



AQUATIC CONSULTING & TESTING, INC.

1525 W. University Drive, Suite 106
P.O. Box 1510
Tempe, Arizona 85281
Phone: (480) 921-8044 • Fax: (480) 921-0049

Lic. No. AZ0003

06 December 2019

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

Ref: Oasis Lake, November 2019

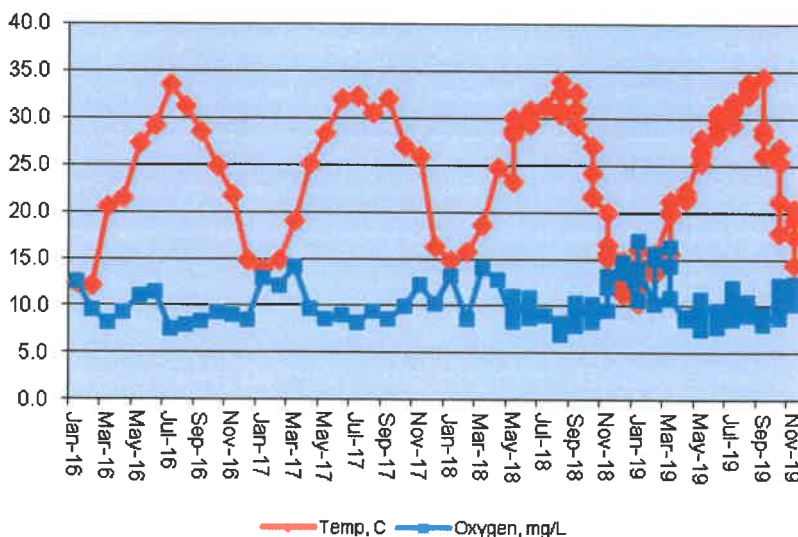
Dear Ms. Tribioli:

The following report summarizes water quality data collected for Oasis Lake on 06 November 2019. 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 was stable at 19.4 C (67 F) and the dissolved oxygen concentration remained over 100 percent saturation (12.4 mg/L). Operation of the floating fountains, as well as the trial nanobubble oxygenation system, helped maintain dissolved oxygen at a level that was more than satisfactory for the fishery.

2016-2019 Temperature and Oxygen

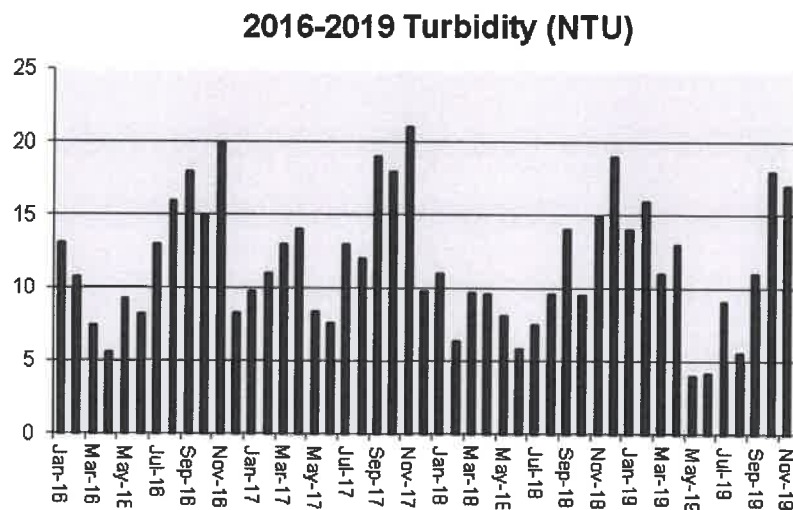


The table below shows the USEPA criteria for dissolved oxygen in warm water fisheries.

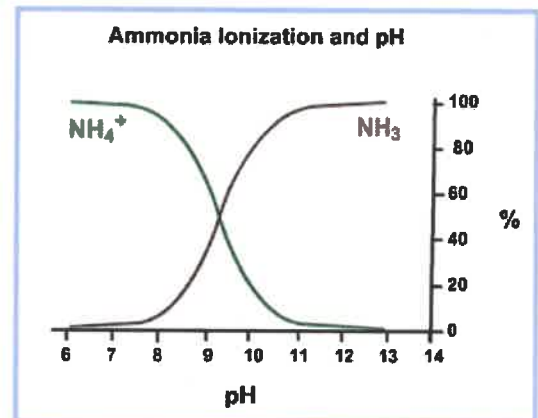
Criterion	Early life stages	Other life stages
Daily mean	>6.0	>4.0
Daily minimum	>5.0	>3.0

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 was essentially unchanged at 17 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.



pH: The lake water pH varied from 8.2 to 8.9 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 decreased very slightly as water temperatures and algae density did not change appreciably from that measured 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.

