Appendix B

Sediment Sampling Memo – Winnetka Pond East

resourceful. naturally.
engineering and environmental consultants

BARR

Technical Memorandum

To: Bassett Creek Watershed Management Commission
From: Kevin Menken and Candice Kantor
Subject: Winnetka Pond East Sediment Characterization
Date: February 27, 2017
Project: 23/27-0051

Introduction

This memorandum summarizes sediment characterization for sediment samples collected from the Winnetka Pond East in the City of Crystal (City). Sediment samples were collected by Barr Engineering Co. (Barr) on September 28, 2016 on behalf of Bassett Creek Watershed Management Organization.

The purpose of sediment characterization is to determine whether the sediment in the pond, when excavated or dredged, could potentially be reused as fill, or if other management methods such as landfill disposal would be required. The use and/or disposal of excavated or dredged material is determined based on concentrations of potential contaminants in the sediments, including metals and polycyclic aromatic hydrocarbons (PAHs). Excavated sediment and soils that do not exhibit field screening impacts and do not exceed the Minnesota Pollution Control Agency's (MPCA) Soil Reference Values (SRV) or applicable Screening Soil Leaching Values (SLVs) may be considered Unregulated Fill that is suitable for off-site reuse according to the MPCA document *Best Management Practices for the Off-Site Reuse of Unregulated Fill* (MPCA, 2012). Sediment or soil excavated from stormwater ponds with constituents that exceed SRVs or applicable Screening SLVs are often disposed at a solid waste landfill, but other options involving specific land uses (e.g. non-residential) could be explored if there are suitable locations elsewhere at City-owned property.

Sediment Sample Collection

Sediment sampling was conducted in accordance with the MPCA's *Managing Stormwater Sediment, Best Management Practice Guidance* (MPCA, 2015). This document provides technical guidance for characterizing sediment in stormwater ponds, including the number of samples that should be collected and potential contaminants to be analyzed. Barr staff collected three sediment samples, consistent with MPCA guidance recommendations for ponds 2 to 3 acres in size. Sampling locations were recorded with a handheld GPS unit; locations are shown on Figure 1. Barr staff used aluminum coring tubes for collecting sediment cores. The entire depth of the sediment core was homogenized in a clean stainless steel bowl before transferring portions to sample containers provided by the laboratory. Samples were sent to Pace Analytical laboratory in Minneapolis for analyses of potential contaminants.

The MPCA guidance for stormwater pond sediment management lists the baseline parameters that should be tested for in order to determine whether excavated sediment is contaminated or could be considered Unregulated Fill (MPCA, 2015). The baseline parameters listed in the MPCA guidance are arsenic, copper, and polycyclic aromatic hydrocarbons (PAHs). PAHs are organic compounds that are formed by the incomplete combustion of organic materials, such as wood, oil, and coal. They are also naturally occurring in crude oil and coal. The MPCA determined that coal tar-based sealants are the largest source of PAHs to stormwater ponds, and a state-wide ban of coal tar-based sealants took effect January 1, 2014.

In addition to the baseline parameters, additional parameters may be appropriate with consideration of potential sources of other contaminants in the watershed. A query of MPCA's *What's in My Neighborhood* (WIMN) website was performed for the Winnetka Pond East watershed. *WIMN* is a database maintained by the MPCA that includes potentially contaminated sites (e.g. documented tank leaks), and environmental permits and registrations (e.g. small quantity hazardous waste generator). Based on the WIMN query results and the land uses in the watershed, the sediment samples were analyzed for the MPCA's baseline parameters for stormwater ponds – arsenic, copper, and PAHs. In addition, samples were field screened for potential impacts from chemical impacts, including examination for visual staining, oil sheen, and odors. If field screening indicated possible impacts, additional analytical testing would have been considered.

Laboratory Methodologies and Determination of BaP Equivalents

The parameters analyzed and their laboratory analytical methods are listed below:

- Metals: arsenic, copper (method EPA 6010C)
- Polycyclic aromatic hydrocarbons (PAHs) (method EPA 8270D by SIM)

The PAHs that were analyzed can be grouped into two categories: carcinogenic (i.e. cancer causing) and non-carcinogenic. In order to assess the contamination level of the carcinogenic PAHs in stormwater pond sediment, the MPCA requires the calculation of a "BaP equivalents value". The BaP equivalents value is a single value representing the combined potency of 17 individual carcinogenic PAH compounds with BaP (benzo[a]pyrene) acting as the reference compound. The list of compounds and their respective potency equivalents factors used to calculate the BaP equivalents value can be found in the MPCA guidance document, along with methods for addressing constituents at concentrations below the detection limit (MPCA 2015).

Laboratory analytical results for the sediment samples are summarized in Table 1. The detailed laboratory report is included in Attachment C.

Results of Sediment Characterization

Results of laboratory analytical testing on the sediment samples were compared to the MPCA's current SRVs and Screening SLVs on Table 1. Results of field screening for staining, sheen, or odor, were negative for all three sediment samples; therefore, no additional analytical testing was conducted beyond the baseline parameter list for stormwater pond sediment characterization. Results of arsenic, copper, and PAHs in the sediment of Winnetka Pond East were below Minnesota's SRVs and Screening SLVs for all three samples collected from the pond, with the exception of the arsenic Screening SLV. Sample WPE-01 had an arsenic concentration of 6.3 mg/kg, which is slightly above the SLV of 5.8 mg/kg. However, MPCA guidance for Screening SLVs states that SLVs for metals should only be applied if there has been a significant release of metals documented. Since no significant release of metals has been documented in the pond's watershed, the observed arsenic concentration of 6.3 mg/kg in sample WPE-01 should not preclude the reuse of the material as Unregulated Fill. Overall, the sediment sampling results indicate that the sediment to be removed from Winnetka Pond East is suitable for off-site reuse under MPCA's Unregulated Fill Best Practice (MPCA, 2012).

Results of sediment testing were also compared to the MPCA's proposed changes to SRVs in Table 1. Results of arsenic, copper, and PAHs were below the proposed changes to SRVs for all three of the sediment samples collected from Winnetka Pond East. The MPCA had originally intended that the SRV changes would be implemented later this year (2017), but recent conversations with MCPA staff indicated that the timing of these potential changes may not occur in 2017. The status of MPCA's SRV revisions should be reassessed prior to proceeding with the sediment excavation and management.

References

Minnesota Pollution Control Agency (MPCA), 2012. Best Management Practices for the Off-Site Reuse of Unregulated Fill. February 2012.

MPCA, 2015. Managing Stormwater Sediment, Best Management Practice Guidance, document wq-strm4-16, June 2015.

