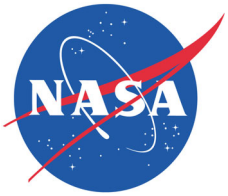
National Aeronautics and Space Administration



Final

Data Summary Report

June 2021 Groundwater Monitoring
Operable Unit 2
Former Fire Training Area

Goddard Space Flight Center
Wallops Flight Facility
Wallops Island, Virginia

May 2022

CERTIFICATION

I certify that the information contained in or accompanying this document is true, accurate, and complete.

As to any portion of this document for which I cannot personally verify its accuracy, I certify under penalty of law that this document and all attachments were prepared in accordance with procedures designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, or the immediate supervisor of such person(s), the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.

Signature: DAVID LIU Digitally signed by DAVID LIU
Date: 2022.08.19 08:18:49 -04'00'

Name: David Liu

Title: NASA Project Coordinator

Final

DATA SUMMARY REPORT

JUNE 2021 GROUNDWATER MONITORING
OPERABLE UNIT 2
FORMER FIRE TRAINING AREA

NASA WALLOPS FLIGHT FACILITY
WALLOPS ISLAND, VIRGINIA

Submitted to:
National Aeronautics and Space Administration
Goddard Space Flight Center
Wallops Flight Facility
Wallops Island, Virginia 23337

Submitted by:
Tetra Tech, Inc.
5700 Lake Wright Drive, Suite 102
Norfolk, Virginia 23502

Indefinite Delivery Indefinite Quantity Contract
Contract No. 80KSC019D0011
Task Order 20
May 2022

PREPARED UNDER THE DIRECTION OF:

CHRISTOPHER PIKE
PROJECT MANAGER
TETRA TECH, INC.
PITTSBURGH, PENNSYLVANIA

APPROVED FOR SUBMISSION BY:

MARK SPERANZA, PE
PROGRAM MANAGER
TETRA TECH, INC.
PITTSBURGH, PENNSYLVANIA

TABLE OF CONTENTS

TABLE OF CONTENTS (CONTINUED)

TABLES

FIGURES

APPENDICIES

ACRONYMS AND ABBREVIATIONS

CoC	chain of custody
FFTA	Former Fire Training Area
GSFC	Goddard Space Flight Center
HDPE	high-density polyethylene
IDIQ	Indefinite Delivery Indefinite Quantity
IDW	investigation derived waste
LTM	Long-Term Monitoring
MS/MSD	matrix spike/matrix spike duplicate
NASA	National Aeronautics and Space Administration
NTU	nephelometric turbidity unit
ORP	oxidation reduction potential
PFAS	per- and polyfluoroalkyl substances
PID	photoionization detector
QA/QC	quality assurance/quality control
QAPP	Quality Assurance Project Plan
ROD	Record of Decision
Tetra Tech	Tetra Tech, Inc.
UFP	Uniform Federal Policy
USEPA	United States Environmental Protection Agency
WFF	Wallops Flight Facility
WWTP	wastewater treatment plant
µg/L	micrograms per liter

1.0 INTRODUCTION

This Data Summary Report documents the field activities and results from the June 2021 long-term monitoring (LTM) event for groundwater at Operable Unit 2 the Former Fire Training Area (FFTA) at the National Aeronautics and Space Administration (NASA) Goddard Space Flight Center (GSFC) Wallops Flight Facility (WFF) located in Accomack County, Virginia (Figures 1-1 and 1-2). This report was prepared by Tetra Tech, Inc. (Tetra Tech) for NASA under Indefinite Delivery Indefinite Quantity (IDIQ) Contract 80KSC019D0011, Task Order 20.

1.1 SCOPE AND OBJECTIVE

This report documents the groundwater monitoring activities and analytical results from the June 2021 LTM event at the FFTA. The objective of this report and the LTM Program is to assess progress towards achieving the groundwater remediation goals documented in the Record of Decision (ROD) for the FFTA (NASA, 2007).

The ROD established cleanup goals for the following constituents of concern:

- benzene - 5 micrograms per liter (µg/L)
- cis-1,2-dichloroethene - 70 µg/L
- vinyl chloride - 2 µg/L
- 4-methylphenol - 27 µg/L
- naphthalene - 16 µg/L
- arsenic - 10 µg/L
- manganese - 124 µg/L

Groundwater LTM activities have been conducted at the FFTA since July 2010. Over this time, several constituents of concern have achieved the performance monitoring goals outlined in the ROD and, therefore, have been removed from monitoring. These constituents of concern and the date they were removed include:

- cis-1,2-dichloroethene (September 2013)
- vinyl chloride (September 2013)
- benzene (December 2018)
- 4-methylphenol (June 2021)

The constituents of concern currently being monitored during the FFTA LTM program are naphthalene, arsenic, and manganese.

1.2 REPORT ORGANIZATION

This report consists of five sections. Section 1.0 provides this introduction. Section 2.0 provides a summary of the field activities. Section 3.0 presents the analytical results. Section 4.0 presents the conclusions and recommendations. Section 5.0 provides the references.

2.0 FIELD INVESTIGATION

Field activities were conducted at the FFTA from June 29-30, 2021 in accordance with the final LTM Plan – Rev 3 (NASA, 2015). Figure 2-1 presents the site layout map for the FFTA. Appendix A provides a photographic log documenting the activities conducted during the June 2021 LTM event.

2.1 GROUNDWATER LEVEL MEASUREMENTS

A synoptic round of groundwater level measurements was collected from 23 monitoring wells at the FFTA on June 30, 2021. Appendix B provides the groundwater level measurement sheet. Table 2-1 presents the well construction details, surveyed top of casing elevation, water level measurement, and groundwater elevation for each monitoring well. Figure 2-2 presents a potentiometric surface contour map for shallow groundwater at the FFTA. The contour lines were plotted based on the groundwater elevations in the monitoring wells. Groundwater flow is perpendicular to the contour lines and flow arrows were added for clarity. The contour lines were dashed where inferred.

2.2 GROUNDWATER SAMPLING

Groundwater samples were collected from 11 monitoring wells on June 29 and 30, 2021 (Figure 2-1). Each groundwater sample was analyzed for naphthalene and total and dissolved metals (arsenic and manganese). Dissolved metal samples were field filtered using an in-line 0.45-micron filter. Field test kits were also used to measure dissolved oxygen concentrations. Groundwater sample log sheets are provided in Appendix C.

Sampling of the monitoring wells was conducted in accordance with United States Environmental Protection Agency (USEPA) Region 3 Recommended Procedures for Low-Flow Purging and Sampling of Groundwater Monitoring Wells, Bulletin No. QAD023. Sampling consisted of the use of dedicated high density polyethylene (HDPE) and silicone tubing, a multi-parameter water quality meter, an independent turbidity meter, and a peristaltic pump. Field parameters and water levels were recorded during low-flow purging activities. These parameters included: turbidity, dissolved oxygen, pH, oxidation-reduction potential (ORP), specific conductivity, temperature, and salinity. Also, upon initially opening the well cap, the head space from riser was screened with a photoionization detector (PID) to measure any vapors that may have accumulated.

2.3 QUALITY ASSURANCE/QUALITY CONTROL

Quality Assurance/Quality Control (QA/QC) samples were collected during the sampling event and included a matrix spike/matrix spike duplicate (MS/MSD), field duplicate, and field blank. Sample log sheets documenting QA/QC samples are provided in Appendix D. Chain of Custody (CoC) forms are provided in Appendix E.

Samples were shipped to the laboratory, SGS-Accutest in Orlando, Florida, via overnight courier service.

2.4 INVESTIGATION DERIVED WASTE MANAGEMENT

Aqueous investigative derived waste (IDW) consisting of decontamination water and purge water was containerized and brought to Building B-29 for temporary storage and onsite treatment.

Groundwater at the FFTA is known to contain per- and polyfluoroalkyl substances (PFAS). PFAS is being investigated separately as part of several ongoing investigations at the Main Base of WFF. A portable granular activated carbon system was used to treat the aqueous IDW and remove PFAS. The discharge of treated water was performed in a controlled manner to prevent negatively impacting the wastewater treatment plant (WWTP).

Used personal protective equipment (i.e., nitrile gloves) and general refuse was bagged and disposed as general trash.

2.5 DEVIATIONS FROM THE SAMPLING PLAN

No deviations from the LTM Plan – Rev 3 occurred.

2.6 FIELD OBSERVATIONS

The following summarizes the field observations made during the June 2021 LTM event at the FFTA.

- No free product was encountered during groundwater monitoring activities.
- No elevated PID readings were observed in the monitoring wells.
- Turbidity measurements were less than 10 nephelometric turbidity units (NTUs) at the time of sampling for all groundwater samples, although some suspended particles were observed during low flow purging.

3.0 GROUNDWATER ANALYTICAL RESULTS AND FINDINGS

This section presents the groundwater analytical results and findings from the June 2021 LTM event at the FFTA. Groundwater samples were collected from 11 monitoring wells and analyzed for naphthalene, and total and dissolved arsenic and manganese. The analytical results (validated), groundwater quality parameters, and field test kit results are provided in Table 3-1. The analytical results from the groundwater samples are presented on Figure 3-1. Figure 3-2 presents the contaminant concentrations that exceeded their respective cleanup goals and the spatial extent of these exceedances. The data validation report is provided in Appendix F.

Naphthalene was detected in samples from two monitoring wells – FFTA-MW055S (estimated concentration [biased low] of 39.4 µg/L) and FFTA-MW055D (8.8 µg/L). Only the naphthalene concentration detected in the sample from FFTA-MW055S exceeded the site cleanup goal of 16 µg/L (Figure 3-2).

Arsenic was detected in 6 of the 11 total samples (unfiltered) and in 5 of the 11 dissolved samples (filtered). Total arsenic concentrations ranged from an estimated concentration of 1.6 µg/L to 40.3 µg/L and dissolved arsenic concentrations ranged from 7.6 µg/L to 41.8 µg/L. Total arsenic concentrations exceeded the site cleanup goal of 10 µg/L in samples from four monitoring wells: FFTA-MW55S (20.2 µg/L), FFTA-MW55D (17.4 µg/L), FFTA-MW061I (13.7 µg/L), and FFTA-MW107 (39.6 µg/L and 40.3 µg/L in the duplicate sample) (Figure 3-2).

Arsenic concentrations detected in the total and dissolved samples were comparable except at concentrations around the instrument detection limit. At these low concentrations, it is common to see a positive detection in either the total or dissolved arsenic sample, but not necessarily both. This was the case at FFTA-MW056D, where arsenic was detected in the total sample with an estimated concentration of 1.6 µg/L, while arsenic was not detected in the dissolved sample.

Manganese was detected in 9 of the 11 total samples (unfiltered) and in 9 of the 11 dissolved samples (filtered). Total manganese concentrations ranged from 1.5 µg/L to 1,100 µg/L and dissolved manganese concentrations ranged from 1.0 µg/L to 1,190 µg/L. Total manganese concentrations exceeded the site cleanup goal of 124 µg/L in the following six monitoring wells: FFTA-MW055S (163 µg/L), FFTA-MW056D (817 µg/L), FFTA-MW057S (436 µg/L), FFTA-MW058S (835 µg/L), FFTA-MW061I (1,100 µg/L), and FFTA-MW107 (329 µg/L and 327 µg/L in the duplicate sample) (Figure 3-2).

Manganese concentrations detected in the total and dissolved samples were mostly comparable with a few exceptions. Total manganese concentrations were significantly higher than the dissolved manganese concentrations at two wells – FFTA-MW056D (817 µg/L versus 121 µg/L) and FFTA-MW057S (436 µg/L versus 1.7 µg/L [estimated value]). This is thought to be partially attributed to suspended particulate that were filtered out of the dissolved samples. Final turbidity readings were 0.1 NTU for FFTA-MW056S and 4.56 NTUs for FFTA-MW057S; however, “visual fleck” or “small wood pieces” were noted during low flow purging (Appendix C). The other exception where total and dissolved concentrations were different was at concentrations around the instrument detection limit where a positive detection occurred in either the total or dissolved

arsenic sample, but not necessarily both. This was the case at FFTA-MW102D and FFTA-MW106.

4.0 CONCLUSIONS AND RECOMMENDATIONS

4.1 CONCLUSIONS

The contaminants of concern detected above their respective site cleanup goals during the June 2021 groundwater monitoring event include naphthalene, arsenic, and manganese. Table 3-1 provides the groundwater analytical results from June 2021 and Table 4-1 provides a summary of the historical groundwater analytical results since 2003. Figures 4-1 through 4-3 graphically illustrate the naphthalene, arsenic, and manganese concentrations dating back to 2010. The organic and inorganic exceedances are confined to a small, isolated area of the FFTA (Figure 3-2).

The analytical results from the June 2021 groundwater monitoring event are generally consistent with the results from previous monitoring events (Table 4-1). The data indicate that concentrations have generally decreased and appear to have reached or are nearing stabilization, with one exception. Total arsenic concentrations detected in samples from FFTA-MW107 are trending up (in 2010 were less than 10 µg/L in 2010 and are now around 40 µg/L)

For the June 2021 LTM event, the trend graph on Figure 4-3 includes the dissolved manganese concentration instead of the total manganese concentration for two monitoring wells (FFTA-MW056D and FFTA-MW057S). Samples from these two wells detected concentrations of total manganese (above the cleanup goal) and dissolved manganese (below the cleanup goal) that were significantly different. Historically total and dissolved metal concentrations have been comparable and the few discrepancies were generally related to suspended particles in the samples (elevated turbidity). During the previous July 2020 LTM event, elevated turbidity (244 NTUs) was also observed during the sampling of FFTA-MW056D, likely causing the total manganese concentration to be significantly higher than the dissolved manganese concentration (NASA, 2021).

4.2 RECOMMENDATIONS

Based on the results of the June 2021 LTM event and previous events, it is recommended that four wells be removed from the sampling portion of the FFTA LTM Program. Since PFAS investigations are ongoing at the FFTA, it is recommended that no wells at the FFTA be abandoned. The rationale for removing the four wells from the FFTA LTM Program are provided below.

- FFTA-MW102D (deep downgradient well)
    - Naphthalene has never exceeded the cleanup goal.
    - Arsenic has never exceeded the cleanup goal
    - Manganese
        - Last exceeded the cleanup goal on March 23, 2011 at 918 µg/L (21 events ago).
        - Last detected on July 22, 2020 at 45 µg/L.

    - The screen interval (37-47 feet) is positioned below two interstitial clay layers (26-29 feet and 33-34 feet) which appears to be limiting contaminants from entering the well. Appendix G provides geologic cross sections that were generated previously (NASA, 2004).
- FFTA-MW105D (deep downgradient well)
        - Naphthalene has never been detected
        - Arsenic has never exceeded the cleanup goal
    - Manganese
        - Last exceeded the cleanup goal on March 23, 2011 at 384 µg/L (21 events ago)
        - Detected on June 30, 2021 at 1.5 µg/L
    - The screen interval (41-51 feet) is positioned below an interstitial clay layer (29-31 feet) which appears to be limiting contaminants from entering the well. Appendix G provides geologic cross sections that were generated previously (NASA, 2004).
- FFTA-MW106 (side-gradient well) and FFTA-MW108 (upgradient well)
    - Naphthalene, arsenic, and manganese have never exceeded their respective cleanup goals

The remaining seven monitoring wells will remain part of the sampling portion of the LTM Program and will continue on a 15-month schedule. A revised LTM Plan (Rev 4) will be generated to update the current sampling and analytical program and include the requirements of the Uniform Federal Policy (UFP) for Quality Assurance Project Plans (QAPP). The LTM Plan (Rev 4) will include procedures to perform well inspections and well development, in case it is deemed necessary at certain wells (e.g., FFTA-MW056D with its periodic high turbidity and the presences of small wood pieces). The subsequent data summary reports will summarize the field activities and results.

5.0 REFERENCES

NASA, 2004. Revised Final Supplemental Remedial Investigation, Former Fire Training Area, NASA Wallops Flight Facility, Wallops Island, Virginia. July.

NASA, 2007. *Record of Decision, Former Fire Training Area,* NASA Wallops Flight Facility, Wallops Island, Virginia. December.
https://code200-external.gsfc.nasa.gov/sites/code250wff/files/inline-files/ffta_rod.pdf

NASA, 2015. *Long Term Monitoring Plan – Rev 3, Former Fire Training Area*, NASA Wallops Flight Facility Wallops Island, Virginia. September.

NASA, 2021. *Data Summary Report July 2020 Groundwater* Monitoring *Former Fire Training Area*, NASA Wallops Flight Facility Wallops Island, Virginia. February.

.

TABLES

TABLE 2-1
GROUNDWATER ELEVATIONS - JUNE 30, 2021
FORMER FIRE TRAINING AREA
NASA WALLOPS FLIGHT FACILITY
WALLOPS ISLAND, VIRGINIA

Monitoring Well (actual)	Monitoring Well (alias)	Screened Interval (ft bgs)	Total Depth (ft BTOC)	Surveyed Elevation Top of Casing (ft MSL)	Static Water Level Measurement (ft BTOC)	Water Level Elevations (ft MSL)
FFTA-MW002S	MW-02S	10-30	31.63	32.84	16.49	16.35
FFTA-MW055S	MW-55S	8-23	23.34	31.33	14.94	16.39
FFTA-MW055D	MW-55D	14-29	29.51	31.46	15.05	16.41
FFTA-MW056D	MW-56D	28-43	44.17	30.95	19.31	11.64
FFTA-MW057S	MW-57S	9-24	26.93	32.12	17.06	15.06
FFTA-MW058S	MW-58S	8-23	21.78	29.87	13.91	15.96
FFTA-MW059S	MW-59S	11-26	26.12	30.46	14.52	15.94
FFTA-MW060I	MW-60I	20-35	36.14	32.24	16.25	15.99
FFTA-MW061I	MW-61I	18-33	20.21	30.34	14.55	15.79
FFTA-MW101S	MW-101S	12-22	24.56	32.01	15.57	16.44
FFTA-MW102D	MW-102D	37-47	50.11	29.14	18.03	11.11
FFTA-MW103S	MW-103S	10.5-15.5	18.11	29.59	13.81	15.78
FFTA-MW103I	MW-103I	20-25	27.32	28.83	15.41	13.42
FFTA-MW103D	MW-103D	38-48	49.83	29.3	18.02	11.28
FFTA-MW105D	MW-105D	41-51	54.14	31.01	20.04	10.97
FFTA-MW106	MW-106	13-23	25.48	30.13	13.94	16.19
FFTA-MW107	MW-107	13-23	25.48	30.76	14.57	16.19
FFTA-MW108	MW-108	13-23	25.35	32.78	16.26	16.52
FFTA-MW109	MW-109	15-30	28.94	31.63	15.03	16.60
14-MW001	14GW-01	15-30	33.07	34.9	20.65	14.25
14-MW002	14GW-02	15-30	33.15	35.5	21.15	14.35
14-MW004	14GW-04	1.5-6.5	7.33	16.88	DRY	DRY
14-MW005	14GW-05	1-6	10.28	17.38	8.97	8.41

Notes:
ft bgs - Feet below ground surface
BTOC - Below Top of Casing
MSL - Mean Sea Level

TABLE 3-1
JUNE 2021 GROUNDWATER ANALYTICAL RESULTS
FORMER FIRE TRAINING AREA
NASA WALLOPS FLIGHT FACILITY
WALLOPS ISLAND, VIRGINIA

LOCATION SAMPLE DATE	Cleanup Goal	FFTA-MW055S 20210629	FFTA-MW055D 20210629	FFTA-MW056D 20210629	FFTA-MW057S 20210630	FFTA-MW058S 20210629	FFTA-MW061I 20210629	FFTA-MW102D 20210630	FFTA-MW105D 20210630	FFTA-MW106 20210629	FFTA-MW107 20210629	FFTA-MW107 20210629 Duplicate	FFTA-MW108 20210630
SVOCs (µg/L)													
Naphthalene	16	**39.4 J-**	8.8	0.48 U	0.48 U	0.48 U	0.48 U	0.49 U	0.48 U	0.48 U	0.48 U	0.48 U	0.48 U
Total Metals (µg/L)													
Arsenic	10	**20.2**	**17.4**	1.6 J	1.3 U	7.7 J	**13.7**	1.3 U	1.3 U	1.3 U	**39.6**	**40.3**	1.3 U
Manganese	124	**163**	93	**817**	**436**	**835**	**1100**	2.7 U	1.5 J	2 J	**329**	**327**	1.0 U
Dissolved Metals (µg/L)													
Arsenic	NC	16.7	15.1	1.3 U	1.3 U	7.6 J	7.6 J	1.3 U	1.3 U	1.3 U	40.4	41.8	1.3 U
Manganese	NC	141	80	121	1.7 J	885	1190	1.0 J	1.2 J	1.0 U	332	336	1.0 U
Field Parameters													
pH (S.U.)	NC	5.8	5.72	6.07	5.7	6.38	6.51	5.56	5.4	6.27	6.41	6.41	5.95
Specific Conductivity (mS/Cm)	NC	0.076	0.079	0.061	0.294	0.068	0.074	0.093	0.082	0.074	0.128	0.128	0.056
Dissolved Oxygen (mg/L) – Horiba	NC	0	1.25	0.41	1.78	0.01	0	3.39	3.18	4.51	0	0	6.56
Dissolved Oxygen (mg/L) – Test Kit	NC	0.6	2	4	4	0.8	1	7	3	8	0.1	0.1	9
Temperature (°C)	NC	24.42	19.73	20.33	19.92	22.03	20.04	21.81	17.43	19.15	18.8	18.8	19.12
Oxygen Reduction Potential (mV)	NC	-83	-8	126	232	-24	-74	183	272	171	-67	-67	247
Turbidity (NTUs)	NC	0	6.19	0.1	4.56	0	4.06	2.46	2.5	0	6.49	6.49	4.71

Notes:
NC - No Criteria
J – Estimated Value
J- – Estimated Value (biased low)
U – Analyte was not detected at a concentration greater than the instrument detection limit
mS/cm – millisiemens per centimeter
mg/L – milligrams per liter
mV – millivolts
NTU – Nephelometric Turbidity Units
S.U. – Standard Units
µg/L – micrograms per liter
°C – degrees Celsius
Bolded and shaded cells indicate exceedances of the Cleanup Goal.

