Kacy Murillo (adpce.ad)

Subject: RE: Dye Trace Study Summary Report, Eco-Vista Class 4 Landfill, Permit No. 0290-S4-R1

AFIN: 72-00144
PMT#: 0290-S4-R1
Received
By Kacy Murillo at 12:11 pm, Jan 5, 2023
DOC ID#: 83123
TO: BS>FILE <KM

From: Steve Jett [mailto:steve.jett@jettenviro.com]
Sent: Thursday, January 5, 2023 6:27 AM
To: gwreports; Travis Atwood (adpce.ad)
Cc: Reynolds, Jodi; Michael Caldwell; Conrad, David; Blake Whittle (adpce.ad); Tyler Wright (adpce.ad); Bill Sadler (adpce.ad)
Subject: Dye Trace Study Summary Report, Eco-Vista Class 4 Landfill, Permit No. 0290-S4-R1

On behalf of Eco-Vista, LLC, Jett Environmental Consulting is submitting the Dye Trace Study Summary Report for the Eco-Vista Class 4 Landfill. Please access the link below to download the report.

https://drive.google.com/file/d/1v9VFAx6eG5JO9dWZ1WvHB_h7N9TmYUx-/view?usp=sharing

If you have any questions or comments regarding this submittal, please do not hesitate to contact us.

Sincerely,

Steve Jett, P.G.
Owner
Jett Environmental Consulting
18 Lexington Oaks Court
Foristell, MO 63348
314-496-4654
steve.jett@jettenviro.com
www.jettenviro.com

JETT ENVIRONMENTAL CONSULTING

January 5, 2023 ***Submitted via Electronic Mail***

Mr. Travis Atwood, Geologist
Arkansas Department of Energy and Environment
Division of Environmental Quality
Office Land Resources
Assessment and Remediation
Groundwater Branch
4170 M.L.K. Jr Blvd #5
Fayetteville, AR 72704

Re: Dye Trace Study Summary Report
Eco-Vista, LLC, Class 4 Landfill
AFIN: 72-00144, Permit No.: 0290-S4-R1

Dear Mr. Atwood:

On behalf of Eco-Vista, LLC, Jett Environmental Consulting is pleased to submit the Dye Trace Study Summary Report.

Professional Geologist Certification

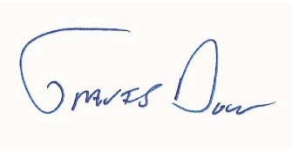
I certify that I am a qualified groundwater scientist who has received a baccalaureate or post-graduate degree in the natural sciences and am registered in the State of Arkansas. I have sufficient training and experience in geology, geohydrology, and groundwater hydrology that enable me to make sound professional judgments regarding groundwater monitoring, contaminant fate and transport, and corrective action.

I further certify that this summary report was prepared by me or by a subordinate working under my direction.

If you have any questions or comments, please contact me at steve.jett@jettenviro.com or 314-496-4654.

Sincerely,

Steve Jett, P.G. No. 1826
Owner



Travis Doll
Senior Geologist

Attachments: *Dye Trace Study Summary Report*

cc: *Jodi Reynolds – WM (PDF via Email)*
David Conrad – WM (PDF via Email)
Michael Caldwell – WM (PDF via Email)

DYE TRACE STUDY
SUMMARY REPORT

Eco-Vista, LLC
Class 4 Landfill
2210 Waste Management Drive
Springdale, Arkansas 72762

Permit Number: 0290-S4-R1
AFIN: 72-00144

January 2023

Prepared by:

JETT ENVIRONMENTAL CONSULTING

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APPENDICES

1.0 INTRODUCTION

Eco-Vista, LLC operates the Eco-Vista Class 4 Landfill under Solid Waste Permit Number 290-S4-R1 (Permit) issued in December 2008. This report was prepared in accordance with the Arkansas Department of Energy and Environment, Division of Environmental Quality (ADEQ) approved Dye Trace Study Work Plan (Document Identification Number (DIN) 81172, dated December 13, 2021). In addition, the following subsequent correspondences occurred to/from ADEQ:

(1) January 6, 2022: ADEQ Response Letter to Dye Trace Study Work Plan (DIN 81264);
(2) January 19, 2022: FTN Response Letter to January 6, 2022 ADEQ Letter (DIN 81306);
(3) February 10, 2022: Dye Trace Study – Background Sampling Data (DIN 81425);
(4) February 11, 2022: Addendum to Dye Trace Study Work Plan (DIN 81436);
(5) February 14, 2022: ADEQ Response, Dye Trace Study Work Plan (DIN 81435);
(6) March 7, 2022: FTN Email: Adding Wildcat Creek to Dye Trace Sampling Program (DIN 82225);
(7) June 14, 2022: Site Email: Agree to Continue Dye Trace Study for 3 Months per ADEQ Request (DIN 81908); and
(8) July 13, 2022: Site Email: Details on Exact Location of Wildcat Creek Dye Sampling Location (DIN 82354).

Concurrent with the proposed class 4 landfill expansion, Eco-Vista Landfill submitted a permit modification application to ADEQ for a 10-acre expansion of the Eco-Vista active class 1 landfill (DIN 80454). The active class 1 landfill is located to the east and northeast of the class 4 landfill and on the same property, as shown by **Figure 1**. A class 1 geotechnical and hydrogeological investigation (GHI) report was submitted to ADEQ in July 2020 (DIN 78620) which fulfilled the requirements of ADEQ Regulation §22.1102(a) through (e)(3) of Chapter 11. As required by §22.1102(e)(4), all proposed class 1 landfills (or lateral expansions of existing landfills) located within the outcrop area of the Boone or St. Joe Formations of northern Arkansas are required to perform a groundwater dye trace study. Five prior dye trace studies have been performed for the class 1 area, three of which encompassed the 10-acre area (DINs 19008, 23178, 31845, 32870, and 66023). Given the historical data available from past dye trace studies performed at the landfill, the requirements of §22.1102(e)(4) have been met for the proposed class 1 expansion area. ADEQ agrees with this conclusion based on a meeting held with Eco-Vista Landfill on December 10, 2021, and approval of the class 1 GHI work plan (DIN 76646).

Eco-Vista Landfill submitted a permit modification application to ADEQ on July 6, 2021, for a 12-acre lateral and vertical expansion of the class 4 landfill, which is the construction and demolition landfill. While not required by ADEQ Regulation No. 22, Eco-Vista Landfill voluntarily performed a dye trace study in the class 4 landfill area. The purpose of the dye trace study was to characterize horizontal groundwater flow direction at the proposed future class 4 landfill expansion area. In addition, the dye trace study would supplement the landfill's site conceptual hydrogeologic model (SCM) formed on the findings from other field studies specified by Chapter 11 GHI requirements for the class 4 landfill area.

This summary report covers the results of the 2022 dye study sampling program. This report includes copies of field forms and laboratory analytical data. Sampling was conducted by FTN Associates, Ltd. (FTN) and Promus Engineering, LLC (Promus), while laboratory analytical testing was performed by Ozark Underground Laboratory, Inc.

2.0 DYE TRACE STUDY

The following sections describe the dye deployment, dye-type used for the study, and dye detection monitoring locations to fulfill the study objectives.

2.1 Location of Dye Introduction

Dye was introduced to the uppermost saturated zone via an excavated trench located as shown on **Figure 2**. This location was within the proposed class 4 expansion area and where much of the cohesive soils of the overlying regolith had been excavated. A fresh trench was excavated prior to dye introduction such that dye was deployed as close as practicable to the uppermost saturated zone.

The dye deployment trench, shown on **Figure 2,** was hydraulically upgradient of the existing permitted class 4 area based on historical data. It was anticipated that a dye deployment at this location would provide data to characterize the horizontal groundwater flow direction beneath the class 4 area. According to the SCM, groundwater is expected to flow away from the deployment trench toward the southeast across the study area.

2.2 Selected Dye

According to the Work Plan, Sulforhodamine B (SRB) fluorescent tracer dye was selected for this study because it had not been used previously in the western part of the property and because previous dye studies incorporating SRB showed very little SRB in background samples. Tracer dye safety data sheets (SDSs) were included in the ADEQ-approved Work Plan.

2.3 Dye Detection Monitoring Locations

The proposed locations for dye detection monitoring were limited to existing groundwater monitoring installations and gas probes. Dye detection monitoring (sampling) locations are shown on **Figure 3** and consisted of eight groundwater monitoring wells, four nature and extent wells (NE-series), three piezometers, and five gas monitoring probes (see **Table 1**). Dye monitoring locations were proposed in the Work Plan and Addendum, based primarily on expected flow direction as predicted by the SCM; however, locations that were expected to be upgradient or side-gradient were also selected to evaluate possible dye movement in directions not predicted by the SCM.

Routine groundwater sampling activities at monitoring wells and NE-series wells were temporarily suspended to decrease the possibility of cross-contamination between monitoring points from non-dedicated sampling equipment (e.g., water level meter use, operated and decontaminated by technicians not involved with the proposed study) and eliminate the potential for false positive dye detections. While routine decontamination procedures work well for constituents required for routine groundwater monitoring, these procedures do not work well for fluorescent dyes.

In addition, limited groundwater elevation data collected from Eco-Vista Landfill gas monitoring probes indicated that the presence of groundwater at these locations is transient and as such, localized temporal groundwater conditions may cause individual gas monitoring probes to be dry for extended periods of time during the course of the study. Also, these gas probes may not be constructed or maintained in a manner compatible with dye detection monitoring. Therefore, it was proposed that the gas probes would be incorporated into the monitoring network if observed field conditions were amenable.

Lastly, no previously identified springs or surface water bodies were initially proposed as monitoring points for this study. This is because dye sampling packets installed at spring and surface water locations are in an uncontrolled environment where they are exposed to variable environmental conditions and possible cross-contamination. As such, the validity of results from these locations has been questionable as shown by prior studies conducted for Eco-Vista Landfill. However, per the request of ADEQ, Wildcat Creek was added as a dye sampling location in late February 2022 due to dye being noticeably present in the creek from the dye placement event on February 16, 2022 (see **Section 3.3**).

During a site visit on July 13, 2022 with site personnel and ADEQ staff, a survey pin was placed near a tree along Wildcat Creek. The dye sampling location in Wildcat Creek was located due south of the survey pin and to the right of the tree adjacent to the pin (DIN 82354). This location is east of the Harmon Road bridge which crosses Wildcat Creek.

3.0 DYE TRACE STUDY METHODOLOGY

Dye study activities were conducted in general accordance with the Ozark Underground Laboratory's *Groundwater Tracing Handbook* (by Thomas Aley, dated 2019) and *Ozark Underground Laboratory Procedures and Criteria, Analysis of Fluorescent Dyes in Water and Charcoal Samplers: Fluorescein, Eosine, Rhodamine WT, and SRB Dyes* (by Thomas Aley and Shiloh Beeman, dated March 3, 2015). Ozark Underground Laboratory (OUL) is located in Protem, Missouri, and has been conducting dye tracing laboratory analyses since 1973. All dye tracing supplies were purchased from OUL, which also conducted each of the sample analyses.

3.1 Sampler Deployment and Retrieval Procedures

Dye tracing samples were collected using mesh packets containing activated charcoal. Packets were provided by OUL and suspended within the well screened interval using nylon cord. Field personnel wore new disposable nitrile gloves during each packet deployment and retrieval. Collected packets were containerized, labeled, stored, and shipped to the laboratory for analysis according to OUL's procedures. In order to potentially adjust charcoal packet deployment depths, static water level measurements were recorded at each monitoring location prior to charcoal packet retrieval. The Work Plan did not include collection of water samples from dye detection locations for dye analysis; unless a dye packet could not be installed in or collected from any of the planned dye detection locations. Two instances occurred, where water samples were collected for dye analysis in lieu of dye packets. The first was a sample from Wildcat Creek #1 for the initial sampling event on February 13, 2022. The second was a sample from Wildcat Creek #3 on August 11, 2022 since a new location along the creek was initiated per a July 13, 2022 site meeting with ADEQ.

3.2 Background Sampling

Prior to background groundwater sampling, any dedicated groundwater sampling equipment were removed from monitoring installations and stored indoors on site in labeled, sealed, clean plastic bags for the duration of the dye study. Dedicated groundwater sampling equipment will be reinstalled for the next routine quarterly groundwater sampling event (January 2023).

Background dye groundwater sampling was conducted prior to dye deployment to provide a baseline for detection monitoring results and to determine if the selected dye was appropriate for the study area. Background dye detection groundwater monitoring samples were collected on January 24, 2022, January 31, 2022, and February 8, 2022. Samples were collected in accordance with the Work Plan and Addendum, with the exception of the following:

- Obstructions were noted in GP-4, GP-6, and GP-10 during the initial deployment of dye packets on January 17, 2022. FTN deployed a downhole camera in each gas probe, which showed that tree roots were causing the obstructions in the three probes. FTN attempted to remove the tree roots at GP-4; however, it was not possible to cleanly cut the roots such that they did not protrude beyond the inside surface of the PVC screen. Given the small inside diameter of the probes, which are constructed with 1-inch diameter PVC pipe, the remaining protrusions prevented deployment of dye detection packets. As such, GP-4, GP-6, and GP-10 were excluded from the study.

- The dye detection packet at NE-4 deployed on January 24, 2022, and collected on January 31, 2022, was not fully submerged in the water column, and laboratory analysis results for this sample were rejected. According to the sampling personnel, due to windy site conditions

during deployment, the nylon string attached to the dye packet had tangled and required splicing. It was suspected that the spliced portion of the string caught on a burr or other imperfection inside the well casing, which prevented full deployment of the packet in the water column. To safeguard against this from reoccurring, spliced lines were not utilized subsequently. A second background dye detection packet deployed in NE-4 on January 31, 2022, was collected on February 8, 2022. The dye detection packet was confirmed to be saturated at the time of collection.

As shown in the background groundwater samples (see **Appendix A**), the laboratory results for the background samples had low-level detections of Fluorescein and Rhodamine WT, eliminating the introduction of those dyes for the dye trace study. The laboratory results for Sulforhodamine B (SRB) were non-detect at all monitored locations. As such, SRB was used for the subsequent dye deployment.

3.3 Dye Deployment

On February 10, 2022, Eco-Vista Landfill excavated a test trench at the location shown on **Figure 2**. According to FTN, an FTN geologist was on site to observe the excavation, log the soils, and to survey the vertical and horizontal location of the test trench. The ground surface elevation at the excavation was approximately 1255 feet (ft) site referenced elevation (SRE). The trench was excavated to an approximate depth of 26 ft or approximately 1229 ft SRE. Bedrock was encountered at depth, which agrees with the bedrock elevation encountered during the installation of nearby piezometer, C4-PZ-1. Excavated soils were logged as chert weathered into a silty gravel, similar to the lithology observed at C4-PZ-1. No groundwater was noted in the excavation, but this condition was expected based on recent water levels taken at C4-PZ-1 which indicate a piezometric surface elevation of approximately 1227 ft SRE.

To address ADEQ concerns about the infiltration rate of the dye into the trench, an Intermediate Bulk Container (IBC) tote filled with approximately 350 gallons of potable water was emptied into the trench a total of three times via a 2-inch hose placed in the trench. Water from the tote completely infiltrated into the exposed lithology within 15 minutes each time. Following completion of field activities, the test trench was backfilled with the excavated soils.

Based on the field work conducted on February 10, 2022, Eco-Vista Landfill proposed (DIN 81436) to introduce the dye via a second, freshly excavated trench adjacent to the location shown on **Figure 2**. The total depth of the excavation was proposed to be approximately 25 ft below ground surface (1229 ft SRE). The target zone for dye introduction would be the highly permeable weathered silty chert gravel/epikarst that directly overlies the limestone and chert bedrock. In correspondence dated February 14, 2022 (DIN 81435), ADEQ approved the proposed injection of SRB and potable water by means of gravity flow injection into a trench. On February 16, 2022 FTN introduced the dye and water into the trench. It is our understanding that ADEQ personnel were present during the dye deployment activities. Included in **Appendix B** are photographs captured during the February 16, 2022 dye deployment.

3.4 Dye Detection Monitoring

Based on an email to FTN from ADEQ dated February 9, 2022, Eco-Vista Landfill acknowledged that ADEQ approved a three month weekly sampling timeline listed in the Work Plan, and that ADEQ reserved the right to extend the length of the dye trace sampling up to an additional four months based on the results of the initial three month sampling period.

Background groundwater sampling began approximately three weeks prior to dye injection to establish baseline concentrations for SRB at all monitored locations.

Following dye injection, dye detection monitoring was performed on a weekly basis for a three month period (as outlined in the Work Plan) from February 21, 2022 through May 9, 2022. Samples were collected as described in **Section 3.1**.

During the March 7, 2022 sample collection, the dye packet was not able to be located for the Wildcat Creek location; therefore, a sample was not collected.

During the May 9, 2022 event, the Wildcat Creek dye packet was found to be washed away, presumedly from a May 5, 2022 flooding event, causing it to lodge in a debris pile above the water surface. Therefore, no sample was collected from Wildcat Creek during the May 9, 2022 event.

In correspondence dated June 9, 2022, ADEQ requested continuation of the dye detection monitoring. On June 14, 2022, Eco-Vista Landfill agreed to continue the dye detection monitoring an additional three months. The additional three months of dye detection monitoring was performed every two weeks for a three month period from August 11, 2022 through November 1, 2022. Samples were collected as described in **Section 3.1**.

During the August 11, 2022 dye packet removal/deployment event, the dye packet in GP-5 was stuck in the 1-inch PVC casing and could not be removed; therefore, dye packets were not able to be collected for sample analysis at this location the remainder of the study. GP-3 was dry during this event and subsequent events; therefore, dye packets were not able to be collected for sample analysis. In addition, during this August 11, 2022 event, the dye packet for the Wildcat Creek location could not be located; therefore, a water sample was collected for analysis and a new dye packet was installed for the subsequent samples that were collected.

3.5 Laboratory Analysis

Included in **Appendix C** are copies of the laboratory analytical reports for each dye detection monitoring event (January 2022 through November 2022).

3.6 Dye Data Analysis

The criteria for a positive dye detection used by Eco-Vista Landfill when evaluating prior dye studies were used for this study. The criteria include: (1) two consecutive dye detections at a single well location; and (2) the detections are at least an order of magnitude greater than background concentrations in the well or the laboratory reporting limit. Laboratory report data were also reviewed for quality control issues.

Attached in **Figure 4** is a groundwater potentiometric surface map (Fourth Quarter 2021) prior to the dye trace study in January 2022.

4.0 DYE RESULTS

Appendix A summarizes all of the dye sampling results from the 2022 study. Dye was reported as non-detect (ND) at the following locations during each dye sampling event: GP-3, GP-5, GP-7, GP-8, GP-9, C4-PZ-1, C4-PZ-2, MW-1N, MW-2N, MW-3N, MW-10N, MW-17, MW-19, MW-20, NE-4, NE-10D, NE-13. Of the four dyes analyzed for the samples (Fluorescein, Eosine, Rhodamine WT, and SRB), the following summarizes the detections.

Fluorescein
Three locations exhibited confirmed low-level detections of Fluorescein: PZ-2D, MW-21, and NE-8. However, Fluorescein was also detected at similar levels in the background sampling at PZ-2D and MW-21. Well NE-8 initially detected low-level Fluorescein on February 28, 2022.

Fluorescein was not the dye introduced into the subsurface as part of this 2022 dye trace study. Fluorescein was utilized during previous dye trace studies at the site in 1996, 2001, 2003, and 2005, and injected directly upgradient to the PZ-2D, MW-21, and NE-8 areas during those studies. The presence of low-level Fluorescein in the 2022 background sampling and subsequent sampling events were likely due to remnants of previous injections.

Eosine
No monitoring point exhibited a confirmed detection of Eosine.

Rhodamine WT
One location exhibited a confirmed detection of Rhodamine WT: PZ-2D. However, Rhodamine WT was also detected at similar levels in the background sampling at PZ-2D.

Rhodamine WT was not the dye introduced into the subsurface as part of this 2022 dye trace study. Rhodamine WT was utilized during previous dye trace studies at the site in 1996 and 2012, and injected directly upgradient to the PZ-2D area during those studies. The presence of low-level Rhodamine WT in the 2022 background sampling and subsequent sampling were likely due to remnants of previous injections.

SRB
One location exhibited a confirmed detection of SRB: Wildcat Creek. Although Wildcat Creek was not initially sampled until February 23, 2022, which was after the initial introduction of dye (SRB on February 16, 2022), concentrations of SRB detected were initially elevated and then decreased throughout the remainder of the dye trace study. Therefore, the SRB detected at Wildcat Creek in 2022 appears to be from the 2022 dye placement in the trench.

As shown on **Table 2**, SRB was detected at Wildcat Creek #1 during the initial sampling event on February 23, 2022 (71.1 ppb). SRB concentrations at Wildcat Creek #1 peaked on February 28, 2022 (1,070 ppb), and subsequently decreased over time until the last sampling event on May 9, 2022 (7 ppb).

As shown on **Table 2**, SRB was detected at Wildcat Creek #2 during the initial sampling event on March 14, 2022 (597 ppb), which was also the peak detection at this location. SRB concentrations at Wildcat Creek #2 subsequently decreased over time until the last sampling event on May 2, 2022 (63 ppb).

As shown on **Table 2**, SRB was detected at trace levels at Wildcat Creek #3 from the initial sampling event on August 11, 2022 (0.058 ppb) until the last sampling event on November 1, 2022 (1.15 ppb).

5.0 CONCLUSIONS

While not required by ADEQ Regulation No. 22, Eco-Vista Landfill voluntarily performed a dye trace study in the class 4 landfill area. The purpose of the dye trace study was to characterize horizontal groundwater flow direction at the proposed future class 4 landfill expansion area. In addition, the study would provide additional groundwater flow data to support the site's conceptual hydrogeological model (SCM) and, as requested by ADEQ, help define additional monitoring locations for the class 1 landfill, if needed. Furthermore, the dye trace study would supplement the SCM formed on the findings from other field studies specified by ADEQ Chapter 11 GHI requirements for the class 4 landfill area.

The following conclusions are based on the results of the 2022 dye trace study sampling program:

- Groundwater flow has a horizontal, northwest component from the class 4 landfill vicinity, as documented by SRB dye being detected at significant amounts at the Wildcat Creek

dye sampling point located approximately 6,000 feet from the dye placement trench. The Northwest/Southeast lineament identified in the vicinity of the proposed class 4 landfill area (DIN 66023), if extrapolated off-site, may extend to the proximity of Wildcat Creek (i.e., Harmon Spring).

- Besides the Wildcat Creek sampling location, SRB dye was not confirmed detected at the remaining monitoring points during the 2022 dye sampling events. Therefore, no other additional conclusions can be made on groundwater flow in the class 4 landfill area.

- The 2022 dye trace sampling appears to support the SCM formed on the findings from other field studies specified by Chapter 11 GHI requirements for the class 4 landfill area. In addition, a northwesterly flow component appears evident in the northern vicinity of the proposed class 4 landfill area based on the 2022 dye trace sampling results.

Recommendations

The site is currently preparing a Work Plan to install four additional groundwater monitoring wells near the class 4 landfill, as requested in the existing draft Class 4 Landfill Permit. Based on the Northwest groundwater flow component identified in the 2022 dye trace study, it is recommended that two of the four new groundwater monitoring wells should be placed to the north and northwest of the new Class 4 expansion area.

TABLES

TABLE 1
DYE TRACE STUDY - SAMPLING LOCATIONS
ECO-VISTA LANDFILL

Groundwater Monitoring System Monitoring Wells		
MW-1N	MW-2N	MW-3N
MW-10N	MW-17	MW-19
MW-20	MW-21	
Nature and Extent Investigation Wells		
NE-4	NE-8	NE-10D
NE-13		
Piezometers		
PZ-2D	C4-PZ-1	C4-PZ-2
Gas Probes		
GP-3	GP-5	GP-7
GP-8	GP-9	

TABLE 2
DYE TEST RESULTS - WILDCAT CREEK
ECO-VISTA LANDFILL

Date Placed	Date Placed	Deployed By	Date Collected	Collected By	SRB Results	
					Peak (nm)	Concentration (ppb)
Wildcat Creek #1	N/A	N/A	02/23/22	FTN	581.5	71.1
	N/A	N/A	02/23/22	FTN	579.3	30.4
	02/23/22	FTN	02/25/22	FTN	579.3	638
	02/25/22	FTN	02/28/22	FTN	579.6	1,070
	02/28/22	FTN				
	03/08/22	FTN	03/14/22	FTN	578.6	162
	03/14/22	FTN	03/21/22	FTN	578.7	120
	03/21/22	FTN	03/28/22	FTN	578.5	74
	03/28/22	FTN	04/04/22	FTN	578.6	83
	04/04/22	FTN	04/11/22	FTN	578.6	66
	04/11/22	FTN	04/18/22	FTN	578.5	69
	04/18/22	FTN	04/25/22	FTN	577.8	87
	04/25/22	FTN	05/02/22	FTN	578.8	41
	05/02/22	FTN	05/09/22	FTN	577.7	7
Wildcat Creek #2	03/08/22	FTN	03/14/22	FTN	578.8	597
	03/14/22	FTN	03/21/22	FTN	578.9	345
	03/21/22	FTN	03/28/22	FTN	578.9	309
	03/28/22	FTN	04/04/22	FTN	578.6	155
	04/04/22	FTN	04/11/22	FTN	578.6	106
	04/11/22	FTN	04/18/22	FTN	578.5	48
	04/18/22	FTN	04/25/22	FTN	578.5	88
	04/25/22	FTN	05/02/22	FTN	578.8	63
	05/02/22	FTN				
Wildcat Creek #3	N/A	N/A	08/11/22	Promus	581.8	0.058
	08/11/22	Promus	08/23/22	Promus	577.8	6.68
	08/23/22	Promus	09/06/22	Promus	578.5	3.36
	09/06/22	Promus	09/19/22	Promus	578.8	1.70
	09/19/22	Promus	10/04/22	Promus	579.2	2.04
	10/04/22	Promus	10/17/22	Promus	578.7	1.52
	10/17/22	Promus	11/01/22	Promus	578.1	1.15

Notes:

SRB: Sulforhodamine B fluorescent tracer dye.

2/23/22: Water sample collected.

2/28/22: According to FTN, the dye packet was inadvertently removed by Washington County environmental enforcement officers.

5/2/22: According to FTN, the dye packet deployed on 5/2/22 was washed away during flooding on 5/5/22, causing it to lodge in a debris pile above the water surface, which prevented sample collection on 5/9/22.

8/11/22: No previous dye packet was located. Therefore, a water sample collected.

FIGURES

LEGEND

- LGW-3R — Existing Groundwater Monitoring Welll
- OW-10 — Existing Out-of-Waste Extraction Welll
- PZ-1D — Existing Piezometer
- Property Line Boundaries (Approximate)

Note1: Basemap provided by Waste Management.

0 200 400 600 1200

Scale in Feet
Graphic Scale: 1 inch = 600 feet

NORTH

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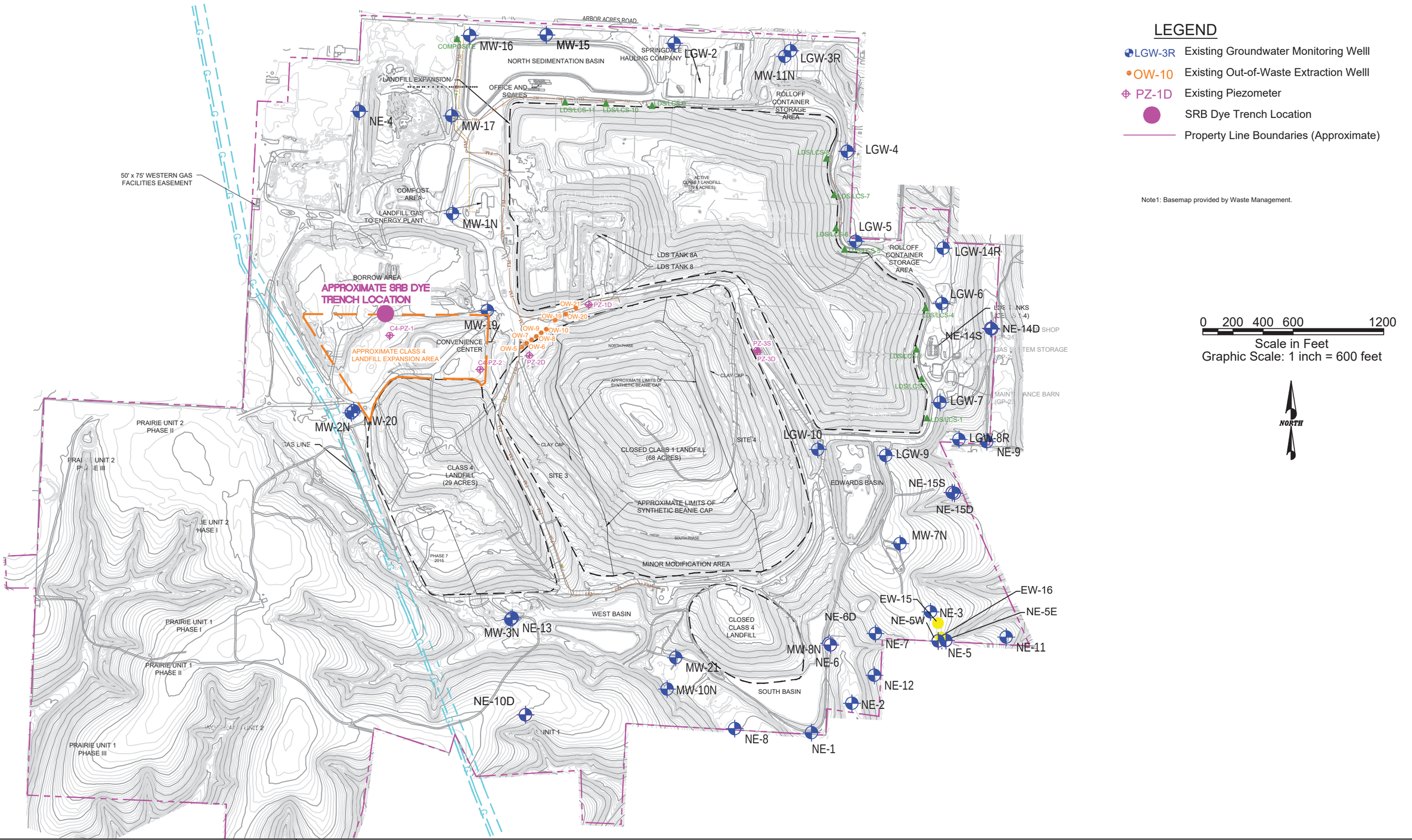
Figure 1
Site Layout Map
Eco-Vista Landfill, Springdale, Arkansas



LEGEND

- LGW-3R — Existing Groundwater Monitoring Welll
- OW-10 — Existing Out-of-Waste Extraction Welll
- PZ-1D — Existing Piezometer
- SRB Dye Trench Location
- Property Line Boundaries (Approximate)

Note1: Basemap provided by Waste Management.

0 200 400 600 1200

Scale in Feet

Graphic Scale: 1 inch = 600 feet

NORTH

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Figure 2
Dye Trench Location Map
Eco-Vista Landfill, Springdale, Arkansas

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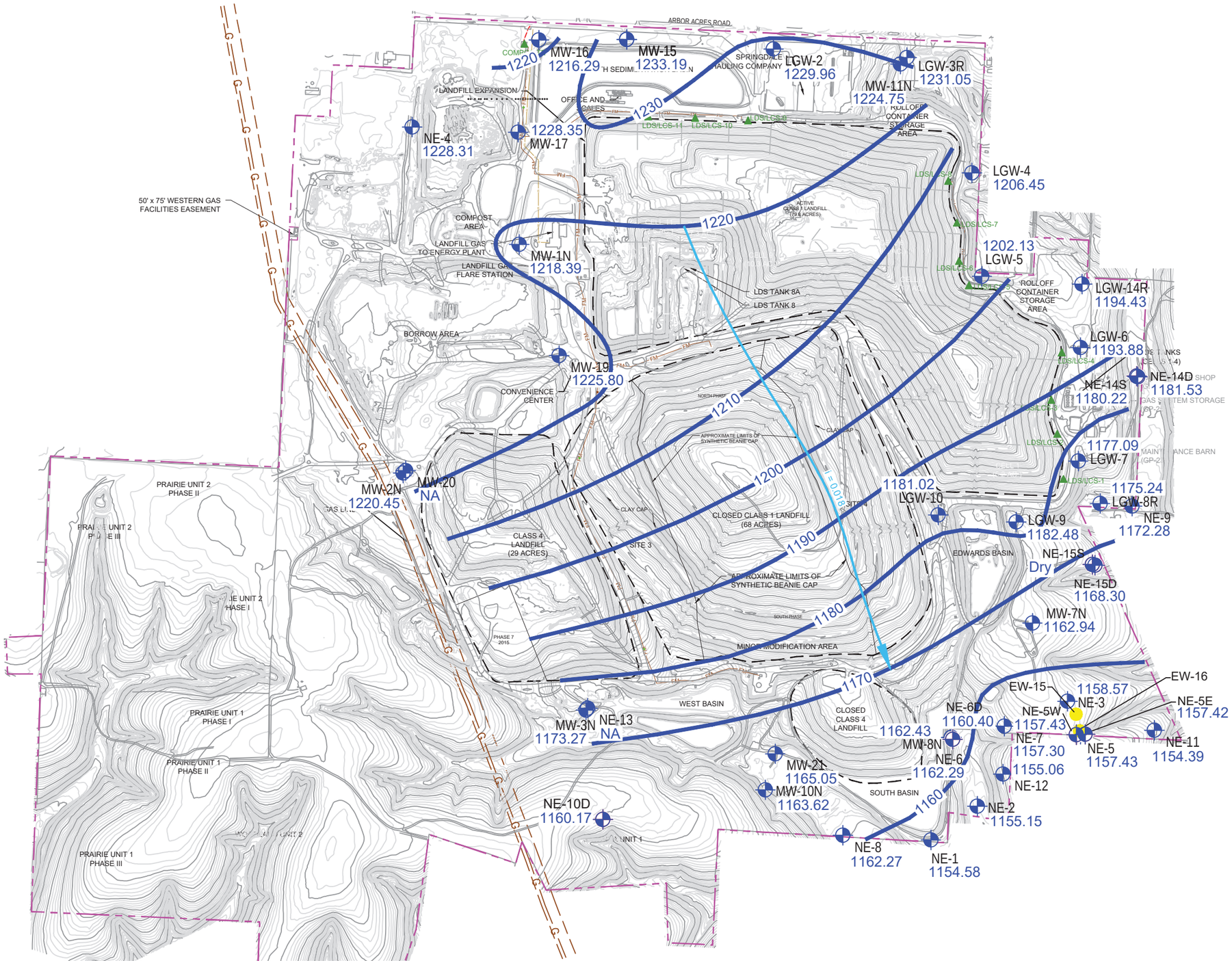
Figure 3
Dye Sampling Locations Map
Eco-Vista Landfill, Springdale, Arkansas



LEGEND

- MW-1N — Groundwater Monitoring Well
- 1218.39 — Groundwater Elevation (fmsl) (feet above mean sea level)
- 1200 — Potentiometric Surface Contour (fmsl)
- i = 0.018 — Groundwater Flow Direction & Hydraulic Gradient
- Property Line Boundaries (Approximate)

Note1: Basemap provided by Waste Management.

Note2: Water levels collected by Promus Engineering on October 4, 2021.

Note3: Groundwater elevation calculations are available in Report.

