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June 2023

Mr. Ryan O'Meara
Remediation Project Manager
National Aeronautics and Space Administration
Mail Code SI-E2
Building K6-1547 (Logistics Facility)
John F. Kennedy Space Center
Kennedy Space Center, FL 32899-0001

**Subject:** **Request for Discontinuation of Long-Term Monitoring**
**Orsino Storage Yard**
**Solid Waste Management Unit 004**
**Kennedy Space Center, Florida**

**Reference:** **Indefinite Delivery Indefinite Quantity (IDIQ) Contract 80KSC019D0010**

Dear Mr. O'Meara:

AECOM Technical Services, Inc. (AECOM) is pleased to provide Kennedy Space Center (KSC), National Aeronautics and Space Administration (NASA), with this letter report for the Orsino Storage Yard (ORSY). The purpose of this letter report is to present the site history, groundwater data, and recommendations resulting from assessments and long-term monitoring (LTM) activities at ORSY. This letter report was prepared for NASA under Contract 80KSC019D0010, Task Order 80KSC019F0071.

## Executive Summary

This report presents the site history, groundwater sampling results, and recommendations from the 2021 Industrial Area (IA) LTM activities at ORSY. ORSY has been used as a staging facility for electrical equipment since 1966 (EG&G 1991). Initial investigations conducted between 1986 and 1992 focused on polychlorinated biphenyls (PCBs) in soil. A series of soil excavation interim measures (IMs) were conducted to remove soils containing total PCB concentrations of greater than 25 milligrams per kilogram (mg/kg).

A Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) was completed in several phases at ORSY from 1998 through 2005, with PCBs in soil and volatile organic compounds (VOCs) in groundwater identified as contaminants of concern. Between 2000 and 2004, additional soil IMs were completed to remove soil with PCB concentrations greater than the State of Florida Industrial Soil Cleanup Target Level (SCTL) of 2.1 mg/kg given in Chapter 62-777, Florida Administrative Code (F.A.C.). A land use control (LUC) is in place at ORSY due to the presence of PCBs in soils at concentrations exceeding the Residential SCTL. In 2005, a statement of basis was issued to prevent residential exposure to site surface soils, prohibit the use of groundwater as a potable water supply, and initiate monitored natural attenuation (MNA). ORSY entered the IA LTM program at an annual sampling frequency with the goal of reducing groundwater concentrations to below the State of Florida Groundwater Cleanup Target Levels (GCTLs) given in Chapter 62-777, F.A.C.

In November 2020, concentrations of VOCs declined to below GCTLs. Therefore, the next sampling event was accelerated to September 2021 and a downgradient monitoring well was added into the sampling

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program. The September 2021 ORSY sampling data indicated VOC concentrations remained below GCTLs, marking the second consecutive sampling event with results below GCTLs.

The September 2021 groundwater sampling activities at ORSY were conducted in accordance with the KSC Sampling and Analysis Plan (SAP) (Geosyntec 2017), Florida Department of Environmental Protection (FDEP) April 2022 regulatory comments on the 2019-2020 IA LTM report, and the KSC Remediation Team (KSCRT) decisions from the February 2021 meeting. The April 2022 regulatory comments are included in **Appendix A**. The KSCRT meeting minutes are included in **Appendix B**.

Based on the 2020 and 2021 groundwater sampling results, discontinuation of MNA at ORSY is recommended. The existing LUC at ORSY will remain for PCB soil exceedances.

## SITE DESCRIPTION AND HISTORY

ORSY is located to the southeast of the C Avenue and 5th Street Southeast intersection. A power substation borders ORSY to the west. The storage yard has been utilized since 1966 as a staging area for electrical equipment, consisting of wooden electric poles, transformers containing PCBs, electrical cables, control panels, and oil-based switches. The site is predominantly gravel-paved with several sheds situated on concrete pads along the western side of the site (NASA 2005). Refer to **Figure 1** for a site map.

## PREVIOUS SITE INVESTIGATIONS

Based on evidence of apparent spills, ORSY was identified as a potential spill site in 1991. Initial site investigations focused on PCBs, which led to IM activities being conducted from 1986 through 1992 to remove soils with PCB concentrations exceeding 25 mg/kg as specified in the Toxic Substances Control Act (TSCA). A total of 921 tons of soil were excavated, transported, and properly disposed of during this time.

An RFI and RFI Addendum were completed between 1998 and 2005 that identified VOCs, including vinyl chloride (VC), chlorobenzene, 1,3-dichlorobenzene (DCB), 1,4-DCB, 1,2,3-trichlorobenzene (TCB), and 1,2,4-TCB, at concentrations in groundwater above their respective GCTLs (Geosyntec 2003, 2005). A risk evaluation determined these VOCs may cause an unacceptable human health risk if groundwater was to be used as a source of drinking water. MNA of groundwater was selected as the remediation strategy and ORSY was incorporated into the LTM program in 2005 at an annual sampling frequency. Concurrent with the RFI, soil with PCB concentrations greater than the Industrial SCTL of 2.1 mg/kg were delineated and several soil IMs were conducted, resulting in the excavation and disposal of approximately 2,340 tons of soil with PCB concentrations between 2.1 mg/kg and 25 mg/kg. Approximately 375 tons were excavated and disposed of with PCB concentrations greater than the TSCA level of 25 mg/kg. A LUC was recommended to prevent residential exposure to site soils.

VC concentrations have remained below the GCTL since 2006. Chlorobenzene, 1,3-DCB, and 1,4-DCB concentrations have remained below their respective GCTLs since 2007; however, 1,2,3-TCB and 1,2,4-TCB remained at concentrations exceeding their FDEP GCTLs. In 2012, the ORSY LTM groundwater sampling interval was changed to biennial frequency.

November 2020 sampling results from monitoring well ORSY-EXC-MW0001I revealed that both the 1,2,3-TCB and 1,2,4-TCB concentrations were below the Chapter 62-777, F.A.C. GCTL (70 µg/L) for the

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first time. Rather than wait until the next scheduled biennial event in 2022, the sampling was accelerated in 2021 to obtain a second consecutive sample below the GCTL within 12 months.

## FIELD SAMPLING ACTIVITIES

The ORSY site was sampled using low-flow sampling techniques, where each monitoring well was purged and sampled with a peristaltic pump and high-density polyethylene tubing. The sample tubing was placed at the mid-point of the well screen at each intermediate monitoring well to obtain a representative groundwater sample of aquifer conditions. Purge water, generated during sampling activities, was containerized in 55-gallon steel drums staged on spill containment pallets at the Components Cleaning Facility. The storage drums of purge water were sampled at the end of the sampling event and characterized for disposal. Upon receipt, analytical data were provided to the NASA Remediation Project Manager along with an inventory of the storage tank for disposal.

During purging of monitoring wells, geochemical parameters consisting of pH, specific conductivity, turbidity, dissolved oxygen, temperature, oxidation reduction potential, and salinity were monitored and recorded. Samples were collected once the geochemical parameters reached stabilization in accordance with FDEP Standard Operating Procedures (FDEP 2017) and the SAP. Daily Field Activity Logs are included in **Appendix C**. Groundwater Sampling Logs, which include the geochemical data, are included in **Appendix D**.

On September 16, 2021, Groundwater elevations were measured at five monitoring wells, and samples from two monitoring wells were collected. ORSY-EXC-MW0003I was added to the sampling event as a background well, as requested by FDEP. The following table shows the wells used for the groundwater level measurements and sampling at ORSY.

| Well Name | Screen Interval (ft bls) | Analysis |
|---|---|---|
| ORSY-DRM-MW0001I | 20-25 | WL Only |
| ORSY-EXC-MW0001I | 20-25 | WL + select VOCs |
| ORSY-EXC-MW0002I | 20-25 | WL Only |
| ORSY-EXC-MW0003I | 20-25 | WL + select VOCs |
| ORSY-EXC-MW0004I | 20-30 | WL Only |

WL = water level measurement
Select VOCs = monitoring well sampled for 1,2,3-TCB and 1,2,4-TCB by Method 8260B

The groundwater samples collected from ORSY-EXC-MW0001I and ORSY-EXC-MW0003I during the September 2021 sampling event were analyzed for select VOCs by Method 8260B. Analytes detected in the groundwater at each site were compared to GCTLs and State of Florida Natural Attenuation Default Concentration (NADC) levels established in Chapter 62-777, F.A.C., which are listed below.

| COC | GCTL (µg/L) | NADC (µg/L) |
|---|---|---|
| 1,2,3-TCB | 70 | 700 |
| 1,2,4-TCB | 70 | 700 |

µg/L = micrograms per liter

## WATER LEVEL COLLECTION AND GROUNDWATER FLOW DIRECTION

At the onset of each scheduled LTM sampling event and prior to collection of samples, predetermined monitoring wells were vented to allow for atmospheric equilibration. Once stabilized, groundwater

elevations were measured in site monitoring wells to determine the groundwater gradient and flow direction. Water levels in each well were measured to the nearest 0.01 foot using an electronic water level meter. Measurements were recorded from a permanent point identified on the top of each monitoring well casing (TOC), typically the northernmost point, for consistency. Groundwater elevations are calculated by subtracting the measured depth to water from the surveyed TOC elevation relative to the North American Vertical Datum of 1988 (NAVD88). Additionally, observations of the condition of the monitoring wells, surrounding vegetation, and biological hazards were noted.

The groundwater elevation data collected during the September 2021 sampling event, as well as historical data from 2014 through 2020, are presented in **Table 1**. Groundwater levels collected during the September 2021 event were used to determine the contours and flow direction for the intermediate aquifer zone (20 ft bls to 30 ft bls) at ORSY, presented on **Figure 2**. The flow direction during the September 2021 sampling event was toward the southeast, which is consistent with the observed historical groundwater flow at ORSY.

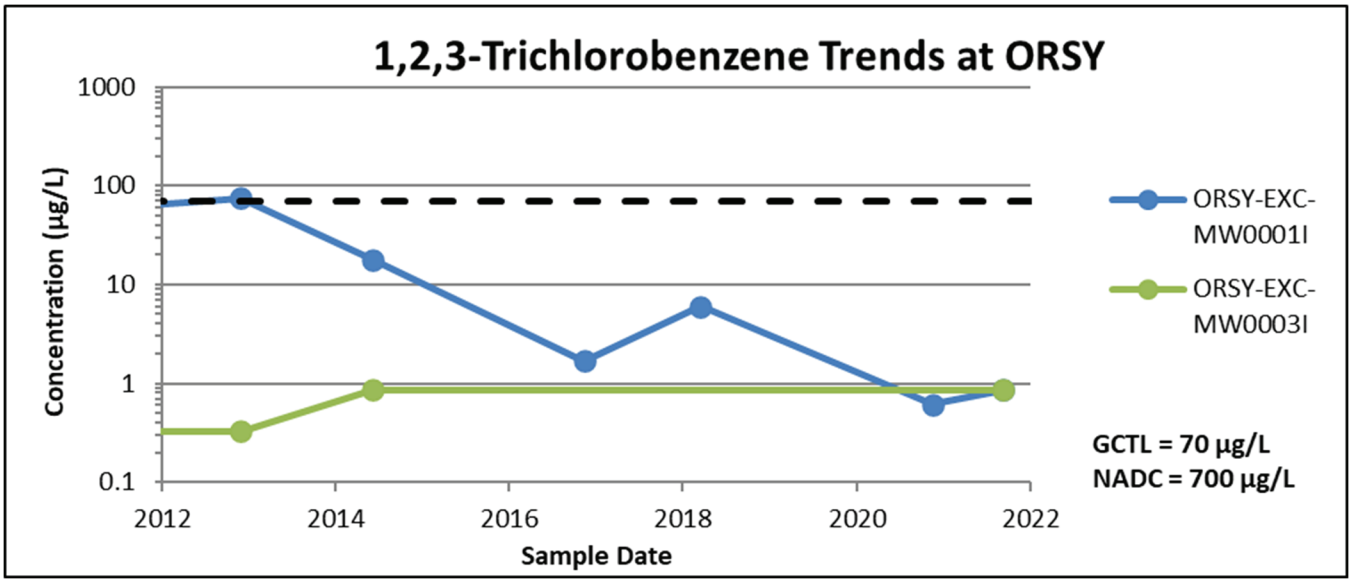
### Analytical Results

During the September 2021 sampling event, groundwater from monitoring wells ORSY-EXC-MW0001I and ORSY-EXC-MW0003I was sampled for select VOCs. The analytical results determined the concentration of 1,2,4-TCB was below the GCTL for the second consecutive event at ORSY-EXC-MW0001I (0.73 I µg/L) and 1,2,3-TCB has remained below its GCTL for five consecutive sampling events. Site contaminants of concern (COCs) remain non-detect in downgradient monitoring well ORSY-EXC-MW0003I.

