	Water	Oxygen	DO		PH	PH		
Months	mg/l	mg/l	MPN/100 ml	MPN/100 ml	Temp	(DO)	mg/l	PH	Lower	Upper	Salinity	Turbidity
				Limit	C°	mg/l	Limit		Limit	Limit	ppt	NTU
1.17	ND	ND	ND	1,000	11.9	14.2	5	8.4	6.5	8.5	23.88	17
2.17	0.12	ND	4.5	1,000	14.9	8.78	5	8.3	6.5	8.5	25.62	24.9
3.17				1,000			5		6.5	8.5		
4.17				1,000			5		6.5	8.5		
5.17				1,000			5		6.5	8.5		
6.17				1,000			5		6.5	8.5		
7.17				1,000			5		6.5	8.5		
8.17				1,000			5		6.5	8.5		
9.17				1,000			5		6.5	8.5		
10.17				1,000			5		6.5	8.5		
11.17				1,000			5		6.5	8.5		
12.17				1,000			5		6.5	8.5		

SITE R-3

				Dissolved						
	Ortho		Water	Oxygen	DO		PH	PH		
	Phosphate	Nitrate as N	Temp	(DO)	mg/l		Lower	Upper	Salinity	Turbidity
Months	mg/l	mg/l	C°	mg/l	Limit	PH	Limit	Limit	ppt	NTU
1.17	0.13	ND	11.3	9.43	5	7.8	6.5	8.5	27.73	51.4
2.17	ND	ND	14.3	8.21	5	7.9	6.5	8.5	25.44	38.2
3.17					5		6.5	8.5		
4.17					5		6.5	8.5		
5.17					5		6.5	8.5		
6.17					5		6.5	8.5		
7.17					5		6.5	8.5		
8.17					5		6.5	8.5		
9.17					5		6.5	8.5		
10.17					5		6.5	8.5		
11.17					5		6.5	8.5		
12.17					5		6.5	8.5		

SITE R-4

				Dissolved						
	Ortho		Water	Oxygen	DO		PH	PH		
	Phosphate	Nitrate as N	Temp	(DO)	mg/l		Lower	Upper	Salinity	Turbidity
Months	mg/l	mg/l	C°	mg/l	Limit	PH	Limit	Limit	ppt	NTU
1.17	0.14	ND	11.5	10.07	5	8.4	6.5	8.5	23.78	60.3
2.17	0.17	ND	14.3	9.11	5	7.8	6.5	8.5	26.31	42.7
3.17					5		6.5	8.5		
4.17					5		6.5	8.5		
5.17					5		6.5	8.5		
6.17					5		6.5	8.5		
7.17					5		6.5	8.5		
8.17					5		6.5	8.5		
9.17					5		6.5	8.5		
10.17					5		6.5	8.5		
11.17					5		6.5	8.5		
12.17					5		6.5	8.5		

				Dissolved						
	Ortho		Water	Oxygen	DO		PH	PH		
	Phosphate	Nitrate as N	Temp	(DO)	mg/l		Lower	Upper	Salinity	Turbidity
Months	mg/l	mg/l	C°	mg/l	Limit	PH	Limit	Limit	ppt	NTU
1.17	ND	ND	10.8	7.88	5	8.2	6.5	8.5	23.7	10.9
2.17	0.15	ND	14.5	8.83	5	8.2	6.5	8.5	25.26	35
3.17					5		6.5	8.5		
4.17					5		6.5	8.5		
5.17					5		6.5	8.5		
6.17					5		6.5	8.5		
7.17					5		6.5	8.5		
8.17					5		6.5	8.5		
9.17					5		6.5	8.5		
10.17					5		6.5	8.5		
11.17					5		6.5	8.5		
12.17					5		6.5	8.5		

NUTRIENTS – Orthophosphate as P (ORP) was detected at every site except R-3 in a range between 0.12 and 0.17 mg/l. The lowest sites for ORP were at R-1 and R-2 measuring 0.12 mg/l, while R-4 measured 0.17 mg/l. ORP concentration increased at every site except for R-3, in comparison to January. Nitrate as N was not detected at any site in February.

Phosphorus and nitrogen are essential nutrients for the plants and animals that make up the aquatic food web. Since phosphorus is the nutrient in short supply in most fresh waters, even a modest increase in phosphorus can, under the right conditions, set off a whole chain of undesirable events in a stream including accelerated plant growth, algae blooms, low dissolved oxygen, and the death of certain fish, invertebrates, and other aquatic animals.