Tables

Table 1 – Winnetka Pond East Sediment Analytical Data Summary

Figures

Figure 1 – Winnetka Pond East Sediment Sampling Locations

Attachments

Attachment A – Sediment Core Field Logs

Attachment B – Photographs

Attachment C – Laboratory Analytical Data Report

Tables

Table 1
Winnetka Pond East Sediment Analytical Data Summary
Bassett Creek Watershed Management Commission

							Sample ID:	**WPE-01**	**WPE-02**	**WPE-03**
							Sample Date:	**9/23/2016**	**9/23/2016**	**9/23/2016**
Parameter	Units	Minnesota Screening Soil Leaching Values	Minnesota Residential Soil Reference Values	Proposed Minnesota Residential/ Recreational SRVs	Minnesota Industrial Soil Reference Values	Proposed Minnesota Commercial/ Industrial SRVs				
Effective Date		06/01/2013	06/22/2009	08/01/2016	06/22/2009	08/01/2016				
Exceedance Key		**Bold**	No Exceed	No Exceed	No Exceed	No Exceed				
General Parameters										
Moisture	%							64.7	19.6	28.8
Metals										
Arsenic	mg/kg	**5.8**	9	9	20	9		**6.3**	2.3	2.9
Copper	mg/kg	700	100	2200	9000	33000		33.1	24.5	15.3
Carcinogenic PAHs										
3-Methylcholanthrene	mg/kg	T	T	T	T	T		0.0062 j*	0.0088 j	0.0049 j
5-Methylchrysene	mg/kg	T	T	T	T	T		0.0258 j	0.0384	0.0289
7,12-Dimethylbenz(a)anthracene	mg/kg	T	T	T	T	T		< 0.0079	< 0.0035	< 0.0039
7h-Dibenzo(c,g)carbazole	mg/kg	T	T	T	T	T		< 0.0048	< 0.0021	< 0.0024
Benz(a)anthracene	mg/kg	T	T	T	T	T		0.114	0.192	0.112
Benzo(a)pyrene	mg/kg	T	T	T	T	T		0.182	0.256	0.171
Chrysene	mg/kg	T	T	T	T	T		0.207	0.298	0.198
Dibenz(a,h)acridine	mg/kg	T	T	T	T	T		< 0.0107	0.0080 j	0.0056 j
Dibenz(a,h)anthracene	mg/kg	T	T	T	T	T		0.0223 j	0.0238	0.0169
Dibenzo(a,e)pyrene	mg/kg	T	T	T	T	T		0.0237 j*	0.0193	< 0.0013
Dibenzo(a,h)pyrene	mg/kg	T	T	T	T	T		0.0114 j*	0.0075 j	0.0070 j
Dibenzo(a,i)pyrene	mg/kg	T	T	T	T	T		0.0040 j*	0.0026 j	0.0027 j
Dibenzo(a,l)pyrene	mg/kg	T	T	T	T	T		0.0046 j*	0.0024 j	0.0025 j
Indeno(1,2,3-cd)pyrene	mg/kg	T	T	T	T	T		0.0769	0.0791	0.0595
BaP Equivalents, calculated using Kaplan-Meier method	mg/kg	1.4 T	2 T	1 T	3 T	14 T		0.57 a^	0.60 a	0.43 a
% Non-detects	%							20.0 a	13.3 a	20.0 a
PAHs										
2-Methylnaphthalene	mg/kg		100	39	369	370		0.0019 j	0.0024 j	0.0023 j
Acenaphthene	mg/kg	81	1200	1300	5260	19000		0.0066 j	0.0139	0.0121 j
Acenaphthylene	mg/kg	NA						0.0091 j	0.0090 j	0.0110 j
Anthracene	mg/kg	1300	7880	6500	45400	97000		0.0222 j	0.0370	0.0321
Benzo(g,h,i)perylene	mg/kg	NA						0.0881 *	0.0764	0.0656
Benzofluoranthenes	mg/kg							0.478	0.635	0.453
Fluoranthene	mg/kg	670	1080	510	6800	6700		0.344	0.523	0.419
Fluorene	mg/kg	110	850	860	4120	13000		0.0093 j	0.0207	0.0151
Naphthalene	mg/kg	4.5	10	81	28	120		0.0021 j	0.0018 j	0.0020 j
Phenanthrene	mg/kg	NA						0.101	0.223	0.144
Pyrene	mg/kg	440	890	44	5800	44		0.254	0.361	0.252

Table 1 Data Footnotes and Qualifiers

Barr Standard Footnotes and Qualifiers

*	Estimated value, QA/QC criteria not met.
a	Estimated value, calculated using some or all values that are estimates.
j	Estimated detected value. The reported value is less than the stated laboratory quantitation limit but greater than the laboratory method detection limit.
^	Possible low bias due to four BaP compounds having low MS/MSD (dibenz(a,e)pyrene,dibenz(a,h)pyrene, dibenz(a,i)pyrene, dibenz(a,l)pyrene) and one compound (3-methylcholanthrene with low LCS.

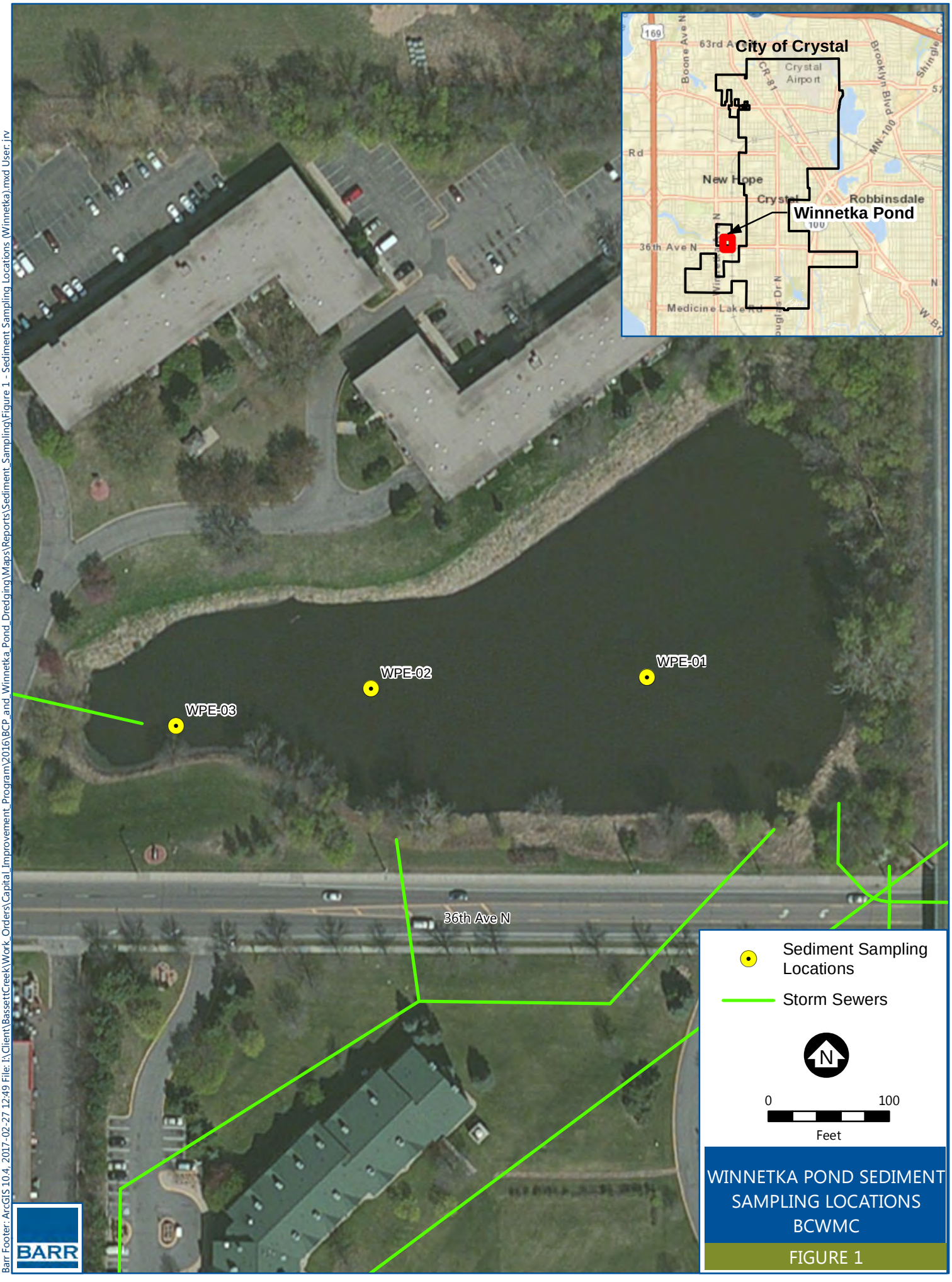
Minnesota Screening Soil Leaching Values

NA	Criterion value is not available for this analyte.
T	Value represents a criteria for the total carcinogenic PAHs as BaP.