Currently, no COC concentrations exceed GCTLs in the sampled wells at ORSY. A summary of recent and historical analytical results is presented in **Table 2**. Analytical results are depicted on **Figure 3**. Data upload confirmation to the KSC Remediation Information System (RIS) database is provided in **Appendix E**. Laboratory analytical data are provided in **Appendix F**.

### Trend Analysis

Concentrations of 1,2,3-TCB and 1,2,4-TCB have declined below GCTLs, as shown in the following trend analyses.



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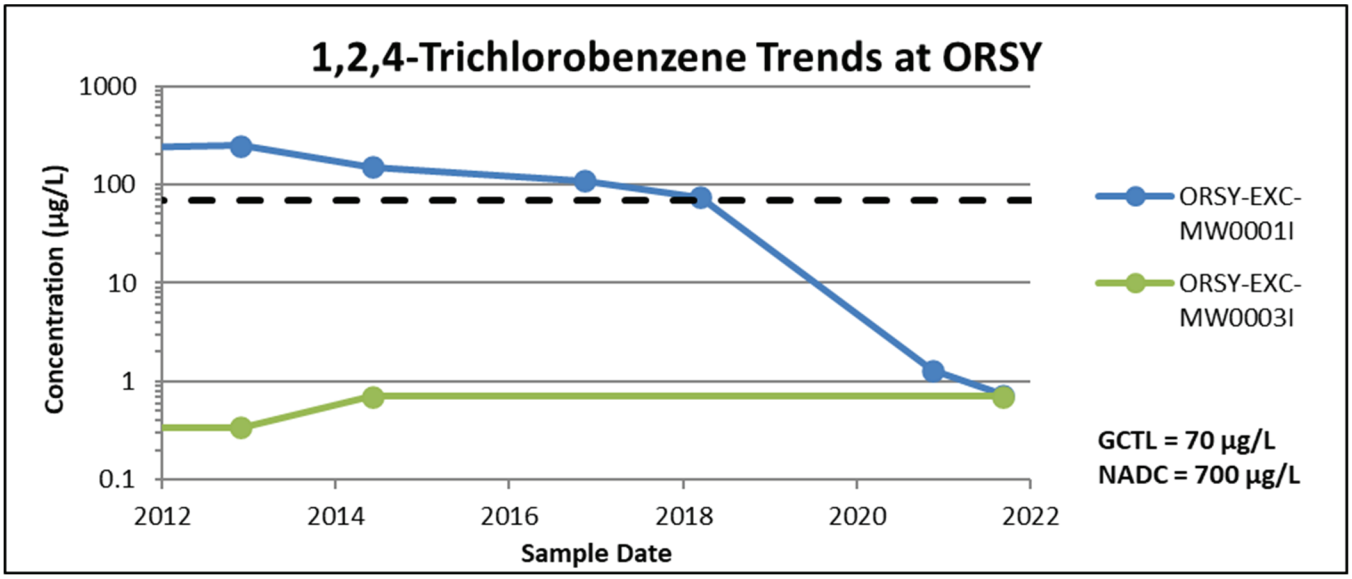


## Conclusions and Recommendations

Groundwater COC concentrations remained below GCTLs for two consecutive sampling events in November 2020 and September 2021. Groundwater MNA sampling at ORSY is recommended to discontinue. The LUC will remain in place for soil at the site.

Should you need additional information, please contact Chris Marshall at chris.marshall@aecom.com or via phone at 407.513.8230.

Sincerely,

**AECOM Technical Services, Inc.**

In accordance with the provisions of Florida Statutes, Chapter 471, this Request for Discontinuation of LTM at the Kennedy Space Center Orsino Storage Yard, located in Merritt Island, Florida, has been prepared under the direct supervision of a Professional Engineer registered in the State of Florida. This work was performed in accordance with generally accepted professional engineering practices under Chapter 471 of the Florida Statutes. The data, findings, recommendations, specifications, or professional opinions were prepared solely for the use of the National Aeronautics and Space Administration and the Florida Department of Environmental Protection. AECOM makes no other warranty, either expressed or implied, and is not responsible for the interpretation by others of these data.

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## TABLES



## FIGURES



## APPENDICES



## REFERENCES

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# Tables

**Table 1**
**Orsino Storage Yard - Long Term Monitoring (LTM)**
**Monitoring Well Groundwater Elevations**

| **INTERMEDIATE WELL ID:** | ORSY-DRM-MW0001I | | ORSY-EXC-MW0001I | | ORSY-EXC-MW0002I | |
|---|---|---|---|---|---|---|
| **Screen Interval (ft bls):** | 20 - 25 | | 20 - 25 | | 20 - 25 | |
| **TOC Elevation (ft NAVD88):** | 7.54 | | 6.35 | | 10.11 | |
| **Date** | Depth to Water (ft BTOC) | Water Elevation (ft NAVD88) | Depth to Water (ft BTOC) | Water Elevation (ft NAVD88) | Depth to Water (ft BTOC) | Water Elevation (ft NAVD88) |
| May 2014 | 5.95 | 1.59 | 4.43 | 1.92 | 8.29 | 1.82 |
| November 2016 | 5.11 | 2.43 | 3.65 | 2.70 | 7.44 | 2.67 |
| March 2018 | 5.53 | 2.01 | 4.01 | 2.34 | 7.78 | 2.33 |
| November 2020 | 4.31 | 3.23 | 3.43 | 2.92 | 7.22 | 2.89 |
| September 2021 | 4.33 | 3.21 | 3.38 | 2.97 | 7.21 | 2.90 |

| **INTERMEDIATE WELL ID:** | ORSY-EXC-MW0003I | | ORSY-EXC-MW0004I | |
|---|---|---|---|---|
| **Screen Interval (ft bls):** | 20 - 25 | | 20 - 30 | |
| **TOC Elevation (ft NAVD88):** | 9.45 | | 7.20 | |
| **Date** | Depth to Water (ft BTOC) | Water Elevation (ft NAVD88) | Depth to Water (ft BTOC) | Water Elevation (ft NAVD88) |
| May 2014 | 7.7 | 1.75 | 5.13 | 2.07 |
| November 2016 | 6.89 | 2.56 | 4.18 | 3.02 |
| March 2018 | 7.21 | 2.24 | 4.64 | 2.56 |
| November 2020 | 6.76 | 2.69 | 3.87 | 3.33 |
| September 2021 | 6.72 | 2.73 | 3.98 | 3.22 |

**Notes:**
ORSY = Orsino Storage Yard
ft. = feet
bls = Below Land Surface
NAVD88 = North American Vertical Datum of 1988
TOC = Top of Casing
BTOC = Below Top of Casing

**Table 2**
**Orsino Storage Yard - Long Term Monitoring (LTM)**
**Summary of Groundwater Analytical Results**

| Category | | | *Volatile Organic Compounds (VOC) by Method 8260* | | | | | |
|---|---|---|---|---|---|---|---|---|
| Analyte | | | 1,2,3-TRICHLOROBENZENE | 1,2,4-TRICHLOROBENZENE | 1,3-DICHLOROBENZENE | 1,4-DICHLOROBENZENE | CHLOROBENZENE | VINYL CHLORIDE |
| FDEP GCTLs (µg/L) | | | 70 | 70 | 210 | 75 | 100 | 1 |
| FDEP NADCs (µg/L) | | | 700 | 700 | 2100 | 7500 | 1000 | 100 |
| **Location ID** | **Sample Date** | **Screened Interval (ft bls)** | | | | | | |
| **ORSY-DRM-MW0001I** | 7/28/1999 | 20 - 25 | NA | NA | **3.8** | **2.2** | 0.18 U | 0.18 U |
| | 7/28/1999 | 20 - 25 | NA | NA | **4.3** | **2.5** | 0.18 U | 0.18 U |
| | 9/20/2002 | 20 - 25 | NA | NA | **20** | **67** | 0.63 U | 0.5 U |
| | 9/20/2002 | 20 - 25 | NA | NA | **25** | **96** | 0.63 U | 0.5 U |
| | 11/9/2005 | 20 - 25 | 0.5 U | **16.6** | **18.8** | **59.4** | 0.5 U | 0.5 U |
| | 5/23/2006 | 20 - 25 | **0.66 I** | **5.5 I** | **13** | **43** | **0.55 I** | 0.12 U |
| | 11/7/2006 | 20 - 25 | 0.2 U | **20** | **19** | **45** | **0.45 I** | 0.12 U |
| **ORSY-EXC-MW0001I** | 10/14/1998 | 20 - 25 | NA | NA | NA | NA | 0.18 U | 0.18 U |
| | 7/28/1999 | 20 - 25 | NA | NA | **22** | **57** | 0.72 U | 0.72 U |
| | 9/19/2002 | 20 - 25 | NA | NA | **22** | **53** | 6.3 U | 5.0 U |
| | 11/9/2005 | 20 - 25 | **163** | **367** | **47.2** | **71.3** | 0.50 U | 0.5 U |
| | 5/23/2006 | 20 - 25 | 0.20 UJ | 0.20 UJ | **5.5** | **15** | **5.9** | 0.12 U |
| | 11/7/2006 | 20 - 25 | **210** | **440** | **62** | **84** | 0.10 U | 0.12 U |
| | 5/9/2007 | 20 - 25 | **160** | **280** | **46** | **69** | 0.10 U | 0.12 U |
| | 11/6/2007 | 20 - 25 | **170** | **310** | **35** | **59** | 0.10 U | 0.12 U |
| | 5/6/2008 | 20 - 25 | **150** | **300** | **26** | **46** | 0.19 U | 0.23 U |
| | 11/4/2008 | 20 - 25 | **170** | **390** | **23** | **51** | 0.15 U | 0.25 U |
| | 5/12/2009 | 20 - 25 | **120** | **290** | **24** | **45** | 0.15 U | 0.25 U |
| | 11/10/2009 | 20 - 25 | **170** | **310** | **31** | **44** | 0.15 U | 0.25 U |
| | 5/18/2010 | 20 - 25 | **170** | **420** | **25** | **38** | 0.42 U | 0.16 U |
| | 5/9/2011 | 20 - 25 | **59.3** | **237** | **19.3** | **32.9** | 0.16 U | 0.36 U |
| | 11/28/2012 | 20 - 25 | **75** | **250** | **31** | **46** | **0.18 I** | 0.36 U |
| | 6/5/2014 | 20 - 25 | **18** | **150** | **22** | **54** | 0.72 U | 0.71 U |
| | 11/16/2016 | 20 - 25 | 1.7 U | **110** | **29** | **50** | 1.4 U | 1.4 U |
| | 3/20/2018 | 20 - 25 | **6.0** | **74** | **19** | **47** | 0.72 U | 0.71 U |
| | 11/20/2020 | 20 - 25 | 0.61 U | **1.3 I** | NA | NA | NA | NA |
| | 9/16/2021 | 20 - 25 | 0.86 U | **0.73 I** | NA | NA | NA | NA |
| **ORSY-MNT-MW0001I** | 10/14/1998 | 20 - 25 | NA | NA | NA | NA | 0.18 U | **1.3** |
| | 7/28/1999 | 20 - 25 | NA | NA | 1.6 U | 1.9 U | 1.8 U | 1.8 U |
| | 9/20/2002 | 20 - 25 | NA | NA | 0.64 U | 0.52 U | 0.63 U | **2.2** |
| | 2/14/2005 | 20 - 25 | NA | 0.32 U | 0.18 U | 0.19 U | 0.15 U | **3.6** |
| | 11/9/2005 | 20 - 25 | 0.5 U | 0.5 U | 0.5 U | 0.5 U | 0.5 U | **1.5** |
| | 5/23/2006 | 20 - 25 | 0.2 UJ | 0.2 UJ | 0.14 U | 0.085 U | 0.1 U | 0.12 U |
| | 11/7/2006 | 20 - 25 | 0.2 UJ | 0.2 U | 0.14 U | 0.085 U | **0.60 I** | **0.88 I** |
| **ORSY-MW0001S** | 10/14/1998 | 10 - 15 | NA | NA | NA | NA | 0.18 U | 0.18 U |
| | 7/28/1999 | 10 - 15 | NA | NA | 0.8 U | 0.95 U | 0.9 U | 0.9 U |
| | 9/20/2002 | 10 - 15 | NA | NA | 0.64 U | 0.52 U | 0.63 U | 0.5 U |
| **ORSY-DRM-MW0001S** | 9/19/2002 | 5 - 15 | NA | NA | **9.8** | **31** | 0.63 U | 0.5 U |
| **ORSY-EXC-MW0001S** | 10/14/1998 | 10 - 15 | NA | NA | NA | NA | **20** | **1.3** |
| | 7/28/1999 | 10 - 15 | NA | NA | **120** | **160** | 1.8 U | 1.8 U |
| | 9/19/2002 | 10 - 15 | NA | NA | **71** | **170** | **110** | 2.5 U |
| | 11/24/2004 | 10 - 15 | NA | 0.35 J | **8.8** | **32** | **4.6** | 0.43 U |