TABLE 4-1
HISTORICAL GROUNDWATER ANALYTICAL RESULTS
FORMER FIRE TRAINING AREA
NASA WALLOPS FLIGHT FACILITY
WALLOPS ISLAND, VIRGINIA

LOCATION SAMPLE DATE	Cleanup Goal	FFTA-MW055S 20030311	FFTA-MW055S 20081208	FFTA-MW055S 20090113	FFTA-MW055S 20090819	FFTA-MW055S 20090819 duplicate	FFTA-MW055S 20100316	FFTA-MW055S 20100608	FFTA-MW055S 20100608 duplicate	FFTA-MW055S 20100916	FFTA-MW055S 20101207	FFTA-MW055S 20110323	FFTA-MW055S 20110323 duplicate	FFTA-MW055S 20110915	FFTA-MW055S 20110915 duplicate	FFTA-MW055S 20120313	FFTA-MW055S 20120313 duplicate	FFTA-MW055S 20120918	FFTA-MW055S 20120918 duplicate	FFTA-MW055S 20130320
VOCs (µg/L)																				
Benzene	5	2	1 U	4	1.1 U	1.1	1	0.3 U	0.3 U	2	1 J	0.8 J	0.7 J	0.687 J	0.748 J	0.61 J	0.54 J	0.36 J	0.29 J	0.19 J
SVOCs (µg/L)																				
3&4-Methylphenol	27	**300**	11 U	**150**	14 J	8.8 J	**90**	14	17	**98**	5	**43**	**47**	**34.4**	**35.4**	20	17	15	15	**50**
Naphthalene	16	**22**	6 U	2 J	0.031 U	0.029 U	**40**	12	10	**43**	**23 L**	0.4	0.4	13.4	14.4	7.1 U	7.1 U	5.2 J	9.2 J	12
Metals (µg/L)																				
Total Arsenic	10	**25.4**	**21**	**63**	**23.7**	**22.8**	**40.9 J**	**15.4**	**15.4**	**42.4**	**27.5**	**27.1**	**27.8**	**39.1**	**37.4**	**37.8**	**32.4**	**21**	**22**	**23**
Dissolved Arsenic	NC	25.6	--	--	24.2	25	38.2 J	15.5	17	41.4	25.3	28.8	29.3	42.9	39.2	37.4	38.3	25	26	24
Total Manganese	124	**417**	**303**	**243**	**281**	**295**	**2030**	**1210**	**1240**	**396**	**383**	**558**	**554**	**505**	**489**	**424**	**399**	**260 J**	**250 J**	**350**
Dissolved Manganese	NC	428	--	--	299	295	1990	1480 J	1490 J	408	368 L	586	572	577	512	421	447	270	280	370
Field Parameters																				
pH (S.U.)	NC	7.14	5.88	5.18	5.26	--	6.36	5.99	--	8.98	5.67	6.6	--	5.05	--	5.56	--	6.14	--	5.09
S. Conductivity (mS/cm)	NC	0.183	0.064	0.236	0.112	--	0.305	0.243	--	0.234	0.161	0.153	--	0.122	--	0.156	--	0.1	--	0.107
Dissolved Oxygen (mg/L) - Horiba	NC	0.46		0	0	--	0	4.91	--	15.68	0	--	--	1.06	--	0.04	--	0.85	--	0.1
Dissolved Oxygen (mg/L) - Test Kit	NC	--	--	--	--	--	--	--	--	--	--	--	--	1.5	--	0.05	--	0.8	--	0.2
Temperature (ºC)	NC	14	16.64	15.9	21.72	--	12.7	17.38	--	20.2	15.64	14.5	--	19.57	--	15.15	--	21.54	--	14.26
Oxygen Reduction Potential (mV)	NC	-96	-31	-67	-101	--	-158	-148	--	-125	-116	-99	--	-233.8	--	-35	--	-57	--	49
Turbidity (NTU)	NC	5.1	5.2	3.37	0.73	--	7.15	0.78	--	3.51	2.83	4.41	--	1.29	--	2.66	--	6.72	--	2.95
Alkalinity (ppm)	NC	--	--	--	--	--	20	150	--	50	32	40	--	10	--	25	--	40	--	35
Ferrous Iron (ppm)	NC	3.6	--	--	--	--	3	5	--	5	3.8	4.2	--	0	--	3.5	--	2.5	--	2.6
Hydrogen Sulfide (ppm)	NC	0.5	--	--	--	--	0.5	0	--	0.3	0.5	0.3	--	0	--	0.1	--	0.3	--	0
Nitrate (ppm)	NC	--	--	--	--	--	0	0	--	0	0	0	--	0	--	0	--	0	--	0
Nitrite (ppm)	NC	--	--	--	--	--	0	0	--	0	0	0	--	0	--	0	--	0	--	0

LOCATION SAMPLE DATE	Cleanup Goal	FFTA-MW055S 20130320 duplicate	FFTA-MW055S 20130905	FFTA-MW055S 20130905 duplicate	FFTA-MW055S 20140318	FFTA-MW055S 20140318 duplicate	FFTA-MW055S 20140924	FFTA-MW055S 20140924 duplicate	FFTA-MW055S 20150318	FFTA-MW055S 20150318 duplicate	FFTA-MW055S 20151202	FFTA-MW055S 20151202 duplicate	FFTA-MW055S 20160927	FFTA-MW055S 20160927 duplicate	FFTA-MW055S 20170622	FFTA-MW055S 20180327	FFTA-MW055S 20181212	FFTA-MW055S 20200721	FFTA-MW055S 20210629
VOCs (µg/L)																			
Benzene	5	0.23 J	0.42 J	0.52 J	0.5 J	0.47 J	0.31 J	0.31 J	0.28 J	0.29 J	0.26 U	0.34 J	0.26 U	0.26 U	0.26 U	0.26 U	--	--	--
SVOCs (µg/L)																			
3&4-Methylphenol	27	**61**	**44**	**44**	**49 J**	**49**	9.7	9.8	24	19	15	19	**28 J**	18 J	14	5.6	9	20	--
Naphthalene	16	15	**46**	**47**	**44 J**	**44 J**	15	15	1.4 J	0.94 J	**29 J**	**41 J**	**27 J**	**24 J**	12	**27**	**28**	**38 J**	**39.4 J-**
Metals (µg/L)																			
Total Arsenic	10	**21**	**24**	**23**	**28**	**26**	**16**	**17**	**26**	**27**	**27.8**	**29.9**	**23**	**23.4**	**22**	**15**	**13**	**20**	**20.2**
Dissolved Arsenic	NC	25	24	22	23	23	15	16	27	27	25.3	28.1	22	21	22	13	11	21	16.7
Total Manganese	124	**330**	**430**	**430**	**440**	**420**	**200**	**210**	**300**	**300**	**294**	**312**	**270**	**260**	**189**	**160**	**146**	**150**	**163**
Dissolved Manganese	NC	380	410	400	410	410	210	210	320	310	268	300	294	273	194	160	142	160	141
Field Parameters																			
pH (S.U.)	NC	--	5.68	--	5.41	--	5.19	--	5.79	--	5.75	--	5.85	--	5.74	5.88	5.67	5.42	5.8
S. Conductivity (mS/cm)	NC	--	0.058	--	0.179	--	0.118	--	0.135	--	0.088	--	0.12	--	0.116	0.099	0.098	0.139	0.076
Dissolved Oxygen (mg/L) - Horiba	NC	--	1.78	--	0.31	--	0.8	--	0.52	--	0	--	0.00	--	0.96	1.21	0	0.01	0
Dissolved Oxygen (mg/L) - Test Kit	NC	--	2	--	0.2	--	0.7	--	0.4	--	0.2	--	0.8	--	1	1	2	0	0.6
Temperature (ºC)	NC	--	18.23	--	11.49	--	17.79	--	13.37	--	17.64	--	19.24	--	19.72	13.52	17.01	22.37	24.42
Oxygen Reduction Potential (mV)	NC	--	-28	--	-39	--	40	--	-1	--	68	--	-7	--	-23	-24	21	-9	-83
Turbidity (NTU)	NC	--	9.26	--	0.69	--	2.17	--	2.24	--	2.12	--	3.11	--	7.2	3.4	3.9	5.42	0
Alkalinity (ppm)	NC	--	12	--	20	--	40	--	--	--	--	--	--	--	--	--	--	--	--
Ferrous Iron (ppm)	NC	--	4.6	--	1.2	--	2.6	--	--	--	--	--	--	--	--	--	--	--	--
Hydrogen Sulfide (ppm)	NC	--	0.3	--	0	--	0.1	--	--	--	--	--	--	--	--	--	--	--	--
Nitrate (ppm)	NC	--	0	--	0	--	0	--	--	--	--	--	--	--	--	--	--	--	--
Nitrite (ppm)	NC	--	0	--	0	--	0	--	--	--	--	--	--	--	--	--	--	--	--

Notes:

NC - No Criteria
µg/L - micrograms per liter
J - Estimated Value
mS/cm - millisiemens per centimeter
mV - millivolts
NTU - Nephelometric Turbidity Units
ppm - parts per million

S.U. - Standard Units
°C - degrees Celsius
L - Biased Low
U - Analyte was not detected at a concentration greater than the instrument detection limit
R - Surrogate Recovery Noncompliance

Bolded and shaded cells indicate Cleanup Goal exceedance

TABLE 4-1
HISTORICAL GROUNDWATER ANALYTICAL RESULTS
FORMER FIRE TRAINING AREA
NASA WALLOPS FLIGHT FACILITY
WALLOPS ISLAND, VIRGINIA

LOCATION SAMPLE DATE	Cleanup Goal	FFTA-MW055D 20030310	FFTA-MW055D 20081204	FFTA-MW055D 20090819	FFTA-MW055D 20100316	FFTA-MW055D 20100608	FFTA-MW055D 20100916	FFTA-MW055D 20101207	FFTA-MW055D 20110323	FFTA-MW055D 20110915	FFTA-MW055D 20120313	FFTA-MW055D 20120918	FFTA-MW055D 20130320	FFTA-MW055D 20130905	FFTA-MW055D 20140318	FFTA-MW055D 20140924	FFTA-MW055D 20150318	FFTA-MW055D 20170622	FFTA-MW055D 20170622 Duplicate	FFTA-MW055D 20180327
VOCs (µg/L)																				
Benzene	5	1 U	1 U	0.11 U	0.3 U	0.3 U	0.3 U	0.3 UJ	0.3 U	0.5 U	0.5 U	0.2 U	0.11 U	0.25 U	0.25 U	0.11 U	0.11 U	0.26 U	0.26 U	0.26 U
SVOCs (µg/L)																				
3&4-Methylphenol	27	**88**	11 U	0.33 J	6 J	5 UJ	22	6	4	2.31 UL	7.1 U	0.25 U	1.5	16	10 U	0.61 J	0.21 U	24	24	8.6
Naphthalene	16	5 U	11 U	0.029 U	**17**	**30**	8 J	6	3	2.31 U	7.1 U	0.04 U	0.013 U	13	5 U	0.024 U	0.06 J	13	14	3.2
Metals (µg/L)																				
Total Arsenic	10	5.1	1.45 U	0.47	**18.6 J**	**15.1**	**16.4**	7.9	3 J	1.5 U	4 UL	0.5 U	3.8	**12**	3.2 J	0.29 U	0.47 J	**11**	**13**	4.6 J
Dissolved Arsenic	NC	5	--	0.63	18.4 J	15.1	17.5	8.5	3.7 J	1.5 U	4 UL	0.5 U	3.1	11	1.4 J	0.29 U	0.37 J	10	12	4.3 K
Total Manganese	124	**258**	16.4	41.2	**170**	**187**	**178**	77	55.6	37.6	53.4	26 J	50	65	31	30	29	**175**	**173**	91.9
Dissolved Manganese	NC	257	--	41.8	170	186 J	198	78.7 L	60.4	33.7	71.8	21	57	66	23	29	31	162	168	97
Field Parameters																				
pH (S.U.)	NC	6.48	5.37	4.64	6.73	6.04	7.37	5.52	5.55	4.84	5.58	4.98	4.42	5.81	5.53	5.01	5.17	5.75	--	5.76
S. Conductivity (mS/cm)	NC	0.069	0.06	0.067	0.151	0.182	0.139	0.087	0.074	0.057	0.072	0.072	0.72	0.072	0.076	0.075	0.084	0.098	--	0.072
Dissolved Oxygen (mg/L) - Horiba	NC	3.06	4.8	1.85	0	0.8	> 20	3.15	6.38	8.51	3.41	5.19	2.19	0	6.54	3.3	4.32	2.19	--	4.0
Dissolved Oxygen (mg/L) - Test Kit	NC	--	--	--	--	--	--	--	--	5	3	4	5	0.1	4	3	4	2	--	--
Temperature (ºC)	NC	14.8	17.1	21.26	13.64	16.29	20.7	15.07	14.91	18.21	16.97	20.72	14.1	20.89	10.82	17.85	11.8	18.88	--	14.01
Oxygen Reduction Potential (mV)	NC	50	168	121	-156	-84	-16	-27	101	-153.9	116	171	224	-79	133	181	176	18	--	101
Turbidity (NTU)	NC	8.22	7.2	-2.32	1.35	1	1.2	1.2	0	0.96	0.55	5.52	1.4	0.41	5.35	0.73	1.59	6	--	4.3
Alkalinity (ppm)	NC	--	--	--	175	600	15	35	< 10	0	< 10	12	< 10	< 10	10	14	--	--	--	--
Ferrous Iron (ppm)	NC	--	--	--	2	7	4.5	1.2	1.7	0	1	0	1	5	1	1	--	--	--	--
Hydrogen Sulfide (ppm)	NC	--	--	--	0.1	0	0.1	0.1	0	0	0	0	0	1.5	0	0	--	--	--	--
Nitrate (ppm)	NC	--	--	--	0	0	0	0	0	0	0	0	0	0	0	0	--	--	--	--
Nitrite (ppm)	NC	--	--	--	0.1	0	0	0	0	0	0	0	0	0	0	0	--	--	--	--

LOCATION SAMPLE DATE	Cleanup Goal	FFTA-MW055D 20181212	FFTA-MW055D 20200721	FFTA-MW055D 20210629
VOCs (µg/L)				
Benzene	5	--	--	--
SVOCs (µg/L)				
3&4-Methylphenol	27	7.8 J	9.5 U	--
Naphthalene	16	3.2	9.5 U	8.8
Metals (µg/L)				
Total Arsenic	10	4.7 J	3.3	**17.4**
Dissolved Arsenic	NC	5.0 J	3.1	15.1
Total Manganese	124	86.2	110	93
Dissolved Manganese	NC	92.7	110	80
Field Parameters				
pH (S.U.)	NC	5.47	5.58	5.72
S. Conductivity (mS/cm)	NC	0.076	0.07	0.079
Dissolved Oxygen (mg/L) - Horiba	NC	2.39	8.5	1.25
Dissolved Oxygen (mg/L) - Test Kit	NC	3	0	2
Temperature (ºC)	NC	17.21	23.12	19.73
Oxygen Reduction Potential (mV)	NC	81	79	-8
Turbidity (NTU)	NC	0.9	4.8	6.19
Alkalinity (ppm)	NC	--	--	--
Ferrous Iron (ppm)	NC	--	--	--
Hydrogen Sulfide (ppm)	NC	--	--	--
Nitrate (ppm)	NC	--	--	--
Nitrite (ppm)	NC	--	--	

Notes:

NC - No Criteria
µg/L - micrograms per liter
J - Estimated Value
mS/cm - millisiemens per centimeter
mV - millivolts
NTU - Nephelometric Turbidity Units
ppm - parts per million
S.U. - Standard Units
°C - degrees Celsius
L - Biased Low
U - Analyte was not detected at a concentration greater than the instrument detection limit
R - Surrogate Recovery Noncompliance

Bolded and shaded cells indicate Cleanup Goal exceedance

TABLE 4-1
HISTORICAL GROUNDWATER ANALYTICAL RESULTS
FORMER FIRE TRAINING AREA
NASA WALLOPS FLIGHT FACILITY
WALLOPS ISLAND, VIRGINIA

LOCATION SAMPLE DATE	Cleanup Goal	FFTA-MW056D 20030310	FFTA-MW056D 20081204	FFTA-MW056D 20090817	FFTA-MW056D 20100317	FFTA-MW056D 20100609	FFTA-MW056D 20100917	FFTA-MW056D 20101208	FFTA-MW056D 20110322	FFTA-MW056D 20110913	FFTA-MW056D 20120314	FFTA-MW056D 20120919	FFTA-MW056D 20130319	FFTA-MW056D 20130904	FFTA-MW056D 20140317	FFTA-MW056D 20140923	FFTA-MW056D 20150317	FFTA-MW056D 20170622	FFTA-MW056D 20180327	FFTA-MW056D 20180327 Duplicate
VOCs (µg/L)																				
Benzene	5	**14**	2	2.1	1 J	1	1	1 J	2	1.15	0.26 J	0.86 J	0.42 J	0.8 J	0.91 J	0.49 J	0.36 J	0.26 U	0.26 U	0.26 U
SVOCs (µg/L)																				
3&4-Methylphenol	27	5 U	11 U	0.053 J	6 U	6 U	5 UR	0.4 UL	0.4 U	2.31 U	7.5 U	0.28 U	0.099 U	2 U	9.6 U	0.21 U	0.22 U	0.42 U	0.42 U	0.42 U
Naphthalene	16	**40**	11 U	0.026 U	2 U	2 U	2 U	0.06 U	0.06 U	2.31 U	7.5 U	0.37	0.015 U	1 U	4.8 U	0.023 U	0.1 J	0.060 U	0.060 U	0.060 U
Metals (µg/L)																				
Total Arsenic	10	3 U	1.45 U	0.14 U	1.5 U	2.6 B	3.6 B	3.2 B	3.2 J	1.88 J	4 UL	1.7	3.3	1.2 U	1.2 U	2.7	0.93 J	2.5 J	2.3 U	2.3 U
Dissolved Arsenic	NC	3 U	--	0.72	1.5 U	3 B	3.1 B	1.8 B	3 J	1.72 J	4 UL	0.55 J	3.3	1.2 U	1.3 J	2.4	0.88 J	4.0 U	2.3 U	2.3 U
Total Manganese	124	**1990**	**1260**	**1560**	**1640**	**1820**	**1820**	**1720**	**1870**	**1690**	**1030**	**1000 J**	**700**	**940**	**930**	**910**	**790**	**303**	**154**	**149**
Dissolved Manganese	NC	2080	--	1750	1620	1810 J	1840	1670 L	1800	1780	943	970	710	950	920	850	780	251	136	129
Field Parameters																				
pH (S.U.)	NC	6.12	6.08	5.27	6.23	5.83	5.86	5.81	6.03	4.82	6.06	6.33	5.99	6	6.14	5.48	5.85	5.88	6	--
S. Conductivity (mS/cm)	NC	0.154	0.122	0.136	0.127	0.115	0.14	0.129	0.123	0.112	0.11	0.11	0.084	0.082	0.122	0.136	0.122	0.09	0.082	--
Dissolved Oxygen (mg/L) - Horiba	NC	0.67	2.05	0.97	0.12	2.34	2.9	1.27	--	5	0	0.82	1.6	0.55	0.43	1.28	3.41	2.78	2.24	--
Dissolved Oxygen (mg/L) - Test Kit	NC	--	--	--	--	--	--	--	--	0.8	0.6	1	1	1	0.8	1	1	3	2	--
Temperature (ºC)	NC	15.1	16.14	17.9	15.24	16.24	18.95	15.22	16.7	19.43	17.96	20.13	15.54	16.04	12.12	16.75	16.63	20.8	15.07	--
Oxygen Reduction Potential (mV)	NC	44	36	18	147	136	103	61	-13	-269.7	77	40	115	45	52	131	97	259	204	--
Turbidity (NTU)	NC	1	0.2	4.12	0.88	0	0	0.89	0.34	0	0	6.8	0.21	0.35	0.05	0.21	0.13	3.7	0.3	--
Alkalinity (ppm)	NC	--	--	--	35	32	40	18	14	36	35	20	27	14	25	30	--	--	--	--
Ferrous Iron (ppm)	NC	--	--	--	0.8	0.6	0	0.4	0.6	1	0	0	0.2	0	0.2	0	--	--	--	--
Hydrogen Sulfide (ppm)	NC	--	--	--	0	0	0	0	0	0	0	0	0	0	0	0	--	--	--	--
Nitrate (ppm)	NC	--	--	--	0	0	0	0	0	0	0	0	0	0	0	0	--	--	--	--
Nitrite (ppm)	NC	--	--	--	0	0	0	0	0	0	0	0	0	0	0	0	--	--	--	--

LOCATION SAMPLE DATE	Cleanup Goal	FFTA-MW056D 20181212	FFTA-MW056D 20200722	FFTA-MW056D 20210629
VOCs (µg/L)				
Benzene	5	--	--	--
SVOCs (µg/L)				
3&4-Methylphenol	27	0.42 U	9.5 U	--
Naphthalene	16	0.060 U	9.5 U	0.48 U
Metals (µg/L)				
Total Arsenic	10	2.3 U	**260**	1.6 J
Dissolved Arsenic	NC	2.3 U	3	1.3 U
Total Manganese	124	**239**	**41,000**	**817**
Dissolved Manganese	NC	131	44	121
Field Parameters				
pH (S.U.)	NC	5.83	6.2	6.07
S. Conductivity (mS/cm)	NC	0.089	0.082	0.061
Dissolved Oxygen (mg/L) - Horiba	NC	1.38	3.95	0.41
Dissolved Oxygen (mg/L) - Test Kit	NC	2	4	4
Temperature (ºC)	NC	16.93	25.31	20.33
Oxygen Reduction Potential (mV)	NC	242	183	126
Turbidity (NTU)	NC	0	244	0.1
Alkalinity (ppm)	NC	--	--	--
Ferrous Iron (ppm)	NC	--	--	--
Hydrogen Sulfide (ppm)	NC	--	--	--
Nitrate (ppm)	NC	--	--	--
Nitrite (ppm)	NC	--	--	--

Notes:
NC - No Criteria
µg/L - micrograms per liter
J - Estimated Value
mS/cm - millisiemens per centimeter
mV - millivolts
NTU - Nephelometric Turbidity Units
ppm - parts per million
S.U. - Standard Units
°C - degrees Celsius
L - Biased Low
U - Analyte was not detected at a concentration greater than the instrument detection limit
R - Surrogate Recovery Noncompliance

Bolded and shaded cells indicate Cleanup Goal exceedance

TABLE 4-1
HISTORICAL GROUNDWATER ANALYTICAL RESULTS
FORMER FIRE TRAINING AREA
NASA WALLOPS FLIGHT FACILITY
WALLOPS ISLAND, VIRGINIA

LOCATION SAMPLE DATE	Cleanup Goal	FFTA-MW057S 20030306	FFTA-MW057S 20081204	FFTA-MW057S 20090817	FFTA-MW057S 20100317	FFTA-MW057S 20100317 duplicate	FFTA-MW057S 20100609	FFTA-MW057S 20100917	FFTA-MW057S 20101207	FFTA-MW057S 20110322	FFTA-MW057S 20110914	FFTA-MW057S 20120314	FFTA-MW057S 20120919	FFTA-MW057S 20130319	FFTA-MW057S 20130904	FFTA-MW057S 20140317	FFTA-MW057S 20140923	FFTA-MW057S 20160928	FFTA-MW057S 20170620	FFTA-MW057S 20180328
VOCs (µg/L)																				
Benzene	5	3 L	0.8 J	0.44 J	0.3 U	0.3 U	0.3 U	0.3 U	0.3 UJ	0.3 U	0.5 U	0.5 U	0.3 J	0.11 U	0.45 J	0.32 J	0.11 U	0.26 U	0.26 U	0.26 U
SVOCs (µg/L)																				
3&4-Methylphenol	27	5 UR	10 U	0.019 J	6 U	6 U	6 U	5 U	0.4 U	0.4 U	2.45 U	7.1 U	0.24 U	0.088 U	1.9 U	10 U	0.19 U	0.45 U	0.42 U	0.42 U
Naphthalene	16	5 UR	6 J	2.3	2 U	2 U	2 U	2 U	0.4	0.3	4.11 J	2.6 J	2.1	0.22	4.1 J	5.1 U	0.49	0.065 U	0.60 U	0.60 U
Metals (µg/L)																				
Total Arsenic	10	3 U	1.45 U	0.23	1.5 U	1.5 U	1.5 B	2.8 B	2.3 B	2.25 U	1.5 U	4 UL	0.5 U	2.2	1.2 U	1.2 U	0.29 U	2.3 U	4.0 U	2.3 U
Dissolved Arsenic	NC	3 U	--	0.14 U	1.5 U	1.5 U	2 B	2.4 B	1.6 B	2.25 U	1.5 U	4 UL	0.48 J	3.2	1.2 U	1.2 U	0.29 U	2.3 U	4.0 U	3.0 J
Total Manganese	124	34.8	99.4	**128**	5.3 J	5.4 J	15.6	2.3	78.8	46.6	**166**	**560**	**430 J**	20	**140**	**220**	**250**	**156**	25.6	0.77 U
Dissolved Manganese	NC	36	--	218	4.9 J	4.9 J	15.2 J	2.2	72.8	50.1	152	520	510	7.1	130	160	250	153	24.3	12.8
Field Parameters																				
pH (S.U.)	NC	5.64	4.61	5.06	6.33	--	5.88	5.35	5.46	4.91	4.51	6	5.44	5.65	5.4	5.45	5.79	5.87	4.96	5.69
S. Conductivity (mS/cm)	NC	0.09	0.116	0.112	0.202	--	0.17	0.139	0.09	0.078	0.07	0.085	0.112	0.116	0.75	0.081	0.114	0.083	0.175	0.175
Dissolved Oxygen (mg/L) - Horiba	NC	2.83	2.93	3.16	1.91	--	2.24	> 20	5.15	--	1.73	0	5.36	5.08	0	1.53	1.25	0.00	7.44	6.5
Dissolved Oxygen (mg/L) - Test Kit	NC	--	--	--	--	--	--	--	--	--	1	0.8	2	5	1	2	1	1.0	6	6
Temperature (ºC)	NC	14.7	16.9	17.9	10.29	--	15.02	18.1	15.13	15.6	18.37	25.44	17.8	15.78	16.07	11.58	17.05	17.56	18.22	14.15
Oxygen Reduction Potential (mV)	NC	92	147	138	139	--	356	108	77	150	-238.1	6	42	232	301	226	157	235	43	255
Turbidity (NTU)	NC	1.6	0.91	1.06	1.26	--	0.28	1.28	0	3.71	0.76	0	1.12	0.72	0.62	3.05	0.21	0.00	0.2	0
Alkalinity (ppm)	NC	--	--	--	27	--	25	21	40	20	20	25	20	< 10	15	20	20	--	--	--
Ferrous Iron (ppm)	NC	--	--	--	0	--	0	0	0.2	0	0.4	0	0.5	0	0	0	0	--	--	--
Hydrogen Sulfide (ppm)	NC	--	--	--	0	--	0	0	0	0	0	0	0.1	0	0.6	0	0	--	--	--
Nitrate (ppm)	NC	--	--	--	0	--	0	0	0	0	0	0	0	0	0	0	0	--	--	--
Nitrite (ppm)	NC	--	--	--	0	--	0	0	0	0	0	0	0	0	0	0	0	--	--	--

LOCATION SAMPLE DATE	Cleanup Goal	FFTA-MW057S 20181213	FFTA-MW057S 20200722	FFTA-MW057S 20210630
VOCs (µg/L)				
Benzene	5	--	--	--
SVOCs (µg/L)				
3&4-Methylphenol	27	0.042 U	9.5 U	--
Naphthalene	16	0.060 U	9.5 U	0.48 U
Metals (µg/L)				
Total Arsenic	10	2.3 U	3.0 U	1.3 U
Dissolved Arsenic	NC	2.3 U	3.0 U	1.3 U
Total Manganese	124	**216**	**150**	**436**
Dissolved Manganese	NC	113	160	1.7 J
Field Parameters				
pH (S.U.)	NC	5.83	5.74	5.7
S. Conductivity (mS/cm)	NC	0.086	0.1	0.294
Dissolved Oxygen (mg/L) - Horiba	NC	1.41	0.17	1.78
Dissolved Oxygen (mg/L) - Test Kit	NC	3	1	4
Temperature (ºC)	NC	16.09	17.61	19.92
Oxygen Reduction Potential (mV)	NC	261	249	232
Turbidity (NTU)	NC	0	0.8	4.56
Alkalinity (ppm)	NC	--	--	--
Ferrous Iron (ppm)	NC	--	--	--
Hydrogen Sulfide (ppm)	NC	--	--	--
Nitrate (ppm)	NC	--	--	--
Nitrite (ppm)	NC	--	--	--

