

# **Lagoon Final Closure Report**

for the

**Ojibway Correctional Facility  
Marenisco, Michigan**

Prepared for:

Michigan Department of Corrections  
P.O. Box 30026, Lansing, Michigan 48909

Prepared by:

U.P. Engineers & Architects, Inc.  
100 Portage Street  
Houghton, MI 49931  
UPEA Job No.: M12-19220  
July 2021

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## **1.0 SUMMARY OF CESSATION OF DISCHARGE AND LAGOON CLOSURE PLAN**

At the request of the site owner, Michigan Department of Corrections (MDOC), U.P. Engineers & Architects, Inc. (UPEA) has completed the following Lagoon Final Closure Report which details the steps the owner completed in order to abandon their existing wastewater treatment plant – WWTP (lagoons).

The purpose of this report is to provide details for the cessation of discharge from the WWTP (lagoons) and to satisfy the requirements of Rule 323.2226 of the Part 22 Rules of Part 31 of the National Resources and Environmental Protection Act (NREPA), Public Act 451 of 1994, as amended. This report documents the activities completed as presented in the “Cessation of Discharge and Lagoon Closure Work Plan” dated September 2019.

The MDOC entered into an agreement with MKC Group on August 13, 2019 to complete the work outlined in the construction plans and specifications to close the Ojibway Correctional Facility (OCF) WWTP lagoons.

### **1.1 Existing Facilities**

The Ojibway Correctional Facility (OCF) was closed December 1, 2018. The Facility is located at N5705 Ojibway Road, in Section 08, T45N, R43W, in Marenisco Township, Gogebic County approximately 6 miles south of Marenisco, MI. The existing WWTP is in the northeast corner of the property which is just north of the correctional facility. A Site Location Map is presented as Figure 1.

The existing treatment system received wastewater from the correctional facility via gravity sewer to a lift station, which in turn flowed to the aerated lagoons (lagoons 5-8) primarily, and non-aerated lagoons (lagoons 1-4) occasionally. See Figure 2 for system layout. The facility utilized a bar screen in-line of the wastewater stream ahead of the lift station. The bar screen was utilized to collect larger items such as t-shirts, sheets, towels, rags, etc. prior to being discharged into the lift station.

The aerated ponds were operated in series, with wastewater entering pond 5 and moving through pond 6 to pond 7. Once in pond 7, additional treatment and solids settling occurred, while flow could be either transferred to pond 8, or discharged. Each aerated pond was constructed with a single liner consisting of a flexible membrane liner on top of a 12" layer of sand. The aerated lagoons were built according the plans and specifications with a flexible membrane liner keyed into the top, with a 12" granular material cover placed over the membrane liner. There was riprap placed on top of the granular material on the side slopes of each lagoon and around the outlet pipes.

The wastewater is held in the ponds until it is discharged. Discharges from the facility are regulated by a discharge permit issued by the Michigan Department of Environment, Great Lakes, and Energy (formerly Michigan Department of Environmental Quality (MDEQ)), permit number MIG580000.

## **1.2 Lagoon Closure Sequence**

The following list details the sequence of events leading towards final closure of the lagoons as outlined in the approved “Cessation of Discharge and Lagoon Closure Work Plan”:

- 1) Remaining standing water within the lagoons was pumped to the discharge point of the system to the lowest possible water level without drawing biosolids. This was completed under the existing discharge permit issued by the MDEQ, permit number MIG580000. Prior to discharge, samples were collected from the wastewater. Each sampling event included all the parameters listed specifically for the effluent in Section A, Part 1 of the NPDES permit. The first sampling event occurred prior to discharge, with sample results submitted to EGLE prior to the first day of discharge. Subsequent sampling events followed the same procedures.
- 2) Biosolids, and minor amounts of water remaining in the lagoons, were removed and land applied in accordance with Part 24 Rules (Part 31, NREPA, P.A. 451, as amended) on-site. OCF has an existing Residuals Management Plan (RMP) for land application of biosolids, on file with EGLE. Sludge testing completed in March 2019 was utilized since no additional sludge was added to the lagoons by OCF after December 1, 2018. Approximately 2,510,000 gallons of biosolids were removed and land applied on-site. The sand (granular)

layer above the liner, where present, was mixed with the biosolids in an effort to make the biosolids manageable to transport. Samples of the mixed biosolids and sand were collected by UPEA staff from each lagoon and analyzed for Part 24 rule compliance. A summary of analytical results is included in Attachment 1. Copies of the laboratory reports are included in Attachment 2. The mixed biosolids met Part 24 criteria and were utilized in the final cover within 12-18 inches of the surface.

- 3) MKC Group demolished the lagoons in accordance with plans and specifications including the removal of the flexible membrane liners, where present, and the geo-composite clay liner, where present, and disposed of the material off-site at an approved landfill.
- 4) Staff from UPEA collected and submitted for analysis samples from soil beneath the liner as outlined in the approved closure work plan. Samples were submitted to Prein & Newhof in Grand Rapids, MI. Sample locations are shown on Figure 3. A summary of the analytical results is included in Attachment 3, with copies of the laboratory reports included in Attachment 4.
- 5) Since no contamination was found in the soil beneath the liner, no additional soil or groundwater sampling was conducted, and soils below the liner remained in place.
- 6) MKC Group removed any discharge structures and capped lines left in the ground, according to the plans and specifications.
- 7) MKC Group removed and stockpiled any items required by the owner to salvage.

### **1.3 Final Closure Report**

This report was completed to meet the requirements from the Lagoon Closure Work Plan. In accordance with R323.2226(4)(e), the MDOC shall submit a closure report documenting the implementation of the Work Plan since it is seeking EGLE approval of the lagoon closure. In addition to submitting all sampling results, as described in Section 1.6 of the Closure Work Plan, the report includes, as applicable, the sampling analysis procedures, a map showing the location where samples were obtained, and a summary of waste types and quantities removed from the site and its destination of these wastes.

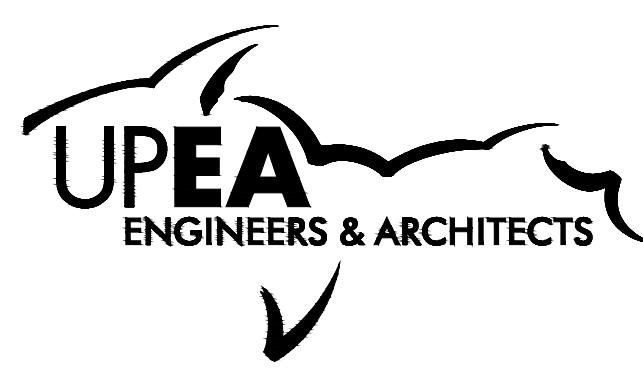
# OJIBWAY CORRECTIONAL FACILITY

N 5705 OJIBWAY ROAD  
MARENISCO, MI 49947  
PLAN OF PROPOSED

## WASTEWATER LAGOON DEMOLITION

GOGEBIC COUNTY COUNTY, MICHIGAN

FILE No.: 472/19031.RAA  
INDEX No.: 190CF04



**U.P. ENGINEERS & ARCHITECTS, INC.**  
ENGINEERING ARCHITECTURE PLANNING SURVEYING ENVIRONMENTAL



STATE OF MICHIGAN  
DEPARTMENT OF TECHNOLOGY, MANAGEMENT AND BUDGET  
FACILITIES AND BUSINESS SERVICES ADMINISTRATION  
DESIGN AND CONSTRUCTION DIVISION  
ROBERT C. HALL, RA, NCARB, DIRECTOR



www.upea.com

**OJIBWAY CORRECTIONAL FACILITY  
WASTEWATER LAGOON DEMOLITION**  
MICHIGAN DEPARTMENT OF CORRECTIONS  
N5705 OJIBWAY ROAD MARENISCO, MICHIGAN

ISSUED FOR:	LAGOON FINAL CLOSURE REPORT
DATE:	7/20/21

OJIBWAY CORRECTIONAL FACILITY WASTEWATER LAGOON DEMOLITION PROJECT NO.: M12-19220	PROFESSIONAL SERVICE CONTRACTOR CHRIS HOLMES, P.E. U.P. ENGINEERS & ARCHITECTS, INC 100 PORTAGE STREET HOUGHTON, MICHIGAN 49931 (906) 482-4810
DESIGNED BY: DRAWN BY: CHECKED: APPROVED:	CLH MEP CLH C-H
A	A

**FIG I**



www.ypea.com

**OJIBWAY CORRECTIONAL FACILITY  
WASTEWATER LAGOON DEMOLITION**  
MICHIGAN DEPARTMENT OF CORRECTIONS  
N5705 OJIBWAY ROAD MARINSCO, MICHIGAN

ISSUED FOR: OJIBWAY CORRECTIONAL FACILITY WASTEWATER LAGOON DEMOLITION MICHIGAN DEPARTMENT OF CORRECTIONS PROJECT NO.: M12-19220	DATE: 7/20/21
DESIGNED BY: DRAWN BY: CHECKED: APPROVED: CLH MEP CLH C-H	

OJIBWAY CORRECTIONAL FACILITY WASTEWATER LAGOON DEMOLITION MICHIGAN DEPARTMENT OF CORRECTIONS PROJECT NO.: M12-19220	7/28/2021 12:14 PM - P-M12-19220.DWGS - OCF SEWAGE POND DEMOLITION.DWG
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**FIG II**

**OJIBWAY CORRECTIONAL FACILITY  
WASTEWATER LAGOON DEMOLITION**

MICHIGAN DEPARTMENT OF CORRECTIONS

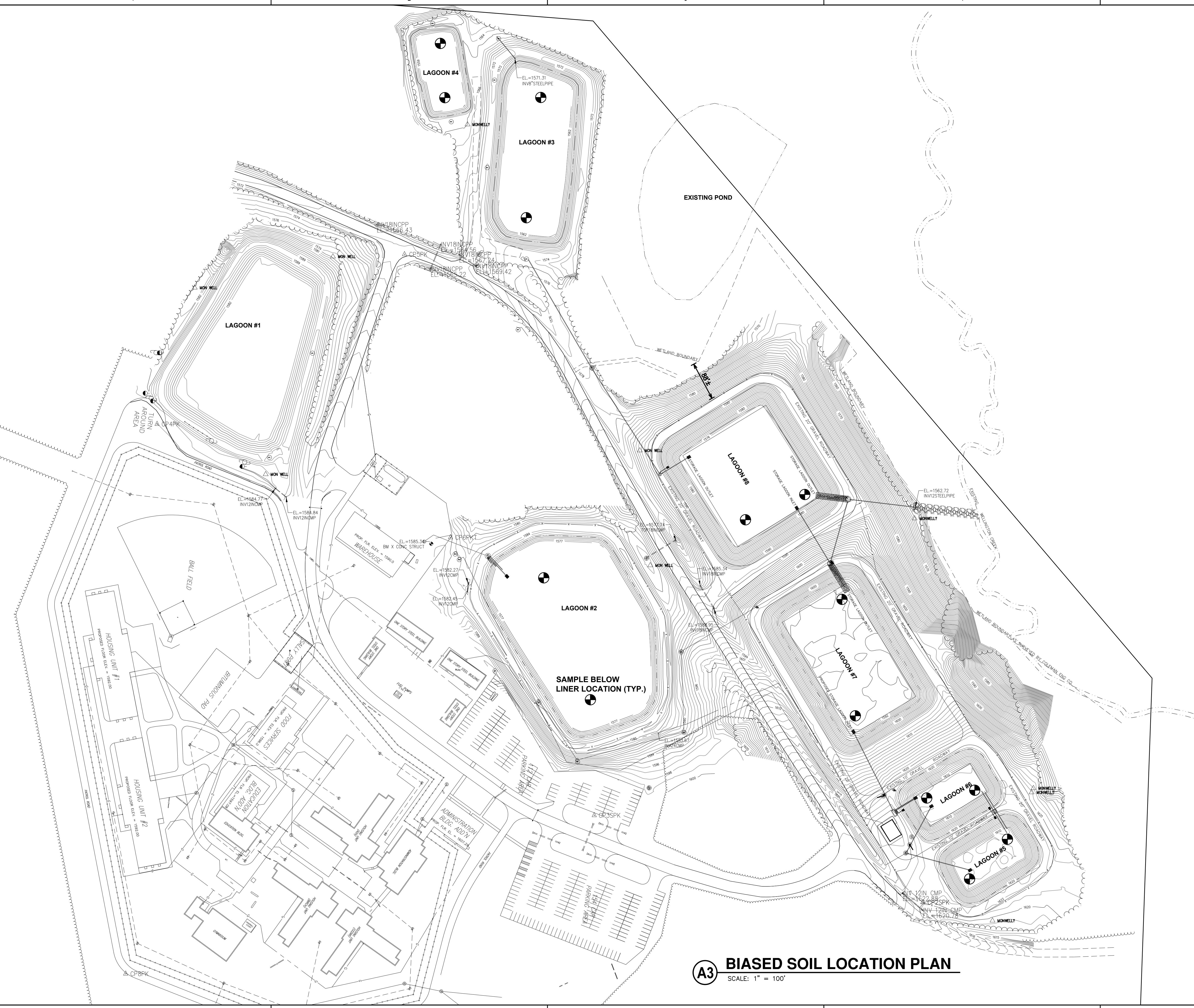
N5705 OJIBWAY ROAD MARINSCO, MICHIGAN

OJIBWAY CORRECTIONAL FACILITY WASTEWATER LAGOON DEMOLITION MICHIGAN DEPARTMENT OF CORRECTIONS PROJECT NO.: M12-19220	ISSUED FOR: LAGOON FINAL CLOSURE REPORT	DATE: 7/2021
DESIGNED BY: CLH MEP DRAWN BY: CLH C-H CHECKED: APPROVED:		

GRAPHIC SCALE  
( IN FEET )  
1 inch = 100' ft.