Minnesota Soil Reference Values

T	Value represents a criteria for the total carcinogenic PAHs as BaP.

Figures



Barr Footer: ArcGIS 10.4, 2017-02-27 12:49 File: I:\Client\BassettCreek\Work_Orders\Capital_Improvement_Program\2016\BCP_and_Winnetka_Pond_Dredging\Maps\Reports\Sediment_Sampling\Figure 1 - Sediment Sampling Locations (Winnetka).mxd User: jrv

Attachment A

Sediment/Soil Coring Logs

Sediment Core/Boring Log

BARR

Winnetka Pond East

Proj#: 23270051. Project: Bassett Creek Ponds

Collection Date(s): 9-23-16 GPS X:

Ice Thickness (feet): — GPS Y: DNR

Water Depth (feet): 3.0 GPS Z: GPS

Length of Push (feet): 2.3' Driller: Barr

Recovery (feet): 2.1 Crew: JWJ/KDM

% Recovery: Observer: —

VC: vibracore
PC: push core

Core/Boring#: WPE-01

Drilling Method: VC

Logged by: JWJ

Checked by: KDM

Depth (ft.)		Sample Interval and number	Properties										Description
			Moisture	Density or Consistency	Plasticity	Cohesiveness	Particles	Odor	Staining	Sheen	ASTM / USCS Classification	Graphic Log	
0	1	0'-2.1'	W	Soft	N	Low	roots	N	N	N	OL/OH		0'-0.1' = loose Black organic silts 0.1'-1.0' = Soft Black organic silts
1	2.1			Spongy	N	Low	Fibrous	N	N	N	OL/OH (Peat)		1.0'-2.1' = Black to V dark brown organic peat spongy and fibrous
													Refusal @ 2.3'

Sediment Core/Boring Log

BARR

Proj#: 23270051. Project: Bassett Creek Ponds — Winnetka Pond East

Collection Date(s): 9-23-16 GPS X:

Ice Thickness (feet): — GPS Y: ON GPS

Water Depth (feet): 2.0 GPS Z:

Length of Push (feet): 2.7' Driller: Barr

Recovery (feet): 2.3' Crew: JWJ/KDM

% Recovery: Observer: —

VC: vibracore
PC: push core

Core/Boring#: WPE-02

Drilling Method: VC

Logged by: JWJ

Checked by: KDM

Depth (ft.)		Sample Interval and number	Properties: Moisture	Density or Consistency	Plasticity	Cohesiveness	Particles	Odor	Staining	Sheen	ASTM / USCS Classification	Graphic Log	Description
0	1.3	0'-2.3'	W	loose	N	N	N	N	N	N	~~PT~~ SM		0-1.3' = Black silty sand fg-cg w/ trace fine gravel
1.3'	2.3'		~~Sat~~	soft { med soft	Low	Yes	N	N	N	N	OL/OH & CL		1.3-2.3 = Black to olive blue color soft(Black) Organic silts grades to (olive blue) lean clay med soft trace coarse sand throughout
													Refusal @ 2.7'

Sediment Core/Boring Log

BARR

VC: vibracore
PC: push core

Proj#: 23270051 Project: Winnetka Pond East Core/Boring#: WPE-03

Collection Date(s): 9-23-16 GPS X: Length of Push (feet): 3.6 Driller: Barr Drilling Method: VC

Ice Thickness (feet): GPS Y: Recovery (feet): 3.6 Crew: JWJ/KDM Logged by: JWJ

Water Depth (feet): 2.4 GPS Z: % Recovery: Observer: Checked by: KDM

Depth (ft.)		Sample Interval and number	Properties										Description
			Moisture	Density or Consistency	Plasticity	Cohesiveness	Particles	Odor	Staining	Sheen	ASTM / USCS Classification	Graphic Log	
0	1.5	0-3.6	W	Loose	N	N	N	N	N	N	SM		0-1.5'= Black silty sand w/ roots fg-cg sand
1.5	2.5		W	Soft	N	Yes	N	N	N	N	OL/OH		1.5-2.5'= Black peaty silts w/ sand
2.5	3.6		W	Stiff	Low	Yes	N	N	N	N	CL		2.5-3.6'= Gray lean clay w/ gravel and sand fg-cg.

Attachment B

Photographs

Photograph #1: Sediment core WPE-01.

Photograph #2: Sediment core WPE-02.

Photograph #3: Sediment core WPE-03, 0-2.5’ interval.

Photograph #4: Sediment core WPE-03, 1.5-3.5’ interval.

Attachment C

Laboratory Analytical Data

Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

October 11, 2016

Terri Olson
Barr Engineering
4300 MarketPointe Drive
Suite 200
Minneapolis, MN 55435

RE: Project: 23270051.37 Pond Zoo Bassett
Pace Project No.: 10363579

Dear Terri Olson:
Enclosed are the analytical results for sample(s) received by the laboratory on September 23, 2016. The results relate only to the samples included in this report. Results reported herein conform to the most current, applicable TNI/NELAC standards and the laboratory's Quality Assurance Manual, where applicable, unless otherwise noted in the body of the report.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Amanda Albrecht
amanda.albrecht@pacelabs.com
Project Manager

Enclosures

cc: BarrDM, Barr Engineering
Kevin Menken, Barr Engineering

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

CERTIFICATIONS

Project: 23270051.37 Pond Zoo Bassett
Pace Project No.: 10363579

Minnesota Certification IDs

1700 Elm Street SE Suite 200, Minneapolis, MN 55414
Alaska Certification UST-107
525 N 8th Street, Salina, KS 67401
A2LA Certification #: 2926.01
Alaska Certification #: UST-078
Alaska Certification #MN00064
Alabama Certification #40770
Arizona Certification #: AZ-0014
Arkansas Certification #: 88-0680
California Certification #: 01155CA
Colorado Certification #Pace
Connecticut Certification #: PH-0256
EPA Region 8 Certification #: 8TMS-L
Florida/NELAP Certification #: E87605
Guam Certification #:14-008r
Georgia Certification #: 959
Georgia EPD #: Pace
Idaho Certification #: MN00064
Hawaii Certification #MN00064
Illinois Certification #: 200011
Indiana Certification#C-MN-01
Iowa Certification #: 368
Kansas Certification #: E-10167
Kentucky Dept of Envi. Protection - DW #90062
Kentucky Dept of Envi. Protection - WW #:90062
Louisiana DEQ Certification #: 3086
Louisiana DHH #: LA140001
Maine Certification #: 2013011
Maryland Certification #: 322
Michigan DEPH Certification #: 9909
Minnesota Certification #: 027-053-137
Mississippi Certification #: Pace
Montana Certification #: MT0092
Nevada Certification #: MN_00064
Nebraska Certification #: Pace
New Jersey Certification #: MN-002
New York Certification #: 11647
North Carolina Certification #: 530
North Carolina State Public Health #: 27700
North Dakota Certification #: R-036
Ohio EPA #: 4150
Ohio VAP Certification #: CL101
Oklahoma Certification #: 9507
Oregon Certification #: MN200001
Oregon Certification #: MN300001
Pennsylvania Certification #: 68-00563
Puerto Rico Certification
Saipan (CNMI) #:MP0003
South Carolina #:74003001
Texas Certification #: T104704192
Tennessee Certification #: 02818
Utah Certification #: MN000642013-4
Virginia DGS Certification #: 251
Virginia/VELAP Certification #: Pace
Washington Certification #: C486
West Virginia Certification #: 382
West Virginia DHHR #:9952C
Wisconsin Certification #: 999407970