0 200 400 600 1200

Scale in Feet

Graphic Scale: 1 inch = 600 feet

NORTH

JETT ENVIRONMENTAL CONSULTING

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Foristell, MO 63348
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Figure 4
Potentiometric Surface Map, Fourth Quarter 2021 Event
Eco-Vista Landfill, Springdale, Arkansas

APPENDIX A

Dye Sampling Results Summary

OUL Number	Station Name	Sample Type	Date Placed	Deployed By	Date Collected	Collected By	Fluorescein Results		Eosine Results		RWT Results		SRB Results		Comments
							Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	
F5651	C4-PZ-1	Background	01/17/22	FTN	01/24/22	FTN	ND		ND		ND		ND		
F5703	C4-PZ-1	Background	01/24/22	FTN	01/31/22	FTN	ND		ND		ND		ND		
F6025	C4-PZ-1	Monitoring	01/31/22	FTN	02/21/22	FTN	ND		ND		ND		ND		
F6087	C4-PZ-1	Monitoring	02/21/22	FTN	02/25/22	FTN	ND		ND		ND		ND		
F6136	C4-PZ-1	Monitoring	02/25/22	FTN	02/28/22	FTN	ND		ND		ND		ND		
F6262	C4-PZ-1	Monitoring	02/28/22	FTN	03/07/22	FTN	ND		ND		ND		ND		
F6341	C4-PZ-1	Monitoring	03/07/22	FTN	03/14/22	FTN	ND		ND		ND		ND		
F6451	C4-PZ-1	Monitoring	03/14/22	FTN	03/21/22	FTN	ND		ND		ND		ND		
F6541	C4-PZ-1	Monitoring	03/21/22	FTN	03/28/22	FTN	ND		ND		ND		ND		
F6633	C4-PZ-1	Monitoring	03/28/22	FTN	04/04/22	FTN	ND		ND		ND		ND		
F6913	C4-PZ-1	Monitoring	04/04/22	FTN	04/11/22	FTN	ND		ND		ND		ND		
F7158	C4-PZ-1	Monitoring	04/11/22	FTN	04/18/22	FTN	ND		ND		ND		ND		
F7271	C4-PZ-1	Monitoring	04/18/22	FTN	04/25/22	FTN	ND		ND		ND		ND		
F7364	C4-PZ-1	Monitoring	04/25/22	FTN	05/02/22	FTN	ND		ND		ND		ND		
F7444	C4-PZ-1	Monitoring	05/02/22	FTN	05/09/22	FTN	ND		ND		ND		ND		
F8787	C4-PZ-1	Monitoring	05/09/22	FTN	08/11/22	Promus	ND		ND		ND		ND		
F8945	C4-PZ-1	Monitoring	08/11/22	Promus	08/23/22	Promus	ND		ND		ND		ND		
F9211	C4-PZ-1	Monitoring	08/23/22	Promus	09/06/22	Promus	ND		ND		ND		ND		
F9375	C4-PZ-1	Monitoring	09/06/22	Promus	09/19/22	Promus	ND		ND		ND		ND		
F9728	C4-PZ-1	Monitoring	09/19/22	Promus	10/04/22	Promus	ND		ND		ND		ND		
F9950	C4-PZ-1	Monitoring	10/04/22	Promus	10/17/22	Promus	ND		ND		ND		ND		
G0422	C4-PZ-1	Monitoring	10/17/22	Promus	11/01/22	Promus	ND		ND		ND		ND		

OUL Number	Station Name	Sample Type	Date Placed	Deployed By	Date Collected	Collected By	Fluorescein Results		Eosine Results		RWT Results		SRB Results		Comments
							Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	
F5652	C4-PZ-2	Background	01/17/22	FTN	01/24/22	FTN	ND		ND		ND		ND		
F5704	C4-PZ-2	Background	01/24/22	FTN	01/31/22	FTN	ND		ND		ND		ND		
F6024	C4-PZ-2	Monitoring	01/31/22	FTN	02/21/22	FTN	ND		ND		ND		ND		
F6086	C4-PZ-2	Monitoring	02/21/22	FTN	02/25/22	FTN	ND		ND		ND		ND		
F6135	C4-PZ-2	Monitoring	02/25/22	FTN	02/28/22	FTN	ND		ND		ND		ND		
F6261	C4-PZ-2	Monitoring	02/28/22	FTN	03/07/22	FTN	ND		ND		ND		ND		
F6339	C4-PZ-2	Monitoring	03/07/22	FTN	03/14/22	FTN	ND		ND		ND		ND		
F6450	C4-PZ-2	Monitoring	03/14/22	FTN	03/21/22	FTN	ND		ND		ND		ND		
F6539	C4-PZ-2	Monitoring	03/21/22	FTN	03/28/22	FTN	ND		ND		ND		ND		
F6631	C4-PZ-2	Monitoring	03/28/22	FTN	04/04/22	FTN	ND		ND		ND		ND		
F6912	C4-PZ-2	Monitoring	04/04/22	FTN	04/11/22	FTN	ND		ND		ND		ND		
F7157	C4-PZ-2	Monitoring	04/11/22	FTN	04/18/22	FTN	ND		ND		ND		ND		
F7270	C4-PZ-2	Monitoring	04/18/22	FTN	04/25/22	FTN	ND		ND		ND		ND		
F7363	C4-PZ-2	Monitoring	04/25/22	FTN	05/02/22	FTN	ND		ND		ND		ND		
F7443	C4-PZ-2	Monitoring	05/02/22	FTN	05/09/22	FTN	ND		ND		ND		ND		
F8788	C4-PZ-2	Monitoring	05/09/22	FTN	08/11/22	Promus	ND		ND		ND		ND		
F8946	C4-PZ-2	Monitoring	08/11/22	Promus	08/23/22	Promus	ND		ND		ND		ND		
F9212	C4-PZ-2	Monitoring	08/23/22	Promus	09/06/22	Promus	ND		ND		ND		ND		
F9376	C4-PZ-2	Monitoring	09/06/22	Promus	09/19/22	Promus	ND		ND		ND		ND		
F9729	C4-PZ-2	Monitoring	09/19/22	Promus	10/04/22	Promus	ND		ND		ND		ND		
F9951	C4-PZ-2	Monitoring	10/04/22	Promus	10/17/22	Promus	ND		ND		ND		ND		
G0423	C4-PZ-2	Monitoring	10/17/22	Promus	11/01/22	Promus	ND		ND		ND		ND		

OUL Number	Station Name	Sample Type	Date Placed	Deployed By	Date Collected	Collected By	Fluorescein Results		Eosine Results		RWT Results		SRB Results		Comments
							Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	
F5634	GP-3	Background	01/17/22	FTN	01/24/22	FTN	ND		ND		ND		ND		
F5688	GP-3	Background	01/24/22	FTN	01/31/22	FTN	ND		ND		ND		ND		
F6009	GP-3	Monitoring	01/31/22	FTN	02/21/22	FTN	ND		ND		ND		ND		
F6071	GP-3	Monitoring	02/21/22	FTN	02/25/22	FTN	ND		ND		ND		ND		
F6119	GP-3	Monitoring	02/25/22	FTN	02/28/22	FTN	ND		ND		ND		ND		
F6266	GP-3	Monitoring	02/28/22	FTN	03/07/22	FTN	ND		ND		ND		ND		
F6345	GP-3	Monitoring	03/07/22	FTN	03/14/22	FTN	ND		ND		ND		ND		
F6455	GP-3	Monitoring	03/14/22	FTN	03/21/22	FTN	ND		ND		ND		ND		
F6545	GP-3	Monitoring	03/21/22	FTN	03/28/22	FTN	ND		ND		ND		ND		
F6638	GP-3	Monitoring	03/28/22	FTN	04/04/22	FTN	ND		ND		ND		ND		
F6917	GP-3	Monitoring	04/04/22	FTN	04/11/22	FTN	ND		ND		ND		ND		
F7163	GP-3	Monitoring	04/11/22	FTN	04/18/22	FTN	ND		ND		ND		ND		
F7275	GP-3	Monitoring	04/18/22	FTN	04/25/22	FTN	ND		ND		ND		ND		
F7368	GP-3	Monitoring	04/25/22	FTN	05/02/22	FTN	ND		ND		ND		ND		
F7448	GP-3	Monitoring	05/02/22	FTN	05/09/22	FTN	ND		ND		ND		ND		
F8769	GP-3	Monitoring	05/09/22	FTN	08/11/22	Promus	ND		ND		ND		ND		

OUL Number	Station Name	Sample Type	Date Placed	Deployed By	Date Collected	Collected By	Fluorescein Results		Eosine Results		RWT Results		SRB Results		Comments
							Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	
F5635	GP-5	Background	01/17/22	FTN	01/24/22	FTN	ND		ND		ND		ND		
F5689	GP-5	Background	01/24/22	FTN	01/31/22	FTN	ND		ND		ND		ND		
F6010	GP-5	Monitoring	01/31/22	FTN	02/21/22	FTN	ND		ND		ND		ND		
F6072	GP-5	Monitoring	02/21/22	FTN	02/25/22	FTN	ND		ND		ND		ND		
F6121	GP-5	Monitoring	02/25/22	FTN	02/28/22	FTN	ND		ND		ND		ND		
F6247	GP-5	Monitoring	02/28/22	FTN	03/07/22	FTN	ND		ND		ND		ND		
F6326	GP-5	Monitoring	03/07/22	FTN	03/14/22	FTN	ND		ND		ND		ND		
F6436	GP-5	Monitoring	03/14/22	FTN	03/21/22	FTN	ND		ND		ND		ND		
F6526	GP-5	Monitoring	03/21/22	FTN	03/28/22	FTN	ND		ND		ND		ND		
F6617	GP-5	Monitoring	03/28/22	FTN	04/04/22	FTN	ND		ND		ND		ND		
F6898	GP-5	Monitoring	04/04/22	FTN	04/11/22	FTN	ND		ND		ND		ND		
F7144	GP-5	Monitoring	04/11/22	FTN	04/18/22	FTN	ND		ND		ND		ND		

OUL Number	Station Name	Sample Type	Date Placed	Deployed By	Date Collected	Collected By	Fluorescein Results		Eosine Results		RWT Results		SRB Results		Comments
							Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	
F5636	GP-7	Background	01/17/22	FTN	01/24/22	FTN	ND		ND		ND		ND		
F5692	GP-7	Background	01/24/22	FTN	01/31/22	FTN	ND		ND		ND		ND		
F6011	GP-7	Monitoring	01/31/22	FTN	02/21/22	FTN	ND		ND		ND		ND		
F6077	GP-7	Monitoring	02/21/22	FTN	02/25/22	FTN	ND		ND		ND		ND		
F6122	GP-7	Monitoring	02/25/22	FTN	02/28/22	FTN	ND		ND		ND		ND		
F6248	GP-7	Monitoring	02/28/22	FTN	03/07/22	FTN	ND		ND		ND		ND		
F6327	GP-7	Monitoring	03/07/22	FTN	03/14/22	FTN	ND		ND		ND		ND		
F6437	GP-7	Monitoring	03/14/22	FTN	03/21/22	FTN	ND		ND		ND		ND		
F6527	GP-7	Monitoring	03/21/22	FTN	03/28/22	FTN	ND		ND		ND		ND		
F6618	GP-7	Monitoring	03/28/22	FTN	04/04/22	FTN	ND		ND		ND		ND		
F6899	GP-7	Monitoring	04/04/22	FTN	04/11/22	FTN	ND		ND		ND		ND		
F7145	GP-7	Monitoring	04/11/22	FTN	04/18/22	FTN	ND		ND		ND		ND		
F7257	GP-7	Monitoring	04/18/22	FTN	04/25/22	FTN	ND		ND		ND		ND		
F7350	GP-7	Monitoring	04/25/22	FTN	05/02/22	FTN	ND		ND		ND		ND		
F7430	GP-7	Monitoring	05/02/22	FTN	05/09/22	FTN	ND		ND		ND		ND		
F8770	GP-7	Monitoring	05/09/22	FTN	08/11/22	Promus	ND		ND		ND		ND		
F8952	GP-7	Monitoring	08/11/22	Promus	08/23/22	Promus	ND		ND		ND		ND		
F9218	GP-7	Monitoring	08/23/22	Promus	09/06/22	Promus	ND		ND		ND		ND		
F9383	GP-7	Monitoring	09/06/22	Promus	09/19/22	Promus	ND		ND		ND		ND		
F9735	GP-7	Monitoring	09/19/22	Promus	10/04/22	Promus	ND		ND		ND		ND		
F9957	GP-7	Monitoring	10/04/22	Promus	10/17/22	Promus	ND		ND		ND		ND		
G0429	GP-7	Monitoring	10/17/22	Promus	11/01/22	Promus	ND		ND		ND		ND		

OUL Number	Station Name	Sample Type	Date Placed	Deployed By	Date Collected	Collected By	Fluorescein Results		Eosine Results		RWT Results		SRB Results		Comments
							Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	
F5637	GP-8	Background	01/17/22	FTN	01/24/22	FTN	ND		ND		ND		ND		
F5691	GP-8	Background	01/24/22	FTN	01/31/22	FTN	ND		ND		ND		ND		
F6012	GP-8	Monitoring	01/31/22	FTN	02/21/22	FTN	ND		ND		ND		ND		
F6078	GP-8	Monitoring	02/21/22	FTN	02/25/22	FTN	ND		ND		ND		ND		
F6123	GP-8	Monitoring	02/25/22	FTN	02/28/22	FTN	ND		ND		ND		ND		
F6249	GP-8	Monitoring	02/28/22	FTN	03/07/22	FTN	ND		ND		ND		ND		
F6328	GP-8	Monitoring	03/07/22	FTN	03/14/22	FTN	ND		ND		ND		ND		
F6438	GP-8	Monitoring	03/14/22	FTN	03/21/22	FTN	ND		ND		ND		ND		
F6528	GP-8	Monitoring	03/21/22	FTN	03/28/22	FTN	ND		ND		ND		ND		
F6619	GP-8	Monitoring	03/28/22	FTN	04/04/22	FTN	ND		ND		ND		ND		
F6901	GP-8	Monitoring	04/04/22	FTN	04/11/22	FTN	ND		ND		ND		ND		
F7146	GP-8	Monitoring	04/11/22	FTN	04/18/22	FTN	ND		ND		ND		ND		
F7258	GP-8	Monitoring	04/18/22	FTN	04/25/22	FTN	ND		ND		ND		ND		
F7351	GP-8	Monitoring	04/25/22	FTN	05/02/22	FTN	ND		ND		ND		ND		
F7431	GP-8	Monitoring	05/02/22	FTN	05/09/22	FTN	ND		ND		ND		ND		
F8771	GP-8	Monitoring	05/09/22	FTN	08/11/22	Promus	ND		ND		ND		ND		
F8953	GP-8	Monitoring	08/11/22	Promus	08/23/22	Promus	ND		ND		ND		ND		
F9384	GP-8	Monitoring	09/06/22	Promus	09/19/22	Promus	ND		ND		ND		ND		
F9736	GP-8	Monitoring	09/19/22	Promus	10/04/22	Promus	ND		ND		ND		ND		
F9958	GP-8	Monitoring	10/04/22	Promus	10/17/22	Promus	ND		ND		ND		ND		
G0430	GP-8	Monitoring	10/17/22	Promus	11/01/22	Promus	ND		ND		ND		ND		
F5638	GP-9	Background	01/17/22	FTN	01/24/22	FTN	ND		ND		ND		ND		
F5693	GP-9	Background	01/24/22	FTN	01/31/22	FTN	ND		ND		ND		ND		
F6013	GP-9	Monitoring	01/31/22	FTN	02/21/22	FTN	ND		ND		ND		ND		
F6079	GP-9	Monitoring	02/21/22	FTN	02/25/22	FTN	ND		ND		ND		ND		
F6124	GP-9	Monitoring	02/25/22	FTN	02/28/22	FTN	ND		ND		ND		ND		
F6250	GP-9	Monitoring	02/28/22	FTN	03/07/22	FTN	ND		ND		ND		ND		
F6329	GP-9	Monitoring	03/07/22	FTN	03/14/22	FTN	ND		ND		ND		ND		
F6439	GP-9	Monitoring	03/14/22	FTN	03/21/22	FTN	ND		ND		ND		ND		
F6529	GP-9	Monitoring	03/21/22	FTN	03/28/22	FTN	ND		ND		ND		ND		
F6621	GP-9	Monitoring	03/28/22	FTN	04/04/22	FTN	ND		ND		ND		ND		
F6902	GP-9	Monitoring	04/04/22	FTN	04/11/22	FTN	ND		ND		ND		ND		
F7147	GP-9	Monitoring	04/11/22	FTN	04/18/22	FTN	ND		ND		ND		ND		
F7259	GP-9	Monitoring	04/18/22	FTN	04/25/22	FTN	ND		ND		ND		ND		
F7352	GP-9	Monitoring	04/25/22	FTN	05/02/22	FTN	ND		ND		ND		ND		
F7432	GP-9	Monitoring	05/02/22	FTN	05/09/22	FTN	ND		ND		ND		ND		
F8772	GP-9	Monitoring	05/09/22	FTN	08/11/22	Promus	ND		ND		ND		ND		
F8954	GP-9	Monitoring	08/11/22	Promus	08/23/22	Promus	ND		ND		ND		ND		
F9221	GP-9	Monitoring	08/23/22	Promus	09/06/22	Promus	ND		ND		ND		ND		
F9385	GP-9	Monitoring	09/06/22	Promus	09/19/22	Promus	ND		ND		ND		ND		
F9737	GP-9	Monitoring	09/19/22	Promus	10/04/22	Promus	ND		ND		ND		ND		
F9959	GP-9	Monitoring	10/04/22	Promus	10/17/22	Promus	ND		ND		ND		ND		
G0431	GP-9	Monitoring	10/17/22	Promus	11/01/22	Promus	ND		ND		ND		ND		

OUL Number	Station Name	Sample Type	Date Placed	Deployed By	Date Collected	Collected By	Fluorescein Results		Eosine Results		RWT Results		SRB Results		Comments
							Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	
F5644	MW-10N	Background	01/17/22	FTN	01/24/22	FTN	ND		ND		ND		ND		
F5698	MW-10N	Background	01/24/22	FTN	01/31/22	FTN	ND		ND		ND		ND		
F6014	MW-10N	Monitoring	01/31/22	FTN	02/21/22	FTN	ND		ND		ND		ND		
F6126	MW-10N	Monitoring	02/21/22	FTN	02/28/22	FTN	ND		ND		ND		ND		
F6253	MW-10N	Monitoring	02/28/22	FTN	03/07/22	FTN	ND		ND		ND		ND		
F6332	MW-10N	Monitoring	03/07/22	FTN	03/14/22	FTN	ND		ND		ND		ND		
F6443	MW-10N	Monitoring	03/14/22	FTN	03/21/22	FTN	ND		ND		ND		ND		
F6532	MW-10N	Monitoring	03/21/22	FTN	03/28/22	FTN	ND		ND		ND		ND		
F6624	MW-10N	Monitoring	03/28/22	FTN	04/04/22	FTN	ND		ND		ND		ND		
F6905	MW-10N	Monitoring	04/04/22	FTN	04/11/22	FTN	ND		ND		ND		ND		
F7150	MW-10N	Monitoring	04/11/22	FTN	04/18/22	FTN	ND		ND		ND		ND		
F7263	MW-10N	Monitoring	04/18/22	FTN	04/25/22	FTN	ND		ND		ND		ND		
F7355	MW-10N	Monitoring	04/25/22	FTN	05/02/22	FTN	ND		ND		ND		ND		
F7435	MW-10N	Monitoring	05/02/22	FTN	05/09/22	FTN	ND		ND		ND		ND		
F8775	MW-10N	Monitoring	05/09/22	FTN	08/11/22	Promus	ND		ND		ND		ND		
F8961	MW-10N	Monitoring	08/11/22	Promus	08/23/22	Promus	ND		ND		ND		ND		
F9227	MW-10N	Monitoring	08/23/22	Promus	09/06/22	Promus	ND		ND		ND		ND		
F9391	MW-10N	Monitoring	09/06/22	Promus	09/19/22	Promus	ND		ND		ND		ND		
F9744	MW-10N	Monitoring	09/19/22	Promus	10/04/22	Promus	ND		ND		ND		ND		
F9966	MW-10N	Monitoring	10/04/22	Promus	10/17/22	Promus	ND		ND		ND		ND		
G0437	MW-10N	Monitoring	10/17/22	Promus	11/01/22	Promus	ND		ND		ND		ND		

OUL Number	Station Name	Sample Type	Date Placed	Deployed By	Date Collected	Collected By	Fluorescein Results		Eosine Results		RWT Results		SRB Results		Comments
							Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	
F5632	MW-17	Background	01/17/22	FTN	01/24/22	FTN	ND		ND		ND		ND		
F5686	MW-17	Background	01/24/22	FTN	01/31/22	FTN	ND		ND		ND		ND		
F6006	MW-17	Monitoring	01/31/22	FTN	02/21/22	FTN	ND		ND		ND		ND		
F6069	MW-17	Monitoring	02/21/22	FTN	02/25/22	FTN	ND		ND		ND		ND		
F6116	MW-17	Monitoring	02/25/22	FTN	02/28/22	FTN	ND		ND		ND		ND		
F6265	MW-17	Monitoring	02/28/22	FTN	03/07/22	FTN	ND		ND		ND		ND		
F6344	MW-17	Monitoring	03/07/22	FTN	03/14/22	FTN	ND		ND		ND		ND		
F6454	MW-17	Monitoring	03/14/22	FTN	03/21/22	FTN	ND		ND		ND		ND		
F6544	MW-17	Monitoring	03/21/22	FTN	03/28/22	FTN	ND		ND		ND		ND		
F6637	MW-17	Monitoring	03/28/22	FTN	04/04/22	FTN	ND		ND		ND		ND		
F6916	MW-17	Monitoring	04/04/22	FTN	04/11/22	FTN	ND		ND		ND		ND		
F7162	MW-17	Monitoring	04/11/22	FTN	04/18/22	FTN	ND		ND		ND		ND		
F7274	MW-17	Monitoring	04/18/22	FTN	04/25/22	FTN	ND		ND		ND		ND		
F7367	MW-17	Monitoring	04/25/22	FTN	05/02/22	FTN	ND		ND		ND		ND		
F7447	MW-17	Monitoring	05/02/22	FTN	05/09/22	FTN	ND		ND		ND		ND		
F8784	MW-17	Monitoring	05/09/22	FTN	08/11/22	Promus	ND		ND		ND		ND		
F8948	MW-17	Monitoring	08/11/22	Promus	08/23/22	Promus	ND		ND		ND		ND		
F9214	MW-17	Monitoring	08/23/22	Promus	09/06/22	Promus	ND		ND		ND		ND		
F9378	MW-17	Monitoring	09/06/22	Promus	09/19/22	Promus	ND		ND		ND		ND		
F9731	MW-17	Monitoring	09/19/22	Promus	10/04/22	Promus	ND		ND		ND		ND		
F9953	MW-17	Monitoring	10/04/22	Promus	10/17/22	Promus	ND		ND		ND		ND		
G0425	MW-17	Monitoring	10/17/22	Promus	11/01/22	Promus	ND		ND		ND		ND		

OUL Number	Station Name	Sample Type	Date Placed	Deployed By	Date Collected	Collected By	Fluorescein Results		Eosine Results		RWT Results		SRB Results		Comments
							Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	
F5649	MW-19	Background	01/17/22	FTN	01/24/22	FTN	ND		ND		ND		ND		
F5705	MW-19	Background	01/24/22	FTN	01/31/22	FTN	ND		ND		ND		ND		
F6023	MW-19	Monitoring	01/31/22	FTN	02/21/22	FTN	ND		ND		ND		ND		
F6084	MW-19	Monitoring	02/21/22	FTN	02/25/22	FTN	ND		ND		ND		ND		
F6134	MW-19	Monitoring	02/25/22	FTN	02/28/22	FTN	ND		ND		ND		ND		
F6263	MW-19	Monitoring	02/28/22	FTN	03/07/22	FTN	ND		ND		ND		ND		
F6342	MW-19	Monitoring	03/07/22	FTN	03/14/22	FTN	ND		ND		ND		ND		
F6452	MW-19	Monitoring	03/14/22	FTN	03/21/22	FTN	ND		ND		ND		ND		
F6542	MW-19	Monitoring	03/21/22	FTN	03/28/22	FTN	ND		ND		ND		ND		
F6635	MW-19	Monitoring	03/28/22	FTN	04/04/22	FTN	ND		ND		ND		ND		
F6914	MW-19	Monitoring	04/04/22	FTN	04/11/22	FTN	ND		ND		ND		ND		
F7159	MW-19	Monitoring	04/11/22	FTN	04/18/22	FTN	ND		ND		ND		ND		
F7272	MW-19	Monitoring	04/18/22	FTN	04/25/22	FTN	ND		ND		ND		ND		
F7365	MW-19	Monitoring	04/25/22	FTN	05/02/22	FTN	ND		ND		ND		ND		
F7445	MW-19	Monitoring	05/02/22	FTN	05/09/22	FTN	ND		ND		ND		ND		
F8783	MW-19	Monitoring	05/09/22	FTN	08/11/22	Promus	ND		ND		ND		ND		
F8944	MW-19	Monitoring	08/11/22	Promus	08/23/22	Promus	ND		ND		ND		ND		
F9210	MW-19	Monitoring	08/23/22	Promus	09/06/22	Promus	ND		ND		ND		ND		
F9374	MW-19	Monitoring	09/06/22	Promus	09/19/22	Promus	ND		ND		ND		ND		
F9727	MW-19	Monitoring	09/19/22	Promus	10/04/22	Promus	ND		ND		ND		ND		
F9949	MW-19	Monitoring	10/04/22	Promus	10/17/22	Promus	ND		ND		ND		ND		
G0421	MW-19	Monitoring	10/17/22	Promus	11/01/22	Promus	ND		ND		ND		ND		

OUL Number	Station Name	Sample Type	Date Placed	Deployed By	Date Collected	Collected By	Fluorescein Results		Eosine Results		RWT Results		SRB Results		Comments
							Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	
F5650	MW-1N	Background	01/17/22	FTN	01/24/22	FTN	ND		ND		ND		ND		
F5690	MW-1N	Background	01/24/22	FTN	01/31/22	FTN	ND		ND		ND		ND		
F6007	MW-1N	Monitoring	01/31/22	FTN	02/21/22	FTN	ND		ND		ND		ND		
F6085	MW-1N	Monitoring	02/21/22	FTN	02/25/22	FTN	ND		ND		ND		ND		
F6117	MW-1N	Monitoring	02/25/22	FTN	02/28/22	FTN	ND		ND		ND		ND		
F6264	MW-1N	Monitoring	02/28/22	FTN	03/07/22	FTN	ND		ND		ND		ND		
F6343	MW-1N	Monitoring	03/07/22	FTN	03/14/22	FTN	ND		ND		ND		ND		
F6453	MW-1N	Monitoring	03/14/22	FTN	03/21/22	FTN	ND		ND		ND		ND		
F6543	MW-1N	Monitoring	03/21/22	FTN	03/28/22	FTN	ND		ND		ND		ND		
F6636	MW-1N	Monitoring	03/28/22	FTN	04/04/22	FTN	ND		ND		ND		ND		
F6915	MW-1N	Monitoring	04/04/22	FTN	04/11/22	FTN	ND		ND		ND		ND		
F7161	MW-1N	Monitoring	04/11/22	FTN	04/18/22	FTN	ND		ND		ND		ND		
F7273	MW-1N	Monitoring	04/18/22	FTN	04/25/22	FTN	ND		ND		ND		ND		
F7366	MW-1N	Monitoring	04/25/22	FTN	05/02/22	FTN	ND		ND		ND		ND		
F7446	MW-1N	Monitoring	05/02/22	FTN	05/09/22	FTN	ND		ND		ND		ND		
F8786	MW-1N	Monitoring	05/09/22	FTN	08/11/22	Promus	ND		ND		ND		ND		
F8947	MW-1N	Monitoring	08/11/22	Promus	08/23/22	Promus	ND		ND		ND		ND		
F9213	MW-1N	Monitoring	08/23/22	Promus	09/06/22	Promus	ND		ND		ND		ND		
F9377	MW-1N	Monitoring	09/06/22	Promus	09/19/22	Promus	ND		ND		ND		ND		
F9730	MW-1N	Monitoring	09/19/22	Promus	10/04/22	Promus	ND		ND		ND		ND		
F9952	MW-1N	Monitoring	10/04/22	Promus	10/17/22	Promus	ND		ND		ND		ND		
G0424	MW-1N	Monitoring	10/17/22	Promus	11/01/22	Promus	ND		ND		ND		ND		

OUL Number	Station Name	Sample Type	Date Placed	Deployed By	Date Collected	Collected By	Fluorescein Results		Eosine Results		RWT Results		SRB Results		Comments
							Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	
F5647	MW-20	Background	01/17/22	FTN	01/24/22	FTN	ND		ND		ND		ND		
F5699	MW-20	Background	01/24/22	FTN	01/31/22	FTN	ND		ND		ND		ND		
F6021	MW-20	Monitoring	01/31/22	FTN	02/21/22	FTN	ND		ND		ND		ND		
F6073	MW-20	Monitoring	02/21/22	FTN	02/25/22	FTN	ND		ND		ND		ND		
F6132	MW-20	Monitoring	02/25/22	FTN	02/28/22	FTN	ND		ND		ND		ND		
F6257	MW-20	Monitoring	02/28/22	FTN	03/07/22	FTN	ND		ND		ND		ND		
F6336	MW-20	Monitoring	03/07/22	FTN	03/14/22	FTN	ND		ND		ND		ND		
F6447	MW-20	Monitoring	03/14/22	FTN	03/21/22	FTN	ND		ND		ND		ND		
F6536	MW-20	Monitoring	03/21/22	FTN	03/28/22	FTN	ND		ND		ND		ND		
F6628	MW-20	Monitoring	03/28/22	FTN	04/04/22	FTN	ND		ND		ND		ND		
F6909	MW-20	Monitoring	04/04/22	FTN	04/11/22	FTN	ND		ND		ND		ND		
F7154	MW-20	Monitoring	04/11/22	FTN	04/18/22	FTN	ND		ND		ND		ND		
F7267	MW-20	Monitoring	04/18/22	FTN	04/25/22	FTN	ND		ND		ND		ND		
F7359	MW-20	Monitoring	04/25/22	FTN	05/02/22	FTN	ND		ND		ND		ND		
F7439	MW-20	Monitoring	05/02/22	FTN	05/09/22	FTN	ND		ND		ND		ND		
F8781	MW-20	Monitoring	05/09/22	FTN	08/11/22	Promus	ND		ND		ND		ND		
F8951	MW-20	Monitoring	08/11/22	Promus	08/23/22	Promus	ND		ND		ND		ND		
F9217	MW-20	Monitoring	08/23/22	Promus	09/06/22	Promus	ND		ND		ND		ND		
F9382	MW-20	Monitoring	09/06/22	Promus	09/19/22	Promus	ND		ND		ND		ND		
F9734	MW-20	Monitoring	09/19/22	Promus	10/04/22	Promus	ND		ND		ND		ND		
F9956	MW-20	Monitoring	10/04/22	Promus	10/17/22	Promus	ND		ND		ND		ND		
G0428	MW-20	Monitoring	10/17/22	Promus	11/01/22	Promus	ND		ND		ND		ND		

OUL Number	Station Name	Sample Type	Date Placed	Deployed By	Date Collected	Collected By	Fluorescein Results		Eosine Results		RWT Results		SRB Results		Comments
							Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	
F5643	MW-21	Background	01/17/22	FTN	01/24/22	FTN	514.5	0.587	ND		ND		ND		
F5697	MW-21	Background	01/24/22	FTN	01/31/22	FTN	514.4	0.659	ND		ND		ND		
F6015	MW-21	Monitoring	01/31/22	FTN	02/21/22	FTN	515.0	0.932	ND		ND		ND		
F6082	MW-21	Monitoring	02/21/22	FTN	02/25/22	FTN	514.4	0.483	ND		ND		ND		
F6127	MW-21	Monitoring	02/25/22	FTN	02/28/22	FTN	514.2	0.657	ND		ND		ND		
F6254	MW-21	Monitoring	02/28/22	FTN	03/07/22	FTN	514.3	0.523	ND		ND		ND		
F6333	MW-21	Monitoring	03/07/22	FTN	03/14/22	FTN	513.0 *	0.481	ND		ND		ND		
F6444	MW-21	Monitoring	03/14/22	FTN	03/21/22	FTN	515.8	0.626	ND		ND		ND		
F6533	MW-21	Monitoring	03/21/22	FTN	03/28/22	FTN	514.6	0.678	ND		ND		ND		
F6625	MW-21	Monitoring	03/28/22	FTN	04/04/22	FTN	515.4	0.472	ND		ND		ND		
F6906	MW-21	Monitoring	04/04/22	FTN	04/11/22	FTN	514.9	0.933	ND		ND		ND		
F7151	MW-21	Monitoring	04/11/22	FTN	04/18/22	FTN	514.8	0.855	ND		ND		ND		
F7264	MW-21	Monitoring	04/18/22	FTN	04/25/22	FTN	514.0	0.904	ND		ND		ND		
F7356	MW-21	Monitoring	04/25/22	FTN	05/02/22	FTN	514.4	1.1	ND		ND		ND		
F7436	MW-21	Monitoring	05/02/22	FTN	05/09/22	FTN	515.3	0.689	ND		ND		ND		
F8774	MW-21	Monitoring	05/09/22	FTN	08/11/22	Promus	515.7	2.15	ND		ND		ND		
F8959	MW-21	Monitoring	08/11/22	Promus	08/23/22	Promus	512.0 *	0.55	ND		ND		ND		
F9226	MW-21	Monitoring	08/23/22	Promus	09/06/22	Promus	512.8 *	0.539	ND		ND		ND		
F9390	MW-21	Monitoring	09/06/22	Promus	09/19/22	Promus	ND		ND		ND		ND		
F9743	MW-21	Monitoring	09/19/22	Promus	10/04/22	Promus	ND		ND		ND		ND		
F9965	MW-21	Monitoring	10/04/22	Promus	10/17/22	Promus	ND		ND		ND		ND		
G0436	MW-21	Monitoring	10/17/22	Promus	11/01/22	Promus	515.4 *	0.616	ND		ND		ND		

OUL Number	Station Name	Sample Type	Date Placed	Deployed By	Date Collected	Collected By	Fluorescein Results		Eosine Results		RWT Results		SRB Results		Comments
							Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	
F5648	MW-2N	Background	01/17/22	FTN	01/24/22	FTN	ND		ND		ND		ND		
F5702	MW-2N	Background	01/24/22	FTN	01/31/22	FTN	ND		ND		ND		ND		
F6022	MW-2N	Monitoring	01/31/22	FTN	02/21/22	FTN	ND		ND		ND		ND		
F6074	MW-2N	Monitoring	02/21/22	FTN	02/25/22	FTN	ND		ND		ND		ND		
F6133	MW-2N	Monitoring	02/25/22	FTN	02/28/22	FTN	ND		ND		ND		ND		
F6258	MW-2N	Monitoring	02/28/22	FTN	03/07/22	FTN	ND		ND		ND		ND		
F6337	MW-2N	Monitoring	03/07/22	FTN	03/14/22	FTN	ND		ND		ND		ND		
F6448	MW-2N	Monitoring	03/14/22	FTN	03/21/22	FTN	ND		ND		ND		ND		
F6537	MW-2N	Monitoring	03/21/22	FTN	03/28/22	FTN	ND		ND		ND		ND		
F6629	MW-2N	Monitoring	03/28/22	FTN	04/04/22	FTN	ND		ND		ND		ND		
F6910	MW-2N	Monitoring	04/04/22	FTN	04/11/22	FTN	ND		ND		ND		ND		
F7155	MW-2N	Monitoring	04/11/22	FTN	04/18/22	FTN	ND		ND		ND		ND		
F7268	MW-2N	Monitoring	04/18/22	FTN	04/25/22	FTN	ND		ND		ND		ND		
F7361	MW-2N	Monitoring	04/25/22	FTN	05/02/22	FTN	ND		ND		ND		ND		
F7441	MW-2N	Monitoring	05/02/22	FTN	05/09/22	FTN	ND		ND		ND		ND		
F8779	MW-2N	Monitoring	05/09/22	FTN	08/11/22	Promus	ND		ND		ND		ND		
F8950	MW-2N	Monitoring	08/11/22	Promus	08/23/22	Promus	ND		ND		ND		ND		
F9216	MW-2N	Monitoring	08/23/22	Promus	09/06/22	Promus	ND		ND		ND		ND		
F9381	MW-2N	Monitoring	09/06/22	Promus	09/19/22	Promus	ND		ND		ND		ND		
F9733	MW-2N	Monitoring	09/19/22	Promus	10/04/22	Promus	ND		ND		ND		ND		
F9955	MW-2N	Monitoring	10/04/22	Promus	10/17/22	Promus	ND		ND		ND		ND		
G0427	MW-2N	Monitoring	10/17/22	Promus	11/01/22	Promus	ND		ND		ND		ND		

OUL Number	Station Name	Sample Type	Date Placed	Deployed By	Date Collected	Collected By	Fluorescein Results		Eosine Results		RWT Results		SRB Results		Comments
							Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	
F5642	MW-3N	Background	01/17/22	FTN	01/24/22	FTN	ND		ND		ND		ND		
F5696	MW-3N	Background	01/24/22	FTN	01/31/22	FTN	ND		ND		ND		ND		
F6018	MW-3N	Monitoring	01/31/22	FTN	02/21/22	FTN	ND		ND		ND		ND		
F6076	MW-3N	Monitoring	02/21/22	FTN	02/25/22	FTN	ND		ND		ND		ND		
F6130	MW-3N	Monitoring	02/25/22	FTN	02/28/22	FTN	ND		ND		ND		ND		
F6256	MW-3N	Monitoring	02/28/22	FTN	03/07/22	FTN	ND		ND		ND		ND		
F6335	MW-3N	Monitoring	03/07/22	FTN	03/14/22	FTN	ND		ND		ND		ND		
F6446	MW-3N	Monitoring	03/14/22	FTN	03/21/22	FTN	ND		ND		ND		ND		
F6535	MW-3N	Monitoring	03/21/22	FTN	03/28/22	FTN	ND		ND		ND		ND		
F6627	MW-3N	Monitoring	03/28/22	FTN	04/04/22	FTN	ND		ND		ND		ND		
F6908	MW-3N	Monitoring	04/04/22	FTN	04/11/22	FTN	ND		ND		ND		ND		
F7153	MW-3N	Monitoring	04/11/22	FTN	04/18/22	FTN	ND		ND		ND		ND		
F7266	MW-3N	Monitoring	04/18/22	FTN	04/25/22	FTN	ND		ND		ND		ND		
F7358	MW-3N	Monitoring	04/25/22	FTN	05/02/22	FTN	ND		ND		ND		ND		
F7438	MW-3N	Monitoring	05/02/22	FTN	05/09/22	FTN	ND		ND		ND		ND		
F8777	MW-3N	Monitoring	05/09/22	FTN	08/11/22	Promus	ND		ND		ND		ND		
F8956	MW-3N	Monitoring	08/11/22	Promus	08/23/22	Promus	ND		ND		ND		ND		
F9223	MW-3N	Monitoring	08/23/22	Promus	09/06/22	Promus	ND		ND		ND		ND		
F9387	MW-3N	Monitoring	09/06/22	Promus	09/19/22	Promus	ND		ND		ND		ND		
F9739	MW-3N	Monitoring	09/19/22	Promus	10/04/22	Promus	ND		ND		ND		ND		
F9962	MW-3N	Monitoring	10/04/22	Promus	10/17/22	Promus	ND		ND		ND		ND		
G0433	MW-3N	Monitoring	10/17/22	Promus	11/01/22	Promus	ND		ND		ND		ND		

OUL Number	Station Name	Sample Type	Date Placed	Deployed By	Date Collected	Collected By	Fluorescein Results		Eosine Results		RWT Results		SRB Results		Comments
							Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	
F5639	NE-10D	Background	01/17/22	FTN	01/24/22	FTN	ND		ND		ND		ND		
F5694	NE-10D	Background	01/24/22	FTN	01/31/22	FTN	ND		ND		ND		ND		
F6016	NE-10D	Monitoring	01/31/22	FTN	02/21/22	FTN	ND		ND		ND		ND		
F6081	NE-10D	Monitoring	02/21/22	FTN	02/25/22	FTN	ND		ND		ND		ND		
F6128	NE-10D	Monitoring	02/25/22	FTN	02/28/22	FTN	ND		ND		ND		ND		
F6251	NE-10D	Monitoring	02/28/22	FTN	03/07/22	FTN	ND		ND		ND		ND		
F6330	NE-10D	Monitoring	03/07/22	FTN	03/14/22	FTN	ND		ND		ND		ND		
F6441	NE-10D	Monitoring	03/14/22	FTN	03/21/22	FTN	ND		ND		ND		ND		
F6530	NE-10D	Monitoring	03/21/22	FTN	03/28/22	FTN	ND		ND		ND		ND		
F6622	NE-10D	Monitoring	03/28/22	FTN	04/04/22	FTN	ND		ND		ND		ND		
F6903	NE-10D	Monitoring	04/04/22	FTN	04/11/22	FTN	ND		ND		ND		ND		
F7148	NE-10D	Monitoring	04/11/22	FTN	04/18/22	FTN	ND		ND		ND		ND		
F7261	NE-10D	Monitoring	04/18/22	FTN	04/25/22	FTN	ND		ND		ND		ND		
F7353	NE-10D	Monitoring	04/25/22	FTN	05/02/22	FTN	ND		ND		ND		ND		
F7433	NE-10D	Monitoring	05/02/22	FTN	05/09/22	FTN	ND		ND		ND		ND		
F8776	NE-10D	Monitoring	05/09/22	FTN	08/11/22	Promus	ND		ND		ND		ND		
F8955	NE-10D	Monitoring	08/11/22	Promus	08/23/22	Promus	ND		ND		ND		ND		
F9222	NE-10D	Monitoring	08/23/22	Promus	09/06/22	Promus	ND		ND		ND		ND		
F9386	NE-10D	Monitoring	09/06/22	Promus	09/19/22	Promus	ND		ND		ND		ND		
F9738	NE-10D	Monitoring	09/19/22	Promus	10/04/22	Promus	ND		ND		ND		ND		
F9961	NE-10D	Monitoring	10/04/22	Promus	10/17/22	Promus	ND		ND		ND		ND		
G0432	NE-10D	Monitoring	10/17/22	Promus	11/01/22	Promus	ND		ND		ND		ND		

OUL Number	Station Name	Sample Type	Date Placed	Deployed By	Date Collected	Collected By	Fluorescein Results		Eosine Results		RWT Results		SRB Results		Comments
							Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	
F5641	NE-13	Background	01/17/22	FTN	01/24/22	FTN	ND		ND		ND		ND		
F5695	NE-13	Background	01/24/22	FTN	01/31/22	FTN	ND		ND		ND		ND		
F6017	NE-13	Monitoring	01/31/22	FTN	02/21/22	FTN	ND		ND		ND		ND		
F6075	NE-13	Monitoring	02/21/22	FTN	02/25/22	FTN	ND		ND		ND		ND		
F6129	NE-13	Monitoring	02/25/22	FTN	02/28/22	FTN	ND		ND		ND		ND		
F6255	NE-13	Monitoring	02/28/22	FTN	03/07/22	FTN	ND		ND		ND		ND		
F6334	NE-13	Monitoring	03/07/22	FTN	03/14/22	FTN	ND		ND		ND		ND		
F6445	NE-13	Monitoring	03/14/22	FTN	03/21/22	FTN	ND		ND		ND		ND		
F6534	NE-13	Monitoring	03/21/22	FTN	03/28/22	FTN	ND		ND		ND		ND		
F6626	NE-13	Monitoring	03/28/22	FTN	04/04/22	FTN	ND		ND		ND		ND		
F6907	NE-13	Monitoring	04/04/22	FTN	04/11/22	FTN	ND		ND		ND		ND		
F7152	NE-13	Monitoring	04/11/22	FTN	04/18/22	FTN	ND		ND		ND		ND		
F7265	NE-13	Monitoring	04/18/22	FTN	04/25/22	FTN	ND		ND		ND		ND		
F7357	NE-13	Monitoring	04/25/22	FTN	05/02/22	FTN	ND		ND		ND		ND		
F7437	NE-13	Monitoring	05/02/22	FTN	05/09/22	FTN	ND		ND		ND		ND		
F8778	NE-13	Monitoring	05/09/22	FTN	08/11/22	Promus	ND		ND		ND		ND		
F8957	NE-13	Monitoring	08/11/22	Promus	08/23/22	Promus	ND		ND		ND		ND		
F9224	NE-13	Monitoring	08/23/22	Promus	09/06/22	Promus	ND		ND		ND		ND		
F9388	NE-13	Monitoring	09/06/22	Promus	09/19/22	Promus	ND		ND		ND		ND		
F9741	NE-13	Monitoring	09/19/22	Promus	10/04/22	Promus	ND		ND		ND		ND		
F9963	NE-13	Monitoring	10/04/22	Promus	10/17/22	Promus	ND		ND		ND		ND		
G0434	NE-13	Monitoring	10/17/22	Promus	11/01/22	Promus	ND		ND		ND		ND		