**A3 BIASED SOIL LOCATION PLAN**  
SCALE: 1" = 100'

**FIG III**



**ATTACHMENT 1**

**SAMPLE RESULTS SUMMARY TABLE – BIOSOLIDS/SAND MIXTURE**

**OJIBWAY CORRECTIONAL FACILITY  
LAGOON SLUDGE SAMPLES  
SEPTEMBER - NOVEMBER 2019  
BIOSOLIDS DATA**

Parameter	Biosolids Mixed with Soil - Utilized as Topsoil							Part 24 Limit
	POND 2	POND 3	POND 4	POND 5	POND 6	POND 7	POND 8	
	Oct-19	Oct-19	Nov-19	Sep-19	Sep-19	Oct-19	Oct-19	
Parameter	Composite	Composite	Composite	Composite	Composite	Composite	Composite	Part 24 Limit
Total Arsenic	1.67	1.28	1.40	0.96	1.04	1.12	1.11	41
Total Cadmium	0.14	0.15	0.10	0.04	<0.0512	0.04	0.04	39
Total Calcium	2,850	4,220	4,100	4,320	3,910	4,680	3,860	NA
Total Chromium	12.20	9.64	11.40	6.48	8.14	6.70	6.61	NA
Total Copper	13.0	15.3	22.6	20.2	19.9	14.9	13.3	1,500
Total Lead	3.39	2.29	2.36	1.48	1.12	1.27	1.32	300
Total Magnesium	2,950	3,130	3,090	3,310	3,660	3,100	2,880	NA
Total Mercury	<0.0191	<0.0179	0.04	<0.0165	<0.0177	<0.0215	<0.0167	17
Total Molybdenum	<0.333	<0.389	<0.433	<0.368	<0.512	<0.334	<0.391	75
Total Nickel	12.00	11.70	13.20	10.30	10.40	9.39	8.43	420
Total Potassium	845	834	569	468	499	582	471	NA
Total Selenium	0.20	0.68	0.67	0.44	0.64	0.56	0.41	100
Total Zinc	31.3	23.3	28.4	20.4	24.1	16.0	24.8	2,800
Ammonia	49.60	8.53	43.70	1.34	6.82	13.40	10.10	NA
Unionized Ammonia*	3.57	0.61	3.15	0.10	0.49	0.96	0.73	NA
Nitrogen (Kjeldahl)	823	512	451	262	176	3,360	553	NA
Phosphorus	297	240	477	84	220	253	93	NA
Total Solids	74.60%	75.90%	78.60%	88.60%	85.80%	74.60%	87.00%	NA
Percent Volatile Solids	7.41%	5.91%	2.80%	10.60%	7.93%	3.31%	2.45%	NA

All values listed in mg/kg

Based on the data above, the sludge testing results are well within land application guidelines.

ATTACHMENT 2

LABORATORY ANALYTICAL REPORTS - BIOSOLIDS/SAND MIXTURE

October 21, 2019

UP Engineers & Architects  
707 Ashmun St.  
Sault Ste. Marie, MI 49783

RE: OCF Lagoon Demo

Order No.: 1910545

Dear Mr. Chris Holmes:

Prein&Newhof Laboratory received 3 sample(s) on 10/10/2019 for the analyses presented in the following report.

There were no problems with the analytical events associated with this report unless noted in the Case Narrative.

Any analyte that exceeds the provided permit level are noted on the report with an "\*" in the Qual field.

Quality control data is within laboratory defined or method specified acceptance limits except if noted.

If you have any questions regarding these tests results, please feel free to call.

Thank you for your business.

Sincerely,



Steve Bylsma  
Laboratory Manager

<b>CLIENT:</b>	UP Engineers & Architects	<b>Collection Date:</b>	10/9/2019 12:00:00 PM
<b>Project:</b>	OCF Lagoon Demo	<b>Received Date:</b>	10/10/2019 10:30:00 AM
<b>Lab ID:</b>	1910545-03	<b>Matrix:</b>	BIOSOLIDS
<b>Client Sample ID:</b>	Pond 2 Composite	<b>Sampled By:</b>	C. Holmes

Analyses	Result	Units	RL	Qual	<b>Table 3</b>		Date Analyzed	Method
					Limit	Analyst		
Arsenic	1.67	mg/Kg-dry	0.166		41.0	KS	10/15/2019	SW 6020B
Cadmium	0.135	mg/Kg-dry	0.0333		39.0	KS	10/15/2019	SW 6020B
Calcium	2850	mg/Kg-dry	3.33			KS	10/15/2019	SW 6020B
Chromium	12.2	mg/Kg-dry	0.166			KS	10/15/2019	SW 6020B
Copper	13.0	mg/Kg-dry	0.166		1500	KS	10/15/2019	SW 6020B
Lead	3.39	mg/Kg-dry	0.166		300	KS	10/15/2019	SW 6020B
Magnesium	2950	mg/Kg-dry	3.33			KS	10/15/2019	SW 6020B
Mercury	< 0.0191	mg/Kg-dry	0.0191		17.0	SJ	10/17/2019	SW 7471A
Molybdenum	< 0.333	mg/Kg-dry	0.333		75.0	KS	10/15/2019	SW 6020B
Nickel	12.0	mg/Kg-dry	0.166		420	KS	10/15/2019	SW 6020B
Potassium	845	mg/Kg-dry	16.6			KS	10/15/2019	SW 6020B
Selenium	0.204	mg/Kg-dry	0.166		100	KS	10/15/2019	SW 6020B
Zinc	31.3	mg/Kg-dry	0.166		2800	KS	10/15/2019	SW 6020B
Density	15.9	lb/Gal	1.00			SJ	10/14/2019	SM 2710-F
Hydrogen Ion (pH)	6.10	pH Units	1.00			SD	10/10/2019	SW 9045C
Nitrogen, Ammonia	49.6	mg/Kg-dry	1.31			PS	10/11/2019	SM 4500-NH3-D
Nitrogen, Nitrate	< 1.31	mg/Kg-dry	1.31			KS	10/14/2019	SW 9056A
Nitrogen, Total	823	mg/Kg-dry	1.31			SB	10/21/2019	
Nitrogen, Total Available	0.408	lb/ton-dry	0.131			SB	10/21/2019	
Nitrogen, Total Kjeldahl	823	mg/Kg-dry	16.3			TE	10/15/2019	SM 4500-N
Phosphorus, Total (As P)	297	mg/Kg-dry	6.53			AB	10/11/2019	SM 4500-P-E
Total Solids	76.6	%	0.0100			SJ	10/12/2019	D2216
Total Volatile Solids	7.41	%	0.100			SJ	10/11/2019	EPA 160.4

**Qualifiers:** \* Value exceeds Maximum Contaminant Level.  
 D Dilution was required.  
 J Analyte detected below quantitation limits  
 PL Permit Limit

< Not Detected at the Reporting Limit  
 H Holding times for preparation or analysis exceeded  
 MCL Maximum Contaminant Level  
 RL Reporting Limit

Original  
 Page 4 of 4

Prein & Newhof

3260 Evergreen Dr NE  
Grand Rapids, MI 49525  
t: 616-364-7600  
f: 616-364-4222

CHAIN OF CUSTODY

M12-19220-701

OCF - Lagoon Dens

Client U.P.E.A.  
Project Land Application  
Send Results to [cholmes@upea.com](mailto:cholmes@upea.com)  
Sampler C. Chris Holmes

Lab Sample ID	Date	Time	Sample Description	Analysis Requested							Other List Below	
				Preservative								
				Land App			Fecal	Geomean				
105451	10/9/19	1120AM	Pond 2 under liner outlet	X								
2	10/9/19	1150AM	Pond 2 under liner Southwest	X								
3	10/9/19	1200 PM	Pond 2 Composite	X								
				Land App:	As Ca	Mg Hg	Cd Cr	Cu Pb	Ni Zn	K Mo	Se	
				Density	NH3	NO3	TPO4	pH	TKN	% Solids		
				T Nitrogen	T Av N	TVS						
				Fecal is a set of 7 plus Geomean								

Relinquished By: Name/Date/Time

Chris

10/9/19 330 PM

Received By: Name/Date/Time

Relinquished By: Name/Date/Time

Received for Laboratory By: Name/Date/Time

C. Diem 10/10/19 1030

November 11, 2019

UP Engineers & Architects  
707 Ashmun St.  
Sault Ste. Marie, MI 49783

RE: OCF Lagoon Demo

Order No.: 1911017

Dear Mr. Chris Holmes:

Prein&Newhof Laboratory received 3 sample(s) on 11/1/2019 for the analyses presented in the following report.

There were no problems with the analytical events associated with this report unless noted in the Case Narrative.

Any analyte that exceeds the provided permit level are noted on the report with an "\*" in the Qual field.

Quality control data is within laboratory defined or method specified acceptance limits except if noted.

If you have any questions regarding these tests results, please feel free to call.

Thank you for your business.

Sincerely,



Steve Bylsma  
Laboratory Manager

<b>CLIENT:</b>	UP Engineers & Architects	<b>Collection Date:</b>	10/31/2019 12:40:00 PM
<b>Project:</b>	OCF Lagoon Demo	<b>Received Date:</b>	11/1/2019 10:10:00 AM
<b>Lab ID:</b>	1911017-03	<b>Matrix:</b>	BIOSOLIDS
<b>Client Sample ID:</b>	Pond 3 Composite	<b>Sampled By:</b>	C. Holmes

Analyses	Result	Units	RL	Qual	Table 3		Analyst	Date Analyzed	Method
					Limit				
Arsenic	1.28	mg/Kg-dry	0.195		41.0	TE	11/7/2019	SW 6020B	
Cadmium	0.151	mg/Kg-dry	0.0389		39.0	TE	11/7/2019	SW 6020B	
Calcium	4220	mg/Kg-dry	3.89			TE	11/7/2019	SW 6020B	
Chromium	9.64	mg/Kg-dry	0.195			TE	11/7/2019	SW 6020B	
Copper	15.3	mg/Kg-dry	0.195		1500	TE	11/7/2019	SW 6020B	
Lead	2.29	mg/Kg-dry	0.195		300	TE	11/7/2019	SW 6020B	
Magnesium	3130	mg/Kg-dry	3.89			TE	11/7/2019	SW 6020B	
Mercury	< 0.0179	mg/Kg-dry	0.0179		17.0	SJ	11/6/2019	SW 7471A	
Molybdenum	< 0.389	mg/Kg-dry	0.389		75.0	TE	11/7/2019	SW 6020B	
Nickel	11.7	mg/Kg-dry	0.195		420	TE	11/7/2019	SW 6020B	
Potassium	834	mg/Kg-dry	19.5			TE	11/7/2019	SW 6020B	
Selenium	0.683	mg/Kg-dry	0.195		100	TE	11/7/2019	SW 6020B	
Zinc	23.3	mg/Kg-dry	0.195		2800	TE	11/7/2019	SW 6020B	
Density	14.1	lb/Gal	1.00			SJ	11/4/2019	SM 2710-F	
Hydrogen Ion (pH)	7.10	pH Units	1.00			KF	11/1/2019	SW 9045C	
Nitrogen, Ammonia	8.53	mg/Kg-dry	1.32			PS	11/4/2019	SM 4500-NH3-D	
Nitrogen, Nitrate	< 1.32	mg/Kg-dry	1.32			AB	11/2/2019	SW 9056A	
Nitrogen, Total	513	mg/Kg-dry	1.32			SB	11/8/2019		
Nitrogen, Total Available	0.219	lb/ton-dry	0.132			SB	11/8/2019		
Nitrogen, Total Kjeldahl	512	mg/Kg-dry	16.5			TE	11/7/2019	SM 4500-N	
Phosphorus, Total (As P)	240	mg/Kg-dry	6.58			AB	11/7/2019	SM 4500-P-E	
Total Solids	75.9	%	0.0100			PS	11/4/2019	D2216	
Total Volatile Solids	5.91	%	0.100			SJ	11/4/2019	EPA 160.4	

**Qualifiers:**    < Not Detected at the Reporting Limit  
 MCL Maximum Contaminant Level  
 RL Reporting Limit

H Holding times for preparation or analysis exceeded  
 PL Permit Limit

Original  
 Page 4 of 4

Prein & Newhof

3260 Evergreen Dr NE  
Grand Rapids, MI 49525  
t: 616-364-7600  
f: 616-364-4222

M12-19220-701

CHAIN OF CUSTODY

OCF Lagoon Demo

Client U.P. Engineers + Arch. 906-482-4810  
Project Land Application  
Send Results to [cholmes@upea.com](mailto:cholmes@upea.com)  
Sampler Chris Holmes

Lab Sample ID	Date	Time	Sample Description	Analysis Requested							Other List Below	
				Preservative								
				Land App			Fecal	Geomean				
11017-1	10/31/19	1200	Pond 3 Inlet Below	X								
-2	10/31/19	1235	Pond 3 Outlet Below	X								
-3	10/31/19	1240	Pond 3 Composite	X								
* Hold	10/31/19	1200	Pond 3 clay Inlet Clay	X								
* Hold	10/31/19	1235	Pond 3 Outlet Clay	X	As Ca	Mg Hg	Cd Cr	Cu Pb	Ni Zn	K Mo	Se	
					Density	NH3	NO3	TPO4	pH	TKN	% Solids	
					T Nitrogen	T Av N	TVS					
				Fecal is a set of 7 plus Geomean								

Relinquished By: Name/Date/Time

Chris Holmes  10/31/19 3:30 PM

Received By: Name/Date/Time

Relinquished By: Name/Date/Time

Received for Laboratory By: Name/Date/Time

S. Diem 11/1/19 1010

November 13, 2019

UP Engineers & Architects  
707 Ashmun St.  
Sault Ste. Marie, MI 49783

RE: OCF Lagoon Demo

Order No.: 1911261

Dear Mr. Chris Holmes:

Prein&Newhof Laboratory received 3 sample(s) on 11/7/2019 for the analyses presented in the following report.

There were no problems with the analytical events associated with this report unless noted in the Case Narrative.

Any analyte that exceeds the provided permit level are noted on the report with an "\*" in the Qual field.

Quality control data is within laboratory defined or method specified acceptance limits except if noted.

If you have any questions regarding these tests results, please feel free to call.

Thank you for your business.