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

SAMPLE SUMMARY

Project: 23270051.37 Pond Zoo Bassett
Pace Project No.: 10363579

Lab ID	Sample ID	Matrix	Date Collected	Date Received
10363579001	**WPE-01**	Solid	09/23/16 11:45	09/23/16 15:20
10363579002	**WPE-02**	Solid	09/23/16 12:00	09/23/16 15:20
10363579003	**WPE-03**	Solid	09/23/16 12:30	09/23/16 15:20
10363579004	**WPE-Comp**	Solid	09/23/16 12:38	09/23/16 15:20

Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

SAMPLE ANALYTE COUNT

Project: 23270051.37 Pond Zoo Bassett
Pace Project No.: 10363579

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
10363579001	**WPE-01**	EPA 6010C	DM	2	PASI-M
		ASTM D2974	JDL	1	PASI-M
		EPA 8270D by SIM	JLR	27	PASI-M
10363579002	**WPE-02**	EPA 6010C	DM	2	PASI-M
		ASTM D2974	JDL	1	PASI-M
		EPA 8270D by SIM	JLR	27	PASI-M
10363579003	**WPE-03**	EPA 6010C	DM	2	PASI-M
		ASTM D2974	JDL	1	PASI-M
		EPA 8270D by SIM	JLR	27	PASI-M

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

PROJECT NARRATIVE

Project: 23270051.37 Pond Zoo Bassett
Pace Project No.: 10363579

Date: October 11, 2016

Case Narrative

Semi-Volatile Organics Analysis

8270D CPAH

Refering to data qualifiers that appear later in the report:

SS - The 7,12 dimethylbenz(a)anthracene result associated with batch QC did not meet secondary source verification criteria. It was recovered at 175% (recovery limits are 50-150%). The high recovery leads to a high bias in the QC but does not impact any results.

Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

ANALYTICAL RESULTS

Project: 23270051.37 Pond Zoo Bassett
Pace Project No.: 10363579

Sample: WPE-01 **Lab ID: 10363579001** Collected: 09/23/16 11:45 Received: 09/23/16 15:20 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	PQL	MDL	DF	Prepared	Analyzed	CAS No.	Qual
6010C MET ICP	Analytical Method: EPA 6010C Preparation Method: EPA 3050								
Arsenic	**6.3**	mg/kg	2.8	0.56	1	09/27/16 11:54	09/30/16 11:03	7440-38-2	
Copper	**33.1**	mg/kg	1.4	0.11	1	09/27/16 11:54	09/30/16 11:03	7440-50-8	
Dry Weight	Analytical Method: ASTM D2974								
Percent Moisture	**64.7**	%	0.10	0.10	1		09/30/16 11:49		
8270D MSSV CPAH by SIM	Analytical Method: EPA 8270D by SIM Preparation Method: EPA 3550								
Acenaphthene	**6.6J**	ug/kg	28.3	1.7	1	09/26/16 07:13	10/04/16 14:42	83-32-9	
Acenaphthylene	**9.1J**	ug/kg	28.3	1.6	1	09/26/16 07:13	10/04/16 14:42	208-96-8	
Anthracene	**22.2J**	ug/kg	28.3	1.6	1	09/26/16 07:13	10/04/16 14:42	120-12-7	
Benzo(a)anthracene	**114**	ug/kg	28.3	4.2	1	09/26/16 07:13	10/04/16 14:42	56-55-3	
Benzo(a)pyrene	**182**	ug/kg	28.3	3.7	1	09/26/16 07:13	10/04/16 14:42	50-32-8	
Benzo(g,h,i)perylene	**88.1**	ug/kg	28.3	8.2	1	09/26/16 07:13	10/04/16 14:42	191-24-2	M1
Benzofluoranthenes (Total)	**478**	ug/kg	84.8	31.1	1	09/26/16 07:13	10/04/16 14:42		
Chrysene	**207**	ug/kg	28.3	1.5	1	09/26/16 07:13	10/04/16 14:42	218-01-9	
Dibenz(a,h)acridine	**<10.7**	ug/kg	28.3	10.7	1	09/26/16 07:13	10/04/16 14:42	226-36-8	
Dibenz(a,h)anthracene	**22.3J**	ug/kg	28.3	9.6	1	09/26/16 07:13	10/04/16 14:42	53-70-3	
Dibenzo(a,e)pyrene	**23.7J**	ug/kg	28.3	2.6	1	09/26/16 07:13	10/04/16 14:42	192-65-4	M1
Dibenzo(a,h)pyrene	**11.4J**	ug/kg	28.3	7.9	1	09/26/16 07:13	10/04/16 14:42	189-64-0	M1
Dibenzo(a,i)pyrene	**4.0J**	ug/kg	28.3	2.7	1	09/26/16 07:13	10/04/16 14:42	189-55-9	M1
Dibenzo(a,l)pyrene	**4.6J**	ug/kg	28.3	1.6	1	09/26/16 07:13	10/04/16 14:42	191-30-0	M1
7H-Dibenzo(c,g)carbazole	**<4.8**	ug/kg	28.3	4.8	1	09/26/16 07:13	10/04/16 14:42	194-59-2	
7,12-Dimethylbenz(a)anthracene	**<7.9**	ug/kg	28.3	7.9	1	09/26/16 07:13	10/04/16 14:42	57-97-6	
Fluoranthene	**344**	ug/kg	28.3	2.1	1	09/26/16 07:13	10/04/16 14:42	206-44-0	
Fluorene	**9.3J**	ug/kg	28.3	1.6	1	09/26/16 07:13	10/04/16 14:42	86-73-7	
Indeno(1,2,3-cd)pyrene	**76.9**	ug/kg	28.3	8.5	1	09/26/16 07:13	10/04/16 14:42	193-39-5	
3-Methylcholanthrene	**6.2J**	ug/kg	28.3	4.2	1	09/26/16 07:13	10/04/16 14:42	56-49-5	L2
5-Methylchrysene	**25.8J**	ug/kg	28.3	3.4	1	09/26/16 07:13	10/04/16 14:42	3697-24-3	
2-Methylnaphthalene	**1.9J**	ug/kg	28.3	1.8	1	09/26/16 07:13	10/04/16 14:42	91-57-6	
Naphthalene	**2.1J**	ug/kg	28.3	1.7	1	09/26/16 07:13	10/04/16 14:42	91-20-3	
Phenanthrene	**101**	ug/kg	28.3	1.7	1	09/26/16 07:13	10/04/16 14:42	85-01-8	
Pyrene	**254**	ug/kg	28.3	2.1	1	09/26/16 07:13	10/04/16 14:42	129-00-0	
Surrogates									
2-Fluorobiphenyl (S)	65	%.	46-125		1	09/26/16 07:13	10/04/16 14:42	321-60-8	
p-Terphenyl-d14 (S)	65	%.	46-125		1	09/26/16 07:13	10/04/16 14:42	1718-51-0	

