



AQUATIC CONSULTING & TESTING, INC.

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Tempe, Arizona 85281
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Lic. No. AZ0003

15 July 2020

Ms. Debbie Tribioli
The Oasis at Anozira
c/o Kinney Management Services
6303 South Rural Road
Tempe, Arizona 85283

Ref: Oasis Lake, June 2020

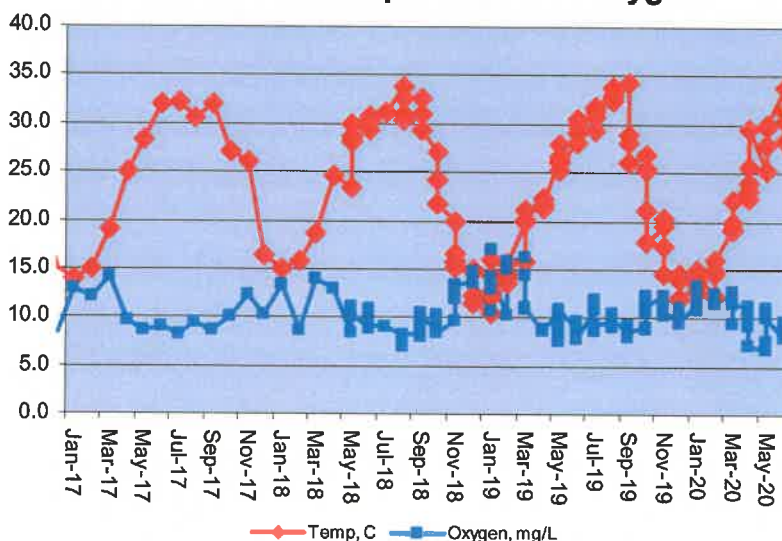
Dear Ms. Tribioli:

The following report summarizes water quality data collected for Oasis Lake on 03 June 2020. Similar data have been reported each month and are used in this report to generate the graphs that are used for tracking changes in water quality. The report includes field data sheets summarizing weekly lake and mechanical system conditions during the month.

Chemical and Physical Composition

Temperature, Oxygen, and pH: Water temperature increased to 33.8 C (93 F) and the dissolved oxygen concentration was over 100 percent saturation (7.9 mg/L). Operation of the floating fountains, as well as the trial nanobubble oxygenation system, helped maintain dissolved oxygen at a level that was satisfactory for the fishery.

2017-2020 Temperature and Oxygen

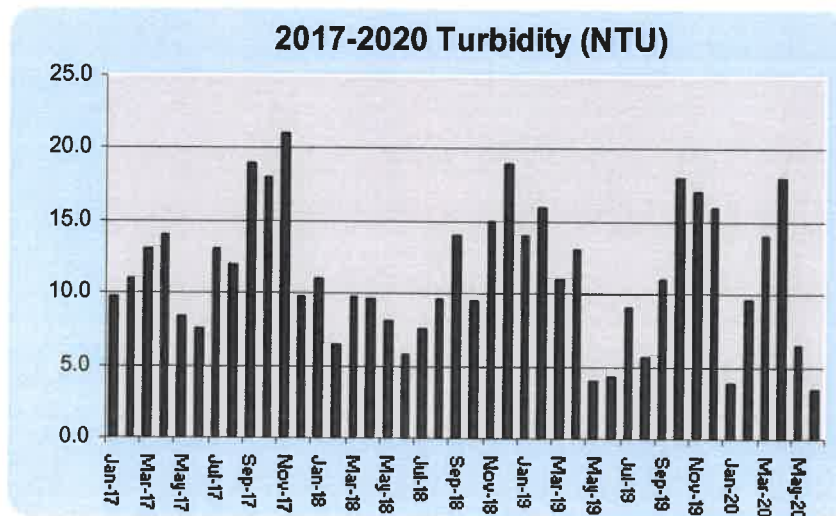


The table below shows the USEPA criteria for dissolved oxygen in warm water fisheries.