Notes:

NC - No Criteria
µg/L - micrograms per liter
J - Estimated Value
mS/cm - millisiemens per centimeter
mV - millivolts
NTU - Nephelometric Turbidity Units
ppm - parts per million
S.U. - Standard Units
°C - degrees Celsius
L - Biased Low
U - Analyte was not detected at a concentration greater than the instrument detection limit
R - Surrogate Recovery Noncompliance

Bolded and shaded cells indicate Cleanup Goal exceedance

TABLE 4-1
HISTORICAL GROUNDWATER ANALYTICAL RESULTS
FORMER FIRE TRAINING AREA
NASA WALLOPS FLIGHT FACILITY
WALLOPS ISLAND, VIRGINIA

LOCATION SAMPLE DATE	Cleanup Goal	FFTA-MW058S 20030310	FFTA-MW058S 20081203	FFTA-MW058S 20090818	FFTA-MW058S 20100317	FFTA-MW058S 20100608	FFTA-MW058S 20100916	FFTA-MW058S 20101207	FFTA-MW058S 20110323	FFTA-MW058S 20110913	FFTA-MW058S 20120313	FFTA-MW058S 20120918	FFTA-MW058S 20130319	FFTA-MW058S 20130904	FFTA-MW058S 20140318	FFTA-MW058S 20140923	FFTA-MW058S 20150317	FFTA-MW058S 20170621	FFTA-MW058S 20180326	FFTA-MW058S 20181212
VOCs (µg/L)																				
Benzene	5	**12**	**8**	3.4 J	0.3 U	0.3 U	0.3 U	0.3 UJ	0.3 U	2.44	3	4 J	1.1	1.6 J	2.6 J	1.4	1.1	0.26 U	0.50 J	--
SVOCs (µg/L)																				
3&4-Methylphenol	27	5 U	10 U	0.62 J	5 U	5 U	5 UR	0.4 UR	0.4 U	5.23	7.5 UR	4.1	1	1.9 U	10 U	1.5	0.23 U	0.42 U	2.6	2.2
Naphthalene	16	**21**	**41**	13	2 U	2 U	16	0.5	0.06 U	**28.3**	**25**	**27**	**21**	16	**40 J**	11	**17**	11	**17**	**18**
Metals (µg/L)																				
Total Arsenic	10	3 U	5.2 U	1.3	1.5 U	2.6 B	9.1 L	1.4 B	2.25 U	7.13	6.2 L	9.1	5.7	6.7 J	10	9.6	8.3	7.9	**15**	**21**
Dissolved Arsenic	NC	3 U	--	1.8	1.5 U	2.3 B	9.3 L	1.6 B	2.25 U	7.37	6.3 L	10	5.7	7.2 J	9.9 J	8.7	8.5	7.7	17	19
Total Manganese	124	**563**	**2620**	**929**	4.2 B	24.9	**1730**	**463**	4.3	**903**	**884**	**1100 J**	**490**	**1100**	**1800**	**1000**	**1100**	**271**	**432**	**663**
Dissolved Manganese	NC	612	--	1070	3.9 B	3.1 J	1870	400 L	1.9 B	978	892	1100	510	1100	1700	1000	1100	271	417	649
Field Parameters																				
pH (S.U.)	NC	7.13	6.3	5.5	6.03	5.34	6.06	6.07	6.24	4.84	6.73	6.67	6.27	5.77	6.08	6.43	6.43	5.8	6.4	6.52
S. Conductivity (mS/cm)	NC	0.112	0.219	0.218	0.091	0.063	0.09	0.139	0.175	0.198	0.183	2.11	0.138	0.154	0.2	0.215	0.196	0.121	0.193	0.169
Dissolved Oxygen (mg/L) - Horiba	NC	5.59	1.85	2.13	7.58	7.62	> 20	2.78	5.28	1.14	0.68	0.57	0.88	0	0.55	0.67	0.73	6.68	0.73	0
Dissolved Oxygen (mg/L) - Test Kit	NC	--	--	--	--	--	--	--	--	2	2	0	1	0.4	0	0	0.1	5	0	0
Temperature (ºC)	NC	12.6	16.76	19.6	12.93	17.13	19.6	15.62	13.59	19.32	15.31	20.11	13.1	22.32	11.07	18.16	15.77	18.39	14.25	16.79
Oxygen Reduction Potential (mV)	NC	167	-47	-31	220	192	24	39	-51	-11.5	-78	-140	-55	66	-85	-80	-56	-67	-55	-106
Turbidity (NTU)	NC	5.38	0.91	0.16	1.61	0.8	0.6	1.2	4.69	1.81	0	2.11	3.3	0.6	0.61	3.04	3.55	0	0	2.3
Alkalinity (ppm)	NC	--	--	--	20	< 10	25	17	65	20	55	50	60	25	50	50	--	--	--	--
Ferrous Iron (ppm)	NC	--	--	--	0.5	0.8	2.5	1.2	2.8	5.5	6	4.6	2	0	3.2	5	--	--	--	--
Hydrogen Sulfide (ppm)	NC	--	--	--	0	0	0	0	0	0	0	0	0	0	0	0	--	--	--	--
Nitrate (ppm)	NC	--	--	--	0	0	0	0	0	0	0	0	0	0	0	0	--	--	--	--
Nitrite (ppm)	NC	--	--	--	0	0	0	0	0	0	0	0	0	0	0	0	--	--	--	--

LOCATION SAMPLE DATE	Cleanup Goal	FFTA-MW058S 20200721	FFTA-MW058S 20210629
VOCs (µg/L)			
Benzene	5	--	--
SVOCs (µg/L)			
3&4-Methylphenol	27	9.5 U	--
Naphthalene	16	12	0.48 U
Metals (µg/L)			
Total Arsenic	10	**20**	7.7 J
Dissolved Arsenic	NC	21	7.6 J
Total Manganese	124	**810**	**835**
Dissolved Manganese	NC	820	885
Field Parameters			
pH (S.U.)	NC	6.6	6.38
S. Conductivity (mS/cm)	NC	0.117	0.068
Dissolved Oxygen (mg/L) - Horiba	NC	0	0.01
Dissolved Oxygen (mg/L) - Test Kit	NC	0	0.8
Temperature (ºC)	NC	26.19	22.03
Oxygen Reduction Potential (mV)	NC	-78	-24
Turbidity (NTU)	NC	10.9	0
Alkalinity (ppm)	NC	--	--
Ferrous Iron (ppm)	NC	--	--
Hydrogen Sulfide (ppm)	NC	--	--
Nitrate (ppm)	NC	--	--
Nitrite (ppm)	NC	--	--

Notes:

NC - No Criteria
µg/L - micrograms per liter
J - Estimated Value
mS/cm - millisiemens per centimeter
mV - millivolts
NTU - Nephelometric Turbidity Units
ppm - parts per million
S.U. - Standard Units
°C - degrees Celsius
L - Biased Low
U - Analyte was not detected at a concentration greater than the instrument detection limit
R - Surrogate Recovery Noncompliance

Bolded and shaded cells indicate Cleanup Goal exceedance

TABLE 4-1
HISTORICAL GROUNDWATER ANALYTICAL RESULTS
FORMER FIRE TRAINING AREA
NASA WALLOPS FLIGHT FACILITY
WALLOPS ISLAND, VIRGINIA

LOCATION SAMPLE DATE	Cleanup Goal	FFTA-MW061I 20030310	FFTA-MW061I 20081208	FFTA-MW061I 20090113	FFTA-MW061I 20090817	FFTA-MW061I 20100316	FFTA-MW061I 20100609	FFTA-MW061I 20100915	FFTA-MW061I 20101208	FFTA-MW061I 20110322	FFTA-MW061I 20110913	FFTA-MW061I 20120314	FFTA-MW061I 20120919	FFTA-MW061I 20130319	FFTA-MW061I 20130521	FFTA-MW061I 20130521 duplicate	FFTA-MW061I 20130905	FFTA-MW061I 20150317	FFTA-MW061I 20151201	FFTA-MW061I 20160928
VOCs (µg/L)																				
Benzene	5	**28**	2	0.5 J	0.19 J	1	1	2	3 J	4	3.67	2.6	2	1.3	--	--	1.1 J	0.11 U	0.26 U	0.26 U
SVOCs (µg/L)																				
3&4-Methylphenol	27	5 U	10 U	10 U	0.017 U	6 UR	6 U	5 UR	0.4 UR	0.5 UR	2.36 U	7.1 UR	0.27 U	0.087 U	--	--	1.9 U	0.22 U	5.5 U	0.43 U
Naphthalene	16	**66**	13	6 J	2.1	**22**	14	2 UR	**36 L**	**25 L**	**35.2**	**24**	8.7	11	--	--	6.8 J	0.22	2.2 U	0.32
Metals (µg/L)																				
Total Arsenic	10	**13.7**	**12.9**	**14.4**	2.9	7.3 J	**10.4**	0.8 UL	**12.2**	**10.7**	**12.1**	**23.3**	9.9	**370**	6	6.3	**18**	7.5	5.9 U	3.5 J
Dissolved Arsenic	NC	8.6	--	5.6	3.4	6.8 J	7.9	0.96 J	9	10.6	10.9	10.5	11	11	6.1	6	8.5 J	7	5 U	4.3 J
Total Manganese	124	**4990**	**3400**	**3130**	**3020**	**2400**	**1890**	**280**	**1570**	**2110**	**1490**	**1770**	**1400 J**	**1400**	**1700**	**1600**	**1100**	**740**	**664**	**508**
Dissolved Manganese	NC	4900	--	3120	2940	2340	1990 J	307	2010 L	2160	1880	1660	1500	1600	1600	1600	1100	740	655	502
Field Parameters																				
pH (S.U.)	NC	6.35	6.01	5.31	--	5.46	6.29	5.68	6.16	6.26	5.36	5.91	6.7	6.2	--	--	6.1	6.05	5.85	5.84
S. Conductivity (mS/cm)	NC	0.179	0.145	0.163	--	0.162	0.122	0.191	0.185	0.229	0.183	0.202	0.191	0.28	--	--	0.096	0.121	0.051	0.065
Dissolved Oxygen (mg/L) - Horiba	NC	0.56	0.75	9.63	--	2.67	5.83	4.86	1.89	5	0.79	0	0.58	0.41	--	--	0	2.55	0	0.00
Dissolved Oxygen (mg/L) - Test Kit	NC	--	--	--	--	--	--	--	--	--	0.05	0	0	0	--	--	0	0.05	0	0.4
Temperature (ºC)	NC	14.9	17.24	16	--	15.21	15.39	18.13	15.38	15.36	18.91	15.2	18.42	14.5	--	--	17.54	14.85	17.71	21.07
Oxygen Reduction Potential (mV)	NC	-45	-66	7	--	32	-24	-23	-31	-94	-310.6	-99	-133	-41	--	--	40	-12	72	37
Turbidity (NTU)	NC	9	2.2	41.5	--	3.43	9.28	2.47	2	1.57	0	0	2.25	0.84	--	--	5.32	1.49	1.39	0.47
Alkalinity (ppm)	NC	--	--	--	--	55	50	80	50	50	70	40	50	32	--	--	30	--	--	--
Ferrous Iron (ppm)	NC	--	--	--	--	0.8	2.6	5	1.6	4	4.8	4	6	3	--	--	1.2	--	--	--
Hydrogen Sulfide (ppm)	NC	--	--	--	--	0	0	0	0	0	0	0	0	0	--	--	0	--	--	--
Nitrate (ppm)	NC	--	--	--	--	0	0	0	0	0	0	0	0	0	--	--	0	--	--	--
Nitrite (ppm)	NC	--	--	--	--	0	0	0	0	0	0	0	0	0	--	--	0	--	--	--

LOCATION SAMPLE DATE	Cleanup Goal	FFTA-MW061I 20170621	FFTA-MW061I 20180326	FFTA-MW061I 20181213	FFTA-MW061I 20200721	FFTA-MW061I 20210629
VOCs (µg/L)						
Benzene	5	0.26 U	0.26 U	--	--	--
SVOCs (µg/L)						
3&4-Methylphenol	27	0.42 U	0.42 U	0.42 U	9.6 U	--
Naphthalene	16	0.33	0.29	0.43	9.6 U	0.48 U
Metals (µg/L)						
Total Arsenic	10	**14**	9.2	9.2	9.3	**13.7**
Dissolved Arsenic	NC	17	7.4	7.8	9.5	7.6 J
Total Manganese	124	**1760**	**748**	**1450**	**1200**	**1100**
Dissolved Manganese	NC	1890	772	1460	1200	1190
Field Parameters						
pH (S.U.)	NC	6	6.66	6.57	6.52	6.51
S. Conductivity (mS/cm)	NC	0.11	0.09	0.094	0.079	0.074
Dissolved Oxygen (mg/L) - Horiba	NC	0.54	11.8	0	0	0
Dissolved Oxygen (mg/L) - Test Kit	NC	1	0	0	2	1
Temperature (ºC)	NC	16.78	14.28	16.09	24.96	20.04
Oxygen Reduction Potential (mV)	NC	38	-39	249	-43	-74
Turbidity (NTU)	NC	2.9	36	0	7.1	4.06
Alkalinity (ppm)	NC	--	--	--	--	--
Ferrous Iron (ppm)	NC	--	--	--	--	--
Hydrogen Sulfide (ppm)	NC	--	--	--	--	--
Nitrate (ppm)	NC	--	--	--	--	--
Nitrite (ppm)	NC	--	--	--	--	--

Notes:

NC - No Criteria
µg/L - micrograms per liter
J - Estimated Value
mS/cm - millisiemens per centimeter
mV - millivolts
NTU - Nephelometric Turbidity Units
ppm - parts per million
S.U. - Standard Units
°C - degrees Celsius
L - Biased Low
U - Analyte was not detected at a concentration greater than the instrument detection limit
R - Surrogate Recovery Noncompliance

Bolded and shaded cells indicate Cleanup Goal exceedance

TABLE 4-1
HISTORICAL GROUNDWATER ANALYTICAL RESULTS
FORMER FIRE TRAINING AREA
NASA WALLOPS FLIGHT FACILITY
WALLOPS ISLAND, VIRGINIA

LOCATION SAMPLE DATE	Cleanup Goal	FFTA-MW101S 20030313	FFTA-MW101S 20030313 duplicate	FFTA-MW101S 20081209	FFTA-MW101S 20090819	FFTA-MW101S 20100316	FFTA-MW101S 20100609	FFTA-MW101S 20100916	FFTA-MW101S 20101208	FFTA-MW101S 20110323	FFTA-MW101S 20110915	FFTA-MW101S 20120313	FFTA-MW101S 20120918	FFTA-MW101S 20130320	FFTA-MW101S 20130905	FFTA-MW101S 20140318	FFTA-MW101S 20140924	FFTA-MW101S 20160927	FFTA-MW101S 20170622
VOCs (µg/L)																			
Benzene	5	1 U	1 U	1 U	0.84 U	0.8 J	0.8 J	0.3 J	0.3 UJ	0.3 U	0.5 U	0.5 U	0.2 U	0.11 U	0.25 U	0.25 U	0.11 U	0.26 U	0.26 U
SVOCs (µg/L)																			
3&4-Methylphenol	27	5 U	5 UJ	12 U	19	**140**	**48**	**79**	4	0.8 J	2.31 U	7.1 U	0.37 J	5.3	8.5 J	9.5 U	0.21 U	0.49 U	0.42 U
Naphthalene	16	5 U	5 U	4 J	**25**	**25**	**45**	**60**	**89**	**40**	**27.1**	7.7 J	2.7	13	**36**	11 J	0.023 U	0.071 U	3.6
Metals (µg/L)																			
Total Arsenic	10	3 U	3 U	1.45 U	**16.2**	**47.7**	**42.2**	**51.2**	**23.8**	6.7	**10.2**	2.4 J	0.5 U	5.4	**11**	2.1 J	0.29 U	2.9 J	2.6 J
Dissolved Arsenic	NC	3 U	3 U	--	16.9	42.3	41.4	48.1	22	6.1	8.48	3 J	0.5 U	6.3	9.9 J	2.1 J	0.29 U	2.3 U	3.3 J
Total Manganese	124	116	114	7.6	39.3	**648**	**452**	**616**	**128**	18.2	27	4.8	2.3 B	15	35	11	0.92 J	4.41	15.2
Dissolved Manganese	NC	116	119	--	41.8	622	458 J	612	121	18.3	27.3	6.6	3.9 B	16	34	12	1.1 J	4.75	15.4
Field Parameters																			
pH (S.U.)	NC	6.28	--	5.25	5.05	6.54	5.61	5.81	5.73	6.06	4.78	5.44	5.16	4.82	5.52	5.71	5.74	5.93	5.57
S. Conductivity (mS/cm)	NC	0.084	--	0.075	0.125	0.408	8.04	0.238	0.095	0.071	0.076	0.086	0.094	0.103	0.088	0.102	0.117	0.077	0.117
Dissolved Oxygen (mg/L) - Horiba	NC	2.28	--	5.33	1.57	0	3.39	2.88	3.46	--	12.95	4.55	2.98	3.83	1.77	-1.02	4.62	0.00	4.02
Dissolved Oxygen (mg/L) - Test Kit	NC	--	--	--	--	--	--	--	--	--	4	4	3	3	3	4	3	0.0	4
Temperature (ºC)	NC	15.3	--	18.63	19.5	15.89	16.48	21.26	17.17	14.5	19.36	16.7	19.21	13.99	23.9	13.82	18.16	19.10	17.77
Oxygen Reduction Potential (mV)	NC	122	--	69	-61	-65	-112	-48	-42	-26	-190.2	126	143	82	152	77	154	161	365
Turbidity (NTU)	NC	5.07	--	1.27	9.85	5.03	1.58	4.78	0.59	4.92	3.49	0.49	5.33	0.44	2.52	0.09	1.1	0.38	0.6
Alkalinity (ppm)	NC	--	--	--	--	140	70	70	18	11	18	11	15	12	15	14	12	--	--
Ferrous Iron (ppm)	NC	--	--	--	--	2.2	5	5.5	2.1	1.4	5	0.8	1	2	1	1.3	0	--	--
Hydrogen Sulfide (ppm)	NC	--	--	--	--	0	0	0.1	0.3	0	0	0	0	0	0.1	0	0	--	--
Nitrate (ppm)	NC	--	--	--	--	0	0	0	0	0	0	0	0	0	0	0	0	--	--
Nitrite (ppm)	NC	--	--	--	--	0	0	0	0	0	0	0	0	0	0	0	0	--	--

LOCATION SAMPLE DATE	Cleanup Goal	FFTA-MW101S 20180326
VOCs (µg/L)		
Benzene	5	0.26 U
SVOCs (µg/L)		
3&4-Methylphenol	27	0.42 U
Naphthalene	16	0.060 U
Metals (µg/L)		
Total Arsenic	10	2.3 U
Dissolved Arsenic	NC	2.3 U
Total Manganese	124	45.1
Dissolved Manganese	NC	21
Field Parameters		
pH (S.U.)	NC	6.1
S. Conductivity (mS/cm)	NC	0.067
Dissolved Oxygen (mg/L) - Horiba	NC	5.72
Dissolved Oxygen (mg/L) - Test Kit	NC	5
Temperature (ºC)	NC	14.1
Oxygen Reduction Potential (mV)	NC	87
Turbidity (NTU)	NC	0
Alkalinity (ppm)	NC	--
Ferrous Iron (ppm)	NC	--
Hydrogen Sulfide (ppm)	NC	--
Nitrate (ppm)	NC	--
Nitrite (ppm)	NC	--

Notes:

NC - No Criteria
µg/L - micrograms per liter
J - Estimated Value
mS/cm - millisiemens per centimeter
mV - millivolts
NTU - Nephelometric Turbidity Units
ppm - parts per million
S.U. - Standard Units
°C - degrees Celsius
L - Biased Low
U - Analyte was not detected at a concentration greater than the instrument detection limit
R - Surrogate Recovery Noncompliance

Bolded and shaded cells indicate Cleanup Goal exceedance

TABLE 4-1
HISTORICAL GROUNDWATER ANALYTICAL RESULTS
FORMER FIRE TRAINING AREA
NASA WALLOPS FLIGHT FACILITY
WALLOPS ISLAND, VIRGINIA

LOCATION SAMPLE DATE	Cleanup Goal	FFTA-MW102D 20030307	FFTA-MW102D 20081203	FFTA-MW102D 20090818	FFTA-MW102D 20090818 duplicate	FFTA-MW102D 20100317	FFTA-MW102D 20100608	FFTA-MW102D 20100917	FFTA-MW102D 20101207	FFTA-MW102D 20110323	FFTA-MW102D 20110913	FFTA-MW102D 20120313	FFTA-MW102D 20120918	FFTA-MW102D 20130319	FFTA-MW102D 20130904	FFTA-MW102D 20140318	FFTA-MW102D 20140923	FFTA-MW102D 20160927	FFTA-MW102D 20170621	FFTA-MW102D 20180326
VOCs (µg/L)																				
Benzene	5	1 U	1 U	0.11 U	0.11 U	0.3 U	0.3 U	0.3 U	0.3 UJ	0.3 U	0.5 U	0.5 U	0.2 U	0.11 U	0.25 U	0.25 U	0.11 U	0.26 U	0.26 U	0.26 U
SVOCs (µg/L)																				
3&4-Methylphenol	27	5 U	10 U	0.017 U	0.018 U	6 U	6 U	5 U	0.4 U	0.5 UR	2.31 U	7.9 U	0.25 U	0.094 U	1.9 U	9.8 U	0.22 U	0.43 U	0.42 U	0.42 U
Naphthalene	16	5 U	10 J	0.048 J	0.045 J	2 U	2 U	2 U	0.06 U	8	2.31 U	7.9 U	0.04 J	0.015 U	0.95 U	4.9 U	0.03 J	0.062 U	0.060 U	0.060 U
Metals (µg/L)																				
Total Arsenic	10	6.4 B	1.45 U	0.14 U	0.14 U	1.5 U	2 B	1.8 B	0.8 U	2.25 U	3 U	4 UL	0.5 U	2.6	1.2 U	1.2 U	1.7	2.3 U	4.0 U	2.3 U
Dissolved Arsenic	NC	4.4 B	--	0.14 U	0.14 U	1.5 U	3.4 B	2 B	1.4 B	2.25 U	3 U	4 UL	0.5 U	3.1	1.2 U	1.2 U	1.9	2.3 U	4.0 U	2.3 U
Total Manganese	124	**381**	9.5	3.3	3.2	15	2.9 B	4.6	4.2	**918**	28.9	32.1	4.6 B	5.8 B	7.9	2.7	2.4 J	2.6	34.9	17.1
Dissolved Manganese	NC	381	--	2.9	3.3	4.4 B	2.3 B	2	3.3	869	24.5	6	2.5 B	2.2 B	1.6 J	1.6 J	0.97 J	1.5 U	2.8	136
Field Parameters																				
pH (S.U.)	NC	5.69	4.46	5.04	--	5.82	5.33	5.03	5.47	4.5	3.22	5.25	5.57	5.73	5.55	4.92	5.63	5.61	5.45	5.73
S. Conductivity (mS/cm)	NC	0.098	0.114	0.105	--	0.107	0.108	0.121	0.085	0.094	0.1	0.11	0.126	0.098	0.09	0.094	0.128	0.098	0.117	0.112
Dissolved Oxygen (mg/L) - Horiba	NC	3.02	6.11	3.38	--	2.64	4.97	> 20	3.52	--	7.68	3.47	2.73	4.14	3.26	2.22	2.93	2.71	4.02	4.14
Dissolved Oxygen (mg/L) - Test Kit	NC	--	--	--	--	--	--	--	--	--	5	2	3	3	5	2	4	3.0	4	3
Temperature (ºC)	NC	14.7	15.85	20.36	--	18.7	17.66	18.1	15.13	15.3	17.72	15.82	19.2	14.34	18.07	12.99	17.24	19.48	17.77	15.29
Oxygen Reduction Potential (mV)	NC	157	392	246	--	248	297	127	119	189	681.2	267	116	254	265	279	191	281	365	223
Turbidity (NTU)	NC	10	0.97	2.83	--	1.53	8.34	1.19	0	0.82	3.26	7.13	0.53	0.12	0.18	0	1.51	0.32	0.6	2.8
Alkalinity (ppm)	NC	--	--	--	--	10	< 10	10	< 10	70	12	< 10	< 10	< 10	14	< 10	<10	--	--	--
Ferrous Iron (ppm)	NC	--	--	--	--	0.6	0.4	0	0.8	0.2	0.02	0	0.4	0.2	0.2	0	0	--	--	--
Hydrogen Sulfide (ppm)	NC	--	--	--	--	0	0	0	0	0	0	0	0	0	0	0	0	--	--	--
Nitrate (ppm)	NC	--	--	--	--	0	0	0	0	0	0	0	0	0	0	0	0	--	--	--
Nitrite (ppm)	NC	--	--	--	--	0	0	0	0	0	0	0	0	0	0	0	0	--	--	--