**Table 2**
**Orsino Storage Yard - Long Term Monitoring (LTM)**
**Summary of Groundwater Analytical Results**

| Category | | | *Volatile Organic Compounds (VOC) by Method 8260* | | | | | |
|---|---|---|---|---|---|---|---|---|
| Analyte | | | 1,2,3-TRICHLOROBENZENE | 1,2,4-TRICHLOROBENZENE | 1,3-DICHLOROBENZENE | 1,4-DICHLOROBENZENE | CHLOROBENZENE | VINYL CHLORIDE |
| FDEP GCTLs (µg/L) | | | 70 | 70 | 210 | 75 | 100 | 1 |
| FDEP NADCs (µg/L) | | | 700 | 700 | 2100 | 7500 | 1000 | 100 |
| **Location ID** | **Sample Date** | **Screened Interval (ft bls)** | | | | | | |
| **ORSY-SW-MW0001S** | 9/20/2002 | 5 - 15 | NA | NA | 0.64 U | 0.52 U | 0.63 U | 0.5 U |
| **ORSY-WEP-MW0001S** | 10/14/1998 | 10 - 15 | NA | NA | NA | NA | 0.18 U | 0.18 U |
| | 10/14/1998 | 10 - 15 | NA | NA | NA | NA | 0.18 U | 0.18 U |
| | 7/28/1999 | 10 - 15 | NA | NA | 0.16 U | 0.19 U | 0.18 U | 0.18 U |
| | 9/20/2002 | 10 - 15 | NA | NA | 0.64 U | 0.52 U | 0.63 U | 0.5 U |
| **ORSY-MW0002I** | 7/28/1999 | 20 - 25 | NA | NA | 0.16 U | 0.19 U | 0.18 U | 0.18 U |
| | 9/20/2002 | 20 - 25 | NA | NA | 0.64 U | 0.52 U | 0.63 U | 0.5 U |
| **ORSY-EXC-MW0002I** | 8/5/2005 | 20 - 25 | NA | 0.32 U | 0.18 U | 0.19 U | 0.15 U | 0.43 U |
| | 11/9/2005 | 20 - 25 | 0.5 U | 0.5 U | 0.5 U | 0.5 U | 0.5 U | 0.5 U |
| | 5/23/2006 | 20 - 25 | 0.2 UJ | 0.2 UJ | 0.14 U | 0.085 U | 0.1 U | 0.12 U |
| | 11/7/2006 | 20 - 25 | 0.2 U | **1.1 I** | 0.14 U | 0.085 U | 0.1 U | 0.12 U |
| **ORSY-EXC-MW0003I** | 8/5/2005 | 20 - 25 | NA | 0.32 U | 0.18 U | 0.19 U | 0.15 U | 0.43 U |
| | 11/9/2005 | 20 - 25 | 0.5 U | 0.5 U | 0.5 U | 0.5 U | 0.5 U | 0.5 U |
| | 5/23/2006 | 20 - 25 | 0.2 U | **0.60 I** | 0.14 U | **0.37 I** | 0.1 U | 0.12 U |
| | 11/7/2006 | 20 - 25 | 0.2 U | 0.2 U | 0.14 U | 0.085 U | 0.1 U | 0.12 U |
| | 5/9/2007 | 20 - 25 | **57** | **38** | 0.14 U | 0.085 U | 0.1 U | 0.12 U |
| | 11/6/2007 | 20 - 25 | 0.2 U | 0.2 U | 0.14 U | 0.085 U | 0.1 U | 0.12 U |
| | 5/6/2008 | 20 - 25 | **7.7 I** | **8.2 I** | 0.34 U | 0.21 U | 0.19 U | 0.23 U |
| | 11/4/2008 | 20 - 25 | 0.35 U | 0.3 U | 0.14 U | 0.14 U | 0.15 U | 0.25 U |
| | 5/12/2009 | 20 - 25 | 0.35 UJ | 0.3 UJ | 0.14 U | 0.14 U | 0.15 U | 0.25 U |
| | 11/10/2009 | 20 - 25 | 0.35 U | 0.3 U | 0.14 U | 0.14 U | 0.15 U | 0.25 U |
| | 5/18/2010 | 20 - 25 | 0.31 U | 0.91 U | 0.38 U | 0.46 U | 0.42 U | 0.16 U |
| | 5/9/2011 | 20 - 25 | 0.33 U | 0.34 U | 0.22 U | 0.16 U | 0.16 U | 0.36 U |
| | 11/28/2012 | 20 - 25 | 0.33 U | 0.34 U | 0.22 U | 0.16 U | 0.16 U | 0.36 U |
| | 6/5/2014 | 20 - 25 | 0.86 U | 0.70 U | 0.77 U | 0.76 U | 0.72 U | 0.71 U |
| | 9/16/2021 | 20 - 25 | 0.86 U | 0.70 U | NA | NA | NA | NA |
| **ORSY-EXC-MW0004I** | 5/6/2008 | 20 - 30 | 1.7 U | **1.7 I** | 0.34 U | 0.21 U | 0.19 U | 0.23 U |
| | 11/4/2008 | 20 - 30 | **2.6 I** | **3.2 I** | 0.14 U | 0.14 U | 0.15 U | 0.25 U |
| | 5/12/2009 | 20 - 30 | 0.35 UJ | 0.3 UJ | 0.14 U | 0.14 U | 0.15 U | 0.25 U |
| | 11/10/2009 | 20 - 30 | 0.35 U | 0.3 U | 0.14 U | 0.14 U | 0.15 U | 0.25 U |
| | 5/18/2010 | 20 - 30 | 0.31 U | 0.91 U | 0.38 U | 0.46 U | 0.42 U | 0.16 U |
| | 5/9/2011 | 20 - 30 | 0.33 U | 0.34 U | 0.22 U | 0.16 U | 0.16 U | 0.36 U |
| | 11/28/2012 | 20 - 30 | 0.33 U | 0.34 U | 0.22 U | 0.16 U | 0.16 U | 0.36 U |
| | 6/5/2014 | 20 - 30 | 0.86 U | 0.7 U | 0.77 U | 0.76 U | 0.72 U | 0.71 U |

Notes:
Results and screening criteria presented in µg/L (micrograms per liter)
**Bolded** results indicate the presence of an analyte at the specified concentration
**Red** font indicates an exceedance of FDEP GCTLs
U = Analyte not detected
I = Analyte greater than or equal to the method detection limit, but less than the practical quantitation limit
J = Estimated value
The numeric value presented for non-detects is the sample-specific reporting detection limit
FDEP GCTLs = Florida Department of Environmental Protection Groundwater Cleanup Target Levels, Chapter 62-777 Florida Administrative Code, Table 1 (2005)
FDEP NADCs = Natural Attenuation Default Concentration, Chapter 62-777 Florida Administrative Code, Table V (2005)
NA = Not Analyzed
ft bls = feet below land surface

# FIGURES


**Legend**

- Monitoring Well (LTM)
- Monitoring Well (LTM - Water Level Only)
- Monitoring Well (Non - LTM)

Notes:
- (20-25) = Monitoring well screen interval in feet below land surface
- LTM = Long Term Monitoring
- SWMU = Solid Waste Management Unit
- Aerial Source: FDOT 2018

N

0 80 160 Feet

**FIGURE 1**
**Site Map**

2022 - Industrial Area Long Term Monitoring
Orsino Storage Yard (ORSY)
SWMU 004
NASA Kennedy Space Center, Florida

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**FIGURE 2**
**Groundwater Elevation Map – September 2021**

2022 - Industrial Area Long Term Monitoring
Orsino Storage Yard (ORSY)
SWMU 004
NASA Kennedy Space Center, Florida

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**ORSY-EXC-MW0001I**

| Location ID | ORSY-EXC-MW0001I | ORSY-EXC-MW0001I | ORSY-EXC-MW0001I | ORSY-EXC-MW0001I | ORSY-EXC-MW0001I | ORSY-EXC-MW0001I |
|---|---|---|---|---|---|---|
| Date | 11/28/2012 | 06/05/2014 | 11/16/2016 | 03/20/2018 | 11/20/2020 | 09/16/2021 |
| Screen Interval | 20.0 - 25.0 | 20.0 - 25.0 | 20.0 - 25.0 | 20.0 - 25.0 | 20.0 - 25.0 | 20.0 - 25.0 |
| Sample Type | NM | NM | NM | NM | NM | NM |
| Analyte | | | | | | |
| 1,2,3-TRICHLOROBENZENE | 75 | 18 | 1.7 U | 6 | 0.61 U | 0.86 U |
| 1,2,4-TRICHLOROBENZENE | 250 | 150 | 110 | 74 | 1.3 I | 0.73 I |

**ORSY-EXC-MW0003I**

| Location ID | ORSY-EXC-MW0003I | ORSY-EXC-MW0003I | ORSY-EXC-MW0003I |
|---|---|---|---|
| Date | 11/28/2012 | 06/05/2014 | 09/16/2021 |
| Screen Interval | 20.0 - 25.0 | 20.0 - 25.0 | 20.0 - 25.0 |
| Sample Type | NM | NM | NM |
| Analyte | | | |
| 1,2,3-TRICHLOROBENZENE | 0.33 U | 0.86 U | 0.86 U |
| 1,2,4-TRICHLOROBENZENE | 0.34 U | 0.7 U | 0.70 U |

**Legend**

- Intermediate LTM Well, Sample Results Below GCTL
- Non-LTM, No Sample Results
- Intermediate Groundwater Elevation Contours - September 2021
- Direction of Groundwater Flow

Notes:
1. I = Result is greater than or equal to the Method Detection Limit (MDL) but less than the Practical Quantitation limit (PQL)
2. SWMU = Solid Waste Management Unit
3. LTM = Long Term Monitoring
4. MW = Monitoring Well
5. NM = Normal Sample
6. U = Result was below the laboratory Method Detection Limit (MDL)
7. FDEP GCTLs = Florida Department of Environmental Protection Groundwater Cleanup Target Levels 62-777, F.A.C.
8. Aerial Source: ESRI 2018.
9. All results and screening criteria presented in µg/L.
10. **Blue** font indicates an exceedance of FDEP GCTLs.
11. **Bolded** results indicate the presence of an analyte at the specified concentration.
12. Depth of monitoring well screen interval is presented in feet below land surface.

| Analyte | GCTL |
|---|---|
| 1,2,3-TRICHLOROBENZENE | 70 |
| 1,2,4-TRICHLOROBENZENE | 70 |

0 60 120 Feet

Scale 1" = 60'

N

**FIGURE 3**
**Groundwater Sampling Analytical Results**

2022 - Industrial Area Long Term Monitoring
Orsino Storage Yard (ORSY)
SWMU 004
NASA Kennedy Space Center, Florida

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# APPENDIX A

**FDEP REGULATORY COMMENTS**

**2019-2020 INDUSTRIAL AREA LONG-TERM MONITORING REPORT**

**APRIL 2022**

# FLORIDA DEPARTMENT OF Environmental Protection

Bob Martinez Center
2600 Blair Stone Road
Tallahassee, FL 32399-2400

Ron DeSantis
Governor

Jeanette Nuñez
Lt. Governor

Shawn Hamilton
Secretary


April 4, 2022

Ms. Anne Chrest
Remediation Program Technical Lead
Environmental Assurance Branch
National Aeronautics and Space Administration
John F. Kennedy Space Center
Kennedy Space Center, Florida 32899-0001

**RE: 2019-2020 Long-Term Groundwater Monitoring Report Industrial Area Kennedy Space Center, Florida**

Dear Ms. Chrest,

The Department has reviewed National Aeronautics and Space Administration (NASA) Industrial Area (IA) 2019-2020 Long-Term Monitoring (LTM) Program that includes the 15 sites, dated May 2021 and revised June 2021. The Department has the following comments:

Ransom Road Landfill
The Department agrees to continue monitored natural attenuation (MNA) at the site under the LTM program and add downgradient monitoring well RRLF-MW0039I for vinyl chloride (VC) analysis and to continue current sampling schedule, which includes May 2022 LTM sampling of four monitor wells (MWs) and collection of water level measurements at 15 monitoring wells.

Orsino Storage Yard
The Department concurs with the recommendation with the addition that the downgradient monitoring well ORSY-EXC-MW0003I will be sampled for select volatile organic compound (VOC) analysis for site closure purposes to obtain two consecutive events below groundwater cleanup target levels (GCTLs) per Chapter 62-780, Florida Administrative Code (F.A.C.).

With the 2020 results for monitoring well ORSY-EXC-MW0001I below GCTLs, one more round of results below GCTLs would be needed for a site closure request. Please note there is a Land Use Control (LUC) at the site for soil exceedances. Monitoring well ORSY-EXCMW0003I was last sampled in 2014. At that time, the results had been below GCTLs since 2008. In addition, monitoring well ORSYEXC- MW0004I has been below GCTLs since May 2014. The Department recommends submitting historical sampling results to support site closure.

