

2018 FINAL REPORT

To: Stevan Keith, P.E. - Environmental Services Unit Leader
From: Robert Peschel, P.E., Morgan Schroeder
Sigma Project Number: 17821
Date: January 3, 2019
RE: Veterans Park Lagoon Pilot Study

The Sigma Group, Inc (Sigma) appreciates the opportunity to assist the Milwaukee County Department of Administration (County) in conducting the Veterans Park Lagoon Pilot Study (Study). Sigma understands the Study is the short- term part of the 3-stage approach in addressing the legacy concerns of lagoon, particularly addressing harmful algal blooms (HABs). The study area is located in the southernmost quarter of the 14-acre Veterans Park Lagoon.

The installation of the aeration system, including, 2-inch underground conduit, connections, and manifold, three (3) diffused aeration pods with connected 1-inch air supply line, and a single air compressor system with housing box were installed on August 29, 2018. Kasco Marine manufactured aeration equipment was installed by Joel Reinders of Reinders, Inc. Aeration pods were placed in optimal locations determined Mr. Reinders and based Sigma's bathymetrical measurements, depicted in attached *Figure 1*. A Hanes Geo Components turbidity curtain was installed by Sigma on August 28, 2018. The turbidity curtain spans 200 feet across the width of the lagoon, allowing a 6 feet barrier below the surface of the water, and separating the southern, study area of the lagoon from the rest of the lagoon. A *Summary of Activities* and a *Summary of Equipment* is included in the report. The attached *Figure 2* depicts the approximate depth to sediment and depth to pond bottom at the location of each pod, the airline geometry, air compressor location, and turbidity curtain.

Sigma has conducted an existing conditions visual observation and seven (7) weekly visual observations using a camera affixed to a UAS to capture images of the lagoon's conditions during the duration of the pilot study. Incorporated in the report is *Observation Photo Documentation* including eight (8) sets of four (4) photos for each observation session.

Sigma terminated the aeration system operation by purging the air supply lines, closing the valves, capping the electrical the conduit connection and the removing the air compressor on October 26, 2018. The three aeration pods remained submerged in the lagoon. The air compressor motor and cabinet are currently being stored at Sigma. On October 30, 2018 Sigma staff removed the turbidity curtain from the Lagoon and used a pressure washer to remove debris and material from the curtain. The curtain was then transported and laid out to dry at the McKinley Marina parking lot. The curtain was folded and transported to a dry storage garage located at Gordan Park on November 1, 2018.



Final expert opinion regarding effectiveness of aerator treatment in the Veterans Park Lagoon is inconclusive at this time. Sigma recommends the continuation of the study in Spring 2019, in order to have the opportunity to analyze a longer study duration and provide conclusive results regarding effectiveness of the system.

A handwritten signature in blue ink that reads "Robert Peschel".

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A handwritten signature in black ink that reads "Morgan Schroeder".

Morgan Schroeder
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SUMMARY OF ACTIVITIES

8/22/2018	Existing conditions observation
8/27/2018	Directional boring
8/29/2018	Conduit, diffused aeration pods, and turbidity curtain installation
9/6/2018	Observation 1
9/13/2018	Observation 2
9/19/2018	Observation 3
9/28/2018	Observation 4
10/8/2018	Observation 5
10/16/2018	Observation 6
10/26/2018	Observation 7, Air supply line turned off and conduit capped
10/30/2018	Turbidity curtain removed
11/1/2018	Turbidity curtain placed in dry storage garage