LOCATION SAMPLE DATE	Cleanup Goal	FFTA-MW102D 20181212	FFTA-MW102D 20181212 Duplicate	FFTA-MW102D 20200722	FFTA-MW102D 20210629
VOCs (µg/L)					
Benzene	5	--	--	--	--
SVOCs (µg/L)					
3&4-Methylphenol	27	0.42 U	0.42 U	9.5 U	--
Naphthalene	16	.060 U	.060 U	9.5 U	0.49 U
Metals (µg/L)					
Total Arsenic	10	2.3 U	2.3 U	3.0 U	1.3 U
Dissolved Arsenic	NC	2.3 U	2.3 U	3.0 U	1.3 U
Total Manganese	124	2.2	6.88	45	2.7 U
Dissolved Manganese	NC	3.1	7.76	7.9	1.0 J
Field Parameters					
pH (S.U.)	NC	5.53	--	5.42	5.56
S. Conductivity (mS/cm)	NC	0.116	--	0.129	0.093
Dissolved Oxygen (mg/L) - Horiba	NC	0	--	4.85	3.39
Dissolved Oxygen (mg/L) - Test Kit	NC	2	--	4	7
Temperature (ºC)	NC	16.09	--	22.86	21.81
Oxygen Reduction Potential (mV)	NC	249	--	258	183
Turbidity (NTU)	NC	0	--	57	2.46
Alkalinity (ppm)	NC	--	--	--	--
Ferrous Iron (ppm)	NC	--	--	--	--
Hydrogen Sulfide (ppm)	NC	--	--	--	--
Nitrate (ppm)	NC	--	--	--	--
Nitrite (ppm)	NC	--	--	--	--

Notes:

NC - No Criteria
µg/L - micrograms per liter
J - Estimated Value
mS/cm - millisiemens per centimeter
mV - millivolts
NTU - Nephelometric Turbidity Units
ppm - parts per million
S.U. - Standard Units
°C - degrees Celsius
L - Biased Low
U - Analyte was not detected at a concentration greater than the instrument detection limit
R - Surrogate Recovery Noncompliance

Bolded and shaded cells indicate Cleanup Goal exceedance

TABLE 4-1
HISTORICAL GROUNDWATER ANALYTICAL RESULTS
FORMER FIRE TRAINING AREA
NASA WALLOPS FLIGHT FACILITY
WALLOPS ISLAND, VIRGINIA

LOCATION SAMPLE DATE	Cleanup Goal	FFTA-MW105D 20030305	FFTA-MW105D 20081204	FFTA-MW105D 20090817	FFTA-MW105D 20100317	FFTA-MW105D 20100609	FFTA-MW105D 20100917	FFTA-MW105D 20101207	FFTA-MW105D 20101207 duplicate	FFTA-MW105D 20110322	FFTA-MW105D 20110914	FFTA-MW105D 20120314	FFTA-MW105D 20120919	FFTA-MW105D 20130319	FFTA-MW105D 20130904	FFTA-MW105D 20140317	FFTA-MW105D 20140923	FFTA-MW105D 20160928	FFTA-MW105D 20170620	FFTA-MW105D 20180328
VOCs (µg/L)																				
Benzene	5	1 U	1 U	0.11 U	0.3 U	0.3 U	0.3 U	0.3 UJ	0.3 UJ	0.3 U	0.5 U	0.5 U	0.2 U	0.11 U	0.25 U	0.25 U	0.11 U	0.26 U	0.26 U	0.26 U
SVOCs (µg/L)																				
3&4-Methylphenol	27	5 U	10 U	0.018 U	5 U	6 U	6 U	0.4 U	0.4 U	0.4 U	2.34 U	7.1 U	0.24 U	0.086 U	1.9 U	9.6 U	0.2 U	0.43 U	0.42 U	0.42 U
Naphthalene	16	5 U	10 U	0.028 U	2 U	2 U	2 U	0.06 U	0.06 U	0.06 U	2.34 U	7.1 U	0.038 U	0.013 U	0.95 U	4.8 U	0.022 U	0.063 U	0.060 U	0.060 U
Metals (µg/L)																				
Total Arsenic	10	3 U	1.45 U	0.14 U	1.5 U	3.7 B	1.8 B	1.2 B	1.7 B	2.25 U	1.5 U	4 UL	0.36 J	2.5	1.2 U	1.2 U	0.29 U	2.3 U	4.0 U	2.3 U
Dissolved Arsenic	NC	3 U	--	0.14 U	1.5 U	3.8 B	1.8 B	1.8 B	0.8 U	2.25 U	1.5 U	4 UL	0.5 U	3.3	1.2 U	1.2 U	0.94 J	2.3 U	2.4 J	2.3 U
Total Manganese	124	**384**	3.2	2.5	8.5 J	4.3	2.2	3.7 B	1.9 B	2.3	2.98 J	1.7 B	1.7 B	1.6 B	1.3 J	1.6 J	1.4 J	1.6 U	1.6 J	9.34
Dissolved Manganese	NC	321	--	2.1	3.5 J	2.3 B	2	2.7 B	2 B	2.3	1.84 J	1.7 B	1.9 B	1.4 B	2.8	7.5	1.2 J	2.4	1.8 U	7.76
Field Parameters																				
pH (S.U.)	NC	5.51	4.29	5.06	5.77	5.28	5.28	5.7	--	4.52	4.95	5.37	5.08	5.32	5.18	5.05	5.37	5.43	4.32	5.62
S. Conductivity (mS/cm)	NC	0.095	0.95	0.088	0.101	0.091	0.113	0.087	--	0.081	0.07	0.09	0.1	0.081	0.07	0.081	0.108	0.092	0.105	0.104
Dissolved Oxygen (mg/L) - Horiba	NC	2.95	4.32	2.59	2.67	4.87	4.77	8.14	--	--	4.58	3.47	2.57	3.95	2.72	2.47	2.25	0.00	3.67	3.72
Dissolved Oxygen (mg/L) - Test Kit	NC	--	--	--	--	--	--	--	--	--	4	4	2	3	2	1	1	1.0	4	3
Temperature (ºC)	NC	16.1	15.95	19.23	14.43	16.41	16.76	17.3	--	16.2	17.2	16.93	16.13	15.67	16.72	10.07	16.43	18.64	16.28	13.69
Oxygen Reduction Potential (mV)	NC	170	418	231	145	339	287	267	--	190	-193.4	260	220	285	338	305	245	318	450	267
Turbidity (NTU)	NC	5.1	0.63	-0.04	6.29	0	0	1.26	--	1.22	0	0	8.08	0.03	0.39	3.08	0	4.56	0.3	0
Alkalinity (ppm)	NC	--	--	--	< 10	< 10	< 10	< 10	--	1000	< 10	10	12	< 10	10	10	< 10	--	--	--
Ferrous Iron (ppm)	NC	--	--	--	0	0.4	0	0.4	--	0.2	0.4	0	0	0.2	0	0	0	--	--	--
Hydrogen Sulfide (ppm)	NC	--	--	--	0	0	0	0	--	0	0	0	--	0	0	0	0	--	--	--
Nitrate (ppm)	NC	--	--	--	0	0	0	0	--	0	0	0	0	0	0	0	0	--	--	--
Nitrite (ppm)	NC	--	--	--	0	0	0	0	--	0	0	0	0	0	0	0	0	--	--	--

LOCATION SAMPLE DATE	Cleanup Goal	FFTA-MW105D 20181213	FFTA-MW105D 20200722	FFTA-MW105D 20210630
VOCs (µg/L)				
Benzene	5	--	--	--
SVOCs (µg/L)				
3&4-Methylphenol	27	0.42 U	9.5 U	--
Naphthalene	16	.060 U	9.5 U	0.48 U
Metals (µg/L)				
Total Arsenic	10	2.3 U	3.0 U	1.3 U
Dissolved Arsenic	NC	2.3 U	3.0 U	1.3 U
Total Manganese	124	6.23	5.0 U	1.5 J
Dissolved Manganese	NC	1.7 J	5.0 U	1.2 J
Field Parameters				
pH (S.U.)	NC	5.44	5.43	5.4
S. Conductivity (mS/cm)	NC	0.107	0.084	0.082
Dissolved Oxygen (mg/L) - Horiba	NC	2.25	5.21	3.18
Dissolved Oxygen (mg/L) - Test Kit	NC	3	4	3
Temperature (ºC)	NC	15.27	23.76	17.43
Oxygen Reduction Potential (mV)	NC	302	288	272
Turbidity (NTU)	NC	0	3.2	2.5
Alkalinity (ppm)	NC	--	--	--
Ferrous Iron (ppm)	NC	--	--	--
Hydrogen Sulfide (ppm)	NC	--	--	--
Nitrate (ppm)	NC	--	--	--
Nitrite (ppm)	NC	--	--	--

Notes:

NC - No Criteria
µg/L - micrograms per liter
J - Estimated Value
mS/cm - millisiemens per centimeter
mV - millivolts
NTU - Nephelometric Turbidity Units
ppm - parts per million
S.U. - Standard Units
°C - degrees Celsius
L - Biased Low
U - Analyte was not detected at a concentration greater than the instrument detection limit
R - Surrogate Recovery Noncompliance

Bolded and shaded cells indicate Cleanup Goal exceedance

TABLE 4-1
HISTORICAL GROUNDWATER ANALYTICAL RESULTS
FORMER FIRE TRAINING AREA
NASA WALLOPS FLIGHT FACILITY
WALLOPS ISLAND, VIRGINIA

LOCATION SAMPLE DATE	Cleanup Goal	FFTA-MW106 20090824	FFTA-MW106 20100317	FFTA-MW106 20100609	FFTA-MW106 20100916	FFTA-MW106 20101208	FFTA-MW106 20110323	FFTA-MW106 20110914	FFTA-MW106 20120313	FFTA-MW106 20120918	FFTA-MW106 20130320	FFTA-MW106 20130904	FFTA-MW106 20140317	FFTA-MW106 20140923	FFTA-MW106 20150317	FFTA-MW106 20151201	FFTA-MW106 20180327	FFTA-MW106 20181212	FFTA-MW106 20200721
VOCs (µg/L)																			
Benzene	5	0.11 U	0.3 U	0.3 U	0.3 U	0.3 UJ	0.3 U	0.5 U	0.5 U	0.2 U	0.11 U	0.25 U	0.25 U	0.11 U	0.11 U	0.26 U	0.26 U	--	--
SVOCs (µg/L)																			
3&4-Methylphenol	27	0.018 U	5 U	5 U	5 U	0.4 U	0.4 U	2.5 UR	7.9 U	0.24 U	0.086 U	1.9 U	10 U	0.22 U	0.22 U	6.2 U	0.42 U	0.42 U	9.5 U
Naphthalene	16	0.029 U	2 U	2 U	2 U	0.06 U	0.06 U	2.5 U	7.9 U	0.039 U	0.013 U	0.95 U	5.1 U	0.024 U	0.024	2.4 U	0.060U	0.060 U	9.5 U
Metals (µg/L)																			
Total Arsenic	10	0.52	1.5 U	0.8 U	0.8 UL	1.9 B	2.25 U	1.5 U	4 UL	0.5 U	1.3	1.2 U	1.2 U	1.6 U	0.29 U	2.3 U	2.3 U	2.3 U	3.0 U
Dissolved Arsenic	NC	0.14 U	1.5 U	1.3 B	0.8 UL	1.4 B	2.25 U	1.5 U	4 UL	0.5 U	2.4	1.2 U	1.2 U	1.5 U	0.29 U	2.3 U	2.3 U	2.3 U	3.0 U
Total Manganese	124	48.1	6.4 B	1.4 B	1.1 B	1.4 B	0.77 B	0.995 J	0.96 B	0.92 B	0.44 B	1 J	0.87 J	0.7 J	1.2 U	0.92 J	1.3 U	3.2	5.0 U
Dissolved Manganese	NC	27.3	0.85 B	1.2 B	0.91 B	1.1 B	0.77 B	0.994 J	1.4 B	0.78 B	0.69 B	0.74 J	0.65 J	0.78 J	0.88 U	1 U	0.81 U		5.0 U
Field Parameters																			
pH (S.U.)	NC	6.16	6.22	4.99	5.65	6.88	5.01	5.08	6.41	6.09	6.22	6.19	5.81	5.54	6.17	5.79	6.32	6.15	5.83
S. Conductivity (mS/cm)	NC	0.124	0.338	0.512	0.198	0.137	0.097	0.097	0.128	0.117	0.143	0.077	0.086	0.115	0.144	0.071	0.099	0.118	0.108
Dissolved Oxygen (mg/L) - Horiba	NC	6.08	4.2	8.25	> 20	13.34	--	8.7	7.08	5.14	6.2	9.14	10.25	6.85	6.14	6.36	7.75	6.06	9.48
Dissolved Oxygen (mg/L) - Test Kit	NC	--	--	--	--	--	--	8	7	3	8	7	8	6	5	5	8	6	6
Temperature (ºC)	NC	21.31	16.6	16.38	20.7	13.94	13.8	19.25	16.78	19.06	14.57	19.09	8.67	17.36	18.5	17.69	13.77	17.35	23.76
Oxygen Reduction Potential (mV)	NC	190	228	116	104	234	127	-158	199	217	204	195	314	160	168	363	133	231	288
Turbidity (NTU)	NC	-3.92	2.51	1.97	0.98	0	0.53	0	0	0.7	0.32	0.18	1.69	1.39	0.06	2.01	0	0	0
Alkalinity (ppm)	NC	--	13	100	11	45	35	25	30	22	5	12	24	35	--	--	--	--	--
Ferrous Iron (ppm)	NC	--	0	0	0	0.5	0.3	0.4	0	0.6	0.6	0	0	0	--	--	--	--	--
Hydrogen Sulfide (ppm)	NC	--	0	0	0	0	0	0	0	0	0	0.1	0	0	--	--	--	--	--
Nitrate (ppm)	NC	--	0	0	0	0	0	0	0	0	0	0	0	0	--	--	--	--	--
Nitrite (ppm)	NC	--	0	0	0	0	0	0	0	0	0	0	0	0	--	--	--	--	--

LOCATION SAMPLE DATE	Cleanup Goal	FFTA-MW106 20210629
VOCs (µg/L)		
Benzene	5	--
SVOCs (µg/L)		
3&4-Methylphenol	27	--
Naphthalene	16	0.48 U
Metals (µg/L)		
Total Arsenic	10	1.3 U
Dissolved Arsenic	NC	1.3 U
Total Manganese	124	2 J
Dissolved Manganese	NC	1.0 U
Field Parameters		
pH (S.U.)	NC	6.27
S. Conductivity (mS/cm)	NC	0.074
Dissolved Oxygen (mg/L) - Horiba	NC	4.51
Dissolved Oxygen (mg/L) - Test Kit	NC	8
Temperature (ºC)	NC	19.15
Oxygen Reduction Potential (mV)	NC	171
Turbidity (NTU)	NC	0
Alkalinity (ppm)	NC	--
Ferrous Iron (ppm)	NC	--
Hydrogen Sulfide (ppm)	NC	--
Nitrate (ppm)	NC	--
Nitrite (ppm)	NC	--

Notes:

NC - No Criteria
µg/L - micrograms per liter
J - Estimated Value
mS/cm - millisiemens per centimeter
mV - millivolts
NTU - Nephelometric Turbidity Units
ppm - parts per million
S.U. - Standard Units
°C - degrees Celsius
L - Biased Low
U - Analyte was not detected at a concentration greater than the instrument detection limit
R - Surrogate Recovery Noncompliance

Bolded and shaded cells indicate Cleanup Goal exceedance

TABLE 4-1
HISTORICAL GROUNDWATER ANALYTICAL RESULTS
FORMER FIRE TRAINING AREA
NASA WALLOPS FLIGHT FACILITY
WALLOPS ISLAND, VIRGINIA

LOCATION SAMPLE DATE	Cleanup Goal	FFTA-MW107 20090824	FFTA-MW107 20100316	FFTA-MW107 20100608	FFTA-MW107 20100916	FFTA-MW107 20100916 duplicate	FFTA-MW107 20101208	FFTA-MW107 20110323	FFTA-MW107 20110914	FFTA-MW107 20120313	FFTA-MW107 20120918	FFTA-MW107 20130320	FFTA-MW107 20130905	FFTA-MW107 20140317	FFTA-MW107 20140923	FFTA-MW107 20150317	FFTA-MW107 20151201	FFTA-MW107 20180326	FFTA-MW107 20181212	FFTA-MW107 20200722
VOCs (µg/L)																				
Benzene	5	2.9 J	0.3 U	0.3 U	0.3 U	0.3 U	0.3 UJ	4	**7.49**	**6.3**	**5.6**	**6.6**	4.7 J	3.5 J	**5.2**	3.3	2.7	1.2	--	--
SVOCs (µg/L)																				
3&4-Methylphenol	27	7.1	5 U	6 U	6 U	5 UR	0.4 U	6	4.99	7.1 UR	5.5	7.1	7.9 J	11 U	20	6	9.2 J	4.1	2.7 J	9.5 U
Naphthalene	16	**19**	**27**	2 U	2 U	2 U	5	**59 L**	**73.4**	**49**	**36**	**72**	**40**	**83**	**41**	**39**	**80**	**39 J**	**38 J**	**33**
Metals (µg/L)																				
Total Arsenic	10	7.4	7 J	8	7.4 L	7.4 L	7.3	**17.6**	**19.1**	**21**	**18**	**27**	**35**	**27**	**30**	**28**	**36.6**	**35.1**	**39.2**	**43**
Dissolved Arsenic	NC	6.6	7.7 J	7.6	7.8 L	6.8 L	7.4	16.5	18.2	20.8	19	26	35	25	26	26	38.3	34.7	40.1	50
Total Manganese	124	**2720**	**512**	**654**	**537**	**552**	**307**	**483**	**4100**	**1320**	**630 J**	**520**	**500**	**620**	**510**	**490**	**407**	**437**	**630**	**250**
Dissolved Manganese	NC	2720	520	641 J	548	556	338	475	4020	1270	610	510	480	580	520	500	411	452	671	270
Field Parameters																				
pH (S.U.)	NC	5.54	6.98	6.09	5.74	--	6.26	6.5	4.72	6.76	6.51	6.48	6.35	6.45	6.03	6.45	6.16	6.65	6.39	6.37
S. Conductivity (mS/cm)	NC	0.252	0.219	0.187	0.191	--	0.176	0.264	0.197	0.238	0.293	0.185	0.299	0.278	0.298	0.245	0.135	0.18	0.197	0.146
Dissolved Oxygen (mg/L) - Horiba	NC	0.81	0	0.93	2.84	--	1.49	4.33	2.19	0	0.54	0	0	0	1.56	0.47	0.08	4.58	0	0
Dissolved Oxygen (mg/L) - Test Kit	NC	--	--	--	--	--	--	--	1	0	0	0	0	0	1	0	0.1	0	0	0
Temperature (ºC)	NC	19.1	12.85	16.43	20.34	--	14.15	13.63	18.91	20.1	19.66	14.77	21.67	11.4	17.59	19.55	17.68	13.47	17.13	18.68
Oxygen Reduction Potential (mV)	NC	-56	-160	-54	-43	--	-32	-128	-41.7	-133	-128	-121	-75	-116	-64	-72	-4	-105	-85	-74
Turbidity (NTU)	NC	0.17	8.99	14.3	4.04	--	5.12	1.64	0.55	0	3.76	3.85	0.52	0.37	1.94	0.57	1.85	2.3	0	4.4
Alkalinity (ppm)	NC	--	15	55	60	--	60	60	30	100	75	100	35	45	100	--	--	--	--	--
Ferrous Iron (ppm)	NC	--	4.6	5.6	5.8	--	2	3.8	2.2	3.8	5	7	2	2.2	1.6	--	--	--	--	--
Hydrogen Sulfide (ppm)	NC	--	0	0	0	--	0	0	0	0	0	0	0	0	0	--	--	--	--	--
Nitrate (ppm)	NC	--	0	0	0	--	0	0	0	0	0	0	0	0	0	--	--	--	--	--
Nitrite (ppm)	NC	--	0	0	0	--	0	0	0	0	0	0	0	0	0	--	--	--	--	--

LOCATION SAMPLE DATE	Cleanup Goal	FFTA-MW107 20210629	FFTA-MW107 20210629 Duplicate
VOCs (µg/L)			
Benzene	5	--	--
SVOCs (µg/L)			
3&4-Methylphenol	27	--	--
Naphthalene	16	0.48 U	0.48 U
Metals (µg/L)			
Total Arsenic	10	**39.6**	**40.3**
Dissolved Arsenic	NC	40.4	41.8
Total Manganese	124	**329**	**327**
Dissolved Manganese	NC	332	336
Field Parameters			
pH (S.U.)	NC	6.41	--
S. Conductivity (mS/cm)	NC	0.128	--
Dissolved Oxygen (mg/L) - Horiba	NC	0	--
Dissolved Oxygen (mg/L) - Test Kit	NC	0.1	--
Temperature (ºC)	NC	18.8	--
Oxygen Reduction Potential (mV)	NC	-67	--
Turbidity (NTU)	NC	6.49	--
Alkalinity (ppm)	NC	--	--
Ferrous Iron (ppm)	NC	--	--
Hydrogen Sulfide (ppm)	NC	--	--
Nitrate (ppm)	NC	--	--
Nitrite (ppm)	NC	--	--

Notes:
NC - No Criteria
µg/L - micrograms per liter
J - Estimated Value
mS/cm - millisiemens per centimeter
mV - millivolts
NTU - Nephelometric Turbidity Units
ppm - parts per million
S.U. - Standard Units
°C - degrees Celsius
L - Biased Low
U - Analyte was not detected at a concentration greater than the instrument detection limit
R - Surrogate Recovery Noncompliance

Bolded and shaded cells indicate Cleanup Goal exceedance

TABLE 4-1
HISTORICAL GROUNDWATER ANALYTICAL RESULTS
FORMER FIRE TRAINING AREA
NASA WALLOPS FLIGHT FACILITY
WALLOPS ISLAND, VIRGINIA

LOCATION SAMPLE DATE	Cleanup Goal	FFTA-MW054S 20030304 (1)	FFTA-MW108 20090824	FFTA-MW108 20100316	FFTA-MW108 20100608	FFTA-MW108 20100916	FFTA-MW108 20101208	FFTA-MW108 20110323	FFTA-MW108 20110915	FFTA-MW108 20120313	FFTA-MW108 20120918	FFTA-MW108 20130320	FFTA-MW108 20130905	FFTA-MW108 20140318	FFTA-MW108 20150318	FFTA-MW108 20151202	FFTA-MW108 20160927	FFTA-MW108 20170622	FFTA-MW108 20200722	FFTA-MW108 20200723 Duplicate
VOCs (µg/L)																				
Benzene	5	1 U	0.11 U	0.3 U	0.3 U	0.3 U	0.3 UJ	0.3 U	0.5 U	0.5 U	0.2 U	0.11 U	0.25 U	0.25 U	0.11 U	0.26 U	0.26 U	0.26 U	--	--
SVOCs (µg/L)																				
3&4-Methylphenol	27	5 U	0.052 J	6 U	5 U	5 U	0.4 U	0.4 U	2.78 U	7.1 U	0.24 U	0.09 U	1.9 U	10 U	0.21 U	5.3 U	0.42 U	0.42 U	9.5 U	9.5 U
Naphthalene	16	5 U	0.12 J	2 U	2 U	2 U	0.06 UL	0.06 U	2.78 U	7.1 U	0.038 U	0.014 U	0.97 U	5.1 U	0.023 U	2.1 U	0.061 U	0.060 U	9.5 U	9.5 U
Metals (µg/L)																				
Total Arsenic	10	3 U	0.14 U	1.5 U	2.3 B	0.8 UL	0.8 U	2.25 U	1.5 U	4 UL	0.5 U	3.3	1.2 U	1.2 U	0.29 U	2.3 U	2.3 U	4.0 U	3.0 U	3.0 U
Dissolved Arsenic	NC	3 U	0.14 U	1.5 U	3.4 B	0.8 UL	1.2 B	2.25 U	1.5 U	4 UL	0.5 U	3.2	1.2 U	1.2 U	0.29 U	2.3 U	2.3 U	4.0 U	3.0 U	3.0 U
Total Manganese	124	3.4 B	35.2	3.8 J	4	0.66 B	1 B	0.55 B	0.812 J	0.71 B	0.83 B	0.56 B	0.39 J	0.25 J	0.48 U	1.9 U	1.2 U	2.6	5.0 U	5.0 U
Dissolved Manganese	NC	1.3 B	38.2	3.5 J	2.6 B	0.86 B	1.2 B	0.58 B	2.5 U	0.83 B	0.57 B	0.77 B	0.39 J	0.35 J	0.63 U	1.2 J	1.5 U	0.89 J	5.0 U	5.0 U
Field Parameters																				
pH (S.U.)	NC	5.79	5.62	6.22	6.01	5.69	6.09	5.84	5.84	5.92	5.08	5.55	5.83	5.03	5.37	4.87	5.77	5.35	5.61	--
S. Conductivity (mS/cm)	NC	0.062	0.102	0.143	0.125	0.091	0.11	0.102	0.102	0.087	0.093	0.089	0.065	0.066	0.107	0.047	0.074	0.066	0.084	--
Dissolved Oxygen (mg/L) - Horiba	NC	8.41	6.39	6	9.82	8.4	13.97	9.29	9.29	4.81	4.33	6.9	4.55	4.5	6.08	5.25	6.10	10.05	8.58	--
Dissolved Oxygen (mg/L) - Test Kit	NC	--	--	--	--	--	--	--	--	4	5	2	6	4	2	3	5.0	3	6	--
Temperature (ºC)	NC	15.1	20.32	14.32	16.39	19.55	10.17	15.14	15.14	18.79	20.01	13.61	17.02	13.33	11.63	17.5	18.44	18.79	18.16	--
Oxygen Reduction Potential (mV)	NC	234	201	203	386	201	295	239	239	211	229	212	219	293	297	316	295	54	256	--
Turbidity (NTU)	NC	8	0	3.17	9.83	1.35	0	0.12	0.12	3.21	3.42	0.62	0.35	0	0	3.67	0.32	0.5	0	--
Alkalinity (ppm)	NC	--	--	12.5	700	10	10	11	11	13	20	11	12	< 10	--	--	--	--	--	--
Ferrous Iron (ppm)	NC	--	--	0.4	0	0	0.5	0.5	0.5	0	0	0.2	0	0	--	--	--	--	--	--
Hydrogen Sulfide (ppm)	NC	--	--	0	0	0	0	0	0	0	0	0	0	0	--	--	--	--	--	--
Nitrate (ppm)	NC	--	--	0	0	0	0	0	0	0	0.6	0	0	0	--	--	--	--	--	--
Nitrite (ppm)	NC	--	--	0	0	0	0	0	0	0	0	0	0	0	--	--	--	--	--	--