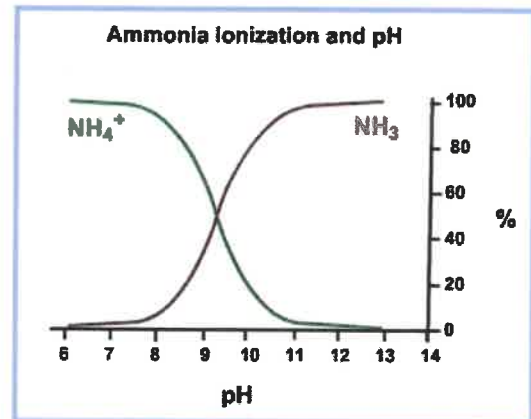
Criterion	Early life stages	Other life stages
Daily mean	>6.0	>4.0
Daily minimum	>5.0	>3.0

Water temperature tolerance varies among fish species. However, the maximum weekly temperature tolerance of most common urban lake fish species is 32 to 35 C.

Turbidity: The turbidity of the lake water continued to decrease (3.5 NTU). Water turbidity is impacted by algae density and dissolved and particulate matter in the water, including storm water runoff and dye that is periodically added for algae and weed management. As turbidity increases, clarity decreases. The trend shows continued improvement in lake clarity.



pH: The lake water pH varied, as typical, from 8.7 to 9.2 SU during the month. Water pH is influenced by the chemical makeup of the water and the amount of algae in the lake. In a very simplified explanation for the role of algae, carbonic acid in the water is formed from dissolution of carbon dioxide. Carbonic acid tends to make the water more acidic and pH decreases. However, algae utilize carbon dioxide during photosynthesis during daylight, making less carbon dioxide available to form carbonic acid, and pH increases. The more algae present, the greater the increase in pH that usually occurs. Data indicate that pH was similar to measurements last month. pH changes may also result from differences in SRP canal feed water composition.

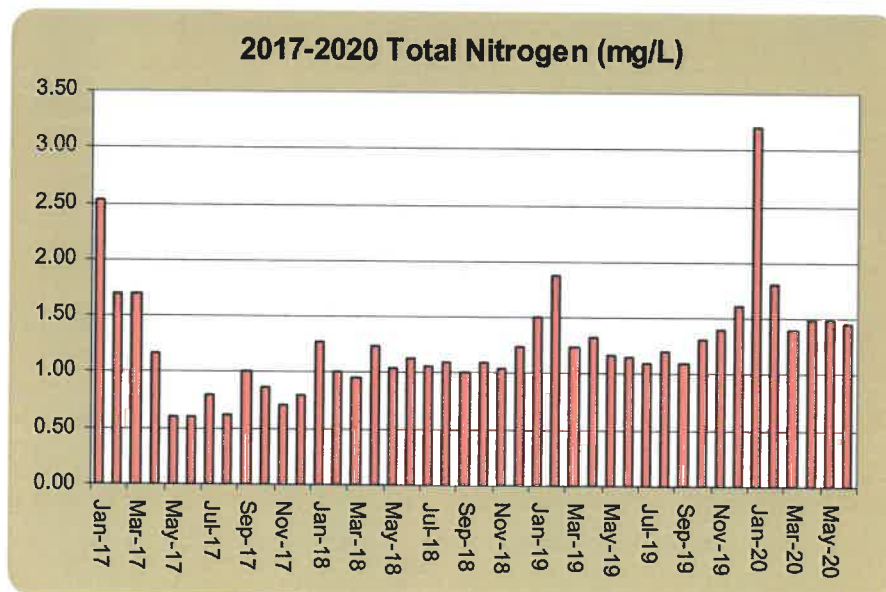
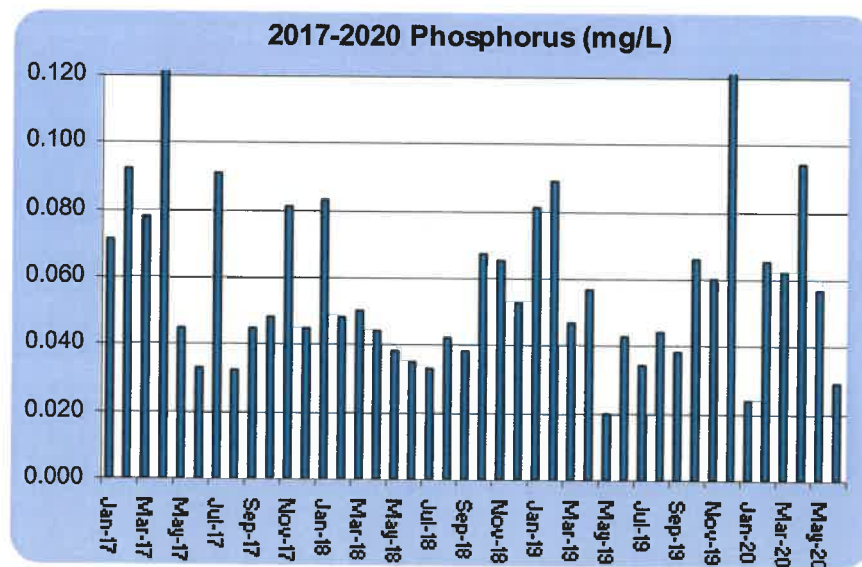