Sincerely,



Steve Bylsma  
Laboratory Manager

<b>CLIENT:</b>	UP Engineers & Architects	<b>Collection Date:</b>	11/6/2019 1:50:00 PM
<b>Project:</b>	OCF Lagoon Demo	<b>Received Date:</b>	11/7/2019 10:20:00 AM
<b>Lab ID:</b>	1911261-03	<b>Matrix:</b>	BIOSOLIDS
<b>Client Sample ID:</b>	Pond 4 Composite	<b>Sampled By:</b>	C. Holmes

Analyses	Result	Units	RL	Qual	Table 3		Date Analyzed	Method
					Limit	Analyst		
Arsenic	1.40	mg/Kg-dry	0.217		41.0	KS	11/11/2019	SW 6020B
Cadmium	0.0891	mg/Kg-dry	0.0433		39.0	KS	11/11/2019	SW 6020B
Calcium	4100	mg/Kg-dry	4.33			KS	11/11/2019	SW 6020B
Chromium	11.4	mg/Kg-dry	0.217			KS	11/11/2019	SW 6020B
Copper	22.6	mg/Kg-dry	0.217		1500	KS	11/11/2019	SW 6020B
Lead	2.36	mg/Kg-dry	0.217		300	KS	11/11/2019	SW 6020B
Magnesium	3090	mg/Kg-dry	4.33			KS	11/11/2019	SW 6020B
Mercury	0.0412	mg/Kg-dry	0.0202		17.0	SJ	11/12/2019	SW 7471A
Molybdenum	< 0.433	mg/Kg-dry	0.433		75.0	KS	11/11/2019	SW 6020B
Nickel	13.2	mg/Kg-dry	0.217		420	KS	11/11/2019	SW 6020B
Potassium	569	mg/Kg-dry	21.7			KS	11/11/2019	SW 6020B
Selenium	0.667	mg/Kg-dry	0.217		100	KS	11/11/2019	SW 6020B
Zinc	28.4	mg/Kg-dry	0.217		2800	KS	11/11/2019	SW 6020B
Density	13.9	lb/Gal	1.00			SJ	11/7/2019	SM 2710-F
Hydrogen Ion (pH)	7.21	pH Units	1.00			KF	11/7/2019	SW 9045C
Nitrogen, Ammonia	43.7	mg/Kg-dry	1.27			PS	11/13/2019	SM 4500-NH3-D
Nitrogen, Nitrate	< 1.27	mg/Kg-dry	1.27			KS	11/8/2019	SW 9056A
Nitrogen, Total	451	mg/Kg-dry	1.27			SB	11/13/2019	
Nitrogen, Total Available	0.269	lb/ton-dry	0.127			SB	11/13/2019	
Nitrogen, Total Kjeldahl	451	mg/Kg-dry	15.9			TE	11/8/2019	SM 4500-N
Phosphorus, Total (As P)	477	mg/Kg-dry	6.36			AB	11/13/2019	SM 4500-P-E
Total Solids	78.6	%	0.0100			PS	11/8/2019	D2216
Total Volatile Solids	2.80	%	0.100			SJ	11/8/2019	EPA 160.4

**Qualifiers:**    < Not Detected at the Reporting Limit  
                   MCL Maximum Contaminant Level  
                   RL Reporting Limit

H Holding times for preparation or analysis exceeded  
                   PL Permit Limit

Original  
                   Page 4 of 4

Prein & Newhof

3260 Evergreen Dr NE

Grand Rapids, MI 49525

t: 616-364-7600

f: 616-364-4222

MR-19226-701

DGF Lagoon Demo

CHAIN OF CUSTODY

Client

U.P. Engineers + Arch. Inc.

Project

Land Application

Send Results to

chris@upea.com

Sampler

Chris Holmes

Lab Sample ID	Date	Time	Sample Description	Analysis Requested								Other List Below
				Preservative								
	Land App			Fecal	Geomean							
112611	11/6/19	1:00	Pond 4 Inlet Below liner	X								
2	11/6/19	1:45	Pond 4 outlet Below liner	X								
3	11/6/19	1:50	Pond 4 Composite	X								
				Land App:	As Ca	Mg Hg	Cd Cr	Cu Pb	Ni Zn	K Mo	Se	
				Density	NH3	NO3	TPO4	pH	TKN	% Solids		
				T Nitrogen	T Av N	TVS						
				Fecal is a set of 7 plus Geomean								

Relinquished By: Name/Date/Time

Christ Holmes 11/6/19 4:30 PM

Received By: Name/Date/Time

Relinquished By: Name/Date/Time

Received for Laboratory By: Name/Date/Time

S. Diem 11/7/19 10:20

October 09, 2019

UP Engineers & Architects  
707 Ashmun St.  
Sault Ste. Marie, MI 49783

RE: OCF Lagoon Demo Order No.: 1910035

Dear Mr. Chris Holmes:

Order No.: 1910035

Dear Mr. Chris Holmes:

Prein&Newhof Laboratory received 6 sample(s) on 10/1/2019 for the analyses presented in the following report.

There were no problems with the analytical events associated with this report unless noted in the Case Narrative.

Any analyte that exceeds the provided permit level are noted on the report with an "\*" in the Qual field.

Quality control data is within laboratory defined or method specified acceptance limits except if noted.

If you have any questions regarding these tests results, please feel free to call.

Thank you for your business.

Sincerely,



## Steve Bylsma Laboratory Manager

<b>CLIENT:</b>	UP Engineers & Architects	<b>Collection Date:</b>	9/27/2019 2:45:00 PM
<b>Project:</b>	OCF Lagoon Demo	<b>Received Date:</b>	10/1/2019 10:20:00 AM
<b>Lab ID:</b>	1910035-03	<b>Matrix:</b>	SOLID
<b>Client Sample ID:</b>	Pond 5 Composite	<b>Sampled By:</b>	Chris H.

Analyses	Result	Units	RL	Qual	Table 3		Analyst	Date Analyzed	Method
					Limit				
Arsenic	0.962	mg/Kg-dry	0.184		41.0	KS	10/2/2019	SW 6020B	
Cadmium	0.0368	mg/Kg-dry	0.0368		39.0	KS	10/2/2019	SW 6020B	
Calcium	4320	mg/Kg-dry	3.68			KS	10/2/2019	SW 6020B	
Chromium	6.48	mg/Kg-dry	0.184			KS	10/2/2019	SW 6020B	
Copper	20.2	mg/Kg-dry	0.184		1500	KS	10/2/2019	SW 6020B	
Lead	1.48	mg/Kg-dry	0.184		300	KS	10/2/2019	SW 6020B	
Magnesium	3310	mg/Kg-dry	3.68			KS	10/2/2019	SW 6020B	
Mercury	< 0.0165	mg/Kg-dry	0.0165		17.0	SJ	10/4/2019	SW 7471A	
Molybdenum	< 0.368	mg/Kg-dry	0.368		75.0	KS	10/2/2019	SW 6020B	
Nickel	10.3	mg/Kg-dry	0.184		420	KS	10/2/2019	SW 6020B	
Potassium	468	mg/Kg-dry	18.4			KS	10/2/2019	SW 6020B	
Selenium	0.437	mg/Kg-dry	0.184		100	KS	10/2/2019	SW 6020B	
Zinc	20.4	mg/Kg-dry	0.184		2800	KS	10/2/2019	SW 6020B	
Density	17.8	lb/Gal	1.00			SJ	10/1/2019	SM 2710-F	
Hydrogen Ion (pH)	7.47	pH Units	1.00			KF	10/1/2019	SW 9045C	
Nitrogen, Ammonia	1.34	mg/Kg-dry	1.13			PS	10/2/2019	SM 4500-NH3-D	
Nitrogen, Nitrate	< 1.13	mg/Kg-dry	1.13			AB	10/2/2019	SW 9056A	
Nitrogen, Total	263	mg/Kg-dry	1.13			SB	10/8/2019		
Nitrogen, Total Available	< 0.113	lb/ton-dry	0.113			SB	10/8/2019		
Nitrogen, Total Kjeldahl	262	mg/Kg-dry	14.1			TE	10/8/2019	SM 4500-N	
Phosphorus, Total (As P)	83.9	mg/Kg-dry	5.65			AB	10/7/2019	SM 4500-P-E	
Total Solids	88.6	%	0.0100			PS	10/2/2019	D2216	
Total Volatile Solids	10.6	%	0.100			SJ	10/3/2019	EPA 160.4	

**Qualifiers:**    < Not Detected at the Reporting Limit  
                   MCL Maximum Contaminant Level  
                   RL Reporting Limit

H Holding times for preparation or analysis exceeded  
                   PL Permit Limit

<b>CLIENT:</b>	UP Engineers & Architects	<b>Collection Date:</b>	9/27/2019 4:00:00 PM
<b>Project:</b>	OCF Lagoon Demo	<b>Received Date:</b>	10/1/2019 10:20:00 AM
<b>Lab ID:</b>	1910035-06	<b>Matrix:</b>	SOLID
<b>Client Sample ID:</b>	Pond 6 Composite	<b>Sampled By:</b>	Chris H.

Analyses	Result	Units	RL	Qual	Table 3		Analyst	Date Analyzed	Method
					Limit				
Arsenic	1.04	mg/Kg-dry	0.256		41.0	KS	10/2/2019	SW 6020B	
Cadmium	< 0.0512	mg/Kg-dry	0.0512		39.0	KS	10/2/2019	SW 6020B	
Calcium	3910	mg/Kg-dry	5.12			KS	10/2/2019	SW 6020B	
Chromium	8.14	mg/Kg-dry	0.256			KS	10/2/2019	SW 6020B	
Copper	19.9	mg/Kg-dry	0.256		1500	KS	10/2/2019	SW 6020B	
Lead	1.12	mg/Kg-dry	0.256		300	KS	10/2/2019	SW 6020B	
Magnesium	3660	mg/Kg-dry	5.12			KS	10/2/2019	SW 6020B	
Mercury	< 0.0177	mg/Kg-dry	0.0177		17.0	SJ	10/4/2019	SW 7471A	
Molybdenum	< 0.512	mg/Kg-dry	0.512		75.0	KS	10/2/2019	SW 6020B	
Nickel	10.4	mg/Kg-dry	0.256		420	KS	10/2/2019	SW 6020B	
Potassium	499	mg/Kg-dry	25.6			KS	10/2/2019	SW 6020B	
Selenium	0.638	mg/Kg-dry	0.256		100	KS	10/2/2019	SW 6020B	
Zinc	24.1	mg/Kg-dry	0.256		2800	KS	10/2/2019	SW 6020B	
Density	17.5	lb/Gal	1.00			SJ	10/1/2019	SM 2710-F	
Hydrogen Ion (pH)	7.52	pH Units	1.00			KF	10/1/2019	SW 9045C	
Nitrogen, Ammonia	6.82	mg/Kg-dry	1.17			PS	10/2/2019	SM 4500-NH3-D	
Nitrogen, Nitrate	2.89	mg/Kg-dry	1.17			AB	10/2/2019	SW 9056A	
Nitrogen, Total	179	mg/Kg-dry	1.17			SB	10/8/2019		
Nitrogen, Total Available	< 0.117	lb/ton-dry	0.117			SB	10/8/2019		
Nitrogen, Total Kjeldahl	176	mg/Kg-dry	14.6			TE	10/7/2019	SM 4500-N	
Phosphorus, Total (As P)	220	mg/Kg-dry	5.83			AB	10/7/2019	SM 4500-P-E	
Total Solids	85.8	%	0.0100			PS	10/2/2019	D2216	
Total Volatile Solids	7.93	%	0.100			SJ	10/3/2019	EPA 160.4	

**Qualifiers:**    < Not Detected at the Reporting Limit  
                   MCL Maximum Contaminant Level  
                   RL Reporting Limit

H Holding times for preparation or analysis exceeded  
                   PL Permit Limit

Prein & Newhof

3260 Evergreen Dr NE

Grand Rapids, MI 49525  
t: 616-364-7600  
f: 616-364-4222

M12-19220-501

## CHAIN OF CUSTODY

## OCF - Lagom Demo

**Relinquished By:** Name/Date/Time

*Cole*

9/30/19

Received By: Name/Date/Time

Relinquished By: Name/Date/Time

Received for Laboratory By: Name/Date/Time

G.-Doerr 10/1/19 1020

October 11, 2019

UP Engineers & Architects  
707 Ashmun St.  
Sault Ste. Marie, MI 49783

RE: OCF Lagoon Demo

Order No.: 1910274

Dear Mr. Chris Holmes:

Prein&Newhof Laboratory received 3 sample(s) on 10/4/2019 for the analyses presented in the following report.

There were no problems with the analytical events associated with this report unless noted in the Case Narrative.

Any analyte that exceeds the provided permit level are noted on the report with an "\*" in the Qual field.

Quality control data is within laboratory defined or method specified acceptance limits except if noted.

If you have any questions regarding these tests results, please feel free to call.

Thank you for your business.