LOCATION SAMPLE DATE	Cleanup Goal	FFTA-MW108 20210630
VOCs (µg/L)		
Benzene	5	--
SVOCs (µg/L)		
3&4-Methylphenol	27	--
Naphthalene	16	0.48 U
Metals (µg/L)		
Total Arsenic	10	1.3 U
Dissolved Arsenic	NC	1.3 U
Total Manganese	124	1.0 U
Dissolved Manganese	NC	1.0 U
Field Parameters		
pH (S.U.)	NC	5.95
S. Conductivity (mS/cm)	NC	0.056
Dissolved Oxygen (mg/L) - Horiba	NC	6.56
Dissolved Oxygen (mg/L) - Test Kit	NC	9
Temperature (ºC)	NC	19.12
Oxygen Reduction Potential (mV)	NC	247
Turbidity (NTU)	NC	4.71
Alkalinity (ppm)	NC	--
Ferrous Iron (ppm)	NC	--
Hydrogen Sulfide (ppm)	NC	--
Nitrate (ppm)	NC	--
Nitrite (ppm)	NC	--

Notes:

NC - No Criteria
µg/L - micrograms per liter
J - Estimated Value
mS/cm - millisiemens per centimeter
mV - millivolts
NTU - Nephelometric Turbidity Units
ppm - parts per million
S.U. - Standard Units
°C - degrees Celsius
L - Biased Low
U - Analyte was not detected at a concentration greater than the instrument detection limit
R - Surrogate Recovery Noncompliance

Bolded and shaded cells indicate Cleanup Goal exceedance

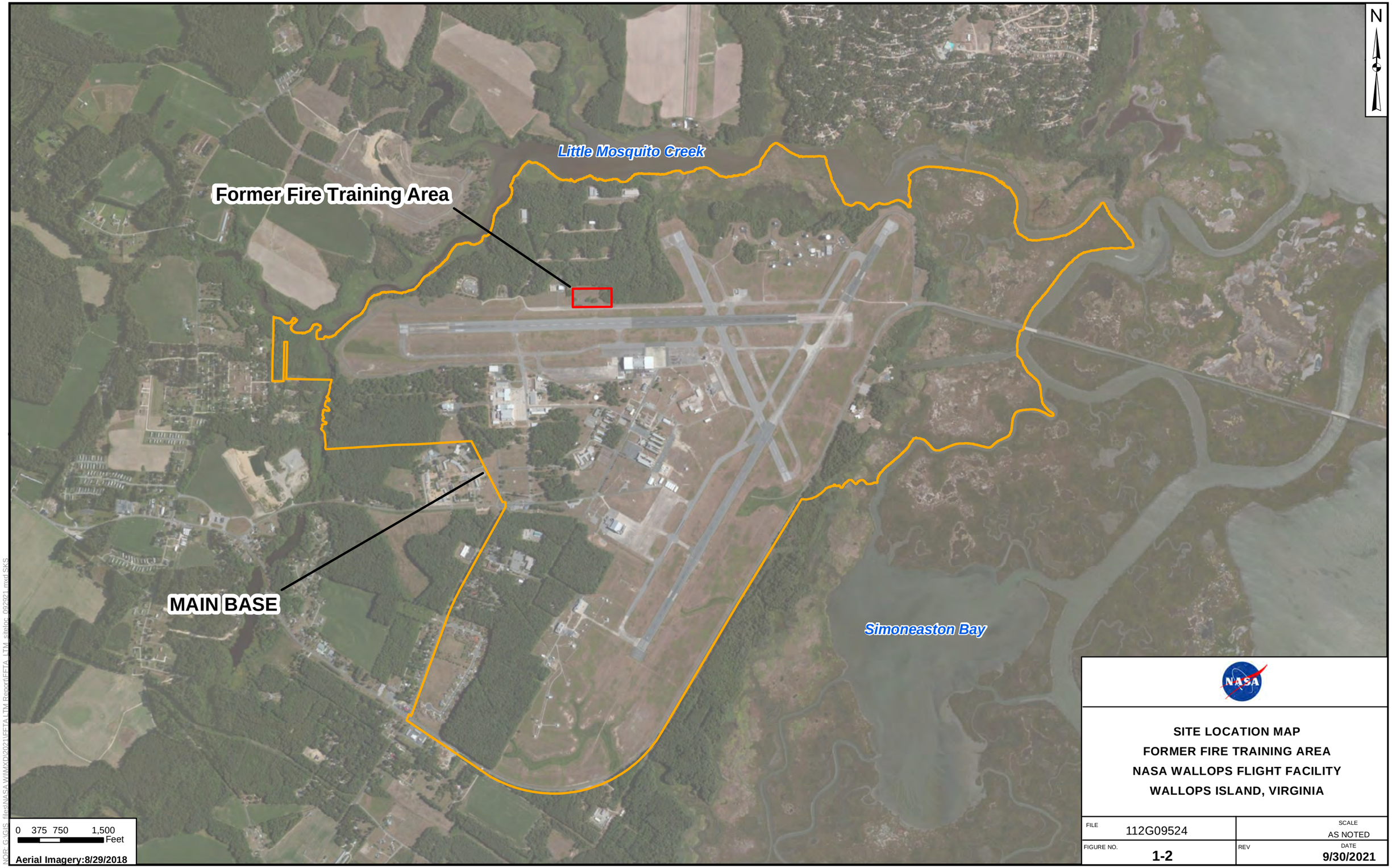
(1) FFTA-MW54S was replaced by FFTA-MW108 in August 2009.

FIGURES

NOR:G:\GIS_files\NASA WI\MXD\2021\FFTA LTM Report\Facilitylocmap_8x11_092921.mxd

FACILITY LOCATION MAP
NASA WALLOPS FLIGHT FACILITY
WALLOPS ISLAND, VIRGINIA

FILE	112G09158	SCALE	AS NOTED
FIGURE NO.	1-1	REV DATE	9/30/2021

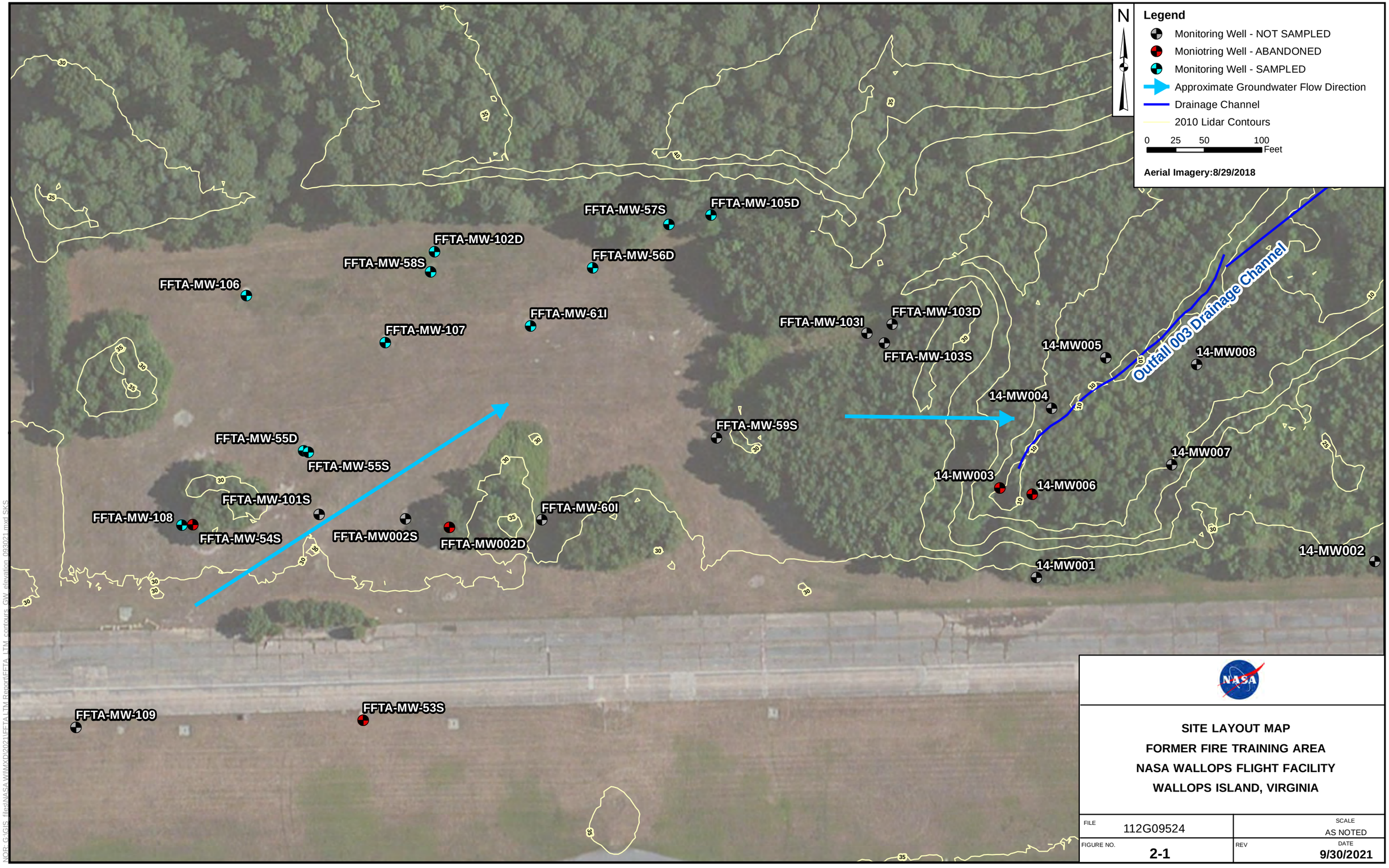


NOR: G:\GIS_files\NASA WIMX\2021\FEFTA LTM Report\FEFTA_LTM_sitelocmap_092821.mxd SKS

NASA

SITE LOCATION MAP
FORMER FIRE TRAINING AREA
NASA WALLOPS FLIGHT FACILITY
WALLOPS ISLAND, VIRGINIA

FILE	SCALE
112G09524	AS NOTED
FIGURE NO.	REV / DATE
1-2	**9/30/2021**



SITE LAYOUT MAP
FORMER FIRE TRAINING AREA
NASA WALLOPS FLIGHT FACILITY
WALLOPS ISLAND, VIRGINIA

FILE	SCALE
112G09524	AS NOTED
FIGURE NO.	REV / DATE
2-1	9/30/2021

NOR: G:\GIS_files\NASA WI\MXD\2021\FFTA LTM Report\FFTA_LTM_contours_GW_elevation_093021.mxd SKS

N

Legend

- Monitoring Well - NOT SAMPLED
- Monitoring Well - ABANDONED
- Monitoring Well - SAMPLED
- Groundwater Contour Line
- Groundwater Contour Line (Inferred)
- Approximate Groundwater Flow Direction
- Drainage Channel
- 2010 Lidar Contours

0 25 50 100 Feet

Notes:
NM - not measured
* Water elevation not used to generate potentiometric map

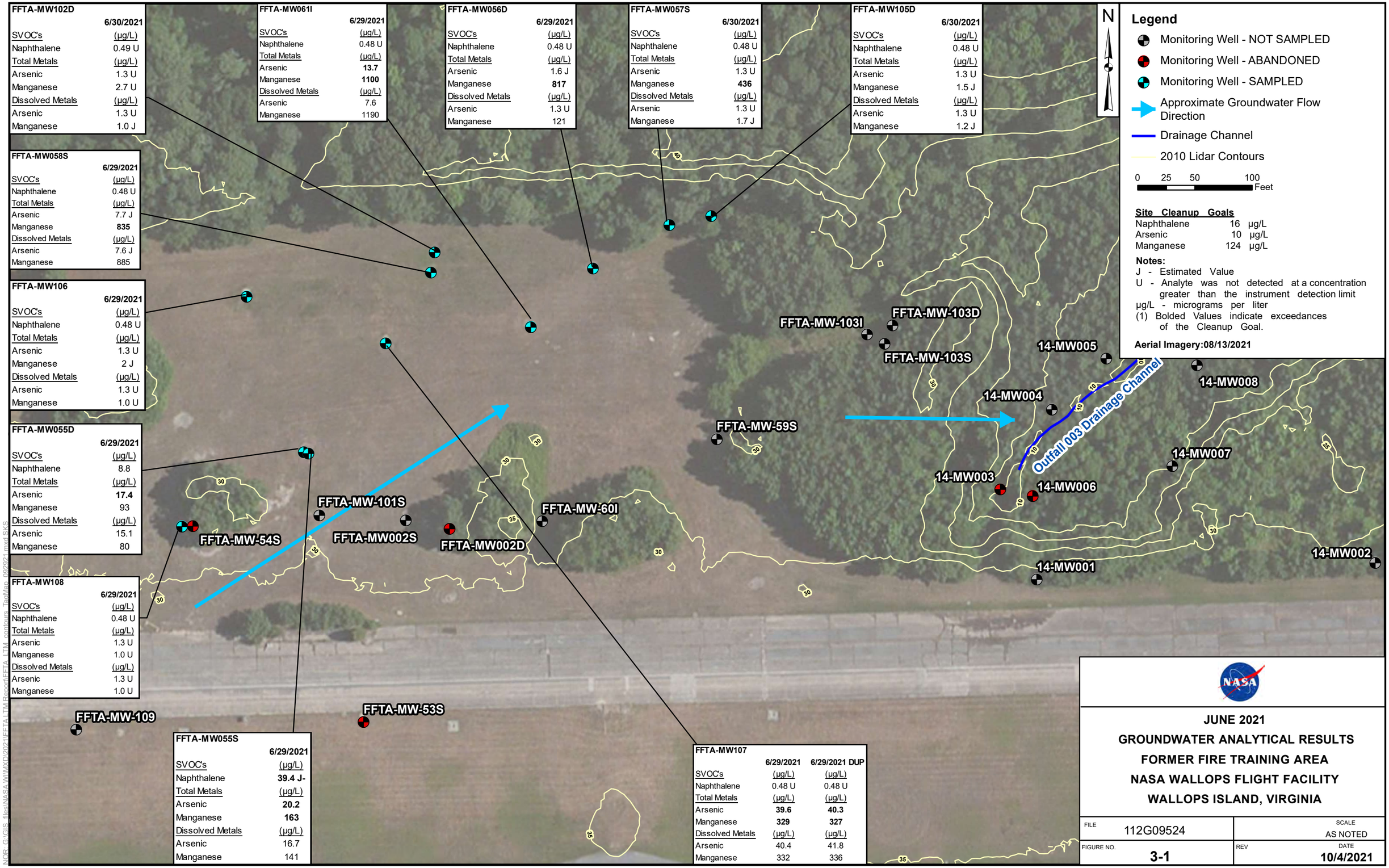
Aerial Imagery:8/29/2018

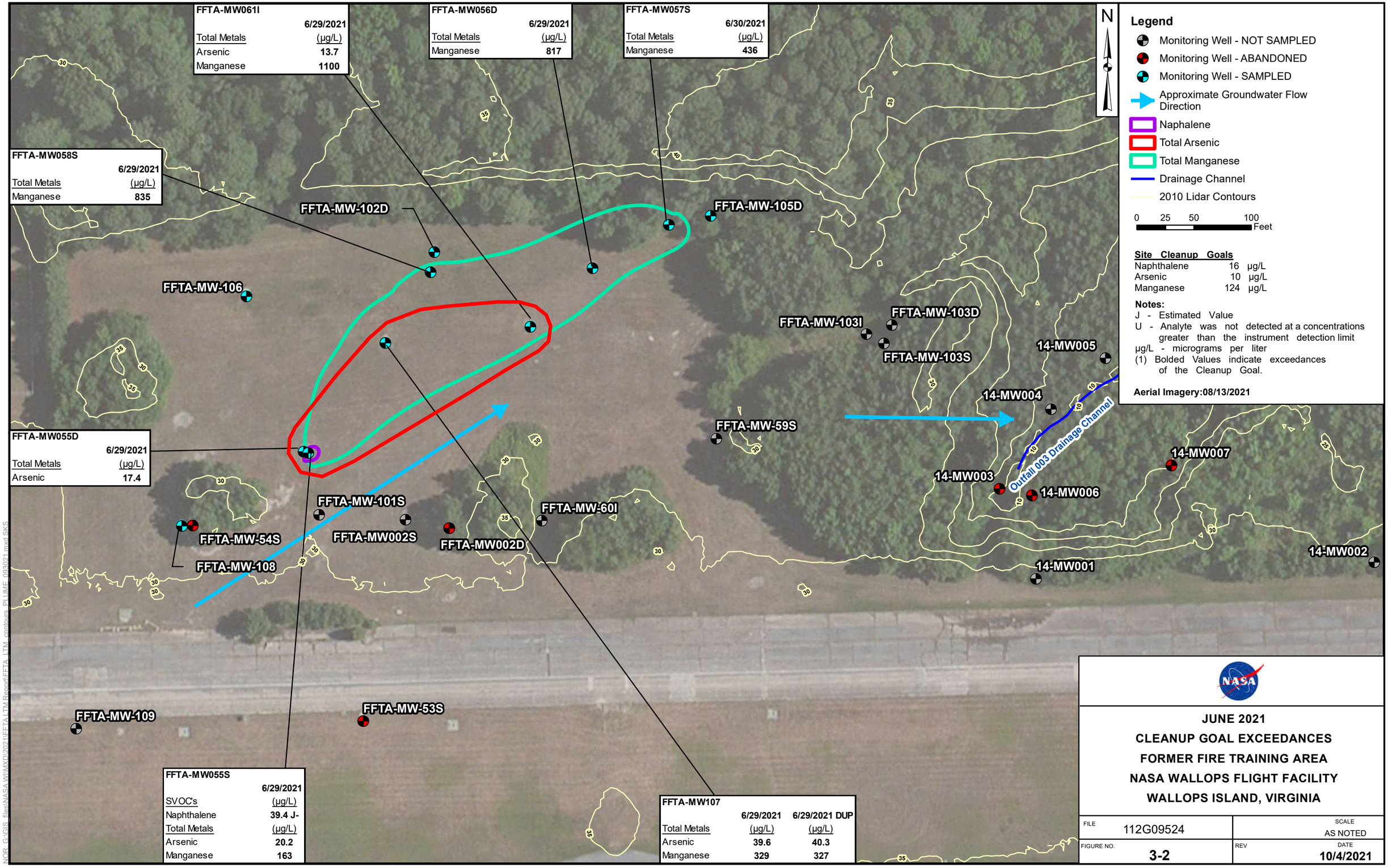
FFTA-MW-57S 15.06
FFTA-MW-105D 10.97*
FFTA-MW-102D 11.11*
FFTA-MW-58S 15.96
FFTA-MW-56D 11.64*
FFTA-MW-106 16.19
FFTA-MW-61I 15.79
FFTA-MW-107 16.19
FFTA-MW-103I 13.42*
FFTA-MW-103D 11.28*
FFTA-MW-103S 15.78
14-MW005 8.41
14-MW008 NM
Outfall 003 Drainage Channel
14-MW004 DRY
FFTA-MW-59S 15.94
FFTA-MW-55D 16.41*
FFTA-MW-55S 16.39
14-MW007 NM
14-MW003
14-MW006
FFTA-MW-101S 16.44
FFTA-MW-108 16.52
FFTA-MW-54S
FFTA-MW002S 16.35
FFTA-MW002D
FFTA-MW-60I 15.99
14-MW001 14.25
14-MW002 14.35
FFTA-MW-109 16.60
FFTA-MW-53S

JUNE 2021 SHALLOW GROUNDWATER POTENTIOMETRIC SURFACE CONTOUR MAP FORMER FIRE TRAINING AREA NASA WALLOPS FLIGHT FACILITY WALLOPS ISLAND, VIRGINIA

FILE	SCALE
112G09524	AS NOTED
FIGURE NO.	REV / DATE
2-2	9/30/2021

NOR: G:\GIS_files\NASA WIM\MXD\2021\FFTA LTM Report\FFTA_LTM_contours_POTMap_092821.mxd SKS


FFTA-MW102D
6/30/2021
SVOC's (µg/L)
Naphthalene 0.49 U
Total Metals (µg/L)
Arsenic 1.3 U
Manganese 2.7 U
Dissolved Metals (µg/L)
Arsenic 1.3 U
Manganese 1.0 J
FFTA-MW061I
6/29/2021
SVOC's (µg/L)
Naphthalene 0.48 U
Total Metals (µg/L)
Arsenic 13.7
Manganese 1100
Dissolved Metals (µg/L)
Arsenic 7.6
Manganese 1190
FFTA-MW056D
6/29/2021
SVOC's (µg/L)
Naphthalene 0.48 U
Total Metals (µg/L)
Arsenic 1.6 J
Manganese 817
Dissolved Metals (µg/L)
Arsenic 1.3 U
Manganese 121
FFTA-MW057S
6/30/2021
SVOC's (µg/L)
Naphthalene 0.48 U
Total Metals (µg/L)
Arsenic 1.3 U
Manganese 436
Dissolved Metals (µg/L)
Arsenic 1.3 U
Manganese 1.7 J
FFTA-MW105D
6/30/2021
SVOC's (µg/L)
Naphthalene 0.48 U
Total Metals (µg/L)
Arsenic 1.3 U
Manganese 1.5 J
Dissolved Metals (µg/L)
Arsenic 1.3 U
Manganese 1.2 J
FFTA-MW058S
6/29/2021
SVOC's (µg/L)
Naphthalene 0.48 U
Total Metals (µg/L)
Arsenic 7.7 J
Manganese 835
Dissolved Metals (µg/L)
Arsenic 7.6 J
Manganese 885
FFTA-MW106
6/29/2021
SVOC's (µg/L)
Naphthalene 0.48 U
Total Metals (µg/L)
Arsenic 1.3 U
Manganese 2 J
Dissolved Metals (µg/L)
Arsenic 1.3 U
Manganese 1.0 U
FFTA-MW055D
6/29/2021
SVOC's (µg/L)
Naphthalene 8.8
Total Metals (µg/L)
Arsenic 17.4
Manganese 93
Dissolved Metals (µg/L)
Arsenic 15.1
Manganese 80
FFTA-MW108
6/29/2021
SVOC's (µg/L)
Naphthalene 0.48 U
Total Metals (µg/L)
Arsenic 1.3 U
Manganese 1.0 U
Dissolved Metals (µg/L)
Arsenic 1.3 U
Manganese 1.0 U
FFTA-MW055S
6/29/2021
SVOC's (µg/L)
Naphthalene 39.4 J-
Total Metals (µg/L)
Arsenic 20.2
Manganese 163
Dissolved Metals (µg/L)
Arsenic 16.7
Manganese 141
FFTA-MW107
6/29/2021 6/29/2021 DUP
SVOC's (µg/L) (µg/L)
Naphthalene 0.48 U 0.48 U
Total Metals (µg/L) (µg/L)
Arsenic 39.6 40.3
Manganese 329 327
Dissolved Metals (µg/L) (µg/L)
Arsenic 40.4 41.8
Manganese 332 336
FFTA-MW-103I
FFTA-MW-103D
FFTA-MW-103S
FFTA-MW-59S
FFTA-MW-101S
FFTA-MW-60I
FFTA-MW-54S
FFTA-MW002S
FFTA-MW002D
FFTA-MW-109
FFTA-MW-53S
14-MW005
14-MW008
14-MW004
14-MW007
14-MW003
14-MW006
14-MW001
14-MW002
Outfall 003 Drainage Channel
N
Legend
Monitoring Well - NOT SAMPLED
Monitoring Well - ABANDONED
Monitoring Well - SAMPLED
Approximate Groundwater Flow Direction
Drainage Channel
2010 Lidar Contours
0 25 50 100
Feet
Site Cleanup Goals
Naphthalene 16 µg/L
Arsenic 10 µg/L
Manganese 124 µg/L
Notes:
J - Estimated Value
U - Analyte was not detected at a concentration greater than the instrument detection limit
µg/L - micrograms per liter
(1) Bolded Values indicate exceedances of the Cleanup Goal.
Aerial Imagery:08/13/2021
JUNE 2021
GROUNDWATER ANALYTICAL RESULTS
FORMER FIRE TRAINING AREA
NASA WALLOPS FLIGHT FACILITY
WALLOPS ISLAND, VIRGINIA
FILE 112G09524
SCALE AS NOTED
FIGURE NO. 3-1
REV
DATE 10/4/2021
N:\GR-G\GIS_files\NASA WI\MXD\2021\FFTA LTM Report\FFTA_LTM_contours_TopMap_092921.mxd SKS