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

ANALYTICAL RESULTS

Project: 23270051.37 Pond Zoo Bassett
Pace Project No.: 10363579

Sample: WPE-02 **Lab ID: 10363579002** Collected: 09/23/16 12:00 Received: 09/23/16 15:20 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	PQL	MDL	DF	Prepared	Analyzed	CAS No.	Qual
6010C MET ICP	Analytical Method: EPA 6010C Preparation Method: EPA 3050								
Arsenic	**2.3**	mg/kg	1.1	0.22	1	09/27/16 11:54	09/30/16 11:29	7440-38-2	
Copper	**24.5**	mg/kg	0.55	0.044	1	09/27/16 11:54	09/30/16 11:29	7440-50-8	
Dry Weight	Analytical Method: ASTM D2974								
Percent Moisture	**19.6**	%	0.10	0.10	1		09/30/16 11:49		
8270D MSSV CPAH by SIM	Analytical Method: EPA 8270D by SIM Preparation Method: EPA 3550								
Acenaphthene	**13.9**	ug/kg	12.4	0.76	1	09/26/16 07:13	10/04/16 16:09	83-32-9	
Acenaphthylene	**9.0J**	ug/kg	12.4	0.71	1	09/26/16 07:13	10/04/16 16:09	208-96-8	
Anthracene	**37.0**	ug/kg	12.4	0.72	1	09/26/16 07:13	10/04/16 16:09	120-12-7	
Benzo(a)anthracene	**192**	ug/kg	12.4	1.9	1	09/26/16 07:13	10/04/16 16:09	56-55-3	
Benzo(a)pyrene	**256**	ug/kg	12.4	1.6	1	09/26/16 07:13	10/04/16 16:09	50-32-8	
Benzo(g,h,i)perylene	**76.4**	ug/kg	12.4	3.6	1	09/26/16 07:13	10/04/16 16:09	191-24-2	
Benzofluoranthenes (Total)	**635**	ug/kg	186	68.2	5	09/26/16 07:13	10/05/16 14:56		
Chrysene	**298**	ug/kg	12.4	0.66	1	09/26/16 07:13	10/04/16 16:09	218-01-9	
Dibenz(a,h)acridine	**8.0J**	ug/kg	12.4	4.7	1	09/26/16 07:13	10/04/16 16:09	226-36-8	
Dibenz(a,h)anthracene	**23.8**	ug/kg	12.4	4.2	1	09/26/16 07:13	10/04/16 16:09	53-70-3	
Dibenzo(a,e)pyrene	**19.3**	ug/kg	12.4	1.1	1	09/26/16 07:13	10/04/16 16:09	192-65-4	
Dibenzo(a,h)pyrene	**7.5J**	ug/kg	12.4	3.5	1	09/26/16 07:13	10/04/16 16:09	189-64-0	
Dibenzo(a,i)pyrene	**2.6J**	ug/kg	12.4	1.2	1	09/26/16 07:13	10/04/16 16:09	189-55-9	
Dibenzo(a,l)pyrene	**2.4J**	ug/kg	12.4	0.71	1	09/26/16 07:13	10/04/16 16:09	191-30-0	
7H-Dibenzo(c,g)carbazole	**<2.1**	ug/kg	12.4	2.1	1	09/26/16 07:13	10/04/16 16:09	194-59-2	
7,12-Dimethylbenz(a)anthracene	**<3.5**	ug/kg	12.4	3.5	1	09/26/16 07:13	10/04/16 16:09	57-97-6	
Fluoranthene	**523**	ug/kg	62.0	4.6	5	09/26/16 07:13	10/05/16 14:56	206-44-0	
Fluorene	**20.7**	ug/kg	12.4	0.71	1	09/26/16 07:13	10/04/16 16:09	86-73-7	
Indeno(1,2,3-cd)pyrene	**79.1**	ug/kg	12.4	3.7	1	09/26/16 07:13	10/04/16 16:09	193-39-5	
3-Methylcholanthrene	**8.8J**	ug/kg	12.4	1.9	1	09/26/16 07:13	10/04/16 16:09	56-49-5	L2
5-Methylchrysene	**38.4**	ug/kg	12.4	1.5	1	09/26/16 07:13	10/04/16 16:09	3697-24-3	
2-Methylnaphthalene	**2.4J**	ug/kg	12.4	0.79	1	09/26/16 07:13	10/04/16 16:09	91-57-6	
Naphthalene	**1.8J**	ug/kg	12.4	0.76	1	09/26/16 07:13	10/04/16 16:09	91-20-3	
Phenanthrene	**223**	ug/kg	12.4	0.76	1	09/26/16 07:13	10/04/16 16:09	85-01-8	
Pyrene	**361**	ug/kg	62.0	4.6	5	09/26/16 07:13	10/05/16 14:56	129-00-0	
Surrogates									
2-Fluorobiphenyl (S)	67	%.	46-125		1	09/26/16 07:13	10/04/16 16:09	321-60-8	
p-Terphenyl-d14 (S)	90	%.	46-125		1	09/26/16 07:13	10/04/16 16:09	1718-51-0	