Building M7-0505 Treatment Tank Area
The Department concurs with the recommendation to remove monitoring wells M505-MW0020, M505-W0028, , and M505-MW0057 from the sampling plan those wells have yielded results less than GCTLs for two consecutive sampling events and none are serving as horizontal or vertical point of compliance monitoring wells.

The Department does not concur with the removal of monitor wells M505-MW0049 and M505-MW0033 from the sampling plan. These wells provide important information on the horizontal and vertical distribution of contaminants along the axis of the remaining VOC plume. Additionally, the Department requests that a cross-section constructed along the axis of the contaminant plume be included in the next iteration of the LTM report covering this location.

Hypergol Maintenance Facility South
The Department concurs with the recommendation to move sampling of HMF-NLPIW0004I to May 2021 and add downgradient HMF-MW0006I for trichlorofluoromethane (TCFM) analysis.

The Department suggests that the NASA look to obtain any data points needed to support a site closure request. All wells in the approved monitoring program must be at or below GCTLs for two consecutive rounds to support a closure decision per Rule 62-780.680, F.A.C.

Operations and Checkout Building
The Department concurs with the recommendation to install a downgradient monitoring well at the site and continue the current sampling schedule.

Vertical Processing Facility
The Department concurs with the recommendation for biennial sampling of six monitoring wells for select VOCs (TCE, cis-1,2-DCE, and VC) and collection of water level measurements at 34 monitoring wells.

Environmental Health Facility
VC is the only remaining contaminant of concern (COC). Its concentrations exceeded GCTLs at EHF-MW0001 and EHF-MW0004. The Department concurs with the recommendation to continue monitored natural attenuation (MNA) at the site.

Communication, Maintenance, And Storage Facility
The Department concurs with the recommendation to re-enter the Engineering Evaluation process for this site due to the presence of the sizeable hot spots as a result of concentrations exceeding 10 times the Natural Attenuation Default Concentration (NADCs)) of VOCs at the site. The Department recommends elaborating on the timeframe and schedule for a whole plume site characterization to update the conceptual site model.

Kennedy Athletic, Recreational, And Social Park 1
The Department concurs with the recommendation to continue MNA at LOC 7 with the next sampling event to take place in November 2025 and including sampling of the downgradient

monitoring well KP1-MW0013. The only well shown in the area of discussion was in the lead shot area (KP1- MW0007). The Department recommends providing additional data on LOC 9.

Engineering Development Laboratory
The Department concurs with recommendation to continue biennial LTM sampling frequency.

Launch Equipment Test Facility
The Department notes that two groundwater sampling events (separated by at least three months) with results less than GCTLs for monitoring well LETF-MW0001 would be needed to support site closure.

General Services Administration Seized Property
The LTM sampling program should continue with sampling of monitoring wells on an annual frequency during the wet season. The next annual sampling event, scheduled for November 2021, will include water level measurements at 33 monitoring wells and 14 groundwater samples. The Department recommends providing data regarding delineation of the groundwater plume to the northwest.

Space Station Processing Facility
The Department concurs with the recommendation to add downgradient monitoring well SSPF-MW0013 for analysis.

Citgo Service Station
The Department concurs with the recommendation to continue the current sampling schedule, which includes May 2022 sampling of three MWs for select VOCs [benzene, 1,2,4-trimethylbenzene (TMB), xylenes, methyl-tertiary-butyl-ether (MTBE)] and select PAHs [naphthalene, 1-methylnaphthalene,2-methylnaphthalene], and both monitoring wells CGO-MW0018 and CGOMW0019 for select VOCs [benzene, 1,2,4-TMB, xylenes, MTBE]).

The Department recommends including a figure or table that illustrates that the aquifer has been delineated vertically.

FSA1 Building 1044 UST (PRL #157)
The Department concurs with the recommendation to install a new downgradient monitoring well (screened 15 to 25 ft bls) west of FSA1-MW0027, and the recommendation to add monitoring wells FSA1-MW0012R and FSA1-MW0014 back into the LTM sampling program based on the 2020 DPT groundwater results.

Additionally, monitoring wells FSA1-MW0001 and FSA1-MW0021 contain TRPH and isopropylbenzene in excess of Florida GCTLs. FSA1-MW0002 contains TRPH in excess of Florida GCTLs. Each of these wells is screened from 2 -12 feet below land surface. The Department recommends investigating the vertical extent of the TRPH/isopropylbenzene plume.

If I can be of any further assistance with this matter, please do not hesitate to contact us.

Sincerely,

**Mary Maurer**
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LB/mm

Cc: Bob Cook, FDEP-HWPP, robert.cook@FloridaDEP.gov
Edith Johansen, KSC, edith.m.johansen@nasa.gov

# APPENDIX B

**KENNEDY SPACE CENTER REMEDIATION TEAM MEETING MINUTES**

**INDUSTRIAL AREA LONG-TERM MONITORING**

**FEBRUARY 2021**

Revision 1 Meeting Minutes for February 17th & 18th, 2021

Attendees:

1. Laura Barrett/FDEP
2. Kirk Johnson/FDEP
3. Bruce Moore/FDEP
4. Mike Deliz/NASA
5. Ryan O'Meara/NASA
6. Deda Johansen/NASA
7. Anne Chrest/NASA
8. Natasha Darre/NASA
9. Dinh Vo/NASA
10. Michelle Moore/NEMCON
11. Mark Speranza/Tetra Tech
12. Mark Jonnet/Tetra Tech
13. Chris Adkison/Tetra Tech
14. Debbie Wilson/Tetra Tech
15. Chris Hook/Tetra Tech
16. Chris Pike/Tetra Tech
17. Jennifer Buel/Tetra Tech
18. James Lloyd/Tetra Tech
19. Sarah Damphousse/Tetra Tech
20. Jennifer Joyal/AECOM
21. Mike McCoy/AECOM
22. Chad Lee/AECOM
23. Matt Zenker/AECOM
24. Greg Kusel/AECOM
25. Jason Bublitz/AECOM
26. Chris Marshall/AECOM
27. Linnea King/AECOM
28. Richard Smith/HGL
29. Scott Starr/HGL

**2102-M01 Team**

**Meeting Minutes and Miscellaneous Items**

Team consensus was reached that Revision 1 of the meeting minutes and action/decision items for the December 2020 Team meeting will become final. Team members acknowledged and did not object to the fact that these meeting minutes may become public as part of a final report at a later date (**2102-D01**).

Open action items were reviewed by the Team. The following action items were closed out:

Mobile Launch Platform Rehabilitation Sites/Vehicle Assembly Building Area (MLP/VAB), Solid Waste Management Unit (SWMU #056) Corrective Measures Implementation (CMI) and Interim Measures (IM) Update, August 2020: An action item was assigned to the National Aeronautics and Space Administration (NASA) and AECOM to devise a plan regarding the data gap in the northwest portion of the site, where the vinyl chloride (VC) results had recently exceeded its groundwater cleanup target level (1 µg/L) and show signs of increasing.

February Update: AECOM is under contract to conduct additional groundwater assessment and installation of wells to the east of the biosparge barrier and railroad tracks. Up to 10 monitoring wells will

system delivery, installation, commissioning, and start-up; October 2021: Q1 performance monitoring sampling (results included within ADP); and from August 2021 to present: OM&M of the site.

The recommended path forward is to continue OM&M of the air sparge IM, which includes: Year 1 quarterly performance monitoring, routine preventative maintenance and inspections, operational data recording, and ambient air monitoring. The path forward also includes assessing Q2 performance monitoring results and optimization operations such as pulse duration, pulse frequency, and air sparge zone air flow rate and pressure. The Year 1 OM&M report will be provided upon completion.

FDEP inquired if this was just the AS portion of the remediation, to which Tetra Tech confirmed it was. FDEP observed that this briefing was more detailed than the ADP provided, and requested a copy. Tetra Tech stated they would provide after the meeting. FDEP also noted that in the future they would like to see groundwater monitoring on the entirety of the plume; more of a total delineation of horizontal and vertical plume to include the low concentration plume. How long will this system run? NASA responded with a minimum of four years of run time. The design of the IM for treatment of deep CVOCs will be refined with performance monitoring data from the AS IM, so maybe six years total.

**2102-M13 Chris Marshall /AECOM**

**Industrial Area LTM, February 2021**

**Goal:** The purpose of the ADP is to present activities and data associated with 15 Industrial Area (IA) long-term monitoring (LTM) sites: Communication, Maintenance, and Storage (CMS) Facility (SWMU 082), Fuel Storage Area #1 (FSA1) Building 1044 Underground Storage Tank (UST) (Potential Release Location [PRL] 157), Launch Equipment Test Facility (LETF) (SWMU 091), Orsino Storage Yard (ORSY) (SWMU 004), Citgo Service Station (CGO) (PRL 129), Ransom Road Landfill (RRLF) (SWMU 003), Vertical Processing Facility (VPF) (SWMU 077), Environmental Health Facility (EHF) (SWMU 079), Space Station Processing Facility (SSPF) (SWMU 098), Operations and Checkout Building (O&C) (SWMU 076), Engineering Development Laboratory (EDL) (SWMU 085), Building M7-0505 Treatment Tank Area (M7-505)

(SWMU 039), General Services Administration Seized Property (GSSP) (SWMU 095), Kennedy Athletic, Recreation, and Social Park 1 (KARS Park 1) (SWMU 084), and the Hypergol Maintenance Facility Hazardous Waste South Staging Area (HMF South) (SWMU 070).

**Discussion:** Field efforts summarized in the ADP include LTM sampling from May 2020 through November 2020 and direct-push technology (DPT) investigation activities conducted in July 2020 at the CMS site and August 2020 at the FSA1 site. The objective of the LTM program is to evaluate the groundwater quality based on current data and trends in order to determine if modifications to the sampling schedule and/or additional measures are warranted.
CMS (SMWU #082)

Groundwater elevation was measured at 34 monitoring wells and groundwater samples were collected from 23 monitoring wells in May 2020. Groundwater flows are generally consistent with historical flow pattens. Overall, cis-1,2-dichloroethene (cDCE) concentrations continue to decline, resulting in slight plume area contraction. Vinyl chloride (VC) concentrations are slowly declining with minor lateral migration of the VC hot spot. The 2020 high-density DPT data strongly correlates with the 2004-2007 high concentration plume (HCP) DPT data. High level groundwater modeling of cDCE, which is the most widespread contaminant, supports that concentrations are naturally attenuating. The recommendation is that the current scope of interim monitored natural attenuation (MNA) remains appropriate for the CMS site.

FDEP inquired how the DPT data presented has been incorporated into the overall plume delineation. NASA stated that the 2020 DPT was not for reassessment. When IGM/MNA was selected as a remedy, the Team agreed to performing more detailed groundwater sampling every five years to verify that the degradation is proceeding in a reasonable timeframe. The 2020 DPT sampling was completed rather than sampling a greater number of monitoring wells to reevaluate the former hot spot (concentrations of 10xNADC) to see if it has migrated. Results show it has migrated 150ft to the west.

FDEP inquired if the average transport velocity correlates with the model, to which NASA confirmed that it did.

FDEP asked about the basis of selecting MNA for the CMS remedy. Was active remediation considered? NASA explained that at the time of remedy selection (2011), multiple sites with dense non-aqueous phase liquid sites were also in remedy evaluations. CMS was ranked a lower priority than those sites. Since no parent product (trichloroethene or tetrachloroethene) remained in significant concentrations, the Team did not believe active treatment was a priority at that time. NASA agreed that now, ten years later, we should be asking this question and should look at potentially performing active treatment in the future.

FDEP inquired what would be the likely decision points for a change in approach? NASA stated that they will talk internally at length on CMS. Is the recommendation to continue LTM for the next year and look at getting more aggressive down the road to support meeting a reasonable timeframe? Ryan O'Meara was tasked to consider this site in this regard. Anne Chrest pointed out that the Team evaluates CMS annually. The site isn't just placed into LTM and blinders put on. That is one reason that every five years more robust sampling is performed.