NOR: G:\GIS_files\NASA WI\MXD\2021\FFTA LTM Report\FFTA_LTM_contours_PLUME_093021.mxd SKS

JUNE 2021
CLEANUP GOAL EXCEEDANCES
FORMER FIRE TRAINING AREA
NASA WALLOPS FLIGHT FACILITY
WALLOPS ISLAND, VIRGINIA

FILE	SCALE
112G09524	AS NOTED
FIGURE NO. 3-2	REV / DATE 10/4/2021

Figure 4-1
Naphthalene Concentration Trend Graph
Former Fire Training Area
Wallops Flight Facility

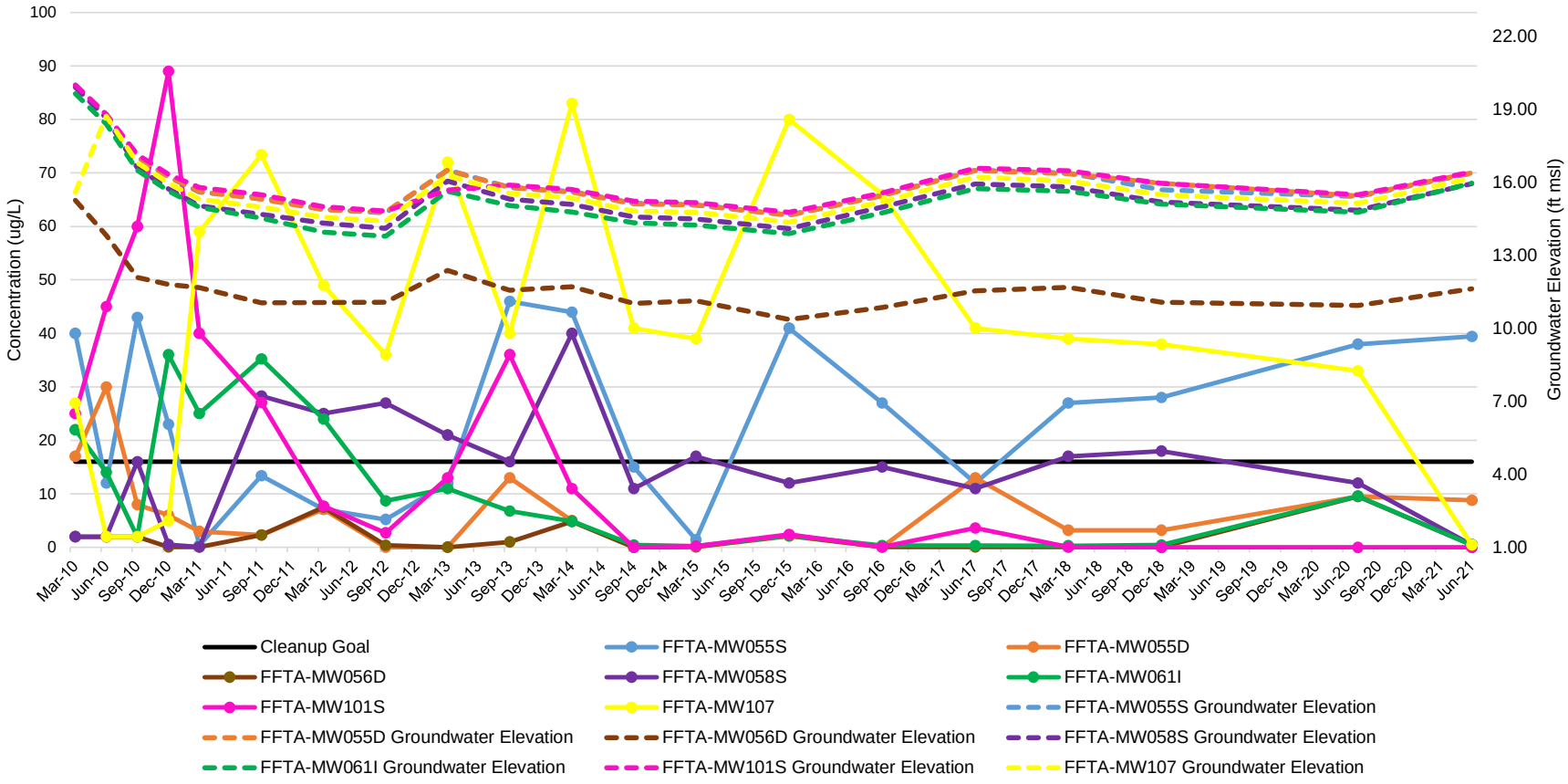


Figure 4-2
Total Arsenic Concentration Trend Graph
Former Fire Training Area
Wallops Flight Facility

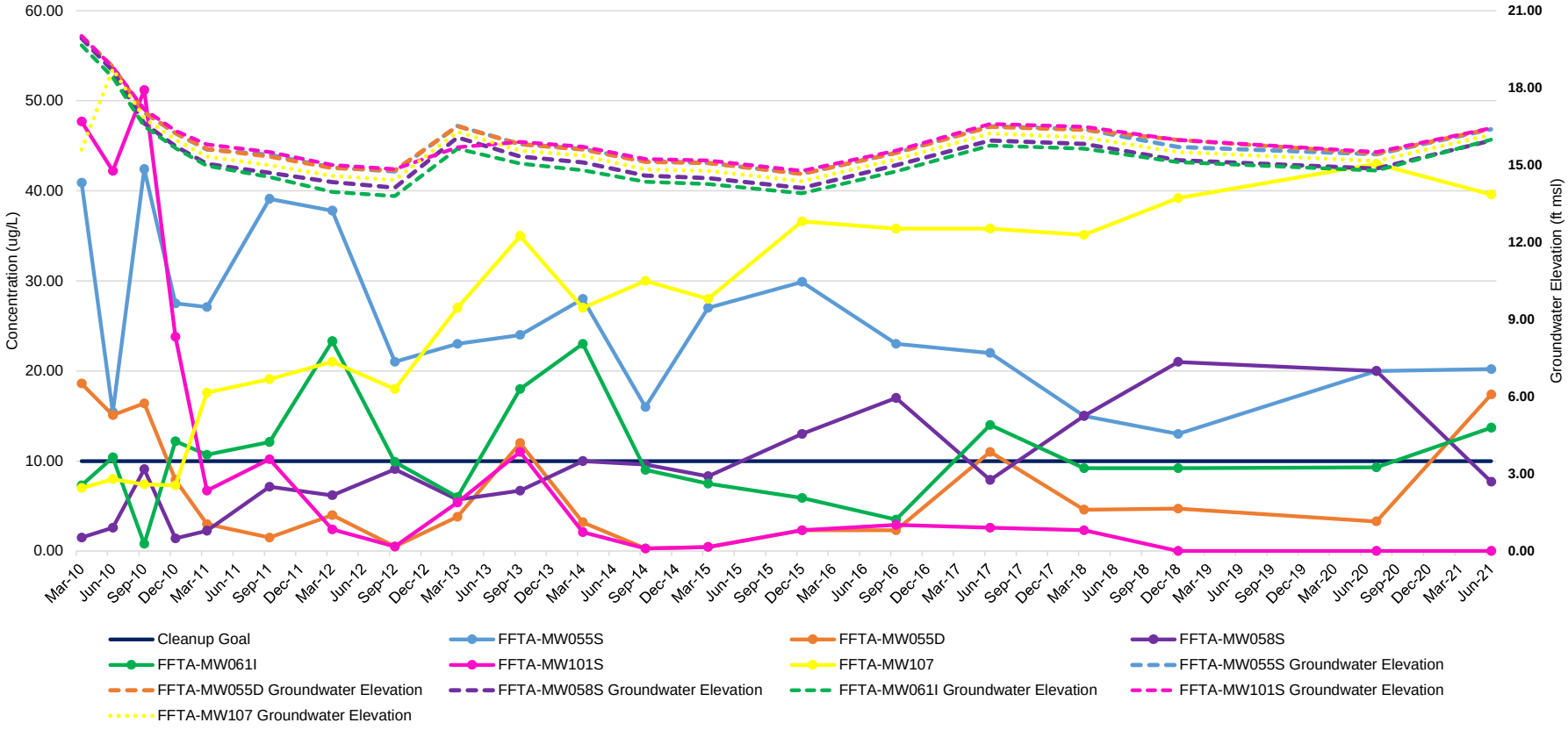
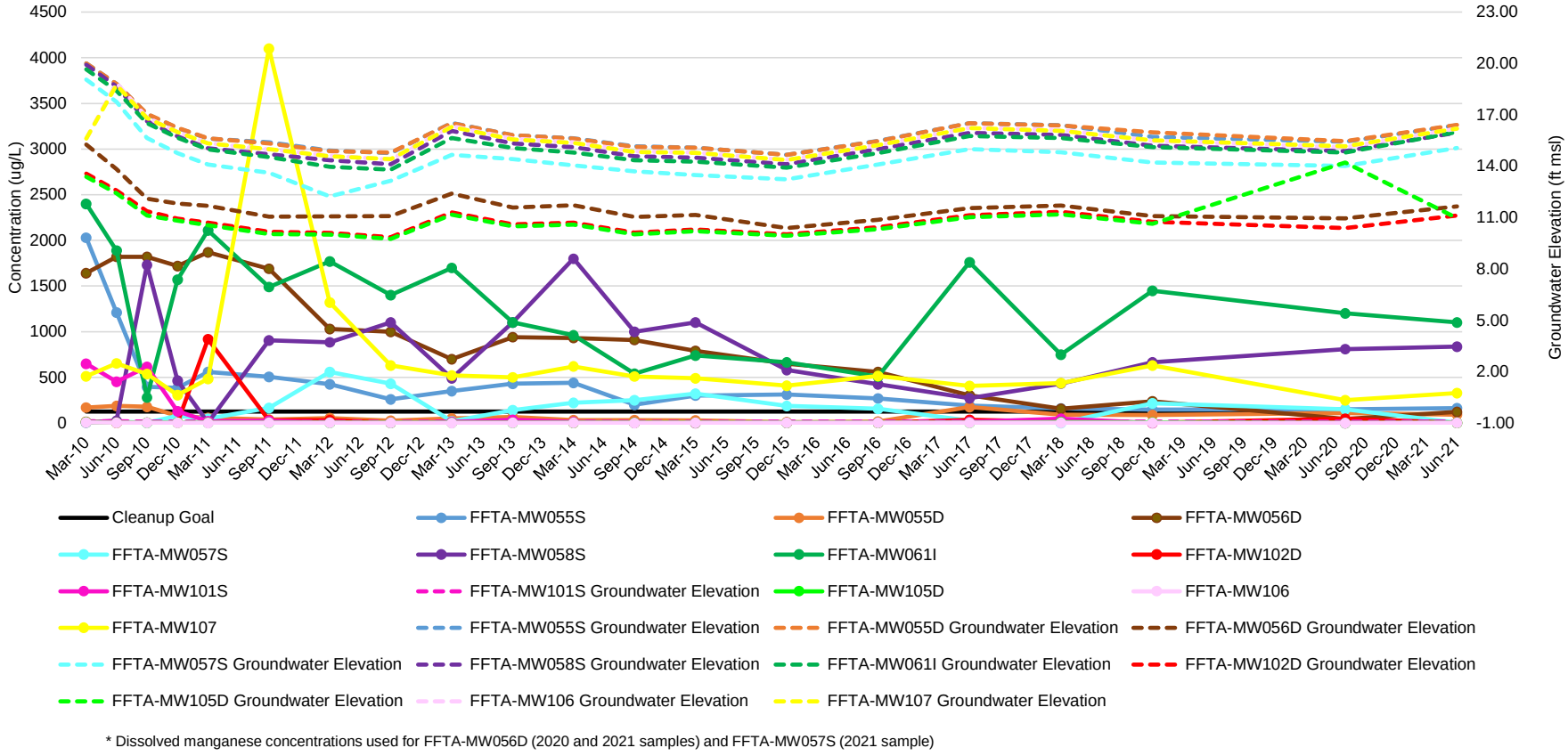


Figure 4-3
Total Manganese Concentration Trend Graph
Former Fire Training Area
Wallops Flight Facility



* Dissolved manganese concentrations used for FFTA-MW056D (2020 and 2021 samples) and FFTA-MW057S (2021 sample)

APPENDICES

APPENDIX A

PHOTOGRAPHIC LOG

GROUNDWATER MONITORING FFTA LTM JUNE 2021 PHOTOGRAPHIC LOG

Date:	View:	Photographer:
06/30/2021		J. Smith

Sampling a monitoring well (FFTA-MW057S).

Date:	View:	Photographer:
06/29/2021		R. Brydon

Sampling a monitoring well.

GROUNDWATER MONITORING FFTA LTM JUNE 2021 PHOTOGRAPHIC LOG

Date:	View:	Photographer:
06/29/2021		R. Brydon

Groundwater sampling setup at FFTA.

Date:	View:	Photographer:
06/30/2021		R. Brydon

Sampling a monitoring well at FFTA.

APPENDIX B

GROUNDWATER LEVEL MEASUREMENT SHEETS

GROUNDWATER LEVEL MEASUREMENT SHEET

TETRA TECH

Project Site Name: NASA WFF FFTA LTM June 2021
Project No.: 112G09524
Page No.: 1 of 1

Weather Conditions: Sunny 91°F
Personnel: RS Brydon / Jed Smith
Tidally Influenced: No
Measuring Device: Sonilist 101 water level

Well or Piezometer No.	Date	Time	Elevation of Reference Point (feet)*	Total Well Depth (feet)*	Water Level (feet)*	Thickness of Free Product (feet)*	Groundwater Elevation (feet)*	Comments
FFTA-MW002S	6/30/21	1139		31.63	16.49			
FFTA-MW055S		1130		23.40	14.94			
FFTA-MW055D		1133		29.45	15.05			
FFTA-MW056D		1119		44.17	19.31			
FFTA-MW057S		1120		26.93	17.06			
FFTA-MW058S		1115		21.78	13.91			
FFTA-MW059S		1125		26.12	14.52			
FFTA-MW060I		1142		36.14	16.25			
FFTA-MW061I		1117		20.21	14.55			
FFTA-MW101S		1137		24.80	15.57			
FFTA-MW102D		1116		50.11	18.03			
FFTA-MW103S		1146		18.11	13.81			
FFTA-MW103I		1147		27.32	15.41			
FFTA-MW103D		1148		49.83	18.02			
FFTA-MW105D		1121		54.14	20.04			
FFTA-MW106		1116		25.48	13.94			
FFTA-MW107		1113		25.48	14.57			
FFTA-MW108		1209		25.35	16.26			
FFTA-MW109		1206		28.94	15.03			
14-MW01		1150		33.07	20.65			
14-MW02		1201		33.15	21.15			
14-MW004		1155		7.33	Dry			
14-MW005	↓	1157		10.28	8.97			

* All measurements to the nearest 0.01 foot

APPENDIX C

GROUNDWATER SAMPLE AND LOW FLOW PURGE LOG SHEETS

GROUNDWATER SAMPLE LOG SHEET

Tetra Tech Inc.

Event: June 2021 FFTA LTM
Project Site Name: FFTA
Project No.: 112G09524

Sample ID: FFTA-MW-0555-20210629	Sampled By: JFS
QA/QC Duplicate ID: NA	Sample Date: 6/29/21
MS/MSD Collected: NA	Sample Time: 1100
WELL INFORMATION:	
Well ID : FFTA-MW 0555	Purge Date: 6/29/21
Well Diameter (in): 2-inch	Static Water Level (ft-BTOR): 14.94 btoc
Top of Screen (ft-BTOR): 8 ft	PID Monitor Reading: 0.0
Bottom of Screen (ft-BTOR): 23 ft	Purge Method: low flow
Total Well Depth (ft-BTOR): 23.44	Sample Method: low flow
EQUIPMENT INFORMATION:	
Water Quality Instrument: Horiba	Pump Controller: peristaltic pump
Turbidity Meter: LaMotte	

PURGE DATA:

Time (Hrs)	H^20 Level (ft-BTOR)	Flow mL / min.	Color	pH (S.U.)	S.C. (mS/cm)	DO (mg/L)	Turbidity (NTU)	Temp. (C°)	ORP (mV)	Salinity (% or ppt)	Other
1000	14.99	400ml	clear	5.75	0.107	0.17	12.0	25.85	-101	0.05	
1005	15.02	400ml	clear	5.78	0.094	0.0	27.3	22.70	-114	0.04	
1010	15.02	400ml	clear	5.76	0.068	0.0	25.9	21.08	-105	0.03	
1015	15.01	400ml	clear	5.85	0.068	0.0	23.7	21.11	-103	0.05	
1020	15.01	400ml	clear	5.84	0.068	0.0	24.6	21.10	-103	0.03	
1025	14.99	400ml	clear	5.74	0.067	0.0	7.52	21.52	-97	0.03	
1030	14.99	400ml	clear	5.75	0.076	0.0	3.6	20.52	-85	0.03	
1035	14.99	400ml	clear	5.72	0.076	0.0	3.5	20.30	-86	0.03	
1040	14.99	400ml	clear	5.76	0.076	0.0	0.0	21.09	-82	0.03	
1045	14.99	400ml	clear	5.81	0.076	0.0	0.0	21.16	-84	0.03	
1050	14.99	400ml	clear	5.80	0.076	0.0	0.0	21.32	-86	0.05	
1055	14.99	400ml	clear	5.80	0.076	0.0	0.0	21.42	-83	0.03	

JFS

FINAL PURGE / SAMPLE DATA:

Start Purge	End Purge	Total (min.)	Total Vol. (gal. / L.)	pH (S.U.)	S.C. (mS/cm)	DO (mg/L)	Turbidity (NTU)	Temp. (C°)	ORP (mV)	Salinity (% or ppt)	Other
1050	1055	55	4.2	5.80	0.076	0.0	0.0	21.42	-83	0.05	

ANALYSIS, PRESERVATION AND BOTTLE REQUIRMENTS

Analysis	Method	Preservative	Number	Vol.	Bottle Type	Collected
SVOCs (naphthalene)	SW-846 8270D	none	2	1-L	amber glass	yes
Total Metals (Ar and Mn)	SW-846 3005/6010	HNO3	1	250-mL	HDPE	yes
Dissolved Metals (Ar and Mn)	SW-846 3005/6010	HNO3	1	250-mL	HDPE	yes

OBSERVATIONS / NOTES:

Positioned tubing intake in the middle of the screen. D.O. Test Kit: ~~ppm~~ mg/L 0.6

Raised Tubing up an additional Foot at 1025

Coordinates:	N	E

Signature(s):

GROUNDWATER SAMPLE LOG SHEET

Tetra Tech Inc.

Event: June 2021 FFTA LTM
Project Site Name: FFTA
Project No.: 112G09524

Sample ID: FFTA-MW055D-20210629	**Sampled By:** RJB
QA/QC Duplicate ID: NA	**Sample Date:** 6/29/21
MS/MSD Collected: NA	**Sample Time:** 1045
WELL INFORMATION:	
Well ID : FFTA-MW055D	**Purge Date:** 6/29/21
Well Diameter (in): 2-inch	**Static Water Level (ft-BTOR):** 15.05
Top of Screen (ft-BTOR): 14	**PID Monitor Reading:**
Bottom of Screen (ft-BTOR): 29	**Purge Method:** low flow
Total Well Depth (ft-BTOR): 29.45	**Sample Method:** low flow
EQUIPMENT INFORMATION:	
Water Quality Instrument: Horiba	**Pump Controller:** peristaltic pump
Turbidity Meter: LaMotte	

PURGE DATA:

Time (Hrs)	H^20 Level (ft-BTOR)	Flow mL / min.	Color	pH (S.U.)	S.C. (mS/cm)	DO (mg/L)	Turbidity (NTU)	Temp. (C°)	ORP (mV)	Salinity (% or ppt)	Other
1000	15.05	400	Clear	~	~	Start Purge	~	~	~	~	~
1010	15.11	400	Clear	5.50	0.048	3.76	28.6	18.11	122	0.02	
1015	15.11	400	clear	5.53	0.057	2.16	17.9	18.71	70	0.02	
1020	15.11	400	Clear	5.58	0.066	1.88	9.15	19.17	15	0.03	
1025	15.11	400	Clear	5.62	0.073	1.57	8.61	19.26	3	0.03	
1030	15.11	400	Clear	5.66	0.073	1.51	7.09	19.21	1	0.03	
1035	15.11	400	Clear	5.70	0.073	1.49	6.81	19.19	-4	0.03	
1040	15.11	400	clear	5.70	0.075	1.31	6.66	19.29	-4	0.03	
1045	15.11	400	Clear	5.72	0.079	1.25	6.19	19.73	-8	0.03	
~~1050~~											

FINAL PURGE / SAMPLE DATA:

Start Purge	End Purge	Total (min.)	Total Vol. (gal. / L)	pH (S.U.)	S.C. (mS/cm)	DO (mg/L)	Turbidity (NTU)	Temp. (C°)	ORP (mV)	Salinity (% or ppt)	Other
1005	1045	40	4.2	5.72	0.079	1.25	6.19	19.73	-8	0.03	

ANALYSIS, PRESERVATION AND BOTTLE REQUIRMENTS

Analysis	Method	Preservative	Number	Vol.	Bottle Type	Collected
SVOCs (naphthalene)	SW-846 8270D	none	2	1-L	amber glass	yes
Total Metals (Ar and Mn)	SW-846 3005/6010	HNO3	1	250-mL	HDPE	yes
Dissolved Metals (Ar and Mn)	SW-846 3005/6010	HNO3	1	250-mL	HDPE	yes

OBSERVATIONS / NOTES:

Positioned tubing intake in the middle of the screen. D.O. Test Kit: 2 ppm

Coordinates:	N	E	Signature(s): RJB

GROUNDWATER SAMPLE LOG SHEET

Tetra Tech Inc.

Event: June 2021 FFTA LTM
Project Site Name: FFTA
Project No.: 112G09524

Sample ID: FFTA-MW-056D-20210629	Sampled By: JFS
QA/QC Duplicate ID: NA	Sample Date: 06/29/2021
MS/MSD Collected: NA	Sample Time: 1555

WELL INFORMATION:

Well ID : FFTA-MW 056D	Purge Date: 06/29/2021
Well Diameter (in): 2-inch	Static Water Level (ft-BTOR): 19.31
Top of Screen (ft-BTOR): 28.0	PID Monitor Reading: 0.0 ppm
Bottom of Screen (ft-BTOR): 43.0	Purge Method: low flow
Total Well Depth (ft-BTOR): 44.25	Sample Method: low flow

EQUIPMENT INFORMATION:

Water Quality Instrument: Horiba	Pump Controller: peristaltic pump
Turbidity Meter: LaMotte	

PURGE DATA:

Time (Hrs)	$H^2$0 Level (ft-BTOR)	Flow mL / min.	Color	pH (S.U.)	S.C. (mS/cm)	DO (mg/L)	Turbidity (NTU)	Temp. (C°)	ORP (mV)	Salinity (% or ppt)	Other
1500	20.36	400mL	Tan	6.05	0.059	2.57	52.1	19.29	122	0.04	
1505	20.36	400 mL	Tan/clear	6.06	0.058	2.50	67.5	19.41	123	0.03	
1510	20.42	400 mL	Tan/clear	6.07	0.058	1.99	29.6	19.42	131	0.03	
1515	20.40	400mL	clear	5.96	0.057	1.47	0.0	19.72	113	0.05	
1520	20.38	400mL	clear	5.92	0.057	1.42	0.0	19.66	114	0.03	
1525	20.38	400mL	clear	5.88	0.058	1.33	1.6	19.50	116	0.05	
1530	20.38	400mL	clear	5.86	0.059	1.30	4.3	19.47	130	0.03	
1535	20.38	400mL	clear	6.05	0.058	0.64	11.7	20.04	130	0.03	
1540	20.38	400mL	clear	6.09	0.060	0.38	4.2	20.16	130	0.03	
1545	20.38	400mL	clear	6.08	0.061	0.35	1.2	20.30	128	0.05	
1550	20.38	400mL	clear	6.07	0.061	0.41	0.1	20.33	126	0.05	
					JFS						

FINAL PURGE / SAMPLE DATA:

Start Purge	End Purge	Total (min.)	Total Vol. (gal. / L.)	pH (S.U.)	S.C. (mS/cm)	DO (mg/L)	Turbidity (NTU)	Temp. (C°)	ORP (mV)	Salinity (% or ppt)	Other
1500	1550	50	8 gal	6.07	0.061	0.41	0.1	20.33	126	0.05	

ANALYSIS, PRESERVATION AND BOTTLE REQUIRMENTS

Analysis	Method	Preservative	Number	Vol.	Bottle Type	Collected
SVOCs (naphthalene)	SW-846 8270D	none	2	1-L	amber glass	yes
Total Metals (Ar and Mn)	SW-846 3005/6010	HNO3	1	250-mL	HDPE	yes
Dissolved Metals (Ar and Mn)	SW-846 3005/6010	HNO3	1	250-mL	HDPE	yes

OBSERVATIONS / NOTES:

Positioned tubing intake in the middle of the screen. D.O. Test Kit: ~4.0 ~~ppm~~ mg/L

Visual Flock in Purge water from 1500 - 1510

Coordinates:	N	E	Signature(s):

GROUNDWATER SAMPLE LOG SHEET

Tetra Tech Inc.