High pH can be problematic in terms of toxicity if high concentrations of ammonia are present in the water. Ammonia is in equilibrium between two forms; ammonium ion and ammonia gas. At pH concentrations above 9.0 SU and a water

temperature increases, ammonia converts to the gas which is toxic to many aquatic organisms. At the measured water temperatures and pH values, ammonia toxicity could occur. However, no signs of fish stress were observed.

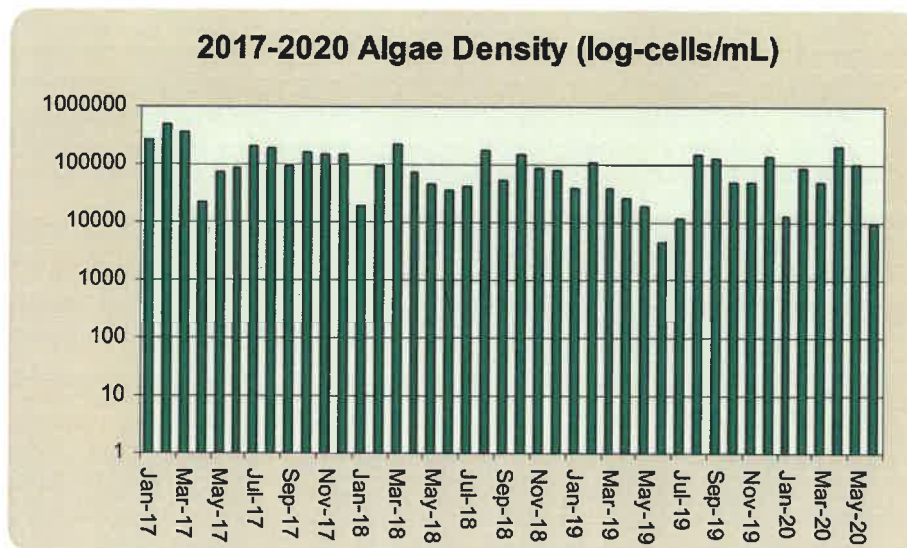
Nutrients: Nitrogen and phosphorus are the primary nutrients that stimulate algae and submerged plant growth. Phosphorus is typically the nutrient that dictates how much plant growth can be sustained in a lake. Usually if the total phosphorus concentration is below 0.030 mg/L, low levels of suspended algae occur. A nitrogen concentration of about 10 to 15 times the phosphorus (0.30–0.45 mg/L) is typically needed to support algal growth.

The phosphorus concentration continued to decrease (0.029) mg/L as P. The total nitrogen concentration was stable at 1.45 mg/L as N. Nitrate, immediately available to algal cells, was at a low concentration of 0.05 mg/L. A decrease in nutrient concentrations was evident and a corresponding decrease in algae growth would be expected and occurred.

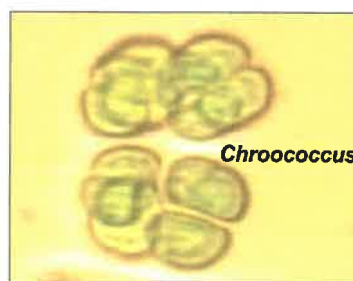


Biological Composition

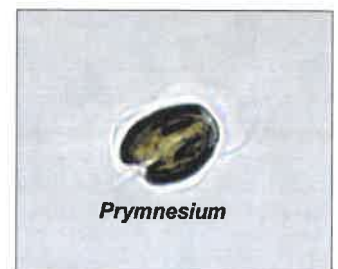
Phytoplankton (algae): The amount and types of algae in a lake dictate the aesthetic and operational quality of the water. Algae density affects the clarity and color of the water, two very important aesthetic criteria. The species composition dictates the form of growth observed; floating mats, suspended cells, stringy attached filaments, etc. It also impacts the choice, frequency, and dosage of herbicides used for water quality management.