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

ANALYTICAL RESULTS

Project: 23270051.37 Pond Zoo Bassett
Pace Project No.: 10363579

Sample: WPE-03 **Lab ID: 10363579003** Collected: 09/23/16 12:30 Received: 09/23/16 15:20 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	PQL	MDL	DF	Prepared	Analyzed	CAS No.	Qual
6010C MET ICP	Analytical Method: EPA 6010C Preparation Method: EPA 3050								
Arsenic	**2.9**	mg/kg	1.3	0.26	1	09/27/16 11:54	09/30/16 11:31	7440-38-2	
Copper	**15.3**	mg/kg	0.64	0.051	1	09/27/16 11:54	09/30/16 11:31	7440-50-8	
Dry Weight	Analytical Method: ASTM D2974								
Percent Moisture	**28.8**	%	0.10	0.10	1		09/30/16 11:49		
8270D MSSV CPAH by SIM	Analytical Method: EPA 8270D by SIM Preparation Method: EPA 3550								
Acenaphthene	**12.1J**	ug/kg	14.0	0.86	1	09/26/16 07:13	10/05/16 14:27	83-32-9	
Acenaphthylene	**11.0J**	ug/kg	14.0	0.80	1	09/26/16 07:13	10/05/16 14:27	208-96-8	
Anthracene	**32.1**	ug/kg	14.0	0.81	1	09/26/16 07:13	10/05/16 14:27	120-12-7	
Benzo(a)anthracene	**112**	ug/kg	14.0	2.1	1	09/26/16 07:13	10/05/16 14:27	56-55-3	
Benzo(a)pyrene	**171**	ug/kg	14.0	1.8	1	09/26/16 07:13	10/05/16 14:27	50-32-8	
Benzo(g,h,i)perylene	**65.6**	ug/kg	14.0	4.1	1	09/26/16 07:13	10/05/16 14:27	191-24-2	
Benzofluoranthenes (Total)	**453**	ug/kg	42.1	15.5	1	09/26/16 07:13	10/05/16 14:27		
Chrysene	**198**	ug/kg	14.0	0.74	1	09/26/16 07:13	10/05/16 14:27	218-01-9	
Dibenz(a,h)acridine	**5.6J**	ug/kg	14.0	5.3	1	09/26/16 07:13	10/05/16 14:27	226-36-8	
Dibenz(a,h)anthracene	**16.9**	ug/kg	14.0	4.8	1	09/26/16 07:13	10/05/16 14:27	53-70-3	
Dibenzo(a,e)pyrene	**<1.3**	ug/kg	14.0	1.3	1	09/26/16 07:13	10/05/16 14:27	192-65-4	
Dibenzo(a,h)pyrene	**7.0J**	ug/kg	14.0	3.9	1	09/26/16 07:13	10/05/16 14:27	189-64-0	
Dibenzo(a,i)pyrene	**2.7J**	ug/kg	14.0	1.4	1	09/26/16 07:13	10/05/16 14:27	189-55-9	
Dibenzo(a,l)pyrene	**2.5J**	ug/kg	14.0	0.80	1	09/26/16 07:13	10/05/16 14:27	191-30-0	
7H-Dibenzo(c,g)carbazole	**<2.4**	ug/kg	14.0	2.4	1	09/26/16 07:13	10/05/16 14:27	194-59-2	
7,12-Dimethylbenz(a)anthracene	**<3.9**	ug/kg	14.0	3.9	1	09/26/16 07:13	10/05/16 14:27	57-97-6	
Fluoranthene	**419**	ug/kg	14.0	1.0	1	09/26/16 07:13	10/05/16 14:27	206-44-0	
Fluorene	**15.1**	ug/kg	14.0	0.80	1	09/26/16 07:13	10/05/16 14:27	86-73-7	
Indeno(1,2,3-cd)pyrene	**59.5**	ug/kg	14.0	4.2	1	09/26/16 07:13	10/05/16 14:27	193-39-5	
3-Methylcholanthrene	**4.9J**	ug/kg	14.0	2.1	1	09/26/16 07:13	10/05/16 14:27	56-49-5	L2
5-Methylchrysene	**28.9**	ug/kg	14.0	1.7	1	09/26/16 07:13	10/05/16 14:27	3697-24-3	
2-Methylnaphthalene	**2.3J**	ug/kg	14.0	0.90	1	09/26/16 07:13	10/05/16 14:27	91-57-6	
Naphthalene	**2.0J**	ug/kg	14.0	0.86	1	09/26/16 07:13	10/05/16 14:27	91-20-3	
Phenanthrene	**144**	ug/kg	14.0	0.86	1	09/26/16 07:13	10/05/16 14:27	85-01-8	
Pyrene	**252**	ug/kg	14.0	1.1	1	09/26/16 07:13	10/05/16 14:27	129-00-0	
Surrogates									
2-Fluorobiphenyl (S)	74	%.	46-125		1	09/26/16 07:13	10/05/16 14:27	321-60-8	
p-Terphenyl-d14 (S)	69	%.	46-125		1	09/26/16 07:13	10/05/16 14:27	1718-51-0	

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

QUALITY CONTROL DATA

Project: 23270051.37 Pond Zoo Bassett
Pace Project No.: 10363579

QC Batch: 437522 Analysis Method: EPA 6010C
QC Batch Method: EPA 3050 Analysis Description: 6010C Solids
Associated Lab Samples: 10363579001, 10363579002, 10363579003

METHOD BLANK: 2377135 Matrix: Solid
Associated Lab Samples: 10363579001, 10363579002, 10363579003

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
Arsenic	mg/kg	<0.19	0.96	0.19	09/30/16 10:52	
Copper	mg/kg	<0.038	0.48	0.038	09/30/16 10:52	

LABORATORY CONTROL SAMPLE: 2377136

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Arsenic	mg/kg	49.5	46.3	94	80-120	
Copper	mg/kg	49.5	49.3	100	80-120	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2377137 2377138

Parameter	Units	10363579001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Arsenic	mg/kg	6.3	129	120	123	121	90	96	75-125	1	20	
Copper	mg/kg	33.1	129	120	162	147	100	95	75-125	10	20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

QUALITY CONTROL DATA

Project: 23270051.37 Pond Zoo Bassett
Pace Project No.: 10363579

QC Batch: 438463 Analysis Method: ASTM D2974
QC Batch Method: ASTM D2974 Analysis Description: Dry Weight/Percent Moisture
Associated Lab Samples: 10363579001, 10363579002, 10363579003

SAMPLE DUPLICATE: 2381583

Parameter	Units	10364275001 Result	Dup Result	RPD	Max RPD	Qualifiers
Percent Moisture	%	8.2	7.3	11	30	

SAMPLE DUPLICATE: 2381605

Parameter	Units	10363579003 Result	Dup Result	RPD	Max RPD	Qualifiers
Percent Moisture	%	28.8	29.3	2	30	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

QUALITY CONTROL DATA

Project: 23270051.37 Pond Zoo Bassett
Pace Project No.: 10363579

QC Batch: 437411 Analysis Method: EPA 8270D by SIM
QC Batch Method: EPA 3550 Analysis Description: 8270D CPAH by SIM MSSV
Associated Lab Samples: 10363579001, 10363579002, 10363579003

METHOD BLANK: 2376626 Matrix: Solid
Associated Lab Samples: 10363579001, 10363579002, 10363579003

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
2-Methylnaphthalene	ug/kg	<0.64	10.0	0.64	10/04/16 12:45	
3-Methylcholanthrene	ug/kg	<1.5	10.0	1.5	10/04/16 12:45	
5-Methylchrysene	ug/kg	<1.2	10.0	1.2	10/04/16 12:45	
7,12-Dimethylbenz(a)anthracene	ug/kg	<2.8	10.0	2.8	10/04/16 12:45	
7H-Dibenzo(c,g)carbazole	ug/kg	<1.7	10.0	1.7	10/04/16 12:45	
Acenaphthene	ug/kg	<0.61	10.0	0.61	10/04/16 12:45	
Acenaphthylene	ug/kg	<0.57	10.0	0.57	10/04/16 12:45	
Anthracene	ug/kg	<0.58	10.0	0.58	10/04/16 12:45	
Benzo(a)anthracene	ug/kg	<1.5	10.0	1.5	10/04/16 12:45	
Benzo(a)pyrene	ug/kg	<1.3	10.0	1.3	10/04/16 12:45	
Benzo(g,h,i)perylene	ug/kg	<2.9	10.0	2.9	10/04/16 12:45	
Benzofluoranthenes (Total)	ug/kg	<11.0	30.0	11.0	10/04/16 12:45	
Chrysene	ug/kg	<0.53	10.0	0.53	10/04/16 12:45	
Dibenz(a,h)acridine	ug/kg	<3.8	10.0	3.8	10/04/16 12:45	
Dibenz(a,h)anthracene	ug/kg	<3.4	10.0	3.4	10/04/16 12:45	
Dibenzo(a,e)pyrene	ug/kg	<0.92	10.0	0.92	10/04/16 12:45	
Dibenzo(a,h)pyrene	ug/kg	<2.8	10.0	2.8	10/04/16 12:45	
Dibenzo(a,i)pyrene	ug/kg	<0.97	10.0	0.97	10/04/16 12:45	
Dibenzo(a,l)pyrene	ug/kg	<0.57	10.0	0.57	10/04/16 12:45	
Fluoranthene	ug/kg	<0.74	10.0	0.74	10/04/16 12:45	
Fluorene	ug/kg	<0.57	10.0	0.57	10/04/16 12:45	
Indeno(1,2,3-cd)pyrene	ug/kg	<3.0	10.0	3.0	10/04/16 12:45	
Naphthalene	ug/kg	<0.61	10.0	0.61	10/04/16 12:45	
Phenanthrene	ug/kg	<0.61	10.0	0.61	10/04/16 12:45	
Pyrene	ug/kg	<0.75	10.0	0.75	10/04/16 12:45	
2-Fluorobiphenyl (S)	%.	75	46-125		10/04/16 12:45	
p-Terphenyl-d14 (S)	%.	101	46-125		10/04/16 12:45	