OUL Number	Station Name	Sample Type	Date Placed	Deployed By	Date Collected	Collected By	Fluorescein Results		Eosine Results		RWT Results		SRB Results		Comments
							Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	
F5633	NE-4	Background	01/17/22	FTN	01/24/22	FTN	ND		ND		ND		ND		
F5687	NE-4	Background	01/24/22	FTN	01/31/22	FTN	ND (R)		ND (R)		ND (R)		ND (R)		
F5823	NE-4	Background	01/31/22	FTN	02/08/22	FTN	ND		ND		ND		ND		
F6008	NE-4	Monitoring	02/08/22	FTN	02/21/22	FTN	ND		ND		ND		ND		
F6070	NE-4	Monitoring	02/21/22	FTN	02/25/22	FTN	ND		ND		ND		ND		
F6118	NE-4	Monitoring	02/25/22	FTN	02/28/22	FTN	ND		ND		ND		ND		
F6267	NE-4	Monitoring	02/28/22	FTN	03/07/22	FTN	ND		ND		ND		ND		
F6346	NE-4	Monitoring	03/07/22	FTN	03/14/22	FTN	ND		ND		ND		ND		
F6456	NE-4	Monitoring	03/14/22	FTN	03/21/22	FTN	ND		ND		ND		ND		
F6546	NE-4	Monitoring	03/21/22	FTN	03/28/22	FTN	ND		ND		ND		ND		
F6639	NE-4	Monitoring	03/28/22	FTN	04/04/22	FTN	ND		ND		ND		ND		
F6918	NE-4	Monitoring	04/04/22	FTN	04/11/22	FTN	ND		ND		ND		ND		
F7164	NE-4	Monitoring	04/11/22	FTN	04/18/22	FTN	ND		ND		ND		ND		
F7276	NE-4	Monitoring	04/18/22	FTN	04/25/22	FTN	ND		ND		ND		ND		
F7369	NE-4	Monitoring	04/25/22	FTN	05/02/22	FTN	ND		ND		ND		ND		
F7449	NE-4	Monitoring	05/02/22	FTN	05/09/22	FTN	ND		ND		ND		ND		
F8785	NE-4	Monitoring	05/09/22	FTN	08/11/22	Promus	ND		ND		ND		ND		
F8949	NE-4	Monitoring	08/11/22	Promus	08/23/22	Promus	ND		ND		ND		ND		
F9215	NE-4	Monitoring	08/23/22	Promus	09/06/22	Promus	ND		ND		ND		ND		
F9379	NE-4	Monitoring	09/06/22	Promus	09/19/22	Promus	ND		ND		ND		ND		
F9732	NE-4	Monitoring	09/19/22	Promus	10/04/22	Promus	ND		ND		ND		ND		
F9954	NE-4	Monitoring	10/04/22	Promus	10/17/22	Promus	ND		ND		ND		ND		
G0426	NE-4	Monitoring	10/17/22	Promus	11/01/22	Promus	ND		ND		ND		ND		

OUL	Station Name	Sample	Date	Deployed	Date	Collected	Fluorescein Results		Eosine Results		RWT Results		SRB Results		Comments
Number		Type	Placed	By	Collected	By	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	
F5645	NE-8	Background	01/17/22	FTN	01/24/22	FTN	ND		ND		ND		ND		
F5701	NE-8	Background	01/24/22	FTN	01/31/22	FTN	ND		ND		ND		ND		
F6026	NE-8	Monitoring	01/31/22	FTN	02/21/22	FTN	ND		ND		ND		ND		
F6125	NE-8	Monitoring	02/21/22	FTN	02/28/22	FTN	513.5 *	0.414	ND		ND		ND		
F6252	NE-8	Monitoring	02/28/22	FTN	03/07/22	FTN	514.5 *	0.397	ND		ND		ND		
F6331	NE-8	Monitoring	03/07/22	FTN	03/14/22	FTN	513.2 *	0.472	ND		ND		ND		
F6442	NE-8	Monitoring	03/14/22	FTN	03/21/22	FTN	511.8 *	0.409	ND		ND		ND		
F6531	NE-8	Monitoring	03/21/22	FTN	03/28/22	FTN	ND		ND		ND		ND		
F6623	NE-8	Monitoring	03/28/22	FTN	04/04/22	FTN	513.7 *	0.514	ND		ND		ND		
F6904	NE-8	Monitoring	04/04/22	FTN	04/11/22	FTN	514.7	0.579	ND		ND		ND		
F7149	NE-8	Monitoring	04/11/22	FTN	04/18/22	FTN	509.8 *	0.496	ND		ND		ND		
F7262	NE-8	Monitoring	04/18/22	FTN	04/25/22	FTN	513.4 *	0.534	ND		ND		ND		
F7354	NE-8	Monitoring	04/25/22	FTN	05/02/22	FTN	512.8 *	0.714	ND		ND		ND		
F7434	NE-8	Monitoring	05/02/22	FTN	05/09/22	FTN	ND		ND		ND		ND		
F8773	NE-8	Monitoring	05/09/22	FTN	08/11/22	Promus	514.7	0.871	ND		ND		ND		
F8958	NE-8	Monitoring	08/11/22	Promus	08/23/22	Promus	ND		ND		ND		ND		
F9225	NE-8	Monitoring	08/23/22	Promus	09/06/22	Promus	ND		ND		ND		ND		
F9389	NE-8	Monitoring	09/06/22	Promus	09/19/22	Promus	ND		ND		ND		ND		
F9742	NE-8	Monitoring	09/19/22	Promus	10/04/22	Promus	ND		ND		ND		ND		
F9964	NE-8	Monitoring	10/04/22	Promus	10/17/22	Promus	ND		ND		ND		ND		
G0435	NE-8	Monitoring	10/17/22	Promus	11/01/22	Promus	ND		ND		ND		ND		

OUL Number	Station Name	Sample Type	Date Placed	Deployed By	Date Collected	Collected By	Fluorescein Results		Eosine Results		RWT Results		SRB Results		Comments
							Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	
F5646	PZ-2D	Background	01/17/22	FTN	01/24/22	FTN	515.3	56.8	ND		566.8	1.33	ND		
F5706	PZ-2D	Background	01/24/22	FTN	01/31/22	FTN	515.4	76.2	ND		568.2 *	1.48	ND		
F6019	PZ-2D	Monitoring	01/31/22	FTN	02/21/22	FTN	ND		ND		ND		ND		
F6083	PZ-2D	Monitoring	02/21/22	FTN	02/25/22	FTN	ND		ND		ND		ND		
F6131	PZ-2D	Monitoring	02/25/22	FTN	02/28/22	FTN	515.2	35.8	ND		ND		ND		
F6259	PZ-2D	Monitoring	02/28/22	FTN	03/07/22	FTN	515.3	14.9	ND		ND		ND		
F6338	PZ-2D	Monitoring	03/07/22	FTN	03/14/22	FTN	515.4	18.4	ND		ND		ND		
F6449	PZ-2D	Monitoring	03/14/22	FTN	03/21/22	FTN	515.2	8.78	ND		ND		ND		
F6538	PZ-2D	Monitoring	03/21/22	FTN	03/28/22	FTN	515.3	8.48	ND		ND		ND		
F6630	PZ-2D	Monitoring	03/28/22	FTN	04/04/22	FTN	515.1	8.83	ND		ND		ND		
F6911	PZ-2D	Monitoring	04/04/22	FTN	04/11/22	FTN	515.3	7.64	ND		ND		ND		
F7156	PZ-2D	Monitoring	04/11/22	FTN	04/18/22	FTN	515.5	16.3	ND		ND		ND		
F7269	PZ-2D	Monitoring	04/18/22	FTN	04/25/22	FTN	515.5	98.2	ND		564.6 *	2.28	ND		
F7362	PZ-2D	Monitoring	04/25/22	FTN	05/02/22	FTN	515.1	9.23	ND		ND		ND		
F7442	PZ-2D	Monitoring	05/02/22	FTN	05/09/22	FTN	515.1	43.1	ND		568.2 *	1.06	ND		
F8782	PZ-2D	Monitoring	05/09/22	FTN	08/11/22	Promus	515.1	22.9	ND		568.0 *	1.54	ND		
F8943	PZ-2D	Monitoring	08/11/22	Promus	08/23/22	Promus	515.3	10.6	ND		ND		ND		
F9209	PZ-2D	Monitoring	08/23/22	Promus	09/06/22	Promus	515.3	20.2	ND		ND		ND		
F9373	PZ-2D	Monitoring	09/06/22	Promus	09/19/22	Promus	515.2	14.6	ND		ND		ND		
F9726	PZ-2D	Monitoring	09/19/22	Promus	10/04/22	Promus	514.9	55.8	ND		ND		ND		
F9948	PZ-2D	Monitoring	10/04/22	Promus	10/17/22	Promus	515.4	25.7	ND		ND		ND		
G0419	PZ-2D	Monitoring	10/17/22	Promus	11/01/22	Promus	ND		ND		ND		ND		

OUL Number	Station Name	Sample Type	Date Placed	Deployed By	Date Collected	Collected By	Fluorescein Results		Eosine Results		RWT Results		SRB Results		Comments
							Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	
F6067	Wildcat Creek @ WC31	Monitoring	N/A	N/A	02/23/22	FTN	ND		ND		ND		581.5	71.1	Water sample
F6001	Wildcat Creek @ WC31	Monitoring	N/A	N/A	02/23/22	FTN	ND		ND		ND		579.3	30.4	
F6068	Wildcat Creek @ WC31	Monitoring	02/23/22	FTN	02/25/22	FTN	ND		ND		ND		579.3	638	
F6139	Wildcat Creek @ WC31	Monitoring	02/25/22	FTN	02/28/22	FTN	ND		ND		ND		579.6	1,070	
N/A	Wildcat Creek @ WC31	Monitoring	02/28/22	FTN											Sample was inadvertently removed by Washington County environmental enforcement officers.
F6347	Wildcat Creek #1	Monitoring	03/08/22	FTN	03/14/22	FTN	ND		ND		ND		578.6	162	
F6457	Wildcat Creek #1	Monitoring	03/14/22	FTN	03/21/22	FTN	ND		ND		ND		578.7	120	
F6547	Wildcat Creek #1	Monitoring	03/21/22	FTN	03/28/22	FTN	ND		ND		ND		578.5	74	
F6641	Wildcat Creek #1	Monitoring	03/28/22	FTN	04/04/22	FTN	ND		ND		ND		578.6	83	
F6919	Wildcat Creek #1	Monitoring	04/04/22	FTN	04/11/22	FTN	ND		ND		ND		578.6	66	
F7165	Wildcat Creek #1	Monitoring	04/11/22	FTN	04/18/22	FTN	ND		ND		ND		578.5	69	
F7277	Wildcat Creek #1	Monitoring	04/18/22	FTN	04/25/22	FTN	ND		ND		ND		577.8	87	
F7370	Wildcat Creek #1	Monitoring	04/25/22	FTN	05/02/22	FTN	ND		ND		ND		578.8	41	
F7450	Wildcat Creek #1	Monitoring	05/02/22	FTN	05/09/22	FTN	ND		ND		ND		577.7	7	
F6348	Wildcat Creek #2	Monitoring	03/08/22	FTN	03/14/22	FTN	ND		ND		ND		578.8	597	
F6458	Wildcat Creek #2	Monitoring	03/14/22	FTN	03/21/22	FTN	ND		ND		ND		578.9	345	
F6548	Wildcat Creek #2	Monitoring	03/21/22	FTN	03/28/22	FTN	ND		ND		ND		578.9	309	
F6642	Wildcat Creek #2	Monitoring	03/28/22	FTN	04/04/22	FTN	ND		ND		ND		578.6	155	
F6921	Wildcat Creek #2	Monitoring	04/04/22	FTN	04/11/22	FTN	ND		ND		ND		578.6	106	
F7166	Wildcat Creek #2	Monitoring	04/11/22	FTN	04/18/22	FTN	ND		ND		ND		578.5	48	
F7278	Wildcat Creek #2	Monitoring	04/18/22	FTN	04/25/22	FTN	ND		ND		ND		578.5	88	
F7371	Wildcat Creek #2	Monitoring	04/25/22	FTN	05/02/22	FTN	ND		ND		ND		578.8	63	
N/A	Wildcat Creek #2	Monitoring	05/02/22	FTN											Sample was washed away during flooding on 5/5/22 causing it to lodge in a debris pile above the water surface.
F8789	Wildcat Creek #3	Monitoring	N/A	N/A	08/11/22	Promus	ND		ND		ND		581.8	0.058	No previous dye packet was located. Water sample collected.
F8962	Wildcat Creek #3	Monitoring	08/11/22	Promus	08/23/22	Promus	ND		ND		ND		577.8	6.68	
F9228	Wildcat Creek #3	Monitoring	08/23/22	Promus	09/06/22	Promus	ND		ND		ND		578.5	3.36	
F9392	Wildcat Creek #3	Monitoring	09/06/22	Promus	09/19/22	Promus	ND		ND		ND		578.8	1.70	
F9745	Wildcat Creek #3	Monitoring	09/19/22	Promus	10/04/22	Promus	ND		ND		ND		579.2	2.04	
F9967	Wildcat Creek #3	Monitoring	10/04/22	Promus	10/17/22	Promus	ND		ND		ND		578.7	1.52	
G0438	Wildcat Creek #3	Monitoring	10/17/22	Promus	11/01/22	Promus	ND		ND		ND		578.1	1.15	

Notes:

ND = No dye detected

** = Laboratory Note: A fluorescence peak is present that does not meet all the criteria for a positive dye result; however, it has been calculated as though it was the tracer dye.*

Results from January 2022 through May 2022 provided by FTN.

RWT = Rhodamine Water Tracer

SRB = Sulforhodamine B

nm = Peak wavelengths are reported in nanometers

ppb = Dye concentrations are reported in parts per billion

APPENDIX B

Site Photographs

APPENDIX C

Laboratory Analytical Reports

Ozark UNDERGROUND LABORATORY 1572 Aley Lane • Protem, MO 65733 • (417) 785-4289 • fax (417) 785-4290 • contact@ozarkundergroundlab.com

Certificate of Analysis

Date of certificate: January 27, 2022
Client: FTN Associates, Ltd
131990 Olive Blvd. Suite 204
Chesterfield, MO 63017
Project name: Eco-Vista Class 4 Landfill
Project number: 06820-0100-016
Contact person: Dana Derrington (dld@ftn-assoc.com)

Samples collected by: EWS / KMD
Date samples shipped: January 24, 2022
Date samples rec'd at OUL: January 25, 2022
Date analyzed by OUL: January 27, 2022
Included with certificate of analysis: Table of results and copy of sample collection data sheets

Results for week 1 charcoal samplers analyzed for the presence of fluorescein, eosine, rhodamine WT (RWT) and sulforhodamine B (SRB) dyes.

Peak wavelengths are reported in nanometers (nm); dye concentrations are reported in parts per billion (ppb).

OUL	Station Name	Date/Time	Date/Time	Fluorescein Results		Eosine Results		RWT Results		SRB Results	
Number		Placed	Collected	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)
F5632	MW-17	1/17/22 1520	1/24/22 1005	ND		ND		ND		ND	
F5633	NE-4	1/17/22 1700	1/24/22 1020	ND		ND		ND		ND	
F5634	GP-3	1/17/22 1018	1/24/22 1035	ND		ND		ND		ND	
F5635	GP-5	1/17/22 1720	1/24/22 1100	ND		ND		ND		ND	
F5636	GP-7	1/17/22 1200	1/24/22 1115	ND		ND		ND		ND	
F5637	GP-8	1/17/22 1215	1/24/22 1130	ND		ND		ND		ND	
F5638	GP-9	1/17/22 1240	1/24/22 1200	ND		ND		ND		ND	
F5639	NE-10D	1/17/22 1250	1/24/22 1202	ND		ND		ND		ND	
F5640	Laboratory control charcoal blank										
F5641	NE-13	1/17/22 1310	1/24/22 1230	ND		ND		ND		ND	
F5642	MW-3N	1/17/22 1330	1/24/22 1237	ND		ND		ND		ND	
F5643	MW-21	1/17/22 1415	1/24/22 1255	514.5	0.587	ND		ND		ND	
F5644	MW-10N	1/17/22 1420	1/24/22 1300	ND		ND		ND		ND	
F5645	NE-8	1/17/22 1440	1/24/22 1315	ND		ND		ND		ND	
F5646	PZ-2D	1/17/22 1455	1/24/22 1456	515.3	56.8	ND		566.8	1.33	ND	
F5647	MW-20	1/17/22 1350	1/24/22 1327	ND		ND		ND		ND	
F5648	MW-2N	1/17/22 1335	1/24/22 1335	ND		ND		ND		ND	
F5649	MW-19	1/17/22 1505	1/24/22 1445	ND		ND		ND		ND	

F:\docs\COA\FTN\FTN_Eco-VistaLF_01

OUL Number	Station Name	Date/Time Placed	Date/Time Collected	Fluorescein Results		Eosine Results		RWT Results		SRB Results	
				Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)
F5650	MW-1N	1/17/22 1515	1/24/22 1418	ND		ND		ND		ND	
F5651	C4-PZ-1	1/17/22 0958	1/24/22 1350	ND		ND		ND		ND	
F5652	C4-PZ-2	1/17/22 1010	1/24/22 1408	ND		ND		ND		ND	

Note: Dye concentrations are based upon standards used at the OUL. The standard concentrations are based upon the as sold weight of the dye that the OUL uses.

If the client is not using OUL dyes, the client should provide the OUL with a sample of the dye to compare to the OUL dyes.

Footnotes: ND = No dye detected

Thomas J. Aley, PHG and RG

OZARK UNDERGROUND LABORATORY, INC.

1572 Aley Lane Protem, MO 65733 (417) 785-4289 fax (417) 785-4290 email: contact@ozarkundergroundlab.com

SAMPLE COLLECTION DATA SHEET for FLUORESCENCE ANALYSIS

Project 06820-0100-016 EVLF Dye Trace Week No: 1 Samples Collected By: EWS / KMD

Samples Shipped By: Kacan Davis Samples Received By: C. Aley Lou

Date Samples Shipped: 1/24/2022 Date Samples Received: 1-25-22 Time Samples Received: 1330 Return Cooler? Yes ☐ No ☑

Bill to: FTN Associates, 3 Innwood Circle Ste. 220, Little Rock, AR 72211 Send Results to: Dana Denington, dld@ftn-assoc.com

Analyze for: ☑ Fluorescein ☑ Eosine ☑ Rhodamine WT ☑ Other SRB Ship cooler to:

OUL use only			Please indicate stations where dye was visible in the field for field technician use - use black ink only					OUL use only
# CHAR REC'D	LAB NUMBER	STATION NUMBER	STATION NAME	PLACED		COLLECTED		# WATER REC'D
				DATE	TIME	DATE	TIME	
1	F5632		MW-17	1/17/22	1520	1/24/22	1005	0
1	F5633		NE-4		1700		1020	0
1	F5634		GP-3		1018		1035	0
1	F5635		GP-5		1720		1100	0
1	F5636		GP-7		1200		1115	0
1	F5637		GP-8		1215		1130	0
1	F5638		GP-9		1240		1200	0
1	F5639		NE-10D		1250		1202	0
1	F5641		NE-13		1310		1230	0
1	F5642		MW-3N		1330		1237	0
1	F5643		MW-21		1415		1255	0
1	F5644		MW-10N		1420		1300	0
1	F5645		NE-8		1440		1315	0
1	F5646		PZ-2D	↓	1455	↓	1456	0

COMMENTS Bill to email: accounting@ftn-assoc.com F5640 OUL charcoal blank
phone: 479-571-3334

This sheet filled out by OUL staff? Yes ___ No X Charts for samples on this page proofed by OUL: CG

OUL Project No. 1926 Date Analyzed: 1/27/22 Analyzed By: AC/OUL

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SAMPLE COLLECTION DATA SHEET for FLUORESCENCE ANALYSIS

Project 0820-0100-010 ENF Dye Trace **Week No:** 1 **Samples Collected By:** (EWS/KMD) Elizabeth Studebaker/Kagan Davis

Samples Shipped By: Kagan Davis **Samples Received By:** C. Aley/OUL

Date Samples Shipped: 1/24/2022 **Date Samples Received:** ~~SRB~~ 1-25-22 **Time Samples Received:** 1330 **Return Cooler? Yes** ☐ **No** ☑

Bill to: accounting@ftn-assoc.com **Send Results to:** dld@ftn-assoc.com

Analyze for: ☑ Fluorescein ☑ Eosine ☑ Rhodamine WT ☑ Other SRB **Ship cooler to:**

OUL use only		*Please indicate stations where dye was visible in the field* for field technician use - use black ink only						*OUL use only*
# CHAR REC'D	LAB NUMBER	STATION NUMBER 1-4 Numbers	STATION NAME	PLACED DATE	PLACED TIME	COLLECTED DATE	COLLECTED TIME	# WATER REC'D
1	F5647		MW-20	1/17/22	1350	1/24/22	1327	0
1	F5648		MW-2N	↓	1335	↓	1335	0
1	F5649		MW-19		1505		1445	0
1	F5650		MW-1N		1515		1418	0
1	F5651		C4-PZ-1		0958		1350	0
1	F5652		C4-PZ-2	↓	1010	↓	1408	0

COMMENTS phone: 479-571-3334

This sheet filled out by OUL staff? Yes ☐ **No** ☑ **Charts for samples on this page proofed by OUL:** CA

OUL Project No. 1926 **Date Analyzed:** 1/27/22 **Analyzed By:** AC/OUL

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Certificate of Analysis

Date of certificate: February 2, 2022
Client: FTN Associates, Ltd
131990 Olive Blvd. Suite 204
Chesterfield, MO 63017
Project name: Eco-Vista Class 4 Landfill
Project number: 06820-0100-016
Contact person: Dana Derrington (dld@ftn-assoc.com)

Samples collected by: AJP HET
Date samples shipped: January 31, 2022
Date samples rec'd at OUL: February 1, 2022
Date analyzed by OUL: February 2, 2022
Included with certificate of analysis: Table of results and copy of sample collection data sheets

Results for week 2 charcoal samplers analyzed for the presence of fluorescein, eosine, rhodamine WT (RWT) and sulforhodamine B (SRB) dyes.

Peak wavelengths are reported in nanometers (nm); dye concentrations are reported in parts per billion (ppb).

OUL	Station Name	Date/Time	Date/Time	Fluorescein Results		Eosine Results		RWT Results		SRB Results	
Number		Placed	Collected	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)
F5686	MW-17	1/24/22 1010	1/31/22 1020	ND		ND		ND		ND	
F5687	NE-4	1/24/22 1027	1/31/22 1105	ND		ND		ND		ND	
F5688	GP-3	1/24/22 1043	1/31/22 1135	ND		ND		ND		ND	
F5689	GP-5	1/24/22 1110	1/31/22 1335	ND		ND		ND		ND	
F5690	MW-1N	1/24/22 1440	1/31/22 1210	ND		ND		ND		ND	
F5691	GP-8	1/24/22 1136	1/31/22 1410	ND		ND		ND		ND	
F5692	GP-7	1/24/22 1117	1/31/22 1355	ND		ND		ND		ND	
F5693	GP-9	1/24/22 1201	1/31/22 1420	ND		ND		ND		ND	
F5694	NE-10D	1/24/22 1220	1/31/22 1440	ND		ND		ND		ND	
F5695	NE-13	1/24/22 1236	1/31/22 1450	ND		ND		ND		ND	
F5696	MW-3N	1/24/22 1245	1/31/22 1500	ND		ND		ND		ND	
F5697	MW-21	1/24/22 1258	1/31/22 1525	514.4	0.659	ND		ND		ND	
F5698	MW-10N	1/24/22 1308	1/31/22 1540	ND		ND		ND		ND	
F5699	MW-20	1/24/22 1332	1/31/22 1620	ND		ND		ND		ND	
F5700	Laboratory control charcoal blank										
F5701	NE-8	1/24/22 1318	1/31/22 1605	ND		ND		ND		ND	
F5702	MW-2N	1/24/22 1340	1/31/22 1630	ND		ND		ND		ND	
F5703	C4-PZ-1	1/24/22 1400	1/31/22 1715	ND		ND		ND		ND	

OUL Number	Station Name	Date/Time Placed	Date/Time Collected	Fluorescein Results		Eosine Results		RWT Results		SRB Results	
				Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)
F5704	C4-PZ-2	1/24/22 1413	1/31/22 1730	ND		ND		ND		ND	
F5705	MW-19	1/24/22 1450	1/31/22 1700	ND		ND		ND		ND	
F5706	PZ-2D	1/24/22 1503	1/31/22 1650	515.4	76.2	ND		568.2 *	1.48	ND	
F5707	PZ-2C	1/24/22 1455	1/31/22 1710	ND		ND		ND		ND	
F5708	C4-PZ-2C	1/24/22 1500	1/31/22 1725	ND		ND		ND		ND	

Note: Dye concentrations are based upon standards used at the OUL. The standard concentrations are based upon the as sold weight of the dye that the OUL uses.

If the client is not using OUL dyes, the client should provide the OUL with a sample of the dye to compare to the OUL dyes.

Footnotes: ND = No dye detected

* = A fluorescence peak is present that does not meet all the criteria for a positive dye result. However, it has been calculated as though it was the tracer dye.

Thomas J. Aley, PHG and RG

* per shipping label

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SAMPLE COLLECTION DATA SHEET for FLUORESCENCE ANALYSIS

Project 06820-0100-010 Week No: 2 Samples Collected By: ASP HET

Samples Shipped By: Andrew Pruitt Hayley Turner Samples Received By: Amber Comstock/OUL

Date Samples Shipped: 1/31/22 Date Samples Received: 2/1/22 Time Samples Received: 1400 Return Cooler? Yes ☐ No ☑

Bill to: accounting@ftn-assoc.com Send Results to: did@ftn-assoc.com

Analyze for: ☑ Fluorescein ☑ Eosine ☑ Rhodamine WT ☑ Other SRB Ship cooler to: N/A

OUL use only			*Please indicate stations where dye was visible in the field* for field technician use - use black ink only					OUL use only
# CHAR REC'D	LAB NUMBER Charcoal	STATION NUMBER 1-4 Numbers	STATION NAME	PLACED DATE	PLACED TIME	COLLECTED DATE	COLLECTED TIME	# WATER REC'D
1	F5686		MW-17	1/24/22	1010	1/31/22	1020	0
1	F5687		NE-4	↓	1027	↓	1105	0
1	F5688		GP-3		1043		1135	0
1	F5689		GP-5		1110		1335	0
1	F5690		MW-1N		1440		1210	0
1	F5691		~~GP-6~~ ASP 1/31/22 GP8		1136		1410	0
1	F5692		GP-7		1117		1355	0
1	F5693		GP-9		1201		1420	0
1	F5694		~~GP-10~~ ASP 1/31/22 NE-10D		1220		1440	0
1	F5695		NE-13		1236		1450	0
1	F5696		MW-3N		1245		1500	0
1	F5697		MW-21		1258		1525	0
1	F5698		MW-10N		1309		1540	0
1	F5699		MW-20	↓	1332	↓	1620	0

COMMENTS F5700 OUL Charcoal Blank

This sheet filled out by OUL staff? Yes ☐ No ☑ Charts for samples on this page proofed by OUL: AG

OUL Project No. 1926 Date Analyzed: 2-2-22 Analyzed By: AG/OUL

AG/OUL

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SAMPLE COLLECTION DATA SHEET for FLUORESCENCE ANALYSIS

Project 060820-0100-0116 Week No: 2 Samples Collected By: _____

Samples Shipped By: Andrew Smith Hayley Turner Samples Received By: Amber Comstock

Date Samples Shipped: 1/31/22 Date Samples Received: 2/1/22 Time Samples Received: 1400 Return Cooler? Yes ☐ No ☑

Bill to: accounting@ftn-assoc.com Send Results to: dld@ftn-assoc.com

Analyze for: ☑ Fluorescein ☑ Eosine ☑ Rhodamine WT ☑ Other SRB Ship cooler to: N/A

Please indicate stations where dye was visible in the field

for field technician use - use black ink only

OUL use only				PLACED		COLLECTED		OUL use only
# CHAR REC'D	LAB NUMBER (Charcoal)	STATION NUMBER 1-4 Numbers	STATION NAME	DATE	TIME	DATE	TIME	# WATER REC'D
1	F5701		NE-8	1/24/22	1319	1/31/22	1605	0
1	F5702		MW-2N	↓	1340	↓	1630	0
1	F5703		C4-PZ-1		1400		~~1750~~ 1715	0
1	F5704		C4-PZ-2		1413		1730	0
			~~MW-1N~~				~~1210~~	
1	F5705		MW-19		1450		1700	0
1	F5706		PZ-2D		1503		1650	0
1	F5707		PZ-2C		1455		1710	0
1	F5708		C4-PZ-2C	↓	1500	↓	1725	0

COMMENTS _____

This sheet filled out by OUL staff? Yes ☐ No ☑ Charts for samples on this page proofed by OUL: OC

OUL Project No. 1926 Date Analyzed: 2-2-22 Analyzed By: AC/OUL

AC/OUL

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Certificate of Analysis

Date of certificate: February 14, 2022
Client: FTN Associates, Ltd
131990 Olive Blvd. Suite 204
Chesterfield, MO 63017
Project name: Eco-Vista Class 4 Landfill
Project number: 06820-0100-016
Contact person: Dana Derrington (dld@ftn-assoc.com)

Samples collected by: (KMD) Kagan Davis
Date samples shipped: February 8, 2022
Date samples rec'd at OUL: February 9, 2022
Date analyzed by OUL: February 10, 2022
Included with certificate of analysis: Table of results and copy of sample collection data sheet

Results for week 3 charcoal samplers analyzed for the presence of fluorescein, eosine, rhodamine WT (RWT) and sulforhodamine B (SRB) dyes.

Peak wavelengths are reported in nanometers (nm); dye concentrations are reported in parts per billion (ppb).

OUL Number	Station Name	Date/Time Placed	Date/Time Collected	Fluorescein Results		Eosine Results		RWT Results		SRB Results	
				Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)
F5823	NE-4	1/31/22 1130	2/8/22 1515	ND		ND		ND		ND	
F5824	MW-40	NDT	2/8/22 1605	ND		ND		ND		ND	

Note: Dye concentrations are based upon standards used at the OUL. The standard concentrations are based upon the as sold weight of the dye that the OUL uses. If the client is not using OUL dyes, the client should provide the OUL with a sample of the dye to compare to the OUL dyes.

Footnotes: ND = No dye detected NDT = No date or time given

Thomas J. Aley, PHG and RG

F:\docs\COA\FTN\FTN_Eco-VistaLF_03

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SAMPLE COLLECTION DATA SHEET for FLUORESCENCE ANALYSIS

Project 0680-0100-016 EVLF Dye Trace **Week No:** 3 **Samples Collected By:** (KMD) Kagan Davis

Samples Shipped By: Kagan Davis **Samples Received By:** C. Aley OUL

Date Samples Shipped: 2/8/22 **Date Samples Received:** 2-9-22 **Time Samples Received:** 1400 **Return Cooler?** Yes ☐ No ☑

Bill to: accounting@ftn-assoc.com **Send Results to:** dcl@ftn-assoc.com

Analyze for: ☑ Fluorescein ☑ Eosine ☐ Rhodamine WT ☑ Other SRB **Ship cooler to:**

OUL use only			*Please indicate stations where dye was visible in the field* for field technician use - use black ink only					OUL use only
# CHAR REC'D	LAB NUMBER	STATION NUMBER 1-4 Numbers	STATION NAME	PLACED DATE	PLACED TIME	COLLECTED DATE	COLLECTED TIME	# WATER REC'D
1	F5823		NE-4	1/31/22	1130	2/8/22	1515	0
1	F5824		MW-40	—	—	2/8/22	1605	0

COMMENTS phone: 479-571-3534 chain of custody seal intact upon arrival @ OUL - AC/OUL

This sheet filled out by OUL staff? Yes ☐ No ☑ **Charts for samples on this page proofed by OUL:** AC/OUL

OUL Project No. 1926 **Date Analyzed:** 2/10/22 **Analyzed By:** AC/OUL

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Certificate of Analysis

Date of certificate: February 28, 2022
Client: FTN Associates, Ltd
131990 Olive Blvd. Suite 204
Chesterfield, MO 63017
Project name: Eco-Vista Class 4 Landfill
Project number: 06820-0100-016
Contact person: Dana Derrington (dld@ftn-assoc.com)

Samples collected by: EWS/KMD/CLN
Date samples shipped: February 21, 2022
Date samples rec'd at OUL: February 25, 2022
Date analyzed by OUL: February 28, 2022
Included with certificate of analysis: Table of results, copies of sample collection data sheets and discrepancy sheet

Results for week 4 charcoal and water samples analyzed for the presence of fluorescein, eosine, rhodamine WT (RWT) and sulforhodamine B (SRB) dyes.
Peak wavelengths are reported in nanometers (nm); dye concentrations are reported in parts per billion (ppb).
All results are for charcoal unless otherwise indicated.

OUL	Station Name	Date/Time	Date/Time	Fluorescein Results		Eosine Results		RWT Results		SRB Results	
Number		Placed	Collected	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)
F6001	Wildcat Creek @ WC31	NDT	2/23/22 1135	ND		ND		ND		579.3	30.4
F6006	MW-17	1/31/22 1050	2/21/22 0935	ND		ND		ND		ND	
F6007	MW-1N	1/31/22 1215	2/21/22 0950	ND		ND		ND		ND	
F6008	NE-4	2/8/22 1520	2/21/22 1006	ND		ND		ND		ND	
F6009	GP-3	1/31/22 1145	2/21/22 1330	ND		ND		ND		ND	
F6010	GP-5	1/31/22 1345	2/21/22 1115	ND		ND		ND		ND	
F6011	GP-7	1/31/22 1400	2/21/22 1230	ND		ND		ND		ND	
F6012	GP-8	1/31/22 1415	2/21/22 1326	ND		ND		ND		ND	
F6013	GP-9	1/31/22 1425	2/21/22 1428	ND		ND		ND		ND	
F6014	MW-10N	1/31/22 1555	2/21/22 1500	ND		ND		ND		ND	
F6015	MW-21	1/31/22 1530	2/21/22 1512	515.0	0.932	ND		ND		ND	
F6016	NE-10D	1/31/22 1445	2/21/22 1530	ND		ND		ND		ND	
F6017	NE-13	1/31/22 1455	2/21/22 1550	ND		ND		ND		ND	
F6018	MW-3N	1/31/22 1505	2/21/22 1557	ND		ND		ND		ND	
F6019	PZ-2D	1/31/22 1655	2/21/22 1610	ND		ND		ND		ND	
F6020	Laboratory control charcoal blank										
F6021	MW-20	1/31/22 1625	2/21/22 1637	ND		ND		ND		ND	

OUL Number	Station Name	Date/Time Placed	Date/Time Collected	Fluorescein Results		Eosine Results		RWT Results		SRB Results	
				Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)
F6022	MW-2N	1/31/22 1635	2/21/22 1650	ND		ND		ND		ND	
F6023	MW-19	1/31/22 1705	2/21/22 1707	ND		ND		ND		ND	
F6024	C4-PZ-2	1/31/22 1735	2/21/22 1719	ND		ND		ND		ND	
F6025	C4-PZ-1	1/31/22 1720	2/21/22 1737	ND		ND		ND		ND	
F6026	NE-8	1/31/22 1610	2/21/22 1443	ND		ND		ND		ND	
F6027	MW-22	1/31/22 1530	2/21/22 1512	514.6	0.890	ND		ND		ND	
F6028	PZ-3D	1/31/22 1655	2/21/22 1610	515.4	25.1	ND		ND		ND	
F6029	C4-PZ-3	NDT	2/21/22 1735	ND		ND		ND		ND	
F6067	Wildcat Creek @ WC31	**water**	2/23/22 1115	ND		ND		ND		581.5	71.1

Note: Dye concentrations are based upon standards used at the OUL. The standard concentrations are based upon the as sold weight of the dye that the OUL uses.

If the client is not using OUL dyes, the client should provide the OUL with a sample of the dye to compare to the OUL dyes.

Footnotes: ND = No dye detected NDT = No date or time given

Thomas J. Aley, PHG and RG

(*) hand delivered 2-25-22 Ca OUL

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SAMPLE COLLECTION DATA SHEET for FLUORESCENCE ANALYSIS

Project 00820-0100-016 EWF Dye Trace **Week No:** ___ **Samples Collected By:** EWS/CLN

Samples Shipped By: EWS/CLN **Samples Received By:** C. Aley/OUL

Date Samples Shipped: 2/23/22 (*) **Date Samples Received:** 2-25-22 **Time Samples Received:** 1315 **Return Cooler?** Yes ☐ No ☒

Bill to: accounting@ftn-assoc.com **Send Results to:** dld@ftn-assoc.com

Analyze for: ☑ Fluorescein ☑ Eosine ☑ Rhodamine WT ☑ Other SRB **Ship cooler to:** N/A

OUL use only			Please indicate stations where dye was visible in the field — for field technician use - use black ink only 2022/Ca OUL					OUL use only
# CHAR REC'D	LAB NUMBER (Charcoal)	STATION NUMBER 1-4 Numbers	STATION NAME	PLACED DATE	PLACED TIME	COLLECTED DATE	COLLECTED TIME	# WATER REC'D
0			WILDCAT CREEK @ WC31	2/3		2/23/22	1115	1
1	F60001		WILDCAT CREEK @ WC31			2/23/22	1135	6

COMMENTS Dye visible in water
★★PLEASE EXPEDITE SAMPLE ANALYSIS★★

This sheet filled out by OUL staff? Yes ☐ **No** ☒ **Charts for samples on this page proofed by OUL:** Ca

OUL Project No. 926 **Date Analyzed:** 2/28/22 **Analyzed By:** AC/OUL

Ⓐ hand delivered 2-25-22 Ca OUL

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SAMPLE COLLECTION DATA SHEET for FLUORESCENCE ANALYSIS

Project 060820-0100-016 EWF Dye Trace **Week No:** ___ **Samples Collected By:** EWS/CLN

Samples Shipped By: EWS/CLN **Samples Received By:** C. Aley/OUL

Date Samples Shipped: 2/23/22 Ⓐ **Date Samples Received:** 2-25-22 **Time Samples Received:** 1315 **Return Cooler? Yes** ☐ **No** ☒

Bill to: accounting@ftn-assoc.com **Send Results to:** dld@ftn-assoc.com

Analyze for: ☑ **Fluorescein** ☑ **Eosine** ☑ **Rhodamine WT** ☐ **Other** SRB **Ship cooler to:** N/A

OUL use only			*Please indicate stations where dye was visible in the field* for field technician use - use black ink only 2022/CA/OUL					OUL use only
# CHAR REC'D	LAB NUMBER Water	STATION NUMBER 1-4 Numbers	STATION NAME	PLACED DATE	PLACED TIME	COLLECTED DATE	COLLECTED TIME	# WATER REC'D
0	FLE067		WILDCAT CREEK @ WC31	~~2/23~~		2/23/21	1115	1
1			WILDCAT CREEK @ WC31			2/23/21	1135	6

COMMENTS Dye visible in water
★★PLEASE EXPEDITE SAMPLE ANALYSIS★★

This sheet filled out by OUL staff? Yes ☐ **No** ☒ **Charts for samples on this page proofed by OUL:** Ca

OUL Project No. 1926 **Date Analyzed:** 2/28/22 **Analyzed By:** AC/OUL

OZARK UNDERGROUND LABORATORY, INC.

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SAMPLE COLLECTION DATA SHEET for FLUORESCENCE ANALYSIS

Project 060320-0100-010 EVLF D-Retrace **Week No:** 4 **Samples Collected By:** EWJ/KMD

Samples Shipped By: Kagan Davi **Samples Received By:** Amber Comstock/OUL

Date Samples Shipped: 2/21/22 **Date Samples Received:** 2/25/22 **Time Samples Received:** 1530 **Return Cooler?** Yes ☐ No ☑

Bill to: accounting@ftn-assoc.com **Send Results to:** dld@ftn-assoc.com

Analyze for: ☑ Fluorescein ☐ Eosine ☑ Rhodamine WT ☑ Other SRB **Ship cooler to:** N/A

OUL use only			*Please indicate stations where dye was visible in the field* for field technician use - use black ink only					OUL use only
# CHAR REC'D	LAB NUMBER Charcoal	STATION NUMBER 1-4 Numbers	STATION NAME	PLACED DATE	PLACED TIME	COLLECTED DATE	COLLECTED TIME	# WATER REC'D
1	F60006		MW-17	1/31/22	1050	2/21/22	0935	0
1	F60007		MW-1N	↓	1215		0950	0
1	F60008		NE-4	2/8/22	1520		1006	0
1	F60009		GP-3	1/31/22	1145		~~1155~~ EJ 1320	⊛
1	F60010		EJ ~~GP~~ GP-5		1345		1115	0
1	F60011		GP-7		1400		~~1335~~ ED 1230	0
1	F60012		GP-8		1415		1326	0
1	F60013		GP-9		18425		1428	0
1	F60014		MW-10N		1555		EJ ~~PR~~ 1500	0
1	F60015		MW-21	1530	~~1445~~ EJ		1512	0
1	F60016		NE-10D		1445		1530	0
1	F60017		NE-13		1455		1550	0
1	F60018		MW-3N		1505		1557	0
1	F60019		PZ-2D	↓	1055	↓	1610	0

COMMENTS F60020 OUL Charcoal Blank

⊛ See discrepancy sheet

This sheet filled out by OUL staff? Yes ☐ No ☑ **Charts for samples on this page proofed by OUL:** CA

OUL Project No. 1926 **Date Analyzed:** 2/28/22 **Analyzed By:** AC/OUL

OZARK UNDERGROUND LABORATORY, INC.

