



# AQUATIC CONSULTING & TESTING, INC.

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Tempe, Arizona 85281  
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Lic. No. AZ0003

07 April 2015

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

Ref: Oasis Lake, March 2015

Dear Ms. Triboli:

The following report summarizes initial water quality data collected for Oasis Lake on 05 March 2015. Similar data will be reported each month and, once sufficient data has been collected, will be used to generate graphs to track changes in water quality. This report also includes field data sheets reflecting lake and mechanical system conditions each week during the month.

## Chemical and Physical Composition

**Temperature, Oxygen, and pH:** Water temperature was 17.8 C (64 F) and the dissolved oxygen concentration was 11.8 mg/L. The amount of oxygen that can dissolve in water is temperature dependent; colder water can hold more oxygen than warmer water. At the time of sampling, the oxygen saturation was over 100 percent, indicating maximum oxygenation content and adequate operation of the aeration system. The dissolved oxygen content was also satisfactory for the fishery. 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 increased to 28.1 NTU. Water turbidity is impacted by dissolved and particulate matter in the water. As turbidity increases, clarity and aesthetic quality decreases.

**pH:** The lake water pH dropped and was well within the desired range at 8.2 SU. Water pH is influenced by the amount of algae in the lake. In a very simplified explanation, 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.

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, ammonia converts to the gas which is toxic to many aquatic organisms. At pH 8.2 any ammonia present would have negligible impact on the fishery.

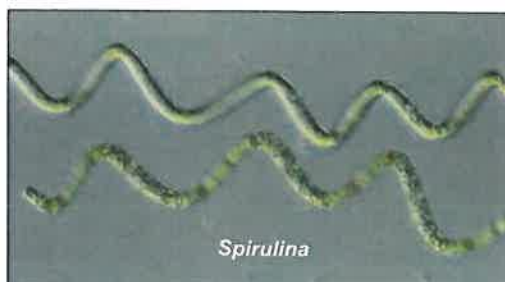
**Nutrients:** Nitrogen and phosphorus are the primary nutrients that stimulate algae and submerged plant growth. Phosphorus is typically the nutrient that dictates how much plant growth can be sustained in a lake. Usually if the total phosphorus concentration is below 0.030 mg/L, low levels of suspended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

The total nitrogen concentration increased to 1.75 mg/L as N. The phosphorus concentration also increased to 0.083 mg/L as P. These data indicate that the lake has sufficient nutrients to support a moderate to high density algae population.

### Biological Composition

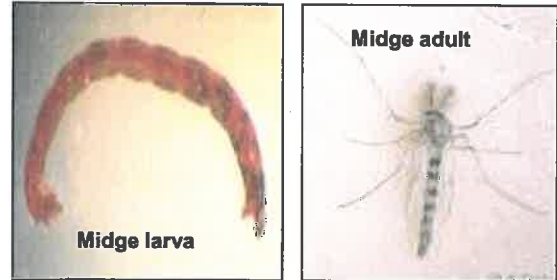
**Phytoplankton (algae):** The amount and types of algae in a lake dictate the aesthetic and operational quality of the water. Algae density affects the clarity and color of the water, two very important aesthetic criteria. The species composition dictates the form of growth observed; floating mats,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

The total algae density in the lake increased to  $2.73 \times 10^4$  cells per mL; still considered low to moderate for an urban reservoir in metro-Phoenix. The increase in nutrients are likely responsible for the increase, along with increased day length and solar intensity. The dominant alga in Oasis Lake was *Spirulina*, a filamentous blue-green (Cyanophyta) form. Although blue-green algae are often problematic, *Spirulina* cells are extremely small and the alga does not usually create major issues other than making the water appear turbid and green. The toxic alga, *Prymnesium parvum*, was not detected in samples. This alga has been responsible for many fish kills in central Arizona. The alga produces two toxins that destroy gill cells, leading to asphyxiation of exposed fish.



No submerged weeds were detected in the lake system.

**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. The 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.



Minimal midge fly adults were detected during the month.

**Fishery:** Fish activity appeared normal. No dead fish were observed or reported 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.