SUMMARY OF EQUIPMENT



Directionally Bored Conduit and Air Diffuser Manifold



Air Compressor



Three (3) Diffused Aeration Pods



Turbidity Curtain

OBSERVATION PHOTO DOCUMENTATION

Existing Conditions Observation
August 22, 2018



NW –View of Study Area



N – View of Study Area



September 6,S – View of Study Area



NW – View of Study Area

Observation 1
September 6, 2018



NW – View of Study Area



W – View of Turbidity Curtain



S – View of Study Area



NW – View of Turbidity Curtain/North-End of Lagoon

Observation 2
September 13, 2018



NW – View of Study Area



W – View of Turbidity Curtain



S – View of Study Area



N – View of Turbidity Curtain/North-End of Lagoon

Observation 3
September 19, 2018



NW – View of Study Area



W – View of Turbidity Curtain



S – View of Study Area



N – View of Turbidity Curtain/North-End of Lagoon

Observation 4
September 28, 2018



NW – View of Study Area



W – View of Turbidity Curtain



S – View of Study Area



N – View of Turbidity Curtain/North-End of Lagoon

Observation 5
October 8, 2018



NW – View of Study Area



W – View of Turbidity Curtain



S – View of Study Area



N – View of Turbidity Curtain/North-End of Lagoon

Observation 6
October 16, 2018



NW – View of Study Area



W – View of Turbidity Curtain



S – View of Study Area



N – View of Turbidity Curtain/North-End of Lagoon

Observation 7
October 26, 2018



NW – View of Study Area



W – View of Turbidity Curtain



N – View of Study Area



N – View of Turbidity Curtain/North-End of Lagoon

Observation Summary Table

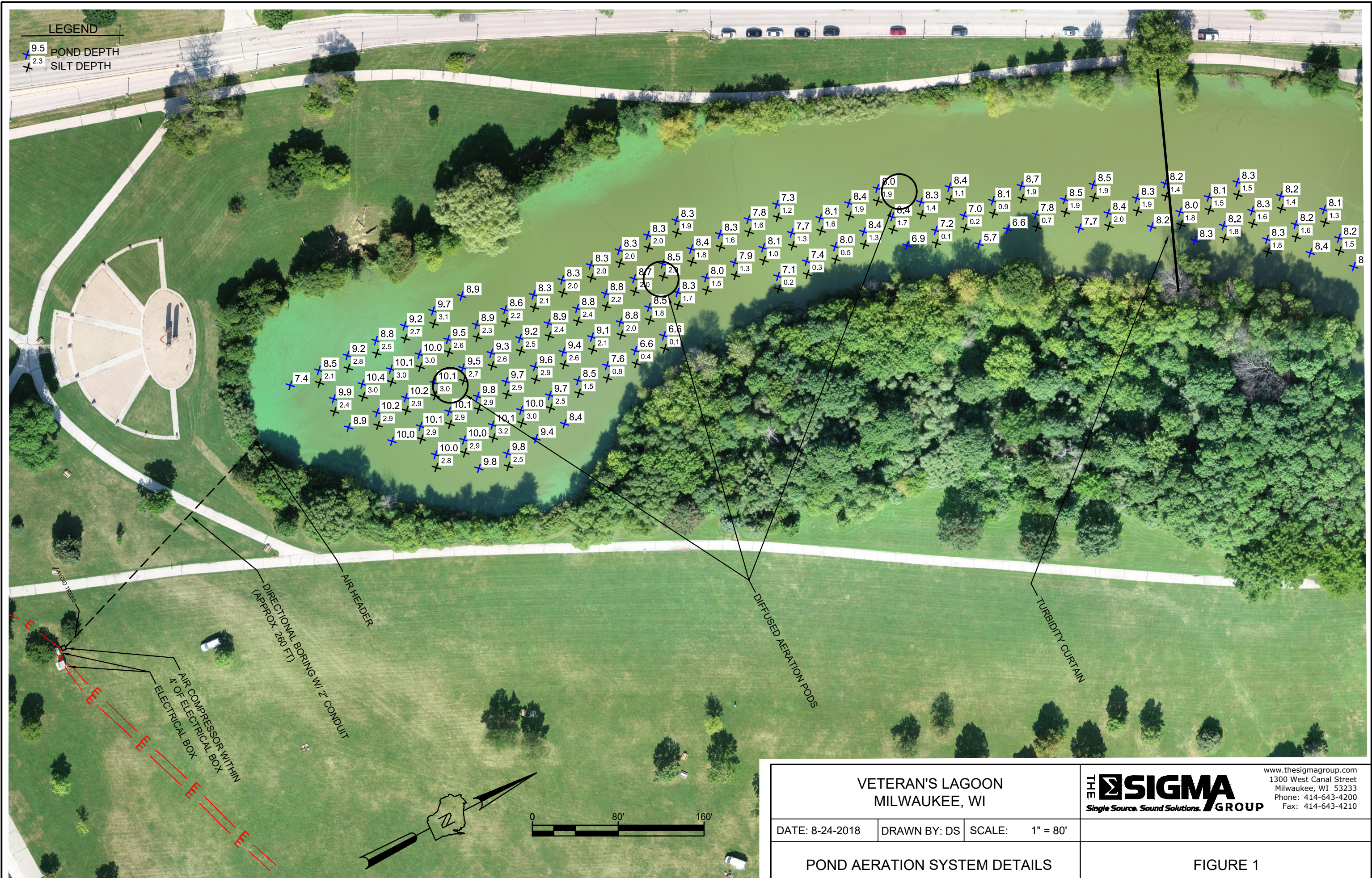
Veterans Lagoon Pilot Study Observation Summary Table

			Rain Event		Rain Event	Observation 1	Observation 2	Observation 3	Rain Event	Observation 4	Rain Event	Rain Event	Observation 5	Observation 6	Observation 7
			28-Aug	4-Sep	5-Sep	6-Sep	13-Sep	19-Sep	20-Sep	28-Sep	30-Sep	1-Oct	8-Oct	16-Oct	26-Oct
Sigma	Water Temp	F	---	---	---	75.2	75.2	73.4	---	---	---	---	---	51.8	---
County	Lagoon Elevation	ft	582.8775	583.44	---	---	---	---	---	---	---	---	---	---	---
	Lake Michigan Elevation	ft	580.9858	581.44	---	---	---	---	---	---	---	---	---	---	---
NOAA	Average Temperature	F	77.5	72.0	75.5	63.5	66.0	64.0	75.0	53.5	52.5	57.5	72.0	47.0	48.0
	Precipitation	in	1.15	0.58	1.28	T	0.00	0.04	2.13	0.00	1.16	2.06	0.09	0.00	0.00