1572 Aley Lane Protem, MO 65733 (417) 785-4289 fax (417) 785-4290 email: contact@ozarkundergroundlab.com

SAMPLE COLLECTION DATA SHEET for FLUORESCENCE ANALYSIS

Project 0820-0100-016 ENF DyeTrace **Week No:** 4 **Samples Collected By:** EWS | KMD

Samples Shipped By: KMD **Samples Received By:** CamberComstock/OUL

Date Samples Shipped: 2/21/22 **Date Samples Received:** 2/25/22 **Time Samples Received:** 1530 **Return Cooler? Yes** ☐ **No** ☑

Bill to: accounting@ftn-assoc.com **Send Results to:** did@ftn-assoc.com

Analyze for: ☐ Fluorescein ☑ Eosine ☑ Rhodamine WT ☑ Other SRB **Ship cooler to:** N/A

OUL use only			*Please indicate stations where dye was visible in the field* for field technician use - use black ink only					OUL use only
# CHAR REC'D	LAB NUMBER Charcoal	STATION NUMBER 1-4 Numbers	STATION NAME	PLACED DATE	PLACED TIME	COLLECTED DATE	COLLECTED TIME	# WATER REC'D
1	F6021		MW-20	1/31/22	1625	2/21/22	1637	0
1	F6022		MW-2N	↓	1635	↓	1650	0
1	F6023		MW-19	↓	1705	↓	1707	0
1	F6024		~~CP-PZ-2 EJ~~ CH-PZ-2	↓	1735	↓	1719	0
1	F6025		~~CP-PZ-1 EJ~~ CH-PZ-1	↓	1720	↓	1737	0
1	F6026		~~CP-8~~ NE-8	↓	1610	↓	1443	0
1	F6027		MW-22	↓	1530	↓	1512	0
1	F6028		PZ-3D	↓	1655	↓	1610	0
1	F6029		CH-PZ-3			↓	1735	0

COMMENTS

This sheet filled out by OUL staff? Yes ☐ **No** ☑ **Charts for samples on this page proofed by OUL:** AC

OUL Project No. 1926 **Date Analyzed:** 2/28/22 **Analyzed By:** AC/OUL

AC/OUL

OZARK UNDERGROUND LABORATORY, INC.

DISCREPANCIES BETWEEN CHAIN-OF-CUSTODY SHEETS AND ACTUAL SAMPLES RECEIVED

Company & Project Name: FTN/EVLF

Page 1 **of** 1

Date Rec'd by OUL: 2/25/22

Wk # 4

Lab #	Sta #	Station Name	Date Pulled	Problem	Solution
F6006		MW-17	2/21/22	Collection date on COC is 2/21/22, sample has 2/27/22	Per Email from ES COC is correct
F6010		GP-5	2/21/22	Collection date not on sample.	Collection date 2/21/22
F6009		GP-3	2/21/22	Collection time on COC is 1320 and sample has 1330	Collection time is 1330
F6013		GP-9	2/21/22	There was no sample with this station, but a sample received with the same collection time of 1428, labeled NE-9	Sample mislabeled as NE-9
F6027		MW-22		Date collected on COC = 2-21-22 Date collected on sample = 2-12-22	OUL will use date on COC

Comments:

Ozark UNDERGROUND LABORATORY 1572 Aley Lane • Protem, MO 65733 • (417) 785-4289 • fax (417) 785-4290 • contact@ozarkundergroundlab.com

Certificate of Analysis

Date of certificate: March 1, 2022
Client: FTN Associates, Ltd
131990 Olive Blvd. Suite 204
Chesterfield, MO 63017
Project name: Eco-Vista Class 4 Landfill
Project number: 06820-0100-016
Contact person: Dana Derrington (dld@ftn-assoc.com)

Samples collected by: EWS/KMD
Date samples shipped: February 28, 2022
Date samples rec'd at OUL: February 28, 2022
Date analyzed by OUL: March 1, 2022
Included with certificate of analysis: Table of results, copy of sample collection data sheets and a page on basic analysis information

Results for week 4 charcoal samplers analyzed for the presence of fluorescein, eosine, rhodamine WT (RWT) and sulforhodamine B (SRB) dyes.

Peak wavelengths are reported in nanometers (nm); dye concentrations are reported in parts per billion (ppb).

OUL Number	Station Name	Date/Time Placed	Date/Time Collected	Fluorescein Results		Eosine Results		RWT Results		SRB Results	
				Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)
F6068	Wildcat Creek @ WC31	2/23/22 1145	2/25/22 1215	ND		ND		ND		579.3	638
F6069	MW-17	2/21/22 0941	2/25/22 1237	ND		ND		ND		ND	
F6070	NE-4	2/21/22 1032	2/25/22 1255	ND		ND		ND		ND	
F6071	GP-3	2/21/22 1330	2/25/22 1310	ND		ND		ND		ND	
F6072	GP-5	2/21/22 1130	2/25/22 1347	ND		ND		ND		ND	
F6073	MW-20	2/21/22 1643	2/25/22 1404	ND		ND		ND		ND	
F6074	MW-2N	2/21/22 1656	2/25/22 1413	ND		ND		ND		ND	
F6075	NE-13	2/21/22 1553	2/25/22 1430	ND		ND		ND		ND	
F6076	MW-3N	2/21/22 1601	2/25/22 1437	ND		ND		ND		ND	
F6077	GP-7	2/21/22 1303	2/25/22 1453	ND		ND		ND		ND	
F6078	GP-8	2/21/22 1335	2/25/22 1517	ND		ND		ND		ND	
F6079	GP-9	2/21/22 1435	2/25/22 1533	ND		ND		ND		ND	
F6080	Laboratory control charcoal blank										
F6081	NE-10D	2/21/22 1543	2/25/22 1543	ND		ND		ND		ND	
F6082	MW-21	2/21/22 1520	2/25/22 1604	514.4	0.483	ND		ND		ND	
F6083	PZ-2D	2/21/22 1630	2/25/22 1618	ND		ND		ND		ND	
F6084	MW-19	2/21/22 1707	2/25/22 1634	ND		ND		ND		ND	
F6085	MW-1N	2/21/22 0907	2/25/22 1642	ND		ND		ND		ND	

OUL Number	Station Name	Date/Time Placed	Date/Time Collected	Fluorescein Results		Eosine Results		RWT Results		SRB Results	
				Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)
F6086	C4-PZ-2	2/21/22 1725	2/25/22 1658	ND		ND		ND		ND	
F6087	C4-PZ-1	2/21/22 1800	2/25/22 1716	ND		ND		ND		ND	
F6088	C4-PZ-4	2/21/22 1800	2/25/22 1716	ND		ND		ND		ND	
F6089	C4-PZ-5	NDT	2/25/22 1715	ND		ND		ND		ND	

Note: Dye concentrations are based upon standards used at the OUL. The standard concentrations are based upon the as sold weight of the dye that the OUL uses.

If the client is not using OUL dyes, the client should provide the OUL with a sample of the dye to compare to the OUL dyes.

Footnotes: ND = No dye detected NDT = No date or time given

Thomas J. Aley, PHG and RG

hand delivered

OZARK UNDERGROUND LABORATORY, INC.

1572 Aley Lane Protem, MO 65733 (417) 785-4289 fax (417) 785-4290 email: contact@ozarkundergroundlab.com

SAMPLE COLLECTION DATA SHEET for FLUORESCENCE ANALYSIS

Project 00320-6100-016 EVLF Dye Trace **Week No:** 4 **Samples Collected By:** EWS / KMD

Samples Shipped By: JWM **Samples Received By:** C. Aley / OUL

Date Samples Shipped: 2/28/22 **Date Samples Received:** 2-28-22 **Time Samples Received:** 1100 **Return Cooler? Yes** ☐ **No** ☑

Bill to: accounting@ftn-assoc.com **Send Results to:** dld@ftn-assoc.com

Analyze for: ☑ Fluorescein ☑ Eosine ☑ Rhodamine WT ☑ Other SRB **Ship cooler to:**

OUL use only			Please indicate stations where dye was visible in the field — for field technician use - use black ink only (2-25-22 calm)					OUL use only
# CHAR REC'D	LAB NUMBER	STATION NUMBER 1-4 Numbers	STATION NAME	PLACED DATE	PLACED TIME	COLLECTED DATE	COLLECTED TIME	# WATER REC'D
1	F6068		WILDCAT CREEK @ WC31	2/23/22	1145	2/25/22	1215	0
1	F6069		MW-17	2/21/22	0941		1237	0
1	F6070		NE-4		1032		1255	0
1	F6071		GP-3		1330		1310	0
1	F6072		GP-5		1130		1347	0
1	F6073		MW-20		1643		1404	0
1	F6074		MW-2N		1650		1413	0
1	F6075		NE-13		1553		1430	0
1	F6076		MW-3N		1601		1437	0
1	F6077		GP-7		1303		1453	0
1	F6078		GP-8		1335		1517	0
1	F6079		GP-9		1435		1533	0
1	F6081		NE-10D		1543		1543	0
1	F6082		MW-21		1520		1604	0

COMMENTS Dye @ WILDCAT CREEK @ WC31 sample location
F6080 OUL Charcoal Blank

This sheet filled out by OUL staff? Yes ☐ **No** ☑ **Charts for samples on this page proofed by OUL:** CC

OUL Project No. 1926 **Date Analyzed:** 3-1-22 **Analyzed By:** A. Goers / OUL

hand delivered

OZARK UNDERGROUND LABORATORY, INC.

1572 Aley Lane Protem, MO 65733 (417) 785-4289 fax (417) 785-4290 email: contact@ozarkundergroundlab.com

SAMPLE COLLECTION DATA SHEET for FLUORESCENCE ANALYSIS

Project 0603202100-016 EVLF Dye Trace **Week No:** 4 **Samples Collected By:** EWS | KMD

Samples Shipped By: JWM **Samples Received By:** C. Aley / OUL

Date Samples Shipped: 2/21/22 **Date Samples Received:** 2-28-22 **Time Samples Received:** 1100 **Return Cooler? Yes** ☐ **No** ☑

Bill to: accounting@ftn-assoc.com **Send Results to:** dld@ftn-assoc.com

Analyze for: ☑ **Fluorescein** ☑ **Eosine** ☑ **Rhodamine WT** ☐ **Other** SRB **Ship cooler to:**

OUL use only			***Please indicate stations where dye was visible in the field*** *for field technician use - use black ink only*					*OUL use only*
# CHAR REC'D	LAB NUMBER	STATION NUMBER 1-4 Numbers	STATION NAME	PLACED DATE	PLACED TIME	COLLECTED DATE	COLLECTED TIME	# WATER REC'D
1	F6083		DZ-2D	2/21/22	1030	2/25/22	1013	0
1	F6084		MW-19	↓	1707	↓	1034	0
1	F6085		MW-1N		0907		1042	0
1	F6086		C4-PZ-2		1725		1658	0
1	F6087		C4-PZ-1		1800		1716	0
1	F6088		C4-PZ-4	↓	1800		1716	0
1	F6089		C4-PZ-5			↓	1715	0

COMMENTS

This sheet filled out by OUL staff? Yes ☐ **No** ☑ **Charts for samples on this page proofed by OUL:** CA

OUL Project No. 1926 **Date Analyzed:** 3-1-22 **Analyzed By:** A. Goers / OUL

BASIC INFORMATION ON TRACER DYE ANALYSIS BY OZARK UNDERGROUND LABORATORY

Note: More detailed information is available in the OUL's "Procedures and Criteria for the Analysis of Fluorescent Tracer Dyes in Water and Charcoal Samplers". This 20 page document can be downloaded from www.ozarkundergroundlab.com. Clients are welcome to attach the Procedures and Criteria document as an appendix to workplans or reports.

Normally acceptable emission wavelength ranges and detection limits for the four most commonly used tracer dyes in water samples and elutants from activated carbon samplers are shown in Table 1 below.

Table 1. RF-5301 Spectrofluorophotometer. Normal emission wavelength ranges and detection limits for fluorescein, eosine, rhodamine WT, and sulforhodamine B dyes in water and elutant samples.

Fluorescent Dye	Normal Acceptable Emission Wavelength Range (nm)		Detection Limit (ppb)	
	Elutant	Water	Elutant	Water
Eosine	539.3 to 545.1	532.5 to 537.0	0.050	0.015
Fluorescein	514.1 to 519.2	505.9 to 509.7	0.025	0.002
Rhodamine WT	564.6 to 571.2	571.9 to 577.2	0.170	0.015
Sulforhodamine B	575.2 to 582.0	580.1 to 583.7	0.080	0.008

Note: Detection limits are based upon the as-sold weight of the dye mixtures normally used by the OUL. Fluorescein and eosine detection limits in water are based on samples pH adjusted to greater than 9.5.

Detection limits are based on 3X signal to noise ratio determined from spiked samples. The normal acceptable emission wavelength range is based on a large suite of samples from actual field sites where the dyes are known to be present in the samples; the values shown are the mean plus and minus 2 standard deviations. Emission fluorescence peaks are a function of the instrument used, standard instrument settings, the dye, and the dye matrix. Contaminants in water samples may slightly alter peak emission wavelengths. In some cases fluorescence peaks may become shorter than shown in Table 1 as a result of decomposition of the tracer dyes. In most cases this is a very slow process.

All OUL carbon (charcoal) samplers contain 4.25 grams of activated carbon. Dyes are eluted from the carbon with 15 ml of an eluting solution which is a mixture of 5% aqua ammonia and 95% isopropyl alcohol solution and sufficient potassium hydroxide pellets to saturate the solution. The isopropyl alcohol solution is 70% alcohol and 30% water. The aqua ammonia solution is 29% ammonia and the remainder water. The potassium hydroxide is added until a super-saturated layer is visible in the bottom of the container. This super-saturated layer is not used for elution.

All water samples analyzed for fluorescein, eosine, rhodamine Wt and sulforhodamine B are pH adjusted to greater than pH 9.5 to maximize fluorescence intensity of these dyes. The pH adjustment is conducted by placing uncapped water samples in a high ammonia environment. If serial dilutions are required for water samples the diluting water used has been pH adjusted to greater than pH 9.5.

Ozark UNDERGROUND LABORATORY 1572 Aley Lane • Protem, MO 65733 • (417) 785-4289 • fax (417) 785-4290 • contact@ozarkundergroundlab.com

Certificate of Analysis

Date of certificate: March 2, 2022
Client: FTN Associates, Ltd
131990 Olive Blvd. Suite 204
Chesterfield, MO 63017
Project name: Eco-Vista Class 4 Landfill
Project number: 06820-0100-016
Contact people: Dana Derrington (dld@ftn-assoc.com)
Melissa Vaught (mmv@ftn-assoc.com)

Samples collected by: EWS/KMD
Date samples shipped: February 28, 2022
Date samples rec'd at OUL: March 1, 2022
Date analyzed by OUL: March 2, 2022
Included with certificate of analysis: Table of results, copy of sample collection data sheets and a page on basic analysis information

Results for charcoal samplers analyzed for the presence of fluorescein, eosine, rhodamine WT (RWT) and sulforhodamine B (SRB) dyes.

Peak wavelengths are reported in nanometers (nm); dye concentrations are reported in parts per billion (ppb).

OUL Number	Station Name	Date/Time Placed	Date/Time Collected	Fluorescein Results		Eosine Results		RWT Results		SRB Results	
				Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)
F6116	MW-17	2/25/22 1247	2/28/22 0854	ND		ND		ND		ND	
F6117	MW-1N	2/25/22 1649	2/28/22 0910	ND		ND		ND		ND	
F6118	NE-4	2/25/22 1300	2/28/22 0922	ND		ND		ND		ND	
F6119	GP-3	2/25/22 1338	2/28/22 0940	ND		ND		ND		ND	
F6120	Laboratory control charcoal blank										
F6121	GP-5	2/25/22 1351	2/28/22 1000	ND		ND		ND		ND	
F6122	GP-7	2/25/22 1509	2/28/22 1015	ND		ND		ND		ND	
F6123	GP-8	2/25/22 1523	2/28/22 1040	ND		ND		ND		ND	
F6124	GP-9	2/25/22 1538	2/28/22 1100	ND		ND		ND		ND	
F6125	NE-8	2/21/22 1453	2/28/22 1128	513.5 *	0.414	ND		ND		ND	
F6126	MW-10N	2/21/22 1505	2/28/22 1152	ND		ND		ND		ND	
F6127	MW-21	2/25/22 1610	2/28/22 1229	514.2	0.657	ND		ND		ND	
F6128	NE-10D	2/25/22 1551	2/28/22 1247	ND		ND		ND		ND	
F6129	NE-13	2/25/22 1433	2/28/22 1305	ND		ND		ND		ND	
F6130	MW-3N	2/25/22 1442	2/28/22 1315	ND		ND		ND		ND	
F6131	PZ-2D	2/25/22 1625	2/28/22 1340	515.2	35.8	ND		ND		ND	
F6132	MW-20	2/25/22 1408	2/28/22 1409	ND		ND		ND		ND	

OUL Number	Station Name	Date/Time Placed	Date/Time Collected	Fluorescein Results		Eosine Results		RWT Results		SRB Results	
				Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)
F6133	MW-2N	2/25/22 1418	2/28/22 1427	ND		ND		ND		ND	
F6134	MW-19	2/25/22 1635	2/28/22 1457	ND		ND		ND		ND	
F6135	C4-PZ-2	2/25/22 1703	2/28/22 1515	ND		ND		ND		ND	
F6136	C4-PZ-1	2/25/22 1725	2/28/22 1540	ND		ND		ND		ND	
F6137	C4-PZ-4	2/25/22 1725	2/28/22 1541	ND		ND		ND		ND	
F6138	C4-PZ-5	NDT	2/28/22 1600	ND		ND		ND		ND	
F6139	Wildcat Creek @ WC31	2/25/22 1220	2/28/22 1130	ND		ND		ND		579.6	1,070
F6140	Laboratory control charcoal blank										

Note: Dye concentrations are based upon standards used at the OUL. The standard concentrations are based upon the as sold weight of the dye that the OUL uses.

If the client is not using OUL dyes, the client should provide the OUL with a sample of the dye to compare to the OUL dyes.

Footnotes: ND = No dye detected NDT = No date or time given

* = A fluorescence peak is present that does not meet all the criteria for a positive dye result. However, it has been calculated as though it was the tracer dye.

Thomas J. Aley, PHG and RG

OZARK UNDERGROUND LABORATORY, INC.

1572 Aley Lane Protem, MO 65733 (417) 785-4289 fax (417) 785-4290 email: contact@ozarkundergroundlab.com

SAMPLE COLLECTION DATA SHEET for FLUORESCENCE ANALYSIS

Project 0820-0100-01e EVLF Dye Trace **Week No:** ___ **Samples Collected By:** EWS/KMD

Samples Shipped By: KMD **Samples Received By:** Amber Comstock/OUL

Date Samples Shipped: 2/28/22 **Date Samples Received:** 3/1/22 **Time Samples Received:** 1330 **Return Cooler?** Yes ☐ No ☑

Bill to: accounting@ftn-assoc.com **Send Results to:** did@ftn-assoc.com

Analyze for: ☑ Fluorescein ☑ Eosine ☑ Rhodamine WT ☑ Other SRB **Ship cooler to:** N/A

OUL use only			***Please indicate stations where dye was visible in the field*** *for field technician use - use black ink only*					OUL use only
# CHAR REC'D	LAB NUMBER	STATION NUMBER 1-4 Numbers	STATION NAME	PLACED DATE	PLACED TIME	COLLECTED DATE	COLLECTED TIME	# WATER REC'D
1	F6116		MW-17	2/25/22	1247	2/28/22	0854	0
1	F6117		MW-1N	↓	1049	↓	0910	0
1	F6118		NE-4		1300		0922	0
1	F6119		GP-3		1338		0940	0
1	F6121		GP-5		1351		1000	0
1	F6122		GP-7		1509		1015	0
1	F6123		GP-8		1523		1040	0
1	F6124		GP-9	↓	1538		1100	0
1	F6125		NE-8	2/21/22	1453		1128	0
1	F6126		MW-10N	↓	1505		1152	0
1	F6127		MW-21	2/25/22	1610		1229	0
1	F6128		NE-10D	↓	1551		1247	0
1	F6129		NE-13	↓	1433		1305	0
1	F6130		MW-3N	↓	1442	↓	1315	0

COMMENTS F6120 OUL Charcoal Blank

This sheet filled out by OUL staff? Yes ☐ No ☑ **Charts for samples on this page proofed by OUL:** CA

OUL Project No. 1926 **Date Analyzed:** 3/2/22 **Analyzed By:** AC/OUL

AC/OUL

OZARK UNDERGROUND LABORATORY, INC.

1572 Aley Lane Protem, MO 65733 (417) 785-4289 fax (417) 785-4290 email: contact@ozarkundergroundlab.com

SAMPLE COLLECTION DATA SHEET for FLUORESCENCE ANALYSIS

Project 06820-0100-016 EVLF Dye trace **Week No:** ___ **Samples Collected By:** EWS/KMD

Samples Shipped By: KMD **Samples Received By:** Amber Comstock/OUL

Date Samples Shipped: 2/28/22 **Date Samples Received:** 3/1/22 **Time Samples Received:** 1330 **Return Cooler?** Yes ☐ No ☑

Bill to: accounting@ftn-assoc.com **Send Results to:** dld@ftn-assoc.com

Analyze for: ☑ Fluorescein ☑ Eosine ☐ Rhodamine WT ☑ Other SRB **Ship cooler to:**

OUL use only			*Please indicate stations where dye was visible in the field* for field technician use - use black ink only					OUL use only
# CHAR REC'D	LAB NUMBER	STATION NUMBER 1-4 Numbers	STATION NAME	PLACED DATE	PLACED TIME	COLLECTED DATE	COLLECTED TIME	# WATER REC'D
1	F6131		PZ-20	2/25/22	1625	2/28/22	1340	0
1	F6132		MW-20		1408		1409	0
1	F6133		MW-2N		1418		1427	0
1	F6134		MW-19		1635		1457	0
1	F6135		CH-PZ-3		1703		1515	0
1	F6136		CH-PZ-1		1725		1540	0
1	F6137		CH-PZ-4		1725		1541	0
1	F6138		CH-PZ-5	N/A	N/A		1600	0
1	F6139		Wildcat Creek WC31	↓	1220	↓	1130	0

COMMENTS Dye visible in water at Wildcat Creek @ WC31 location
F6140 au Charcoal Blank

This sheet filled out by OUL staff? Yes ☐ No ☑ **Charts for samples on this page proofed by OUL:** CG

OUL Project No. 1926 **Date Analyzed:** 3/2/22 **Analyzed By:** AC/OUL

AC/OUL

BASIC INFORMATION ON TRACER DYE ANALYSIS BY OZARK UNDERGROUND LABORATORY

Note: More detailed information is available in the OUL's "Procedures and Criteria for the Analysis of Fluorescent Tracer Dyes in Water and Charcoal Samplers". This 20 page document can be downloaded from www.ozarkundergroundlab.com. Clients are welcome to attach the Procedures and Criteria document as an appendix to workplans or reports.

Normally acceptable emission wavelength ranges and detection limits for the four most commonly used tracer dyes in water samples and elutants from activated carbon samplers are shown in Table 1 below.

Table 1. RF-5301 Spectrofluorophotometer. Normal emission wavelength ranges and detection limits for fluorescein, eosine, rhodamine WT, and sulforhodamine B dyes in water and elutant samples.

Fluorescent Dye	**Normal Acceptable Emission Wavelength Range (nm)**		**Detection Limit (ppb)**	
	Elutant	**Water**	**Elutant**	**Water**
Eosine	539.3 to 545.1	532.5 to 537.0	0.050	0.015
Fluorescein	514.1 to 519.2	505.9 to 509.7	0.025	0.002
Rhodamine WT	564.6 to 571.2	571.9 to 577.2	0.170	0.015
Sulforhodamine B	575.2 to 582.0	580.1 to 583.7	0.080	0.008

Note: Detection limits are based upon the as-sold weight of the dye mixtures normally used by the OUL. Fluorescein and eosine detection limits in water are based on samples pH adjusted to greater than 9.5.

Detection limits are based on 3X signal to noise ratio determined from spiked samples. The normal acceptable emission wavelength range is based on a large suite of samples from actual field sites where the dyes are known to be present in the samples; the values shown are the mean plus and minus 2 standard deviations. Emission fluorescence peaks are a function of the instrument used, standard instrument settings, the dye, and the dye matrix. Contaminants in water samples may slightly alter peak emission wavelengths. In some cases fluorescence peaks may become shorter than shown in Table 1 as a result of decomposition of the tracer dyes. In most cases this is a very slow process.

All OUL carbon (charcoal) samplers contain 4.25 grams of activated carbon. Dyes are eluted from the carbon with 15 ml of an eluting solution which is a mixture of 5% aqua ammonia and 95% isopropyl alcohol solution and sufficient potassium hydroxide pellets to saturate the solution. The isopropyl alcohol solution is 70% alcohol and 30% water. The aqua ammonia solution is 29% ammonia and the remainder water. The potassium hydroxide is added until a super-saturated layer is visible in the bottom of the container. This super-saturated layer is not used for elution.

All water samples analyzed for fluorescein, eosine, rhodamine Wt and sulforhodamine B are pH adjusted to greater than pH 9.5 to maximize fluorescence intensity of these dyes. The pH adjustment is conducted by placing uncapped water samples in a high ammonia environment. If serial dilutions are required for water samples the diluting water used has been pH adjusted to greater than pH 9.5.

Ozark UNDERGROUND LABORATORY 1572 Aley Lane • Protem, MO 65733 • (417) 785-4289 • fax (417) 785-4290 • contact@ozarkundergroundlab.com

Certificate of Analysis

Date of certificate: March 10, 2022
Client: FTN Associates, Ltd
131990 Olive Blvd. Suite 204
Chesterfield, MO 63017
Project name: Eco-Vista Class 4 Landfill
Project number: 06820-0100-016
Contact people: Dana Derrington (dld@ftn-assoc.com)
Melissa Vaught (mmv@ftn-assoc.com)

Samples collected by: KMD
Date samples shipped: March 8, 2022
Date samples rec'd at OUL: March 9, 2022
Date analyzed by OUL: March 10, 2022
Included with certificate of analysis: Table of results, copy of sample collection data sheets and a page on basic analysis information

Results for charcoal samplers analyzed for the presence of fluorescein, eosine, rhodamine WT (RWT) and sulforhodamine B (SRB) dyes.

Peak wavelengths are reported in nanometers (nm); dye concentrations are reported in parts per billion (ppb).

OUL Number	Station Name	Date/Time Placed	Date/Time Collected	Fluorescein Results		Eosine Results		RWT Results		SRB Results	
				Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)
F6247	GP-5	2/28/22 1005	3/7/22 0935	ND		ND		ND		ND	
F6248	GP-7	2/28/22 1030	3/7/22 1002	ND		ND		ND		ND	
F6249	GP-8	2/28/22 1053	3/7/22 1040	ND		ND		ND		ND	
F6250	GP-9	2/28/22 1106	3/7/22 1059	ND		ND		ND		ND	
F6251	NE-10D	2/28/22 1256	3/7/22 1121	ND		ND		ND		ND	
F6252	NE-8	2/28/22 1137	3/7/22 1147	514.5 *	0.397	ND		ND		ND	
F6253	MW-10N	2/28/22 1219	3/7/22 1207	ND		ND		ND		ND	
F6254	MW-21	2/28/22 1237	3/7/22 1225	514.3	0.523	ND		ND		ND	
F6255	NE-13	2/28/22 1312	3/7/22 1240	ND		ND		ND		ND	
F6256	MW-3N	2/28/22 1320	3/7/22 1250	ND		ND		ND		ND	
F6257	MW-20	2/28/22 1420	3/7/22 1358	ND		ND		ND		ND	
F6258	MW-2N	2/28/22 1437	3/7/22 1415	ND		ND		ND		ND	
F6259	PZ-2D	2/28/22 1359	3/7/22 1445	515.3	14.9	ND		ND		ND	
F6260	Laboratory control charcoal blank										
F6261	C4-PZ-2	2/28/22 1521	3/7/22 1535	ND		ND		ND		ND	
F6262	C4-PZ-1	2/28/22 1552	3/7/22 1559	ND		ND		ND		ND	
F6263	MW-19	2/28/22 1502	3/7/22 1620	ND		ND		ND		ND	

OUL Number	Station Name	Date/Time Placed	Date/Time Collected	Fluorescein Results		Eosine Results		RWT Results		SRB Results	
				Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)
F6264	MW-1N	2/28/22 0914	3/7/22 1632	ND		ND		ND		ND	
F6265	MW-17	2/28/22 0901	3/7/22 1650	ND		ND		ND		ND	
F6266	GP-3	2/28/22 0950	3/7/22 1705	ND		ND		ND		ND	
F6267	NE-4	2/28/22 0925	3/7/22 1725	ND		ND		ND		ND	
F6268	C4-PZ-1D	2/28/22 1553	3/7/22 1600	ND		ND		ND		ND	
F6269	C4-PZ-1B	2/28/22 NT	3/7/22 1605	ND		ND		ND		ND	

Note: Dye concentrations are based upon standards used at the OUL. The standard concentrations are based upon the as sold weight of the dye that the OUL uses.

If the client is not using OUL dyes, the client should provide the OUL with a sample of the dye to compare to the OUL dyes.

Footnotes: ND = No dye detected NT = No time given

* = A fluorescence peak is present that does not meet all the criteria for a positive dye result. However, it has been calculated as though it was the tracer dye.

Thomas J. Aley, PHG and RG

OZARK UNDERGROUND LABORATORY, INC.

1572 Aley Lane Protem, MO 65733 (417) 785-4289 fax (417) 785-4290 email: contact@ozarkundergroundlab.com

SAMPLE COLLECTION DATA SHEET for FLUORESCENCE ANALYSIS

Project 06820-0100-016 FVLFDye Inc **Week No:** ___ **Samples Collected By:** KMO

Samples Shipped By: Kagan Davis (KMO) **Samples Received By:** Amber Comstock/OUL

Date Samples Shipped: 3/8/22 **Date Samples Received:** 3/9/22 **Time Samples Received:** 1400 **Return Cooler? Yes** ☐ **No** ☑

Bill to: FTN Associates, 3 Innwood Circle Ste. 220 Little Rock, 72211 **Send Results to:** Dana Derrington, dld@ftn-assoc.com

Analyze for: ☑ **Fluorescein** ☑ **Eosine** ☑ **Rhodamine WT** ☑ **Other** SRB **Ship cooler to:** N/A

OUL use only			***Please indicate stations where dye was visible in the field*** *for field technician use - use black ink only*					OUL use only
# CHAR REC'D	LAB NUMBER	STATION NUMBER 1-4 Numbers	STATION NAME	PLACED DATE	PLACED TIME	COLLECTED DATE	COLLECTED TIME	# WATER REC'D
1	F6247		GP-5	2/28/22	1005	3/7/22	0935	0
1	F6248		GP-7		1030		1002	0
1	F6249		GP-8		1053		1040	0
1	F6250		GP-9		1106		1059	0
1	F6251		NE-10D		1256		1121	0
1	F6252		NE-8		1137		1147	0
1	F6253		MW-10N		1219		1207	0
1	F6254		MW-21		1237		1225	0
1	F6255		NE-13		1312		1240 ~~1250~~	0
1	F6256		MW-3N		1320		1250	0
1	F6257		MW-20		1420		1358	0
1	F6258		MW-2N		1437		1415	0
1	F6259		P2-2D		1359		1445	0
1	F6261		C4-P2-2		1521		1535	0

KMO 3/7/22

COMMENTS Bill to email: accounting@ftn-assoc.com phone: 479-571-3334
F6260 OUL charcoal Blank

This sheet filled out by OUL staff? Yes ☐ **No** ☑ **Charts for samples on this page proofed by OUL:** CC

OUL Project No. 1926 **Date Analyzed:** 3/10/22 **Analyzed By:** AC/OUL

AC/OUL

OZARK UNDERGROUND LABORATORY, INC.

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SAMPLE COLLECTION DATA SHEET for FLUORESCENCE ANALYSIS

Project 06820-0100-016 EVLF Dye Trace **Week No:** ___ **Samples Collected By:** KMD

Samples Shipped By: Kagan Davis (KMD) **Samples Received By:** Amber Comstock/OUL

Date Samples Shipped: 3/8/22 **Date Samples Received:** 3/9/22 **Time Samples Received:** 1400 **Return Cooler?** Yes ☐ No ☑

Bill to: See page 1 **Send Results to:** See page 1

Analyze for: ☑ Fluorescein ☑ Eosine ☐ Rhodamine WT ☑ Other SRB **Ship cooler to:**

OUL use only		***Please indicate stations where dye was visible in the field*** *for field technician use - use black ink only*						OUL use only
# CHAR REC'D	LAB NUMBER	STATION NUMBER 1-4 Numbers	STATION NAME	PLACED DATE	PLACED TIME	COLLECTED DATE	COLLECTED TIME	# WATER REC'D
1	FL6262		C4-P2-1	2/28/22	1552	3/7/22	1539	0
1	FL6263		MW-19		1502		1620	0
1	FL6264		MW-18		0914		1632	0
1	FL6265		MW-17		0901		1650	0
1	FL6266		GP-3		0950		1705	0
1	FL6267		NE-4		0925		1725	0
1	FL6268		C4-P2-1D	1553	~~1600~~ KMD 3/7/22		1600	~~1600~~ KMD 0
1	FL6269		C4-P2-1B	N/A	~~1605~~		1605	~~1605~~ 3/7/22 0

COMMENTS

This sheet filled out by OUL staff? Yes ☐ **No** ☑ **Charts for samples on this page proofed by OUL:** CA

OUL Project No. 1926 **Date Analyzed:** 3/10/22 **Analyzed By:** AC/OUL

AC/OUL

BASIC INFORMATION ON TRACER DYE ANALYSIS BY OZARK UNDERGROUND LABORATORY

Note: More detailed information is available in the OUL's "Procedures and Criteria for the Analysis of Fluorescent Tracer Dyes in Water and Charcoal Samplers". This 20 page document can be downloaded from www.ozarkundergroundlab.com. Clients are welcome to attach the Procedures and Criteria document as an appendix to workplans or reports.

Normally acceptable emission wavelength ranges and detection limits for the four most commonly used tracer dyes in water samples and elutants from activated carbon samplers are shown in Table 1 below.

Table 1. RF-5301 Spectrofluorophotometer. Normal emission wavelength ranges and detection limits for fluorescein, eosine, rhodamine WT, and sulforhodamine B dyes in water and elutant samples.

Fluorescent Dye	Normal Acceptable Emission Wavelength Range (nm)		Detection Limit (ppb)	
	Elutant	Water	Elutant	Water
Eosine	539.3 to 545.1	532.5 to 537.0	0.050	0.015
Fluorescein	514.1 to 519.2	505.9 to 509.7	0.025	0.002
Rhodamine WT	564.6 to 571.2	571.9 to 577.2	0.170	0.015
Sulforhodamine B	575.2 to 582.0	580.1 to 583.7	0.080	0.008

Note: Detection limits are based upon the as-sold weight of the dye mixtures normally used by the OUL. Fluorescein and eosine detection limits in water are based on samples pH adjusted to greater than 9.5.

Detection limits are based on 3X signal to noise ratio determined from spiked samples. The normal acceptable emission wavelength range is based on a large suite of samples from actual field sites where the dyes are known to be present in the samples; the values shown are the mean plus and minus 2 standard deviations. Emission fluorescence peaks are a function of the instrument used, standard instrument settings, the dye, and the dye matrix. Contaminants in water samples may slightly alter peak emission wavelengths. In some cases fluorescence peaks may become shorter than shown in Table 1 as a result of decomposition of the tracer dyes. In most cases this is a very slow process.

All OUL carbon (charcoal) samplers contain 4.25 grams of activated carbon. Dyes are eluted from the carbon with 15 ml of an eluting solution which is a mixture of 5% aqua ammonia and 95% isopropyl alcohol solution and sufficient potassium hydroxide pellets to saturate the solution. The isopropyl alcohol solution is 70% alcohol and 30% water. The aqua ammonia solution is 29% ammonia and the remainder water. The potassium hydroxide is added until a super-saturated layer is visible in the bottom of the container. This super-saturated layer is not used for elution.

All water samples analyzed for fluorescein, eosine, rhodamine Wt and sulforhodamine B are pH adjusted to greater than pH 9.5 to maximize fluorescence intensity of these dyes. The pH adjustment is conducted by placing uncapped water samples in a high ammonia environment. If serial dilutions are required for water samples the diluting water used has been pH adjusted to greater than pH 9.5.

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Certificate of Analysis
Revised

Date of revised certificate: March 23, 2022
Date of original certificate: March 17, 2022
Client: FTN Associates, Ltd
131990 Olive Blvd. Suite 204
Chesterfield, MO 63017
Project name: Eco-Vista Class 4 Landfill
Project number: 06820-0100-016
Contact people: Dana Derrington (dld@ftn-assoc.com)
Melissa Vaught (mmv@ftn-assoc.com)

Samples collected by: KMD/EWS
Date samples shipped: March 15, 2022
Date samples rec'd at OUL: March 16, 2022
Date analyzed by OUL: March 17, 2022
Included with certificate of analysis: Table of results, copy of sample collection data sheets, discrepancy sheet and a page on basic analysis information

Results for charcoal samplers analyzed for the presence of fluorescein, eosine, rhodamine WT (RWT) and sulforhodamine B (SRB) dyes.

Peak wavelengths are reported in nanometers (nm); dye concentrations are reported in parts per billion (ppb).

OUL Number	Station Name	Date/Time Placed	Date/Time Collected	Fluorescein Results		Eosine Results		RWT Results		SRB Results	
				Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)
F6326	GP-5	3/7/22 0945	3/14/22 0930	ND		ND		ND		ND	
F6327	GP-7	3/7/22 1017	3/14/22 1007	ND		ND		ND		ND	
F6328	GP-8	3/7/22 1049	3/14/22 1026	ND		ND		ND		ND	
F6329	GP-9	3/7/22 1103	3/14/22 1105	ND		ND		ND		ND	
F6330	NE-10D	3/7/22 1135	3/14/22 1126	ND		ND		ND		ND	
F6331	NE-8	3/7/22 1154	3/14/22 1149	513.2 *	0.472	ND		ND		ND	
F6332	MW-10N	3/7/22 1217	3/14/22 1206	ND		ND		ND		ND	
F6333	MW-21	3/7/22 1504	3/14/22 1231	513.0 *	0.481	ND		ND		ND	
F6334	NE-13	3/7/22 1245	3/14/22 1310	ND		ND		ND		ND	
F6335	MW-3N	3/7/22 1256	3/14/22 1323	ND		ND		ND		ND	
F6336	MW-20	3/7/22 1408	3/14/22 1337	ND		ND		ND		ND	
F6337	MW-2N	3/7/22 1425	3/14/22 1348	ND		ND		ND		ND	
F6338	PZ-2D	3/7/22 1449	3/14/22 1412	515.4	18.4	ND		ND		ND	
F6339	C4-PZ-2	3/7/22 1540	3/14/22 1431	ND		ND		ND		ND	
F6340	Laboratory control charcoal blank										

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OUL Number	Station Name	Date/Time Placed	Date/Time Collected	Fluorescein Results		Eosine Results		RWT Results		SRB Results	
				Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)
F6341	C4-PZ-1	3/7/22 1611	3/14/22 1525	ND		ND		ND		ND	
F6342	MW-19	3/7/22 1625	3/14/22 1545	ND		ND		ND		ND	
F6343	MW-1N	3/7/22 1641	3/14/22 1602	ND		ND		ND		ND	
F6344	MW-17	3/7/22 1657	3/14/22 1621	ND		ND		ND		ND	
F6345	GP-3	3/7/22 1715	3/14/22 1638	ND		ND		ND		ND	
F6346	NE-4	3/7/22 1733	3/14/22 0934	ND		ND		ND		ND	
F6347	Wildcat Creek #1	3/8/22 1545	3/14/22 1710	ND		ND		ND		578.6	162
F6348	Wildcat Creek #2	3/8/22 1600	3/14/22 1720	ND		ND		ND		578.8	597
F6349	MW-21D	3/7/22 1505	3/14/22 1232	514.4	0.816	ND		ND		ND	
F6350	C4-PZ-1B	NDT	3/14/22 1528	ND		ND		ND		ND	

Note: Dye concentrations are based upon standards used at the OUL. The standard concentrations are based upon the as sold weight of the dye that the OUL uses.