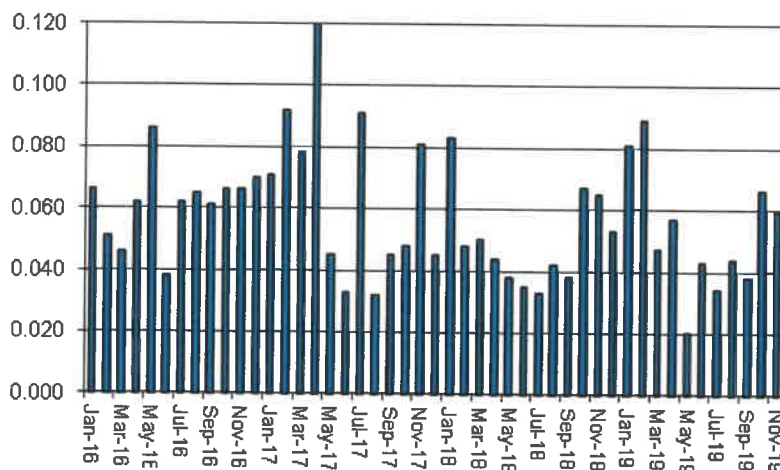
Ammonia is in equilibrium between two forms; ammonium ion and ammonia gas. At pH

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, measured pH values would not result in toxicity. No signs of fish stress were observed.

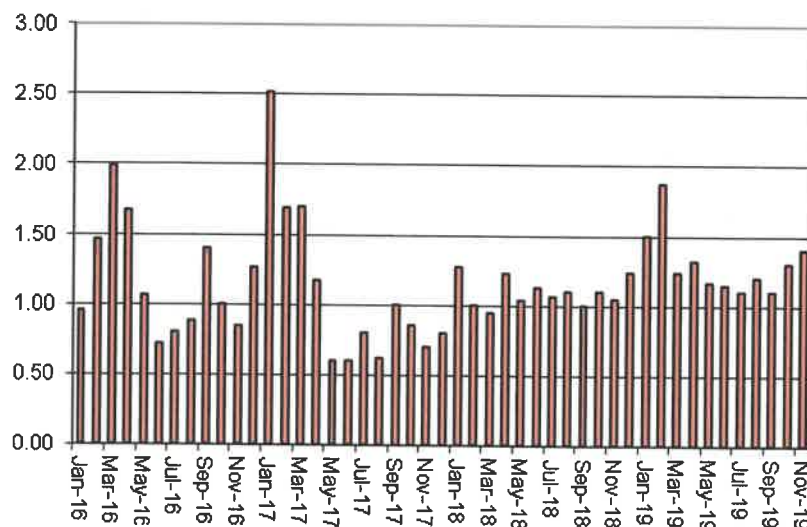
Nutrients: Nitrogen and phosphorus are the primary nutrients that stimulate algae and submerged plant growth. Phosphorus is typically the nutrient that dictates how much plant growth can be sustained in a lake. Usually if the total phosphorus concentration is below 0.030 mg/L, low levels of suspended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

The phosphorus concentration decreased slightly to 0.060 mg/L as P. The total nitrogen concentration increased slightly to 1.40 mg/L as N. Nitrate, immediately available to algal cells, was at a concentration of <0.05 mg/L. Usually a change in nutrient concentrations is reflected in changes in algae growth and density. Because there was little change in nutrient concentrations, little change in algae response would be expected.