Rain Event = Precipitation ≥ 1 in

T = Trace <0.01 in

Figure 1



LEGEND

+ 9.5 POND DEPTH
+ 2.3 SILT DEPTH

**VETERAN'S LAGOON
MILWAUKEE, WI**



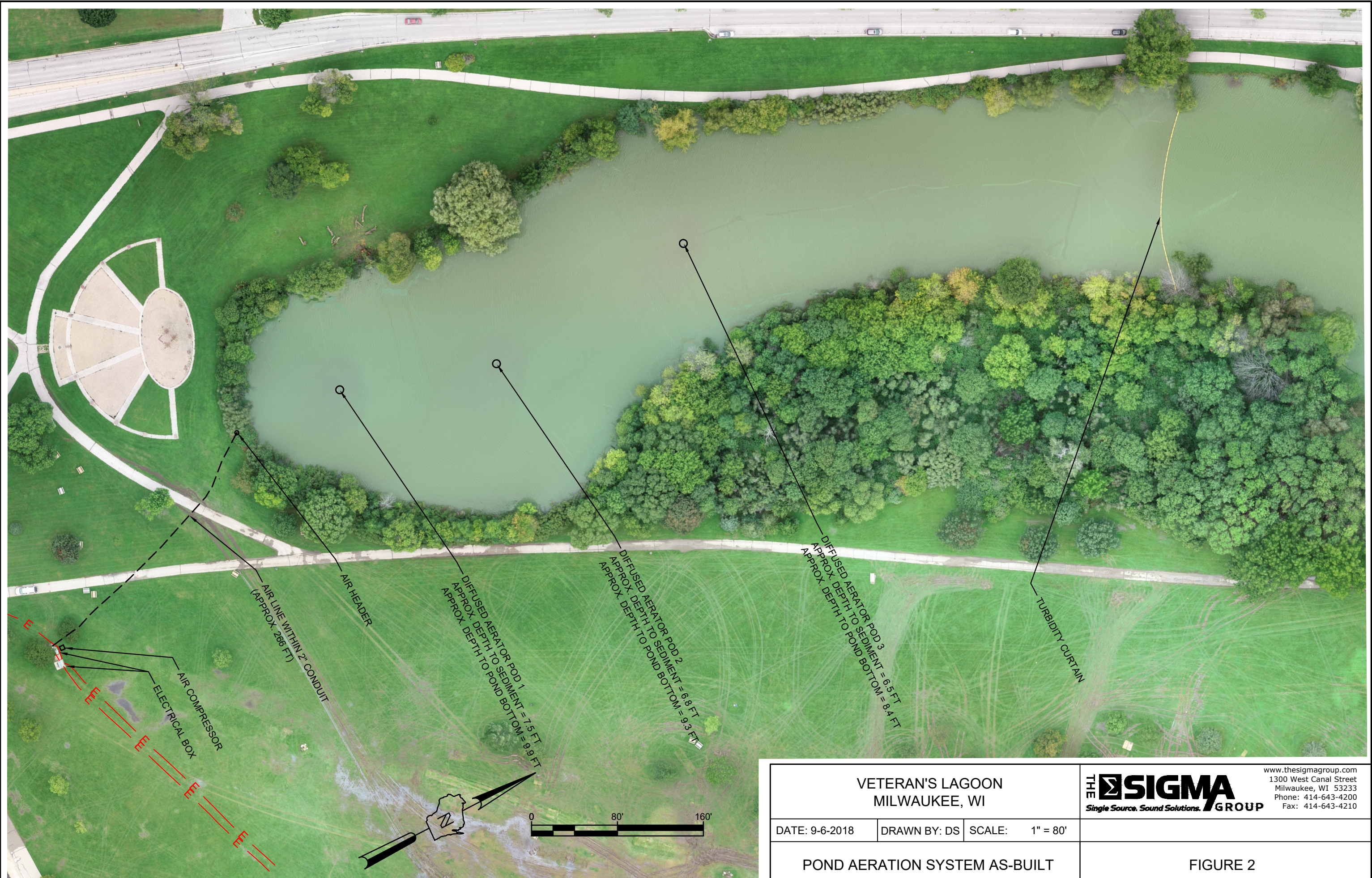
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DATE: 8-24-2018 DRAWN BY: DS SCALE: 1" = 80'

POND AERATION SYSTEM DETAILS

FIGURE 1

Figure 2



VETERAN'S LAGOON MILWAUKEE, WI			 <small>Single Source. Sound Solutions. GROUP</small>	<small>www.thesigmagroup.com 1300 West Canal Street Milwaukee, WI 53233 Phone: 414-643-4200 Fax: 414-643-4210</small>
DATE: 9-6-2018	DRAWN BY: DS	SCALE: 1" = 80'		
POND AERATION SYSTEM AS-BUILT			FIGURE 2	