If the client is not using OUL dyes, the client should provide the OUL with a sample of the dye to compare to the OUL dyes.

Footnotes: ND = No dye detected NDT = No date or time given

* = A fluorescence peak is present that does not meet all the criteria for a positive dye result. However, it has been calculated as though it was the tracer dye.

Thomas J. Aley, PHG and RG

OZARK UNDERGROUND LABORATORY, INC.

1572 Aley Lane Protem, MO 65733 (417) 785-4289 fax (417) 785-4290 email: contact@ozarkundergroundlab.com

SAMPLE COLLECTION DATA SHEET for FLUORESCENCE ANALYSIS

Project 06820-0100-016 Ellf Dye Trace **Week No:** ___ **Samples Collected By:** KMO / EWS

Samples Shipped By: Kagan Davis (KMO) **Samples Received By:** C. Alley OUL

Date Samples Shipped: 3/15/22 **Date Samples Received:** 3-16-22 **Time Samples Received:** 1330 **Return Cooler? Yes** ☐ **No** ☑

Bill to: FTN Associates, 3 Innwood Circle Ste, 220 Little Rock 72211 **Send Results to:** Dana Derrington, dld@ftn-assoc.com

Analyze for: ☑ Fluorescein ☑ Eosine ☑ Rhodamine WT ☑ Other SRB **Ship cooler to:** N/A

OUL use only		Please indicate stations where dye was visible in the field — for field technician use - use black ink only							OUL use only
# CHAR REC'D	LAB NUMBER	STATION NUMBER 1-4 Numbers	STATION NAME	PLACED		COLLECTED			# WATER REC'D
			Calcium ✱	DATE	TIME	DATE	TIME		
1	FL6326		GP-5 3-7-22	3/8/22	0945	3/14/22	0930		0
1	FL6327		GP-7		1017		1007		0
1	FL6328		GP-8		1049		1026		0
1	FL6329		GP-9		1103		1105		0
1	FL6330		WE-10D		1135		1126		0
1	FL6331		WE-8		1154		1149		0
1	FL6332		MW-10W		1217		1206		0
1	FL6333		MW-21		1504		1231		0
1	FL6334		WE-13		1245		1310		0
1	FL6335		MW-3W		1256		1323		0
1	FL6336		MW-20		1408		1337		0
1	FL6337		MW-2W		1425		1348		0
1	FL6338		P2-20		1449		1412		0
1	FL6339		C4-P2-2		1540		1431		0

COMMENTS Bill to email: accounting@ftn-assoc.com phone: 479-571-3334 ✱ see discrepancy sheet

FL6340 OUL charcoal blank

This sheet filled out by OUL staff? Yes ☐ **No** ☑ **Charts for samples on this page proofed by OUL:** CA

OUL Project No. 1926 **Date Analyzed:** 3/17/22 **Analyzed By:** A. Goers

OZARK UNDERGROUND LABORATORY, INC.

1572 Aley Lane Protem, MO 65733 (417) 785-4289 fax (417) 785-4290 email: contact@ozarkundergroundlab.com

SAMPLE COLLECTION DATA SHEET for FLUORESCENCE ANALYSIS

Project 06820-0100-016 EVLF Dye Trace **Week No:** ___ **Samples Collected By:** KMO

Samples Shipped By: Kagan Davis (KMO) **Samples Received By:** C. Aley / OUL

Date Samples Shipped: 3/15/22 **Date Samples Received:** 3-16-22 **Time Samples Received:** 1330 **Return Cooler?** Yes ☐ No ☑

Bill to: See page 1 **Send Results to:** See page 1

Analyze for: ☐ Fluorescein ☐ Eosine ☐ Rhodamine WT ☐ Other ___ **Ship cooler to:** ___

OUL use only		*Please indicate stations where dye was visible in the field* for field technician use - use black ink only							OUL use only
# CHAR REC'D	LAB NUMBER	STATION NUMBER 1-4 Numbers	STATION NAME	Colour (A-B)	PLACED DATE	PLACED TIME	COLLECTED DATE	COLLECTED TIME	# WATER REC'D
1	F6341		CH-P2-1	3-7-22	3/8/22	1611	3/14/22	1525	0
1	F6342		MW-19			1625		1545	0
1	F6343		MW-1W			1641		1602	0
1	F6344		MW-17			1657		1621	0
1	F6345		GP-3			1715		1638	0
1	F6346		WE-4			1733		0934	0
1	F6347		Wild Cat Creek #1	3-8-22	3/9/22	1545		1710	0
1	F6348		Wild Cat Creek #2	3-8-22	3/9/22	1600		1720	0
1	F6349		MW-21D	3-7-22	3/8/22	1505		1232	0
1	F6350		CH-P2-1B		N/A	N/A		1528	0

COMMENTS ___

This sheet filled out by OUL staff? Yes ☐ No ☑ **Charts for samples on this page proofed by OUL:** ___

OUL Project No. 1926 **Date Analyzed:** 3/17/22 **Analyzed By:** A. Goers

OZARK UNDERGROUND LABORATORY, INC.

DISCREPANCIES BETWEEN CHAIN-OF-CUSTODY SHEETS AND ACTUAL SAMPLES RECEIVED Page 1 of 1

Company & Project Name: ETN Associates **Date Rec'd by OUL:** 3-16-22 **Wk #** _____

06820-0100.-016 EVLF Dye Trace

Lab #	Sta #	Station Name	Date Pulled	Problem	Solution

Comments: Per M. Vaught on 3-23-22, The correct placement dates are 3/7/22 except for Wildcat Creek #1 and #2 which were placed 3/8/22.

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BASIC INFORMATION ON TRACER DYE ANALYSIS BY OZARK UNDERGROUND LABORATORY

Note: More detailed information is available in the OUL's "Procedures and Criteria for the Analysis of Fluorescent Tracer Dyes in Water and Charcoal Samplers". This 20 page document can be downloaded from www.ozarkundergroundlab.com. Clients are welcome to attach the Procedures and Criteria document as an appendix to workplans or reports.

Normally acceptable emission wavelength ranges and detection limits for the four most commonly used tracer dyes in water samples and elutants from activated carbon samplers are shown in Table 1 below.

Table 1. RF-5301 Spectrofluorophotometer. Normal emission wavelength ranges and detection limits for fluorescein, eosine, rhodamine WT, and sulforhodamine B dyes in water and elutant samples.

Fluorescent Dye	Normal Acceptable Emission Wavelength Range (nm)		Detection Limit (ppb)	
	Elutant	Water	Elutant	Water
Eosine	539.3 to 545.1	532.5 to 537.0	0.050	0.015
Fluorescein	514.1 to 519.2	505.9 to 509.7	0.025	0.002
Rhodamine WT	564.6 to 571.2	571.9 to 577.2	0.170	0.015
Sulforhodamine B	575.2 to 582.0	580.1 to 583.7	0.080	0.008

Note: Detection limits are based upon the as-sold weight of the dye mixtures normally used by the OUL.
Fluorescein and eosine detection limits in water are based on samples pH adjusted to greater than 9.5.

Detection limits are based on 3X signal to noise ratio determined from spiked samples. The normal acceptable emission wavelength range is based on a large suite of samples from actual field sites where the dyes are known to be present in the samples; the values shown are the mean plus and minus 2 standard deviations. Emission fluorescence peaks are a function of the instrument used, standard instrument settings, the dye, and the dye matrix. Contaminants in water samples may slightly alter peak emission wavelengths. In some cases fluorescence peaks may become shorter than shown in Table 1 as a result of decomposition of the tracer dyes. In most cases this is a very slow process.

All OUL carbon (charcoal) samplers contain 4.25 grams of activated carbon. Dyes are eluted from the carbon with 15 ml of an eluting solution which is a mixture of 5% aqua ammonia and 95% isopropyl alcohol solution and sufficient potassium hydroxide pellets to saturate the solution. The isopropyl alcohol solution is 70% alcohol and 30% water. The aqua ammonia solution is 29% ammonia and the remainder water. The potassium hydroxide is added until a super-saturated layer is visible in the bottom of the container. This super-saturated layer is not used for elution.

All water samples analyzed for fluorescein, eosine, rhodamine Wt and sulforhodamine B are pH adjusted to greater than pH 9.5 to maximize fluorescence intensity of these dyes. The pH adjustment is conducted by placing uncapped water samples in a high ammonia environment. If serial dilutions are required for water samples the diluting water used has been pH adjusted to greater than pH 9.5.

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Certificate of Analysis
Revised

Date of revised certificate: April 1, 2022
Date of original certificate: March 25, 2022
Client: FTN Associates, Ltd
131990 Olive Blvd. Suite 204
Chesterfield, MO 63017
Project name: Eco-Vista Class 4 Landfill
Project number: 06820-0100-016
Contact people: Dana Derrington (dld@ftn-assoc.com)
Melissa Vaught (mmv@ftn-assoc.com)

Samples collected by: (KMD) Kagon Davis
Date samples shipped: March 22, 2022
Date samples rec'd at OUL: March 23, 2022
Date analyzed by OUL: March 24, 2022
Included with certificate of analysis: Table of results, copy of sample collection data sheets and a page on basic analysis information

Results for charcoal samplers analyzed for the presence of fluorescein, eosine, rhodamine WT (RWT) and sulforhodamine B (SRB) dyes.

Peak wavelengths are reported in nanometers (nm); dye concentrations are reported in parts per billion (ppb).

OUL	Station Name	Date/Time	Date/Time	Fluorescein Results		Eosine Results		RWT Results		SRB Results	
Number		Placed	Collected	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)
F6436	GP-5	3/14/22 0940	3/21/22 0845	ND		ND		ND		ND	
F6437	GP-7	3/14/22 1017	3/21/22 0908	ND		ND		ND		ND	
F6438	GP-8	3/14/22 1036	3/21/22 0928	ND		ND		ND		ND	
F6439	GP-9	3/14/22 1116	3/21/22 0950	ND		ND		ND		ND	
F6440	Laboratory control charcoal blank										
F6441	NE-10D	3/14/22 1139	3/21/22 1010	ND		ND		ND		ND	
F6442	NE-8	3/14/22 1157	3/21/22 1035	511.8 *	0.409	ND		ND		ND	
F6443	MW-10N	3/14/22 1221	3/21/22 1051	ND		ND		ND		ND	
F6444	MW-21	3/14/22 1241	3/21/22 1110	515.8	0.626	ND		ND		ND	
F6445	NE-13	3/14/22 1318	3/21/22 1135	ND		ND		ND		ND	
F6446	MW-3N	3/14/22 1331	3/21/22 1143	ND		ND		ND		ND	
F6447	MW-20	3/14/22 1345	3/21/22 1211	ND		ND		ND		ND	
F6448	MW-2N	3/14/22 1358	3/21/22 1220	ND		ND		ND		ND	
F6449	PZ-2D	3/14/22 1421	3/21/22 1250	515.2	8.78	ND		ND		ND	
F6450	C4-PZ-2	3/14/22 1440	3/21/22 1336	ND		ND		ND		ND	

OUL Number	Station Name	Date/Time Placed	Date/Time Collected	Fluorescein Results		Eosine Results		RWT Results		SRB Results	
				Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)
F6451	C4-PZ-1	3/14/22 1533	3/21/22 1358	ND		ND		ND		ND	
F6452	MW-19	3/14/22 1557	3/21/22 1418	ND		ND		ND		ND	
F6453	MW-1N	3/14/22 1617	3/21/22 1430	ND		ND		ND		ND	
F6454	MW-17	3/14/22 1629	3/21/22 1443	ND		ND		ND		ND	
F6455	GP-3	3/14/22 1650	3/21/22 1500	ND		ND		ND		ND	
F6456	NE-4	3/14/22 1004	3/21/22 1530	ND		ND		ND		ND	
F6457	Wildcat Creek #1	3/14/22 1712	3/21/22 1605	ND		ND		ND		578.7	120
F6458	Wildcat Creek #2	3/14/22 1722	3/21/22 1610	ND		ND		ND		578.9	345
F6459	MW-21D	3/14/22 1241	3/21/22 1112	515.1	0.508	ND		ND		ND	
F6460	Laboratory control charcoal blank										
F6461	C4-PZ-1B	NDT	3/21/22 1408	ND		ND		ND		ND	

Note: Dye concentrations are based upon standards used at the OUL. The standard concentrations are based upon the as sold weight of the dye that the OUL uses.

If the client is not using OUL dyes, the client should provide the OUL with a sample of the dye to compare to the OUL dyes.

Footnotes: ND = No dye detected NDT = No date or time given

* = A fluorescence peak is present that does not meet all the criteria for a positive dye result. However, it has been calculated as though it was the tracer dye.

Thomas J. Aley, PHG and RG

OZARK UNDERGROUND LABORATORY, INC.

1572 Aley Lane Protem, MO 65733 (417) 785-4289 fax (417) 785-4290 email: contact@ozarkundergroundlab.com

SAMPLE COLLECTION DATA SHEET for FLUORESCENCE ANALYSIS

Project 06820-0100-016 EVLFDyeTrace **Week No:** ___ **Samples Collected By:** (KMD) Kagan Davis

Samples Shipped By: KMD **Samples Received By:** C. Aley / OUL

Date Samples Shipped: 3/22/22 **Date Samples Received:** 3-23-22 **Time Samples Received:** 1400 **Return Cooler?** Yes ☐ No ☑

Bill to: FTN Associates, 3 Ironwood Circle ste, 220 Little Rock 72211 **Send Results to:** Dana Derrington, dlbd@ftn-assoc.com

Analyze for: ☑ Fluorescein ☑ Eosine ☑ Rhodamine WT ☑ Other SRB **Ship cooler to:** N/A

OUL use only		*Please indicate stations where dye was visible in the field* for field technician use - use black ink only						OUL use only
# CHAR REC'D	LAB NUMBER	STATION NUMBER 1-4 Numbers	STATION NAME	PLACED		COLLECTED		# WATER REC'D
				DATE	TIME	DATE	TIME	
1	F6436		GP-5	3/14/22	0940	3/21/22	0845	0
1	F6437		GP-7		1017		0908	0
1	F6438		GP-8		1036		0928	0
1	F6439		GP-9		1116		0950	0
1	F6441		NE-10D		1139		1010	0
1	F6442		NE-8		1157		1035	0
1	F6443		MW-10N		1221		1051	0
1	F6444		MW-21		1241		1110	0
1	F6445		NE-13		1318		1135	0
1	F6446		MW-3N		1331		1143	0
1	F6447		MW-20		1345		1211	0
1	F6448		MW-2N		1358		1220	0
1	F6449		P2-2D		1421		1250	0
1	F6450		C4-P2-2		1440		1336	0

COMMENTS Bill to email: accounting@ftn-assoc.com
F6440 OUL charcoal blank

This sheet filled out by OUL staff? Yes ☐ **No** ☑ **Charts for samples on this page proofed by OUL:** AC/OUL

OUL Project No. 1926 **Date Analyzed:** 3/24/22 **Analyzed By:** A. Groves/OUL

OZARK UNDERGROUND LABORATORY, INC.

1572 Aley Lane Protem, MO 65733 (417) 785-4289 fax (417) 785-4290 email: contact@ozarkundergroundlab.com

SAMPLE COLLECTION DATA SHEET for FLUORESCENCE ANALYSIS

Project 0820-0100-016 EVLF Dye Trace **Week No:** ___ **Samples Collected By:** (KMD) Keagan Davis

Samples Shipped By: KMD **Samples Received By:** C. Aley OUL

Date Samples Shipped: 3/22/22 **Date Samples Received:** 3-23-22 **Time Samples Received:** 1400 **Return Cooler? Yes** ☐ **No** ☑

Bill to: FTN Associates - See page 1 **Send Results to:** See page 1

Analyze for: ☑ Fluorescein ☐ Eosine ☑ Rhodamine WT ☑ Other SRB **Ship cooler to:** N/A

OUL use only		Please indicate stations where dye was visible in the field for field technician use - use black ink only						OUL use only
# CHAR REC'D	LAB NUMBER	STATION NUMBER 1-4 Numbers	STATION NAME	PLACED DATE	PLACED TIME	COLLECTED DATE	COLLECTED TIME	# WATER REC'D
1	F6451		CH-PZ-1	3/14/22	1533	3/21/22	1358	0
1	F6452		MW-19		1557		1418	0
1	F6453		MW-18		1617		1430	0
1	F6454		MW-17		1629		1443	0
1	F6455		GP-3		1650		1500	0
1	F6456		NE-4		1004		1530	0
1	F6457		Wild Cat Creek #1		1712		1605	0
1	F6458		Wild Cat Creek #2		1722		1610	0
1	F6459		MW-21D		1241		1112	0
1	F6461		CH-PZ-1B		~~1528~~		1408	0

T + Analyzed by AG

Analyzed by AC

per M. Vaught, no date or time given. ca/OUL

COMMENTS F6460 OUL Charcoal blank

This sheet filled out by OUL staff? Yes ☐ **No** ☑ **Charts for samples on this page proofed by OUL:** AC/OUL

OUL Project No. 1926 **Date Analyzed:** 3/24/22 **Analyzed By:** AC + AG

BASIC INFORMATION ON TRACER DYE ANALYSIS BY OZARK UNDERGROUND LABORATORY

Note: More detailed information is available in the OUL's "Procedures and Criteria for the Analysis of Fluorescent Tracer Dyes in Water and Charcoal Samplers". This 20 page document can be downloaded from www.ozarkundergroundlab.com. Clients are welcome to attach the Procedures and Criteria document as an appendix to workplans or reports.

Normally acceptable emission wavelength ranges and detection limits for the four most commonly used tracer dyes in water samples and elutants from activated carbon samplers are shown in Table 1 below.

Table 1. RF-5301 Spectrofluorophotometer. Normal emission wavelength ranges and detection limits for fluorescein, eosine, rhodamine WT, and sulforhodamine B dyes in water and elutant samples.

Fluorescent Dye	Normal Acceptable Emission Wavelength Range (nm)		Detection Limit (ppb)	
	Elutant	Water	Elutant	Water
Eosine	539.3 to 545.1	532.5 to 537.0	0.050	0.015
Fluorescein	514.1 to 519.2	505.9 to 509.7	0.025	0.002
Rhodamine WT	564.6 to 571.2	571.9 to 577.2	0.170	0.015
Sulforhodamine B	575.2 to 582.0	580.1 to 583.7	0.080	0.008

Note: Detection limits are based upon the as-sold weight of the dye mixtures normally used by the OUL.
Fluorescein and eosine detection limits in water are based on samples pH adjusted to greater than 9.5.

Detection limits are based on 3X signal to noise ratio determined from spiked samples. The normal acceptable emission wavelength range is based on a large suite of samples from actual field sites where the dyes are known to be present in the samples; the values shown are the mean plus and minus 2 standard deviations. Emission fluorescence peaks are a function of the instrument used, standard instrument settings, the dye, and the dye matrix. Contaminants in water samples may slightly alter peak emission wavelengths. In some cases fluorescence peaks may become shorter than shown in Table 1 as a result of decomposition of the tracer dyes. In most cases this is a very slow process.

All OUL carbon (charcoal) samplers contain 4.25 grams of activated carbon. Dyes are eluted from the carbon with 15 ml of an eluting solution which is a mixture of 5% aqua ammonia and 95% isopropyl alcohol solution and sufficient potassium hydroxide pellets to saturate the solution. The isopropyl alcohol solution is 70% alcohol and 30% water. The aqua ammonia solution is 29% ammonia and the remainder water. The potassium hydroxide is added until a super-saturated layer is visible in the bottom of the container. This super-saturated layer is not used for elution.

All water samples analyzed for fluorescein, eosine, rhodamine Wt and sulforhodamine B are pH adjusted to greater than pH 9.5 to maximize fluorescence intensity of these dyes. The pH adjustment is conducted by placing uncapped water samples in a high ammonia environment. If serial dilutions are required for water samples the diluting water used has been pH adjusted to greater than pH 9.5.

Ozark UNDERGROUND LABORATORY 1572 Aley Lane • Protem, MO 65733 • (417) 785-4289 • fax (417) 785-4290 • contact@ozarkundergroundlab.com

Certificate of Analysis

Date of certificate: April 4, 2022
Client: FTN Associates, Ltd
131990 Olive Blvd. Suite 204
Chesterfield, MO 63017
Project name: Eco-Vista Class 4 Landfill
Project number: 06820-0100-016
Contact people: Dana Derrington (dld@ftn-assoc.com)
Melissa Vaught (mmv@ftn-assoc.com)

Samples collected by: (KMD) Kagon Davis
Date samples shipped: March 29, 2022
Date samples rec'd at OUL: March 30, 2022
Date analyzed by OUL: April 1, 2022
Included with certificate of analysis: Table of results, copy of sample collection data sheets and a page on basic analysis information

Results for charcoal samplers analyzed for the presence of fluorescein, eosine, rhodamine WT (RWT) and sulforhodamine B (SRB) dyes.

Peak wavelengths are reported in nanometers (nm); dye concentrations are reported in parts per billion (ppb).

OUL	Station Name	Date/Time	Date/Time	Fluorescein Results		Eosine Results		RWT Results		SRB Results	
Number		Placed	Collected	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)
F6526	GP-5	3/21/22 0858	3/28/22 1030	ND		ND		ND		ND	
F6527	GP-7	3/21/22 0918	3/28/22 1058	ND		ND		ND		ND	
F6528	GP-8	3/21/22 0942	3/28/22 1113	ND		ND		ND		ND	
F6529	GP-9	3/21/22 1003	3/28/22 1130	ND		ND		ND		ND	
F6530	NE-10D	3/21/22 1019	3/28/22 1153	ND		ND		ND		ND	
F6531	NE-8	3/21/22 1041	3/28/22 1211	ND		ND		ND		ND	
F6532	MW-10N	3/21/22 1103	3/28/22 1227	ND		ND		ND		ND	
F6533	MW-21	3/21/22 1123	3/28/22 1254	514.6	0.678	ND		ND		ND	
F6534	NE-13	3/21/22 1141	3/28/22 1330	ND		ND		ND		ND	
F6535	MW-3N	3/21/22 1154	3/28/22 1340	ND		ND		ND		ND	
F6536	MW-20	3/21/22 1217	3/28/22 1402	ND		ND		ND		ND	
F6537	MW-2N	3/21/22 1231	3/28/22 1421	ND		ND		ND		ND	
F6538	PZ-2D	3/21/22 1255	3/28/22 1500	515.3	8.48	ND		ND		ND	
F6539	C4-PZ-2	3/21/22 1343	3/28/22 1530	ND		ND		ND		ND	
F6540	Laboratory control charcoal blank										
F6541	C4-PZ-1	3/21/22 1405	3/28/22 1557	ND		ND		ND		ND	
F6542	MW-19	3/21/22 1422	3/28/22 1616	ND		ND		ND		ND	

OUL Number	Station Name	Date/Time Placed	Date/Time Collected	Fluorescein Results		Eosine Results		RWT Results		SRB Results	
				Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)
F6543	MW-1N	3/21/22 1437	3/28/22 1636	ND		ND		ND		ND	
F6544	MW-17	3/21/22 1448	3/28/22 1703	ND		ND		ND		ND	
F6545	GP-3	3/21/22 1515	3/28/22 1722	ND		ND		ND		ND	
F6546	NE-4	3/21/22 1540	3/28/22 1740	ND		ND		ND		ND	
F6547	Wildcat Creek #1	3/21/22 1607	3/28/22 1815	ND		ND		ND		578.5	73.6
F6548	Wildcat Creek #2	3/21/22 1612	3/28/22 1820	ND		ND		ND		578.9	309
F6549	MW-21D	3/21/22 1123	3/28/22 1259	514.4 *	0.565	ND		ND		ND	
F6550	C4-PZ-1B	NDT	3/28/22 1610	ND		ND		ND		ND	

Note: Dye concentrations are based upon standards used at the OUL. The standard concentrations are based upon the as sold weight of the dye that the OUL uses.

If the client is not using OUL dyes, the client should provide the OUL with a sample of the dye to compare to the OUL dyes.

Footnotes: ND = No dye detected NDT = No date or time given

* = A fluorescence peak is present that does not meet all the criteria for a positive dye result. However, it has been calculated as though it was the tracer dye.

Thomas J. Aley, PHG and RG

OZARK UNDERGROUND LABORATORY, INC.

1572 Aley Lane Protem, MO 65733 (417) 785-4289 fax (417) 785-4290 email: contact@ozarkundergroundlab.com

SAMPLE COLLECTION DATA SHEET for FLUORESCENCE ANALYSIS

Project 06820-0100-016 FULF Dye Study **Week No:** ___ **Samples Collected By:** Kagan Davis (KMD)

Samples Shipped By: KMD **Samples Received By:** C. Caley/OUL

Date Samples Shipped: 3/29/22 **Date Samples Received:** 3-30-22 **Time Samples Received:** 1415 **Return Cooler?** Yes ☐ No ☑

Bill to: See page 1 **Send Results to:** See page 1

Analyze for: ☑ Fluorescein ☑ Eosine ☑ Rhodamine WT ☑ Other SRB **Ship cooler to:** ___

OUL use only			*Please indicate stations where dye was visible in the field* for field technician use - use black ink only					OUL use only
# CHAR REC'D	LAB NUMBER	STATION NUMBER 1-4 Numbers	STATION NAME	PLACED DATE	PLACED TIME	COLLECTED DATE	COLLECTED TIME	# WATER REC'D
1	FL6541		C4-PZ-1	3/21/22	1405	3/28/22	1557	0
1	FL6542		MW-19		1422		1616	0
1	FL6543		MW-1N		1437		1636	0
1	FL6544		MW-17		1448		1703	0
1	FL6545		GP-3		1515		1722	0
1	FL6546		NE-4		1540		1740	0
1	FL6547		Wild Cat Creek #1		1607		1815	0
1	FL6548		Wild Cat Creek #2		1612		1820	0
1	FL6549		MW-21D	3/21/22	1123		1259	0
1	FL6550		C4-PZ-1B	N/A	N/A		1610	0

COMMENTS ___

This sheet filled out by OUL staff? Yes ☐ No ☑ **Charts for samples on this page proofed by OUL:** CA

OUL Project No. 1926 **Date Analyzed:** 4/1/22 **Analyzed By:** AC/OUL

OZARK UNDERGROUND LABORATORY, INC.

1572 Aley Lane Protem, MO 65733 (417) 785-4289 fax (417) 785-4290 email: contact@ozarkundergroundlab.com

SAMPLE COLLECTION DATA SHEET for FLUORESCENCE ANALYSIS

Project 06820-0100-016 EVLF Age Study **Week No:** ___ **Samples Collected By:** Kagan Davis (KMO)

Samples Shipped By: KMO **Samples Received By:** C. Aley OUL

Date Samples Shipped: 3/29/22 **Date Samples Received:** 3-30-22 **Time Samples Received:** 1415 **Return Cooler?** Yes ☐ No ☑

Bill to: FTN Associates, 3 Innwood Circle Ste, 220, Little Rock 72211 **Send Results to:** Dana Derrington, dbd@ftn-assoc.com

Analyze for: ☑ Fluorescein ☑ Eosine ☑ Rhodamine WT ☑ Other SRB **Ship cooler to:** ___

OUL use only			***Please indicate stations where dye was visible in the field*** *for field technician use - use black ink only*					OUL use only
# CHAR REC'D	LAB NUMBER	STATION NUMBER 1-4 Numbers	STATION NAME	PLACED 0858 DATE	PLACED 0858 TIME	COLLECTED DATE	COLLECTED TIME	# WATER REC'D
1	FL6526		GP-5	3/21/22	~~0858~~ 0858	3/28/22	1030	0
1	FL6527		GP-7		0918		1058	0
1	FL6528		GP-8		0942		1113	0
1	FL6529		GP-9		1003		1130	0
1	FL6530		NE-10D		1019		1153	0
1	FL6531		NE-8		1041		1211	0
1	FL6532		MW-10N		1103		1227	0
1	FL6533		MW-21		1123		1254	0
1	FL6534		NE-13		1141		1330	0
1	FL6535		MW-3N		1154		1340	0
1	FL6536		MW-20		1217		1402	0
1	FL6537		MW-2N		1231		1421	0
1	FL6538		PZ-20		1255		1500	0
1	FL6539		CH-PZ-2		1343		1530	0

COMMENTS Bill to email: accounting@ftn-assoc.com
FL6540 OUL Charcoal Blank

This sheet filled out by OUL staff? Yes ☐ **No** ☑ **Charts for samples on this page proofed by OUL:** CA

OUL Project No. 1926 **Date Analyzed:** 4/1/22 **Analyzed By:** AC/OUL

BASIC INFORMATION ON TRACER DYE ANALYSIS BY OZARK UNDERGROUND LABORATORY

Note: More detailed information is available in the OUL's "Procedures and Criteria for the Analysis of Fluorescent Tracer Dyes in Water and Charcoal Samplers". This 20 page document can be downloaded from www.ozarkundergroundlab.com. Clients are welcome to attach the Procedures and Criteria document as an appendix to workplans or reports.

Normally acceptable emission wavelength ranges and detection limits for the four most commonly used tracer dyes in water samples and elutants from activated carbon samplers are shown in Table 1 below.

Table 1. RF-5301 Spectrofluorophotometer. Normal emission wavelength ranges and detection limits for fluorescein, eosine, rhodamine WT, and sulforhodamine B dyes in water and elutant samples.

Fluorescent Dye	Normal Acceptable Emission Wavelength Range (nm)		Detection Limit (ppb)	
	Elutant	Water	Elutant	Water
Eosine	539.3 to 545.1	532.5 to 537.0	0.050	0.015
Fluorescein	514.1 to 519.2	505.9 to 509.7	0.025	0.002
Rhodamine WT	564.6 to 571.2	571.9 to 577.2	0.170	0.015
Sulforhodamine B	575.2 to 582.0	580.1 to 583.7	0.080	0.008

Note: Detection limits are based upon the as-sold weight of the dye mixtures normally used by the OUL. Fluorescein and eosine detection limits in water are based on samples pH adjusted to greater than 9.5.

Detection limits are based on 3X signal to noise ratio determined from spiked samples. The normal acceptable emission wavelength range is based on a large suite of samples from actual field sites where the dyes are known to be present in the samples; the values shown are the mean plus and minus 2 standard deviations. Emission fluorescence peaks are a function of the instrument used, standard instrument settings, the dye, and the dye matrix. Contaminants in water samples may slightly alter peak emission wavelengths. In some cases fluorescence peaks may become shorter than shown in Table 1 as a result of decomposition of the tracer dyes. In most cases this is a very slow process.

All OUL carbon (charcoal) samplers contain 4.25 grams of activated carbon. Dyes are eluted from the carbon with 15 ml of an eluting solution which is a mixture of 5% aqua ammonia and 95% isopropyl alcohol solution and sufficient potassium hydroxide pellets to saturate the solution. The isopropyl alcohol solution is 70% alcohol and 30% water. The aqua ammonia solution is 29% ammonia and the remainder water. The potassium hydroxide is added until a super-saturated layer is visible in the bottom of the container. This super-saturated layer is not used for elution.

All water samples analyzed for fluorescein, eosine, rhodamine Wt and sulforhodamine B are pH adjusted to greater than pH 9.5 to maximize fluorescence intensity of these dyes. The pH adjustment is conducted by placing uncapped water samples in a high ammonia environment. If serial dilutions are required for water samples the diluting water used has been pH adjusted to greater than pH 9.5.

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Certificate of Analysis

Date of certificate: April 7, 2022
Client: FTN Associates, Ltd
131990 Olive Blvd. Suite 204
Chesterfield, MO 63017
Project name: Eco-Vista Class 4 Landfill
Project number: 06820-0100-016
Contact people: Dana Derrington (dld@ftn-assoc.com)
Melissa Vaught (mmv@ftn-assoc.com)

Samples collected by: EWS
Date samples shipped: April 4, 2022
Date samples rec'd at OUL: April 5, 2022
Date analyzed by OUL: April 6, 2022
Included with certificate of analysis: Table of results, copy of sample collection data sheets, discrepancy sheet and a page on basic analysis information

Results for charcoal samplers analyzed for the presence of fluorescein, eosine, rhodamine WT (RWT) and sulforhodamine B (SRB) dyes.

Peak wavelengths are reported in nanometers (nm); dye concentrations are reported in parts per billion (ppb).

OUL Number	Station Name	Date/Time Placed	Date/Time Collected	Fluorescein Results		Eosine Results		RWT Results		SRB Results	
				Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)
F6617	GP-5	3/28/22 1038	4/4/22 0830	ND		ND		ND		ND	
F6618	GP-7	3/28/22 1108	4/4/22 0848	ND		ND		ND		ND	
F6619	GP-8	3/28/22 1125	4/4/22 0901	ND		ND		ND		ND	
F6620	Laboratory control charcoal blank										
F6621	GP-9	3/28/22 1142	4/4/22 0922	ND		ND		ND		ND	
F6622	NE-10D	3/28/22 1204	4/4/22 0937	ND		ND		ND		ND	
F6623	NE-8	3/28/22 1218	4/4/22 0956	513.7 *	0.514	ND		ND		ND	
F6624	MW-10N	3/28/22 1238	4/4/22 1009	ND		ND		ND		ND	
F6625	MW-21	3/28/22 1308	4/4/22 1025	515.4	0.472	ND		ND		ND	
F6626	NE-13	3/28/22 1338	4/4/22 1040	ND		ND		ND		ND	
F6627	MW-3N	3/28/22 1350	4/4/22 1049	ND		ND		ND		ND	
F6628	MW-20	3/28/22 1415	4/4/22 1146	ND		ND		ND		ND	
F6629	MW-2N	3/28/22 1440	4/4/22 1156	ND		ND		ND		ND	
F6630	PZ-2D	3/28/22 1515	4/4/22 1222	515.1	8.83	ND		ND		ND	
F6631	C4-PZ-2	3/28/22 1539	4/4/22 1235	ND		ND		ND		ND	
F6632	MW-21D	3/28/22 1308	4/4/22 1025	514.8	0.795	ND		ND		ND	
F6633	C4-PZ-1	3/28/22 1608	4/4/22 1321	ND		ND		ND		ND	

OUL Number	Station Name	Date/Time Placed	Date/Time Collected	Fluorescein Results		Eosine Results		RWT Results		SRB Results	
				Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)
F6634	C4-PZ-1B	NDT	4/4/22 1327	ND		ND		ND		ND	
F6635	MW-19	3/28/22 1630	4/4/22 1337	ND		ND		ND		ND	
F6636	MW-1N	3/28/22 1650	4/4/22 1350	ND		ND		ND		ND	
F6637	MW-17	3/28/22 1713	4/4/22 1407	ND		ND		ND		ND	
F6638	GP-3	3/28/22 1734	4/4/22 1422	ND		ND		ND		ND	
F6639	NE-4	3/28/22 1754	4/4/22 1440	ND		ND		ND		ND	
F6640	Laboratory control charcoal blank										
F6641	Wildcat Creek #1	3/28/22 1817	4/4/22 1504	ND		ND		ND		578.6	82.7
F6642	Wildcat Creek #2	3/28/22 1823	4/4/22 1525	ND		ND		ND		578.6	155

Note: Dye concentrations are based upon standards used at the OUL. The standard concentrations are based upon the as sold weight of the dye that the OUL uses.

If the client is not using OUL dyes, the client should provide the OUL with a sample of the dye to compare to the OUL dyes.

Footnotes: ND = No dye detected NDT = No date or time given

* = A fluorescence peak is present that does not meet all the criteria for a positive dye result. However, it has been calculated as though it was the tracer dye.

Thomas J. Aley, PHG and RG

OZARK UNDERGROUND LABORATORY, INC.

1572 Aley Lane Protem, MO 65733 (417) 785-4289 fax (417) 785-4290 email: contact@ozarkundergroundlab.com

SAMPLE COLLECTION DATA SHEET for FLUORESCENCE ANALYSIS

Project 0620-0100-016 EVLF **Week No:** **Samples Collected By:** EWS

Samples Shipped By: EWS **Samples Received By:** C. Aley/OUL

Date Samples Shipped: 4/4/22 **Date Samples Received:** 4-5-22 **Time Samples Received:** 1330 **Return Cooler?** Yes ☐ No ☑

Bill to: accounting@ftn-assoc.com **Send Results to:** dld@ftn-assoc.com

Analyze for: ☑ Fluorescein ☑ Eosine ☑ Rhodamine WT ☑ Other SRB **Ship cooler to:**

OUL use only			*Please indicate stations where dye was visible in the field* for field technician use - use black ink only					OUL use only
# CHAR REC'D	LAB NUMBER	STATION NUMBER 1-4 Numbers	STATION NAME	PLACED DATE	PLACED TIME	COLLECTED DATE	COLLECTED TIME	# WATER REC'D
1	F6617		GP-5	3/25/22	1038	4/4/22	0830	0
1	F6618		GP-7		1108 4/4/22		0848	0
1	F6619		GP-8		1135		0901	0
1	F6621		GP-9		1142		0922	0
1	F6622		NE-10D		1204		0937	0
1	F6623		NE-8		1218		0956	0
1	F6624		MW-10N		1238		1009	0
1	F6625		MW-21		1308		1025	0
1	F6626		NE-13		1338		1040	0
1	F6627		MW-3N		1350		1049	0
1	F6628		MW-20		1415		1140	0
1	F6629		MW-2N		1440		1150	0
1	F6630		PZ-2D		1515		1222	0
1	F6631		C4-PZ-2	↓	1539	↓	1235	0

COMMENTS F6620 OUL Charcoal Blank

This sheet filled out by OUL staff? Yes ☐ No ☑ **Charts for samples on this page proofed by OUL:** CA

OUL Project No. 1926 **Date Analyzed:** 4/6/22 **Analyzed By** AC/OUL

OZARK UNDERGROUND LABORATORY, INC.

1572 Aley Lane Protem, MO 65733 (417) 785-4289 fax (417) 785-4290 email: contact@ozarkundergroundlab.com

SAMPLE COLLECTION DATA SHEET for FLUORESCENCE ANALYSIS

Project 060820-0100-0116 EVLF **Week No:** ___ **Samples Collected By:** EWS

Samples Shipped By: EWS **Samples Received By:** C. Aley / OUL

Date Samples Shipped: 4/4/22 **Date Samples Received:** 4-5-22 **Time Samples Received:** 1330 **Return Cooler?** Yes ☐ No ☑

Bill to: accounting@ftn-assoc.com **Send Results to:** dld@ftn-assoc.com

Analyze for: ☑ Fluorescein ☑ Eosine ☑ Rhodamine WT ☑ Other SRB **Ship cooler to:**

OUL use only		Please indicate stations where dye was visible in the field — for field technician use - use black ink only							OUL use only	
# CHAR REC'D	LAB NUMBER	STATION NUMBER 1-4 Numbers	STATION NAME	PLACED		COLLECTED			# WATER REC'D	
				DATE	TIME	DATE	TIME			
1	F66632		MW-21D	3/28/22	1308	4/4/22	1025		0	
1	F66633		C4-PZ-1	↓	1721608	↓	1321	(*)	0	
1	F66634		C4-PZ-1B	N/A	N/A	↓	~~1325~~	1327	0	
1	F66635		MW-19	3/29/22	1030	↓	1337	CA OUL	0	
1	F66636		MW-1N	↓	1650	↓	1350		0	
1	F66637		MW-17	↓	1713	↓	1457		0	
1	F66638		GP-3	↓	1734	↓	1422		0	
1	F66639		NE-4	↓	1754	↓	1440		0	
1	F66641		Wild Cat Creek #1	↓	1817	↓	1504		0	
1	F66642		Wild Cat Creek #2	↓	1823	↓	1525		0	

COMMENTS F66640 OUL Charcoal Blank (*) see discrepancy sheet

This sheet filled out by OUL staff? Yes ☐ **No** ☑ **Charts for samples on this page proofed by OUL:** CA

OUL Project No. 1926 **Date Analyzed:** 4/6/22 **Analyzed By:** AC/OUL

OZARK UNDERGROUND LABORATORY, INC.