The Team reached consensus to continue annual LTM sampling of 23 monitoring wells (MWs) (CMS-CSS-MW0001I, CMS-CSS-MW0002I, CMS-MW0001I, CMS-MW0005I, CMS-MW0008I, CMS-MW0014, CMS-MW0022, CMS-MW0027, CMS-MW0028, CMS-MW0029, CMS-MW0030, CMS-MW0031, CMS-MW0033, CMS-MW0034, CMS-MW0039, CMS-MW0041, CMS-MW0042, CMS-MW0043, CMS-MW0044, CMS-MW0045, CMS-MW0046, CMS-MW0047, CMS-MW0049) for select volatile organic compounds (VOCs), including tetrachloroethene (PCE), trichloroethene (TCE), cis-1,2-dichloroethene (cis-1,2-DCE), trans-1,2-dichloroethene (trans-1,2-DCE), 1,1-dichloroethane (1,1-DCA), 1,1-dichloroethene (1,1-DCE), and VC in May 2021 **(2102-D74).**

The Team reached consensus to collect water level measurements in 34 wells (CMS-CSS-MW0001I, CMS-CSS-MW0002I, CMS-CSS-MW0002S, CMS-S-SDJ-MW0001II, CMS-S-UST-MW0001S, CMS-MW0001I, CMS-MW0005I, CMS-MW0008I, CMS-MW0014, CMS-MW0015, CMS-MW0022, CMS-MW0024, CMS-MW0027, CMS-MW0028, CMS-MW0029, CMS-MW0030, CMS-MW0031, CMS-MW0032, CMS-MW0033, CMS-MW0034, CMS-MW0036, CMS-MW0037, CMS-MW0038, CMS-MW0039, CMS-

MW0040, CMS-MW0041, CMS-MW0042, CMS-MW0043, CMS-MW0044, CMS-MW0045, CMS-MW0046, CMS-MW0047, CMS-MW0048, and CMS-MW0049) in May 2021 **(2102-D75).**

FSA1 Building 1044 UST (PRL #157)

DPT soil samples were collected from seven locations in August 2020. None of the soil samples collected from four ft below land surface (bls) and immediately above the water table, contained concentrations of polynuclear aromatic hydrocarbons (PAHs), or total recoverable petroleum hydrocarbons (TRPH) greater than soil cleanup target levels (SCTLs) under the former Building 1044, or adjacent piping locations.

Groundwater elevation was measured at 15 monitoring wells and groundwater samples were collected from five monitoring wells in May and November 2020. DPT groundwater samples were collected at seven locations in August 2020. VOC and TRPH concentration trends are generally stable in monitoring wells with some slight increase in 2020. Isopropyl benzene concentrations from both LTM and DPT are below the health-based groundwater cleanup target level (GCTL) (700µg/L) in 2020 sampling events, those there were exceedances of the organoleptic GCTL of 0.8 µg/L. Applying the health based GCTL would eliminate the analyte as a contaminant of concern for this site.

FDEP inquired about the black outline on the figure on slide 37. NASA explained the black line shows the former jet propellant (JP) storage tank area. JP 5 and JP 1 tanks were present. There was a spill in the 1980's. A remedial action plan (RAP) was approved and completed and no further action (NFA) was approved for that portion of FSA 1. It is named the RPJP site.

The recommendation was made to change site sampling frequency to annual sampling (alternating between wet/dry seasons), which is next scheduled for May 2021 and will include 17 water levels and six monitoring well samples. The Team reached consensus on annual LTM sampling of eight MWs (FSA1-MW0001, FSA1-MW0002, FSA-MW0012R, FSA-MW0014, FSA1-MW0021, FSA1-MW0022R, FSA1-MW0023, and FSA1-MW0027, for isopropyl benzene, select PAHs (naphthalene, 1-methylnaphthalene, 2-methylnaphthalene), and TRPH in May 2021 **(2102-D76).**

The Team reached consensus to add a well to the west of FSA1-MW00027 (to be installed in November 2021), and to be sampled for isopropyl benzene), naphthalene, 1-methylnaphthalene, 2-methylnaphthalene, and TRPH in May 2021. Historical sampling results will be evaluated at the deeper source area wells, and one will be added into the sampling program, if warranted based on the results **(2102-D77).**

The Team reached consensus to collect water level measurements from 18 wells (FSA1-MW0001, FSA1-MW0002, FSA1-MW0004, FSA-MW0012R, FSA-MW0014, FSA1-MW0015, FSA1-MW0016A, FSA1-MW0017A, FSA1-MW0019, FSA1-MW0020, FSA1-MW0021, FSA1-MW0022R, FSA1-MW0023, FSA1-MW0024, FSA1-MW0025, FSA1-MW0026, FSA1-MW0027, and the newly installed well west of FSA1-MW0027) in May 2021 **(2102-D78).**

NASA inquired why the isopropyl benzene is shown as two separate plumes? Is there a well in between the smaller and larger plumes, or should the two be connected? AECOM stated it was shown this way because one plume was slightly deeper than the other. ***Post meeting –** AECOM connected the two plumes moving forward based on this statement.

FDEP stated that there needs to be a downgradient well establishing the extent of the plume. Do we have one? AECOM took an action item to look into that request **(2102-A05).**

NASA stated they will take a look into the prior DPT data to see if we need to install that well and provide the Team with an update and make a recommendation **(2102-A06).**

<u>LETF (SWMU #091)</u>

Groundwater elevation measurements and groundwater samples were obtained from six monitoring wells in May 2020. VC concentrations at monitoring well LETF-MW0001 were above GCTLs in 2020; no other wells had exceedances. It was recommended to conduct DPT groundwater sampling, followed by the installation of up to two additional monitoring wells (source and downgradient), with 10ft screened intervals.

NASA noted that LETF-MW0001 has a 5ft screen. The initial thought behind the proposed approach was to replace MW0001 with one of the new wells with 10ft screens. Then if the new well's results are below GCTL after two sampling events, we would be able to request NFA. Based on the prior CCB site discussion, though, NASA now understands this might not eliminate LETF-MW0001. FDEP confirmed that two clean events from LETF-MW0001 would be needed to support site closure. NASA stated they will continue their current monitoring plan with the six wells for VC at this time.

The Team reached consensus to complete conduct biennial sampling of the following wells (LETF-MW0001, LETF-MW0002, LETF-MW0005, LETF-MW0007, LETF-PSB-MW0001I, LETF-PSB-MW0002I) for water levels and VC in November 2021 **(2102-D79).**

FDEP inquired if the plume was delineated both vertically and horizontally? NASA answered that it is; there are horizontal extent wells and multiple screened intervals to complete delineation.

ORSY

Groundwater elevation measurements were taken from five and groundwater samples were collected from one monitoring well (ORSY-EXC-MW0001I) in November 2020. The trichlorobenzene results were below GCTLs in the one sampled well. It was recommended to move up the next sampling event for this site to May 2021, to include the LTM sampling of ORSY-EXC-MW0001I and adding downgradient ORSY-EXC-MW0003I.

The Team reached consensus to conduct sampling in May 2021, with samples for 1,2,3-TCB and 1,2,4-TCB from two wells (ORSY-EXC-MW0001I and ORSY-EXC-MW0003I) **(2102-D80).**

The Team reached consensus to collect water level measurements at five monitoring wells (ORSY-DRM-MW0001I, ORSY-EXC-MW0001I, ORSY-EXC-MW0002I, ORSY-EXC-MW0003I, ORSY-EXC-MW0004I) in May 2021 **(2102-D81).**

With the 2020 results for ORSY-EXC-MW0001I below GCTLs, FDEP noted that one more round of results below GCTLs would be needed for a site closure request. Do we have a LUC here for soil

exceedances? NASA confirmed there is, and the area is also controlled with a fence.

Looking toward future site closure, FDEP inquired if there was historical delineation to the southwest of monitoring well ORSY-DRM-MW0001I, and if it was historically clean? AECOM confirmed that it is. NASA added that monitoring well ORSY-EXC-MW0003I was last sampled in 2014. At that time, the results had been below GCTLs since 2008. In addition, monitoring well ORSY-EXC-MW0004I has shown clean since May 2014. FDEP inquired if monitoring well ORSY-EXC-MW0003I was truly downgradient to ORSY-DRM-MW0001I. AECOM stated it is and this is shown on slide 60 for reference.
FDEP inquired about past results for monitoring well ORSY-DRM-MW0001I. NASA stated they will look into the historical sampling results and get back with the Team (**2102-A07).**

CGO

Groundwater elevation measurements were taken from nine and groundwater samples were collected from two monitoring wells in November 2020. Samples from one well were analyzed for select PAHs and select VOCs, and results were below GCTLs for the first time since 2012. Three VOCs were analyzed for the second well; two were above GCTLs. It was recommended to continue MNA for the site under the LTM program and add a downgradient monitoring well (CGO-MW0019) for select VOCs.

The Team reached consensus to continue the current sampling schedule, which includes May 2022 sampling of three MWs (CGO-MW0006, CGO-MW018, and CGO-MW0019) for select VOCs [benzene, 1,2,4-trimethylbenzene (TMB), xylenes, methyl tert butyl ether (MTBE)] and select PAHs [naphthalene, 1-methylnaphthalene, 2-methylnaphthalene], and both MWs CGO-MW0018 and CGO-MW0019 for select VOCs [benzene, 1,2,4-TMB, xylenes, MTBE]) **(2102-D82).**

The Team reached consensus to collect water level measurements at nine monitoring wells (CGO-MW0005, CGO-MW0006, CGO-MW0007, CGO-MW0014, CGO-MW0015, CGO-MW0018, CGO-MW0019, CGO-MW0023, and CGO-MW0024) in May 2022 **(2102-D83).**

FDEP inquired if the shallow and the deeper zones are delineated and clean? AECOM confirmed that there has been extensive sampling conducted in this area, and that it is adequately delineated.

RRLF

Groundwater elevation measurements were taken from 14 monitoring wells and samples were collected from three monitoring wells in November 2020. Samples were analyzed for VC; results for two wells were above its GCTL. It was recommended to continue MNA at the site under the LTM program and add downgradient monitoring well RRLF-MW0039I for VC analysis.
The Team reached consensus to continue current sampling schedule, which includes May 2022 LTM sampling of four MWs (RRLF-MW0033, RRLF-MW0038I, RRLF-MW0039I, and RRLF-MW00040I) for VC and collect water level measurements at 15 monitoring wells (RRLF-MW0012, RRLF-MW0015, RRLF-MW0029, RRLF-MW0030, RRLF-MW0031, RRLF-MW0033, RRLF-MW0034, RRLF-MW0036, RRLF-MW0037, RRLF-MW0038S, RRLF-MW0038I, RRLF-MW0039S, RRLF-MW0039I, RRLF-MW0040I, RRLF-MW0042I) **(2102-D84).**

FDEP inquired what the landfill cover was made of? NASA stated that this was a C&D landfill with soil cover. There is a Central District closure order for the landfill (1996 timeframe).

VPF

Groundwater elevation measurements were taken from 34 and groundwater samples were collected from eight monitoring wells in November 2020. TCE and VC are the remaining COCs. The trends for TCE were mixed, while VC trends were stable to slightly increasing. Based on the results, MNA remains an appropriate and viable remedy for the site. It was recommended to remove VPF-MW0026 and VPF-MW0029 from the sampling list since these monitoring well results were less than GCTLs for two consecutive events. It was also recommended to change groundwater sampling frequency to biennial (alternating wet/dry season), which is next scheduled for May 2022, and will include 34 water levels and six monitoring well samples.

The Team reached consensus to change sampling frequency to biennial LTM sampling of six MWs (VPF-IW0008I, VPF-IW0018I, VPF-IW0021, VPF-IW0022, VPF-IW0025, and VPF-IW0027) for select VOCs (TCE, cis-1,2-DCE, and VC) and collect water level measurements at 34 monitoring wells (VPF-IW0001S, VPF-IW0002I, VPF-IW0002S, VPF-IW0003I, VPF-IW0003S, VPF-IW0004I, VPF-IW0004S, VPF-IW0005S, VPF-IW0006S, VPF-IW0007I, VPF-IW0008D, VPF-IW0008I, VPF-IW0009I, VPF-IW0010I, VPF-IW0011I, VPF-IW0012I, VPF-IW0013I, VPF-IW0014I, VPF-IW0015I, VPF-IW0016I, VPF-IW0017I, VPF-IW0018I, VPF-MW0020, VPF- MW0021, VPF- MW0022, VPF-MW0023, VPF- MW0024, VPF- MW0025, VPF- MW0026, VPF-MW0027, VPF- MW0028, VPF- MW0029, VPF- MW0030, VPF-MW0031), in May 2022 **(2102-D85).**

NASA noted that a single plume previously extended well to the north. What is now present are the collapsed vestiges of what used to be a multi-acre plume.

EHF

Groundwater samples (from three monitoring wells) and groundwater elevation measurements (from six monitoring wells) were taken at the site in November of 2020. VC is the remaining COC. Its concentrations exceeded GCTLs at EHF-MW0001 and EHF-MW0004. It was recommended to continue MNA at the site.

