

Redwood Shores Lagoon
April 2015
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

May 2015

RESULTS - Water quality results for each site is provided below in Table format for 2015 to allow comparison of results from month to month.

SITE R-1

	Ortho		Fecal		Dissolved							
	Phosphate	Nitrate as N	Fecal Coliform	Coliform	Water	Oxygen	DO		pH	pH		
Months	mg/l	mg/l	MPN/100 mL	Limit	Temp	(DO)	mg/l	Limit	Lower	Upper	Salinity	Turbidity
					C°						ppt	NTU
1.15	0.18	ND	>1,600	1,000	12.1	15.49	5	8.40	6.5	8.5	28.39	6.81
2.15	0.17	ND	7.8	1,000	16.8	15.01	5	8.70	6.5	8.5	22.20	5.94
3.15	0.15	ND	13.0	1,000	18.3	7.79	5	8.40	6.5	8.5	27.17	9.4
4.15	0.27	ND	7.8	1,000	18.7	6.24	5	8.00	6.5	8.5	27.91	22.2
5.15				1,000			5		6.5	8.5		
6.15				1,000			5		6.5	8.5		
7.15				1,000			5		6.5	8.5		
8.15				1,000			5		6.5	8.5		
9.15				1,000			5		6.5	8.5		
10.15				1,000			5		6.5	8.5		
11.15				1,000			5		6.5	8.5		
12.15				1,000			5		6.5	8.5		

SITE R-2

	Ortho		Fecal		Dissolved							
	Phosphate	Nitrate as N	Fecal Coliform	Coliform	Water	Oxygen	DO		pH	pH		
Months	mg/l	mg/l	MPN/100 mL	Limit	Temp	(DO)	mg/l	Limit	Lower	Upper	Salinity	Turbidity
					C°						ppt	NTU
1.15	0.16	ND	2.0	1,000	13.0	7.76	5	2.80	6.5	8.5	35.12	21.7
2.15	0.13	ND	7.8	1,000	15.8	3.51	5	8.40	6.5	8.5	30.25	14.3
3.15	0.25	ND	2.0	1,000	17.6	5.45	5	8.00	6.5	8.5	31.11	60.4
4.15	0.23	ND	46.0	1,000	17.5	5.84	5	7.70	6.5	8.5	31.56	23.5
5.15				1,000			5		6.5	8.5		
6.15				1,000			5		6.5	8.5		
7.15				1,000			5		6.5	8.5		
8.15				1,000			5		6.5	8.5		
9.15				1,000			5		6.5	8.5		
10.15				1,000			5		6.5	8.5		
11.15				1,000			5		6.5	8.5		
12.15				1,000			5		6.5	8.5		

SITE R-3

	Ortho		Water	Dissolved			pH	pH		
	Phosphate	Nitrate as N	Temp	Oxygen	DO		Lower	Upper	Salinity	Turbidity
Months	mg/l	mg/l	C°	(DO)	mg/l	pH	Limit	Limit	ppt	NTU
1.15	0.13	ND	12.30	6.38	5	8.70	6.5	8.5	33.39	49.20
2.15	0.15	ND	14.60	11.31	5	3.30	6.5	8.5	31.48	21.90
3.15	0.20	ND	16.40	7.48	5	7.80	6.5	8.5	26.00	46.50
4.15	0.20	ND	15.60	7.26	5	7.00	6.5	8.5	31.26	43.80
5.15					5		6.5	8.5		
6.15					5		6.5	8.5		
7.15					5		6.5	8.5		
8.15					5		6.5	8.5		
9.15					5		6.5	8.5		
10.15					5		6.5	8.5		
11.15					5		6.5	8.5		
12.15					5		6.5	8.5		

SITE R-4

	Ortho		Water	Dissolved			pH	pH		
	Phosphate	Nitrate as N	Temp	Oxygen	DO		Lower	Upper	Salinity	Turbidity
Months	mg/l	mg/l	C°	(DO)	mg/l	pH	Limit	Limit	ppt	NTU
1.15	0.12	ND	12.60	8.41	5	1.20	6.5	8.5	37.44	17.10
2.15	0.12	ND	15.40	12.08	5	8.20	6.5	8.5	29.05	15.90
3.15	0.27	ND	17.80	5.48	5	8.30	6.5	8.5	23.88	35.70
4.15	0.27	ND	18.70	3.52	5	7.10	6.5	8.5	32.09	23.10
5.15					5		6.5	8.5		
6.15					5		6.5	8.5		
7.15					5		6.5	8.5		
8.15					5		6.5	8.5		
9.15					5		6.5	8.5		
10.15					5		6.5	8.5		
11.15					5		6.5	8.5		
12.15					5		6.5	8.5		