Sincerely,



Steve Bylsma  
Laboratory Manager

<b>CLIENT:</b>	UP Engineers & Architects	<b>Collection Date:</b>	10/3/2019 1:30:00 PM
<b>Project:</b>	OCF Lagoon Demo	<b>Received Date:</b>	10/4/2019 10:15:00 AM
<b>Lab ID:</b>	1910274-03	<b>Matrix:</b>	BIOSOLIDS
<b>Client Sample ID:</b>	Pond 7 Composite	<b>Sampled By:</b>	C. Holmes

Analyses	Result	Units	RL	Qual	Table 3		Date Analyzed	Method
					Limit	Analyst		
Arsenic	1.12	mg/Kg-dry	0.167		41.0	KS	10/8/2019	SW 6020B
Cadmium	0.0411	mg/Kg-dry	0.0334		39.0	KS	10/8/2019	SW 6020B
Calcium	4680	mg/Kg-dry	3.34			KS	10/10/2019	SW 6020B
Chromium	6.70	mg/Kg-dry	0.167			KS	10/8/2019	SW 6020B
Copper	14.9	mg/Kg-dry	0.167		1500	KS	10/8/2019	SW 6020B
Lead	1.27	mg/Kg-dry	0.167		300	KS	10/8/2019	SW 6020B
Magnesium	3100	mg/Kg-dry	3.34			KS	10/10/2019	SW 6020B
Mercury	< 0.0215	mg/Kg-dry	0.0215		17.0	SJ	10/10/2019	SW 7471A
Molybdenum	< 0.334	mg/Kg-dry	0.334		75.0	KS	10/8/2019	SW 6020B
Nickel	9.39	mg/Kg-dry	0.167		420	KS	10/8/2019	SW 6020B
Potassium	582	mg/Kg-dry	16.7			KS	10/8/2019	SW 6020B
Selenium	0.559	mg/Kg-dry	0.167		100	KS	10/8/2019	SW 6020B
Zinc	16.0	mg/Kg-dry	0.167		2800	KS	10/8/2019	SW 6020B
Density	14.4	lb/Gal	1.00			SJ	10/9/2019	SM 2710-F
Hydrogen Ion (pH)	7.10	pH Units	1.00			KF	10/4/2019	SW 9045C
Nitrogen, Ammonia	13.4	mg/Kg-dry	1.34			PS	10/7/2019	SM 4500-NH3-D
Nitrogen, Nitrate	< 1.34	mg/Kg-dry	1.34			KS	10/4/2019	SW 9056A
Nitrogen, Total	3360	mg/Kg-dry	1.34			SB	10/11/2019	
Nitrogen, Total Available	1.37	lb/ton-dry	0.134			SB	10/11/2019	
Nitrogen, Total Kjeldahl	3360	mg/Kg-dry	16.8			TE	10/10/2019	SM 4500-N
Phosphorus, Total (As P)	253	mg/Kg-dry	6.71			AB	10/7/2019	SM 4500-P-E
Total Solids	74.6	%	0.0100			JS	10/4/2019	D2216
Total Volatile Solids	3.31	%	0.100			SJ	10/8/2019	EPA 160.4

**Qualifiers:** \* Value exceeds Maximum Contaminant Level.  
D Dilution was required.  
J Analyte detected below quantitation limits  
PL Permit Limit

< Not Detected at the Reporting Limit  
H Holding times for preparation or analysis exceeded  
MCL Maximum Contaminant Level  
RL Reporting Limit

Original  
Page 4 of 4

Prein & Newhof

3260 Evergreen Dr NE  
Grand Rapids, MI 49525  
t: 616-364-7600  
f: 616-364-4222

Client

*U.P. Engineers + Arch.*

Project Land Application

Send Results to

*cholmes@upea.com*

Sampler

*Chris Holmes*

### CHAIN OF CUSTODY

*OCF Lagoon Demo*

Lab Sample ID	Date	Time	Sample Description	Analysis Requested								Other List Below
				Preservative				Fecal	Geomean			
10274-1	10/3/19	1245	Pond 7 inlet under liner	X								
-2	10/3/19	110	Pond 7 outlet under liner	X								
-3	10/3/19	130	Pond 7 Composite	X								
				Land App:	As Ca	Mg Hg	Cd Cr	Cu Pb	Ni Zn	K Mo	Se	
				Density	NH3	NO3	TPO4	pH	TKN	% Solids		
				T Nitrogen	T Av N	TVS						
				Fecal is a set of 7 plus Geomean								

Relinquished By: Name/Date/Time

*OPBL* 10/3/19

Received By: Name/Date/Time

Relinquished By: Name/Date/Time

Received for Laboratory By: Name/Date/Time

*S. Diem* 10/4/19 1015

October 25, 2019

UP Engineers & Architects  
707 Ashmun St.  
Sault Ste. Marie, MI 49783

RE: OCF Lagoon Demo

Order No.: 1910921

Dear Mr. Chris Holmes:

Prein&Newhof Laboratory received 3 sample(s) on 10/18/2019 for the analyses presented in the following report.

There were no problems with the analytical events associated with this report unless noted in the Case Narrative.

Any analyte that exceeds the provided permit level are noted on the report with an "\*" in the Qual field.

Quality control data is within laboratory defined or method specified acceptance limits except if noted.

If you have any questions regarding these tests results, please feel free to call.

Thank you for your business.

Sincerely,



Steve Bylsma  
Laboratory Manager

<b>CLIENT:</b>	UP Engineers & Architects	<b>Collection Date:</b>	10/17/2019 1:00:00 PM
<b>Project:</b>	OCF Lagoon Demo	<b>Received Date:</b>	10/18/2019 10:25:00 AM
<b>Lab ID:</b>	1910921-03	<b>Matrix:</b>	BIOSOLIDS
<b>Client Sample ID:</b>	Lagoon 8 Composite	<b>Sampled By:</b>	C. Holmes

Analyses	Result	Units	RL	Qual	Table 3		Analyst	Date Analyzed	Method
					Limit	Date			
Arsenic	1.11	mg/Kg-dry	0.145		41.0	KS	10/23/2019	SW 6020B	
Cadmium	0.0350	mg/Kg-dry	0.0291		39.0	KS	10/23/2019	SW 6020B	
Calcium	3860	mg/Kg-dry	2.91			KS	10/23/2019	SW 6020B	
Chromium	6.61	mg/Kg-dry	0.145			KS	10/23/2019	SW 6020B	
Copper	13.3	mg/Kg-dry	0.145		1500	KS	10/23/2019	SW 6020B	
Lead	1.32	mg/Kg-dry	0.145		300	KS	10/23/2019	SW 6020B	
Magnesium	2880	mg/Kg-dry	2.91			KS	10/23/2019	SW 6020B	
Mercury	< 0.0167	mg/Kg-dry	0.0167		17.0	SJ	10/22/2019	SW 7471A	
Molybdenum	< 0.291	mg/Kg-dry	0.291		75.0	KS	10/23/2019	SW 6020B	
Nickel	8.43	mg/Kg-dry	0.145		420	KS	10/23/2019	SW 6020B	
Potassium	471	mg/Kg-dry	14.5			KS	10/23/2019	SW 6020B	
Selenium	0.405	mg/Kg-dry	0.145		100	KS	10/23/2019	SW 6020B	
Zinc	24.8	mg/Kg-dry	0.145		2800	KS	10/23/2019	SW 6020B	
Density	17.6	lb/Gal	1.00			SJ	10/18/2019	SM 2710-F	
Hydrogen Ion (pH)	7.17	pH Units	1.00			KF	10/18/2019	SW 9045C	
Nitrogen, Ammonia	10.1	mg/Kg-dry	1.15			PS	10/18/2019	SM 4500-NH3-D	
Nitrogen, Nitrate	< 1.15	mg/Kg-dry	1.15			KS	10/19/2019	SW 9056A	
Nitrogen, Total	553	mg/Kg-dry	1.15			SB	10/25/2019		
Nitrogen, Total Available	0.237	lb/ton-dry	0.115			SB	10/25/2019		
Nitrogen, Total Kjeldahl	553	mg/Kg-dry	14.4			TE	10/23/2019	SM 4500-N	
Phosphorus, Total (As P)	93.4	mg/Kg-dry	5.75			AB	10/22/2019	SM 4500-P-E	
Total Solids	87.0	%	0.0100			SJ	10/18/2019	D2216	
Total Volatile Solids	2.45	%	0.100			SJ	10/21/2019	EPA 160.4	

**Qualifiers:**    < Not Detected at the Reporting Limit  
                   MCL Maximum Contaminant Level  
                   RL Reporting Limit

H Holding times for preparation or analysis exceeded  
                   PL Permit Limit

Original  
                   Page 4 of 4

Prein & Newhof

3260 Evergreen Dr NE  
Grand Rapids, MI 49525  
t: 616-364-7600  
f: 616-364-4222

M12-19220-701

CHAIN OF CUSTODY

OCF Lagoon Demo

Client U.P.E.A.  
Project Land Application  
Send Results to [holmes@upea.com](mailto:holmes@upea.com)  
Sampler Chris Holmes

Lab Sample ID	Date	Time	Sample Description	Analysis Requested							Other List Below
				Preservative							
10921-1	10/17/19	1200	Lagoon 8 Inlet Below inner	X			Fecal	Geomean			
-2		1230	Lagoon 8 outlet Below inner	X							
-3		1:00 PM	Lagoon 8 Composite	X							
				Land App:	As Ca	Mg Hg	Cd Cr	Cu Pb	Ni Zn	K Mo	Se
				Density	NH3	NO3	TPO4	pH	TKN	% Solids	
				T Nitrogen	T Av N	TVS					
				Fecal is a set of 7 plus Geomean							

Relinquished By: Name/Date/Time

 10/17/19 4:30 PM

Received By: Name/Date/Time

Relinquished By: Name/Date/Time

Received for Laboratory By: Name/Date/Time

 10/18/19 1021

ATTACHMENT 3  
SAMPLE RESULTS SUMMARY TABLE – SUB LINER SOILS

OJIBWAY CORRECTIONAL FACILITY  
UNDER LAGOON LINER SOIL SAMPLES  
SEPTEMBER - NOVEMBER 2019

Parameter	Soil Below Liner - Left in Place																	
	POND 2 October 2019		POND 3 October 2019		POND 4 November 2019		POND 5 September 2019		POND 6 September 2019		POND 7 October 2019		POND 8 October 2019		Part 24 Limit	Part 201 Res DW	Part 201 NonRes DW	Part 201 Res GSIP
	Under Liner Outlet	Under Liner SW	Inlet Below	Outlet Below	Below Liner West	Below Liner East	Below Liner West	Below Liner East	Inlet Under Liner	Outlet Under Liner	Inlet Under Liner	Outlet Under Liner						
Total Arsenic	0.95	1.34	0.68	0.81	1.40	1.60	0.78	1.20	0.79	0.72	0.72	0.82	0.81	0.95	41	4.6	4.6	4.6
Total Cadmium	0.07	0.08	0.06	0.10	0.06	0.07	<0.0478	<0.0368	0.03	0.06	0.04	0.04	0.05	<0.0372	39	6	6	3.26G
Total Calcium	3.050	2.950	2.790	2.890	5.540	5.000	2.770	2.090	3.210	3.590	4.760	3.980	4.240	3.380	NA	NA	NA	NA
Total Chromium	7.45	7.74	4.98	6.51	9.46	10.40	6.93	4.54	4.94	4.58	5.44	5.65	5.65	4.36	NA	1.00E+06	1.00E+06	2.60E+06
Total Copper	12.7	7.7	7.1	9.5	13.8	15.3	13.7	10.0	14.4	12.5	11.8	10.9	13.5	11.9	1.500	5.800	3.800	65G
Total Lead	1.78	14.10	1.03	1.48	2.17	2.26	1.03	0.92	0.89	0.96	0.93	0.98	1.29	1.04	300	700	700	5371G
Total Magnesium	2.270	1.75	1.680	2.260	3.180	3.020	2.940	1.820	2.100	2.060	3.660	2.870	2.780	2.180	NA	8.000	22.000	NA
Total Mercury	<0.0176	<.00184	<0.0166	<0.0169	<0.0215	<0.0190	<0.0192	<0.0154	<0.0160	<0.0151	<0.0160	<0.0157	<0.0153	<0.0137	17	1.7	1.7	0.05
Total Molybdenum	<365	<0.354	<0.457	<0.302	<0.444	<0.489	<0.478	<0.368	<0.305	<0.326	<0.256	<0.265	<0.303	<0.372	75	1.5	4.2	64
Total Nickel	9.21	12.20	6.60	8.55	13.20	13.50	9.40	6.22	6.60	6.09	8.85	6.50	8.96	7.07	420	100	100	68G
Total Potassium	434	509	530	503	674	694	560	390	418	472	381	399	420	546	NA	NA	NA	NA
Total Selenium	<0.183	0.19	0.42	0.44	0.80	0.77	0.52	0.50	0.40	0.35	0.41	0.42	0.45	0.41	100	4	4	0.41
Total Zinc	16.2	28.2	9.4	11.6	22.7	19.3	12.8	10.2	10.5	10.1	17.7	12.0	12.7	11.5	2.800	2.400	5.000	146G
Ammonia	6.38	1.85	3.45	18.90	29.50	128.00	<1.23	18.40	30.60	85.70	1.54	<1.03	1.34	<1.01	NA	NA	NA	NA
Unionized Ammonia*	0.46	0.13	0.25	1.36	2.12	9.22	<1.23	1.32	2.20	6.17	0.11	<1.03	0.10	<1.01	NA	NA	NA	1.1
Nitrogen (Kjeldahl)	309	335	182	103	183	322	126	106	138	44	2.550	2.580	<12.6	<12.6	NA	NA	NA	NA
Phosphorus	.78	128	81	78	141	216	30	66	71	89	19	30	55	61	NA	1.300	4.800	NA
Total Solids	82.30%	82.20%	85.20%	79.60%	75.70%	77.80%	81.30%	96.30%	97.00%	89.40%	97.70%	97.50%	99.00%	99.40%	NA	NA	NA	NA
Percent Volatile Solids	6.04%	5.93%	3.68%	5.02%	1.74%	2.27%	2.13%	8.25%	12.10%	10.90%	7.83%	6.67%	1.60%	3.86%	NA	NA	NA	NA

All values listed in mg/kg

Based on the data above, the sludge testing results are well within land application guidelines.

G: Calculated based off receiving water hardness

\*Calculated based on EGLE cold water criteria

ATTACHMENT 4  
LABORATORY ANALYTICAL REPORTS – SUB LINER SOILS

October 21, 2019

UP Engineers & Architects  
707 Ashmun St.  
Sault Ste. Marie, MI 49783

RE: OCF Lagoon Demo

Order No.: 1910545

Dear Mr. Chris Holmes:

Prein&Newhof Laboratory received 3 sample(s) on 10/10/2019 for the analyses presented in the following report.

There were no problems with the analytical events associated with this report unless noted in the Case Narrative.

Any analyte that exceeds the provided permit level are noted on the report with an "\*" in the Qual field.

Quality control data is within laboratory defined or method specified acceptance limits except if noted.

If you have any questions regarding these tests results, please feel free to call.

Thank you for your business.