As predicted, the total algae density in the lake decreased to 8.94×10^3 cells per mL, a density considered low to moderate for an urban reservoir in metro-Phoenix. Often-problematic blue-green (Cyanophyta) algae (*Oscillatoria*, *Chroococcus*) comprised about 32 percent of the total assemblage. The dominant alga was again, *Chlorella*, a generally benign green (Chlorophyta) unicell.



Golden algae were not detected. The golden alga (*P. parvum*), produces toxins that rupture unprotected cells. The toxin release is believed to benefit golden algae by killing other species of algae, thereby making resources (nutrients) more available to the golden algae population. Unfortunately, the cells of fish gills are also unprotected because that is where oxygen absorption occurs. Thus, the toxin also results in asphyxiation of fish. Susceptibility to the toxin varies amongst fish species.



Midge flies: Midge flies are common inhabitants of most lakes. Adult females lay hundreds of eggs on the water surface. The eggs settle to the lake bottom and hatch in a few days. Larvae develop and grow in the superficial sediments over a three to four week period. In about 30 days the insect larvae become pupae, rise in the water column, and emerge as adult flies. The life cycle is shown diagrammatically below. Adults tend to swarm at dusk and dawn and become a nuisance. They fly into residents' eyes and mouths, congregate under eaves of houses, and leave a sticky messy residue when they die. Management techniques may include stocking of bottom-feeding fishes to consume the larvae and/or application of bacterial or chemical larvicides. Because fish have not been stocked for three years or more, a maintenance stocking proposal has been presented to the Board. Action has been delayed because of golden algae and lake wall repairs.



Few adult midge flies were detected during the month.

Fishery: No fish losses were observed or reported.

Waterfowl: Ducks and geese can be a beautiful sight on a small urban pond or lake. They seem to make the lake look more like a natural lake than an artificial reservoir. They are fascinating creatures. However, when ducks and geese become too numerous, several lake management and aesthetic problems can develop. These problems are listed below.

- Bird wastes are unattractive and cause slippery conditions.
- Cleaning waste from sidewalks and turf is an additional maintenance item.
- Geese and other waterfowl can become aggressive toward humans.
- Waterfowl can damage turf areas.
- Waterfowl add nitrogen and phosphorus to the water.
- Bird wastes contain bacteria that are a health risk to humans and pets.
- Diving birds consume fish that are stocked in the lack for management purposes.



Arizona Game and Fish Department has developed criteria for waterfowl on small urban lakes (see table). Based on the Arizona Game & Fish Department scale, the lake condition in terms of waterfowl has remained in the “good to excellent” category.

Problematic Canada geese were observed during the month. Canada geese can destroy turf and, along with other birds, contribute fecal matter to the common areas and water. Cormorants, diving birds that feed on small fish, were not seen. See photos above.

Ranking	Waterfowl Density
Excellent	<3/acre
Good	3-4/acre
Fair	5-6/acre
Poor	>6/acre

Bacteria

In terms of public health protection, the *E. coli* bacteria concentration was relatively low (20 per 100 mL) and met incidental or partial body contact (PBC) and full body contact (FBC) recreational standards. The table below displays the numeric standards from the State Water Quality Standards (R18-11-109 A; 2016).

Designated use	<i>E. coli</i> single sample max. no/100 mL
Full body contact (swimming)	235
Partial body contact (boating, fishing)	575

Mechanical Systems and Field Observations

Weekly field inspection forms are attached to this report. In-lake and entry fountains and nanobubble aeration systems operated during the month. Issues with some of the nanobubble discharge lines continued. Oxygen generator and pump appeared to be operating properly.

Endothall and peroxide-based algaecide applications were made, as needed, to the three entry fountains to reduce algae growth on the wetted rock surfaces.

Lake Report Card

The water quality data are summarized on the attached Oasis Lake Report Card. Each salient parameter has been qualitatively evaluated and then assigned a numeric value for quantitative comparison and tracking purposes. The June score improved to 47 and remained in the “excellent” range.