There are many sources of phosphorus, both natural and human. These include soil and rocks, wastewater treatment plants, runoff from fertilized lawns and cropland, failing septic systems, runoff from animal manure storage areas, disturbed land areas, drained wetlands, water treatment, and commercial cleaning preparations.

Inorganic nitrate as N should be less than 0.3 mg/L to avoid algal blooms. Excessive concentrations of nitrate in lakes and streams greater than about 5 milligrams per liter (measured as nitrogen), depending on the water body, can cause excessive growth of algae and other plants, leading to accelerated eutrophication or "aging" of lakes, and occasional loss of dissolved oxygen. Animals and humans cannot use inorganic forms of nitrogen.

Since phosphorus is often scarce in freshwater ecosystems, it is typically a limiting nutrient, meaning that it limits the amount of life the system can sustain. When humans add phosphate-rich sewage or agricultural runoff, algae growth may no longer be limited by the scarcity of phosphorus in its environment and may grow out of control. In order to control algae growth, the EPA recommends that phosphate levels not exceed 0.05 milligrams per liter for streams discharging into lakes or reservoirs, 0.1 milligrams per liter for lakes and reservoirs, and 0.1 milligrams per liter for other streams and rivers.

FECAL COLIFORM - The fecal coliform levels were measured at 2 MPN/100ml and 4.5 MPN/100ml for sites R-1 and R-2, respectively. Coliform levels increased in both sites in comparison to January 2017. Fecal coliform did not exceed the established limits. Single sample results over 1,000 MPN/100mL are considered to exceed limits.

GENERAL WATER QUALITY ANALYSIS – The Dissolved Oxygen (DO) levels in February exceeded the 5.0 mg/l threshold in every site. DO was highest at Site R-1 (20.52 mg/l) and lowest at Site R-3 (8.21 mg/l). Water temperature increased at every site during February, with temperatures ranging from 14.3 to 16.1 C. PH measurements were within the limit at every site except for R-1, ranging from 7.8 to 9.1. Salinity measurements varied from approximately 22.43 ppt. to a maximum of 26.31 ppt. Turbidity was within limits and varied between 10.2 and 42.7 NTU. It was noted in the field data sheet that the pumps were not running in R-4, but were running in R-5 during the time of sampling. It was also noted that a light film was observed on top of the water in R-1.

Field Results

Redwood Shores Lagoon
Monthly Water Quality Monitoring Field Data

Date: 2/14/17	Name(s) of Field Personnel: Richard Chaffey
Weather Conditions	Air Temperature: 58'
Wind Conditions: Light / Moderate / High	Percent Cloud: 25 %
Field Measurements	

Sampling Station	Time	Maximum Depth (ft)	Sample Depth (ft)	Water Temp°C	Dis. Oxy. Mg/l	pH units	Salinity ppt	Turbidity NTU
R-1	1222	4.0'	2.0'	16.1	20.52	9.1	22.43	10.2
R-2	1141	5.0'	2.5'	14.9	8.78	8.3	25.62	24.9
R-3	1100	2.0'	1.0'	14.3	8.21	7.9	25.44	38.2
R-4	1022	6.0'	3.0'	14.3	9.11	7.8	26.31	42.7
R-5	0943	6.0'	3.0'	14.5	8.83	8.2	25.26	35.0

<p>Samples for the following test will be collected for laboratory analyses</p> <ul style="list-style-type: none"> • Nitrate-N • Ortho-P04-P (preservative required, do not rinse bottle) • Fecal Coliform Bacteria (R-1 and R-2 only)
<p>Notes & Observations about floatables, oil & grease, films, scum water discoloration, algae, aquatic plant growth and presence of dead wildlife:</p> <p>R-1- Light film on top of water.</p> <hr/> <p>R-2- _____</p> <hr/> <p>R-3- _____</p> <hr/> <p>R-4- Pumps not running at time of sample.</p> <hr/> <p>R-5- Pumps running at time of sample.</p> <hr/>

Laboratory Results



Alpha Analytical Laboratories Inc.