	Ortho		Water	Dissolved			pH	pH		
	Phosphate	Nitrate as N	Temp	Oxygen	DO		Lower	Upper	Salinity	Turbidity
Months	mg/l	mg/l	C°	(DO)	mg/l	pH	Limit	Limit	ppt	NTU
1.15	ND	ND	12.00	8.06	5	3.90	6.5	8.5	36.83	6.16
2.15	0.11	ND	16.00	10.51	5	8.20	6.5	8.5	28.63	6.09
3.15	0.20	ND	17.50	5.46	5	8.00	6.5	8.5	32.40	3.81
4.15	0.10	ND	17.30	4.61	5	7.60	6.5	8.5	32.56	2.98
5.15					5		6.5	8.5		
6.15					5		6.5	8.5		
7.15					5		6.5	8.5		
8.15					5		6.5	8.5		
9.15					5		6.5	8.5		
10.15					5		6.5	8.5		
11.15					5		6.5	8.5		
12.15					5		6.5	8.5		

NUTRIENTS – Orthophosphate as P (ORP) was detected at all sites in a range between 0.20 and 0.27 mg/l. The lowest site for ORP was at R-3 while three sites measured the highest. ORP increased at one site and remained the same or reduced at the others sites in comparison to March. Phosphorus can stimulate algae blooms, and algae was noted in the area of R-2, so the City and Waterworks (the maintenance contractor) should monitor conditions closely for increasing algae blooms or algae mats in the coming months as water and air temperatures increase. There were no detectable levels reported for Nitrate as N at any monitoring site.

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 7.8 MPN/100 mL and 46 MPN/100 mL for R-1 and R-2, respectively. Coliform increased slightly at R-2 in comparison to March 2015. These results are relatively close to the laboratory detection limit of 1.8 MPN/100 ml. Fecal coliform did not exceed established limits. Single sample results over 1,000 MPN/mL are considered to exceed limits.

GENERAL WATER QUALITY ANALYSIS – The Dissolved Oxygen (DO) levels in April were measured below 5.0 mg/l thresholds at sites R-4 and R-5. DO was highest at Site R-3 (7.26 mg/l) and lowest at Site R-4 (3.52 mg/l). Water temperature increased marginally, remained the same, or dropped marginally over March with temperatures ranging from 15.6 to 18.7 C. pH measurements were within limits at all Sites. Salinity measurements varied from approximately 27.9 ppt to a maximum of 32.56 ppt. Turbidity was within limits and varied between 2.98 and 43.8 NTU.

Field Results

Redwood Shores Lagoon
Monthly Water Quality Monitoring Field Data

Date: <u>4/22/15</u>	Name(s) of Field Personnel: <u>Richard Chaffey</u>
Weather Conditions	Air Temperature: <u>50</u> °
Wind Conditions: <u>Light</u> / Moderate / High	Percent Cloud: <u>75</u> %
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	1234	4.0'	2.0'	18.7	6.24	8.0	27.91	22.2
R-2	1141	6.0'	3.0'	17.5	5.84	7.7	31.56	23.5
R-3	1007	3.0'	1.5'	15.6	7.26	7.0	31.26	43.8
R-4	0951	4.0'	2.0'	18.7	3.52	7.1	32.09	23.1
R-5	0823	4.0'	2.0'	17.3	4.61	7.6	32.56	2.98

<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- _____ _____</p> <p>R-2- <u>Algae in area.</u> _____</p> <p>R-3- _____ _____</p> <p>R-4- _____ _____</p> <p>R-5- _____ _____</p>

Laboratory Results



Alpha

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

CHEMICAL EXAMINATION REPORT

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Redwood City, City of - Redwood Shores
 1400 Broadway Street
 Redwood City, CA 94063
 Attn: Brandon Gilmore

Report Date: 05/05/15 14:40
 Project No: Monthly Monitoring
 Project ID: Redwood Shores Lagoon

Order Number	Receipt Date/Time	Client Code	Client PO/Reference
15D2426	04/22/2015 22:50	SEL_REDWOODRS	

Alpha Analytical Laboratories, Inc.