Report card scores for the past three years have been graphically summarized below. Polynomial regression analysis (black line) still indicates a somewhat cyclic pattern. Linear regression analysis (red line) indicates an overall increasing trend in score.



Respectfully,

AQUATIC CONSULTING & TESTING, INC.

Frederick A. Amalfi, Ph.D., C.L.M.
Laboratory Director





LABORATORY REPORTS



FIELD INSPECTION FORMS



PESTICIDE APPLICATION DOCUMENTS

OASIS LAKE REPORT CARD

DATE OF EVALUATION:

Jun-20	CONDITION	EXCELLENT	SCORE	47
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PREVIOUS EVALUATION:

May-20	CONDITION	EXCELLENT	SCORE	44
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CONDITION	RESULT	RATIONALE	4 pts EXCELLENT	3 pts GOOD	2 pts FAIR	1 pt POOR	SCORE
Turbidity (NTU)	3.5	aesthetics	<5	5-10	11-20	>20	4
Dissolved oxygen (mg/L)	7.9	aquatic life, sediment nutrient release, odors	>7.0	5.6-6.9	4.0-5.5	<4.0	4
Nitrogen, total (mg/L)	1.45	algae and macrophyte growth	<0.5	0.5-1.0	1.1-2.0	>2.0	2
Phosphorus, total (mg/L)	0.029	algae and macrophyte growth	<0.03	0.03-0.05	0.06-0.10	>0.10	4
Algae density (no./mL)	8.94 x 10 ³	aesthetics	<5 x 10 ⁴	5x10 ⁴ - 9x10 ⁴	1 x 10 ⁵ - 5x 10 ⁶	>5 x 10 ⁶	4
Algae form (dominant)	Green unicells	aesthetics, treatability	greens; no floating mats	diatoms; no floating mats	blue-greens; no floating mats	blue-greens; floating mats common	4
Macrophytes (% cover)	<1	aesthetics, boating	none	<10%	11-20%	>20%	4
pH (SU) avg.	8.7	swimming, fishery, ammonia toxicity	6.5-8.0	8.0-8.5	8.6-9.0	>9.0	2
E. coli bacteria (#/100 mL) avg.	20	public health protection	<20	21-80	81-125	>125	4
Midge flies	no nuisances	quality of life	no nuisances	minor nuisances	moderate nuisances	significant nuisances	4
Waterfowl (no. per acre)	2	nutrient and bacteria loading	<2	2-5	6-10	>10	3
Fishery	normal	recreation, aesthetics	no fish piping; no fish kills	some fish piping, gulping; no fish kills	fish piping before dawn; occasional fish kills	fish piping common; fish kills common	4
Shoreline/banks	limited edge growths	aesthetics	no evidence of salt crusts or algal scums	some white deposits and scums	numerous patches of salt deposits and algae scums	most of lake shore covered with crusts or scums	4

SCORING KEY:

Excellent	Good	Fair	Poor
42-48	36-41	30-35	<30

Definitions: Ratings

Excellent: Lake aesthetic and operational conditions above level of expectation.

Good: Lake aesthetic and operational conditions at level of expectation.

Fair: Lake aesthetic and operational conditions slightly below level of expectation.

Poor: Lake aesthetic and operational conditions considerably below level of expectation.

Definitions: Terms

Macrophyte: Large plant, observable without the aid of a microscope, that may be floating, submerged or emergent.

Midge: Small, flying, non-biting "gnat-like" insect whose larval stage exists in the lake sediments (bloodworm).

N/A: not applicable; insufficient data or too early in development of lake (an arbitrary 3 rating is provided for these items).

pH: -log hydrogen ion conc.; amount of acid in the water identified on scale 1-14; 1 being most acid, 7 neutral, and 14 being most caustic.

Phytoplankton (algae): Microscopic plant fraction of the plankton community.

Piping: Act of fish coming to surface of water and capturing a bubble of air in their mouth; a sign of low oxygen concentrations.

Plankton: Organisms of relatively small size that have relatively small powers of locomotion or that drift in the water.

Turbidity: Degree to which particles and color in the water scatter light; the "cloudiness" of the water.