LABORATORY CONTROL SAMPLE: 2376627

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
2-Methylnaphthalene	ug/kg	100	52.9	53	41-125	
3-Methylcholanthrene	ug/kg	100	26.5	26	30-125	L0
5-Methylchrysene	ug/kg	100	94.0	94	67-125	
7,12-Dimethylbenz(a)anthracene	ug/kg	100	35.8	36	31-125	SS
7H-Dibenzo(c,g)carbazole	ug/kg	100	92.9	93	51-125	
Acenaphthene	ug/kg	100	59.5	60	49-125	
Acenaphthylene	ug/kg	100	57.8	58	48-125	
Anthracene	ug/kg	100	78.4	78	63-125	
Benzo(a)anthracene	ug/kg	100	89.5	90	60-125	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

QUALITY CONTROL DATA

Project: 23270051.37 Pond Zoo Bassett
Pace Project No.: 10363579

LABORATORY CONTROL SAMPLE: 2376627

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Benzo(a)pyrene	ug/kg	100	93.4	93	63-125	
Benzo(g,h,i)perylene	ug/kg	100	86.7	87	59-125	
Benzofluoranthenes (Total)	ug/kg	300	292	97	67-125	
Chrysene	ug/kg	100	89.3	89	62-125	
Dibenz(a,h)acridine	ug/kg	100	93.6	94	61-125	
Dibenz(a,h)anthracene	ug/kg	100	90.2	90	59-125	
Dibenzo(a,e)pyrene	ug/kg	100	88.2	88	48-125	
Dibenzo(a,h)pyrene	ug/kg	100	100	100	41-128	
Dibenzo(a,i)pyrene	ug/kg	100	84.7	85	33-125	
Dibenzo(a,l)pyrene	ug/kg	100	64.2	64	30-125	
Fluoranthene	ug/kg	100	84.0	84	65-125	
Fluorene	ug/kg	100	67.7	68	58-125	
Indeno(1,2,3-cd)pyrene	ug/kg	100	90.4	90	60-125	
Naphthalene	ug/kg	100	51.1	51	38-125	
Phenanthrene	ug/kg	100	79.8	80	62-125	
Pyrene	ug/kg	100	102	102	61-125	
2-Fluorobiphenyl (S)	%.			48	46-125	
p-Terphenyl-d14 (S)	%.			91	46-125	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2376628 2376629

Parameter	Units	10363579001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
2-Methylnaphthalene	ug/kg	1.9J	284	283	183	217	64	76	47-125	17	30	
3-Methylcholanthrene	ug/kg	6.2J	284	283	88.7	105	29	35	30-150	16	30	
5-Methylchrysene	ug/kg	25.8J	284	283	209	239	65	75	46-125	13	30	
7,12-Dimethylbenz(a)anthracene	ug/kg	<7.9	284	283	225	283	79	100	30-150	23	30	SS
7H-Dibenzo(c,g)carbazole	ug/kg	<4.8	284	283	104	110	37	39	30-130	5	30	
Acenaphthene	ug/kg	6.6J	284	283	197	229	67	79	30-144	15	30	
Acenaphthylene	ug/kg	9.1J	284	283	199	231	67	78	36-125	15	30	
Anthracene	ug/kg	22.2J	284	283	194	229	61	73	34-125	17	30	
Benzo(a)anthracene	ug/kg	114	284	283	283	334	60	78	30-150	17	30	
Benzo(a)pyrene	ug/kg	182	284	283	356	424	61	86	30-150	18	30	
Benzo(g,h,i)perylene	ug/kg	88.1	284	283	157	166	24	28	30-148	6	30	M1
Benzofluoranthenes (Total)	ug/kg	478	851	848	1180	1470	83	117	30-150	22	30	
Chrysene	ug/kg	207	284	283	348	413	50	73	30-150	17	30	
Dibenz(a,h)acridine	ug/kg	<10.7	284	283	152	168	51	57	30-127	10	30	
Dibenz(a,h)anthracene	ug/kg	22.3J	284	283	146	154	44	46	30-137	5	30	
Dibenzo(a,e)pyrene	ug/kg	23.7J	284	283	74.3	76.2	18	19	30-150	2	30	M1
Dibenzo(a,h)pyrene	ug/kg	11.4J	284	283	51.3	53.0	14	15	30-125	3	30	M1
Dibenzo(a,i)pyrene	ug/kg	4.0J	284	283	37.9	39.1	12	12	30-125	3	30	M1
Dibenzo(a,l)pyrene	ug/kg	4.6J	284	283	30.6	31.3	9	9	30-125	2	30	M1
Fluoranthene	ug/kg	344	284	283	450	540	37	69	30-150	18	30	
Fluorene	ug/kg	9.3J	284	283	195	225	65	76	38-125	14	30	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

QUALITY CONTROL DATA

Project: 23270051.37 Pond Zoo Bassett
Pace Project No.: 10363579

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2376628 2376629

Parameter	Units	10363579001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Indeno(1,2,3-cd)pyrene	ug/kg	76.9	284	283	176	191	35	40	30-150	8	30	
Naphthalene	ug/kg	2.1J	284	283	153	188	53	66	38-125	20	30	
Phenanthrene	ug/kg	101	284	283	238	282	48	64	30-150	17	30	
Pyrene	ug/kg	254	284	283	380	479	45	80	30-150	23	30	
2-Fluorobiphenyl (S)	%.						58	67	46-125			
p-Terphenyl-d14 (S)	%.						63	78	46-125			

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

QUALIFIERS

Project: 23270051.37 Pond Zoo Bassett
Pace Project No.: 10363579

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

LABORATORIES

PASI-M	Pace Analytical Services - Minneapolis

ANALYTE QUALIFIERS

L0	Analyte recovery in the laboratory control sample (LCS) was outside QC limits.
L2	Analyte recovery in the laboratory control sample (LCS) was below QC limits. Results may be biased low.
M1	Matrix spike recovery exceeded QC limits. Batch accepted based on laboratory control sample (LCS) recovery.
SS	This analyte did not meet the secondary source verification criteria for the initial calibration. The reported result should be considered an estimated value.

Pace Analytical Services, LLC
1700 Elm Street - Suite 200
Minneapolis, MN 55414
(612)607-1700

QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: 23270051.37 Pond Zoo Bassett
Pace Project No.: 10363579

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
10363579001	**WPE-01**	EPA 3050	437522	EPA 6010C	437880
10363579002	**WPE-02**	EPA 3050	437522	EPA 6010C	437880
10363579003	**WPE-03**	EPA 3050	437522	EPA 6010C	437880
10363579001	**WPE-01**	ASTM D2974	438463		
10363579002	**WPE-02**	ASTM D2974	438463		
10363579003	**WPE-03**	ASTM D2974	438463		
10363579001	**WPE-01**	EPA 3550	437411	EPA 8270D by SIM	438966
10363579002	**WPE-02**	EPA 3550	437411	EPA 8270D by SIM	438966
10363579003	**WPE-03**	EPA 3550	437411	EPA 8270D by SIM	438966

