# **Remedial Action Work Plan**

# Waste Oil Dump Site

# **NASA Wallops Flight Facility**

Wallops Island, Virginia



National Aeronautics and Space Administration Goddard Space Flight Center Wallops Flight Facility

September 2009

## CERTIFICATION

The enclosed document was prepared, and is being submitted, in accordance with the requirements of the Administrative Agreement On Consent between the United States Environmental Protection Agency and the National Aeronautics and Space Administration [U.S. EPA Docket Number RCRA-03-2004-0201TH].

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

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.

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Title: \_\_\_\_\_ NASA Project Coordinator

## REMEDIAL ACTION WORK PLAN

## WASTE OIL DUMP SITE

## NASA WALLOPS FLIGHT FACILITY WALLOPS ISLAND, VIRGINIA

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> > N62472-03-D-0057 Contract Task Order 012

> > > September 2009

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## ACRONYMS

AOC	Area of Concern
bgs	Below Ground Surface
CLEAN	Comprehensive Long-Term Environmental Action Navy
COC	Constituents of Concern
СТО	Contract Task Order
DO	Dissolved Oxygen
DPT	Direct Push Technology
EPA	United States Environmental Protection Agency
FOL	Field Operations Leader
ft	Feet or Foot
GSFC	Goddard Space Flight Center
HASP	Health and Safety Plan
HSA	Hollow-stem Auger
HSM	Health and Safety Manager
IDW	Investigation-Derived Waste
MSDS	Material Safety Data Sheet
NASA	National Aeronautics and Space Administration
NELAP	National Environmental Laboratory Accreditation Program
ORC®	Oxygen Releasing Compounds
ORP	Oxidation-Reduction Potential
PPE	Personal Protective Equipment
QA	Quality Assurance
QC	Quality Control
Regenesis	Regenesis Bioremediation Products
ROD	Record of Decision
Slurry	ORC <sup>®</sup> and water mixture
TtNUS	Tetra Tech NUS, Inc.
VOC	Volatile Organic Compound
WFF	Wallops Flight Facility
WOD	Waste Oil Dump Site

## **1.0 INTRODUCTION**

This Remedial Action Work Plan (Work Plan) has been prepared by Tetra Tech NUS, Inc. (TtNUS) for the National Aeronautics and Space Administration (NASA) under Contract Task Order (CTO) 0012 issued by the Naval Facilities Engineering Command Mid-Atlantic under the Comprehensive Long-Term Environmental Action Navy (CLEAN III) contract number N62472-03-D-0057. This work plan has been developed to detail the procedures to be used during the implementation of enhanced bioremediation as the remedial technology for the Waste Oil Dump (WOD) Site at the NASA Goddard Space Flight Center (GSFC) Wallops Flight Facility (WFF) located in Accomack County, Virginia. The objective of the Remedial Action is to reduce the concentrations of the volatile organic compound (VOC) benzene in site groundwater by increasing oxygen levels to encourage growth of native microorganisms and increase the rate of biodegradation and create favorable conditions to break down benzene into non-toxic forms, create an oxygen-rich environment to cause arsenic to transform from soluble to non-soluble forms, and restore the groundwater to drinking water standards and cleanup goals identified in the Record of Decision (ROD). This Work Plan incorporates the results of a pilot study conducted at the Site from December 2008 through January 2009.

#### 1.1 DOCUMENT ORGANIZATION

Section 1.0 of this Work Plan presents this introduction, a brief site description, a summary of the pilot test results, and the project scope. Section 2.0 describes the proposed field operations. Section 3.0 describes management aspects of the project such as management structure, reporting requirements, and quality assurance (QA) activities. The Pilot Study Report is presented as Appendix A. Post-injection groundwater sampling will be addressed in a report under separate cover.

#### 1.2 SITE OPERATIONS AND HISTORY

WFF is located in Accomack County on the Eastern Shore of the Commonwealth of Virginia, see Figure 1-1. The WOD is located at the northern end of Runway 17-35 on a peninsula-like feature adjacent to Little Mosquito Creek (see Figure 1-2). The WOD was reportedly used for the disposal of waste oils and possibly solvents from the 1940s through the 1950s. Reportedly, the site was used to dispose of excess waste oil that could not be used for fire training activities. No records are available to determine the types and quantities of materials disposed or the duration of this activity at the site. NASA conducted a removal action in the area from November 12 to December 30, 1986 that included the excavation and removal of approximately 180 cubic yards of impacted soils in four separate areas of the site.

The southern half of the site is basically flat, with little slope, and is grass covered. The central portion of the site slopes to the north and east, with slopes ranging from 1 to 3 percent. The northern, eastern, and western boundaries of the site are steeply sloped. These slopes direct surface water runoff into low-lying marshes that border an unnamed tributary to Little Mosquito Creek and Little Mosquito Creek. The northern portion of the site is vegetated by bushes, conifer saplings, and tall grasses. There are no surface water bodies within or immediately adjacent to the disposal area at the WOD.