The Team reached consensus to continue the current sampling schedule, which includes November 2022 LTM sampling of three MWs (EHF-MW0001, EHF-MW0004, EHF-MW0005) for VC and collecting water level measurements at six monitoring wells (EHF-MW0001, EHF-MW0003, EHF-MW0004, EHF-MW0005, EHF-MW0006, EHF-MW0007) **(2102-D86).**

FDEP and NASA discussed the site. NASA stated that the MNA program is routinely optimized, but this site was never included in an engineering evaluation process. Mounding takes place at this location, and a building was removed in the past few years. NASA took an action item to review the sampling data in the RFI for this location **(2102-A08, RO).**

SSPF

Groundwater elevation measurements were taken from 14 and groundwater samples were collected from four monitoring wells for ammonia in November 2020. It was recommended to continue MNA at the site under the LTM program. The next sampling event is scheduled for May 2022. It was also recommended to add downgradient monitoring well SSPF-MW0013 for analysis.

The Team reached consensus to continue the current sampling schedule, which includes May 2022 LTM sampling of five MWs (SSPF-MW0004, SSPF-MW0006, SSPF-MW0014, SSPF-MW0016 and adding downgradient MW SSPF-MW0013) for ammonia, and the collection of water level measurements at 14 monitoring wells (SSPF-MW0001, SSPF-MW0002, SSPF-MW0003, SSPF-MW0004, SSPF-MW0005, SSPF-MW0006, SSPF-MW0007, SSPF-MW0010, SSPF-MW0014, SSPF-MW0015, SSPF-MW0016, SSPF-MW0017, SSPF-MW0018, SSPF-MW0020) **(2102-D87).**

FDEP inquired if there was any indication of other nitrogen species present that pose concern? Is the nitrogen staying as ammonia? NASA stated it was ammonium nitrogen (NH3). FDEP has seen releases of nitrate that traveled downstream as ammonia at another site. AECOM stated in the initial assessment the site was sampled for more constituents and does recall additional analytes. Would FDEP like the Team to take an action item to follow up on and look into this? FDEP stated they are good with what the Team is proposing to monitor, but if you happen to have additional information on this, please send over.

O&C

Groundwater elevation measurements were taken from three and groundwater samples were collected from one monitoring well in November 2020. VC is only remaining COC. The VC concentrations were above GCTLs at monitoring well O_C-MW0005 in November 2020 yet remain stable at low concentrations. A recommendation was made to continue MNA at this site under the LTM program, with the next sampling event scheduled for May 2022. A recommendation was made to install a downgradient monitoring well at the site.

The Team reached consensus to install a downgradient MW and continue the current sampling schedule, with May 2022 sampling of two monitoring wells (O_C-MW0005 and the new downgradient monitoring well) for VC, and collect water level measurements at four monitoring wells (O_C-MW0003, O_C-MW0004, O_C-MW0005, and the new downgradient well) **(2102-D88).**

EDL:

Groundwater elevation measurements were taken from four monitoring wells and groundwater samples were collected from two monitoring wells in November 2020. VC is the remaining COC. VC concentrations were greater than GCTLs yet remain stable at low concentrations. It was recommended to continue MNA at the site under the LTM program. The EDL is scheduled for a biennial sampling event in November 2022.

FDEP inquired if the groundwater flow was toward the storage shed which is the vicinity with remaining GCTL exceedances. AECOM confirmed that it is, with the shed area in a groundwater low.

The Team reached consensus to continue current sampling schedule, which includes November 2022 LTM sampling of two MWs (EDL-MW0004 and EDL-MW0006R) for VC and collection of water level measurements at four monitoring wells (EDL-MW0004, EDL-MW0005, EDL-MW0006R, and EDL-MW0007) **(2102-D89).**

FDEP observed that, based on the current monitoring network and plume depiction, one could think the plume is not delineated. Trepidations exist about making decisions without understanding how MNA has progressed. NASA confirmed that vertical and horizontal delineation was completed. For clarity moving forward, the NASA lead requested that future documents include the end point assessment map that shows that we have plume delineation, as well as a cross-section, for any of these sites **(2102-A09, Standing Action item**).

M7-0505:

Groundwater elevation measurements were taken from 35 and groundwater samples were collected from 11 monitoring wells in November 2020. TCE, cDCE and VC are the remaining COCs.

VOC concentration trends are generally stable and/or declining at the site. The current scope of MNA remains an appropriate and viable remedy for M7-0505. It was recommended to remove five monitoring wells from the sampling event and change the groundwater sampling frequency to biennial (alternating wet/dry season), which is next scheduled for May 2022, and to retain laboratory analysis of select VOCs.

FDEP disagreed with the removal of M505-MW0051 since it is the next well downgradient of the middle plume segment. FDEP concurs with removal of M505-MW0020, M505-MW0028 and M505-MW0057. FDEP was also uncertain with the removal of M505-MW0033. They inquired what the difference was between M505-MW0032 and M505-MW0033. AECOM stated one monitoring well was shallower than the other. FDEP inquired if there existed a delineation well deeper than these two? NASA stated that this monitoring well was probably a performance well, but there is likely another data point we can pull to confirm this. NASA took an action item to investigate if there are deeper data points around the location of M505-MW0033 (**2102-A10**).

The Team reached consensus to also sample biennially the following six monitoring wells: M505-MW0013, M505-MW0032, M505-MW0039, M505-MW0051, M505-MW0055, M505-MW0059) and to remove the following wells from the sampling plan: M505-MW0020, M505-MW0028, M505-MW0033, M505-MW0049, and M505-MW0057). The Team reached consensus to collect water level measurements in May 2022 from 35 monitoring wells (M505-MW0003S, M505-MW0007S, M505-MW0007I, M505-MW0008S, M505-MW0009S, M505-MW0009I, M505-MW0012I, M505-MW0013, M505-MW0014, M505-MW0017, M505-MW0020, M505-MW0022, M505-MW0024, M505-MW0025, M505-MW0026, M505-MW0027, M505-MW0028, M505-MW0029, M505-MW0030, M505-MW0031, M505-MW0032, M505-MW0033, M505-MW0035, M505-MW0039, M505-MW0042, M505-MW0045, M505-MW0046, M505-MW0049, M505-MW0050, M505-MW0051, M505-MW0054, M505-MW0055, M505-MW0057, M505-MW0058, and M505-MW0059) **(2102-D90).**

NASA stated that this site has been well delineated, but the air sparge system was not as effective as expected. This instigated the process of NASA performing high resolution site characterizations. FDEP inquired if this was around the 2010-2013 timeframe, which NASA confirmed it was.

GSSP:

Groundwater elevation measurements were taken from 33 and groundwater samples were collected from 14 monitoring wells in November 2020. Tetrachloroethene, its breakdown products, and naphthalene are the COCs. VC concentrations exceeded GCTLs in eight monitoring wells, and naphthalene concentrations exceeded GCTLs in two monitoring wells. Other COCs at the site remain under GCTLs. The current scope of MNA remains an appropriate and viable remedy for the site as source concentrations remain low and the hot spot is contracting. The next sampling event is scheduled for November 2021.

FDEP inquired if this site was delineated to the northwest of the lake, and if we have vertical delineation at this location. NASA stated a site characterization was performed in 2012. In 2009, DPT55 was placed on the west side of the pond (west of MW0035) and DPT56 was located on the east side of the pond (20ft NW of the location of monitoring wells MW0033, MW0034, and MW0035). On the west side there were no detections, and on the east side there were low detections. Surface water was also sampled here. NASA took an action item to provide this data to FDEP for reference following the meeting **(2102-A11).**

The Team reached consensus to continue annual LTM sampling of 23 monitoring wells (GSSP-MW0013, GSSP-MW0019, GSSP-MW0020, GSSP-MW0024, GSSP-MW0034, GSSP-MW0035, GSSP-MW0036, GSSP-MW0039, GSSP-MW0042, GSSP-MW0043, GSSP-MW0044, GSSP-MW0045, GSSP-MW0047, GSSP-MW0049, GSSP-MW0053, GSSP-MW0054, GSSP-MW0055, GSSP-MW0058, GSSP-MW0059, GSSP-MW0060, GSSP-MW0061, GSSP-MW0062, GSSP-MW0063) for select VOCs (PCE, TCE, cis-1,2-DCE, trans-1,2-DCE, and VC) and PAHs (naphthalene) and collect water level measurements in 33 monitoring wells (GSSP-MW0006, GSSP-MW0007, GSSP-MW0008, GSSP-MW0009, GSSP-MW0013, GSSP-MW0014, GSSP-MW0019,

GSSP-MW0020, GSSP-MW0021, GSSP-MW0022, GSSP-MW0023, GSSP-MW0024, GSSP-MW0026, GSSP-MW0027, GSSP-MW0034, GSSP-MW0035, GSSP-MW0036, GSSP-MW0039, GSSP-MW0042, GSSP-MW0043, GSSP-MW0044, GSSP-MW0045, GSSP-MW0047, GSSP-MW0049, GSSP-MW0053, GSSP-MW0054, GSSP-MW0055, GSSP-MW0058, GSSP-MW0059, GSSP-MW0060, GSSP-MW0061, GSSP-MW0062, GSSP-MW0063), in November 2021 **(2102-D91).**

KARS Park 1:

Groundwater elevation measurements were taken from five and groundwater samples were collected from one monitoring well at location of concern (LOC) 7 in November 2020. Arsenic is the COC. Groundwater elevation measurements were taken from 16 and groundwater samples were collected from three monitoring wells at LOC 9 in November 2020. Lead is the COC. KP1-MW0018 was found to be damaged during the sampling event.

Arsenic concentrations at LOC 7 remain greater than GCTLs with a decreasing trend. Lead concentrations at LOC 9 area were less than GCTLs. It was recommended to continue MNA at LOC 7 and sample again in November 2025 as scheduled, adding downgradient KP1-MW0013 to the sampling schedule. It was recommended to abandon KP1-MW0018 at LOC 9 and move up the next sampling event at LOC 9 to May 2021.

The Team reached consensus to continue MNA at LOC 7 with the next sampling event to take place in November 2025 and adding sampling of the downgradient monitoring well KP1-MW0013 **(2102-D92).**

The Team reached consensus to abandon KP1-MW0018 and move up next sampling event at LOC 9 to May 2021, which includes LTM sampling of three MWs (KP1-MW0003, KP1-MW0022, KP1-MW0033) for total lead and collection of 16 water level measurements **(2102-D93).**

FDEP inquired if this will provide two clean events for all three monitoring wells? AECOM confirmed that it would. NASA added that there were 100,000 tons of lead-contaminated soil removed from this location under a previous IM.

FDEP inquired if this was a skeet range previously? NASA stated there was a rifle/pistol range with a skeet range to the west (reference slide 154). FDEP inquired on the groundwater in the rifle/pistol range area? NASA stated that the groundwater was not monitored in that area. Tetra Tech pulled up the old wells in a previous presentation figure during the meeting. The only well shown in the area of discussion was in the lead shot area (KP1-MW0007). FDEP stated they would like to know what happened west of LOC 9 if NASA can provide that data. NASA took an action item to look into this **(2102-A12, RO).**

HMF South:

Groundwater elevation measurements were taken from seven and groundwater samples were collected from one monitoring well in November 2020. Trichlorofluoromethane (TCFM) is the remaining COC. TCFM concentrations were less than GCTLs at HMF South in November 2020, as confirmed by a December 2020 re-sample. The next sampling event is scheduled for May 2022. It was recommended to add downgradient HMF-MW0006I for TCFM analysis, and to move up the next sampling event to May 2021.

The Team reached consensus to move up the next sampling event to May 2021, which includes LTM sampling of two MWs (HMF-NLP-IW0004I and added downgradient HMF-MW0006I) for TCFM and collect water level measurements at seven wells (HMF-NLP-IW0001I, HMF-NLP-IW0002I, HMF-NLP-IW0004I, HMF-NLP-IW0005I, HMF-NLP-IW0006I, HMF-NLP-IW0007I) **(2102-D94).**

FDEP suggested that the NASA look for or obtain any data points needed to support a site closure request. All wells in the approved monitoring program must meet GCTLs for two consecutive rounds to support a closure decision. NASA took an action item to look through the historical sampling data **(2102-A11, RO).**

**Results: Decision Items 2102-D74 through D94**
**Action Items 2120-A05 through A12**

**2102-M14 KSCRT**

**Miscellaneous Discussion**

Proposed future meeting dates for 2021:

- April 13 and 14th

# APPENDIX C

## DAILY FIELD ACTIVITY LOGS

9/16/21 NASA KSC - IA LTM GK DS

Groundwater sampling at KARS and ORSY

vehicles: AECOM F-150's # 275, 905

personnel: Greg Kusel + Dustin Slater

Equipment: DTW meter, In Situ Aqua Troll, Geo pump, backup Hach 2100p, Ipad.

PPE: Level D + Nitrile gloves

0800 GK + DS meet at KARS park #1
- go over SOW
- organize + cal equipment
- Safety meeting.

0830 Begin to Locate and gauge wells.
- Depths on gauging sheet.

1027 Collect KPI-MW0022-003.5-20210916

1048 Collect KPI-MW0035-003.0-20210916

1109 Collect KPI-MW0003-003.5-20210916

1115 Move to the ORSY site.

1135 Begin locating and gauging wells.

1213 Collect ORSY-EXC-MW0031-022.5-20210916

1235 Collect ORSY-EXC-MW0001I-022.5-20210916

1255 Drop off IDW at the CCF.
Drum ID: 222843
pallet ID: 222842

1300 crew offsite.