2016-2019 Phosphorus (mg/L)



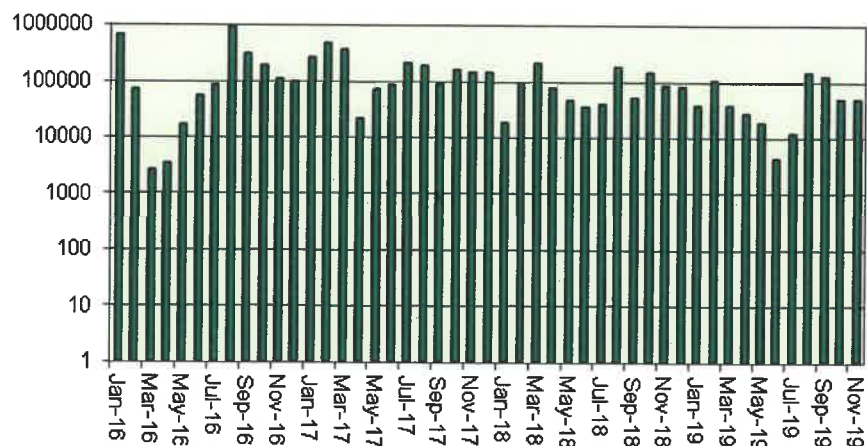
2016-2019 Total Nitrogen (mg/L)



Biological Composition

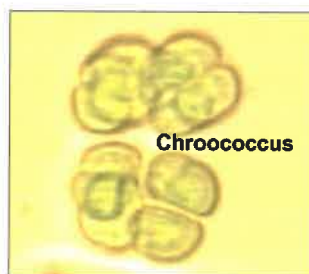
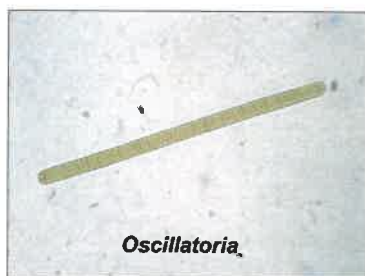
Phytoplankton (algae): The amount and types of algae in a lake dictate the aesthetic and operational quality of the water. Algae density affects the clarity and color of the water, two very important aesthetic criteria. The species composition dictates the form of growth observed; floating mats, suspended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

2016-2019 Algae Density (log-cells/mL)



As predicted, the total algae density in the lake was essentially unchanged at 4.99×10^4 cells per mL, a density considered moderate for an urban reservoir in metro-Phoenix. Blue-green (Cyanophyta) filamentous and colonial algae, *Oscillatoria* and *Chroococcus*, respectively, were the dominant forms. *Oscillatoria* can form stringers along the lake edge, bottom growths, or floating mats. However, only minor edge growth was observed. *Chroococcus* typically turns the water color to olive green.

Lake dye was not added during the month because (a) reduction in algae growth would be anticipated with cooler water temperatures, and (b) to allow greater capacity for photodegradation of toxin should golden algae (*Prymnesium parvum* and related species) develop.



Tests conducted through the month indicated no presence of golden algae. Golden algae have been identified in six lake systems in metro-Phoenix so far this season. 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 will be delivered to the Board in December.



Few adult midge flies were detected during the month.

Fishery: No significant loss of fish occurred during the month.

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 lake 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 been in the “excellent” category. However, the migratory season has begun and additional waterfowl are expected to visit or take temporary residence at the lake during the winter.

Cormorants and Canada geese were rarely observed during the month. Cormorants are diving birds that feed on small fish. Canada geese destroy turf and, along with other birds, contribute fecal matter to the common areas and water. 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 high (166 per 100 mL), but 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

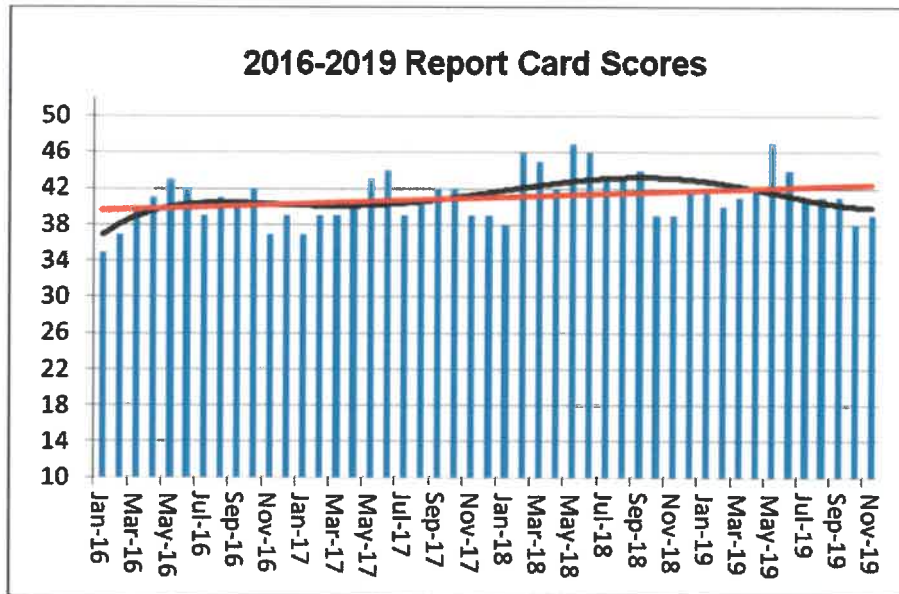
Weekly field inspection forms are attached to this report. The nanobubble aeration system had an electrical fault alarm during October and was taken out of service. A temporary replacement unit was installed. A new unit was scheduled for installation.