Sincerely,



Steve Bylsma  
Laboratory Manager

<b>CLIENT:</b>	UP Engineers & Architects	<b>Collection Date:</b>	10/9/2019 11:20:00 AM
<b>Project:</b>	OCF Lagoon Demo	<b>Received Date:</b>	10/10/2019 10:30:00 AM
<b>Lab ID:</b>	1910545-01	<b>Matrix:</b>	BIOSOLIDS
<b>Client Sample ID:</b>	Pond 2 Under Liner Outlet	<b>Sampled By:</b>	C. Holmes

<b>Analyses</b>	<b>Result</b>	<b>Units</b>	<b>RL</b>	<b>Qual</b>	<b>Table 3</b>		<b>Date Analyzed</b>	<b>Method</b>
					<b>Limit</b>	<b>Analyst</b>		
Arsenic	0.949	mg/Kg-dry	0.183		41.0	KS	10/15/2019	SW 6020B
Cadmium	0.0692	mg/Kg-dry	0.0365		39.0	KS	10/15/2019	SW 6020B
Calcium	3050	mg/Kg-dry	3.65			KS	10/15/2019	SW 6020B
Chromium	7.45	mg/Kg-dry	0.183			KS	10/15/2019	SW 6020B
Copper	12.7	mg/Kg-dry	0.183		1500	KS	10/15/2019	SW 6020B
Lead	1.78	mg/Kg-dry	0.183		300	KS	10/15/2019	SW 6020B
Magnesium	2270	mg/Kg-dry	3.65			KS	10/15/2019	SW 6020B
Mercury	< 0.0176	mg/Kg-dry	0.0176		17.0	SJ	10/17/2019	SW 7471A
Molybdenum	< 0.365	mg/Kg-dry	0.365		75.0	KS	10/15/2019	SW 6020B
Nickel	9.21	mg/Kg-dry	0.183		420	KS	10/15/2019	SW 6020B
Potassium	434	mg/Kg-dry	18.3			KS	10/15/2019	SW 6020B
Selenium	< 0.183	mg/Kg-dry	0.183		100	KS	10/15/2019	SW 6020B
Zinc	16.2	mg/Kg-dry	0.183		2800	KS	10/15/2019	SW 6020B
Density	18.6	lb/Gal	1.00			SJ	10/14/2019	SM 2710-F
Hydrogen Ion (pH)	6.86	pH Units	1.00			SD	10/10/2019	SW 9045C
Nitrogen, Ammonia	6.38	mg/Kg-dry	1.21			PS	10/11/2019	SM 4500-NH3-D
Nitrogen, Nitrate	< 1.21	mg/Kg-dry	1.21			KS	10/14/2019	SW 9056A
Nitrogen, Total	310	mg/Kg-dry	1.21			SB	10/21/2019	
Nitrogen, Total Available	0.134	lb/ton-dry	0.121			SB	10/21/2019	
Nitrogen, Total Kjeldahl	309	mg/Kg-dry	15.2			TE	10/15/2019	SM 4500-N
Phosphorus, Total (As P)	77.7	mg/Kg-dry	6.07			AB	10/11/2019	SM 4500-P-E
Total Solids	82.3	%	0.0100			SJ	10/12/2019	D2216
Total Volatile Solids	6.04	%	0.100			SJ	10/11/2019	EPA 160.4

**Qualifiers:** \* Value exceeds Maximum Contaminant Level.  
 D Dilution was required.  
 J Analyte detected below quantitation limits  
 PL Permit Limit

< Not Detected at the Reporting Limit  
 H Holding times for preparation or analysis exceeded  
 MCL Maximum Contaminant Level  
 RL Reporting Limit

Original  
 Page 2 of 4

<b>CLIENT:</b>	UP Engineers & Architects	<b>Collection Date:</b>	10/9/2019 11:50:00 AM
<b>Project:</b>	OCF Lagoon Demo	<b>Received Date:</b>	10/10/2019 10:30:00 AM
<b>Lab ID:</b>	1910545-02	<b>Matrix:</b>	BIOSOLIDS
<b>Client Sample ID:</b>	Pond 2 Under Line SW	<b>Sampled By:</b>	C. Holmes

<b>Analyses</b>	<b>Result</b>	<b>Units</b>	<b>RL</b>	<b>Qual</b>	<b>Table 3</b>	<b>Date</b>	<b>Method</b>	
					<b>Limit</b>	<b>Analyst</b>		
Arsenic	1.34	mg/Kg-dry	0.177		41.0	KS	10/15/2019	SW 6020B
Cadmium	0.0764	mg/Kg-dry	0.0354		39.0	KS	10/15/2019	SW 6020B
Calcium	2950	mg/Kg-dry	3.54			KS	10/15/2019	SW 6020B
Chromium	7.74	mg/Kg-dry	0.177			KS	10/15/2019	SW 6020B
Copper	14.1	mg/Kg-dry	0.177		1500	KS	10/15/2019	SW 6020B
Lead	1.75	mg/Kg-dry	0.177		300	KS	10/15/2019	SW 6020B
Magnesium	3690	mg/Kg-dry	3.54			KS	10/15/2019	SW 6020B
Mercury	< 0.0184	mg/Kg-dry	0.0184		17.0	SJ	10/17/2019	SW 7471A
Molybdenum	< 0.354	mg/Kg-dry	0.354		75.0	KS	10/15/2019	SW 6020B
Nickel	12.2	mg/Kg-dry	0.177		420	KS	10/15/2019	SW 6020B
Potassium	509	mg/Kg-dry	17.7			KS	10/15/2019	SW 6020B
Selenium	0.190	mg/Kg-dry	0.177		100	KS	10/15/2019	SW 6020B
Zinc	28.2	mg/Kg-dry	0.177		2800	KS	10/15/2019	SW 6020B
Density	18.8	lb/Gal	1.00			SJ	10/14/2019	SM 2710-F
Hydrogen Ion (pH)	7.24	pH Units	1.00			SD	10/10/2019	SW 9045C
Nitrogen, Ammonia	1.85	mg/Kg-dry	1.22			PS	10/11/2019	SM 4500-NH3-D
Nitrogen, Nitrate	< 1.22	mg/Kg-dry	1.22			KS	10/14/2019	SW 9056A
Nitrogen, Total	335	mg/Kg-dry	1.22			SB	10/21/2019	
Nitrogen, Total Available	0.137	lb/ton-dry	0.122			SB	10/21/2019	
Nitrogen, Total Kjeldahl	335	mg/Kg-dry	15.2			TE	10/15/2019	SM 4500-N
Phosphorus, Total (As P)	128	mg/Kg-dry	6.09			AB	10/11/2019	SM 4500-P-E
Total Solids	82.2	%	0.0100			SJ	10/12/2019	D2216
Total Volatile Solids	5.93	%	0.100			SJ	10/11/2019	EPA 160.4

**Qualifiers:**

- \* Value exceeds Maximum Contaminant Level.
- D Dilution was required.
- J Analyte detected below quantitation limits
- PL Permit Limit

- < Not Detected at the Reporting Limit
- H Holding times for preparation or analysis exceeded
- MCL Maximum Contaminant Level
- RL Reporting Limit

Original

Page 3 of 4

Prein & Newhof

3260 Evergreen Dr NE  
Grand Rapids, MI 49525  
t: 616-364-7600  
f: 616-364-4222

CHAIN OF CUSTODY

M12-19220-701

OCF - Lagoon Dens

Client U.P.E.A.  
Project Land Application  
Send Results to [cholmes@upea.com](mailto:cholmes@upea.com)  
Sampler C. Chris Holmes

Lab Sample ID	Date	Time	Sample Description	Analysis Requested							Other List Below	
				Preservative								
				Land App			Fecal	Geomean				
105451	10/9/19	1120AM	Pond 2 under liner outlet	X								
2	10/9/19	1150AM	Pond 2 under liner Southwest	X								
3	10/9/19	1200 PM	Pond 2 Composite	X								
				Land App:	As Ca	Mg Hg	Cd Cr	Cu Pb	Ni Zn	K Mo	Se	
				Density	NH3	NO3	TPO4	pH	TKN	% Solids		
				T Nitrogen	T Av N	TVS						
				Fecal is a set of 7 plus Geomean								

Relinquished By: Name/Date/Time

Chris

10/9/19 330 PM

Received By: Name/Date/Time

Relinquished By: Name/Date/Time

Received for Laboratory By: Name/Date/Time

C. Diem 10/10/19 1030

November 11, 2019

UP Engineers & Architects  
707 Ashmun St.  
Sault Ste. Marie, MI 49783

RE: OCF Lagoon Demo

Order No.: 1911017

Dear Mr. Chris Holmes:

Prein&Newhof Laboratory received 3 sample(s) on 11/1/2019 for the analyses presented in the following report.

There were no problems with the analytical events associated with this report unless noted in the Case Narrative.

Any analyte that exceeds the provided permit level are noted on the report with an "\*" in the Qual field.

Quality control data is within laboratory defined or method specified acceptance limits except if noted.

If you have any questions regarding these tests results, please feel free to call.

Thank you for your business.

Sincerely,



Steve Bylsma  
Laboratory Manager

<b>CLIENT:</b>	UP Engineers & Architects	<b>Collection Date:</b>	10/31/2019 12:00:00 PM
<b>Project:</b>	OCF Lagoon Demo	<b>Received Date:</b>	11/1/2019 10:10:00 AM
<b>Lab ID:</b>	1911017-01	<b>Matrix:</b>	BIOSOLIDS
<b>Client Sample ID:</b>	Pond 3 Inlet Below	<b>Sampled By:</b>	C. Holmes

Analyses	Result	Units	RL	Qual	Table 3		Analyst	Date Analyzed	Method
					Limit	Date			
Arsenic	0.682	mg/Kg-dry	0.228		41.0	TE	11/7/2019	SW 6020B	
Cadmium	0.0612	mg/Kg-dry	0.0457		39.0	TE	11/7/2019	SW 6020B	
Calcium	2790	mg/Kg-dry	4.57			TE	11/7/2019	SW 6020B	
Chromium	4.98	mg/Kg-dry	0.228			TE	11/7/2019	SW 6020B	
Copper	7.12	mg/Kg-dry	0.228		1500	TE	11/7/2019	SW 6020B	
Lead	1.03	mg/Kg-dry	0.228		300	TE	11/7/2019	SW 6020B	
Magnesium	1680	mg/Kg-dry	4.57			TE	11/7/2019	SW 6020B	
Mercury	< 0.0166	mg/Kg-dry	0.0166		17.0	SJ	11/6/2019	SW 7471A	
Molybdenum	< 0.457	mg/Kg-dry	0.457		75.0	TE	11/7/2019	SW 6020B	
Nickel	6.60	mg/Kg-dry	0.228		420	TE	11/7/2019	SW 6020B	
Potassium	530	mg/Kg-dry	22.8			TE	11/7/2019	SW 6020B	
Selenium	0.415	mg/Kg-dry	0.228		100	TE	11/7/2019	SW 6020B	
Zinc	9.35	mg/Kg-dry	0.228		2800	TE	11/7/2019	SW 6020B	
Density	14.4	lb/Gal	1.00			SJ	11/4/2019	SM 2710-F	
Hydrogen Ion (pH)	7.72	pH Units	1.00			KF	11/1/2019	SW 9045C	
Nitrogen, Ammonia	3.45	mg/Kg-dry	1.17			PS	11/4/2019	SM 4500-NH3-D	
Nitrogen, Nitrate	< 1.17	mg/Kg-dry	1.17			AB	11/2/2019	SW 9056A	
Nitrogen, Total	183	mg/Kg-dry	1.17			SB	11/8/2019		
Nitrogen, Total Available	< 0.117	lb/ton-dry	0.117			SB	11/8/2019		
Nitrogen, Total Kjeldahl	182	mg/Kg-dry	14.7			TE	11/7/2019	SM 4500-N	
Phosphorus, Total (As P)	80.5	mg/Kg-dry	5.87			AB	11/7/2019	SM 4500-P-E	
Total Solids	85.2	%	0.0100			PS	11/4/2019	D2216	
Total Volatile Solids	3.68	%	0.100			SJ	11/4/2019	EPA 160.4	

**Qualifiers:**    < Not Detected at the Reporting Limit  
 MCL Maximum Contaminant Level  
 RL Reporting Limit

H Holding times for preparation or analysis exceeded  
 PL Permit Limit

Original  
 Page 2 of 4

<b>CLIENT:</b>	UP Engineers & Architects	<b>Collection Date:</b>	10/31/2019 12:35:00 PM
<b>Project:</b>	OCF Lagoon Demo	<b>Received Date:</b>	11/1/2019 10:10:00 AM
<b>Lab ID:</b>	1911017-02	<b>Matrix:</b>	BIOSOLIDS
<b>Client Sample ID:</b>	Pond 3 Outlet Below	<b>Sampled By:</b>	C. Holmes

Analyses	Result	Units	RL	Qual	Table 3		Analyst	Date Analyzed	Method
					Limit	Date			
Arsenic	0.811	mg/Kg-dry	0.151		41.0	TE	11/7/2019		SW 6020B
Cadmium	0.101	mg/Kg-dry	0.0302		39.0	TE	11/7/2019		SW 6020B
Calcium	2890	mg/Kg-dry	3.02			TE	11/7/2019		SW 6020B
Chromium	6.51	mg/Kg-dry	0.151			TE	11/7/2019		SW 6020B
Copper	9.53	mg/Kg-dry	0.151		1500	TE	11/7/2019		SW 6020B
Lead	1.48	mg/Kg-dry	0.151		300	TE	11/7/2019		SW 6020B
Magnesium	2260	mg/Kg-dry	3.02			TE	11/7/2019		SW 6020B
Mercury	< 0.0169	mg/Kg-dry	0.0169		17.0	SJ	11/6/2019		SW 7471A
Molybdenum	< 0.302	mg/Kg-dry	0.302		75.0	TE	11/7/2019		SW 6020B
Nickel	8.55	mg/Kg-dry	0.151		420	TE	11/7/2019		SW 6020B
Potassium	503	mg/Kg-dry	15.1			TE	11/7/2019		SW 6020B
Selenium	0.444	mg/Kg-dry	0.151		100	TE	11/7/2019		SW 6020B
Zinc	11.6	mg/Kg-dry	0.151		2800	TE	11/7/2019		SW 6020B
Density	14.5	lb/Gal	1.00			SJ	11/4/2019		SM 2710-F
Hydrogen Ion (pH)	7.08	pH Units	1.00			KF	11/1/2019		SW 9045C
Nitrogen, Ammonia	18.9	mg/Kg-dry	1.26			PS	11/4/2019		SM 4500-NH3-D
Nitrogen, Nitrate	< 1.26	mg/Kg-dry	1.26			AB	11/2/2019		SW 9056A
Nitrogen, Total	104	mg/Kg-dry	1.26			SB	11/8/2019		
Nitrogen, Total Available	< 0.126	lb/ton-dry	0.126			SB	11/8/2019		
Nitrogen, Total Kjeldahl	103	mg/Kg-dry	15.7			TE	11/7/2019		SM 4500-N
Phosphorus, Total (As P)	77.6	mg/Kg-dry	6.28			AB	11/7/2019		SM 4500-P-E
Total Solids	79.6	%	0.0100			PS	11/4/2019		D2216
Total Volatile Solids	5.02	%	0.100			SJ	11/4/2019		EPA 160.4