Bird droppings can be a nuisance and aesthetic detraction along the shoreline. The droppings create slippery conditions along the shoreline and certainly are not attractive in appearance. Because the droppings must be physically washed from the lake edge, they create an additional maintenance task. Some waterfowl, as geese can become aggressive to humans, especially after they have become accustomed to being fed human food. They can do significant damage to turf areas, ripping up and consuming grass. Water fowl are also a source of nitrogen and phosphorus; nutrients that stimulate algae growth in a lake and cause the water to turn green. Ducks like to forage vegetation from the land. They convert it to water-soluble forms of nitrogen and phosphorus during digestion. The wastes are then deposited in the lake while they swim. Bird wastes contain fecal bacteria. Because we sometimes fish and our children often play along the water's edge, hands or feet somehow find their way into the water. Thus, the waste material can pose a health risk. Finally, some diving birds as cormorants are excellent fishermen. These birds have reduced the fish populations in some nearby lakes, consuming game fish and reducing recreational benefits. They have also removed fish that had been added for weed and insect control. Frequent fish restocking increases operational costs for the lake owner.

Arizona Game and Fish Department has developed the following criteria for waterfowl on small urban lakes.

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

Based on the Arizona Game & Fish Department scale, the lake condition in terms of waterfowl was fair during the month. A variety of geese and ducks visit the lake daily. Cormorants were not observed. In terms of public health protection, the *E. coli* bacteria concentration was 99 per 100 mL. The State swimming standard for *E. coli* is 235 and the secondary (partial body contact) standard is 575 per 100 mL. The lake water meets both these criteria.

#### Mechanical Systems and Field Observations

Weekly field inspection forms are attached to this report. Familiarization with the lake and its mechanical equipment continued. The lake was cleaned of surface debris weekly.

- The south water fountain remained out of service during the month.
- The Elliot south entry feature appeared to still have a slow water leak.
- Two aerator diffuser stations continued to work poorly, suggesting cleaning or replacement of the membranes may be required.

#### Chemical/Biological Product Applications

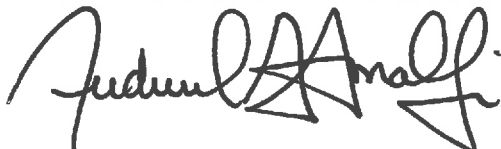
No applications were made to the lake during the month.

#### 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 comparison and tracking purposes. The overall rating decreased from 41 to 28, primarily as a result of increased nutrients and greater algae density. However, the lake remained in the "Good" category for March 2015.

Respectfully,

AQUATIC CONSULTING & TESTING, INC.



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



# OASIS LAKE REPORT CARD

DATE OF EVALUATION:

Mar-15   
 CONDITION   
 GOOD   
 SCORE   
 38

PREVIOUS EVALUATION:

Feb-15   
 CONDITION   
 GOOD   
 SCORE   
 41

CONDITION	RESULT	RATIONALE	4 pts EXCELLENT	3 pts GOOD	2 pts FAIR	1 pt POOR	SCORE
Turbidity (NTU)	28.1	aesthetics	<5	5-10	11-20	>20	1
Dissolved oxygen (mg/L)	11.8	aquatic life, sediment nutrient release, odors	>7.0	5.6-6.9	4.0-5.5	<4.0	4
Nitrogen, total (mg/L)	1.75	algae and macrophyte growth	<0.5	0.5-1.0	1.0-2.0	>2.0	2
Phosphorus, total (mg/L)	0.083	algae and macrophyte growth	<0.03	0.03-0.05	0.06-0.10	>0.10	2
Algae density (no./mL)	2.7 x 10 <sup>4</sup>	aesthetics	<5 x 10 <sup>4</sup>	5x10 <sup>4</sup> - 9x10 <sup>4</sup>	1 x 10 <sup>5</sup> - 5x10 <sup>6</sup>	>5 x 10 <sup>5</sup>	4
Algae form (dominant)	blue-green filaments	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.	8.2	swimming, fishery, ammonia toxicity	6.5-8.0	8.0-8.5	8.5-9.0	>9.0	3
E. coli bacteria (#/100 mL) avg.	99	public health protection	<20	21-80	81-125	>125	2
Midge flies	no nuisances	quality of life	no nuisances	minor nuisances	moderate nuisances	significant nuisances	4
Waterfowl (no. per acre)	6	nutrient and bacteria loading	<2	2-5	6-10	>10	2
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	no 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.