An endothall-based algaecide application was made 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 October score was 38 and the November score was 39; both in the good range. (The Report Card score was incorrectly stated in the narrative last month, but graphics and table were correct.)

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:

Nov-19	CONDITION	GOOD	SCORE	39
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PREVIOUS EVALUATION:

Oct-19	CONDITION	GOOD	SCORE	38
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CONDITION	RESULT	RATIONALE	4 pts EXCELLENT	3 pts GOOD	2 pts FAIR	1 pt POOR	SCORE
Turbidity (NTU)	17.0	aesthetics	<5	5-10	11-20	>20	2
Dissolved oxygen (mg/L)	>7	aquatic life, sediment nutrient release, odors	>7.0	5.6-6.9	4.0-5.5	<4.0	4
Nitrogen, total (mg/L)	1.40	algae and macrophyte growth	<0.5	0.5-1.0	1.1-2.0	>2.0	2
Phosphorus, total (mg/L)	0.060	algae and macrophyte growth	<0.03	0.03-0.05	0.06-0.10	>0.10	2
Algae density (no./mL)	4.99 x 10 ⁴	aesthetics	<5 x 10 ⁴	5x10 ⁴ - 9x10 ⁴	1 x 10 ⁵ - 5x 10 ⁶	>5 x 10 ⁵	4
Algae form (dominant)	bluegreen filament	aesthetics, treatability	greens; no floating mats	diatoms; no floating mats	blue-greens; no floating mats	blue-greens; floating mats common	2
Macrophytes (% cover)	<1	aesthetics, boating	none	<10%	11-20%	>20%	4
pH (SU) avg.	8.9	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.	166	public health protection	<20	21-80	81-125	>125	1
Midge flies	no nuisances	quality of life	no nuisances	minor nuisances	moderate nuisances	significant nuisances	4
Waterfowl (no. per acre)	1	nutrient and bacteria loading	<2	2-5	6-10	>10	4
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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LABORATORY REPORT

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

Date Submitted: 11/06/19

Date Reported: 12/05/19

Attn: Debbie Tribioli

Project: Monthly Lake Monitoring

RESULTS

Client ID: Lake
ACT Lab No.: CB10249

Sample Type: Surface Water
Sample Time: 11/06/19 11:00

Parameter	Analysis Date		Method No.	Result	Unit
	Start	End			
Algae Count	11/30/19	11/30/19	SM 10200 F	See Attached	cells/mL
Algae Identification	11/30/19	11/30/19		See Attached	
Oxygen, Dissolved Field	11/06/19	11/06/19	SM4500 O G	12.4	mg/L as O ₂
pH, Field	11/06/19	11/06/19	SM4500H+ B	8.9	SU
Temperature, Field	11/06/19	11/06/19	SM2550 B	19.4	C
Nitrate + Nitrite - N	11/25/19	11/25/19	SM4500NO ₃ E	<0.05	mg/L as N
Phosphorus, Total	11/25/19	11/25/19	365.3	0.060	mg/L as P
Total Kjeldahl Nitrogen	11/13/19	11/13/19	SMNorg C,NH ₃ C/D	1.4	mg/L as N
E. coli, Colilert	11/06/19	11/07/19	SM 9223 B	166	MPN/100 mL
Turbidity	11/06/19	11/06/19	180.1	17.	NTU

Reviewed by:

Frederick A. Amalfi, Ph.D.