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Lic. No. AZ0003

LABORATORY REPORT

Client: Oasis at Anozira
c/o Kinney Management Services
6303 S. Rural Road
Tempe, Arizona 85283

Date Submitted: 06/03/20

Date Reported: 07/14/20

Attn: Debbie Tribioli

Project: Monthly Lake Monitoring

RESULTS

Client ID: Lake
ACT Lab No.: CC04479

Sample Type: Surface Water
Sample Time: 06/03/20 12:00

<u>Parameter</u>	<u>Analysis Date</u>		<u>Method No.</u>	<u>Result</u>	<u>Unit</u>
	<u>Start</u>	<u>End</u>			
Algae Count	06/30/20	06/30/20	SM 10200 F	See Attached	cells/mL
Algae Identification	06/30/20	06/30/20		See Attached	
Golden Algae	06/03/20	06/03/20	P/C Microscopy	Absent	Pres/Abs
Oxygen, Dissolved Field	06/03/20	06/03/20	SM4500 O G	7.9	mg/L as O ₂
pH, Field	06/03/20	06/03/20	SM4500H+ B	8.7	SU
Temperature, Field	06/03/20	06/03/20	SM2550 B	33.8	C
Nitrate + Nitrite - N	06/06/20	06/06/20	SM4500NO ₃ E	0.05	mg/L as N
Phosphorus, Total	06/25/20	06/25/20	365.3	0.029	mg/L as P
Total Kjeldahl Nitrogen	06/09/20	06/09/20	SMNorg C,NH ₃ C/D	1.4 _{mg/L}	mg/L as N
E. coli, Colilert	06/03/20	06/04/20	SM 9223 B	20	MPN/100 mL
Turbidity	06/03/20	06/03/20	180.1	3.5	NTU

Reviewed by:

Frederick A. Amalfi, Ph.D.
Laboratory Director

ALGAE IDENTIFICATION

AC&T Lab No.	CC04479	Date Collected	06/03/20
Client I.D.	Oasis	Collected By	AC&T

Divisions: bac=Bacillariophyta; chl=Chlorophyta; cry=Chrysophyta; cyn=Cyanophyta; eug=Euglenophyta; hap=Haptophyta; pyr=Pyrrhophyta
Forms: u=unicell; c=colony; f=filament; g= flagellate