DISCREPANCIES BETWEEN CHAIN-OF-CUSTODY SHEETS AND ACTUAL SAMPLES RECEIVED Page 1 of 1

Company & Project Name: FTN / Eco-Vista LF **Date Rec'd by OUL:** 4-5-22 **Wk #** —

Lab #	Sta #	Station Name	Date Pulled	Problem	Solution
F6631		C4-PZ-2	4/4/22	Station name on COC is C4-PZ-2 and sample has C4-PZ-2D	Per email from EStudebaker COC is correct
E6634		C4-PZ-1B	4/4/22	Collection time on COC is 1326 and sample has 1327.	Per email from EStudebaker Sample is correct.

Comments:

f:\shared\forms\dscrpsht.doc
rev. 12/28/99

BASIC INFORMATION ON TRACER DYE ANALYSIS BY OZARK UNDERGROUND LABORATORY

Note: More detailed information is available in the OUL's "Procedures and Criteria for the Analysis of Fluorescent Tracer Dyes in Water and Charcoal Samplers". This 20 page document can be downloaded from www.ozarkundergroundlab.com. Clients are welcome to attach the Procedures and Criteria document as an appendix to workplans or reports.

Normally acceptable emission wavelength ranges and detection limits for the four most commonly used tracer dyes in water samples and elutants from activated carbon samplers are shown in Table 1 below.

Table 1. RF-5301 Spectrofluorophotometer. Normal emission wavelength ranges and detection limits for fluorescein, eosine, rhodamine WT, and sulforhodamine B dyes in water and elutant samples.

Fluorescent Dye	Normal Acceptable Emission Wavelength Range (nm)		Detection Limit (ppb)	
	Elutant	Water	Elutant	Water
Eosine	539.3 to 545.1	532.5 to 537.0	0.050	0.015
Fluorescein	514.1 to 519.2	505.9 to 509.7	0.025	0.002
Rhodamine WT	564.6 to 571.2	571.9 to 577.2	0.170	0.015
Sulforhodamine B	575.2 to 582.0	580.1 to 583.7	0.080	0.008

Note: Detection limits are based upon the as-sold weight of the dye mixtures normally used by the OUL. Fluorescein and eosine detection limits in water are based on samples pH adjusted to greater than 9.5.

Detection limits are based on 3X signal to noise ratio determined from spiked samples. The normal acceptable emission wavelength range is based on a large suite of samples from actual field sites where the dyes are known to be present in the samples; the values shown are the mean plus and minus 2 standard deviations. Emission fluorescence peaks are a function of the instrument used, standard instrument settings, the dye, and the dye matrix. Contaminants in water samples may slightly alter peak emission wavelengths. In some cases fluorescence peaks may become shorter than shown in Table 1 as a result of decomposition of the tracer dyes. In most cases this is a very slow process.

All OUL carbon (charcoal) samplers contain 4.25 grams of activated carbon. Dyes are eluted from the carbon with 15 ml of an eluting solution which is a mixture of 5% aqua ammonia and 95% isopropyl alcohol solution and sufficient potassium hydroxide pellets to saturate the solution. The isopropyl alcohol solution is 70% alcohol and 30% water. The aqua ammonia solution is 29% ammonia and the remainder water. The potassium hydroxide is added until a super-saturated layer is visible in the bottom of the container. This super-saturated layer is not used for elution.

All water samples analyzed for fluorescein, eosine, rhodamine Wt and sulforhodamine B are pH adjusted to greater than pH 9.5 to maximize fluorescence intensity of these dyes. The pH adjustment is conducted by placing uncapped water samples in a high ammonia environment. If serial dilutions are required for water samples the diluting water used has been pH adjusted to greater than pH 9.5.

Ozark UNDERGROUND LABORATORY 1572 Aley Lane • Protem, MO 65733 • (417) 785-4289 • fax (417) 785-4290 • contact@ozarkundergroundlab.com

Certificate of Analysis

Date of certificate: April 15, 2022
Client: FTN Associates, Ltd
131990 Olive Blvd. Suite 204
Chesterfield, MO 63017
Project name: Eco-Vista Class 4 Landfill
Project number: 06820-0100-016
Contact people: Dana Derrington (dld@ftn-assoc.com)
Melissa Vaught (mmv@ftn-assoc.com)

Samples collected by: KMD, Kagan Davis
Date samples shipped: April 12, 2022
Date samples rec'd at OUL: April 13, 2022
Date analyzed by OUL: April 15, 2022
Included with certificate of analysis: Table of results, copy of sample collection data sheets and a page on basic analysis information

Results for charcoal samplers analyzed for the presence of fluorescein, eosine, rhodamine WT (RWT) and sulforhodamine B (SRB) dyes.

Peak wavelengths are reported in nanometers (nm); dye concentrations are reported in parts per billion (ppb).

OUL	Station Name	Date/Time	Date/Time	Fluorescein Results		Eosine Results		RWT Results		SRB Results	
Number		Placed	Collected	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)
F6898	GP-5	4/4/22 0841	4/11/22 1053	ND		ND		ND		ND	
F6899	GP-7	4/4/22 0854	4/11/22 1113	ND		ND		ND		ND	
F6900	Laboratory control charcoal blank										
F6901	GP-8	4/4/22 0914	4/11/22 1130	ND		ND		ND		ND	
F6902	GP-9	4/4/22 0930	4/11/22 1145	ND		ND		ND		ND	
F6903	NE-10D	4/4/22 0946	4/11/22 1159	ND		ND		ND		ND	
F6904	NE-8	4/4/22 1000	4/11/22 1216	514.7	0.579	ND		ND		ND	
F6905	MW-10N	4/4/22 1020	4/11/22 1232	ND		ND		ND		ND	
F6906	MW-21	4/4/22 1033	4/11/22 1256	514.9	0.933	ND		ND		ND	
F6907	NE-13	4/4/22 1046	4/11/22 1316	ND		ND		ND		ND	
F6908	MW-3N	4/4/22 1058	4/11/22 1325	ND		ND		ND		ND	
F6909	MW-20	4/4/22 1151	4/11/22 1349	ND		ND		ND		ND	
F6910	MW-2N	4/4/22 1204	4/11/22 1358	ND		ND		ND		ND	
F6911	PZ-2D	4/4/22 1228	4/11/22 1424	515.3	7.64	ND		ND		ND	
F6912	C4-PZ-2	4/4/22 1241	4/11/22 1455	ND		ND		ND		ND	
F6913	C4-PZ-1	4/4/22 1326	4/11/22 1515	ND		ND		ND		ND	
F6914	MW-19	4/4/22 1343	4/11/22 1530	ND		ND		ND		ND	

OUL Number	Station Name	Date/Time Placed	Date/Time Collected	Fluorescein Results		Eosine Results		RWT Results		SRB Results	
				Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)
F6915	MW-1N	4/4/22 1358	4/11/22 1545	ND		ND		ND		ND	
F6916	MW-17	4/4/22 1412	4/11/22 1600	ND		ND		ND		ND	
F6917	GP-3	4/4/22 1435	4/11/22 1611	ND		ND		ND		ND	
F6918	NE-4	4/4/22 1449	4/11/22 1630	ND		ND		ND		ND	
F6919	Wildcat Creek #1	4/4/22 1507	4/11/22 1705	ND		ND		ND		578.6	65.7
F6920	Laboratory control charcoal blank										
F6921	Wildcat Creek #2	4/4/22 1527	4/11/22 1715	ND		ND		ND		578.6	106
F6922	MW-21D	4/4/22 1033	4/11/22 1258	514.1	0.702	ND		ND		ND	
F6923	C4-PZ-1B	NDT	4/11/22 1524	ND		ND		ND		ND	

Note: Dye concentrations are based upon standards used at the OUL. The standard concentrations are based upon the as sold weight of the dye that the OUL uses.

If the client is not using OUL dyes, the client should provide the OUL with a sample of the dye to compare to the OUL dyes.

Footnotes: ND = No dye detected NDT = No date or time given

Thomas J. Aley, PHG and RG

OZARK UNDERGROUND LABORATORY, INC.

1572 Aley Lane Protem, MO 65733 (417) 785-4289 fax (417) 785-4290 email: contact@ozarkundergroundlab.com

SAMPLE COLLECTION DATA SHEET for FLUORESCENCE ANALYSIS

Project 0820-0100-016 EVLF Dye Trace Study **Week No:** ___ **Samples Collected By:** Keagan Davis

Samples Shipped By: Keagan Davis (IKMD) **Samples Received By:** C. Aley / OUL

Date Samples Shipped: 4/12/22 **Date Samples Received:** 4-13-22 **Time Samples Received:** 1445 **Return Cooler?** Yes ☐ No ☑

Bill to: FTN Associates, 3 Innwood Circle Ste, 220 Little Rock 72211 **Send Results to:** Dana Derrington, dld@ftn-assoc.com

Analyze for: ☑ Fluorescein ☑ Eosine ☑ Rhodamine WT ☑ Other SRB **Ship cooler to:** N/A

OUL use only			Please indicate stations where dye was visible in the field (for field technician use - use black ink only)					OUL use only
# CHAR REC'D	LAB NUMBER	STATION NUMBER 1-4 Numbers	STATION NAME	PLACED DATE	PLACED TIME	COLLECTED DATE	COLLECTED TIME	# WATER REC'D
1	F6898		GP-5	4/4/22	0841	4/11/22	1053	0
1	F6899		GP-7		0854		1113	0
1	F6961		GP-8		0914		1130	0
1	F6902		GP-9		0930		1145	0
1	F6903		NE-10D		0946		1159	0
1	F6904		NE-8		1000		1216	0
1	F6905		MW-10N		1020		1232	0
1	F6906		MW-21		1033		1256	0
1	F6907		NE-13		1046		1316	0
1	F6908		MW-3N		1058		1325	0
1	F6909		MW-20		1151		1349	0
1	F6910		MW-2N		1204		1358	0
1	F6911		P2-2D		1228		1424	0
1	F6912		CH-P2-2		1241		1455	0

COMMENTS Bill to email: accounting@ftn-assoc.com phone: 479-571-3334
F6900 OUL Charcoal Blank

This sheet filled out by OUL staff? Yes ☐ No ☑ **Charts for samples on this page proofed by OUL:** CA

OUL Project No. 1926 **Date Analyzed:** 4/15/22 **Analyzed By:** AC/AH

OZARK UNDERGROUND LABORATORY, INC.

1572 Aley Lane Protem, MO 65733 (417) 785-4289 fax (417) 785-4290 email: contact@ozarkundergroundlab.com

06820-0100-016

SAMPLE COLLECTION DATA SHEET for FLUORESCENCE ANALYSIS

Project ~~06820~~ EVLF Dye Trace Study Week No: ___ Samples Collected By: KMD

Samples Shipped By: Logan Davis Samples Received By: C. Aley/OUL

Date Samples Shipped: 4/12/22 Date Samples Received: 4-13-22 Time Samples Received: 1445 Return Cooler? Yes ☐ No ☑

Bill to: See comments on ~~page~~ page 1 Send Results to: see page 1

Analyze for: ☑ Fluorescein ☑ Eosine ☑ Rhodamine WT ☑ Other SRB Ship cooler to: N/A

OUL use only		Please indicate stations where dye was visible in the field for field technician use - use black ink only						OUL use only
# CHAR REC'D	LAB NUMBER	STATION NUMBER 1-4 Numbers	STATION NAME	PLACED DATE	PLACED TIME	COLLECTED DATE	COLLECTED TIME	# WATER REC'D
1	F6913		CH-P2-1	4/4/22	1326	4/11/22	1515	0
1	F6914		MW-19		1343		1530	0
1	F6915		MW-1N		1358		1545	0
1	F6916		MW-17		1412		1600	0
1	F6917		GP-3		1435		1611	0
1	F6918		NE-4		1449		1630	0
1	F6919		Wild Cat Creek #1		1507		1705	0
1	F6921		Wild Cat Creek #2		1527		1715	0
1	F6922		MW-21D		1033		1258	0
1	F6923		CH-P2-1B	N/A	N/A		1524	0

COMMENTS F6920 OUL Charcoal Blank

This sheet filled out by OUL staff? Yes ☐ No ☑ Charts for samples on this page proofed by OUL: CO

OUL Project No. 1926 Date Analyzed: 4/15/22 Analyzed By: AC/OUL

BASIC INFORMATION ON TRACER DYE ANALYSIS BY OZARK UNDERGROUND LABORATORY

Note: More detailed information is available in the OUL's "Procedures and Criteria for the Analysis of Fluorescent Tracer Dyes in Water and Charcoal Samplers". This 20 page document can be downloaded from www.ozarkundergroundlab.com. Clients are welcome to attach the Procedures and Criteria document as an appendix to workplans or reports.

Normally acceptable emission wavelength ranges and detection limits for the four most commonly used tracer dyes in water samples and elutants from activated carbon samplers are shown in Table 1 below.

Table 1. RF-5301 Spectrofluorophotometer. Normal emission wavelength ranges and detection limits for fluorescein, eosine, rhodamine WT, and sulforhodamine B dyes in water and elutant samples.

Fluorescent Dye	Normal Acceptable Emission Wavelength Range (nm)		Detection Limit (ppb)	
	Elutant	Water	Elutant	Water
Eosine	539.3 to 545.1	532.5 to 537.0	0.050	0.015
Fluorescein	514.1 to 519.2	505.9 to 509.7	0.025	0.002
Rhodamine WT	564.6 to 571.2	571.9 to 577.2	0.170	0.015
Sulforhodamine B	575.2 to 582.0	580.1 to 583.7	0.080	0.008

Note: Detection limits are based upon the as-sold weight of the dye mixtures normally used by the OUL.
Fluorescein and eosine detection limits in water are based on samples pH adjusted to greater than 9.5.

Detection limits are based on 3X signal to noise ratio determined from spiked samples. The normal acceptable emission wavelength range is based on a large suite of samples from actual field sites where the dyes are known to be present in the samples; the values shown are the mean plus and minus 2 standard deviations. Emission fluorescence peaks are a function of the instrument used, standard instrument settings, the dye, and the dye matrix. Contaminants in water samples may slightly alter peak emission wavelengths. In some cases fluorescence peaks may become shorter than shown in Table 1 as a result of decomposition of the tracer dyes. In most cases this is a very slow process.

All OUL carbon (charcoal) samplers contain 4.25 grams of activated carbon. Dyes are eluted from the carbon with 15 ml of an eluting solution which is a mixture of 5% aqua ammonia and 95% isopropyl alcohol solution and sufficient potassium hydroxide pellets to saturate the solution. The isopropyl alcohol solution is 70% alcohol and 30% water. The aqua ammonia solution is 29% ammonia and the remainder water. The potassium hydroxide is added until a super-saturated layer is visible in the bottom of the container. This super-saturated layer is not used for elution.

All water samples analyzed for fluorescein, eosine, rhodamine Wt and sulforhodamine B are pH adjusted to greater than pH 9.5 to maximize fluorescence intensity of these dyes. The pH adjustment is conducted by placing uncapped water samples in a high ammonia environment. If serial dilutions are required for water samples the diluting water used has been pH adjusted to greater than pH 9.5.

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Certificate of Analysis

Date of certificate: April 25, 2022
Client: FTN Associates, Ltd
131990 Olive Blvd. Suite 204
Chesterfield, MO 63017
Project name: Eco-Vista Class 4 Landfill
Project number: 06820-0100-016
Contact people: Dana Derrington (dld@ftn-assoc.com)
Melissa Vaught (mmv@ftn-assoc.com)

Samples collected by: KMD, Kagan Davis
Date samples shipped: April 19, 2022
Date samples rec'd at OUL: April 21, 2022
Date analyzed by OUL: April 22, 2022
Included with certificate of analysis: Table of results, copy of sample collection data sheets and a page on basic analysis information

Results for charcoal samplers analyzed for the presence of fluorescein, eosine, rhodamine WT (RWT) and sulforhodamine B (SRB) dyes.

Peak wavelengths are reported in nanometers (nm); dye concentrations are reported in parts per billion (ppb).

OUL	Station Name	Date/Time	Date/Time	Fluorescein Results		Eosine Results		RWT Results		SRB Results	
Number		Placed	Collected	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)
F7144	GP-5	4/11/22 1103	4/18/22 0950	ND		ND		ND		ND	
F7145	GP-7	4/11/22 1124	4/18/22 1012	ND		ND		ND		ND	
F7146	GP-8	4/11/22 1136	4/18/22 1026	ND		ND		ND		ND	
F7147	GP-9	4/11/22 1154	4/18/22 1042	ND		ND		ND		ND	
F7148	NE-10D	4/11/22 1206	4/18/22 1056	ND		ND		ND		ND	
F7149	NE-8	4/11/22 1221	4/18/22 1117	509.8 *	0.496	ND		ND		ND	
F7150	MW-10N	4/11/22 1240	4/18/22 1130	ND		ND		ND		ND	
F7151	MW-21	4/11/22 1300	4/18/22 1143	514.8	0.855	ND		ND		ND	
F7152	NE-13	4/11/22 1322	4/18/22 1217	ND		ND		ND		ND	
F7153	MW-3N	4/11/22 1336	4/18/22 1225	ND		ND		ND		ND	
F7154	MW-20	4/11/22 1355	4/18/22 1245	ND		ND		ND		ND	
F7155	MW-2N	4/11/22 1411	4/18/22 1255	ND		ND		ND		ND	
F7156	PZ-2D	4/11/22 1435	4/18/22 1320	515.5	16.3	ND		ND		ND	
F7157	C4-PZ-2	4/11/22 1501	4/18/22 1342	ND		ND		ND		ND	
F7158	C4-PZ-1	4/11/22 1519	4/18/22 1349	ND		ND		ND		ND	
F7159	MW-19	4/11/22 1538	4/18/22 1545	ND		ND		ND		ND	
F7160	Laboratory control charcoal blank										

OUL Number	Station Name	Date/Time Placed	Date/Time Collected	Fluorescein Results		Eosine Results		RWT Results		SRB Results	
				Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)
F7161	MW-1N	4/11/22 1553	4/18/22 1608	ND		ND		ND		ND	
F7162	MW-17	4/11/22 1605	4/18/22 1625	ND		ND		ND		ND	
F7163	GP-3	4/11/22 1623	4/18/22 1646	ND		ND		ND		ND	
F7164	NE-4	4/11/22 1638	4/18/22 1709	ND		ND		ND		ND	
F7165	Wild Cat Creek #1	4/11/22 1710	4/18/22 1735	ND		ND		ND		578.5	69.0
F7166	Wild Cat Creek #2	4/11/22 1720	4/18/22 1745	ND		ND		ND		578.5	48.2
F7167	MW-21D	4/11/22 1300	4/18/22 1145	514.9	0.753	ND		ND		ND	
F7168	C4-PZ-1B	NDT	4/18/22 1409	ND		ND		ND		ND	

Note: Dye concentrations are based upon standards used at the OUL. The standard concentrations are based upon the as sold weight of the dye that the OUL uses.

If the client is not using OUL dyes, the client should provide the OUL with a sample of the dye to compare to the OUL dyes.

Footnotes: ND = No dye detected NDT = No date or time given

* = A fluorescence peak is present that does not meet all the criteria for a positive dye result. However, it has been calculated as though it was the tracer dye.

Thomas J. Aley, PHG and RG

OZARK UNDERGROUND LABORATORY, INC.

1572 Aley Lane Protem, MO 65733 (417) 785-4289 fax (417) 785-4290 email: contact@ozarkundergroundlab.com

SAMPLE COLLECTION DATA SHEET for FLUORESCENCE ANALYSIS

Project 06820-0100-016 EVLF Pre Trace **Week No:** ___ **Samples Collected By:** KMD - Kayan Davis

Samples Shipped By: Kayan Davis (KMD) **Samples Received By:** A. Goers/OUL

Date Samples Shipped: 4/19/22 **Date Samples Received:** 4/21/22 **Time Samples Received:** 1400 **Return Cooler?** Yes ☐ No ☑

Bill to: accounting@ftn-assoc.com **Send Results to:** Dana Derrington, dlick@ftn-assoc.com

Analyze for: ☑ Fluorescein ☑ Eosine ☑ Rhodamine WT ☑ Other SRB **Ship cooler to:** N/A

OUL use only			*Please indicate stations where dye was visible in the field* for field technician use - use black ink only					OUL use only
# CHAR REC'D	LAB NUMBER (Charcoal)	STATION NUMBER 1-4 Numbers	STATION NAME	PLACED DATE	PLACED TIME	COLLECTED DATE	COLLECTED TIME	# WATER REC'D
1	F7144		GP-5	4/11/22	1103	4/18/22	0950	0
1	F7145		GP-7		1124		1012	0
1	F7146		GP-8		1136		1026	0
1	F7147		GP-9		1154		1042	0
1	F7148		~~G~~ NE-10D		1206		1056	0
1	F7149		NE-8		1221		1117	0
1	F7150		MW-10N		1240		1130	0
1	F7151		MW-21		1300		1143	0
1	F7152		NE-13		1322		1217	0
1	F7153		MW-3N		1336		1225	0
1	F7154		MW-20		1355		1245	0
1	F7155		MW-2N		1411		1255	0
1	F7156		P2-2D		1435		1320	0
1	F7157		OL-P2-2		1501		1342	0

COMMENTS ___

This sheet filled out by OUL staff? Yes ☐ **No** ☑ **Charts for samples on this page proofed by OUL:** AC/OUL

OUL Project No. 1926 **Date Analyzed:** 4/20/22 **Analyzed By:** AC/OUL

OUL

OZARK UNDERGROUND LABORATORY, INC.

1572 Aley Lane Protem, MO 65733 (417) 785-4289 fax (417) 785-4290 email: contact@ozarkundergroundlab.com

SAMPLE COLLECTION DATA SHEET for FLUORESCENCE ANALYSIS

Project 06820-0100-016 EVLF Dye Trace **Week No:** ___ **Samples Collected By:** Kagan Davis (KMO)

Samples Shipped By: KMO **Samples Received By:** A. Goers/OUL

Date Samples Shipped: 4/19/22 **Date Samples Received:** 4/21/22 **Time Samples Received:** 1400 **Return Cooler?** Yes ☐ No ☑

Bill to: See page 1 **Send Results to:** see page 1

Analyze for: ☑ Fluorescein ☑ Eosine ☑ Rhodamine WT ☑ Other SRB **Ship cooler to:** N/A

OUL use only			*Please indicate stations where dye was visible in the field* for field technician use - use black ink only					OUL use only
# CHAR REC'D	LAB NUMBER	STATION NUMBER 1-4 Numbers	STATION NAME	PLACED		COLLECTED		# WATER REC'D
				DATE	TIME	DATE	TIME	
1	F7158		C4-PZ-1	4/11/22	1519	4/18/22	1349	0
1	F7159		MW-19		1538		1545	0
1	F7161		MW-1W		1553		1608	0
1	F7162		MW-17		1605		1625	0
1	F7163		GP-3		1623		1646	0
1	F7164		NE-4		1638		1709	0
1	F7165		Wild Cat Creek #1		1710		1735	0
1	F7166		Wild Cat Creek #2		1720		1745	0
1	F7167		MW-21D		1300		1145	0
1	F7168		C4-P2-1B	N/A	N/A		1409	0

COMMENTS F7166 OUL charcoal blank

This sheet filled out by OUL staff? Yes ☐ **No** ☑ **Charts for samples on this page proofed by OUL:** AC/OUL

OUL Project No. 1926 **Date Analyzed:** 4/22/22 **Analyzed By:** AC/OUL

OUL

BASIC INFORMATION ON TRACER DYE ANALYSIS BY OZARK UNDERGROUND LABORATORY

Note: More detailed information is available in the OUL's "Procedures and Criteria for the Analysis of Fluorescent Tracer Dyes in Water and Charcoal Samplers". This 20 page document can be downloaded from www.ozarkundergroundlab.com. Clients are welcome to attach the Procedures and Criteria document as an appendix to workplans or reports.

Normally acceptable emission wavelength ranges and detection limits for the four most commonly used tracer dyes in water samples and elutants from activated carbon samplers are shown in Table 1 below.

Table 1. RF-5301 Spectrofluorophotometer. Normal emission wavelength ranges and detection limits for fluorescein, eosine, rhodamine WT, and sulforhodamine B dyes in water and elutant samples.

Fluorescent Dye	Normal Acceptable Emission Wavelength Range (nm)		Detection Limit (ppb)	
	Elutant	Water	Elutant	Water
Eosine	539.3 to 545.1	532.5 to 537.0	0.050	0.015
Fluorescein	514.1 to 519.2	505.9 to 509.7	0.025	0.002
Rhodamine WT	564.6 to 571.2	571.9 to 577.2	0.170	0.015
Sulforhodamine B	575.2 to 582.0	580.1 to 583.7	0.080	0.008

Note: Detection limits are based upon the as-sold weight of the dye mixtures normally used by the OUL. Fluorescein and eosine detection limits in water are based on samples pH adjusted to greater than 9.5.

Detection limits are based on 3X signal to noise ratio determined from spiked samples. The normal acceptable emission wavelength range is based on a large suite of samples from actual field sites where the dyes are known to be present in the samples; the values shown are the mean plus and minus 2 standard deviations. Emission fluorescence peaks are a function of the instrument used, standard instrument settings, the dye, and the dye matrix. Contaminants in water samples may slightly alter peak emission wavelengths. In some cases fluorescence peaks may become shorter than shown in Table 1 as a result of decomposition of the tracer dyes. In most cases this is a very slow process.

All OUL carbon (charcoal) samplers contain 4.25 grams of activated carbon. Dyes are eluted from the carbon with 15 ml of an eluting solution which is a mixture of 5% aqua ammonia and 95% isopropyl alcohol solution and sufficient potassium hydroxide pellets to saturate the solution. The isopropyl alcohol solution is 70% alcohol and 30% water. The aqua ammonia solution is 29% ammonia and the remainder water. The potassium hydroxide is added until a super-saturated layer is visible in the bottom of the container. This super-saturated layer is not used for elution.

All water samples analyzed for fluorescein, eosine, rhodamine Wt and sulforhodamine B are pH adjusted to greater than pH 9.5 to maximize fluorescence intensity of these dyes. The pH adjustment is conducted by placing uncapped water samples in a high ammonia environment. If serial dilutions are required for water samples the diluting water used has been pH adjusted to greater than pH 9.5.

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Certificate of Analysis

Date of certificate: May 3, 2022
Client: FTN Associates, Ltd
131990 Olive Blvd. Suite 204
Chesterfield, MO 63017
Project name: Eco-Vista Class 4 Landfill
Project number: 06820-0100-016
Contact people: Dana Derrington (dld@ftn-assoc.com)
Melissa Vaught (mmv@ftn-assoc.com)

Samples collected by: Kagan Davis (KDM)
Date samples shipped: April 27, 2022
Date samples rec'd at OUL: April 28, 2022
Date analyzed by OUL: April 29, 2022
Included with certificate of analysis: Table of results, copy of sample collection data sheets, discrepancy sheet and a page on basic analysis information

Results for charcoal samplers analyzed for the presence of fluorescein, eosine, rhodamine WT (RWT) and sulforhodamine B (SRB) dyes.

Peak wavelengths are reported in nanometers (nm); dye concentrations are reported in parts per billion (ppb).

OUL Number	Station Name	Date/Time Placed	Date/Time Collected	Fluorescein Results		Eosine Results		RWT Results		SRB Results	
				Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)
F7257	GP-7	4/18/22 1023	4/25/22 1209	ND		ND		ND		ND	
F7258	GP-8	4/18/22 1035	4/25/22 1221	ND		ND		ND		ND	
F7259	GP-9	4/18/22 1051	4/25/22 1237	ND		ND		ND		ND	
F7260	Laboratory control charcoal blank										
F7261	NE-10D	4/18/22 1108	4/25/22 1253	ND		ND		ND		ND	
F7262	NE-8	4/18/22 1123	4/25/22 1322	513.4 *	0.534	ND		ND		ND	
F7263	MW-10N	4/18/22 1140	4/25/22 1342	ND		ND		ND		ND	
F7264	MW-21	4/18/22 1150	4/25/22 1410	514.0	0.904	ND		ND		ND	
F7265	NE-13	4/18/22 1224	4/25/22 1518	ND		ND		ND		ND	
F7266	MW-3N	4/18/22 1233	4/25/22 1532	ND		ND		ND		ND	
F7267	MW-20	4/18/22 1253	4/25/22 1550	ND		ND		ND		ND	
F7268	MW-2N	4/18/22 1305	4/25/22 1601	ND		ND		ND		ND	
F7269	PZ-2D	4/18/22 1331	4/25/22 1625	515.5	98.2	ND		564.6 *	2.28	ND	
F7270	C4-PZ-2	4/18/22 1349	4/25/22 1650	ND		ND		ND		ND	
F7271	C4-PZ-1	4/18/22 1406	4/25/22 1707	ND		ND		ND		ND	
F7272	MW-19	4/18/22 1551	4/25/22 1730	ND		ND		ND		ND	

OUL Number	Station Name	Date/Time Placed	Date/Time Collected	Fluorescein Results		Eosine Results		RWT Results		SRB Results	
				Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)
F7273	MW-1N	4/18/22 1617	4/25/22 1742	ND		ND		ND		ND	
F7274	MW-17	4/18/22 1633	4/25/22 1758	ND		ND		ND		ND	
F7275	GP-3	4/18/22 1653	4/25/22 1812	ND		ND		ND		ND	
F7276	NE-4	4/18/22 1715	4/25/22 1840	ND		ND		ND		ND	
F7277	Wildcat Creek #1	4/18/22 1740	4/25/22 1902	ND		ND		ND		577.8	87.2
F7278	Wildcat Creek #2	4/18/22 1747	4/25/22 1908	ND		ND		ND		578.5	88.0
F7279	MW-21D	4/18/22 1150	4/25/22 1412	514.4	0.911	ND		ND		ND	
F7280	Laboratory control charcoal blank										
F7281	C4-PZ-1B	NDT	4/25/22 1717	ND		ND		ND		ND	

Note: Dye concentrations are based upon standards used at the OUL. The standard concentrations are based upon the as sold weight of the dye that the OUL uses.

If the client is not using OUL dyes, the client should provide the OUL with a sample of the dye to compare to the OUL dyes.

Footnotes: ND = No dye detected NDT = No date or time given

* = A fluorescence peak is present that does not meet all the criteria for a positive dye result. However, it has been calculated as though it was the tracer dye.

Thomas J. Aley, PHG and RG

OZARK UNDERGROUND LABORATORY, INC.

1572 Aley Lane Protem, MO 65733 (417) 785-4289 fax (417) 785-4290 email: contact@ozarkundergroundlab.com

SAMPLE COLLECTION DATA SHEET for FLUORESCENCE ANALYSIS

Project FVLF Dye Trace Study 0880-0100-016 Week No: ___ Samples Collected By: Kagan Davis (KMO)

Samples Shipped By: KMO Samples Received By: A. Goers/OUL

Date Samples Shipped: 4/27/22 Date Samples Received: 4/28/22 Time Samples Received: 1300 Return Cooler? Yes ☐ No ☑

Bill to: accounting@ftn-assoc.com Send Results to: Dana Derrington, DLd@ftn-assoc.com

Analyze for: ☑ Fluorescein ☑ Eosine ☑ Rhodamine WT ☑ Other SRB Ship cooler to: ___

OUL use only			*Please indicate stations where dye was visible in the field* (for field technician use - use black ink only)					OUL use only
# CHAR REC'D	LAB NUMBER Charcoal	STATION NUMBER 1-4 Numbers	STATION NAME	PLACED DATE	PLACED TIME	COLLECTED DATE	COLLECTED TIME	# WATER REC'D
1	F7257		GP-7	4/18/22	1023	4/25/22	1209	0
1	F7258		GP-8		1035		1221	0
1	F7259		GP-9		1051		1237	0
1	F7261		NE-10D		1108		1253	0
1	F7262		NE-8		1123		1322	0
1	F7263		MW-10N		1140		1342	0
1	F7264		MW-21		1150		1410	0
1	F7265		NE-13		1224		1518	0
1	F7266		MW-3N		1233		1532	0
1	F7267		MW-20		1253		1550	0
1	F7268		MW-2N		1305		1601	0
1	F7269		PZ-2D		1331		1625	0
1	F7270		C4-PZ-2		1349		1650	0
1	F7271		C4-PZ-1		1406		1707	0

COMMENTS F7260 OUL charcoal blank

This sheet filled out by OUL staff? Yes ☐ No ☑ Charts for samples on this page proofed by OUL: A. Goers/OUL

OUL Project No. 1926 Date Analyzed: 4/29/22 Analyzed By: A. Goers/OUL

OUL

OZARK UNDERGROUND LABORATORY, INC.

1572 Aley Lane Protem, MO 65733 (417) 785-4289 fax (417) 785-4290 email: contact@ozarkundergroundlab.com

SAMPLE COLLECTION DATA SHEET for FLUORESCENCE ANALYSIS

Project EVLF Dye Trace Study 06820-0100-016 Week No: ___ Samples Collected By: KMO

Samples Shipped By: KMO Samples Received By: A. Goers/OUL

Date Samples Shipped: 4/27/22 Date Samples Received: 4/28/22 Time Samples Received: 1300 Return Cooler? Yes ☐ No ☐

Bill to: See page 1 Send Results to: See page 1

Analyze for: ☑ Fluorescein ☑ Eosine ☑ Rhodamine WT ☑ Other SRB Ship cooler to:

OUL use only			*Please indicate stations where dye was visible in the field* for field technician use - use black ink only					OUL use only
# CHAR REC'D	LAB NUMBER Charcoal	STATION NUMBER 1-4 Numbers	STATION NAME	PLACED DATE	PLACED TIME	COLLECTED DATE	COLLECTED TIME	# WATER REC'D
1	F7272		MW-19	4/18/22	1551	4/25/22	1730	0
1	F7273		MW-1N		1617		1742	0
1	F7274		MW-17		1633		1758	0
1	F7275		GP-3		1653		1812	0
1	F7276		NE-4		1715		1840	0
1	F7277		Wild Cat Creek #1		1740		1902	0
1	F7278		Wild Cat Creek #2		1747		1908	0
1	F7279		MW-21D		1150		1412	0
1	F7281		C4-P2-1B	N/A	N/A		1717	0
~~0~~			~~Beet Juice~~ ⊛ Ca/ou	N/A	N/A	N/A	N/A	~~1~~

COMMENTS F7280 OUL charcoal blank ⊛ see discrepancy sheet

This sheet filled out by OUL staff? Yes ☐ No ☑ Charts for samples on this page proofed by OUL: A. Goers/OUL

OUL Project No. 1920 Date Analyzed: 4/29/22 Analyzed By: A. Goers/OUL

OUL

OZARK UNDERGROUND LABORATORY, INC.

DISCREPANCIES BETWEEN CHAIN-OF-CUSTODY SHEETS AND ACTUAL SAMPLES RECEIVED Page | of |

Company & Project Name: FTN/EVLF **Date Rec'd by OUL:** 4/28/22 **Wk #** _____

Lab #	Sta #	Station Name	Date Pulled	Problem	Solution
		Beet Juice	N/A	Per request from MVaught on 4/28/22, beet juice removed from main COC, secondary COC created.	

Comments: No discrepancies

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rev. 12/28/00

BASIC INFORMATION ON TRACER DYE ANALYSIS BY OZARK UNDERGROUND LABORATORY

Note: More detailed information is available in the OUL's "Procedures and Criteria for the Analysis of Fluorescent Tracer Dyes in Water and Charcoal Samplers". This 20 page document can be downloaded from www.ozarkundergroundlab.com. Clients are welcome to attach the Procedures and Criteria document as an appendix to workplans or reports.

Normally acceptable emission wavelength ranges and detection limits for the four most commonly used tracer dyes in water samples and elutants from activated carbon samplers are shown in Table 1 below.

Table 1. RF-5301 Spectrofluorophotometer. Normal emission wavelength ranges and detection limits for fluorescein, eosine, rhodamine WT, and sulforhodamine B dyes in water and elutant samples.

Fluorescent Dye	Normal Acceptable Emission Wavelength Range (nm)		Detection Limit (ppb)	
	Elutant	Water	Elutant	Water
Eosine	539.3 to 545.1	532.5 to 537.0	0.050	0.015
Fluorescein	514.1 to 519.2	505.9 to 509.7	0.025	0.002
Rhodamine WT	564.6 to 571.2	571.9 to 577.2	0.170	0.015
Sulforhodamine B	575.2 to 582.0	580.1 to 583.7	0.080	0.008

Note: Detection limits are based upon the as-sold weight of the dye mixtures normally used by the OUL. Fluorescein and eosine detection limits in water are based on samples pH adjusted to greater than 9.5.

Detection limits are based on 3X signal to noise ratio determined from spiked samples. The normal acceptable emission wavelength range is based on a large suite of samples from actual field sites where the dyes are known to be present in the samples; the values shown are the mean plus and minus 2 standard deviations. Emission fluorescence peaks are a function of the instrument used, standard instrument settings, the dye, and the dye matrix. Contaminants in water samples may slightly alter peak emission wavelengths. In some cases fluorescence peaks may become shorter than shown in Table 1 as a result of decomposition of the tracer dyes. In most cases this is a very slow process.

All OUL carbon (charcoal) samplers contain 4.25 grams of activated carbon. Dyes are eluted from the carbon with 15 ml of an eluting solution which is a mixture of 5% aqua ammonia and 95% isopropyl alcohol solution and sufficient potassium hydroxide pellets to saturate the solution. The isopropyl alcohol solution is 70% alcohol and 30% water. The aqua ammonia solution is 29% ammonia and the remainder water. The potassium hydroxide is added until a super-saturated layer is visible in the bottom of the container. This super-saturated layer is not used for elution.

All water samples analyzed for fluorescein, eosine, rhodamine Wt and sulforhodamine B are pH adjusted to greater than pH 9.5 to maximize fluorescence intensity of these dyes. The pH adjustment is conducted by placing uncapped water samples in a high ammonia environment. If serial dilutions are required for water samples the diluting water used has been pH adjusted to greater than pH 9.5.

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Certificate of Analysis

Date of certificate: May 10, 2022
Client: FTN Associates, Ltd
131990 Olive Blvd. Suite 204
Chesterfield, MO 63017
Project name: Eco-Vista Class 4 Landfill
Project number: 06820-0100-016
Contact people: Dana Derrington (dld@ftn-assoc.com)
Melissa Vaught (mmv@ftn-assoc.com)

Samples collected by: Kagan Davis (KDM)
Date samples shipped: May 3, 2022
Date samples rec'd at OUL: May 5, 2022
Date analyzed by OUL: May 9, 2022
Included with certificate of analysis: Table of results, copy of sample collection data sheets and a page on basic analysis information

Results for charcoal samplers analyzed for the presence of fluorescein, eosine, rhodamine WT (RWT) and sulforhodamine B (SRB) dyes.

Peak wavelengths are reported in nanometers (nm); dye concentrations are reported in parts per billion (ppb).