Laboratory Director

ALGAE IDENTIFICATION

AC&T Lab No.	CB10249	Date Collected	11/06/19
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	15	2823	5.66%
<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			
<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	125	23522	47.17%
<i>Cephalomonas</i>	chl-ug				<i>Pandorina</i>	chl-cg			
<i>Ceratium</i>	pyr-ug				<i>Pediastrum</i>	chl-c			
<i>Chlamydomonas</i>	chl-ug				<i>Peridinium</i>	pyr-ug			
<i>Chlorella</i>	chl-u				<i>Phacotus</i>	chl-ug			
<i>Chlorococcum</i>	chl-c				<i>Phacus</i>	chl-ug			
Chroococcus	cyn-c	62	11667	23.40%	<i>Pinnularia</i>	bac-u			
<i>Chroomonas</i>	crp-ug				<i>Pithophora</i>	chl-f			
<i>Closterium</i>	chl-u				<i>Prymnesium</i>	hap-ug			
<i>Cocconeis</i>	bac-u				<i>Rhizoclonium</i>	chl-f			
Coelastrum	chl-c	8	1505	3.02%	<i>Rhoicosphenia</i>	bac-u			
<i>Cosmarium</i>	chl-u				<i>Rhopalodia</i>	bac-u			
<i>Cosmocladium</i>	chl-c				Scenedesmus	chl-c	12	2258	4.53%
<i>Crucigenia</i>	chl-c				<i>Scytonema</i>	chl-f			
<i>Cryptomonas</i>	crp-ug				Selanastrum	chl-u	5	941	1.89%
<i>Cyclotella</i>	bac-u				<i>Sphaerocystis</i>	chl-c			
<i>Cymbella</i>	bac-u				<i>Spondylumorum</i>	chl-c			
<i>Diatoma</i>	bac-u				Spirulina	cyn-f	30	5645	11.32%
<i>Dinobryon</i>	bac-c				<i>Stauroneis</i>	bac-u			
<i>Dunaliella</i>	chl-u				<i>Stephanodiscus</i>	bac-u			
Elakathorix	chl-c	4	753	1.51%	<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			
Glenodinium	pyr-ug	3	565	1.13%	<i>Synedra</i>	bac-u			
<i>Golenkinia</i>	chl-c				<i>Synura</i>	cry-cg			
<i>Gomphonema</i>	bac-u				Tetraedron	chl-u	1	188	0.38%
<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.
 1525 W. University Dr., Suite 106
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check 100.00%

Count (cells/mL) 4.99E+04

**OASIS AT ANOZIRA
FIELD INSPECTION FORM**

wpdoc/lists&forms)

Date: 11/6/19
By: Ann

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: Not in Use

Pumps

☒ operational ☐ Problem Details: _____

Entry Fountains

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

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

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

Monthly Chemistry & Biology

☒ Dissolved oxygen 12.4

☒ Temperature 79.4

☒ pH 8.9

☐ 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: 11/13/19
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: Not in use

Pumps

☒ operational ☐ Problem Details: _____

Entry Fountains

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

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

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

Monthly Chemistry & Biology

☒ Dissolved oxygen 11.5

☐ Temperature 20.4

☒ 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: 11/20/19

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: Not in Use

Pumps

☒ operational ☐ Problem Details: _____

Entry Fountains

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

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

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

Monthly Chemistry & Biology

- ☐ Dissolved oxygen 10.2
- ☐ Temperature 17.4
- ☐ pH 8.2
- ☐ 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: 11/27/19
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: Not in Use

Pumps ☒ operational ☐ Problem Details: _____

Entry Fountains

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

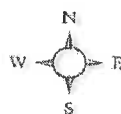
Elliot South: ☒ operational ☒ Screens cleared ☐ Problem Details: _____

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

Monthly Chemistry & Biology

☒ Dissolved oxygen 10.8
☒ Temperature 14.5
☒ pH 8.8

- ☐ Algae ID and count
- ☐ Ammonia-N
- ☐ Organic N (TKN)
- ☐ Phosphorus
- ☐ Turbidity
- ☐ *E. coli*
- ☐ Golden algae (seasonal)





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Phone: 480-921-8044 Fax 480-921-0049

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

Date: 11-06-19

Time: 09:00

Conditions: X clear pt cloudy overcast
cold X mild mild

Material:	Reg. No. (*restricted)	Tot. Qty:	Acres/Volume:
Hydrothol	4581-174	0.0675 gal (0.5 pt)	0.03 Aft

Target Pest: algae

Degree of infestation: low

Application method/calculations:

2.25 G/Aft x 0.03 Aft = 0.0675 gal

Dosage/rate 1.5 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