Genus	Div.-Form	Rel. Count	Total per mL	Comp.	Genus	Div.-Form	Rel. Count	Total per mL	Comp.
<i>Achnanthes</i>	bac-u				<i>Microcystis</i>	cyn-c			
<i>Anabaena</i>	cyn-f				<i>Microspora</i>	chl-f			
<i>Ankistrodesmus</i>	chl-u				<i>Mougeotia</i>	chl-f			
<i>Aphanocapsa</i>	cyn-c				<i>Navicula</i>	bac-u	1	94	1.05%
<i>Asterionella</i>	bac-c				<i>Nitzschia</i>	bac-u			
<i>Botryococcus</i>	chl-c				<i>Oocystis</i>	chl-c			
<i>Carteria</i>	chl-ug				<i>Oscillatoria</i>	cyn-f	25	2352	26.32%
<i>Cephalomonas</i>	chl-ug				<i>Pandorina</i>	chl-cg			
<i>Characium</i>	chl-u				<i>Pediastrum</i>	chl-c			
<i>Chlamydomonas</i>	chl-ug	1	94	1.05%	<i>Peridinium</i>	pyr-ug			
<i>Chlorella</i>	chl-u	50	4704	52.63%	<i>Phacotus</i>	chl-ug			
<i>Chlorococcum</i>	chl-c				<i>Phacus</i>	chl-ug			
<i>Chroococcus</i>	cyn-c	5	470	5.26%	<i>Pinnularia</i>	bac-u			
<i>Chroomonas</i>	crp-ug				<i>Pithophora</i>	chl-f			
<i>Closteridium</i>	chl-u	2	188	2.11%	<i>Prymnesium</i>	hap-ug			
<i>Cocconeis</i>	bac-u				<i>Rhizoclonium</i>	chl-f			
<i>Coelastrum</i>	chl-c				<i>Rhoicosphenia</i>	bac-u			
<i>Cosmarium</i>	chl-u				<i>Rhopalodia</i>	bac-u			
<i>Cosmocladium</i>	chl-c				<i>Scenedesmus</i>	chl-c	7	659	7.37%
<i>Crucigenia</i>	chl-c				<i>Schroederia</i>	chl-u			
<i>Cyclotella</i>	bac-u				<i>Selanastrum</i>	chl-u			
<i>Cylindrospermopsis</i>	cyn-f				<i>Sphaerocystis</i>	chl-c			
<i>Cymbella</i>	bac-u	1	94	1.05%	<i>Spondylumorum</i>	chl-c			
<i>Denticula</i>	bac-u	1	94	1.05%	<i>Spirulina</i>	cyn-f			
<i>Dinobryon</i>	bac-c				<i>Stauroneis</i>	bac-u			
<i>Dunaliella</i>	chl-u				<i>Stephanodiscus</i>	bac-u			
<i>Epithemia</i>	bac-u				<i>Stigeoclonium</i>	chl-f			
<i>Euglena</i>	eug-ug				<i>Surirella</i>	bac-u			
<i>Fragilaria</i>	bac-u				<i>Synechococcus</i>	cyn-u			
<i>Frustulia</i>	bac-u				<i>Synechocystis</i>	cyn-c			
<i>Glenodinium</i>	pyr-ug				<i>Synedra</i>	bac-u	1	94	1.05%
<i>Golenkinia</i>	chl-c				<i>Synura</i>	cry-cg			
<i>Gomphonema</i>	bac-u				<i>Tetradron</i>	chl-u	1	94	1.05%
<i>Gonium</i>	chl-cg				<i>Tetrastrum</i>	chl-c			
<i>Gonyaulax</i>	pyr-ug				<i>Trachelomonas</i>	eug-ug			
<i>Gyrosigma</i>	bac-u				<i>Vaucheria</i>	chl-f			
<i>Hydrodictyon</i>	chl-c				<i>Volvox</i>	chl-cg			
<i>Lyngbya</i>	cyn-f				<i>Zygnema</i>	chl-f			
<i>Melosira</i>	bac-f								
<i>Meridion</i>	bac-u								
<i>Merismopedia</i>	cyn-c								

Aquatic Consulting & Testing, Inc.
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Tempe, Arizona 85281

check 100.00%

Count (cells/mL) 8.94E+03

OASIS AT ANOZIRA
FIELD INSPECTION FORM (
wpdoc/lists&forms)

Date: 6/3/20
By: _____

Aeration System Operation

☒ operational ☐ Problem

Details: _____

Lake Surface

☐ Lake surface cleaning

Floating Fountains ☒ West ☒ East ☒ South

☒ operational ☐ Problem Details: _____

Pump house ☒ housekeeping ☐ leaks ☐ ventilation ☐ lighting Notes _____

Compressors ☐ operational ☐ Problem Details: _____

Pumps ☒ operational ☐ Problem Details: _____

Entry Fountains

Elliot North: ☒ operational ☒ Screens cleared ☐ Problem Details: Hydrothol

Elliot South: ☒ operational ☒ Screens cleared ☐ Problem Details: _____

Los Feliz: ☒ operational ☒ Screens cleared ☐ Problem Details: _____

Monthly Chemistry & Biology

- ☒ Dissolved oxygen 7.9
- ☒ Temperature 33.8
- ☒ pH 8.7
- ☒ Algae ID and count
- ☒ Ammonia-N
- ☒ Organic N (TKN)
- ☒ Phosphorus
- ☒ Turbidity
- ☒ E. coli
- ☒ Golden algae (seasonal)



OASIS AT ANOZIRA
FIELD INSPECTION FORM (
wpdoc/lists&forms)

Date: 6/19/20
By: [Signature]

Aeration System Operation

☒ operational ☐ Problem

Details: _____

Lake Surface

☐ Lake surface cleaning

Floating Fountains ☒ West ☒ East ☐ South

☒ operational ☐ Problem Details: _____

Pump house

☒ housekeeping ☐ leaks ☐ ventilation ☐ lighting Notes _____

Compressors

☐ operational ☐ Problem Details: _____

Pumps

☒ operational ☐ Problem Details: _____

Entry Fountains

Elliot North: ☒ operational ☒ Screens cleared ☐ Problem Details: Hydrothol/phyco

Elliot South: ☒ operational ☒ Screens cleared ☐ Problem Details: _____

Los Feliz: ☒ operational ☒ Screens cleared ☐ Problem Details: _____

Monthly Chemistry & Biology

☒ Dissolved oxygen 9.4

☒ Temperature 31.4

☒ pH 9.1

☐ Algae ID and count

☐ Ammonia-N

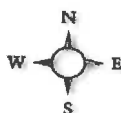
☐ Organic N (TKN)