## **LABORATORY REPORTS**



## **FIELD INSPECTION FORMS**



## **PESTICIDE APPLICATION DOCUMENTS**



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Lic. No. AZ0003

## LABORATORY REPORT

**Client:** Oasis at Anozira  
c/o Kinney Management Services  
6303 S. Rual Road  
Tempe, Arizona 85283  
**Attn:** Debbie Tribioli

**Date Submitted:** 03/05/15  
**Date Reported:** 04/07/15

**Project:** Monthly Lake Monitoring

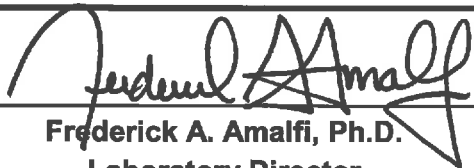
## RESULTS

**Client ID:** Lake  
**ACT Lab No.:** BX02063

**Sample Type:** Surface Water  
**Sample Time:** 03/05/15 13:00

<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	04/06/15	04/06/15	SM 10200 F	See Attached	cells/mL
Algae Identification	04/06/15	04/06/15		See Attached	
Golden Algae	03/05/15	03/05/15	P/C Microscopy	Absent	Pres/Abs
Oxygen, Dissolved Field	03/05/15	03/05/15	SM4500 O G	11.8	mg/L as O <sub>2</sub>
pH, Field	03/05/15	03/05/15	SM4500H+ B	8.2	SU
Temperature, Field	03/05/15	03/05/15	SM2550 B	17.8	C
Nitrate + Nitrite - N	03/18/15	03/18/15	SM4500NO3 E	0.15	mg/L as N
Phosphorus, Total	03/20/15	03/20/15	365.3	0.083	mg/L as P
Total Kjeldahl Nitrogen	03/18/15	03/18/15	SMNorg C,NH <sub>3</sub> C/D	1.6	mg/L as N
E. coli, Colilert	03/05/15	03/06/15	SM 9223 B	99	MPN/100 mL
Turbidity	03/05/15	03/05/15	180.1	28.1	NTU

Reviewed by:

  
Frederick A. Amalfi, Ph.D.  
Laboratory Director



# Town Lake Algae Identification

AC&T Lab No.		BX01075			Date Collected		03/06/15		
Client I.D.		Oasis at Anozira			Collected By		AC&T		
Divisions: bac-Bacillariophyta chl-Chlorophyta; cry-Chrysophyta; crp-Cryptophyta; cyn-Cyanophyta; eug-Euglenophyta; hap-Haptophyta; pyr-Pyrrophyta									
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	24	5327	19.51%	<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	8	1776	6.50%
<i>Asterionella</i>	bac-c				<i>Nitzschia</i>	cry-u			
<i>Botryococcus</i>	chl-c				<i>Oocystis</i>	chl-c	3	666	2.44%
<i>Carteria</i>	chl-ug				<i>Oscillatoria</i>	cyn-f	15	3329	12.20%
<i>Cephalomonas</i>	chl-ug				<i>Pandorina</i>	chl-cg			
<i>Ceratium</i>	pyr-uf				<i>Pediastrum</i>	chl-c			
<i>Chlamydomonas</i>	chl-ug	1	222	0.81%	<i>Peridinium</i>	pyr-ug			
<i>Chlorella</i>	chl-u	2	444	1.63%	<i>Phacotus</i>	chl-ug			
<i>Chlorococcum</i>	chl-c				<i>Phacus</i>	chl-ug			
<i>Chroococcus</i>	cyn-c				<i>Pinnularia</i>	bac-u			
<i>Chroomonas</i>	crp-ug				<i>Pithophora</i>	chl-f			
<i>Closterium</i>	chl-u				<i>Planktosphaeria</i>	chl-c			
<i>Cocconeis</i>	cry-u				<i>Rhizoclonium</i>	chl-f			
<i>Coelastrum</i>	chl-c				<i>Rhoicosphenia</i>	bac-u			
<i>Cosmarium</i>	chl-u	1	222	0.81%	<i>Rhopalodia</i>	bac-u			
<i>Cosmocladium</i>	chl-c				<i>Scenedesmus</i>	chl-c	7	1554	5.69%
<i>Crucigenia</i>	chl-c				<i>Scytonema</i>	chl-f			
<i>Cryptomonas</i>	crp-ug				<i>Selanastrum</i>	chl-u			
<i>Cyclotella</i>	bac-c	3	666	2.44%	<i>Sphaerocystis</i>	chl-c			
<i>Cymbella</i>	bac-c				<i>Spirogyra</i>	chl-f			
<i>Diatoma</i>	bac-c				<i>Spirulina</i>	cyn-f	40	8878	32.52%
<i>Dinobryon</i>	bac-c				<i>Staurastrum</i>	chl-u			
<i>Dunaliella</i>	chl-u				<i>Stephanodiscus</i>	bac-u			
<i>Epithemia</i>	bac-c				<i>Stigeoclonium</i>	chl-f			
<i>Euglena</i>	eug-g				<i>Surirella</i>	bac-u			
<i>Fragilaria</i>	bac-c				<i>Synechococcus</i>	cyn-u			
<i>Franceia</i>	chl-u				<i>Synechocystis</i>	cyn-c			
<i>Glenodinium</i>	pyr-ug				<i>Synedra</i>	bac-u	3	666	2.44%
<i>Golenkinia</i>	chl-u				<i>Synura</i>	cry-cg			
<i>Gomphonema</i>	bac-c				<i>Tetraedron</i>	chl-u			
<i>Gonium</i>	chl-cg				<i>Tetrastrum</i>	chl-c			
<i>Gonyaulax</i>	pyr-ug				<i>Trachelomonas</i>	eug-ug			
<i>Gyrosigma</i>	cry-u				<i>Vaucheria</i>	chl-f			
<i>Hydrodictyon</i>	chl-c				<i>Volvox</i>	chl-cg			
<i>Lagerhemia</i>	chl-u				<i>Zygnema</i>	chl-f			
<i>Melosira</i>	bac-f								
<i>Merismopedia</i>	cyn-c	16	3551	13.01%					
<i>Micrasterias</i>	chl-u								

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Count (cells/mL) 2.73E+04





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Lic. No. AZ0003

## GOLDEN ALGAE REPORT

**Client:** Oasis at Anozira  
c/o Kinney Management Services  
6303 S. Rual Road  
Tempe, Arizona 85283  
**Attn:** Debbie Tribioli

**Date Submitted:** 03/26/15  
**Date Reported:** 04/03/15

**Project:** Golden Algae Screen

### RESULTS

**Client ID:** Lake  
**ACT Lab No.:** BX02719


**Sample Type:** Surface Water  
**Sample Time:** 03/26/15 12:20

<u>Parameter</u>	<u>Analysis Date</u>		<u>Method No.</u>	<u>MDL</u>	<u>Result</u>	<u>Unit</u>	<u>Analyst</u>
	<u>Start</u>	<u>End</u>					
Golden Algae	03/26/15	03/26/15	P/C Microscopy	1	Absent	Pres/Abs	DC

#### Explanation of Terms:

- Absent = No golden algae\* were detected in the submitted sample.
- Present 1 = Golden algae\* were detected, but rarely observed in the submitted sample.
- Present 2 = Golden algae\* were detected and commonly observed in the submitted sample.
- Present 3 = Golden algae\* were detected and were the dominant algae in the submitted sample.

\**Prymnesium parvum* or toxin producing related species.