e-mail: clientservices@alpha-labs.com

Corporate: 208 Mason St., Ukiah, CA 95482 • Phone: (707) 468-0401 • Fax: (707) 468-5267
 Bay Area: 6398 Dougherty Rd., Suite 35, Dublin, CA 94568 • Phone: (925) 828-6226 • Fax: (925) 828-6309
 Central Valley: 9090 Union Park Way, Suite 113, Elk Grove, CA 95624 • Phone: (916) 686-5190 • Fax: (916) 686-5192

Redwood City, City of - Redwood Shores 1400 Broadway Street Redwood City, CA 94063	Project Manager: Eddie Pastrano Project: Redwood Shores Lagoon Project Number: Monthly Monitoring	Reported: 02/28/17 14:18
--	---	-----------------------------

	Result	Reporting Limit	Dilution	Batch	Prepared	Analyzed	Method	Note
R-1 (17B1386-01)								
Conventional Chemistry Parameters: by APHA/EPA Method:								
Orthophosphate as P	0.12 mg/L	0.10	1	AB73526	02/15/17 13:00	02/15/17 14:25	SM4500-PE	
Anions: by EPA Method 300.0								
Nitrate as N	ND mg/L	4.0	20	AB73535	02/15/17 15:01	02/15/17 15:01	EPA 300.0	
Microbiological Parameters: by APHA Standard Methods:								
Fecal Coliforms:	2.0 MPN/100mL	1.8	1	AB73783	02/14/17 17:40	02/17/17 15:00	SM9221	
R-2 (17B1386-02)								
Conventional Chemistry Parameters: by APHA/EPA Method:								
Orthophosphate as P	0.12 mg/L	0.10	1	AB73526	02/15/17 13:00	02/15/17 14:25	SM4500-PE	
Anions: by EPA Method 300.0								
Nitrate as N	ND mg/L	4.0	20	AB73535	02/15/17 16:10	02/15/17 16:10	EPA 300.0	R-06
Microbiological Parameters: by APHA Standard Methods:								
Fecal Coliforms:	4.5 MPN/100mL	1.8	1	AB73783	02/14/17 17:40	02/17/17 15:00	SM9221	
R-3 (17B1386-03)								
Conventional Chemistry Parameters: by APHA/EPA Method:								
Orthophosphate as P	ND mg/L	0.10	1	AB73526	02/15/17 13:00	02/15/17 14:25	SM4500-PE	

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

CLEAN LAKES INC.



Alpha Analytical Laboratories Inc.

e-mail: clientservices@alpha-labs.com

Corporate: 208 Mason St., Ukiah, CA 95482 • Phone: (707) 468-0401 • Fax: (707) 468-5267
 Bay Area: 6398 Dougherty Rd., Suite 35, Dublin, CA 94568 • Phone: (925) 828-6226 • Fax: (925) 828-6309
 Central Valley: 9090 Union Park Way, Suite 113, Elk Grove, CA 95624 • Phone: (916) 686-5190 • Fax: (916) 686-5192

Redwood City, City of - Redwood Shores 1400 Broadway Street Redwood City, CA 94063	Project Manager: Eddie Pastrano Project: Redwood Shores Lagoon Project Number: Monthly Monitoring	Reported: 02/28/17 14:18
--	---	-----------------------------

	Result	Reporting Limit	Dilution	Batch	Prepared	Analyzed	Method	Note
R-3 (17B1386-03)								
Anions by EPA Method 300.0								
Nitrate as N	ND mg/L	4.0	20	AB73535	02/15/17 15:32	02/15/17 18:12	EPA 300.0	R-06
R-4 (17B1386-04)								
Conventional Chemistry Parameters by APHA/EPA Methods:								
Orthophosphate as P	0.17 mg/L	0.10	1	AB73526	02/15/17 13:00	02/15/17 14:25	SM4500-P E	
Anions by EPA Method 300.0								
Nitrate as N	ND mg/L	4.0	20	AB73535	02/15/17 15:32	02/15/17 18:29	EPA 300.0	
R-5 (17B1386-05)								
Conventional Chemistry Parameters by APHA/EPA Methods:								
Orthophosphate as P	0.15 mg/L	0.10	1	AB73526	02/15/17 13:00	02/15/17 14:25	SM4500-P E	
Anions by EPA Method 300.0								
Nitrate as N	ND mg/L	4.0	20	AB73535	02/15/17 19:21	02/15/17 19:21	EPA 300.0	

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Page 3 of 6

END OF REPORT