**Qualifiers:**    < Not Detected at the Reporting Limit  
 MCL Maximum Contaminant Level  
 RL Reporting Limit

H Holding times for preparation or analysis exceeded  
 PL Permit Limit

Original  
 Page 3 of 4

Prein & Newhof

3260 Evergreen Dr NE  
Grand Rapids, MI 49525  
t: 616-364-7600  
f: 616-364-4222

M12-19220-701

CHAIN OF CUSTODY

OCF Lagoon Demo

Client U.P. Engineers + Arch. 906-482-4810  
Project Land Application  
Send Results to [cholmes@upea.com](mailto:cholmes@upea.com)  
Sampler Chris Holmes

Lab Sample ID	Date	Time	Sample Description	Analysis Requested							Other List Below	
				Preservative								
				Land App			Fecal	Geomean				
11017-1	10/31/19	1200	Pond 3 Inlet Below	X								
-2	10/31/19	1235	Pond 3 Outlet Below	X								
-3	10/31/19	1240	Pond 3 Composite	X								
* Hold	10/31/19	1200	Pond 3 clay Inlet Clay	X								
* Hold	10/31/19	1235	Pond 3 Outlet Clay	X	As Ca	Mg Hg	Cd Cr	Cu Pb	Ni Zn	K Mo	Se	
					Density	NH3	NO3	TPO4	pH	TKN	% Solids	
					T Nitrogen	T Av N	TVS					
				Fecal is a set of 7 plus Geomean								

Relinquished By: Name/Date/Time

Chris Holmes  10/31/19 3:30 PM

Received By: Name/Date/Time

Relinquished By: Name/Date/Time

Received for Laboratory By: Name/Date/Time

S. Diem 11/1/19 1010

November 13, 2019

UP Engineers & Architects  
707 Ashmun St.  
Sault Ste. Marie, MI 49783

RE: OCF Lagoon Demo

Order No.: 1911261

Dear Mr. Chris Holmes:

Prein&Newhof Laboratory received 3 sample(s) on 11/7/2019 for the analyses presented in the following report.

There were no problems with the analytical events associated with this report unless noted in the Case Narrative.

Any analyte that exceeds the provided permit level are noted on the report with an "\*" in the Qual field.

Quality control data is within laboratory defined or method specified acceptance limits except if noted.

If you have any questions regarding these tests results, please feel free to call.

Thank you for your business.

Sincerely,



Steve Bylsma  
Laboratory Manager

<b>CLIENT:</b>	UP Engineers & Architects	<b>Collection Date:</b>	11/6/2019 1:00:00 PM
<b>Project:</b>	OCF Lagoon Demo	<b>Received Date:</b>	11/7/2019 10:20:00 AM
<b>Lab ID:</b>	1911261-01	<b>Matrix:</b>	BIOSOLIDS
<b>Client Sample ID:</b>	Pond 4 Inlet Below Liner	<b>Sampled By:</b>	C. Holmes

Analyses	Result	Units	RL	Qual	Table 3		Date Analyzed	Method
					Limit	Analyst		
Arsenic	1.40	mg/Kg-dry	0.222		41.0	KS	11/11/2019	SW 6020B
Cadmium	0.0593	mg/Kg-dry	0.0444		39.0	KS	11/11/2019	SW 6020B
Calcium	5540	mg/Kg-dry	4.44			KS	11/11/2019	SW 6020B
Chromium	9.46	mg/Kg-dry	0.222			KS	11/11/2019	SW 6020B
Copper	13.8	mg/Kg-dry	0.222		1500	KS	11/11/2019	SW 6020B
Lead	2.17	mg/Kg-dry	0.222		300	KS	11/11/2019	SW 6020B
Magnesium	3180	mg/Kg-dry	4.44			KS	11/11/2019	SW 6020B
Mercury	< 0.0215	mg/Kg-dry	0.0215		17.0	SJ	11/12/2019	SW 7471A
Molybdenum	< 0.444	mg/Kg-dry	0.444		75.0	KS	11/11/2019	SW 6020B
Nickel	13.2	mg/Kg-dry	0.222		420	KS	11/11/2019	SW 6020B
Potassium	674	mg/Kg-dry	22.2			KS	11/11/2019	SW 6020B
Selenium	0.804	mg/Kg-dry	0.222		100	KS	11/11/2019	SW 6020B
Zinc	22.7	mg/Kg-dry	0.222		2800	KS	11/11/2019	SW 6020B
Density	16.9	lb/Gal	1.00			SJ	11/7/2019	SM 2710-F
Hydrogen Ion (pH)	7.57	pH Units	1.00			KF	11/7/2019	SW 9045C
Nitrogen, Ammonia	29.5	mg/Kg-dry	1.32			PS	11/13/2019	SM 4500-NH3-D
Nitrogen, Nitrate	< 1.32	mg/Kg-dry	1.32			KS	11/8/2019	SW 9056A
Nitrogen, Total	184	mg/Kg-dry	1.32			SB	11/13/2019	
Nitrogen, Total Available	0.136	lb/ton-dry	0.132			SB	11/13/2019	
Nitrogen, Total Kjeldahl	183	mg/Kg-dry	16.5			TE	11/8/2019	SM 4500-N
Phosphorus, Total (As P)	141	mg/Kg-dry	6.60			AB	11/13/2019	SM 4500-P-E
Total Solids	75.7	%	0.0100			PS	11/8/2019	D2216
Total Volatile Solids	1.74	%	0.100			SJ	11/8/2019	EPA 160.4

**Qualifiers:**    < Not Detected at the Reporting Limit  
                   MCL Maximum Contaminant Level  
                   RL Reporting Limit

H Holding times for preparation or analysis exceeded  
                   PL Permit Limit

Original  
                   Page 2 of 4

<b>CLIENT:</b>	UP Engineers & Architects	<b>Collection Date:</b>	11/6/2019 1:45:00 PM
<b>Project:</b>	OCF Lagoon Demo	<b>Received Date:</b>	11/7/2019 10:20:00 AM
<b>Lab ID:</b>	1911261-02	<b>Matrix:</b>	BIOSOLIDS
<b>Client Sample ID:</b>	Pond 4 Outlet Below Liner	<b>Sampled By:</b>	C. Holmes

Analyses	Result	Units	RL	Qual	Table 3		Date Analyzed	Method
					Limit	Analyst		
Arsenic	1.60	mg/Kg-dry	0.244		41.0	KS	11/11/2019	SW 6020B
Cadmium	0.0650	mg/Kg-dry	0.0489		39.0	KS	11/11/2019	SW 6020B
Calcium	5000	mg/Kg-dry	4.89			KS	11/11/2019	SW 6020B
Chromium	10.4	mg/Kg-dry	0.244			KS	11/11/2019	SW 6020B
Copper	15.3	mg/Kg-dry	0.244		1500	KS	11/11/2019	SW 6020B
Lead	2.26	mg/Kg-dry	0.244		300	KS	11/11/2019	SW 6020B
Magnesium	3020	mg/Kg-dry	4.89			KS	11/11/2019	SW 6020B
Mercury	< 0.0190	mg/Kg-dry	0.0190		17.0	SJ	11/12/2019	SW 7471A
Molybdenum	< 0.489	mg/Kg-dry	0.489		75.0	KS	11/11/2019	SW 6020B
Nickel	13.5	mg/Kg-dry	0.244		420	KS	11/11/2019	SW 6020B
Potassium	694	mg/Kg-dry	24.4			KS	11/11/2019	SW 6020B
Selenium	0.768	mg/Kg-dry	0.244		100	KS	11/11/2019	SW 6020B
Zinc	19.3	mg/Kg-dry	0.244		2800	KS	11/11/2019	SW 6020B
Density	15.6	lb/Gal	1.00			SJ	11/7/2019	SM 2710-F
Hydrogen Ion (pH)	7.19	pH Units	1.00			KF	11/7/2019	SW 9045C
Nitrogen, Ammonia	128	mg/Kg-dry	1.28			PS	11/13/2019	SM 4500-NH3-D
Nitrogen, Nitrate	< 1.28	mg/Kg-dry	1.28			KS	11/8/2019	SW 9056A
Nitrogen, Total	322	mg/Kg-dry	1.28			SB	11/13/2019	
Nitrogen, Total Available	0.393	lb/ton-dry	0.128			SB	11/13/2019	
Nitrogen, Total Kjeldahl	322	mg/Kg-dry	16.1			TE	11/8/2019	SM 4500-N
Phosphorus, Total (As P)	216	mg/Kg-dry	6.42			AB	11/13/2019	SM 4500-P-E
Total Solids	77.8	%	0.0100			PS	11/8/2019	D2216
Total Volatile Solids	2.27	%	0.100			SJ	11/8/2019	EPA 160.4

**Qualifiers:**    < Not Detected at the Reporting Limit  
                   MCL Maximum Contaminant Level  
                   RL Reporting Limit

H Holding times for preparation or analysis exceeded  
                   PL Permit Limit

Original  
                   Page 3 of 4

Prein & Newhof

3260 Evergreen Dr NE

Grand Rapids, MI 49525

t: 616-364-7600

f: 616-364-4222

M12-19726-701

DGF Lagoon Demo

CHAIN OF CUSTODY

Client

U.P. Engineers + Arch. Inc.

Project

Land Application

Send Results to

chris@upea.com

Sampler

Chris Holmes

Lab Sample ID	Date	Time	Sample Description	Analysis Requested								Other List Below
				Preservative								
	Land App			Fecal	Geomean							
112611	11/6/19	1:00	Pond 4 Inlet Below liner	X								
2	11/6/19	1:45	Pond 4 outlet Below liner	X								
3	11/6/19	1:50	Pond 4 Composite	X								
				Land App:	As Ca	Mg Hg	Cd Cr	Cu Pb	Ni Zn	K Mo	Se	
				Density	NH3	NO3	TPO4	pH	TKN	% Solids		
				T Nitrogen	T Av N	TVS						
				Fecal is a set of 7 plus Geomean								

Relinquished By: Name/Date/Time

Christ Holmes 11/6/19 4:30 PM

Received By: Name/Date/Time

Relinquished By: Name/Date/Time

Received for Laboratory By: Name/Date/Time

S. Diem 11/7/19 10:20

October 09, 2019

UP Engineers & Architects  
707 Ashmun St.  
Sault Ste. Marie, MI 49783

RE: OCF Lagoon Demo

Order No.: 1910035

Dear Mr. Chris Holmes:

Prein&Newhof Laboratory received 6 sample(s) on 10/1/2019 for the analyses presented in the following report.

There were no problems with the analytical events associated with this report unless noted in the Case Narrative.

Any analyte that exceeds the provided permit level are noted on the report with an "\*" in the Qual field.

Quality control data is within laboratory defined or method specified acceptance limits except if noted.

If you have any questions regarding these tests results, please feel free to call.

Thank you for your business.

Sincerely,



Steve Bylsma  
Laboratory Manager

<b>CLIENT:</b>	UP Engineers & Architects	<b>Collection Date:</b>	9/27/2019 1:45:00 PM
<b>Project:</b>	OCF Lagoon Demo	<b>Received Date:</b>	10/1/2019 10:20:00 AM
<b>Lab ID:</b>	1910035-01	<b>Matrix:</b>	SOLID
<b>Client Sample ID:</b>	Pond 5 Below Liner West	<b>Sampled By:</b>	Chris H.

Analyses	Result	Units	RL	Qual	Table 3		Date Analyzed	Method
					Limit	Analyst		
Arsenic	0.782	mg/Kg-dry	0.239		41.0	KS	10/2/2019	SW 6020B
Cadmium	< 0.0478	mg/Kg-dry	0.0478		39.0	KS	10/2/2019	SW 6020B
Calcium	2770	mg/Kg-dry	3.05			KS	10/8/2019	SW 6020B
Chromium	6.93	mg/Kg-dry	0.239			KS	10/4/2019	SW 6020B
Copper	13.7	mg/Kg-dry	0.239		1500	KS	10/2/2019	SW 6020B
Lead	1.03	mg/Kg-dry	0.239		300	KS	10/2/2019	SW 6020B
Magnesium	2940	mg/Kg-dry	3.05			KS	10/8/2019	SW 6020B
Mercury	< 0.0192	mg/Kg-dry	0.0192		17.0	SJ	10/4/2019	SW 7471A
Molybdenum	< 0.478	mg/Kg-dry	0.478		75.0	KS	10/2/2019	SW 6020B
Nickel	9.40	mg/Kg-dry	0.152		420	KS	10/8/2019	SW 6020B
Potassium	560	mg/Kg-dry	23.9			KS	10/2/2019	SW 6020B
Selenium	0.523	mg/Kg-dry	0.239		100	KS	10/2/2019	SW 6020B
Zinc	12.8	mg/Kg-dry	0.152		2800	KS	10/8/2019	SW 6020B
Density	16.9	lb/Gal	1.00			SJ	10/1/2019	SM 2710-F
Hydrogen Ion (pH)	8.19	pH Units	1.00			KF	10/1/2019	SW 9045C
Nitrogen, Ammonia	< 1.23	mg/Kg-dry	1.23			PS	10/2/2019	SM 4500-NH3-D
Nitrogen, Nitrate	18.2	mg/Kg-dry	1.23			AB	10/2/2019	SW 9056A
Nitrogen, Total	144	mg/Kg-dry	1.23			SB	10/8/2019	
Nitrogen, Total Available	< 0.123	lb/ton-dry	0.123			SB	10/8/2019	
Nitrogen, Total Kjeldahl	126	mg/Kg-dry	15.4			TE	10/7/2019	SM 4500-N
Phosphorus, Total (As P)	29.5	mg/Kg-dry	6.15			AB	10/7/2019	SM 4500-P-E
Total Solids	81.3	%	0.0100			PS	10/2/2019	D2216
Total Volatile Solids	2.13	%	0.100			SJ	10/2/2019	EPA 160.4

**Qualifiers:**    < Not Detected at the Reporting Limit  
                   MCL Maximum Contaminant Level  
                   RL Reporting Limit

H Holding times for preparation or analysis exceeded  
                   PL Permit Limit

<b>CLIENT:</b>	UP Engineers & Architects	<b>Collection Date:</b>	9/27/2019 2:00:00 PM
<b>Project:</b>	OCF Lagoon Demo	<b>Received Date:</b>	10/1/2019 10:20:00 AM
<b>Lab ID:</b>	1910035-02	<b>Matrix:</b>	SOLID
<b>Client Sample ID:</b>	Pond 5 Below Liner East	<b>Sampled By:</b>	Chris H.