1340 GK dropped off samples at ENCO.

9/16/21 GK

# APPENDIX D

## GROUNDWATER SAMPLING LOGS

AECOM

# GROUNDWATER SAMPLING LOG

Event: IA LTM Sept 2021 Orsino Storage Yard

Site Name: Industrial Area/Orsino Storage Yard (SWMU 004)

Project #: 60610905

| Sample Information | | | |
|---|---|---|---|
| Sample ID: | ORSY-EXC-MW0001I-022.5-20210916 | Date: | 9/16/2021 12:35:00 PM |
| Well ID: | ORSY-EXC-MW0001I | Location Type: | MONITORING WELL |
| Duplicate ID: | | Sampler: | Dustin Slater |
| Analysis: | 1,2,3-TCB,1,2,3-TCB,1,2,3-TCB,1,2,3-TCB,1,2,4-TCB | | |
| Comments: | | | |

| Water Level | | | |
|---|---|---|---|
| Date: | 9/16/2021 12:17:00 PM | Static Water Level (ft-BTOR): | 3.38 FT |
| Top of Screen (ft-BTOR): | 20 | Bottom of Screen (ft-BTOR): | 25 |
| Measured Well Depth: | NE | Total Depth (ft-BTOR): | 25.3 |
| Is Well Dry? | No | Well Diameter (in): | 2 |
| Notes: | | | |

| Purge Information | | | |
|---|---|---|---|
| Begin Date and Time: | 9/16/2021 12:18:00 PM | End Date and Time: | 9/16/2021 12:34:00 PM |
| Purge Method: | Peristaltic Pump | Sample Method: | Peristaltic Pump |
| Notes: | | | |

| Time | Cumulative Volume Purged (gal) | Purge Rate (gal/min) | Volume Purged (gal) | TEMPERATURE (C) | Specific conductivity (FLD) (US/CM) | pH (S.U.) | OXIDATION REDUCTION POTENTIAL (MV) | Turbidity (FLD) (NTU) | SALINITY (PSU) | DISSOLVED OXYGEN (MG/L) |
|---|---|---|---|---|---|---|---|---|---|---|
| **12:18 PM** | 0 | | | | | | | | | |
| **12:28 PM** | 0.1 | 0.05 | 0.1 | 27.56 | 170 | 7.54 | -153.67 | 3.25 | 0.08 | 0.14 |
| **12:30 PM** | 0.2 | 0.05 | 0.1 | 27.48 | 178 | 7.48 | -158.13 | 10.91 | 0.08 | 0.12 |
| **12:32 PM** | 0.3 | 0.05 | 0.1 | 27.36 | 180 | 7.48 | -159.48 | 18.87 | 0.09 | 0.11 |
| **12:34 PM** | 0.4 | 0.05 | 0.1 | 27.38 | 181 | 7.48 | -159.89 | 10.72 | 0.09 | 0.11 |

AECOM

# GROUNDWATER SAMPLING LOG

Event: IA LTM Sept 2021 Orsino Storage Yard

Site Name: Industrial Area/Orsino Storage Yard (SWMU 004)

Project #: 60610905

| Sample Information | | | |
|---|---|---|---|
| Sample ID: | ORSY-EXC-MW0003I-022.5-20210916 | Date: | 9/16/2021 12:13:00 PM |
| Well ID: | ORSY-EXC-MW0003I | Location Type: | MONITORING WELL |
| Duplicate ID: | | Sampler: | Dustin Slater |
| Analysis: | 1,2,3-TCB,1,2,3-TCB,1,2,3-TCB,1,2,3-TCB,1,2,4-TCB | | |
| Comments: | | | |

| Water Level | | | |
|---|---|---|---|
| Date: | 9/16/2021 11:54:00 AM | Static Water Level (ft-BTOR): | 6.72 FT |
| Top of Screen (ft-BTOR): | 20 | Bottom of Screen (ft-BTOR): | 25 |
| Measured Well Depth: | NE | Total Depth (ft-BTOR): | 25 |
| Is Well Dry? | No | Well Diameter (in): | 1 |
| Notes: | | | |

| Purge Information | | | |
|---|---|---|---|
| Begin Date and Time: | 9/16/2021 11:55:00 AM | End Date and Time: | 9/16/2021 12:12:00 PM |
| Purge Method: | Peristaltic Pump | Sample Method: | Peristaltic Pump |
| Notes: | | | |

| Time | Cumulative Volume Purged (gal) | Purge Rate (gal/min) | Volume Purged (gal) | TEMPERATURE (C) | Specific conductivity (FLD) (US/CM) | pH (S.U.) | OXIDATION REDUCTION POTENTIAL (MV) | Turbidity (FLD) (NTU) | SALINITY (PSU) | DISSOLVED OXYGEN (MG/L) |
|---|---|---|---|---|---|---|---|---|---|---|
| **11:56 AM** | 0 | | | | | | | | | |
| **12:06 PM** | 0.5 | 0.05 | 0.5 | 27.21 | 823 | 6.99 | -81.18 | 1.91 | 0.41 | 0.33 |
| **12:08 PM** | 0.6 | 0.05 | 0.1 | 27.19 | 820 | 6.99 | -85.78 | 1.71 | 0.41 | 0.3 |
| **12:10 PM** | 0.7 | 0.05 | 0.1 | 27.23 | 814 | 7.02 | -29.26 | 2.75 | 0.4 | 0.71 |
| **12:12 PM** | 0.8 | 0.05 | 0.1 | 27.38 | 811 | 7.01 | -43.27 | 1.35 | 0.4 | 0.43 |

# APPENDIX E

## RIS COMPLETION TICKETS

# Data Checker

Completion Ticket

On 10/15/2021 at 10:40 AM the following files were submitted to Tetra Tech

**COMPLETION_AECOM_IA_20211014.txt**

**LITHOLOGY_AECOM_IA_20211014.txt**

**LOCATION_AECOM_IA_20211014.txt**

**PROJECT_AECOM_IA_20211014.txt**

**RESULT_AECOM_IA_20211014.txt**

**SAMPLE_AECOM_IA_20211014.txt**

**WATER_AECOM_IA_20211014.txt**

The following comment was provided with this submission:
**Hello - attached is the September 2021 Industrial Area LTM data for ORSY, KP1, HMF, and IDW. If you have any questions let me know. thanks! Jennifer Chastain**

If you need to identify this session at a later date you may use the Ticket Key:

**TetraTechExternalClientsProtectedDataRepository20211015_5855713810_kedd_AECOM**

You may print this page by clicking on the "Print This Page" button
Thank you for using the Data Checker, to upload more files click the "Data Checker" link in the menu.

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# APPENDIX F

## LABORATORY ANALYTICAL DATA

# ENCO Laboratories

Accurate. Timely. Responsive. Innovative.

**10775 Central Port Drive**
**Orlando FL, 32824**
**Phone: 407.826.5314 FAX: 407.850.6945**


Friday, September 24, 2021
AECOM Technical Services, Inc. (SE004)
Attn: Teresa Amentt Jennings
150 N. Orange Ave, Suite 200
Orlando, FL 32801

**RE: Laboratory Results for**
**Project Number: 60610905.Subs 2021-23-Subs 2021-23, Project Name/Desc: NASA KSC**
**ENCO Workorder(s): AE07198**

Dear Teresa Amentt Jennings,

Enclosed is a copy of your laboratory report for test samples received by our laboratory on Thursday, September 16, 2021.

Unless otherwise noted in an attached project narrative, all samples were received in acceptable condition and processed in accordance with the referenced methods/procedures. Results for these procedures apply only to the samples as submitted.

The analytical results contained in this report are in compliance with NELAC standards, except as noted in the project narrative if applicable. This report shall not be reproduced except in full, without the written approval of the Laboratory.

This report contains only those analyses performed by Environmental Conservation Laboratories. Unless otherwise noted, all analyses were performed at ENCO Orlando. Data from outside organizations will be reported under separate cover.

If you have any questions or require further information, please do not hesitate to contact me.

Sincerely,

Kaitlin Dylnicki

Project Manager

Enclosure(s)

## SAMPLE SUMMARY/LABORATORY CHRONICLE

**Client ID:** ORSY-EXC-MW0001I-022.5-20210916 **Lab ID:** AE07198-01 **Sampled:** 09/16/21 12:35 **Received:** 09/16/21 13:40

| Parameter | Preparation | Hold Date/Time(s) | Prep Date/Time(s) | Analysis Date/Time(s) |
|---|---|---|---|---|
| EPA 8260D | EPA 5030B_MS | 09/30/21 | 09/23/21 10:32 | 09/24/21 00:29 |

**Client ID:** ORSY-EXC-MW0003I-022.5-20210916 **Lab ID:** AE07198-02 **Sampled:** 09/16/21 12:13 **Received:** 09/16/21 13:40

| Parameter | Preparation | Hold Date/Time(s) | Prep Date/Time(s) | Analysis Date/Time(s) |
|---|---|---|---|---|
| EPA 8260D | EPA 5030B_MS | 09/30/21 | 09/23/21 10:32 | 09/24/21 00:57 |

**Client ID:** ORSY-TB-20210916-01 **Lab ID:** AE07198-03 **Sampled:** 09/16/21 08:00 **Received:** 09/16/21 13:40

| Parameter | Preparation | Hold Date/Time(s) | Prep Date/Time(s) | Analysis Date/Time(s) |
|---|---|---|---|---|
| EPA 8260D | EPA 5030B_MS | 09/30/21 | 09/23/21 10:32 | 09/24/21 01:26 |

## SAMPLE DETECTION SUMMARY

**Client ID:** ORSY-EXC-MW0001I-022.5-20210916 **Lab ID:** AE07198-01

| Analyte | Results | Flag | MDL | PQL | Units | Method | Notes |
|---|---|---|---|---|---|---|---|
| 1,2,4-Trichlorobenzene | 0.73 | I | 0.70 | 1.0 | ug/L | EPA 8260D | |

# ANALYTICAL RESULTS

**Description:** ORSY-EXC-MW0001I-022.5-20210916 **Lab Sample ID:** AE07198-01 **Received:** 09/16/21 13:40
**Matrix:** Ground Water **Sampled:** 09/16/21 12:35 **Work Order:** AE07198
**Project:** NASA KSC **Sampled By:** Greg Kusel/Dustin Slater

## Volatile Organic Compounds by GCMS

*^ - ENCO Orlando certified analyte [NELAC E83182]*

| Analyte [CAS Number] | Results | Flag | Units | DF | MDL | PQL | Batch | Method | Analyzed | By | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1,2,3-Trichlorobenzene [87-61-6]^ | 0.86 | U | ug/L | 1 | 0.86 | 1.0 | 1I23022 | EPA 8260D | 09/24/21 00:29 | nmc | |
| **1,2,4-Trichlorobenzene [120-82-1]^** | **0.73** | I | ug/L | 1 | 0.70 | 1.0 | 1I23022 | EPA 8260D | 09/24/21 00:29 | nmc | |

| *Surrogates* | *Results* | *DF* | *Spike Lvl* | *% Rec* | *% Rec Limits* | *Batch* | *Method* | *Analyzed* | *By* | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| *4-Bromofluorobenzene* | *45* | *1* | *50.0* | *90 %* | *41-142* | *1I23022* | *EPA 8260D* | *09/24/21 00:29* | *nmc* | |
| *Dibromofluoromethane* | *51* | *1* | *50.0* | *102 %* | *53-146* | *1I23022* | *EPA 8260D* | *09/24/21 00:29* | *nmc* | |
| *Toluene-d8* | *45* | *1* | *50.0* | *91 %* | *41-146* | *1I23022* | *EPA 8260D* | *09/24/21 00:29* | *nmc* | |

**Description:** ORSY-EXC-MW0003I-022.5-20210916 **Lab Sample ID:** AE07198-02 **Received:** 09/16/21 13:40
**Matrix:** Ground Water **Sampled:** 09/16/21 12:13 **Work Order:** AE07198
**Project:** NASA KSC **Sampled By:** Greg Kusel/Dustin Slater