OUL	Station Name	Date/Time	Date/Time	Fluorescein Results		Eosine Results		RWT Results		SRB Results	
Number		Placed	Collected	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)
F7350	GP-7	4/25/22 1216	5/2/22 1133	ND		ND		ND		ND	
F7351	GP-8	4/25/22 1233	5/2/22 1215	ND		ND		ND		ND	
F7352	GP-9	4/25/22 1248	5/2/22 1231	ND		ND		ND		ND	
F7353	NE-10D	4/25/22 1304	5/2/22 1247	ND		ND		ND		ND	
F7354	NE-8	4/25/22 1330	5/2/22 1350	512.8 *	0.714	ND		ND		ND	
F7355	MW-10N	4/25/22 1359	5/2/22 1408	ND		ND		ND		ND	
F7356	MW-21	4/25/22 1426	5/2/22 1428	514.4	1.10	ND		ND		ND	
F7357	NE-13	4/25/22 1530	5/2/22 1453	ND		ND		ND		ND	
F7358	MW-3N	4/25/22 1539	5/2/22 1502	ND		ND		ND		ND	
F7359	MW-20	4/25/22 1559	5/2/22 1557	ND		ND		ND		ND	
F7360	Laboratory control charcoal blank										
F7361	MW-2N	4/25/22 1612	5/2/22 1610	ND		ND		ND		ND	
F7362	PZ-2D	4/25/22 1638	5/2/22 1644	515.1	9.23	ND		ND		ND	
F7363	C4-PZ-2	4/25/22 1655	5/2/22 1710	ND		ND		ND		ND	
F7364	C4-PZ-1	4/25/22 1715	5/2/22 1722	ND		ND		ND		ND	
F7365	MW-19	4/25/22 1737	5/2/22 1732	ND		ND		ND		ND	

OUL Number	Station Name	Date/Time Placed	Date/Time Collected	Fluorescein Results		Eosine Results		RWT Results		SRB Results	
				Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)
F7366	MW-1N	4/25/22 1750	5/2/22 1743	ND		ND		ND		ND	
F7367	MW-17	4/25/22 1804	5/2/22 1755	ND		ND		ND		ND	
F7368	GP-3	4/25/22 1828	5/2/22 1813	ND		ND		ND		ND	
F7369	NE-4	4/25/22 1845	5/2/22 1834	ND		ND		ND		ND	
F7370	Wildcat Creek #1	4/25/22 1905	5/2/22 1900	ND		ND		ND		578.8	41.0
F7371	Wildcat Creek #2	4/25/22 1911	5/2/22 1906	ND		ND		ND		578.8	62.7
F7372	MW-21D	4/25/22 1412	5/2/22 1431	514.8	1.04	ND		ND		ND	
F7373	C4-PZ-1B	NDT	5/2/22 1729	ND		ND		ND		ND	

Note: Dye concentrations are based upon standards used at the OUL. The standard concentrations are based upon the as sold weight of the dye that the OUL uses.

If the client is not using OUL dyes, the client should provide the OUL with a sample of the dye to compare to the OUL dyes.

Footnotes: ND = No dye detected NDT = No date or time given

***** = A fluorescence peak is present that does not meet all the criteria for a positive dye result. However, it has been calculated as though it was the tracer dye.

Thomas J. Aley, PHG and RG

Ozark UNDERGROUND LABORATORY 1572 Aley Lane • Protem, MO 65733 • (417) 785-4289 • fax (417) 785-4290 • contact@ozarkundergroundlab.com

Certificate of Analysis

Date of certificate: May 13, 2022
Client: FTN Associates, Ltd
131990 Olive Blvd. Suite 204
Chesterfield, MO 63017
Project name: Eco-Vista Class 4 Landfill
Project number: 06820-0100-016
Contact people: Dana Derrington (dld@ftn-assoc.com)
Melissa Vaught (mmv@ftn-assoc.com)

Samples collected by: Kagan Davis (KDM)
Date samples shipped: May 10, 2022
Date samples rec'd at OUL: May 11, 2022
Date analyzed by OUL: May 12, 2022
Included with certificate of analysis: Table of results, copy of sample collection data sheets and a page on basic analysis information

Results for charcoal samplers analyzed for the presence of fluorescein, eosine, rhodamine WT (RWT) and sulforhodamine B (SRB) dyes.

Peak wavelengths are reported in nanometers (nm); dye concentrations are reported in parts per billion (ppb).

OUL	Station Name	Date/Time	Date/Time	Fluorescein Results		Eosine Results		RWT Results		SRB Results	
Number		Placed	Collected	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)
F7430	GP-7	5/2/22 1147	5/9/22 1050	ND		ND		ND		ND	
F7431	GP-8	5/2/22 1225	5/9/22 1110	ND		ND		ND		ND	
F7432	GP-9	5/2/22 1246	5/9/22 1125	ND		ND		ND		ND	
F7433	NE-10D	5/2/22 1306	5/9/22 1155	ND		ND		ND		ND	
F7434	NE-8	5/2/22 1358	5/9/22 1217	ND		ND		ND		ND	
F7435	MW-10N	5/2/22 1415	5/9/22 1229	ND		ND		ND		ND	
F7436	MW-21	5/2/22 1436	5/9/22 1259	515.3	0.689	ND		ND		ND	
F7437	NE-13	5/2/22 1500	5/9/22 1315	ND		ND		ND		ND	
F7438	MW-3N	5/2/22 1515	5/9/22 1330	ND		ND		ND		ND	
F7439	MW-20	5/2/22 1608	5/9/22 1351	ND		ND		ND		ND	
F7440	Laboratory control charcoal blank										
F7441	MW-2N	5/2/22 1620	5/9/22 1400	ND		ND		ND		ND	
F7442	PZ-2D	5/2/22 1700	5/9/22 1422	515.1	43.1	ND		568.2 *	1.06	ND	
F7443	C4-PZ-2	5/2/22 1719	5/9/22 1440	ND		ND		ND		ND	
F7444	C4-PZ-1	5/2/22 1726	5/9/22 1506	ND		ND		ND		ND	
F7445	MW-19	5/2/22 1738	5/9/22 1521	ND		ND		ND		ND	
F7446	MW-1N	5/2/22 1750	5/9/22 1533	ND		ND		ND		ND	

OUL Number	Station Name	Date/Time Placed	Date/Time Collected	Fluorescein Results		Eosine Results		RWT Results		SRB Results	
				Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)
F7447	MW-17	5/2/22 1801	5/9/22 1544	ND		ND		ND		ND	
F7448	GP-3	5/2/22 1826	5/9/22 1557	ND		ND		ND		ND	
F7449	NE-4	5/2/22 1841	5/9/22 1620	ND		ND		ND		ND	
F7450	Wildcat Creek #1	5/2/22 1903	5/9/22 1639	ND		ND		ND		577.7	6.73
F7451	MW-21D	5/2/22 1436	5/9/22 1301	515.3	0.998	ND		ND		ND	
F7452	C4-PZ-1B	NDT	5/9/22 1515	ND		ND		ND		ND	

Note: Dye concentrations are based upon standards used at the OUL. The standard concentrations are based upon the as sold weight of the dye that the OUL uses.

If the client is not using OUL dyes, the client should provide the OUL with a sample of the dye to compare to the OUL dyes.

Footnotes: ND = No dye detected NDT = No date or time given

* = A fluorescence peak is present that does not meet all the criteria for a positive dye result. However, it has been calculated as though it was the tracer dye.

Thomas J. Aley, PHG and RG

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SAMPLE COLLECTION DATA SHEET for FLUORESCENCE ANALYSIS

Project EVLF Dye Study C0820-0100-016 Week No: ___ Samples Collected By: Kagan Davis (KMD)

Samples Shipped By: Kagan Davis (KMD) Samples Received By: Amber Comstock / OUL

Date Samples Shipped: 5/10/22 Date Samples Received: 5/11/22 Time Samples Received: 1430 Return Cooler? Yes ☐ No ☑

Bill to: accounting@ftn-assoc.com Send Results to: Dana Derrington, ddd@ftn-assoc.com

Analyze for: ☑ Fluorescein ☑ Eosine ☐ Rhodamine WT ☑ Other SRB Ship cooler to: ___

OUL use only			*Please indicate stations where dye was visible in the field* for field technician use - use black ink only					OUL use only
# CHAR REC'D	LAB NUMBER	STATION NUMBER 1-4 Numbers	STATION NAME	PLACED DATE	PLACED TIME	COLLECTED DATE	COLLECTED TIME	# WATER REC'D
1	F7430		GP-7	5/2/22	1147	5/9/22	1050	0
1	F7431		GP-8		1225		1110	0
1	F7432		GP-9		1246		1125	0
1	F7433		NE-16D		1306		1155	0
1	F7434		NE-8		1358		1217	0
1	F7435		MW-10N		1415		1229	0
1	F7436		MW-21		1436		1259	0
1	F7437		NE-13		1500		1315	0
1	F7438		MW-3N		1515		1330	0
1	F7439		MW-20		1608		1351	0
1	F7441		MW-2N		1620		1400	0
1	F7442		P2-2D		1700		1422	0
1	F7443		C4-P2-2		1719		1440	0
1	F7444		C4-P2-1		1726		1506	0

COMMENTS F7440 OUL Charcoal Blank

This sheet filled out by OUL staff? Yes ☐ No ☑ Charts for samples on this page proofed by OUL: AC/OUL

OUL Project No. 1926 Date Analyzed: 5/12/22 Analyzed By: AC/OUL

AC/OUL

OZARK UNDERGROUND LABORATORY, INC.

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SAMPLE COLLECTION DATA SHEET for FLUORESCENCE ANALYSIS

Project EVLF Dye Trace Study 06820-01000 Week No: ___ Samples Collected By: KMD

Samples Shipped By: KMD Samples Received By: Amber Comstock/OUL

Date Samples Shipped: 5/10/22 Date Samples Received: 5/11/22 Time Samples Received: 1430 Return Cooler? Yes ☐ No ☑

Bill to: accounting@ftn-assoc.com Send Results to: Steve page 1

Analyze for: ☑ Fluorescein ☑ Eosine ☑ Rhodamine WT ☑ Other SRB Ship cooler to: ___

OUL use only			*Please indicate stations where dye was visible in the field* for field technician use - use black ink only					OUL use only
# CHAR REC'D	LAB NUMBER	STATION NUMBER 1-4 Numbers	STATION NAME	PLACED DATE	PLACED TIME	COLLECTED DATE	COLLECTED TIME	# WATER REC'D
1	F7445		MW-19	5/2/22	1738	5/9/22	1521	0
1	F7446		MW-1N		1750		1533	0
1	F7447		MW-17		1801		1544	0
1	F7448		GP-3		1826		1557	0
1	F7449		NE-4		1841		1620	0
1	F7450		Wild Cat Creek #1		1903		1639	0
1	F7451		MW-21D		1436		1301	0
1	F7452		CH-P2-1B	N/A	N/A		1515	0

COMMENTS ___

This sheet filled out by OUL staff? Yes ☐ No ☑ Charts for samples on this page proofed by OUL: AC/OUL

OUL Project No. 1926 Date Analyzed: 5/12/22 Analyzed By: AC/OUL

AC/OUL

BASIC INFORMATION ON TRACER DYE ANALYSIS BY OZARK UNDERGROUND LABORATORY

Note: More detailed information is available in the OUL's "Procedures and Criteria for the Analysis of Fluorescent Tracer Dyes in Water and Charcoal Samplers". This 20 page document can be downloaded from www.ozarkundergroundlab.com. Clients are welcome to attach the Procedures and Criteria document as an appendix to workplans or reports.

Normally acceptable emission wavelength ranges and detection limits for the four most commonly used tracer dyes in water samples and elutants from activated carbon samplers are shown in Table 1 below.

Table 1. RF-5301 Spectrofluorophotometer. Normal emission wavelength ranges and detection limits for fluorescein, eosine, rhodamine WT, and sulforhodamine B dyes in water and elutant samples.

Fluorescent Dye	Normal Acceptable Emission Wavelength Range (nm)		Detection Limit (ppb)	
	Elutant	Water	Elutant	Water
Eosine	539.3 to 545.1	532.5 to 537.0	0.050	0.015
Fluorescein	514.1 to 519.2	505.9 to 509.7	0.025	0.002
Rhodamine WT	564.6 to 571.2	571.9 to 577.2	0.170	0.015
Sulforhodamine B	575.2 to 582.0	580.1 to 583.7	0.080	0.008

Note: Detection limits are based upon the as-sold weight of the dye mixtures normally used by the OUL. Fluorescein and eosine detection limits in water are based on samples pH adjusted to greater than 9.5.

Detection limits are based on 3X signal to noise ratio determined from spiked samples. The normal acceptable emission wavelength range is based on a large suite of samples from actual field sites where the dyes are known to be present in the samples; the values shown are the mean plus and minus 2 standard deviations. Emission fluorescence peaks are a function of the instrument used, standard instrument settings, the dye, and the dye matrix. Contaminants in water samples may slightly alter peak emission wavelengths. In some cases fluorescence peaks may become shorter than shown in Table 1 as a result of decomposition of the tracer dyes. In most cases this is a very slow process.

All OUL carbon (charcoal) samplers contain 4.25 grams of activated carbon. Dyes are eluted from the carbon with 15 ml of an eluting solution which is a mixture of 5% aqua ammonia and 95% isopropyl alcohol solution and sufficient potassium hydroxide pellets to saturate the solution. The isopropyl alcohol solution is 70% alcohol and 30% water. The aqua ammonia solution is 29% ammonia and the remainder water. The potassium hydroxide is added until a super-saturated layer is visible in the bottom of the container. This super-saturated layer is not used for elution.

All water samples analyzed for fluorescein, eosine, rhodamine Wt and sulforhodamine B are pH adjusted to greater than pH 9.5 to maximize fluorescence intensity of these dyes. The pH adjustment is conducted by placing uncapped water samples in a high ammonia environment. If serial dilutions are required for water samples the diluting water used has been pH adjusted to greater than pH 9.5.

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Certificate of Analysis

Date of certificate: August 23, 2022
Client: Jett Environmental Consulting
18 Lexington Oaks Court
Foristell, MO 63348
Project name: Eco-Vista Landfill
Contact person: Steve.Jett@jettenviro.com

Samples collected by: Chris Fincher
Date samples shipped: August 15, 2022
Date samples rec'd at OUL: August 17, 2022
Date analyzed by OUL: August 23, 2022
Included with certificate of analysis: Table of results, copies of sample collection data sheets and a page on basic analysis information

Results for charcoal and water samples analyzed for the presence of fluorescein, eosine, rhodamine WT (RWT) and sulforhodamine B (SRB) dyes.
Peak wavelengths are reported in nanometers (nm); dye concentrations are reported in parts per billion (ppb).
All results are for charcoal unless otherwise indicated.

OUL	Station	Station Name	Date/Time	Date/Time	Fluorescein Results		Eosine Results		RWT Results		SRB Results	
Number	Number		Placed	Collected	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)
F8769	1	GP-3	5/9/22 1608	8/11/22 0915	ND		ND		ND		ND	
F8770	2	GP-7	5/9/22 1103	8/11/22 0950	ND		ND		ND		ND	
F8771	3	GP-8	5/9/22 1119	8/11/22 1020	ND		ND		ND		ND	
F8772	4	GP-9	5/9/22 1137	8/11/22 1050	ND		ND		ND		ND	
F8773	5	NE-8	5/9/22 1223	8/11/22 1110	514.7	0.871	ND		ND		ND	
F8774	6	MW-21	5/9/22 1306	8/11/22 1125	515.7	2.15	ND		ND		ND	
F8775	7	MW-10N	5/9/22 1240	8/11/22 1140	ND		ND		ND		ND	
F8776	8	NE-10D	5/9/22 1206	8/11/22 1155	ND		ND		ND		ND	
F8777	9	MW-3N	5/9/22 1338	8/11/22 1210	ND		ND		ND		ND	
F8778	10	NE-13	5/9/22 1328	8/11/22 1225	ND		ND		ND		ND	
F8779	11	MW-2N	5/9/22 1411	8/11/22 1255	ND		ND		ND		ND	
F8780	Laboratory control charcoal blank											
F8781	12	MW-20	5/9/22 1358	8/11/22 1310	ND		ND		ND		ND	
F8782	13	PZ-2D	5/9/22 1432	8/11/22 1355	515.1	22.9	ND		568.0 *	1.54	ND	
F8783	14	MW-19	5/9/22 1528	8/11/22 1425	ND		ND		ND		ND	
F8784	15	MW-17	5/9/22 1550	8/11/22 1440	ND		ND		ND		ND	
F8785	16	NE-4	5/9/22 1626	8/11/22 1455	ND		ND		ND		ND	

OUL Number	Station Number	Station Name	Date/Time Placed	Date/Time Collected	Fluorescein Results		Eosine Results		RWT Results		SRB Results	
					Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)
F8786	17	MW-1N	5/9/22 1540	8/11/22 1525	ND		ND		ND		ND	
F8787	18	C4-PZ-1	5/9/22 1512	8/11/22 1555	ND		ND		ND		ND	
F8788	19	C4-PZ-2	5/9/22 1446	8/11/22 1610	ND		ND		ND		ND	
F8789	20	Wildcat Creek	**Water**	8/11/22 1645	ND		ND		ND		581.8	0.058

Note: Dye concentrations are based upon standards used at the OUL. The standard concentrations are based upon the as sold weight of the dye that the OUL uses.

If the client is not using OUL dyes, the client should provide the OUL with a sample of the dye to compare to the OUL dyes.

Footnotes: ND = No dye detected

* = A fluorescence peak is present that does not meet all the criteria for a positive dye result. However, it has been calculated as though it was the tracer dye.

Thomas J. Aley, PHG and RG

OZARK UNDERGROUND LABORATORY, INC.

1572 Aley Lane Protem, MO 65733 (417) 785-4289 fax (417) 785-4290 email: contact@ozarkundergroundlab.com

SAMPLE COLLECTION DATA SHEET for FLUORESCENCE ANALYSIS

Project ECO - Vista Landfill Week No: 1 Samples Collected By: Chris Fincher

Samples Shipped By: Chris Fincher Samples Received By: C. Aley OUL

Date Samples Shipped: 8.15.22 Date Samples Received: 8-17-22 Time Samples Received: 1900 Return Cooler? Yes ☐ No ☑

Bill to: Steve Jett (Jett Env. Consulting) Send Results to: Steve Jett

Analyze for: ☑ Fluorescein ☑ Eosine ☑ Rhodamine WT ☑ Other SRB Ship cooler to:

OUL use only		Please indicate stations where dye was visible in the field for field technician use - use black ink only						OUL use only
# CHAR REC'D	LAB NUMBER Charcoal	STATION NUMBER	STATION NAME	PLACED *		COLLECTED		# WATER REC'D
				DATE	TIME	DATE	TIME	
1	F8769	1	GP-3	8.11.22	0930	8.11.22	0915	0
1	F8770	2	GP-7		1000		0950	0
1	F8771	3	GP-8		1030		1020	0
1	F8772	4	GP-9		1100		1050	0
1	F8773	5	NE-8		1115		1110	0
2	F8774	6	MW-21		1130		1125	0
1	F8775	7	MW-10N		1145		1140	0
1	F8776	8	NE-10D		1200		1155	0
1	F8777	9	MW-3N		1215		1210	0
1	F8778	10	NE-13		1230		1225	0
1	F8779	11	MW-2N		1300		1255	0
1	F8781	12	MW-20		1315		1310	0
1	F8782	13	PZ-2D		1400		1355	0
1	F8783	14	MW-19	↓	1430	✓	1425	0

COMMENTS * = "Placed" date/time applies to charcoal packets. Water sample is a grab sample collected on the "collected" date

F8780 OUL Charcoal Blank ✓ Per S. Jett, the placed dates are for the next set of samples. CA/OUL

This sheet filled out by OUL staff? Yes ___ No ✓ Charts for samples on this page proofed by OUL: CA

OUL Project No 1926 Date Analyzed: 8/23/22 Analyzed By: AC/OUL

OZARK UNDERGROUND LABORATORY, INC.

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SAMPLE COLLECTION DATA SHEET for FLUORESCENCE ANALYSIS

Project Eco-Vista Landfill Week No: 1 Samples Collected By: Chris Fincher

Samples Shipped By: Chris Fincher Samples Received By: C. Aley/OUL

Date Samples Shipped: 8.15.22 Date Samples Received: 8-17-22 Time Samples Received: 1900 Return Cooler? Yes ☐ No ☑

Bill to: Steve Jett (Jett Env. Consulting) Send Results to: Steve Jett (Jett Env. Consulting)

Analyze for: ☑ Fluorescein ☑ Eosine ☑ Rhodamine WT ☑ Other SRB Ship cooler to:

OUL use only		Please indicate stations where dye was visible in the field for field technician use - use black ink only						OUL use only
# CHAR REC'D	LAB NUMBER Charcoal	STATION NUMBER	STATION NAME	PLACED * DATE	PLACED * TIME	COLLECTED DATE	COLLECTED TIME	# WATER REC'D
1	F8784	15	MW-17	8.11.22	1445	8.11.22	1440	0
1	F8785	16	NE-4		1500		1455	0
1	F8786	17	MW-1N		1530		1525	0
1	F8787	18	C4-PZ-1		1600		1555	0
1	F8788	19	C4-PZ-2		1615		1610	0
0		20	Wildcat Creek	↓	1645	~~↓~~	~~↓~~	1

COMMENTS * = "Placed" date/time applies to charcoal packets. Water sample is a grab sample collected on the "collected" date

This sheet filled out by OUL staff? Yes ___ No ✓ Charts for samples on this page proofed by OUL: CR

OUL Project No. 1926 Date Analyzed: 8/23/22 Analyzed By: AC/OUL

OZARK UNDERGROUND LABORATORY, INC.

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SAMPLE COLLECTION DATA SHEET for FLUORESCENCE ANALYSIS

Project Eco-Vista Landfill Week No: 1 Samples Collected By: Chris Fincher

Samples Shipped By: Chris Fincher Samples Received By: C. Aley OUL

Date Samples Shipped: 8.15.22 Date Samples Received: 8-17-22 Time Samples Received: 1900 Return Cooler? Yes ☐ No ☑

Bill to: Steve Jett (Jett Env. Consulting) Send Results to: Steve Jett (Jett Env. Consulting)

Analyze for: ☑ Fluorescein ☑ Eosine ☑ Rhodamine WT ☑ Other SRB Ship cooler to:

OUL use only		*Please indicate stations where dye was visible in the field* *for field technician use - use black ink only*						*OUL use only*
# CHAR REC'D	LAB NUMBER Water	STATION NUMBER	STATION NAME	PLACED * DATE	PLACED * TIME	COLLECTED DATE	COLLECTED TIME	# WATER REC'D
1		15	MW-17	8.11.22	1445	8.11.22	1440	0
1		16	NE-4	↓	1500	↓	1455	0
1		17	MW-1N	↓	1530	↓	1525	0
1		18	C4-PZ-1	↓	1600	↓	1555	0
1		19	C4-PZ-2	↓	1615	↓	1610	0
0	F8789	20	Wildcat Creek	↓	1645	X	X	1

COMMENTS * = "Placed" date/time applies to charcoal packets. Water sample is a grab sample collected on the "collected" date

This sheet filled out by OUL staff? Yes ___ No ✓ Charts for samples on this page proofed by OUL: CA

OUL Project No. 926 Date Analyzed: 8/23/22 Analyzed By: AC/OUL

BASIC INFORMATION ON TRACER DYE ANALYSIS BY OZARK UNDERGROUND LABORATORY

Note: More detailed information is available in the OUL's "Procedures and Criteria for the Analysis of Fluorescent Tracer Dyes in Water and Charcoal Samplers". This 20 page document can be downloaded from www.ozarkundergroundlab.com. Clients are welcome to attach the Procedures and Criteria document as an appendix to workplans or reports.

Normally acceptable emission wavelength ranges and detection limits for the four most commonly used tracer dyes in water samples and elutants from activated carbon samplers are shown in Table 1 below.

Table 1. RF-5301 Spectrofluorophotometer. Normal emission wavelength ranges and detection limits for fluorescein, eosine, rhodamine WT, and sulforhodamine B dyes in water and elutant samples.

Fluorescent Dye	Normal Acceptable Emission Wavelength Range (nm)		Detection Limit (ppb)	
	Elutant	Water	Elutant	Water
Eosine	539.3 to 545.1	532.5 to 537.0	0.050	0.015
Fluorescein	514.1 to 519.2	505.9 to 509.7	0.025	0.002
Rhodamine WT	564.6 to 571.2	571.9 to 577.2	0.170	0.015
Sulforhodamine B	575.2 to 582.0	580.1 to 583.7	0.080	0.008

Note: Detection limits are based upon the as-sold weight of the dye mixtures normally used by the OUL. Fluorescein and eosine detection limits in water are based on samples pH adjusted to greater than 9.5.

Detection limits are based on 3X signal to noise ratio determined from spiked samples. The normal acceptable emission wavelength range is based on a large suite of samples from actual field sites where the dyes are known to be present in the samples; the values shown are the mean plus and minus 2 standard deviations. Emission fluorescence peaks are a function of the instrument used, standard instrument settings, the dye, and the dye matrix. Contaminants in water samples may slightly alter peak emission wavelengths. In some cases fluorescence peaks may become shorter than shown in Table 1 as a result of decomposition of the tracer dyes. In most cases this is a very slow process.

All OUL carbon (charcoal) samplers contain 4.25 grams of activated carbon. Dyes are eluted from the carbon with 15 ml of an eluting solution which is a mixture of 5% aqua ammonia and 95% isopropyl alcohol solution and sufficient potassium hydroxide pellets to saturate the solution. The isopropyl alcohol solution is 70% alcohol and 30% water. The aqua ammonia solution is 29% ammonia and the remainder water. The potassium hydroxide is added until a super-saturated layer is visible in the bottom of the container. This super-saturated layer is not used for elution.

All water samples analyzed for fluorescein, eosine, rhodamine Wt and sulforhodamine B are pH adjusted to greater than pH 9.5 to maximize fluorescence intensity of these dyes. The pH adjustment is conducted by placing uncapped water samples in a high ammonia environment. If serial dilutions are required for water samples the diluting water used has been pH adjusted to greater than pH 9.5.

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Certificate of Analysis

Date of certificate: August 30, 2022
Client: Jett Environmental Consulting
18 Lexington Oaks Court
Foristell, MO 63348
Project name: Eco-Vista Landfill
Contact person: Steve.Jett@jettenviro.com

Samples collected by: Chris Fincher
Date samples shipped: August 24, 2022
Date samples rec'd at OUL: August 26, 2022
Date analyzed by OUL: August 29, 2022
Included with certificate of analysis: Table of results, copy of sample collection data sheets and a page on basic analysis information

Results for charcoal samplers analyzed for the presence of fluorescein, eosine, rhodamine WT (RWT) and sulforhodamine B (SRB) dyes.
Peak wavelengths are reported in nanometers (nm); dye concentrations are reported in parts per billion (ppb).

OUL	Station	Station Name	Date/Time	Date/Time	Fluorescein Results		Eosine Results		RWT Results		SRB Results	
Number	Number		Placed	Collected	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)
F8943	1	PZ-2D	8/11/22 1400	8/23/22 0800	515.3	10.6	ND		ND		ND	
F8944	2	MW-19	8/11/22 1430	8/23/22 0815	ND		ND		ND		ND	
F8945	3	C4-PZ-1	8/11/22 1600	8/23/22 0830	ND		ND		ND		ND	
F8946	4	C4-PZ-2	8/11/22 1615	8/23/22 0845	ND		ND		ND		ND	
F8947	5	MW-1N	8/11/22 1530	8/23/22 0900	ND		ND		ND		ND	
F8948	6	MW-17	8/11/22 1445	8/23/22 0915	ND		ND		ND		ND	
F8949	7	NE-4	8/11/22 1500	8/23/22 0930	ND		ND		ND		ND	
F8950	8	MW-2N	8/11/22 1300	8/23/22 0945	ND		ND		ND		ND	
F8951	9	MW-20	8/11/22 1315	8/23/22 1000	ND		ND		ND		ND	
F8952	10	GP-7	8/11/22 1000	8/23/22 1015	ND		ND		ND		ND	
F8953	11	GP-8	8/11/22 1030	8/23/22 1030	ND		ND		ND		ND	
F8954	12	GP-9	8/11/22 1100	8/23/22 1045	ND		ND		ND		ND	
F8955	13	NE-10D	8/11/22 1200	8/23/22 1100	ND		ND		ND		ND	
F8956	14	MW-3N	8/11/22 1215	8/23/22 1115	ND		ND		ND		ND	
F8957	15	NE-13	8/11/22 1230	8/23/22 1130	ND		ND		ND		ND	
F8958	16	NE-8	8/11/22 1115	8/23/22 1145	ND		ND		ND		ND	
F8959	17	MW-21	8/11/22 1130	8/23/22 1200	512.0 *	0.55	ND		ND		ND	
F8960	Laboratory control charcoal blank											
F8961	18	MW-10N	8/11/22 1145	8/23/22 1215	ND		ND		ND		ND	
F8962	19	Wildcat Creek	8/11/22 1645	8/23/22 1300	ND		ND		ND		577.8	6.68

Note: Dye concentrations are based upon standards used at the OUL. The standard concentrations are based upon the as sold weight of the dye that the OUL uses. If the client is not using OUL dyes, the client should provide the OUL with a sample of the dye to compare to the OUL dyes.

Footnotes: ND = No dye detected

* = A fluorescence peak is present that does not meet all the criteria for a positive dye result. However, it has been calculated as though it was the tracer dye.

Thomas J. Aley, PHG and RG

Thomas Aley

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OZARK UNDERGROUND LABORATORY, INC.

1572 Aley Lane Protem, MO 65733 (417) 785-4289 fax (417) 785-4290 email: contact@ozarkundergroundlab.com

SAMPLE COLLECTION DATA SHEET for FLUORESCENCE ANALYSIS

Project ECO-Vista Landfill **Week No:** 2 **Samples Collected By:** Chris Fincher

Samples Shipped By: Chris Fincher **Samples Received By:** C. Aley / OUL

Date Samples Shipped: 8.24.22 **Date Samples Received:** 8-26-22 **Time Samples Received:** 1730 **Return Cooler?** Yes ☐ No ☑

Bill to: Steve Jett **Send Results to:** Steve Jett

Analyze for: ☑ Fluorescein ☑ Eosine ☑ Rhodamine WT ☑ Other SRB **Ship cooler to:**

OUL use only		*Please indicate stations where dye was visible in the field* for field technician use - use black ink only						*OUL use only*
# CHAR REC'D	LAB NUMBER	STATION NUMBER	STATION NAME	PLACED *		COLLECTED		# WATER REC'D
				DATE	TIME	DATE	TIME	
1	F8943	1	PZ-20	8.11	1400	8.23	0800	0
1	F8944	2	MW-19		1430		0815	0
1	F8945	3	C4-PZ-1		1600		0830	0
1	F8946	4	C4-PZ-2		1615		0845	0
1	F8947	5	MW-1N		1530		0900	0
1	F8948	6	MW-17		1445		0915	0
1	F8949	7	NE-4		1500		0930	0
1	F8950	8	MW-2N		1300		0945	0
1	F8951	9	MW-20		1315		1000	0
1	F8952	10	GP-7		1000		1015	0
1	F8953	11	GP-8		1030		1030	0
1	F8954	12	GP-9		1100		1045	0
1	F8955	13	NE-10D		1200		1100	0
1	F8956	14	MW-3N	↓	1215	↓	1115	0

COMMENTS * = "Placed" date/time applies to charcoal packets. Water sample is a grab sample collected on the "collected" date

This sheet filled out by OUL staff? Yes ___ No ✓ **Charts for samples on this page proofed by OUL:** CA

OUL Project No. 1926 **Date Analyzed:** 8/29/22 **Analyzed By:** AC/OUL

OZARK UNDERGROUND LABORATORY, INC.

1572 Aley Lane Protem, MO 65733 (417) 785-4289 fax (417) 785-4290 email: contact@ozarkundergroundlab.com

SAMPLE COLLECTION DATA SHEET for FLUORESCENCE ANALYSIS

Project Eco-Vista Landfill **Week No:** 2 **Samples Collected By:** Chris Fincher

Samples Shipped By: Chris Fincher **Samples Received By:** C. Aley / OUL

Date Samples Shipped: 8.24.22 **Date Samples Received:** 8-26-22 **Time Samples Received:** 1730 **Return Cooler? Yes** ☐ **No** ☑

Bill to: Steve Jett **Send Results to:** Steve Jett

Analyze for: ☑ **Fluorescein** ☑ **Eosine** ☑ **Rhodamine WT** ☑ **Other** SRB **Ship cooler to:**

OUL use only		*Please indicate stations where dye was visible in the field* *for field technician use - use black ink only*						*OUL use only*
# CHAR REC'D	LAB NUMBER	STATION NUMBER	STATION NAME	PLACED *		COLLECTED		# WATER REC'D
				DATE	TIME	DATE	TIME	
1	F8957	15	NE-13	8.11	1230	8.23	1130	0
1	F8958	16	NE-8	↓	1115	↓	1145	0
1	F8959	17	MW-21	↓	1130	↓	1200	0
1	F8961	18	MW-10N	↓	1145	↓	1215	0
1	F8962	19	Wildcat Creek	↓	1645	↓	1300	0

COMMENTS * = "Placed" date/time applies to charcoal packets. Water sample is a grab sample collected on the "collected" date

F8960 OUL Charcoal Blank

This sheet filled out by OUL staff? Yes ___ **No** ✓ **Charts for samples on this page proofed by OUL:** CA

OUL Project No. 1926 **Date Analyzed:** 8/29/22 **Analyzed By:** AC/OUL

BASIC INFORMATION ON TRACER DYE ANALYSIS BY OZARK UNDERGROUND LABORATORY

Note: More detailed information is available in the OUL's "Procedures and Criteria for the Analysis of Fluorescent Tracer Dyes in Water and Charcoal Samplers". This 20 page document can be downloaded from www.ozarkundergroundlab.com. Clients are welcome to attach the Procedures and Criteria document as an appendix to workplans or reports.

Normally acceptable emission wavelength ranges and detection limits for the four most commonly used tracer dyes in water samples and elutants from activated carbon samplers are shown in Table 1 below.

Table 1. RF-5301 Spectrofluorophotometer. Normal emission wavelength ranges and detection limits for fluorescein, eosine, rhodamine WT, and sulforhodamine B dyes in water and elutant samples.

Fluorescent Dye	Normal Acceptable Emission Wavelength Range (nm)		Detection Limit (ppb)	
	Elutant	Water	Elutant	Water
Eosine	539.3 to 545.1	532.5 to 537.0	0.050	0.015
Fluorescein	514.1 to 519.2	505.9 to 509.7	0.025	0.002
Rhodamine WT	564.6 to 571.2	571.9 to 577.2	0.170	0.015
Sulforhodamine B	575.2 to 582.0	580.1 to 583.7	0.080	0.008

Note: Detection limits are based upon the as-sold weight of the dye mixtures normally used by the OUL. Fluorescein and eosine detection limits in water are based on samples pH adjusted to greater than 9.5.

Detection limits are based on 3X signal to noise ratio determined from spiked samples. The normal acceptable emission wavelength range is based on a large suite of samples from actual field sites where the dyes are known to be present in the samples; the values shown are the mean plus and minus 2 standard deviations. Emission fluorescence peaks are a function of the instrument used, standard instrument settings, the dye, and the dye matrix. Contaminants in water samples may slightly alter peak emission wavelengths. In some cases fluorescence peaks may become shorter than shown in Table 1 as a result of decomposition of the tracer dyes. In most cases this is a very slow process.

All OUL carbon (charcoal) samplers contain 4.25 grams of activated carbon. Dyes are eluted from the carbon with 15 ml of an eluting solution which is a mixture of 5% aqua ammonia and 95% isopropyl alcohol solution and sufficient potassium hydroxide pellets to saturate the solution. The isopropyl alcohol solution is 70% alcohol and 30% water. The aqua ammonia solution is 29% ammonia and the remainder water. The potassium hydroxide is added until a super-saturated layer is visible in the bottom of the container. This super-saturated layer is not used for elution.

All water samples analyzed for fluorescein, eosine, rhodamine Wt and sulforhodamine B are pH adjusted to greater than pH 9.5 to maximize fluorescence intensity of these dyes. The pH adjustment is conducted by placing uncapped water samples in a high ammonia environment. If serial dilutions are required for water samples the diluting water used has been pH adjusted to greater than pH 9.5.

Ozark UNDERGROUND LABORATORY 1572 Aley Lane • Protem, MO 65733 • (417) 785-4289 • fax (417) 785-4290 • contact@ozarkundergroundlab.com

Certificate of Analysis

Date of certificate: September 14, 2022
Client: Jett Environmental Consulting
18 Lexington Oaks Court
Foristell, MO 63348
Project name: Eco-Vista Landfill
Contact person: Steve.Jett@jettenviro.com

Samples collected by: Chris Fincher
Date samples shipped: September 7, 2022
Date samples rec'd at OUL: September 9, 2022
Date analyzed by OUL: September 13, 2022
Included with certificate of analysis: Table of results, copy of sample collection data sheets and a page on basic analysis information

Results for charcoal samplers analyzed for the presence of fluorescein, eosine, rhodamine WT (RWT) and sulforhodamine B (SRB) dyes.

Peak wavelengths are reported in nanometers (nm); dye concentrations are reported in parts per billion (ppb).

OUL	Station	Station Name	Date/Time	Date/Time	Fluorescein Results		Eosine Results		RWT Results		SRB Results	
Number	Number		Placed	Collected	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)
F9209	1	PZ-2D	8/23/22 0805	9/6/22 1200	515.3	20.2	ND		ND		ND	
F9210	2	MW-19	8/23/22 0820	9/6/22 1215	ND		ND		ND		ND	
F9211	3	C4-PZ-1	8/23/22 0835	9/6/22 1230	ND		ND		ND		ND	
F9212	4	C4-PZ-2	8/23/22 0850	9/6/22 1245	ND		ND		ND		ND	
F9213	5	MW-1N	8/23/22 0905	9/6/22 1300	ND		ND		ND		ND	
F9214	6	MW-17	8/23/22 0920	9/6/22 1315	ND		ND		ND		ND	
F9215	7	NE-4	8/23/22 0935	9/6/22 1330	ND		ND		ND		ND	
F9216	8	MW-2N	8/23/22 0950	9/6/22 1345	ND		ND		ND		ND	
F9217	9	MW-20	8/23/22 1005	9/6/22 1400	ND		ND		ND		ND	
F9218	10	GP-7	8/23/22 1020	9/6/22 1415	ND		ND		ND		ND	
F9219	11	GP-8	8/23/22 1035	9/6/22 1430	ND		ND		ND		ND	
F9220	Laboratory control charcoal blank											
F9221	12	GP-9	8/23/22 1050	9/6/22 1445	ND		ND		ND		ND	
F9222	13	NE-10D	8/23/22 1105	9/6/22 1500	ND		ND		ND		ND	
F9223	14	MW-3N	8/23/22 1120	9/6/22 1515	ND		ND		ND		ND	
F9224	15	NE-13	8/23/22 1135	9/6/22 1530	ND		ND		ND		ND	
F9225	16	NE-8	8/23/22 1150	9/6/22 1545	ND		ND		ND		ND	
F9226	17	MW-21	8/23/22 1205	9/6/22 1600	512.8 *	0.539	ND		ND		ND	
F9227	18	MW-10N	8/23/22 1220	9/6/22 1615	ND		ND		ND		ND	
F9228	19	Wildcat Creek	8/23/22 1235	9/6/22 1630	ND		ND		ND		578.5	3.36

Note: Dye concentrations are based upon standards used at the OUL. The standard concentrations are based upon the as sold weight of the dye that the OUL uses. If the client is not using OUL dyes, the client should provide the OUL with a sample of the dye to compare to the OUL dyes.

Footnotes: ND = No dye detected

* = A fluorescence peak is present that does not meet all the criteria for a positive dye result. However, it has been calculated as though it was the tracer dye.

Thomas J. Aley, PHG and RG

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OZARK UNDERGROUND LABORATORY, INC.

1572 Aley Lane Protem, MO 65733 (417) 785-4289 fax (417) 785-4290 email: contact@ozarkundergroundlab.com

SAMPLE COLLECTION DATA SHEET for FLUORESCENCE ANALYSIS

Project Eco-Vista Landfill (EVLF) **Week No:** 3 **Samples Collected By:** Chris Fincher

Samples Shipped By: Chris Fincher **Samples Received By:** C. Aley/OUL

Date Samples Shipped: 9.7.22 **Date Samples Received:** 9-9-22 **Time Samples Received:** 1400 **Return Cooler?** Yes ☐ No ☑

Bill to: Steve Jett **Send Results to:** Steve Jett

Analyze for: ☑ Fluorescein ☑ Eosine ☑ Rhodamine WT ☑ Other SRB **Ship cooler to:**

OUL use only		*Please indicate stations where dye was visible in the field* for field technician use - use black ink only						*OUL use only*
# CHAR REC'D	LAB NUMBER	STATION NUMBER	STATION NAME	PLACED *		COLLECTED		# WATER REC'D
				DATE	TIME	DATE	TIME	
1	F9209	1	PZ-2D	8.23	0805	9.6	1200	0
1	F9210	2	MW-19		0820		1215	0
1	F9211	3	C4-PZ-1		0835		1230	0
1	F9212	4	C4-PZ-2		0850		1245	0
1	F9213	5	MW-1N		0905		1300	0
1	F9214	6	MW-17		0920		1315	0
1	F9215	7	ME-4		0935		1330	0
1	F9216	8	MW-2N		0950		1345	0
1	F9217	9	MW-20		1005		1400	0
1	F9218	10	GP-7		1020		1415	0
1	F9219	11	GP-8		1035		1430	0
1	F9221	12	GP-9		1050		1445	0
1	F9222	13	ME-10D		1105		1500	0
1	F9223	14	MW-3N	↓	1120	↓	1515	0

COMMENTS * = "Placed" date/time applies to charcoal packets. Water sample is a grab sample collected on the "collected" date

This sheet filled out by OUL staff? Yes ___ **No** ✓ **Charts for samples on this page proofed by OUL:** CA

OUL Project No. 1926 **Date Analyzed:** 9/13/22 **Analyzed By:** AC/OUL

F9220 OUL Charcoal Blank

OZARK UNDERGROUND LABORATORY, INC.