Analyses	Result	Units	RL	Qual	Table 3		Date Analyzed	Method
					Limit	Analyst		
Arsenic	1.20	mg/Kg-dry	0.184		41.0	KS	10/2/2019	SW 6020B
Cadmium	< 0.0368	mg/Kg-dry	0.0368		39.0	KS	10/2/2019	SW 6020B
Calcium	2090	mg/Kg-dry	3.68			KS	10/2/2019	SW 6020B
Chromium	4.54	mg/Kg-dry	0.184			KS	10/2/2019	SW 6020B
Copper	9.95	mg/Kg-dry	0.184		1500	KS	10/2/2019	SW 6020B
Lead	0.924	mg/Kg-dry	0.184		300	KS	10/2/2019	SW 6020B
Magnesium	1820	mg/Kg-dry	3.68			KS	10/2/2019	SW 6020B
Mercury	< 0.0154	mg/Kg-dry	0.0154		17.0	SJ	10/4/2019	SW 7471A
Molybdenum	< 0.368	mg/Kg-dry	0.368		75.0	KS	10/2/2019	SW 6020B
Nickel	6.22	mg/Kg-dry	0.184		420	KS	10/2/2019	SW 6020B
Potassium	390	mg/Kg-dry	18.4			KS	10/2/2019	SW 6020B
Selenium	0.502	mg/Kg-dry	0.184		100	KS	10/2/2019	SW 6020B
Zinc	10.2	mg/Kg-dry	0.184		2800	KS	10/2/2019	SW 6020B
Density	21.8	lb/Gal	1.00			SJ	10/1/2019	SM 2710-F
Hydrogen Ion (pH)	8.23	pH Units	1.00			KF	10/1/2019	SW 9045C
Nitrogen, Ammonia	18.4	mg/Kg-dry	1.04			PS	10/2/2019	SM 4500-NH3-D
Nitrogen, Nitrate	1.53	mg/Kg-dry	1.04			AB	10/2/2019	SW 9056A
Nitrogen, Total	107	mg/Kg-dry	1.04			SB	10/8/2019	
Nitrogen, Total Available	< 0.104	lb/ton-dry	0.104			SB	10/8/2019	
Nitrogen, Total Kjeldahl	106	mg/Kg-dry	13.0			TE	10/7/2019	SM 4500-N
Phosphorus, Total (As P)	65.5	mg/Kg-dry	5.19			AB	10/7/2019	SM 4500-P-E
Total Solids	96.3	%	0.0100			PS	10/2/2019	D2216
Total Volatile Solids	8.25	%	0.100			SJ	10/3/2019	EPA 160.4

**Qualifiers:**    < Not Detected at the Reporting Limit  
                   MCL Maximum Contaminant Level  
                   RL Reporting Limit

H Holding times for preparation or analysis exceeded  
                   PL Permit Limit

<b>CLIENT:</b>	UP Engineers & Architects	<b>Collection Date:</b>	9/27/2019 3:15:00 PM
<b>Project:</b>	OCF Lagoon Demo	<b>Received Date:</b>	10/1/2019 10:20:00 AM
<b>Lab ID:</b>	1910035-04	<b>Matrix:</b>	SOLID
<b>Client Sample ID:</b>	Pond 6 Below Liner West	<b>Sampled By:</b>	Chris H.

Analyses	Result	Units	RL	Qual	Table 3		Analyst	Date Analyzed	Method
					Limit	Date			
Arsenic	0.786	mg/Kg-dry	0.153		41.0	KS	10/2/2019	SW 6020B	
Cadmium	0.0347	mg/Kg-dry	0.0305		39.0	KS	10/2/2019	SW 6020B	
Calcium	3210	mg/Kg-dry	3.05			KS	10/2/2019	SW 6020B	
Chromium	4.94	mg/Kg-dry	0.153			KS	10/2/2019	SW 6020B	
Copper	14.4	mg/Kg-dry	0.153		1500	KS	10/2/2019	SW 6020B	
Lead	0.888	mg/Kg-dry	0.153		300	KS	10/2/2019	SW 6020B	
Magnesium	2100	mg/Kg-dry	3.05			KS	10/2/2019	SW 6020B	
Mercury	< 0.0160	mg/Kg-dry	0.0160		17.0	SJ	10/4/2019	SW 7471A	
Molybdenum	< 0.305	mg/Kg-dry	0.305		75.0	KS	10/2/2019	SW 6020B	
Nickel	6.60	mg/Kg-dry	0.153		420	KS	10/2/2019	SW 6020B	
Potassium	418	mg/Kg-dry	15.3			KS	10/2/2019	SW 6020B	
Selenium	0.400	mg/Kg-dry	0.153		100	KS	10/2/2019	SW 6020B	
Zinc	10.5	mg/Kg-dry	0.153		2800	KS	10/2/2019	SW 6020B	
Density	19.6	lb/Gal	1.00			SJ	10/1/2019	SM 2710-F	
Hydrogen Ion (pH)	8.23	pH Units	1.00			KF	10/1/2019	SW 9045C	
Nitrogen, Ammonia	30.6	mg/Kg-dry	1.03			PS	10/2/2019	SM 4500-NH3-D	
Nitrogen, Nitrate	1.34	mg/Kg-dry	1.03			AB	10/2/2019	SW 9056A	
Nitrogen, Total	139	mg/Kg-dry	1.03			SB	10/8/2019		
Nitrogen, Total Available	0.104	lb/ton-dry	0.103			SB	10/8/2019		
Nitrogen, Total Kjeldahl	138	mg/Kg-dry	12.9			TE	10/7/2019	SM 4500-N	
Phosphorus, Total (As P)	71.1	mg/Kg-dry	5.15			AB	10/7/2019	SM 4500-P-E	
Total Solids	97.0	%	0.0100			PS	10/2/2019	D2216	
Total Volatile Solids	12.1	%	0.100			SJ	10/3/2019	EPA 160.4	

**Qualifiers:**    < Not Detected at the Reporting Limit  
                   MCL Maximum Contaminant Level  
                   RL Reporting Limit

H Holding times for preparation or analysis exceeded  
                   PL Permit Limit

<b>CLIENT:</b>	UP Engineers & Architects	<b>Collection Date:</b>	9/27/2019 3:30:00 PM
<b>Project:</b>	OCF Lagoon Demo	<b>Received Date:</b>	10/1/2019 10:20:00 AM
<b>Lab ID:</b>	1910035-05	<b>Matrix:</b>	SOLID
<b>Client Sample ID:</b>	Pond 6 Below Liner East	<b>Sampled By:</b>	Chris H.

Analyses	Result	Units	RL	Qual	Table 3		Analyst	Date Analyzed	Method
					Limit	Date			
Arsenic	0.719	mg/Kg-dry	0.163		41.0	KS	10/2/2019	SW 6020B	
Cadmium	0.0593	mg/Kg-dry	0.0326		39.0	KS	10/2/2019	SW 6020B	
Calcium	3590	mg/Kg-dry	3.26			KS	10/2/2019	SW 6020B	
Chromium	4.58	mg/Kg-dry	0.163			KS	10/2/2019	SW 6020B	
Copper	12.5	mg/Kg-dry	0.163		1500	KS	10/2/2019	SW 6020B	
Lead	0.957	mg/Kg-dry	0.163		300	KS	10/2/2019	SW 6020B	
Magnesium	2060	mg/Kg-dry	3.26			KS	10/2/2019	SW 6020B	
Mercury	< 0.0151	mg/Kg-dry	0.0151		17.0	SJ	10/4/2019	SW 7471A	
Molybdenum	< 0.326	mg/Kg-dry	0.326		75.0	KS	10/2/2019	SW 6020B	
Nickel	6.09	mg/Kg-dry	0.163		420	KS	10/2/2019	SW 6020B	
Potassium	472	mg/Kg-dry	16.3			KS	10/2/2019	SW 6020B	
Selenium	0.354	mg/Kg-dry	0.163		100	KS	10/2/2019	SW 6020B	
Zinc	10.1	mg/Kg-dry	0.163		2800	KS	10/2/2019	SW 6020B	
Density	15.8	lb/Gal	1.00			SJ	10/1/2019	SM 2710-F	
Hydrogen Ion (pH)	7.87	pH Units	1.00			KF	10/1/2019	SW 9045C	
Nitrogen, Ammonia	< 1.12	mg/Kg-dry	1.12			PS	10/2/2019	SM 4500-NH3-D	
Nitrogen, Nitrate	< 1.12	mg/Kg-dry	1.12			AB	10/2/2019	SW 9056A	
Nitrogen, Total	86.3	mg/Kg-dry	1.12			SB	10/8/2019		
Nitrogen, Total Available	< 0.112	lb/ton-dry	0.112			SB	10/8/2019		
Nitrogen, Total Kjeldahl	85.7	mg/Kg-dry	14.0			TE	10/7/2019	SM 4500-N	
Phosphorus, Total (As P)	43.8	mg/Kg-dry	5.59			AB	10/7/2019	SM 4500-P-E	
Total Solids	89.4	%	0.0100			PS	10/2/2019	D2216	
Total Volatile Solids	10.9	%	0.100			SJ	10/3/2019	EPA 160.4	

**Qualifiers:**    < Not Detected at the Reporting Limit  
                   MCL Maximum Contaminant Level  
                   RL Reporting Limit

H Holding times for preparation or analysis exceeded  
                   PL Permit Limit

Revision v1  
                   Page 6 of 7

Prein & Newhof

3260 Evergreen Dr NE

Grand Rapids, MI 49525  
t: 616-364-7600  
f: 616-364-4222

M12-19220-501

## CHAIN OF CUSTODY

## OCF - Lagom Demo

**Relinquished By:** Name/Date/Time

*Cole*

9/30/19

Received By: Name/Date/Time

Relinquished By: Name/Date/Time

Received for Laboratory By: Name/Date/Time

S.-Doerr 10/1/19 1020

October 25, 2019

UP Engineers & Architects  
707 Ashmun St.  
Sault Ste. Marie, MI 49783

RE: OCF Lagoon Demo

Order No.: 1910921

Dear Mr. Chris Holmes:

Prein&Newhof Laboratory received 3 sample(s) on 10/18/2019 for the analyses presented in the following report.

There were no problems with the analytical events associated with this report unless noted in the Case Narrative.

Any analyte that exceeds the provided permit level are noted on the report with an "\*" in the Qual field.

Quality control data is within laboratory defined or method specified acceptance limits except if noted.

If you have any questions regarding these tests results, please feel free to call.

Thank you for your business.

Sincerely,



Steve Bylsma  
Laboratory Manager

<b>CLIENT:</b>	UP Engineers & Architects	<b>Collection Date:</b>	10/17/2019 12:00:00 PM
<b>Project:</b>	OCF Lagoon Demo	<b>Received Date:</b>	10/18/2019 10:25:00 AM
<b>Lab ID:</b>	1910921-01	<b>Matrix:</b>	BIOSOLIDS
<b>Client Sample ID:</b>	Lagoon 8 Inlet	<b>Sampled By:</b>	C. Holmes

Analyses	Result	Units	RL	Qual	Table 3		Analyst	Date Analyzed	Method
					Limit	Date			
Arsenic	0.807	mg/Kg-dry	0.151		41.0	KS	10/23/2019	SW 6020B	
Cadmium	0.0468	mg/Kg-dry	0.0303		39.0	KS	10/23/2019	SW 6020B	
Calcium	4240	mg/Kg-dry	3.03			KS	10/23/2019	SW 6020B	
Chromium	5.65	mg/Kg-dry	0.151			KS	10/23/2019	SW 6020B	
Copper	13.5	mg/Kg-dry	0.151		1500	KS	10/23/2019	SW 6020B	
Lead	1.29	mg/Kg-dry	0.151		300	KS	10/23/2019	SW 6020B	
Magnesium	2780	mg/Kg-dry	3.03			KS	10/23/2019	SW 6020B	
Mercury	< 0.0153	mg/Kg-dry	0.0153		17.0	SJ	10/22/2019	SW 7471A	
Molybdenum	< 0.303	mg/Kg-dry	0.303		75.0	KS	10/23/2019	SW 6020B	
Nickel	8.96	mg/Kg-dry	0.151		420	KS	10/23/2019	SW 6020B	
Potassium	420	mg/Kg-dry	15.1			KS	10/23/2019	SW 6020B	
Selenium	0.448	mg/Kg-dry	0.151		100	KS	10/23/2019	SW 6020B	
Zinc	12.7	mg/Kg-dry	0.151		2800	KS	10/23/2019	SW 6020B	
Density	18.1	lb/Gal	1.00			SJ	10/18/2019	SM 2710-F	
Hydrogen Ion (pH)	8.59	pH Units	1.00			KF	10/18/2019	SW 9045C	
Nitrogen, Ammonia	1.34	mg/Kg-dry	1.01			PS	10/18/2019	SM 4500-NH3-D	
Nitrogen, Nitrate	< 1.01	mg/Kg-dry	1.01			KS	10/19/2019	SW 9056A	
Nitrogen, Total	< 1.01	mg/Kg-dry	1.01			SB	10/25/2019		
Nitrogen, Total Available	< 0.101	lb/ton-dry	0.101			SB	10/25/2019		
Nitrogen, Total Kjeldahl	< 12.6	mg/Kg-dry	12.6			TE	10/23/2019	SM 4500-N	
Phosphorus, Total (As P)	55.1	mg/Kg-dry	5.05			AB	10/22/2019	SM 4500-P-E	
Total Solids	99.0	%	0.0100			SJ	10/18/2019	D2216	
Total Volatile Solids	1.60	%	0.100			SJ	10/21/2019	EPA 160.4	