☐ Phosphorus

☐ Turbidity

☐ *E. coli*

☐ Golden algae (seasonal)



OASIS AT ANOZIRA
FIELD INSPECTION FORM (
wpdoc/lists&forms)

Date: 6/17/20
By: Am

Aeration System Operation

☒ operational ☐ Problem

Details: _____

Lake Surface

☐ Lake surface cleaning

Floating Fountains ☒ West ☒ East ☒ South

☒ operational ☐ Problem Details: _____

Pump house

☒ housekeeping ☐ leaks ☐ ventilation ☐ lighting Notes _____

Compressors

☐ operational ☐ Problem Details: _____

Pumps

☒ operational ☐ Problem Details: _____

Entry Fountains

Elliot North: ☒ operational ☒ Screens cleared ☐ Problem Details: Hydrothol

Elliot South: ☒ operational ☒ Screens cleared ☐ Problem Details: _____

Los Feliz: ☒ operational ☒ Screens cleared ☐ Problem Details: _____

Monthly Chemistry & Biology

☒ Dissolved oxygen

☒ Temperature

☒ pH

☐ Algae ID and count

☐ Ammonia-N

☐ Organic N (TKN)

☐ Phosphorus

☐ Turbidity

☐ *E. coli*

☐ Golden algae (seasonal)

9.7
28.4
8.8



OASIS AT ANOZIRA FIELD INSPECTION FORM (

wpdoc/lists&forms)

Date: 6-24-20
By: AM

Aeration System Operation

☒ Operational ☐ Problem

Details: _____

Lake Surface

☐ Lake surface cleaning

Floating Fountains ☒ West ☒ East ☒ South

☒ Operational ☐ Problem Details: _____

Pump house

☒ housekeeping ☐ leaks ☐ ventilation ☐ lighting Notes _____

Compressors

☐ operational ☐ Problem Details: _____

Pumps

☒ operational ☐ Problem Details: _____

Entry Fountains

Elliot North: ☒ Operational ☒ Screens cleared ☐ Problem Details: Hydrothol

Elliot South: ☒ Operational ☒ Screens cleared ☐ Problem Details: _____

Los Feliz: ☒ Operational ☒ Screens cleared ☐ Problem Details: _____

Monthly Chemistry & Biology

☒ Dissolved oxygen 8.6
☒ Temperature 30.3
☒ pH 9.2
☐ Algae ID and count
☐ Ammonia-N
☐ Organic N (TKN)
☐ Phosphorus
☐ Turbidity
☐ E. coli
☐ Golden algae (seasonal)





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PESTICIDE TREATMENT NOTICE & RECORD

Client: The Oasis at Anozira
Attn: Debbie Tribioli The Oasis at Anozira C/O Kinney Management Services 6303 South Rural Road Tempe, Az 85283

Location: Entry features (June 2020)

Date: 06-03-20 06-10-20 06-17-20 06-20-20	Time: 09:00	Conditions: <u>X clear</u> pt cloudy overcast cold <u>X mild</u> mild
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Material:	Reg. No. (*restricted)	Tot. Qty:	Acres/Volume:
Hydrothol	4581-174	2 qt	0.03 Aft

Target Pest: algae

Degree of infestation: low

Application method/calculations:

5.0 G/Aft x 0.03 Aft = 0.15 Gal (1..2 pt) x 3 features \approx 2 qt per week

Dosage/rate 3.0 ppm

Percent active ingredient: 53% endothol

Applicator: Murrett

Cert. No. 061093

Remarks/follow-up: algae

Precautionary Statement:

Warning-Pesticides can be harmful. Keep children and pets away from pesticide applications until dry, dissipated, or aerated. For more information contact Aquatic Consulting & Testing, Inc. at 480-921-8044 and ask for Dr. Rick Amalfi. AC&T License No. 4418 F. A. Amalfi QP#1360 Cert. No. 900496