Reviewed by:   
Frederick A. Amalfi, Ph.D.  
Laboratory Director

**Aquatic Consulting & Testing, Inc.**

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**Chain of Custody**

**Client Project Info:**

**Weekly Lake Monitoring**  
 Oasis at Anozira

**AC&T Client Reporting Information:**

Oasis at Anozira  
 c/o Kinney Management Services  
 Attn: Debbie Tribioli  
 6303 South Rural Road  
 Tempe, AZ 85283  
 P: 480-820-3451  
 E: debbie@kinneymanagement.com

**AC&T Sampler:** *Andrew Murvell*

Sample Location ID	Date	Time	Metric
Lake	<i>3/26/15</i>	<i>1220</i>	SW

NO3+NO2	Total Phosphorous (P-T)	Total Kjeldahl Nitrogen (TKN)	Total E. Coli - MPN	Turbidity	Algae Count & ID	Golden Algae	Field Measurements pH, Temp, O2
						X	X

Sample Containers # / Preservation:	Other:
Non Preserved	
N2S2O3 (Sterile)	
HNO3 (Nitric)	
H2SO4 (Sulfuric)	
Lugole	

**AC&T  
 Laboratory Sample  
 Identification**

**BX-02719**

**1. RELINQUISHED BY:**

Signature: *Andrew Murvell*  
 Print Name: *Andrew Murvell*  
 Date: *3-26-15* Time: *1335*

**2. RECEIVED BY:**

Signature: *T. B. B.*  
 Print Name: *T. B. B.*  
 Date: *3-26-15* Time: *1335*

**A C & T Sample Receipt:**

Location: Oasis at Anozira

Total # Containers: 1

Custody Seals: YES  NO

Samples Intact: YES  NO

Samples On Ice: YES  NO

Ice Type: WET BLUE

Sample Receipt Temperature: 25.0

**3. RELINQUISHED BY:**

Signature: \_\_\_\_\_  
 Print Name: \_\_\_\_\_  
 Date: \_\_\_\_\_ Time: \_\_\_\_\_

**4. RECEIVED BY:**

Signature: \_\_\_\_\_  
 Print Name: \_\_\_\_\_  
 Date: \_\_\_\_\_ Time: \_\_\_\_\_

# OASIS AT ANOZIRA FIELD INSPECTION FORM (

wpdoc/lists&forms)

Date: 3/5/15  
By: jm

### Aeration System Operation

operational  Problem

Details: 2 aerators low pressure

### Lake Surface

Lake surface cleaning

Floating Fountains  West  East  South

operational  Problem Details: out

Pump house  housekeeping  leaks  ventilation  lighting Notes: \_\_\_\_\_

Compressors  operational  Problem Details: No fee

Pumps  operational  Problem Details: \_\_\_\_\_

### Entry Fountains

Elliot North:  operational  Screens cleared  Problem Details: \_\_\_\_\_

Elliot South:  operational  Screens cleared  Problem Details: Low break

Los Feliz:  operational  Screens cleared  Problem Details: \_\_\_\_\_

### Monthly Chemistry & Biology

- Dissolved oxygen 11.8
- Temperature 17.8
- pH 8.2
- Algae ID and count
- Ammonia-N
- Organic N (TKN)
- Phosphorus
- Turbidity
- E. coli



# OASIS AT ANOZIRA FIELD INSPECTION FORM (

wpdoc/lists&forms)

Date: 3/12/15  
By: HW

### Aeration System Operation

operational  Problem

Details: 2 aerators running poorly

### Lake Surface

Lake surface cleaning

Floating Fountains  West  East  South

operational  Problem Details: South OFF

Pump house  housekeeping  leaks  ventilation  lighting Notes \_\_\_\_\_

Compressors  operational  Problem Details: No key

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 19.3
- Temperature 21.0
- pH 8.8
- Algae ID and count
- Ammonia-N
- Organic N (TKN)
- Phosphorus
- Turbidity
- E. coli



# OASIS AT ANOZIRA FIELD INSPECTION FORM (

wpdoc/lists&forms)

Date: 3/19/15  
By: am

### Aeration System Operation

operational  Problem

Details: \_\_\_\_\_

### Lake Surface

Lake surface cleaning

Floating Fountains  West  East  South

operational  Problem Details: OFF

Pump house  housekeeping  leaks  ventilation  lighting Notes \_\_\_\_\_

Compressors  operational  Problem Details: No Key

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 11.4
- Temperature 24.7
- pH 8.6
- Algae ID and count
- Ammonia-N
- Organic N (TKN)
- Phosphorus
- Turbidity
- E. coli