**Qualifiers:**    < Not Detected at the Reporting Limit  
 MCL Maximum Contaminant Level  
 RL Reporting Limit

H Holding times for preparation or analysis exceeded  
 PL Permit Limit

Original  
 Page 2 of 4

<b>CLIENT:</b>	UP Engineers & Architects	<b>Collection Date:</b>	10/17/2019 12:30:00 PM
<b>Project:</b>	OCF Lagoon Demo	<b>Received Date:</b>	10/18/2019 10:25:00 AM
<b>Lab ID:</b>	1910921-02	<b>Matrix:</b>	BIOSOLIDS
<b>Client Sample ID:</b>	Lagoon 8 Outlet	<b>Sampled By:</b>	C. Holmes

Analyses	Result	Units	RL	Qual	Table 3		Date Analyzed	Method
					Limit	Analyst		
Arsenic	0.951	mg/Kg-dry	0.186		41.0	KS	10/23/2019	SW 6020B
Cadmium	< 0.0372	mg/Kg-dry	0.0372		39.0	KS	10/23/2019	SW 6020B
Calcium	3380	mg/Kg-dry	3.72			KS	10/23/2019	SW 6020B
Chromium	4.36	mg/Kg-dry	0.186			KS	10/23/2019	SW 6020B
Copper	11.9	mg/Kg-dry	0.186		1500	KS	10/23/2019	SW 6020B
Lead	1.04	mg/Kg-dry	0.186		300	KS	10/23/2019	SW 6020B
Magnesium	2180	mg/Kg-dry	3.72			KS	10/23/2019	SW 6020B
Mercury	< 0.0137	mg/Kg-dry	0.0137		17.0	SJ	10/22/2019	SW 7471A
Molybdenum	< 0.372	mg/Kg-dry	0.372		75.0	KS	10/23/2019	SW 6020B
Nickel	7.07	mg/Kg-dry	0.186		420	KS	10/23/2019	SW 6020B
Potassium	546	mg/Kg-dry	18.6			KS	10/23/2019	SW 6020B
Selenium	0.411	mg/Kg-dry	0.186		100	KS	10/23/2019	SW 6020B
Zinc	11.5	mg/Kg-dry	0.186		2800	KS	10/23/2019	SW 6020B
Density	18.2	lb/Gal	1.00			SJ	10/18/2019	SM 2710-F
Hydrogen Ion (pH)	7.35	pH Units	1.00			KF	10/18/2019	SW 9045C
Nitrogen, Ammonia	< 1.01	mg/Kg-dry	1.01			PS	10/18/2019	SM 4500-NH3-D
Nitrogen, Nitrate	< 1.01	mg/Kg-dry	1.01			KS	10/19/2019	SW 9056A
Nitrogen, Total	< 1.01	mg/Kg-dry	1.01			SB	10/25/2019	
Nitrogen, Total Available	< 0.101	lb/ton-dry	0.101			SB	10/25/2019	
Nitrogen, Total Kjeldahl	< 12.6	mg/Kg-dry	12.6			TE	10/23/2019	SM 4500-N
Phosphorus, Total (As P)	61.3	mg/Kg-dry	5.03			AB	10/22/2019	SM 4500-P-E
Total Solids	99.4	%	0.0100			SJ	10/18/2019	D2216
Total Volatile Solids	3.86	%	0.100			SJ	10/21/2019	EPA 160.4

**Qualifiers:**    < Not Detected at the Reporting Limit  
 MCL Maximum Contaminant Level  
 RL Reporting Limit

H Holding times for preparation or analysis exceeded  
 PL Permit Limit

Original  
 Page 3 of 4

Prein & Newhof

3260 Evergreen Dr NE  
Grand Rapids, MI 49525  
t: 616-364-7600  
f: 616-364-4222

M12-19220-701

CHAIN OF CUSTODY

OCF Lagoon Demo

Client U.P.E.A.  
Project Land Application  
Send Results to [holmes@upea.com](mailto:holmes@upea.com)  
Sampler Chris Holmes

Lab Sample ID	Date	Time	Sample Description	Analysis Requested							Other List Below
				Preservative							
10921-1	10/17/19	1200	Lagoon 8 Inlet Below inner	X			Fecal	Geomean			
-2		1230	Lagoon 8 outlet Below inner	X							
-3		1:00 PM	Lagoon 8 Composite	X							
				Land App:	As Ca	Mg Hg	Cd Cr	Cu Pb	Ni Zn	K Mo	Se
				Density	NH3	NO3	TPO4	pH	TKN	% Solids	
				T Nitrogen	T Av N	TVS					
				Fecal is a set of 7 plus Geomean							

Relinquished By: Name/Date/Time

 10/17/19 4:30 PM

Received By: Name/Date/Time

Relinquished By: Name/Date/Time

Received for Laboratory By: Name/Date/Time

 10/18/19 1021

October 11, 2019

UP Engineers & Architects  
707 Ashmun St.  
Sault Ste. Marie, MI 49783

RE: OCF Lagoon Demo

Order No.: 1910274

Dear Mr. Chris Holmes:

Prein&Newhof Laboratory received 3 sample(s) on 10/4/2019 for the analyses presented in the following report.

There were no problems with the analytical events associated with this report unless noted in the Case Narrative.

Any analyte that exceeds the provided permit level are noted on the report with an "\*" in the Qual field.

Quality control data is within laboratory defined or method specified acceptance limits except if noted.

If you have any questions regarding these tests results, please feel free to call.

Thank you for your business.

Sincerely,



Steve Bylsma  
Laboratory Manager

<b>CLIENT:</b>	UP Engineers & Architects	<b>Collection Date:</b>	10/3/2019 12:45:00 PM
<b>Project:</b>	OCF Lagoon Demo	<b>Received Date:</b>	10/4/2019 10:15:00 AM
<b>Lab ID:</b>	1910274-01	<b>Matrix:</b>	BIOSOLIDS
<b>Client Sample ID:</b>	Pond 7 Inlet Under Liner	<b>Sampled By:</b>	C. Holmes

Analyses	Result	Units	RL	Qual	Table 3		Date Analyzed	Method
					Limit	Analyst		
Arsenic	0.720	mg/Kg-dry	0.128		41.0	KS	10/8/2019	SW 6020B
Cadmium	0.0374	mg/Kg-dry	0.0256		39.0	KS	10/8/2019	SW 6020B
Calcium	4760	mg/Kg-dry	2.56			KS	10/10/2019	SW 6020B
Chromium	5.44	mg/Kg-dry	0.128			KS	10/8/2019	SW 6020B
Copper	11.8	mg/Kg-dry	0.128		1500	KS	10/8/2019	SW 6020B
Lead	0.931	mg/Kg-dry	0.128		300	KS	10/8/2019	SW 6020B
Magnesium	3660	mg/Kg-dry	2.56			KS	10/10/2019	SW 6020B
Mercury	< 0.0160	mg/Kg-dry	0.0160		17.0	SJ	10/10/2019	SW 7471A
Molybdenum	< 0.256	mg/Kg-dry	0.256		75.0	KS	10/8/2019	SW 6020B
Nickel	8.58	mg/Kg-dry	0.128		420	KS	10/8/2019	SW 6020B
Potassium	381	mg/Kg-dry	12.8			KS	10/8/2019	SW 6020B
Selenium	0.410	mg/Kg-dry	0.128		100	KS	10/8/2019	SW 6020B
Zinc	17.7	mg/Kg-dry	0.128		2800	KS	10/10/2019	SW 6020B
Density	20.3	lb/Gal	1.00			SJ	10/9/2019	SM 2710-F
Hydrogen Ion (pH)	7.44	pH Units	1.00			KF	10/4/2019	SW 9045C
Nitrogen, Ammonia	1.54	mg/Kg-dry	1.02			PS	10/7/2019	SM 4500-NH3-D
Nitrogen, Nitrate	< 1.02	mg/Kg-dry	1.02			KS	10/4/2019	SW 9056A
Nitrogen, Total	2550	mg/Kg-dry	1.02			SB	10/11/2019	
Nitrogen, Total Available	1.02	lb/ton-dry	0.102			SB	10/11/2019	
Nitrogen, Total Kjeldahl	2550	mg/Kg-dry	12.8			TE	10/10/2019	SM 4500-N
Phosphorus, Total (As P)	19.1	mg/Kg-dry	5.12			AB	10/7/2019	SM 4500-P-E
Total Solids	97.7	%	0.0100			JS	10/4/2019	D2216
Total Volatile Solids	7.83	%	0.100			SJ	10/8/2019	EPA 160.4

**Qualifiers:** \* Value exceeds Maximum Contaminant Level.  
D Dilution was required.  
J Analyte detected below quantitation limits  
PL Permit Limit

< Not Detected at the Reporting Limit  
H Holding times for preparation or analysis exceeded  
MCL Maximum Contaminant Level  
RL Reporting Limit

Original  
Page 2 of 4

<b>CLIENT:</b>	UP Engineers & Architects	<b>Collection Date:</b>	10/3/2019 1:10:00 PM
<b>Project:</b>	OCF Lagoon Demo	<b>Received Date:</b>	10/4/2019 10:15:00 AM
<b>Lab ID:</b>	1910274-02	<b>Matrix:</b>	BIOSOLIDS
<b>Client Sample ID:</b>	Pond 7 Outlet Under Liner	<b>Sampled By:</b>	C. Holmes

Analyses	Result	Units	RL	Qual	Table 3		Date Analyzed	Method
					Limit	Analyst		
Arsenic	0.823	mg/Kg-dry	0.133		41.0	KS	10/8/2019	SW 6020B
Cadmium	0.0406	mg/Kg-dry	0.0265		39.0	KS	10/8/2019	SW 6020B
Calcium	3980	mg/Kg-dry	2.65			KS	10/10/2019	SW 6020B
Chromium	5.65	mg/Kg-dry	0.133			KS	10/8/2019	SW 6020B
Copper	10.9	mg/Kg-dry	0.133		1500	KS	10/8/2019	SW 6020B
Lead	0.982	mg/Kg-dry	0.133		300	KS	10/8/2019	SW 6020B
Magnesium	2870	mg/Kg-dry	2.65			KS	10/10/2019	SW 6020B
Mercury	< 0.0157	mg/Kg-dry	0.0157		17.0	SJ	10/10/2019	SW 7471A
Molybdenum	< 0.265	mg/Kg-dry	0.265		75.0	KS	10/8/2019	SW 6020B
Nickel	6.90	mg/Kg-dry	0.133		420	KS	10/8/2019	SW 6020B
Potassium	399	mg/Kg-dry	13.3			KS	10/8/2019	SW 6020B
Selenium	0.423	mg/Kg-dry	0.133		100	KS	10/8/2019	SW 6020B
Zinc	12.0	mg/Kg-dry	0.133		2800	KS	10/8/2019	SW 6020B
Density	19.1	lb/Gal	1.00			SJ	10/9/2019	SM 2710-F
Hydrogen Ion (pH)	7.77	pH Units	1.00			KF	10/4/2019	SW 9045C
Nitrogen, Ammonia	< 1.03	mg/Kg-dry	1.03			PS	10/7/2019	SM 4500-NH3-D
Nitrogen, Nitrate	< 1.03	mg/Kg-dry	1.03			KS	10/4/2019	SW 9056A
Nitrogen, Total	2580	mg/Kg-dry	1.03			SB	10/11/2019	
Nitrogen, Total Available	1.03	lb/ton-dry	0.103			SB	10/11/2019	
Nitrogen, Total Kjeldahl	2580	mg/Kg-dry	12.8			TE	10/10/2019	SM 4500-N
Phosphorus, Total (As P)	30.0	mg/Kg-dry	5.13			AB	10/7/2019	SM 4500-P-E
Total Solids	97.5	%	0.0100			JS	10/4/2019	D2216
Total Volatile Solids	6.67	%	0.100			SJ	10/8/2019	EPA 160.4

**Qualifiers:** \* Value exceeds Maximum Contaminant Level.  
D Dilution was required.  
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< Not Detected at the Reporting Limit  
H Holding times for preparation or analysis exceeded  
MCL Maximum Contaminant Level  
RL Reporting Limit

Original  
Page 3 of 4

Prein & Newhof

3260 Evergreen Dr NE  
Grand Rapids, MI 49525  
t: 616-364-7600  
f: 616-364-4222

Client

*U.P. Engineers + Arch.*

Project Land Application

Send Results to

*cholmes@upea.com*

Sampler

*Chris Holmes*

### CHAIN OF CUSTODY

*OCF Lagoon Demo*

Lab Sample ID	Date	Time	Sample Description	Analysis Requested								Other List Below
				Preservative				Fecal	Geomean			
10274-1	10/3/19	1245	Pond 7 inlet under liner	X								
-2	10/3/19	110	Pond 7 outlet under liner	X								
-3	10/3/19	130	Pond 7 Composite	X								
				Land App:	As Ca	Mg Hg	Cd Cr	Cu Pb	Ni Zn	K Mo	Se	
				Density	NH3	NO3	TPO4	pH	TKN	% Solids		
				T Nitrogen	T Av N	TVS						
				Fecal is a set of 7 plus Geomean								

Relinquished By: Name/Date/Time

*OPBL* 10/3/19

Received By: Name/Date/Time

Relinquished By: Name/Date/Time

Received for Laboratory By: Name/Date/Time

*S. Diem* 10/4/19 1015