METHOD	BATCH	PREPARED	ANALYZED	DILUTION	RESULT	PQL	NOTE
R-1 (15D2426-01)		Sample Type: Water		Sampled: 04/22/15 12:34			
Conventional Chemistry Parameters: by APHA/EPA Methods:							
Orthophosphate as P	SM4500-P E	AD52309	04/23/15 09:00	04/23/15 12:02	1	0.27 mg/L	0.10
Anion: by EPA Method 300.0							
Nitrate as N	EPA 300.0	AD52353	04/23/15 17:26	04/24/15 09:42	5	ND mg/L	5.0 R-01
Microbiological Parameters: by APHA Standard Methods:							
Fecal Coliforms	SM9221	AD52757	04/22/15 17:10	04/25/15 17:10	1	7.8 MPN/100mL	1.8
R-2 (15D2426-02)		Sample Type: Water		Sampled: 04/22/15 11:41			
Conventional Chemistry Parameters: by APHA/EPA Methods:							
Orthophosphate as P	SM4500-P E	AD52309	04/23/15 09:00	04/23/15 12:02	1	0.23 mg/L	0.10
Anion: by EPA Method 300.0							
Nitrate as N	EPA 300.0	AD52353	04/23/15 17:26	04/24/15 09:25	5	ND mg/L	5.0 R-01
Microbiological Parameters: by APHA Standard Methods:							
Fecal Coliforms	SM9221	AD52757	04/22/15 17:10	04/25/15 17:10	1	46 MPN/100mL	1.8
R-3 (15D2426-03)		Sample Type: Water		Sampled: 04/22/15 10:07			
Conventional Chemistry Parameters: by APHA/EPA Methods:							
Orthophosphate as P	SM4500-P E	AD52309	04/23/15 09:00	04/23/15 12:02	1	0.20 mg/L	0.10

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.



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e-mail: clientservices@alpha-labs.com

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CHEMICAL EXAMINATION REPORT

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Redwood City, City of - Redwood Shores
 1400 Broadway Street
 Redwood City, CA 94063
 Attn: Brandon Gilmore

Report Date: 05/05/15 14:40
 Project No: Monthly Monitoring
 Project ID: Redwood Shores Lagoon

Order Number 15D2426	Receipt Date/Time 04/22/2015 22:50	Client Code SEL_REDWOODRS	Client PO/Reference
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Alpha Analytical Laboratories, Inc.

METHOD	BATCH	PREPARED	ANALYZED	DILUTION	RESULT	PQL	NOTE
R-3 (15D2426-03)		Sample Type: Water		Sampled: 04/22/15 10:07			
Anion: by EPA Method 300.0							
Nitrate as N	EPA 300.0	AD52353	04/23/15 17:26	04/24/15 09:09	10	ND mg/L	10 R-01
R-4 (15D2426-04)		Sample Type: Water		Sampled: 04/22/15 09:51			
Conventional Chemistry Parameters: by APHA/EPA Methods:							
Orthophosphate as P	SM4500-PE	AD52309	04/23/15 09:00	04/23/15 12:02	1	0.27 mg/L	0.10
Anion: by EPA Method 300.0							
Nitrate as N	EPA 300.0	AD52353	04/23/15 17:26	04/24/15 08:53	10	ND mg/L	10 R-01
R-5 (15D2426-05)		Sample Type: Water		Sampled: 04/22/15 08:23			
Conventional Chemistry Parameters: by APHA/EPA Methods:							
Orthophosphate as P	SM4500-PE	AD52309	04/23/15 09:00	04/23/15 12:02	1	0.27 mg/L	0.10
Anion: by EPA Method 300.0							
Nitrate as N	EPA 300.0	AD52353	04/23/15 17:26	04/24/15 08:36	10	ND mg/L	10 R-01

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.

END OF REPORT