10363579

Barr Engineering Co. Chain of Custody

BARR ☐ Ann Arbor ☐ Bismarck ☐ Duluth ☐ Hibbing ☐ Jefferson City ☒ Minneapolis

Sample Origination State: ☐ KS ☐ MO ☐ WI ☐ MI ☐ ND Other: ☒ MN ☐ SD

COC Number: 51202

COC 1 of 1

REPORT TO	INVOICE TO
Company: Barr Engineering	Company: Barr Eng.
Address:	Address:
Name: Kevin Menken	Name: Kevin Menken
email: kmenken@barr.com	email: kmenken@barr.com
Copy to: datamgt@barr.com	P.O.
Project Name: Bassett Ponds	Barr Project No: 23270051.37 POND 200

Matrix Code: GW = Groundwater, SW = Surface Water, WW = Waste Water, DW = Drinking Water, S = Soil/Solid, SD = Sediment, O = Other

Preservative Code: A = None, B = HCl, C = HNO_3, D = H_2SO_4, E = NaOH, F = MeOH, G = $NaHSO_4$, H = $Na_2S_2O_3$, I = Ascorbic Acid, J = NH_4Cl, K = Zn Acetate, O = Other

Location	Sample Depth Start	Stop	Unit (m./ft. or in.)	Collection Date (mm/dd/yyyy)	Collection Time (hh:mm)	Matrix Code	Perform MS/MSD Y / N	Total Number Of Containers	Analysis Requested: Water	Soil: arsenic, copper	Soil: cPAHs - stormwater pond list	Soil: Hold For TCLP RCRA metals	Soil: % Solids	Preservative Code	Field Filtered Y/N
										A	A	A			
1. WPE-01				9/23/16	11:45	SD		2		X	X		X		
2. WPE-02				9/23/16	12:00	SD		2		X	X		X		
3. WPE-03				9/23/16	12:30	SD		2		X	X		X		
4. WPE-COMP				9/23/16	12:38	SD		1				hold			hold for TCLP pending other analyses results. aq
5.															
6.															
7.															
8.															
9.															
10.															

BARR USE ONLY

Sampled by: Kevin Menken

Barr Proj. Manager: Candice Kantor

Barr DQ Manager: Terri Olson

Lab Name: Pace - Mpls

Lab Location: Mpls

Relinquished by: Kevin Menken — On Ice? (Y) N — Date 9/23/16 — Time 14:15

Received by: Shawn Wilke/Pace — Date 9/23/16 — Time 1615

Relinquished by: — On Ice? Y N — Date — Time

Received by: — Date — Time

Samples Shipped VIA: ☐ Courier ☐ Federal Express ☐ Sampler ☐ Other:

Air Bill Number:

Lab WO: Temperature on Receipt (°C): 0.3 Custody Seal Intact? ☐ Y ☐ N ☐ None

Requested Due Date: ☐ Standard Turn Around Time ☐ Rush (mm/dd/yyyy)

Page 1 of 1

Distribution - **White-Original:** Accompanies Shipment to Laboratory; **Yellow Copy:** Include in Field Documents; **Pink Copy:** Send to Data Management Administrators.

H:\RLG\STDFORMS\Chain Of Custody Form 2015 RLG Rev. 06/16/15

Pace Analytical	Document Name: **Sample Condition Upon Receipt Form**	Document Revised: 02Aug2016 Page 1 of 2
	Document No.: **F-MN-L-213-rev.17**	Issuing Authority: Pace Minnesota Quality Office

Sample Condition Upon Receipt

Client Name: Barr Engineering

Project #: WO# : 10363579

10363579

Courier: ☐ Fed Ex ☐ UPS ☐ USPS ☐ Client ☑ Commercial ☐ Pace ☐ SpeeDee ☐ Other:_____

Tracking Number: _____

Custody Seal on Cooler/Box Present? ☑ Yes ☐ No **Seals Intact?** ☑ Yes ☐ No

Optional: Proj. Due Date: Proj. Name:

Packing Material: ☐ Bubble Wrap ☑ Bubble Bags ☐ None ☐ Other:_____ **Temp Blank?** ☐ Yes ☑ No

Thermometer Used: ☑ 151401163 ☐ 151401164 ☐ B88A912167504 ☐ B88A0143310098 **Type of Ice:** ☑ Wet ☐ Blue ☐ None ☐ Samples on ice, cooling process has begun

Cooler Temp Read (°C): 0.4 **Cooler Temp Corrected (°C):** 0.3 **Biological Tissue Frozen?** ☐ Yes ☐ No ☑ N/A

Temp should be above freezing to 6°C **Correction Factor:** -0.1 **Date and Initials of Person Examining Contents:** 9/23/16 SG

USDA Regulated Soil (☐ N/A, water sample)

Did samples originate in a quarantine zone within the United States: AL, AR, AZ, CA, FL, GA, ID, LA, MS, NC, NM, NY, OK, OR, SC, TN, TX or VA (check maps)? ☐ Yes ☑ No

Did samples originate from a foreign source (internationally, including Hawaii and Puerto Rico)? ☐ Yes ☑ No

If Yes to either question, fill out a Regulated Soil Checklist (F-MN-Q-338) and include with SCUR/COC paperwork.

				COMMENTS:
Chain of Custody Present? 09/26/16 AAI	☑ Yes	☐ No	☐ N/A	1.
Chain of Custody Filled Out?	☑ Yes	☐ No	☐ N/A	2.
Chain of Custody Relinquished?	☑ Yes	☐ No	☐ N/A	3.
Sampler Name and/or Signature on COC?	☑ Yes	☐ No	☐ N/A	4.
Samples Arrived within Hold Time?	☑ Yes	☐ No	☐ N/A	5.
Short Hold Time Analysis (<72 hr)?	☐ Yes	☑ No	☐ N/A	6.
Rush Turn Around Time Requested?	☐ Yes	☑ No	☐ N/A	7.
Sufficient Volume?	☑ Yes	☐ No	☐ N/A	8.
Correct Containers Used?	☑ Yes	☐ No	☐ N/A	9.
-Pace Containers Used?	☑ Yes	☐ No	☐ N/A	
Containers Intact?	☑ Yes	☐ No	☐ N/A	10.
Filtered Volume Received for Dissolved Tests?	☐ Yes	☐ No	☑ N/A	11. Note if sediment is visible in the dissolved container
Sample Labels Match COC? -Includes Date/Time/ID/Analysis Matrix: SL	☑ Yes	☐ No	☐ N/A	12.
All containers needing acid/base preservation have been checked?	☐ Yes	☐ No	☑ N/A	13. ☐ HNO_3 ☐ H_2SO_4 ☐ NaOH ☐ HCl Sample #
All containers needing preservation are found to be in compliance with EPA recommendation? (HNO_3, H_2SO_4, HCl<2; NaOH >9 Sulfide, NaOH>12 Cyanide)	☐ Yes	☐ No	☑ N/A	
Exceptions: VOA, Coliform, TOC, Oil and Grease, DRO/8015 (water) DOC	☐ Yes	☐ No	☑ N/A	Initial when completed:_____ Lot # of added preservative:_____
Headspace in VOA Vials (>6mm)?	☐ Yes	☐ No	☑ N/A	14.
Trip Blank Present?	☐ Yes	☐ No	☑ N/A	15.
Trip Blank Custody Seals Present?	☐ Yes	☐ No	☑ N/A	
Pace Trip Blank Lot # (if purchased):_____				

CLIENT NOTIFICATION/RESOLUTION **Field Data Required?** ☐ Yes ☐ No

Person Contacted: _____ Date/Time: _____

Comments/Resolution: _____

Project Manager Review: _____ **Date:** 09/26/16

Note: Whenever there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEHNR Certification Office (i.e out of hold, incorrect preservative, out of temp, incorrect containers).