## Volatile Organic Compounds by GCMS

*^ - ENCO Orlando certified analyte [NELAC E83182]*

| Analyte [CAS Number] | Results | Flag | Units | DF | MDL | PQL | Batch | Method | Analyzed | By | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1,2,3-Trichlorobenzene [87-61-6]^ | 0.86 | U | ug/L | 1 | 0.86 | 1.0 | 1I23022 | EPA 8260D | 09/24/21 00:57 | nmc | |
| 1,2,4-Trichlorobenzene [120-82-1]^ | 0.70 | U | ug/L | 1 | 0.70 | 1.0 | 1I23022 | EPA 8260D | 09/24/21 00:57 | nmc | |

| *Surrogates* | *Results* | *DF* | *Spike Lvl* | *% Rec* | *% Rec Limits* | *Batch* | *Method* | *Analyzed* | *By* | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| *4-Bromofluorobenzene* | *46* | *1* | *50.0* | *91 %* | *41-142* | *1I23022* | *EPA 8260D* | *09/24/21 00:57* | *nmc* | |
| *Dibromofluoromethane* | *52* | *1* | *50.0* | *103 %* | *53-146* | *1I23022* | *EPA 8260D* | *09/24/21 00:57* | *nmc* | |
| *Toluene-d8* | *47* | *1* | *50.0* | *93 %* | *41-146* | *1I23022* | *EPA 8260D* | *09/24/21 00:57* | *nmc* | |

**Description:** ORSY-TB-20210916-01 **Lab Sample ID:** AE07198-03 **Received:** 09/16/21 13:40
**Matrix:** Ground Water **Sampled:** 09/16/21 08:00 **Work Order:** AE07198
**Project:** NASA KSC **Sampled By:** Greg Kusel/Dustin Slater

## Volatile Organic Compounds by GCMS

*^ - ENCO Orlando certified analyte [NELAC E83182]*

| Analyte [CAS Number] | Results | Flag | Units | DF | MDL | PQL | Batch | Method | Analyzed | By | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1,2,3-Trichlorobenzene [87-61-6]^ | 0.86 | U | ug/L | 1 | 0.86 | 1.0 | 1I23022 | EPA 8260D | 09/24/21 01:26 | nmc | |
| 1,2,4-Trichlorobenzene [120-82-1]^ | 0.70 | U | ug/L | 1 | 0.70 | 1.0 | 1I23022 | EPA 8260D | 09/24/21 01:26 | nmc | |

| *Surrogates* | *Results* | *DF* | *Spike Lvl* | *% Rec* | *% Rec Limits* | *Batch* | *Method* | *Analyzed* | *By* | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| *4-Bromofluorobenzene* | *46* | *1* | *50.0* | *91 %* | *41-142* | *1I23022* | *EPA 8260D* | *09/24/21 01:26* | *nmc* | |
| *Dibromofluoromethane* | *51* | *1* | *50.0* | *102 %* | *53-146* | *1I23022* | *EPA 8260D* | *09/24/21 01:26* | *nmc* | |
| *Toluene-d8* | *46* | *1* | *50.0* | *91 %* | *41-146* | *1I23022* | *EPA 8260D* | *09/24/21 01:26* | *nmc* | |

# QUALITY CONTROL DATA

## Volatile Organic Compounds by GCMS - Quality Control

***Batch 1I23022 - EPA 5030B_MS***

**Blank (1I23022-BLK1)** Prepared: 09/23/2021 10:32 Analyzed: 09/23/2021 22:34

| Analyte | Result | Flag | POL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1,2,3-Trichlorobenzene | 0.86 | U | 1.0 | ug/L | | | | | | | |
| 1,2,4-Trichlorobenzene | 0.70 | U | 1.0 | ug/L | | | | | | | |
| *4-Bromofluorobenzene* | *47* | | | *ug/L* | *50.0* | | *94* | *41-142* | | | |
| *Dibromofluoromethane* | *53* | | | *ug/L* | *50.0* | | *106* | *53-146* | | | |
| *Toluene-d8* | *47* | | | *ug/L* | *50.0* | | *94* | *41-146* | | | |

**LCS (1I23022-BS1)** Prepared: 09/23/2021 10:32 Analyzed: 09/23/2021 20:11

| Analyte | Result | Flag | POL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1,2,3-Trichlorobenzene | 24 | | 1.0 | ug/L | 20.0 | | 120 | 43-168 | | | |
| 1,2,4-Trichlorobenzene | 21 | | 1.0 | ug/L | 20.0 | | 105 | 52-159 | | | |
| *4-Bromofluorobenzene* | *47* | | | *ug/L* | *50.0* | | *94* | *41-142* | | | |
| *Dibromofluoromethane* | *50* | | | *ug/L* | *50.0* | | *100* | *53-146* | | | |
| *Toluene-d8* | *46* | | | *ug/L* | *50.0* | | *93* | *41-146* | | | |

**Matrix Spike (1I23022-MS1)** Prepared: 09/23/2021 10:32 Analyzed: 09/23/2021 20:40

**Source: AE06854-01**

| Analyte | Result | Flag | POL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1,2,3-Trichlorobenzene | 21 | | 1.0 | ug/L | 20.0 | 0.86 U | 107 | 43-168 | | | |
| 1,2,4-Trichlorobenzene | 20 | | 1.0 | ug/L | 20.0 | 0.70 U | 98 | 52-159 | | | |
| *4-Bromofluorobenzene* | *46* | | | *ug/L* | *50.0* | | *92* | *41-142* | | | |
| *Dibromofluoromethane* | *50* | | | *ug/L* | *50.0* | | *101* | *53-146* | | | |
| *Toluene-d8* | *50* | | | *ug/L* | *50.0* | | *100* | *41-146* | | | |

**Matrix Spike Dup (1I23022-MSD1)** Prepared: 09/23/2021 10:32 Analyzed: 09/23/2021 21:08

**Source: AE06854-01**

| Analyte | Result | Flag | POL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1,2,3-Trichlorobenzene | 21 | | 1.0 | ug/L | 20.0 | 0.86 U | 104 | 43-168 | 3 | 26 | |
| 1,2,4-Trichlorobenzene | 18 | | 1.0 | ug/L | 20.0 | 0.70 U | 92 | 52-159 | 6 | 24 | |
| *4-Bromofluorobenzene* | *46* | | | *ug/L* | *50.0* | | *91* | *41-142* | | | |
| *Dibromofluoromethane* | *50* | | | *ug/L* | *50.0* | | *101* | *53-146* | | | |
| *Toluene-d8* | *47* | | | *ug/L* | *50.0* | | *93* | *41-146* | | | |

## FLAGS/NOTES AND DEFINITIONS

| | |
|---|---|
| **PQL** | PQL: Practical Quantitation Limit. The PQL presented is the laboratory MRL. |
| **B** | Results are based upon membrane filter colony counts that are outside the method indicated ideal range. |
| **I** | The reported value is between the laboratory method detection limit (MDL) and the practical quantitation limit (PQL). |
| **J** | Estimated value. |
| **K** | Off-scale low; Actual value is known to be less than the value given. |
| **L** | Off-scale high; Actual value is known to be greater than value given. |
| **M** | Presence of analyte is verified but not quantified; the actual value is less than the MRL but greater than the MDL. |
| **N** | Presumptive evidence of presence of material. |
| **O** | Sampled, but analysis lost or not performed. |
| **Q** | Sample exceeded the accepted holding time. |
| **T** | Value reported is less than the laboratory method detection limit. The value is reported for informational purposes only and shall not be used in statistical analysis. |
| **U** | Indicates that the compound was analyzed for but not detected. |
| **V** | Indicates that the analyte was detected in both the sample and the associated method blank. |
| **Y** | The laboratory analysis was from an improperly preserved sample. The data may not be accurate. |
| **Z** | Too many colonies were present (TNTC); the numeric value represents the filtration volume. |
| **?** | Data are rejected and should not be used. Some or all of the quality control data for the analyte were outside criteria, and the presence or absence of the analyte cannot be determined from the data. |
| * | Not reported due to interference. |
| **[CALC]** | Calculated analyte - MDL/MRL reported to the highest reporting limit of the component analyses. |

AE07198

# CHAIN OF CUSTODY AND ANALYTICAL REQUEST RECORD

| | | | |
|---|---|---|---|
| Project Name: NASA KSC | COC No. | Page: 1 of 1 | |
| Site Location: Orsino Storage Yard | PO No. | Project No. 60610905.Subs 2021-23-Subs 2021-23 | Phase: |
| TO No.: 80KSC019F0071 — AECOM Project Manager: **Chris Marshall** | Send Invoice To: Instructions in MSA # 19S-24548-GV03 | EDD to: Jennifer Chastain | Cc: Teresa Amentt Jennings |
| Sampler/Phone #: Greg Kusel / (772) 631-7426 — Dustin Slater / (407) 766-0747 | Deliver Sample Kits To: AECOM Depot, 523 18th Street, Orlando | Report to: Jennifer Chastain | Cc: Teresa Amentt Jennings |
| Lab Name: ENCO — Turnaround Time(specify): Standard 14 day | Deliver Samples To: ENCO | Site-Spicific WS#15 from QAPP: 15-30 | |

**Sample Analysis Requested** (*Enter number of containers for each test*)

| Lab ID | Sample ID (sys_samp_code) | Location ID (sys_loc_code) | Date (YYYYMMDD) | Time (Military) (hhmm) | Matrix Code (1) | Sample Type (2) | G=Grab C=Comp | (3) Total No. of Containers | HCl 1,2,3-TCB & 1,2,4-TCB by SW8260B | | | | | | | | | | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ORSY-EXC-MW0001I-[illegible]-20210916 | ORSY-EXC-MW0001I | 20210916 | 1235 | WG | N | G | 3 | 3 | | | | | | | | | | |
| | ORSY-EXC-MW0003I-[illegible]-20210916 | ORSY-EXC-MW0003I | 20210916 | 1213 | WG | N | G | 3 | 3 | | | | | | | | | | |
| | ORSY-TB-20210916-01 | ORSY-TB01 | 20210916 | 0800 | WQ | TB | G | 2 | 2 | | | | | | | | | | |

***Field* Comments:**
Report only per QAPP WS #15-30

***Lab* Comments:**

**Sample Shipment and Delivery Details**
Number of coolers in shipment: 1
Samples Iced?(check) Yes ___ No ___
Shipping Company:
Tracking No:
Date Shipped:

| | Relinquished by (signature) | Date | Time | Received by (signature) | Date | Time |
|---|---|---|---|---|---|---|
| 1 | [signature] | 09/13/21 | 11:50 | [signature] | 9/16/21 | 0700 |
| 2 | [signature] | 9/16/21 | 1340 | [signature] | 9/16/21 | 1340 |
| 3 | | | | | | |

**(1) AA**=Ambient air, **AQ**=Air quality control, **ASB**=Asbestos, **CK**=Caulk, **DS**=Storm drain sediment, **GS**=Soil gas, **IC**=IDW Concrete, **IDD**=IDW Solid, **IDS**=IDW soil, **IDW**=IDW Water, **LF**=Free Product, **MA**=Mastic, **PC**=Paint Chips, **SC**=Cement/Concrete, **SE**=Sediment, **SL**=Sludge, **SO**=Soil, **SQ**=Soil/Solid quality control, **SSD**=Subsurface sediment, **SU**=Surface soil (<6 in), **SW**=Swab or wipe, **TA**=Animal tissue, **TP**=Plant tissue, **TQ**=Tissue quality control, **WG**=Ground water, **WL**=Leachate, **WO**=Ocean water, **WP**=Drinking water, **WQ**=Water quality control, **WR**=Ground water effluent, **WS**=Surface water, **WU**=Storm water, **WW**=Waste water

**(2) Sample Type: AB**=Ambient Blk, **EB**=Equipment Blk, **FB**=Field Blk, **FD**=Field Duplicate Sample, **IDW**=Investigative-Derived Waste, **MIS**=Incremental Sampling Methodology, **N**=Normal Environmental Sample, **TB**=Trip Blk

**(3) Preservative added: 4 DEG C**=Cool to 4 degrees, **Dark**=Store in Darkness, store cool at 4 degrees C **H2SO4**=Hydrogen sulfate, **H2SO4 <2**=Adjust to pH < 2 with sulfuric acid, **H3PO4**=Phosphoric acid, **H3PO4 <2**=Adjust to pH <2 with phosphoric acid, **HCl <2**=Adjust to pH < 2 with hydrochloric acid, **HNaO4S**=Sodium bisulfate preservation, **HNO3 <2**=Adjust to pH < 2 with nitric acid, **MeOH**=Methanol preservation, **Na2O3S2**=Sodium thiosulfate, **Na2O3S2 3/gal**=Add 3 mL 10% sodium thiosulfate per l-gal, **Na2O3S2 4/4oz**=4 drops of 10% sodium thiosulfate to 4 oz, **NaHSO4 <2**=Adjust to pH < 2 with sodium hydrogen sulfate, NaOH >12=Adjust to pH > 12 with sodium hydroxide, NaOH >9=Adjust to pH >9 with sodium hydroxide, **VitC 0.6/500**=0.6 g of ascorbic acid to 500mLs, **ZnAct 2/500**=Add 2 mL of zinc acetate to 500mLs, **ZnAct+NaOH >9**=Zinc acetate and NaOH to pH>9; store cool at 4C If **NO preservative** added leave blank **Rev 8/19**

SM3R7 0.1°C