Event: June 2021 FFTA LTM
Project Site Name: FFTA
Project No.: 112G09524

Sample ID: FFTA-MW0575-20210630	Sampled By: RJB
QA/QC Duplicate ID: NA	Sample Date: 6/30/21
MS/MSD Collected: NA	Sample Time: 0840

WELL INFORMATION:

Well ID : FFTA-MW0575-	Purge Date: 6/30/21
Well Diameter (in): 2-inch	Static Water Level (ft-BTOR): 17.06
Top of Screen (ft-BTOR): 9	PID Monitor Reading: 0
Bottom of Screen (ft-BTOR): 24	Purge Method: low flow
Total Well Depth (ft-BTOR): 27.13	Sample Method: low flow

EQUIPMENT INFORMATION:

Water Quality Instrument: Horiba	Pump Controller: peristaltic pump
Turbidity Meter: LaMotte	

PURGE DATA:

Time (Hrs)	H^20 Level (ft-BTOR)	Flow mL / min.	Color	pH (S.U.)	S.C. (mS/cm)	DO (mg/L)	Turbidity (NTU)	Temp. (C°)	ORP (mV)	Salinity (% or ppt)	Other
0800	17.06	400	Clear			Start	Purge				
0805	17.11	400	Clear	5.64	0.338	4.24	11.6	17.99	207	0.16	
0810	17.12			5.69	0.310	2.17	9.19	18.60	214	0.15	
0815				5.70	0.284	2.21	8.70	19.91	216	0.13	
0820				5.70	0.286	1.91	7.24	19.92	221	0.14	
0825				5.70	0.287	1.86	6.91	19.93	224	0.14	
0830				5.71	0.289	1.60	5.96	19.85	227	0.14	
0835				5.70	0.293	1.64	5.17	19.77	229	0.14	
0840	↓	↓	↓	5.70	0.294	1.78	4.56	19.92	232	0.14	

FINAL PURGE / SAMPLE DATA:

Start Purge	End Purge	Total (min.)	Total Vol. (gal. / L.)	pH (S.U.)	S.C. (mS/cm)	DO (mg/L)	Turbidity (NTU)	Temp. (C°)	ORP (mV)	Salinity (% or ppt)	Other
0800	0840	40	4.2	5.70	0.294	1.78	4.56	19.92	232	0.14	

ANALYSIS, PRESERVATION AND BOTTLE REQUIRMENTS

Analysis	Method	Preservative	Number	Vol.	Bottle Type	Collected
SVOCs (naphthalene)	SW-846 8270D	none	2	1-L	amber glass	yes
Total Metals (Ar and Mn)	SW-846 3005/6010	HNO3	1	250-mL	HDPE	yes
Dissolved Metals (Ar and Mn)	SW-846 3005/6010	HNO3	1	250-mL	HDPE	yes

OBSERVATIONS / NOTES:

Positioned tubing intake in the middle of the screen. D.O. Test Kit: 4 ppm

Small wood pieces in water

Coordinates:	N	E	Signature(s):

GROUNDWATER SAMPLE LOG SHEET

Tetra Tech Inc.

Event: June 2021 FFTA LTM
Project Site Name: FFTA
Project No.: 112G09524

Sample ID:	FFTA-MW-0585 20210629	Sampled By:	JFS
QA/QC Duplicate ID:	NA	Sample Date:	6/29/21
MS/MSD Collected:	NA	Sample Time:	1205
WELL INFORMATION:			
Well ID:	FFTA-MW-0585	Purge Date:	6/29/21
Well Diameter (in):	2-inch	Static Water Level (ft-BTOR):	13.91 btoc
Top of Screen (ft-BTOR):	8 ft btg	PID Monitor Reading:	0.0 ppm
Bottom of Screen (ft-BTOR):	23 ft btg	Purge Method:	low flow
Total Well Depth (ft-BTOR):	21.25 ft btg	Sample Method:	low flow
EQUIPMENT INFORMATION:			
Water Quality Instrument:	Horiba	Pump Controller:	peristaltic pump
Turbidity Meter:	LaMotte		

PURGE DATA:

Time (Hrs)	$H^2$0 Level (ft-BTOR)	Flow mL / min.	Color	pH (S.U.)	S.C. (mS/cm)	DO (mg/L)	Turbidity (NTU)	Temp. (C°)	ORP (mV)	Salinity (% or ppt)	Other
1130	13.94	400ml	clear	6.43	0.068	0.0	17.4	22.53	-35	0.03	
1135	13.94	400ml	clear	6.42	0.072	0.0	7.7	21.90	-36	0.03	
1140	13.94	400ml	clear	6.40	0.072	0.0	4.2	22.07	-32	0.03	
1145	13.94	400ml	clear	6.38	0.070	0.0	0.0	21.93	-28	0.03	
1150	13.94	400ml	clear	6.39	0.068	0.0	0.0	21.77	-26	0.03	
1155	13.94	400ml	clear	6.37	0.068	0.0	0.0	22.14	-26	0.03	
1200	13.94	400ml	clear	6.40	0.069	0.03	0.0	22.30	-27	0.03	
1205	13.94	400ml	clear	6.36	0.069	0.04	0.0	21.92	-25	0.03	
1210	13.94	400ml	clear	6.35	0.068	0.01	0.0	22.03	-24	0.03	

JFS

FINAL PURGE / SAMPLE DATA:

Start Purge	End Purge	Total (min.)	Total Vol. (gal. / L.)	pH (S.U.)	S.C. (mS/cm)	DO (mg/L)	Turbidity (NTU)	Temp. (C°)	ORP (mV)	Salinity (% or ppt)	Other
1130	1210	40	3 gal	6.35	0.068	0.01	0.0	22.03	-24	0.03	

ANALYSIS, PRESERVATION AND BOTTLE REQUIRMENTS

Analysis	Method	Preservative	Number	Vol.	Bottle Type	Collected
SVOCs (naphthalene)	SW-846 8270D	none	2	1-L	amber glass	yes
Total Metals (Ar and Mn)	SW-846 3005/6010	HNO3	1	250-mL	HDPE	yes
Dissolved Metals (Ar and Mn)	SW-846 3005/6010	HNO3	1	250-mL	HDPE	yes

OBSERVATIONS / NOTES:

Positioned tubing intake in the middle of the screen.

D.O. Test Kit: ~~ppm~~ mg/L 0.8

Coordinates:	N	E	Signature(s):

GROUNDWATER SAMPLE LOG SHEET

Tetra Tech Inc.

Event: June 2021 FFTA LTM
Project Site Name: FFTA
Project No.: 112G09524

Sample ID: FFTA-MW06I-20210629	Sampled By: RJB
QA/QC Duplicate ID: NA	Sample Date: 6/29/21
MS/MSD Collected: NA	Sample Time: 1545

WELL INFORMATION:

Well ID : FFTA-MW06I-20210629	Purge Date: 6/29/21
Well Diameter (in): 2-inch	Static Water Level (ft-BTOR): 14.55
Top of Screen (ft-BTOR): 18	PID Monitor Reading: 0
Bottom of Screen (ft-BTOR): 33	Purge Method: low flow
Total Well Depth (ft-BTOR): 32.80	Sample Method: low flow

EQUIPMENT INFORMATION:

Water Quality Instrument: Horiba	Pump Controller: peristaltic pump
Turbidity Meter: LaMotte	

PURGE DATA:

Time (Hrs)	$H^2$0 Level (ft-BTOR)	Flow mL / min.	Color	pH (S.U.)	S.C. (mS/cm)	DO (mg/L)	Turbidity (NTU)	Temp. (C°)	ORP (mV)	Salinity (% or ppt)	Other
1500	14.55	*SP Cloudy 400	—	—	—	Start	Purge	—	—	—	
1505	14.58	*SP Cloudy 400	Cloudy	6.14	0.049	1.71	356	18.97	13	0.07	
1510		400	cloudy	6.29	0.59	0	226	19.17	-21	0.07	
1515			L.cloudy	6.33	0.070	0	131	19.23	-46	0.07	
1520			Clear	6.28	0.071	0	20.7	19.60	-49	0.03	
1525				6.24	0.073	0	16.4	19.67	-51	0.03	
1530				6.31	0.073	0	8.79	20.40	-69	0.03	
1535				6.57	0.073	0	6.41	20.26	-74	0.03	
1540	↓	↓	↓	6.53	0.073	0	4.91	20.26	-74	0.03	
1545	↓	↓	↓	6.51	0.074	0	4.06	20.04	-74	0.03	

FINAL PURGE / SAMPLE DATA:

Start Purge	End Purge	Total (min.)	Total Vol. (gal. / L.)	pH (S.U.)	S.C. (mS/cm)	DO (mg/L)	Turbidity (NTU)	Temp. (C°)	ORP (mV)	Salinity (% or ppt)	Other
1500	1545	45	4.2	6.51	0.074	0	4.06	20.04	-74	0.03	

ANALYSIS, PRESERVATION AND BOTTLE REQUIRMENTS

Analysis	Method	Preservative	Number	Vol.	Bottle Type	Collected
SVOCs (naphthalene)	SW-846 8270D	none	2	1-L	amber glass	yes
Total Metals (Ar and Mn)	SW-846 3005/6010	HNO3	1	250-mL	HDPE	yes
Dissolved Metals (Ar and Mn)	SW-846 3005/6010	HNO3	1	250-mL	HDPE	yes

OBSERVATIONS / NOTES:

Positioned tubing intake in the middle of the screen. D.O. Test Kit: 1 ppm

Coordinates:	N	E	Signature(s):
			RJB

GROUNDWATER SAMPLE LOG SHEET

Tetra Tech Inc.

Event: June 2021 FFTA LTM
Project Site Name: FFTA
Project No.: 112G09524

Sample ID: FFTA-MW102D-20210629	**Sampled By:** RJ Brydon
QA/QC Duplicate ID: NA	**Sample Date:** 6/29/21
MS/MSD Collected: NA	**Sample Time:** 1210
WELL INFORMATION:	
Well ID : FFTA-MW102D	**Purge Date:** 6/29/21
Well Diameter (in): 2-inch	**Static Water Level (ft-BTOR):** 18.03
Top of Screen (ft-BTOR): 37	**PID Monitor Reading:** 0
Bottom of Screen (ft-BTOR): 47	**Purge Method:** low flow
Total Well Depth (ft-BTOR): 50.09	**Sample Method:** low flow
EQUIPMENT INFORMATION:	
Water Quality Instrument: Horiba	**Pump Controller:** peristaltic pump
Turbidity Meter: LaMotte	

PURGE DATA:

Time (Hrs)	$H^2$0 Level (ft-BTOR)	Flow mL / min.	Color	pH (S.U.)	S.C. (mS/cm)	DO (mg/L)	Turbidity (NTU)	Temp. (C°)	ORP (mV)	Salinity (% or ppt)	Other
1130	18.03	400	Clear			Start Purge					
1135	18.07	400	Clear	5.66	0.092	3.35	8.12	22.01	135	0.04	
1140	↓	400	↓	5.61	0.091	3.27	6.96	21.96	151	0.04	
1145		400		5.59	0.090	3.22	4.71	21.93	163	0.04	
1150		400		5.56	0.094	3.27	4.15	21.70	165	0.04	
1155		400		5.54	0.094	3.38	3.71	22.36	173	0.04	
1200		400		5.55	0.093	3.40	3.40	22.08	180	0.04	
1205		400		5.56	0.093	3.39	2.98	21.95	182	0.04	
1210	↓	400	↓	5.56	0.093	3.39	2.96	21.81	183	0.04	

FINAL PURGE / SAMPLE DATA:

Start Purge	End Purge	Total (min.)	Total Vol. (gal. / L.)	pH (S.U.)	S.C. (mS/cm)	DO (mg/L)	Turbidity (NTU)	Temp. (C°)	ORP (mV)	Salinity (% or ppt)	Other
1130	1210	40	4.2	5.56	0.093	3.39	2.96	21.81	183	0.04	

ANALYSIS, PRESERVATION AND BOTTLE REQUIRMENTS

Analysis	Method	Preservative	Number	Vol.	Bottle Type	Collected
SVOCs (naphthalene)	SW-846 8270D	none	2	1-L	amber glass	yes
Total Metals (Ar and Mn)	SW-846 3005/6010	HNO3	1	250-mL	HDPE	yes
Dissolved Metals (Ar and Mn)	SW-846 3005/6010	HNO3	1	250-mL	HDPE	yes

OBSERVATIONS / NOTES:

Positioned tubing intake in the middle of the screen. D.O. Test Kit: 7 ppm

Coordinates:	N	E	Signature(s):
			RJB/BJC

GROUNDWATER SAMPLE LOG SHEET

Tetra Tech Inc.

Event: June 2021 FFTA LTM
Project Site Name: FFTA
Project No.: 112G09524

Sample ID:	FFTA-MW-105D-20210630	Sampled By:	JFS
QA/QC Duplicate ID:	NA	Sample Date:	6/30/21
MS/MSD Collected:	NA	Sample Time:	0845
WELL INFORMATION:			
Well ID:	FFTA-MW-105D	Purge Date:	6/30/21
Well Diameter (in):	2-inch	Static Water Level (ft-BTOR):	20.04
Top of Screen (ft-BTOR):	41.0	PID Monitor Reading:	0.0
Bottom of Screen (ft-BTOR):	51.0	Purge Method:	low flow
Total Well Depth (ft-BTOR):	54.84	Sample Method:	low flow
EQUIPMENT INFORMATION:			
Water Quality Instrument:	Horiba	Pump Controller:	peristaltic pump
Turbidity Meter:	LaMotte		

PURGE DATA:

Time (Hrs)	H^20 Level (ft-BTOR)	Flow mL / min.	Color	pH (S.U.)	S.C. (mS/cm)	DO (mg/L)	Turbidity (NTU)	Temp. (C°)	ORP (mV)	Salinity (% or ppt)	Other
0750	20.13	400 ml	clear	5.60	0.088	2.77	7.7	17.68	230	0.04	
0755	20.13	400	clear	5.52	0.087	2.83	6.9	17.74	236	0.04	
0800	20.13	400	clear	5.52	0.087	2.84	7.1	17.68	238	0.04	
0805	20.13	400	clear	5.52	0.085	4.08	2.7	17.48	243	0.04	
0810	20.13	400	clear	5.45	0.083	3.12	2.3	17.37	255	0.04	
0815	20.13	400	clear	5.40	0.083	3.10	2.0	17.39	267	0.04	
0820	20.13	400	clear	5.37	0.083	3.11	1.5	17.35	270	0.04	
0825	20.13	400	clear	5.36	0.082	3.04	2.1	17.26	276	0.04	
0830	20.13	400	clear	5.35	0.082	3.10	2.5	17.28	278	0.04	
0835	20.13	400	clear	5.38	0.082	3.15	2.7	17.38	274	0.04	
0840	20.13	400	clear	5.40	0.082	3.18	2.5	17.43	272	0.04	
					JFS						

FINAL PURGE / SAMPLE DATA:

Start Purge	End Purge	Total (min.)	Total Vol. (gal. / L.)	pH (S.U.)	S.C. (mS/cm)	DO (mg/L)	Turbidity (NTU)	Temp. (C°)	ORP (mV)	Salinity (% or ppt)	Other
0750	840	50	4 gal	5.40	0.082	3.18	2.5	17.43	272	0.04	

ANALYSIS, PRESERVATION AND BOTTLE REQUIRMENTS

Analysis	Method	Preservative	Number	Vol.	Bottle Type	Collected
SVOCs (naphthalene)	SW-846 8270D	none	2	1-L	amber glass	yes
Total Metals (Ar and Mn)	SW-846 3005/6010	HNO3	1	250-mL	HDPE	yes
Dissolved Metals (Ar and Mn)	SW-846 3005/6010	HNO3	1	250-mL	HDPE	yes

OBSERVATIONS / NOTES:

Positioned tubing intake in the middle of the screen. D.O. Test Kit: ~3.0 ~~ppm~~ mg/L

Adjusted Angle & Flow Through at 0808 to Remove Air bubbles

Coordinates:	N	E	Signature(s):

GROUNDWATER SAMPLE LOG SHEET

Tetra Tech Inc.

Event: June 2021 FFTA LTM
Project Site Name: FFTA
Project No.: 112G09524

Sample ID: FFTA-MW106-20210629	Sampled By: JPS
QA/QC Duplicate ID: ~~FFTA-DUP~~	Sample Date: 6/29/21
MS/MSD Collected: FFTA-MW106-20210629 MS/MSD	Sample Time: 1420
WELL INFORMATION:	
Well ID : FFTA-MW 106	Purge Date: 6/29/21
Well Diameter (in): 2-inch	Static Water Level (ft-BTOR): 13.94
Top of Screen (ft-BTOR): 13	PID Monitor Reading: 0.0ppm
Bottom of Screen (ft-BTOR): 23	Purge Method: low flow
Total Well Depth (ft-BTOR): 25.47ft	Sample Method: low flow
EQUIPMENT INFORMATION:	
Water Quality Instrument: Horiba	Pump Controller: peristaltic pump
Turbidity Meter: LaMotte	

PURGE DATA:

Time (Hrs)	H^20 Level (ft-BTOR)	Flow mL / min.	Color	pH (S.U.)	S.C. (mS/cm)	DO (mg/L)	Turbidity (NTU)	Temp. (C°)	ORP (mV)	Salinity (% or ppt)	Other
1330	14.01	400 ml	clear	6.24	0.082	5.86	0.0	20.17	114	0.04	
1335	13.98	400 ml	clear	6.15	0.081	5.13	0.0	19.89	127	0.04	
1340	13.98	400 ml	clear	6.03	0.076	5.37	0.0	19.54	154	0.05	
1345	13.97	400 ml	clear	5.95	0.073	4.89	0.0	19.36	169	0.03	
1350	13.97	400 ml	clear	5.96	0.073	4.68	0.0	19.40	169	0.03	
1355	13.97	400 ml	clear	6.01	0.071	4.74	0.0	19.68	170	0.03	
1400	13.97	400 ml	clear	6.16	0.073	5.88	0.0	19.26	168	0.03	
1405	13.97	400 ml	clear	6.20	0.073	4.85	0.0	19.15	169	0.03	
1410	13.97	400 ml	clear	6.23	0.074	4.84	0.0	19.12	170	0.03	
1415	13.97	400 ml	clear	6.27	0.074	4.81	0.0	19.15	171	0.03	
				JPS							

FINAL PURGE / SAMPLE DATA:

Start Purge	End Purge	Total (min.)	Total Vol. (gal. / L.)	pH (S.U.)	S.C. (mS/cm)	DO (mg/L)	Turbidity (NTU)	Temp. (C°)	ORP (mV)	Salinity (% or ppt)	Other
1330	1415	45	3 gal	6.27	0.074	4.81	0.0	19.15	171	0.03	

ANALYSIS, PRESERVATION AND BOTTLE REQUIRMENTS

Analysis	Method	Preservative	Number	Vol.	Bottle Type	Collected
SVOCs (naphthalene)	SW-846 8270D	none	2	1-L	amber glass	yes
Total Metals (Ar and Mn)	SW-846 3005/6010	HNO3	1	250-mL	HDPE	yes
Dissolved Metals (Ar and Mn)	SW-846 3005/6010	HNO3	1	250-mL	HDPE	yes

OBSERVATIONS / NOTES:

Positioned tubing intake in the middle of the screen. D.O. Test Kit: ~~ppm~~ mg/L ~ 80mg/L

Coordinates:	N	E	Signature(s):

GROUNDWATER SAMPLE LOG SHEET

Tetra Tech Inc.

Event: June 2021 FFTA LTM
Project Site Name: FFTA
Project No.: 112G09524

Sample ID:	FFTA-MW107-20210629	**Sampled By:**	RJB
QA/QC Duplicate ID:	FFTA-DUP01-20210629	**Sample Date:**	6/29/21
MS/MSD Collected:	NA	**Sample Time:**	1410
WELL INFORMATION:			
Well ID :	FFTA-MW107	**Purge Date:**	6/29/21
Well Diameter (in):	2-inch	**Static Water Level (ft-BTOR):**	14.57
Top of Screen (ft-BTOR):	13	**PID Monitor Reading:**	0
Bottom of Screen (ft-BTOR):	23	**Purge Method:**	low flow
Total Well Depth (ft-BTOR):	25.49	**Sample Method:**	low flow
EQUIPMENT INFORMATION:			
Water Quality Instrument:	Horiba	**Pump Controller:**	peristaltic pump
Turbidity Meter:	LaMotte		

PURGE DATA:

Time (Hrs)	$H^2$0 Level (ft-BTOR)	Flow mL / min.	Color	pH (S.U.)	S.C. (mS/cm)	DO (mg/L)	Turbidity (NTU)	Temp. (C°)	ORP (mV)	Salinity (% or ppt)	Other
1330	14.57	400	Clear								
1335	14.62	400	Clear	6.31	0.158	1.22	34.1	19.56	-73	0.07	
1340	14.63			6.42	0.144	1.96	146	19.23	-73	0.07	
1345				6.49	0.142	1.52	12.9	19.20	-74	0.07	
1350				6.52	0.040	1.41	11.2	19.19	-74	0.06	
1355				6.48	0.137	0.96	9.66	19.11	-71	0.06	
1400				6.44	0.133	0.46	8.17	19.03	-68	0.06	
1405				6.41	0.129	0	7.26	18.88	-67	0.06	
1410	↓	↓	↓	6.41	0.128	0	6.49	18.80	-67	0.06	

FINAL PURGE / SAMPLE DATA:

Start Purge	End Purge	Total (min.)	Total Vol. (gal. / L.)	pH (S.U.)	S.C. (mS/cm)	DO (mg/L)	Turbidity (NTU)	Temp. (C°)	ORP (mV)	Salinity (% or ppt)	Other
1330	1410	40	4.2	6.41	0.128	0	6.49	18.80	-67	0.06	

ANALYSIS, PRESERVATION AND BOTTLE REQUIRMENTS

Analysis	Method	Preservative	Number	Vol.	Bottle Type	Collected
SVOCs (naphthalene)	SW-846 8270D	none	2	1-L	amber glass	yes
Total Metals (Ar and Mn)	SW-846 3005/6010	HNO3	1	250-mL	HDPE	yes
Dissolved Metals (Ar and Mn)	SW-846 3005/6010	HNO3	1	250-mL	HDPE	yes

OBSERVATIONS / NOTES:

Positioned tubing intake in the middle of the screen. D.O. Test Kit: 1 ppm

Coordinates:	N	E	Signature(s):
			RJB

GROUNDWATER SAMPLE LOG SHEET

Tetra Tech Inc.

Event: June 2021 FFTA LTM
Project Site Name: FFTA
Project No.: 112G09524

Sample ID: FFTA-MW108-20210630	Sampled By: RJB
QA/QC Duplicate ID: NA	Sample Date: 6/30/21
MS/MSD Collected: NA	Sample Time: 1100

WELL INFORMATION:

Well ID : FFTA-MW108	Purge Date: 6/30/21
Well Diameter (in): 2-inch	Static Water Level (ft-BTOR): 16.26
Top of Screen (ft-BTOR): 13	PID Monitor Reading: 0
Bottom of Screen (ft-BTOR): 23	Purge Method: low flow
Total Well Depth (ft-BTOR): 25.42	Sample Method: low flow

EQUIPMENT INFORMATION:

Water Quality Instrument: Horiba	Pump Controller: peristaltic pump
Turbidity Meter: LaMotte	

PURGE DATA:

Time (Hrs)	H^20 Level (ft-BTOR)	Flow mL / min.	Color	pH (S.U.)	S.C. (mS/cm)	DO (mg/L)	Turbidity (NTU)	Temp. (C°)	ORP (mV)	Salinity (% or ppt)	Other
1020	16.26	400	Clear			Start	Purge				
1025	16.27			5.93	0.060	6.52	12.6	19.20	234	0.03	
1030				5.92	0.061	6.59	9.30	19.26	239	0.02	
1035				5.92	0.065	6.68	7.41	19.27	241	0.02	
1040				5.94	0.057	6.54	6.17	19.61	240	0.02	
1045				5.94	0.055	6.51	6.01	19.75	244	0.02	
1050				5.93	0.055	6.56	5.75	19.73	246	0.02	
1055				5.93	0.056	6.55	5.06	19.05	246	0.02	
1100	↓	↓	↓	5.95	0.056	6.56	4.71	19.12	247	0.02	

FINAL PURGE / SAMPLE DATA:

Start Purge	End Purge	Total (min.)	Total Vol. (gal. / L.)	pH (S.U.)	S.C. (mS/cm)	DO (mg/L)	Turbidity (NTU)	Temp. (C°)	ORP (mV)	Salinity (% or ppt)	Other
1020	1100	40	4.2	5.95	0.056	6.56	4.71	19.12	247	0.02	

ANALYSIS, PRESERVATION AND BOTTLE REQUIRMENTS

Analysis	Method	Preservative	Number	Vol.	Bottle Type	Collected
SVOCs (naphthalene)	SW-846 8270D	none	2	1-L	amber glass	yes
Total Metals (Ar and Mn)	SW-846 3005/6010	HNO3	1	250-mL	HDPE	yes
Dissolved Metals (Ar and Mn)	SW-846 3005/6010	HNO3	1	250-mL	HDPE	yes

OBSERVATIONS / NOTES:

Positioned tubing intake in the middle of the screen. D.O. Test Kit: 9 ppm

Tilted horiba to remove air bubbles.