1572 Aley Lane Protem, MO 65733 (417) 785-4289 fax (417) 785-4290 email: contact@ozarkundergroundlab.com

SAMPLE COLLECTION DATA SHEET for FLUORESCENCE ANALYSIS

Project Eco-Vista Landfill (EVLF) Week No: 3 Samples Collected By: Chris Fincher

Samples Shipped By: Chris Fincher Samples Received By: C. Aley / OUL

Date Samples Shipped: 9.7.22 Date Samples Received: 9-9-22 Time Samples Received: 1400 Return Cooler? Yes ☐ No ☑

Bill to: Steve Jett Send Results to: Steve Jett

Analyze for: ☑ Fluorescein ☑ Eosine ☑ Rhodamine WT ☑ Other SRB Ship cooler to:

OUL use only		*Please indicate stations where dye was visible in the field* for field technician use - use black ink only						*OUL use only*
# CHAR REC'D	LAB NUMBER	STATION NUMBER	STATION NAME	PLACED *		COLLECTED		# WATER REC'D
				DATE	TIME	DATE	TIME	
1	F9224	15	NE-13	8.23	1135	9.6	1530	0
1	F9225	16	NE-8	↓	1150	↓	1545	0
1	F9226	17	MW-21	↓	1205	↓	1600	0
1	F9227	18	MW-10N	↓	1220	↓	1615	0
1	F9228	19	Wildcat Creek	↓	1235	↓	1630	0

COMMENTS * = "Placed" date/time applies to charcoal packets. Water sample is a grab sample collected on the "collected" date

This sheet filled out by OUL staff? Yes ___ No ✓ Charts for samples on this page proofed by OUL: AC

OUL Project No: 926 Date Analyzed: 9/13/22 Analyzed By: AC/OUL

BASIC INFORMATION ON TRACER DYE ANALYSIS BY OZARK UNDERGROUND LABORATORY

Note: More detailed information is available in the OUL's "Procedures and Criteria for the Analysis of Fluorescent Tracer Dyes in Water and Charcoal Samplers". This 20 page document can be downloaded from www.ozarkundergroundlab.com. Clients are welcome to attach the Procedures and Criteria document as an appendix to workplans or reports.

Normally acceptable emission wavelength ranges and detection limits for the four most commonly used tracer dyes in water samples and elutants from activated carbon samplers are shown in Table 1 below.

Table 1. RF-5301 Spectrofluorophotometer. Normal emission wavelength ranges and detection limits for fluorescein, eosine, rhodamine WT, and sulforhodamine B dyes in water and elutant samples.

Fluorescent Dye	Normal Acceptable Emission Wavelength Range (nm)		Detection Limit (ppb)	
	Elutant	Water	Elutant	Water
Eosine	539.3 to 545.1	532.5 to 537.0	0.050	0.015
Fluorescein	514.1 to 519.2	505.9 to 509.7	0.025	0.002
Rhodamine WT	564.6 to 571.2	571.9 to 577.2	0.170	0.015
Sulforhodamine B	575.2 to 582.0	580.1 to 583.7	0.080	0.008

Note: Detection limits are based upon the as-sold weight of the dye mixtures normally used by the OUL. Fluorescein and eosine detection limits in water are based on samples pH adjusted to greater than 9.5.

Detection limits are based on 3X signal to noise ratio determined from spiked samples. The normal acceptable emission wavelength range is based on a large suite of samples from actual field sites where the dyes are known to be present in the samples; the values shown are the mean plus and minus 2 standard deviations. Emission fluorescence peaks are a function of the instrument used, standard instrument settings, the dye, and the dye matrix. Contaminants in water samples may slightly alter peak emission wavelengths. In some cases fluorescence peaks may become shorter than shown in Table 1 as a result of decomposition of the tracer dyes. In most cases this is a very slow process.

All OUL carbon (charcoal) samplers contain 4.25 grams of activated carbon. Dyes are eluted from the carbon with 15 ml of an eluting solution which is a mixture of 5% aqua ammonia and 95% isopropyl alcohol solution and sufficient potassium hydroxide pellets to saturate the solution. The isopropyl alcohol solution is 70% alcohol and 30% water. The aqua ammonia solution is 29% ammonia and the remainder water. The potassium hydroxide is added until a super-saturated layer is visible in the bottom of the container. This super-saturated layer is not used for elution.

All water samples analyzed for fluorescein, eosine, rhodamine Wt and sulforhodamine B are pH adjusted to greater than pH 9.5 to maximize fluorescence intensity of these dyes. The pH adjustment is conducted by placing uncapped water samples in a high ammonia environment. If serial dilutions are required for water samples the diluting water used has been pH adjusted to greater than pH 9.5.

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Certificate of Analysis

Date of certificate: September 29, 2022
Client: Jett Environmental Consulting
18 Lexington Oaks Court
Foristell, MO 63348
Project name: Eco-Vista Landfill
Contact person: Steve.Jett@jettenviro.com

Samples collected by: Chris Fincher
Date samples shipped: September 19, 2022
Date samples rec'd at OUL: September 20, 2022
Date analyzed by OUL: September 26, 2022
Included with certificate of analysis: Table of results, copy of sample collection data sheets and a page on basic analysis information

Results for charcoal samplers analyzed for the presence of fluorescein, eosine, rhodamine WT (RWT) and sulforhodamine B (SRB) dyes.
Peak wavelengths are reported in nanometers (nm); dye concentrations are reported in parts per billion (ppb).

OUL	Station	Station Name	Date/Time	Date/Time	Fluorescein Results		Eosine Results		RWT Results		SRB Results	
Number	Number		Placed	Collected	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)
F9373	1	PZ-2D	9/6/22 1205	9/19/22 0800	515.2	14.6	ND		ND		ND	
F9374	2	MW-19	9/6/22 1220	9/19/22 0815	ND		ND		ND		ND	
F9375	3	C4-PZ-1	9/6/22 1235	9/19/22 0830	ND		ND		ND		ND	
F9376	4	C4-PZ-2	9/6/22 1250	9/19/22 0845	ND		ND		ND		ND	
F9377	5	MW-1N	9/6/22 1305	9/19/22 0900	ND		ND		ND		ND	
F9378	6	MW-17	9/6/22 1320	9/19/22 0915	ND		ND		ND		ND	
F9379	7	NE-4	9/6/22 1335	9/19/22 0930	ND		ND		ND		ND	
F9380	Laboratory control charcoal blank											
F9381	8	MW-2N	9/6/22 1350	9/19/22 0945	ND		ND		ND		ND	
F9382	9	MW-20	9/6/22 1405	9/19/22 1000	ND		ND		ND		ND	
F9383	10	GP-7	9/6/22 1420	9/19/22 1015	ND		ND		ND		ND	
F9384	11	GP-8	9/6/22 1435	9/19/22 1030	ND		ND		ND		ND	
F9385	12	GP-9	9/6/22 1450	9/19/22 1045	ND		ND		ND		ND	
F9386	13	NE-10D	9/6/22 1505	9/19/22 1100	ND		ND		ND		ND	
F9387	14	MW-3N	9/6/22 1520	9/19/22 1115	ND		ND		ND		ND	
F9388	15	NE-13	9/6/22 1535	9/19/22 1130	ND		ND		ND		ND	
F9389	16	NE-8	9/6/22 1550	9/19/22 1145	ND		ND		ND		ND	
F9390	17	MW-21	9/6/22 1605	9/19/22 1200	ND		ND		ND		ND	
F9391	18	MW-10N	9/6/22 1620	9/19/22 1215	ND		ND		ND		ND	
F9392	19	Wildcat Creek	9/6/22 1635	9/19/22 1230	ND		ND		ND		578.8	1.70

Note: Dye concentrations are based upon standards used at the OUL. The standard concentrations are based upon the as sold weight of the dye that the OUL uses. If the client is not using OUL dyes, the client should provide the OUL with a sample of the dye to compare to the OUL dyes.

Footnotes: ND = No dye detected

Thomas J. Aley, PHG and RG

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OZARK UNDERGROUND LABORATORY, INC.

1572 Aley Lane Protem, MO 65733 (417) 785-4289 fax (417) 785-4290 email: contact@ozarkundergroundlab.com

SAMPLE COLLECTION DATA SHEET for FLUORESCENCE ANALYSIS

Project Eco-Vista Landfill / EVLF Week No: 4 Samples Collected By: Chris Fincher

Samples Shipped By: Chris Fincher Samples Received By: C. Aley OUL

Date Samples Shipped: 9.19.22 Date Samples Received: 9-20-22 Time Samples Received: 1530 Return Cooler? Yes ☐ No ☑

Bill to: Steve Jett Send Results to: Steve Jett

Analyze for: ☑ Fluorescein ☑ Eosine ☑ Rhodamine WT ☑ Other SRB Ship cooler to:

OUL use only		Please indicate stations where dye was visible in the field for field technician use - use black ink only						OUL use only
# CHAR REC'D	LAB NUMBER	STATION NUMBER	STATION NAME	PLACED *		COLLECTED		# WATER REC'D
				DATE	TIME	DATE	TIME	
1	F9373	1	PZ-2D	9.6.22	1205	9.19.22	0800	0
1	F9374	2	MW-19		1220		0815	0
1	F9375	3	CH-PZ-1		1235		0830	0
1	F9376	4	CH-PZ-2		1250		0845	0
1	F9377	5	MW-1N		1305		0900	0
1	F9378	6	MW-17		1320		0915	0
1	F9379	7	NE-4		1335		0930	0
1	F9381	8	MW-2N		1350		0945	0
1	F9382	9	MW-20		1405		1000	0
1	F9383	10	GP-7		1420		1015	0
1	F9384	11	GP-8		1435		1030	0
1	F9385	12	GP-9		1450		1045	0
1	F9386	13	NE-10D		1505		1100	0
1	F9387	14	MW-3N	↓	1520	↓	1115	0

COMMENTS * = "Placed" date/time applies to charcoal packets. Water sample is a grab sample collected on the "collected" date

F9380 OUL charcoal blank

This sheet filled out by OUL staff? Yes ☐ No ☑ Charts for samples on this page proofed by OUL: AG/OUL

OUL Project No. 926 Date Analyzed: 9/26/22 Analyzed By: AG/OUL

OZARK UNDERGROUND LABORATORY, INC.

1572 Aley Lane Protem, MO 65733 (417) 785-4289 fax (417) 785-4290 email: contact@ozarkundergroundlab.com

SAMPLE COLLECTION DATA SHEET for FLUORESCENCE ANALYSIS

Project Eco-Vista Landfill (EVLF) Week No: 4 Samples Collected By: Chris Fincher

Samples Shipped By: Chris Fincher Samples Received By: C. Aley OUL

Date Samples Shipped: 9.19.22 Date Samples Received: 9-20-22 Time Samples Received: 1530 Return Cooler? Yes ☐ No ☑

Bill to: Steve Jett Send Results to: Steve Jett

Analyze for: ☑ Fluorescein ☑ Eosine ☑ Rhodamine WT ☐ Other SRB Ship cooler to:

OUL use only		*Please indicate stations where dye was visible in the field* for field technician use - use black ink only					*OUL use only*
# CHAR REC'D	LAB NUMBER	STATION NUMBER	STATION NAME	PLACED *		COLLECTED		# WATER REC'D
				DATE	TIME	DATE	TIME	
1	F9388	15	NE-13	9.6.22	1535	9.19.22	1130	0
1	F9389	16	NE-8	↓	1550	↓	1145	0
1	F9390	17	MW-21	↓	1605	↓	1200	0
1	F9391	18	MW-10N	↓	1620	↓	1215	0
1	F9392	19	Wildcat Creek	↓	1635	↓	1230	0

COMMENTS * = "Placed" date/time applies to charcoal packets. Water sample is a grab sample collected on the "collected" date

This sheet filled out by OUL staff? Yes ___ No ✓ Charts for samples on this page proofed by OUL: AG/OUL

OUL Project No. 1924 Date Analyzed: 9/26/22 Analyzed By: AC/OUL

Ozark UNDERGROUND LABORATORY 1572 Aley Lane • Protem, MO 65733 • (417) 785-4289 • fax (417) 785-4290 • contact@ozarkundergroundlab.com

Certificate of Analysis

Date of certificate: October 10, 2022
Client: Jett Environmental Consulting
18 Lexington Oaks Court
Foristell, MO 63348
Project name: Eco-Vista Landfill
Contact person: Steve.Jett@jettenviro.com

Samples collected by: Chris Fincher
Date samples shipped: October 5, 2022
Date samples rec'd at OUL: October 6, 2022
Date analyzed by OUL: October 7, 2022
Included with certificate of analysis: Table of results, copy of sample collection data sheets and a page on basic analysis information

Results for charcoal samplers analyzed for the presence of fluorescein, eosine, rhodamine WT (RWT) and sulforhodamine B (SRB) dyes.
Peak wavelengths are reported in nanometers (nm); dye concentrations are reported in parts per billion (ppb).

OUL	Station	Station Name	Date/Time	Date/Time	Fluorescein Results		Eosine Results		RWT Results		SRB Results	
Number	Number		Placed	Collected	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)
F9726	1	PZ-2D	9/19/22 0805	10/4/22 1400	514.9	55.8	ND		ND		ND	
F9727	2	MW-19	9/19/22 0820	10/4/22 1415	ND		ND		ND		ND	
F9728	3	C4-PZ-1	9/19/22 0835	10/4/22 1430	ND		ND		ND		ND	
F9729	4	C4-PZ-2	9/19/22 0850	10/4/22 1445	ND		ND		ND		ND	
F9730	5	MW-1N	9/19/22 0905	10/4/22 1500	ND		ND		ND		ND	
F9731	6	MW-17	9/19/22 0920	10/4/22 1515	ND		ND		ND		ND	
F9732	7	NE-4	9/19/22 0935	10/4/22 1530	ND		ND		ND		ND	
F9733	8	MW-2N	9/19/22 0950	10/4/22 1545	ND		ND		ND		ND	
F9734	9	MW-20	9/19/22 1005	10/4/22 1600	ND		ND		ND		ND	
F9735	10	GP-7	9/19/22 1020	10/4/22 1615	ND		ND		ND		ND	
F9736	11	GP-8	9/19/22 1035	10/4/22 1630	ND		ND		ND		ND	
F9737	12	GP-9	9/19/22 1050	10/4/22 1645	ND		ND		ND		ND	
F9738	13	NE-10D	9/19/22 1105	10/4/22 1700	ND		ND		ND		ND	
F9739	14	MW-3N	9/19/22 1120	10/4/22 1715	ND		ND		ND		ND	
F9740	Laboratory control charcoal blank											
F9741	15	NE-13	9/19/22 1135	10/4/22 1730	ND		ND		ND		ND	
F9742	16	NE-8	9/19/22 1150	10/4/22 1745	ND		ND		ND		ND	
F9743	17	MW-21	9/19/22 1205	10/4/22 1800	ND		ND		ND		ND	
F9744	18	MW-10N	9/19/22 1220	10/4/22 1815	ND		ND		ND		ND	
F9745	19	Wildcat Creek	9/19/22 1235	10/4/22 1830	ND		ND		ND		579.2	2.04

Note: Dye concentrations are based upon standards used at the OUL. The standard concentrations are based upon the as sold weight of the dye that the OUL uses. If the client is not using OUL dyes, the client should provide the OUL with a sample of the dye to compare to the OUL dyes.

Footnotes: ND = No dye detected

Thomas J. Aley, PHG and RG

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OZARK UNDERGROUND LABORATORY, INC.

1572 Aley Lane Protem, MO 65733 (417) 785-4289 fax (417) 785-4290 email: contact@ozarkundergroundlab.com

SAMPLE COLLECTION DATA SHEET for FLUORESCENCE ANALYSIS

Project ECo-Vista Landfill (EVLF) Week No: 5 Samples Collected By: Chris Fincher

Samples Shipped By: Chris Fincher Samples Received By: Cinda Comstock/OUL

Date Samples Shipped: 10.5.22 Date Samples Received: 10/6/22 Time Samples Received: 1700 Return Cooler? Yes ☐ No ☑

Bill to: Steve Jett Send Results to: Steve Jett

Analyze for: ☑ Fluorescein ☑ Eosine ☑ Rhodamine WT ☑ Other SRB Ship cooler to:

OUL use only		Please indicate stations where dye was visible in the field for field technician use - use black ink only						OUL use only
# CHAR REC'D	LAB NUMBER	STATION NUMBER	STATION NAME	PLACED * DATE	PLACED * TIME	COLLECTED DATE	COLLECTED TIME	# WATER REC'D
1	F9726	1	PZ-2D	9.19.22	0805	10.4.22	1400	0
1	F9727	2	MW-19		0820		1415	0
1	F9728	3	C4-PZ-1		0835		1430	0
1	F9729	4	C4-PZ-2		0850		1445	0
1	F9730	5	MW-1N		0905		1500	0
1	F9731	6	MW-17		0920		1515	0
1	F9732	7	NE-4		0935		1530	0
1	F9733	8	MW-2N		0950		1545	0
1	F9734	9	MW-20		1005		1600	0
1	F9735	10	GP-7		1020		1615	0
1	F9736	11	GP-8		1035		1630	0
1	F9737	12	GP-9		1050		1645	0
1	F9738	13	NE-10D		1105		1700	0
1	F9739	14	MW-3N	↓	1120	↓	1715	0

COMMENTS * = "Placed" date/time applies to charcoal packets. Water sample is a grab sample collected on the "collected" date

F9740 OUL Charcoal Blank

This sheet filled out by OUL staff? Yes ___ No ✓ Charts for samples on this page proofed by OUL: AC

OUL Project No. 1926 Date Analyzed: 10/7/22 Analyzed By: AC/OUL

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SAMPLE COLLECTION DATA SHEET for FLUORESCENCE ANALYSIS

Project ECO-Vista Landfill (EVLF) Week No: 5 Samples Collected By: Chris Fincher

Samples Shipped By: Chris Fincher Samples Received By: Amber Comstock/OUL

Date Samples Shipped: 10.5.22 Date Samples Received: 10/6/22 Time Samples Received: 1200 Return Cooler? Yes ☐ No ☑

Bill to: Steve Jett Send Results to: Steve Jett

Analyze for: ☑ Fluorescein ☑ Eosine ☑ Rhodamine WT ☑ Other SRB Ship cooler to:

OUL use only		*Please indicate stations where dye was visible in the field* for field technician use - use black ink only						OUL use only
# CHAR REC'D	LAB NUMBER	STATION NUMBER	STATION NAME	PLACED * DATE	PLACED * TIME	COLLECTED DATE	COLLECTED TIME	# WATER REC'D
1	F9741	15	NE-13	9.19.22	1135	10.4.22	1730	0
1	F9742	16	NE-8	↓	1150	↓	1745	0
1	F9743	17	MW-21	↓	1205	↓	1800	0
1	F9744	18	MW-10N	↓	1220	↓	1815	0
1	F9745	19	Wildcat Creek	↓	1235	↓	1830	0

COMMENTS * = "Placed" date/time applies to charcoal packets. Water sample is a grab sample collected on the "collected" date

This sheet filled out by OUL staff? Yes ___ No ✓ Charts for samples on this page proofed by OUL: CA

OUL Project No. 1926 Date Analyzed: 10/7/22 Analyzed By: AC/OUL

AC/OUL

Ozark UNDERGROUND LABORATORY 1572 Aley Lane • Protem, MO 65733 • (417) 785-4289 • fax (417) 785-4290 • contact@ozarkundergroundlab.com

Certificate of Analysis

Date of certificate: October 21, 2022
Client: Jett Environmental Consulting
18 Lexington Oaks Court
Foristell, MO 63348
Project name: Eco-Vista Landfill
Contact person: Steve.Jett@jettenviro.com

Samples collected by: Chris Fincher
Date samples shipped: October 17, 2022
Date samples rec'd at OUL: October 19, 2022
Date analyzed by OUL: October 20, 2022
Included with certificate of analysis: Table of results, copy of sample collection data sheets and a page on basic analysis information

Results for charcoal samplers analyzed for the presence of fluorescein, eosine, rhodamine WT (RWT) and sulforhodamine B (SRB) dyes.

Peak wavelengths are reported in nanometers (nm); dye concentrations are reported in parts per billion (ppb).

OUL	Station	Station Name	Date/Time	Date/Time	Fluorescein Results		Eosine Results		RWT Results		SRB Results	
Number	Number		Placed	Collected	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)
F9948	1	PZ-2D	10/4/22 1405	10/17/22 1000	515.4	25.7	ND		ND		ND	
F9949	2	MW-19	10/4/22 1420	10/17/22 1015	ND		ND		ND		ND	
F9950	3	C4-PZ-1	10/4/22 1435	10/17/22 1030	ND		ND		ND		ND	
F9951	4	C4-PZ-2	10/4/22 1450	10/17/22 1045	ND		ND		ND		ND	
F9952	5	MW-1N	10/4/22 1505	10/17/22 1100	ND		ND		ND		ND	
F9953	6	MW-17	10/4/22 1520	10/17/22 1115	ND		ND		ND		ND	
F9954	7	NE-4	10/4/22 1535	10/17/22 1130	ND		ND		ND		ND	
F9955	8	MW-2N	10/4/22 1550	10/17/22 1145	ND		ND		ND		ND	
F9956	9	MW-20	10/4/22 1605	10/17/22 1200	ND		ND		ND		ND	
F9957	10	GP-7	10/4/22 1620	10/17/22 1215	ND		ND		ND		ND	
F9958	11	GP-8	10/4/22 1635	10/17/22 1230	ND		ND		ND		ND	
F9959	12	GP-9	10/4/22 1650	10/17/22 1245	ND		ND		ND		ND	
F9960	Laboratory control charcoal blank											
F9961	13	NE-10D	10/4/22 1705	10/17/22 1300	ND		ND		ND		ND	
F9962	14	MW-3N	10/4/22 1720	10/17/22 1315	ND		ND		ND		ND	
F9963	15	NE-13	10/4/22 1735	10/17/22 1330	ND		ND		ND		ND	
F9964	16	NE-8	10/4/22 1750	10/17/22 1345	ND		ND		ND		ND	
F9965	17	MW-21	10/4/22 1805	10/17/22 1400	ND		ND		ND		ND	
F9966	18	MW-10N	10/4/22 1820	10/17/22 1415	ND		ND		ND		ND	
F9967	19	Wildcat Creek	10/4/22 1835	10/17/22 1430	ND		ND		ND		578.7	1.52

Note: Dye concentrations are based upon standards used at the OUL. The standard concentrations are based upon the as sold weight of the dye that the OUL uses. If the client is not using OUL dyes, the client should provide the OUL with a sample of the dye to compare to the OUL dyes.

Footnotes: ND = No dye detected

Thomas J. Aley, PHG and RG

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OZARK UNDERGROUND LABORATORY, INC.

1572 Aley Lane Protem, MO 65733 (417) 785-4289 fax (417) 785-4290 email: contact@ozarkundergroundlab.com

SAMPLE COLLECTION DATA SHEET for FLUORESCENCE ANALYSIS

Project Eco-Vista Landfill (EVLF) Week No: 6 Samples Collected By: Chris Fincler

Samples Shipped By: Chris Fincler Samples Received By: Amber Comstock

Date Samples Shipped: 10.17.22 Date Samples Received: 10/19/22 Time Samples Received: 1700 Return Cooler? Yes ☐ No ☑

Bill to: Steve Jett Send Results to:

Analyze for: ☑ Fluorescein ☑ Eosine ☑ Rhodamine WT ☑ Other SRB Ship cooler to:

OUL use only		Please indicate stations where dye was visible in the field for field technician use - use black ink only						OUL use only
# CHAR REC'D	LAB NUMBER	STATION NUMBER	STATION NAME	PLACED * DATE	PLACED * TIME	COLLECTED DATE	COLLECTED TIME	# WATER REC'D
1	F9948	1	PZ-2D	10.14.22	1405	10.17.22	1000	0
1	F9949	2	MW-19	↓	1420	↓	1015	0
1	F9950	3	CL-PZ-1		1435		1030	0
1	F9951	4	CL-PZ-2		1450		1045	0
1	F9952	5	MW-1N		1505		1100	0
1	F9953	6	MW-17		1520		1115	0
1	F9954	7	NE-4		1535		1130	0
1	F9955	8	MW-2N		1550		1145	0
1	F9956	9	MW-20		1605		1200	0
1	F9957	10	GP-7		1620		1715	0
1	F9958	11	GP-8		1635		1230	0
1	F9959	12	GP-9		1650		1245	0
1	F9961	13	NE-10D		1705		1300	0
1	F9962	14	MW-3N	↓	1720	↓	1315	0

COMMENTS * = "Placed" date/time applies to charcoal packets. Water sample is a grab sample collected on the "collected" date

F9960 OUL Charcoal Blank

This sheet filled out by OUL staff? Yes ___ No X Charts for samples on this page proofed by OUL: Ca

OUL Project No. 1926 Date Analyzed: 10/20/22 Analyzed By: AC/OUL

AC/OUL

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SAMPLE COLLECTION DATA SHEET for FLUORESCENCE ANALYSIS

Project ECO-Vista Landfill (EVLF) Week No: 6 Samples Collected By: Chris Fincher

Samples Shipped By: Chris Fincher Samples Received By: Amber Comstock

Date Samples Shipped: 10.17.22 Date Samples Received: 10/19/22 Time Samples Received: 1700 Return Cooler? Yes ☐ No ☑

Bill to: Steve Jett Send Results to: Steve Jett

Analyze for: ☑ Fluorescein ☑ Eosine ☑ Rhodamine WT ☑ Other SRB Ship cooler to:

OUL use only		***Please indicate stations where dye was visible in the field*** *for field technician use - use black ink only*						*OUL use only*
# CHAR REC'D	LAB NUMBER	STATION NUMBER	STATION NAME	PLACED *		COLLECTED		# WATER REC'D
				DATE	TIME	DATE	TIME	
1	F9963	15	NE-13	10.4.22	1735	10.17.22	1330	0
1	F9964	16	NE-8	↓	1750	↓	1345	0
1	F9965	17	MW-21	↓	1805	↓	1400	0
1	F9966	18	MW-10N	↓	1820	↓	1415	0
1	F9967	19	Wildcat Creek	↓	1835	↓	1430	0

COMMENTS * = "Placed" date/time applies to charcoal packets. Water sample is a grab sample collected on the "collected" date

This sheet filled out by OUL staff? Yes ___ No ✓ Charts for samples on this page proofed by OUL: CA

OUL Project No. 1926 Date Analyzed: 10/20/22 Analyzed By: AC/OUL

AC/OUL

BASIC INFORMATION ON TRACER DYE ANALYSIS BY OZARK UNDERGROUND LABORATORY

Note: More detailed information is available in the OUL's "Procedures and Criteria for the Analysis of Fluorescent Tracer Dyes in Water and Charcoal Samplers". This 20 page document can be downloaded from www.ozarkundergroundlab.com. Clients are welcome to attach the Procedures and Criteria document as an appendix to workplans or reports.

Normally acceptable emission wavelength ranges and detection limits for the four most commonly used tracer dyes in water samples and elutants from activated carbon samplers are shown in Table 1 below.

Table 1. RF-5301 Spectrofluorophotometer. Normal emission wavelength ranges and detection limits for fluorescein, eosine, rhodamine WT, and sulforhodamine B dyes in water and elutant samples.

Fluorescent Dye	Normal Acceptable Emission Wavelength Range (nm)		Detection Limit (ppb)	
	Elutant	Water	Elutant	Water
Eosine	539.3 to 545.1	532.5 to 537.0	0.050	0.015
Fluorescein	514.1 to 519.2	505.9 to 509.7	0.025	0.002
Rhodamine WT	564.6 to 571.2	571.9 to 577.2	0.170	0.015
Sulforhodamine B	575.2 to 582.0	580.1 to 583.7	0.080	0.008

Note: Detection limits are based upon the as-sold weight of the dye mixtures normally used by the OUL. Fluorescein and eosine detection limits in water are based on samples pH adjusted to greater than 9.5.

Detection limits are based on 3X signal to noise ratio determined from spiked samples. The normal acceptable emission wavelength range is based on a large suite of samples from actual field sites where the dyes are known to be present in the samples; the values shown are the mean plus and minus 2 standard deviations. Emission fluorescence peaks are a function of the instrument used, standard instrument settings, the dye, and the dye matrix. Contaminants in water samples may slightly alter peak emission wavelengths. In some cases fluorescence peaks may become shorter than shown in Table 1 as a result of decomposition of the tracer dyes. In most cases this is a very slow process.

All OUL carbon (charcoal) samplers contain 4.25 grams of activated carbon. Dyes are eluted from the carbon with 15 ml of an eluting solution which is a mixture of 5% aqua ammonia and 95% isopropyl alcohol solution and sufficient potassium hydroxide pellets to saturate the solution. The isopropyl alcohol solution is 70% alcohol and 30% water. The aqua ammonia solution is 29% ammonia and the remainder water. The potassium hydroxide is added until a super-saturated layer is visible in the bottom of the container. This super-saturated layer is not used for elution.

All water samples analyzed for fluorescein, eosine, rhodamine Wt and sulforhodamine B are pH adjusted to greater than pH 9.5 to maximize fluorescence intensity of these dyes. The pH adjustment is conducted by placing uncapped water samples in a high ammonia environment. If serial dilutions are required for water samples the diluting water used has been pH adjusted to greater than pH 9.5.

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Certificate of Analysis
Revised

Date of revised certificate: November 9, 2022

Date of original certificate: November 8, 2022

Client: Jett Environmental Consulting
18 Lexington Oaks Court
Foristell, MO 63348

Project name: Eco-Vista Landfill

Contact person: Steve.Jett@jettenviro.com

Samples collected by: Chris Fincher

Date samples shipped: November 1, 2022

Date samples rec'd at OUL: November 3, 2022

Date analyzed by OUL: November 7, 2022

Included with certificate of analysis: Table of results, copy of sample collection data sheets and a page on basic analysis information

Results for charcoal samplers analyzed for the presence of fluorescein, eosine, rhodamine WT (RWT) and sulforhodamine B (SRB) dyes.

Peak wavelengths are reported in nanometers (nm); dye concentrations are reported in parts per billion (ppb).

OUL	Station	Station	Date/Time	Date/Time	Fluorescein Results		Eosine Results		RWT Results		SRB Results	
Number	Number	Name	Placed	Collected	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)
G0419	1	PZ-2D	10/17/22 1005	11/1/22 1000	ND		ND		ND		ND	
G0420	Laboratory control charcoal blank											
G0421	2	MW-19	10/17/22 1020	11/1/22 1015	ND		ND		ND		ND	
G0422	3	C4-PZ-1	10/17/22 1035	11/1/22 1030	ND		ND		ND		ND	
G0423	4	C4-PZ-2	10/17/22 1050	11/1/22 1045	ND		ND		ND		ND	
G0424	5	MW-1N	10/17/22 1105	11/1/22 1100	ND		ND		ND		ND	
G0425	6	MW-17	10/17/22 1120	11/1/22 1115	ND		ND		ND		ND	
G0426	7	NE-4	10/17/22 1135	11/1/22 1130	ND		ND		ND		ND	
G0427	8	MW-2N	10/17/22 1150	11/1/22 1145	ND		ND		ND		ND	
G0428	9	MW-20	10/17/22 1205	11/1/22 1200	ND		ND		ND		ND	
G0429	10	GP-7	10/17/22 1220	11/1/22 1215	ND		ND		ND		ND	
G0430	11	GP-8	10/17/22 1235	11/1/22 1230	ND		ND		ND		ND	
G0431	12	GP-9	10/17/22 1250	11/1/22 1245	ND		ND		ND		ND	

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OUL Number	Station Number	Station Name	Date/Time Placed	Date/Time Collected	Fluorescein Results		Eosine Results		RWT Results		SRB Results	
					Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)
G0432	13	NE-10D	10/17/22 1305	11/1/22 1300	ND		ND		ND		ND	
G0433	14	MW-3N	10/17/22 1320	11/1/22 1315	ND		ND		ND		ND	
G0434	15	NE-13	10/17/22 1335	11/1/22 1330	ND		ND		ND		ND	
G0435	16	NE-8	10/17/22 1350	11/1/22 1345	ND		ND		ND		ND	
G0436	17	MW-21	10/17/22 1405	11/1/22 1400	515.4 *	0.616	ND		ND		ND	
G0437	18	MW-10N	10/17/22 1420	11/1/22 1415	ND		ND		ND		ND	
G0438	19	Wildcat Creek	10/17/22 1435	11/1/22 1430	ND		ND		ND		578.1	1.15

Note: Dye concentrations are based upon standards used at the OUL. The standard concentrations are based upon the as sold weight of the dye that the OUL uses.

If the client is not using OUL dyes, the client should provide the OUL with a sample of the dye to compare to the OUL dyes.

Footnotes: ND = No dye detected

* = A fluorescence peak is present that does not meet all the criteria for a positive dye result. However, it has been calculated as though it was the tracer dye.

Thomas J. Aley, PHG and RG

OZARK UNDERGROUND LABORATORY, INC.

1572 Aley Lane Protem, MO 65733 (417) 785-4289 fax (417) 785-4290 email: contact@ozarkundergroundlab.com

SAMPLE COLLECTION DATA SHEET for FLUORESCENCE ANALYSIS

Project Eco-Vista Landfill (EVLF) **Week No:** 7 **Samples Collected By:** Chris Finder

Samples Shipped By: Chris Finder **Samples Received By:** Amber Comstock/OUL

Date Samples Shipped: 11.1.22 **Date Samples Received:** 11/3/22 **Time Samples Received:** 1700 **Return Cooler?** Yes ☐ No ☑

Bill to: Steve Jett **Send Results to:** Steve Jett

Analyze for: ☑ Fluorescein ☑ Eosine ☑ Rhodamine WT ☑ Other SRB **Ship cooler to:**

OUL use only		***Please indicate stations where dye was visible in the field*** *for field technician use - use black ink only*						*OUL use only*
# CHAR REC'D	LAB NUMBER	STATION NUMBER	STATION NAME	PLACED *		COLLECTED		# WATER REC'D
				DATE	TIME	DATE	TIME	
1	G0419	1	PZ-2D	10.17.22	1005	11.1.22	1000	0
1	G0421	2	MW-19	↓	1020	↓	1015	0
1	G0422	3	CH-PZ-1		1035		1030	0
1	G0423	4	CH-PZ-2		1050		1045	0
1	G0424	5	MW-1N		1105		1100	0
1	G0425	6	MW-17		1120		1115	0
1	G0426	7	NE-4		1135		1130	0
1	G0427	8	MW-2N		1150		1145	0
1	G0428	9	MW-20		1205		12000	0
1	G0429	10	GP-7		1220		1215	0
1	G0430	11	GP-8		1235		1230	0
1	G0431	12	GP-9		1250		1245	0
1	G0432	13	NE-100		1305		1300	0
1	G0433	14	MW-3N	↓	1320	↓	1315	0

COMMENTS * = "Placed" date/time applies to charcoal packets. Water sample is a grab sample collected on the "collected" date

G0420 OUL Charcoal Blank

This sheet filled out by OUL staff? Yes ___ **No** ✓ **Charts for samples on this page proofed by OUL:** AC/OUL and CA/OUL

OUL Project No. 1926 **Date Analyzed:** 11/7/22 **Analyzed By:** AC/OUL

OZARK UNDERGROUND LABORATORY, INC.

1572 Aley Lane Protem, MO 65733 (417) 785-4289 fax (417) 785-4290 email: contact@ozarkundergroundlab.com

SAMPLE COLLECTION DATA SHEET for FLUORESCENCE ANALYSIS

Project ECO - Vista Landfill **Week No:** 7 **Samples Collected By:** Chris Finder

Samples Shipped By: Chris Finder **Samples Received By:** Amber Comstock/OUL

Date Samples Shipped: 11.1.22 **Date Samples Received:** 11/3/22 **Time Samples Received:** 1700 **Return Cooler?** Yes ☐ No ☑

Bill to: Steve Jett **Send Results to:** Steve Jett

Analyze for: ☑ Fluorescein ☑ Eosine ☑ Rhodamine WT ☑ Other SRB **Ship cooler to:**

OUL use only		*Please indicate stations where dye was visible in the field* for field technician use - use black ink only						*OUL use only*
# CHAR REC'D	LAB NUMBER	STATION NUMBER	STATION NAME	PLACED * DATE	PLACED * TIME	COLLECTED DATE	COLLECTED TIME	# WATER REC'D
1	G0434	15	NE-13	10.17.22	1335	11.1.22	1330	0
1	G0435	16	NE-8	↓	1350	↓	1345	0
1	G0436	17	MW-21	↓	1405	↓	1400	0
1	G0437	18	MW-10N	↓	1420	↓	1405	0
1	G0438	19	Wildcat Creek	↓	1435	↓	1430	0

COMMENTS * = "Placed" date/time applies to charcoal packets. Water sample is a grab sample collected on the "collected" date

This sheet filled out by OUL staff? Yes ___ **No** X **Charts for samples on this page proofed by OUL:** AC/OUL and CA/OUL

OUL Project No. 1926 **Date Analyzed:** 11/7/22 **Analyzed By:** AC/OUL

AC/OUL

BASIC INFORMATION ON TRACER DYE ANALYSIS BY OZARK UNDERGROUND LABORATORY

Note: More detailed information is available in the OUL's "Procedures and Criteria for the Analysis of Fluorescent Tracer Dyes in Water and Charcoal Samplers". This 20 page document can be downloaded from www.ozarkundergroundlab.com. Clients are welcome to attach the Procedures and Criteria document as an appendix to workplans or reports.

Normally acceptable emission wavelength ranges and detection limits for the four most commonly used tracer dyes in water samples and elutants from activated carbon samplers are shown in Table 1 below.

Table 1. RF-5301 Spectrofluorophotometer. Normal emission wavelength ranges and detection limits for fluorescein, eosine, rhodamine WT, and sulforhodamine B dyes in water and elutant samples.

Fluorescent Dye	Normal Acceptable Emission Wavelength Range (nm)		Detection Limit (ppb)	
	Elutant	Water	Elutant	Water
Eosine	539.3 to 545.1	532.5 to 537.0	0.050	0.015
Fluorescein	514.1 to 519.2	505.9 to 509.7	0.025	0.002
Rhodamine WT	564.6 to 571.2	571.9 to 577.2	0.170	0.015
Sulforhodamine B	575.2 to 582.0	580.1 to 583.7	0.080	0.008

Note: Detection limits are based upon the as-sold weight of the dye mixtures normally used by the OUL.
Fluorescein and eosine detection limits in water are based on samples pH adjusted to greater than 9.5.

Detection limits are based on 3X signal to noise ratio determined from spiked samples. The normal acceptable emission wavelength range is based on a large suite of samples from actual field sites where the dyes are known to be present in the samples; the values shown are the mean plus and minus 2 standard deviations. Emission fluorescence peaks are a function of the instrument used, standard instrument settings, the dye, and the dye matrix. Contaminants in water samples may slightly alter peak emission wavelengths. In some cases fluorescence peaks may become shorter than shown in Table 1 as a result of decomposition of the tracer dyes. In most cases this is a very slow process.

All OUL carbon (charcoal) samplers contain 4.25 grams of activated carbon. Dyes are eluted from the carbon with 15 ml of an eluting solution which is a mixture of 5% aqua ammonia and 95% isopropyl alcohol solution and sufficient potassium hydroxide pellets to saturate the solution. The isopropyl alcohol solution is 70% alcohol and 30% water. The aqua ammonia solution is 29% ammonia and the remainder water. The potassium hydroxide is added until a super-saturated layer is visible in the bottom of the container. This super-saturated layer is not used for elution.

All water samples analyzed for fluorescein, eosine, rhodamine Wt and sulforhodamine B are pH adjusted to greater than pH 9.5 to maximize fluorescence intensity of these dyes. The pH adjustment is conducted by placing uncapped water samples in a high ammonia environment. If serial dilutions are required for water samples the diluting water used has been pH adjusted to greater than pH 9.5.