Coordinates:	N	E	Signature(s):
			RJB

APPENDIX D

QUALITY ASSURANCE SAMPLE LOG SHEETS

TETRA TECH

QA SAMPLE LOG SHEET

Project Site Name: NASA Wallops FFTA

Sample ID: FFTA - FB01 - 20210630

Project Number: 112609524

Sampled By: RJ Brydon

QA Sample Type:
[ ] Trip Blank
[ ] Source Water Blank

[ ] Rinsate Blank
[X] Other Blank

SAMPLING DATA:	WATER SOURCE:
Date: 6/30/21 Time: 1630 Method: Direct from container using peristaltic Pump	[ ] Laboratory Prepared [ ] Tap [ ] Purchased [ ] Fire Hydrant [ ] Other
PURCHASED WATER INFORMATION (If Applicable as Source or Rinsate Water):	**RINSATE INFORMATION (If Applicable):**
Product Name: Distilled Water Supplier: Food Lion Manufacturer: Food Lion Order Number: Lot Number: Expiration Date: July 2022	Media Type: Equipment Used: Equipment Type: [ ] Dedicated [ ] Reusable

SAMPLE COLLECTION INFORMATION:

ANALYSIS	METHOD	PRESERVATIVE	QUANTITY	VOLUME	BOTTLE TYPE	COLLECTED?
Total Metals	SW-846 3005/6010	HNO_3	1	250 mL	HPDE	Yes
Dissolved Metals	SW-846 3005/6010	HNO_3	1	250 mL	HPDE	Yes
SVOC	SW-846 8270D	None	2	1L	Amber	Yes

OBSERVATIONS / NOTES:

Dissolved Metals were filtered

Signature(s):

RJB

APPENDIX E

CHAIN OF CUSTODY FORMS

TETRA TECH

CHAIN OF CUSTODY

NO. 001 FA86916

Page 1 of 1

Project No:	Facility:	Project Manger:	Phone:	Laboratory Name and Contact:
112609524	NASA WFF	Rob Sok	757-466-4904	SGS-Accutest - Andrea Colby
Samplers: RJ Brydon, Jed Smith		**Field Ops. Leader:** Jed Smith	**Phone:** 304-532-2279	**Address:** 4405 Vineland Road
		Fed Ex Airbill Number: 8138 8367 3995		**City, State, Zip:** Orlando, FL 32811

Container Type: Plastic (P) or Glass (G) — G R | P | P

Preservative Used: None | ~~NaOH~~ None | HNO_3

	Date Year: 2021	Time	Sample ID	Location ID	Top Depth (FT)	Bottom Depth (FT)	Matrix (GW, SO, SW, QC)	Grab, Composite (G, C)	Total No. of Containers	ANALYSIS: SVOCs (naphthalene) SW-846 8270D	Total Metals (Ar and Mn) SW-846 3005/6010	Diss. Metals (Ar and Mn) Field Filtered SW-846 3005/6010					Comments
1	6/29/21	1100	FFTA-MW055S-20210629	FFTA-MW055S	8	23	GW	G	4	2	1	1	--	--	--	--	
2	6/29/21	1045	FFTA-MW055D-20210629	FFTA-MW055D	14	29	GW	G	4	2	1	1	--	--	--	--	
3	6/29/21	1535	FFTA-MW056D-20210629	FFTA-MW056D	24	43	GW	G	4	2	1	1	--	--	--	--	
4	6/30/21	0840	FFTA-MW057S-20210630	FFTA-MW057S	9	24	GW	G	4	2	1	1	--	--	--	--	
5	6/29/21	1215	FFTA-MW058S-20210629	FFTA-MW058S	8	23	GW	G	4	2	1	1	--	--	--	--	
6	6/29/21	1545	FFTA-MW061I-20210629	FFTA-MW061I	18	33	GW	G	4	2	1	1	--	--	--	--	
7	6/29/21	1210	FFTA-MW102D-20210629	FFTA-MW102D	37	47	GW	G	4	2	1	1	--	--	--	--	
8	6/30/21	0845	FFTA-MW105D-20210630	FFTA-MW105D	41	51	GW	G	4	2	1	1	--	--	--	--	
9	6/29/21	1420	FFTA-MW106-20210629	FFTA-MW106	13	23	GW	G	12	2	1	1	--	--	--	--	Run MSMSD
10	6/29/21	1410	FFTA-MW107-20210629	FFTA-MW107	13	23	GW	G	4	2	1	1	--	--	--	--	
11	6/30/21	1100	FFTA-MW108-20210630	FFTA-MW108	13	23	GW	G	4	2	1	1	--	--	--	--	
12	6/29/21	1200	FFTA-DUP01-20210629	--	--	--	GW	G	4	2	1	1	--	--	--	--	Duplicate
13	6/30/21	1630	FFTA-FB01-20210630	--	--	--	QA	G	4	2	1	1	--	--	--	--	Field Blank

INITIAL ASSESSMENT LABEL VERIFICATION

1. Relinquished By: Richard Brydon RJB	Date: 6/30/21	Time: 1730	1. Received By: FedEx	Date:	Time:
2. Relinquished By: FX	Date:	Time:	2. Received By:	Date: 7/1/21	Time: 0945

Comments: 1,4°-1R4

APPENDIX F

DATA VALIDATION REPORT

TETRA TECH

INTERNAL CORRESPONDENCE

TO: **R. SOK** **DATE:** **SEPTEMBER 14, 2021**

FROM: **TERRI L. SOLOMON** **COPIES:** **DV FILE**

SUBJECT: **ORGANIC & INORGANIC DATA VALIDATION – NAPHTHALENE / SELECT TOTAL AND DISSOLVED METALS**
NASA WALLOPS ISLAND
SAMPLE DELIVERY GROUP (SDG) FA86916

SAMPLES: 12/Aqueous/
Naphthalene, Select Total and Dissolved Metals

FFTA-DUP01-20210629	FFTA-MW055D-20210629
FFTA-MW055S-20210629	FFTA-MW056D-20210629
FFTA-MW057S-20210630	FFTA-MW058S-20210629
FFTA-MW061I-20210629	FFTA-MW102D-20210629
FFTA-MW105D-20210630	FFTA-MW106-20210629
FFTA-MW107-20210629	FFTA-MW108-20210630

1/Field Blank/
Naphthalene, Select Total and Dissolved Metals
FFTA-FB01-20210630

Overview

The sample set for NASA Wallops Island, SDG FA86916 consisted of twelve (12) aqueous environmental samples and one (1) field blank. The samples were analyzed for naphthalene and total and dissolved metals (arsenic and manganese) as referenced above. One field duplicate pair, FFTA-MW107-20210629 / FFTA-DUP01-20210629, was included in this SDG.

The samples were collected by Tetra Tech, Inc., on June 29 and 30, 2021 and analyzed by SGS Laboratories. All analyses were conducted in accordance with SW-846 Methods 8270D and 6010C analytical and reporting protocols.

The data contained in this SDG were validated with regard to the following parameters: data completeness, holding times, GC/MS tuning, initial/continuing calibrations, laboratory method/instrument/field blanks, Interference Check Sample (ICS), surrogate spike recoveries, laboratory control sample results, internal standard areas and recoveries, matrix spike / matrix spike duplicate results, post digestion spike recoveries, ICP serial dilution results, field duplicate results, chromatographic resolution, analyte identification, analyte quantitation, and detection limits. Areas of concern are listed below.

Major

None.

Minor

- The surrogate recovery for nitrobenzene-d5 was below the quality control limit for sample FFTA-MW055S-20210629. The sample was re-analyzed and the surrogate recoveries for nitrobenzene-d5 and 2-fluorobiphenyl were below the quality control limit. The laboratory noted that there was insufficient sample volume to re-prepare the sample. The original sample result was used for validation. The detected result reported for naphthalene in the affected sample was qualified as estimated biased low (J-).

- The following contamination was detected in method blanks at the following maximum concentrations.

Compound	Concentration	Action Level RL > or <
Manganese(1)	2.3 ug/L	<
Manganese(2)	0.6 ug/L	<

(1) Maximum concentration present in a method blank (preparation batch MP39195) affecting total samples FFTA-MW055D-20210629, FFTA-MW055S-20210629, FFTA-MW056D-20210629, FFTA-MW057S-20210630, FFTA-MW058S-20210629, FFTA-MW061I-20210629 and FFTA-MW102D-20210629.
(2) Maximum concentration present in a method blank (preparation batch MP39200) affecting total sample FFTA-MW106-20210629.

The detected results reported below the RL were qualified as nondetected (U).

- Detected results reported below the reporting limit (RL) but above the method detection limit (MDL) were qualified as estimated (J).

Notes

The nondetected results are reported to the method detection limit (MDL).

Executive Summary

Laboratory Performance: Several surrogate recoveries were below the quality control limits. Blank contamination was present in several method blanks.

Other Factors Affecting Data Quality: Results below the reporting limit were estimated.

The data for these analyses were reviewed with reference to the "National Functional Guidelines for Organic Superfund Methods Review" (January 2017) and the "National Functional Guidelines for Inorganic Superfund Methods Data Review" (January 2017). The text of this report has been formulated to address only those areas affecting data quality.

Tetra Tech, Inc.
Terri L. Solomon
Chemist/Data Validator

Tetra Tech, Inc.
Joseph A. Samchuck
Data Validation Manager

Attachments:
Appendix A – Qualified Analytical Results
Appendix B – Results as Reported by the Laboratory
Appendix C – Support Documentation

Data Qualifier Definitions

The following definitions provide brief explanations of the validation qualifiers assigned to results in the data review process.

U	The analyte was analyzed for, but was not detected at a level greater than or equal to the level of the adjusted detection limit.
J	The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample (due either to the quality of the data generated because certain quality control criteria were not met, or the concentration of the analyte was below the reporting limit).
J+	The result is an estimated quantity, but the result may be biased high.
J-	The result is an estimated quantity, but the result may be biased low.
UJ	The analyte was analyzed for, but was not detected. The reported detection limit is approximate and may be inaccurate or imprecise.
NJ	The analyte has been “tentatively identified” or “presumptively” as present and the associated numerical value is the estimated concentration in the sample.
R	The sample result (detected) is unusable due to the quality of the data generated because certain criteria were not met. The analyte may or may not be present in the sample.
UR	The sample result (nondetected) is unusable due to the quality of the data generated because certain criteria were not met. The analyte may or may not be present in the sample.
X	The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Acceptance or rejection of the data should be decided by the project team, but exclusion of the data is recommended.

Appendix A

Qualified Analytical Results

Qualifier Codes:

A = Lab Blank Contamination
B = Field Blank Contamination
C = Calibration Noncompliance (i.e., % RSDs, %Ds, ICVs, CCVs, RRFs, etc.)
C01 = GC/MS Tuning Noncompliance
D = MS/MSD Recovery Noncompliance
E = LCS/LCSD Recovery Noncompliance
F = Lab Duplicate Imprecision
G = Field Duplicate Imprecision
H = Holding Time Exceedance
I = ICP Serial Dilution Noncompliance
J = ICP PDS Recovery Noncompliance; MSA's r < 0.995
K = ICP Interference - includes ICS % R Noncompliance
L = Instrument Calibration Range Exceedance
M = Sample Preservation Noncompliance
N = Internal Standard Noncompliance
N01 = Internal Standard Recovery Noncompliance Dioxins
N02 = Recovery Standard Noncompliance Dioxins
N03 = Clean-up Standard Noncompliance Dioxins
O = Poor Instrument Performance (i.e., base-time drifting)
P = Uncertainty near detection limit (< 2 x IDL for inorganics and <CRQL for organics)
Q = Other problems (can encompass a number of issues; i.e.chromatography,interferences, etc.)
R = Surrogates Recovery Noncompliance
S = Pesticide/PCB Resolution
T = % Breakdown Noncompliance for DDT and Endrin
U = RPD between columns/detectors >40% for positive results determined via GC/HPLC
V = Non-linear calibrations; correlation coefficient r < 0.995
W = EMPC result
X = Signal to noise response drop
Y = Percent solids <30%
Z = Uncertainty at 2 standard deviations is greater than sample activity
Z1 = Tentatively Identified Compound considered presumptively present
Z2 = Tentatively Identified Compound column bleed
Z3 = Tentatively Identified Compound aldol condensate
Z4 = Sample activity is less than the at uncertainty at 3 standard deviations and greater than the MDC
Z5 = Sample activity is less than the at uncertainty at 3 standard deviations and less than the MDC

PROJ_NO: 112G09524	NSAMPLE	FFTA-DUP01-20210629			FFTA-FB01-20210630			FFTA-MW055D-20210629			FFTA-MW055S-20210629		
SDG: FA86916	LAB_ID	FA86916-12			FA86916-13			FA86916-2			FA86916-1		
FRACTION: OS	SAMP_DATE	6/29/2021			6/29/2021			6/29/2021			6/29/2021		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF	FFTA-MW107-20210629											
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
NAPHTHALENE		0.48	U		0.5	U		8.8			39.4	J-	R

PROJ_NO: 112G09524	NSAMPLE	FFTA-MW056D-20210629			FFTA-MW057S-20210630			FFTA-MW058S-20210629			FFTA-MW061I-20210629		
SDG: FA86916	LAB_ID	FA86916-3			FA86916-4			FA86916-5			FA86916-6		
FRACTION: OS	SAMP_DATE	6/29/2021			6/30/2021			6/29/2021			6/29/2021		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
NAPHTHALENE		0.48	U		0.48	U		0.48	U		0.48	U	

PROJ_NO: 112G09524	NSAMPLE	FFTA-MW102D-20210629			FFTA-MW105D-20210630			FFTA-MW106-20210629			FFTA-MW107-20210629		
SDG: FA86916	LAB_ID	FA86916-7			FA86916-8			FA86916-9			FA86916-10		
FRACTION: OS	SAMP_DATE	6/29/2021			6/30/2021			6/29/2021			6/29/2021		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
NAPHTHALENE		0.49	U		0.48	U		0.48	U		0.48	U	

PROJ_NO: 112G09524	NSAMPLE	FFTA-MW108-20210630		
SDG: FA86916	LAB_ID	FA86916-11		
FRACTION: OS	SAMP_DATE	6/30/2021		
MEDIA: WATER	QC_TYPE	NM		
	UNITS	UG/L		
	PCT_SOLIDS	0.0		
	DUP_OF			
PARAMETER		RESULT	VQL	QLCD
NAPHTHALENE		0.48	U	

PROJ_NO: 112G09524	NSAMPLE	FFTA-DUP01-20210629			FFTA-FB01-20210630			FFTA-MW055D-20210629			FFTA-MW055S-20210629		
SDG: FA86916	LAB_ID	FA86916-12			FA86916-13			FA86916-2			FA86916-1		
FRACTION: M	SAMP_DATE	6/29/2021			6/29/2021			6/29/2021			6/29/2021		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF	FFTA-MW107-20210629											
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ARSENIC		40.3			1.3	U		17.4			20.2		
MANGANESE		327			1	U		93			163		

PROJ_NO: 112G09524	NSAMPLE	FFTA-MW056D-20210629			FFTA-MW057S-20210630			FFTA-MW058S-20210629			FFTA-MW061I-20210629		
SDG: FA86916	LAB_ID	FA86916-3			FA86916-4			FA86916-5			FA86916-6		
FRACTION: M	SAMP_DATE	6/29/2021			6/30/2021			6/29/2021			6/29/2021		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ARSENIC		1.6	J	P	1.3	U		7.7	J	P	13.7		
MANGANESE		817			436			835			1100		

PROJ_NO: 112G09524	NSAMPLE	FFTA-MW102D-20210629			FFTA-MW105D-20210630			FFTA-MW106-20210629			FFTA-MW107-20210629		
SDG: FA86916	LAB_ID	FA86916-7			FA86916-8			FA86916-9			FA86916-10		
FRACTION: M	SAMP_DATE	6/29/2021			6/30/2021			6/29/2021			6/29/2021		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ARSENIC		1.3	U		1.3	U		1.3	U		39.6		
MANGANESE		2.7	U	A	1.5	J	P	2	J	P	329		

PROJ_NO: 112G09524	NSAMPLE	FFTA-MW108-20210630		
SDG: FA86916	LAB_ID	FA86916-11		
FRACTION: M	SAMP_DATE	6/30/2021		
MEDIA: WATER	QC_TYPE	NM		
	UNITS	UG/L		
	PCT_SOLIDS	0.0		
	DUP_OF			
PARAMETER		RESULT	VQL	QLCD
ARSENIC		1.3	U	
MANGANESE		1	U	

PROJ_NO: 112G09524	NSAMPLE	FFTA-DUP01-20210629			FFTA-FB01-20210630			FFTA-MW055D-20210629			FFTA-MW055S-20210629		
SDG: FA86916	LAB_ID	FA86916-12F			FA86916-13F			FA86916-2F			FA86916-1F		
FRACTION: MF	SAMP_DATE	6/29/2021			6/29/2021			6/29/2021			6/29/2021		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF	FFTA-MW107-20210629											
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ARSENIC		41.8			1.3	U		15.1			16.7		
MANGANESE		336			1	U		80			141		

PROJ_NO: 112G09524	NSAMPLE	FFTA-MW056D-20210629			FFTA-MW057S-20210630			FFTA-MW058S-20210629			FFTA-MW061I-20210629		
SDG: FA86916	LAB_ID	FA86916-3F			FA86916-4F			FA86916-5F			FA86916-6F		
FRACTION: MF	SAMP_DATE	6/29/2021			6/30/2021			6/29/2021			6/29/2021		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ARSENIC		1.3	U		1.3	U		7.6	J	P	7.6	J	P
MANGANESE		121			1.7	J	P	885			1190		

PROJ_NO: 112G09524	NSAMPLE	FFTA-MW102D-20210629			FFTA-MW105D-20210630			FFTA-MW106-20210629			FFTA-MW107-20210629		
SDG: FA86916	LAB_ID	FA86916-7F			FA86916-8F			FA86916-9F			FA86916-10F		
FRACTION: MF	SAMP_DATE	6/29/2021			6/30/2021			6/29/2021			6/29/2021		
MEDIA: WATER	QC_TYPE	NM			NM			NM			NM		
	UNITS	UG/L			UG/L			UG/L			UG/L		
	PCT_SOLIDS	0.0			0.0			0.0			0.0		
	DUP_OF												
PARAMETER		RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD	RESULT	VQL	QLCD
ARSENIC		1.3	U		1.3	U		1.3	U		40.4		
MANGANESE		1	J	P	1.2	J	P	1	U		332		

PROJ_NO: 112G09524	NSAMPLE	FFTA-MW108-20210630		
SDG: FA86916	LAB_ID	FA86916-11F		
FRACTION: MF	SAMP_DATE	6/30/2021		
MEDIA: WATER	QC_TYPE	NM		
	UNITS	UG/L		
	PCT_SOLIDS	0.0		
	DUP_OF			
PARAMETER		RESULT	VQL	QLCD
ARSENIC		1.3	U	
MANGANESE		1	U	

APPENDIX G

GEOLOGIC CROSS SECTIONS

NASA-Wallopsisland_4740\FFTA RI\4740GM15.dwg 05/14/04 MKB PHL

N

LEGEND

= MONITORING WELL

= CROSS SECTION LOCATION

M-17 M-19 M-20 M-21 M-22 M-22A M-12 M-14 M-184 M-183 M-9 M-10 M-11 M-18 D-12 D-53 TAXI WAY RUNWAY 10 - 28 RUNWAY 17 - 35

FTA-MW104S B B'

A A'

FTA-MW-57S FTA-MW-102D FTA-MW-105D FTA-MW-58S FTA-MW-61I FTA-MW-56D FTA-MW-103D FTA-MW-103I FTA-MW-103S FTA-MW-55D FTA-MW-55S FTA-MW-59S FTA-MW-54S FTA-MW-01 FTA-MW-101S FTA-MW-60I FTA-MW-02D FTA-MW-02S FTA-MW-53S

MW-14GW-05 MW-14GW-04 MW-14GW-03 MW-14GW-01 MW-14GW-02

0 250± 500±

SCALE IN FEET

NOTE:

ELEVATION CONTOURS ARE METRIC.

TETRA TECH NUS, INC.

FORMER FIRE TRAINING AREA
CROSS SECTION LOCATION MAP
NASA WALLOPS FLIGHT FACILITY
WALLOPS ISLAND, VIRGINIA

FILE 4740GM15.dwg JLF PHL	SCALE AS NOTED
FIGURE NUMBER FIGURE 4-10	REV DATE 8/6/03

NASA-Wallopsisland_4740\FFTA RI\4740GX03.dwg 05/14/04 MKB PHL

FTA-MW-102D | FTA-MW-58S | FTA-MW-61I | FTA-MW-103S,I,D | MW-14GW-05

A

A'

GROUND SURFACE

WATER TABLE

UNNAMED TRIBUTARY TO LITTLE MOSQUITO CREEK

F SAND

FGR SAND

M-C SAND

F SAND

DK GRAY CLAY

F-M SAND

LT. GRAY SILTY CLAY

F SAND

DK GRAY SILTY CLAY

SILTY SAND

DK BROWN SILTY CLAY

F-M SAND

LT. GRAY SILTY CLAY

6.0	14.67		
23.0			
11.0	14.33		
33.0		TD 33.0	
35.0	10.18		
48.0		48.0	TD
8.0	16.42		
16.0			
19.0	12.70		
25.0			
36.0	10.29		
50.0		TD 50.0	
1.0	10.17		
6.0		TD 6.0	

ELEVATION (FEET ABOVE MEAN SEA LEVEL)

30 20 10 0 -10 -20 -30

ELEVATION (METERS ABOVE MEAN SEA LEVEL)

10 5 0 -5 -10

LEGEND

MONITORING WELL OR BORING NUMBER — FTA-MW-58S

GROUND SURFACE

WATER TABLE

TOP OF SCREENED INTERVAL (FT BGS) — 6.0

STRATIGIRAPHIC CONTACT

BOTTOM OF SCREENED INTERVAL (FT BGS) — 23.0 TD 23.0

10.29 — HYDRAULIC HEAD (FEET)

NOTE

WATER ELEVATIONS MEASURED 3/19/03

0 60 120

HORIZONTAL SCALE IN FEET

0 10 20

VERTICAL SCALE IN FEET

TETRA TECH NUS, INC.

FORMER FIRE TRAINING AREA
CROSS SECTION A-A'
NASA WALLOPS FLIGHT FACILITY
WALLOPS ISLAND, VIRGINIA

FILE 4740GX03.dwg JLF PHL	SCALE AS NOTED
FIGURE NUMBER FIGURE 4-11	REV 0 DATE 8/11/03

NASA–Wallopsisland_4740\FFTA RI\4740GX01.dwg 05/14/04 MKB PHL

B

B'

FTA–MW–54S

FTA–MW–55S,D

FTA–MW–61I

FTA–MW–56D

FTA–MW–105D

FTA–MW–57S

FTA–MW104S

GROUND SURFACE

WATER TABLE

FGR SAND 7.0 15.23 24.0 TD 24.0

55S 6.0 15.16 12.0

FGR SAND

55D 23.0 29.0 TD 29.0

CLAY

FGR SAND 11.0 14.33 33.0 TD 33.0

? 15

14

13

12

11

10

M–CGR SAND 15.0 43.0 TD 43.0

FGR SAND 7.0 13.44 24.0 TD 24.0

SILTY CLAY 4.3 14 262

FGR SAND

CLAY

FGR SAND 39.0 10.04 52.0 TD 52.0

F–MGR SAND

FGR SAND 26.0 3.85 36.0 TD 36.0

40 30 20 10 0 –10 –20 –30

10 5 0 –5

ELEVATION (FEET ABOVE MEAN SEA LEVEL)

LEGEND

MONITORING WELL OR BORING NUMBER — FTA–MW–54S

GROUND SURFACE

WATER TABLE

TOP OF SCREENED INTERVAL (FT BGS) — 7.0

LITHOLOGIC CONTACT (DASHED WHERE INFERRED)

BOTTOM OF SCREENED INTERVAL (FT BGS) — 24.0 TD 24.0

14.33 HYDRAULIC HEAD (FEET)

NOTE

WATER ELEVATIONS MEASURED 3/19/03

0 50 100

HORIZONTAL SCALE IN FEET

0 10 20

VERTICAL SCALE IN FEET

TETRA TECH NUS, INC.

FORMER FIRE TRAINING AREA
CROSS SECTION B–B'
NASA WALLOPS FLIGHT FACILITY
WALLOPS ISLAND, VIRGINIA

FILE 4740GX01.dwg JLF PHL	SCALE AS NOTED
FIGURE NUMBER FIGURE 4–12	REV 0 DATE 8/8/03