The geology immediately underlying the study area consists of the lithologic unit called the Columbia Group. Regionally, the Columbia Group is approximately 50 feet thick and is underlain by a 20 to 40 feet thick clay and silt aquitard which isolates the Columbia from the underlying Yorktown Aquifer. The geologic materials encountered at the site consist of fine-to medium-grained quartz sand with some silt, and the lithology did not differ significantly throughout the site. A sandy clay layer was consistently encountered at depths ranging from 10 to 27 feet below ground surface (bgs), or (considering the differences in site topography) at an elevation near sea level. The thickness of this clay at the WOD is reported to be as much as 5 feet.

Investigative activities have been conducted at the site and documented in the Supplemental Remedial Investigation Report (TtNUS, 2004), Feasibility Study (TtNUS, 2005), and ROD (TtNUS, 2008). Constituents of Concern (COCs) have been identified based on analytical data, risk drivers from the human health and ecological risk assessments, and exceedances of regulatory standards and criteria. The COCs for groundwater have been identified as benzene and arsenic, with cleanup goals of 5  $\mu$ g/L and 10  $\mu$ g/L, respectively, having been established. Biostimulation was selected as a component of the remedy for the WOD, as documented in the ROD. A pilot study, consisting of the injection of Oxygen Releasing Compound (ORC<sup>®</sup>), a proprietary formulation of phosphate intercalated magnesium peroxide manufactured by Regenesis Bioremediation Products (Regenesis), was conducted at the WOD to evaluate its potential use in implementing the final remedy for the Site.

#### 1.3 PILOT STUDY RESULTS

A pilot study was conducted from December 2008 to January 2009 at the WOD Area of Concern (AOC), (see Appendix A for the full Pilot Study Report). The purpose of the pilot study was to determine if the application of ORC<sup>®</sup> could significantly reduce the impact of volatile organic compounds (VOC) in site groundwater. The objective of the study was to determine the number and spacing of ORC<sup>®</sup> injection points required for full scale remediation. In addition, the pilot study data were to be used to determine the amount of ORC<sup>®</sup> required for full scale implementation provided it proved successful. The study was to be determined successful if the dissolved oxygen (DO) levels in Site monitoring wells increased after ORC<sup>®</sup> injection.

Baseline and post-injection monitoring and sampling were performed in accordance with the approved Pilot Study Work Plan (TtNUS, 2008a). The data, as presented in Appendix A, indicate that DO and oxidation-reduction potential (ORP) increased in the study area after the injection of ORC<sup>®</sup>. Field measurements were collected prior to and two days, one week and one month after the injection. DO and ORP levels measured in the study area wells are presented in Figures 1-3 and 1-4. As a result of the injection of ORC<sup>®</sup>, DO and ORP levels in the temporary monitoring wells were observed to significantly increase immediately after the injection and then decrease over the following month. These results suggest that the oxygen released within the contamination zone were rapidly consumed. In addition, analytical results indicate that COC concentrations in the monitoring wells decreased over the same time period (see Appendix A).

These and other findings presented in the Pilot Study Report, indicate that full scale implementation of ORC<sup>®</sup> injection should be conducted at the WOD. However, due to the decline of DO recorded between the one week and one month sampling events, it is recommended that ORC Advanced<sup>®</sup> be used instead of ORC<sup>®</sup>. ORC Advanced<sup>®</sup> releases oxygen slower and is 70% more efficient than ORC<sup>®</sup>. As a result of using ORC Advanced<sup>®</sup>, oxygen will be released at a more constant rate and thereby provide a more constant source for enhancing the bioremediation process.

#### 1.4 OBJECTIVES AND SCOPE

The objective of the Remedial Action (RA) is to conduct a full-scale application of ORC Advanced<sup>®</sup> to the impacted AOC at the WOD. ORC Advanced<sup>®</sup> is a proprietary formulation of calcium oxyhydroxide that, when hydrated, produces a controlled release of oxygen for periods of up to 12 months on a single application. ORC Advanced<sup>®</sup> is produced by Regenesis, of San Clemente, California (Regenesis website, 2007). The injection of ORC Advanced<sup>®</sup> is expected to result in an increase of DO in the injection area. The elevated levels of DO will facilitate an aerobic bioremediation reaction with benzene in the affected groundwater. Elevated dissolved arsenic levels in the groundwater will not be addressed directly by ORC Advanced<sup>®</sup>, but it is believed that the arsenic contamination is associated with the reduced environment created by the natural degradation of the organic COCs. It is anticipated that the increase in DO resulting from the injection of the ORC Advanced<sup>®</sup> will allow for the transfer of arsenic from soluble compounds to insoluble oxidized compounds with limited mobility.

This RA will be comprised of one injection event. During the event, an ORC Advanced<sup>®</sup> and water mixture (slurry) will be injected into 52 points placed in the vicinity of monitoring wells WFF16-GW2 and WFF15-GW7. The slurry will be injected via direct push technology (DPT) equipment; the injection will take place throughout the vertical extent of contamination, from approximately 20 feet to 30 feet below ground surface (bgs). It is anticipated that the injected slurry will enhance aerobic microbial activity in groundwater

containing COC concentrations above the established cleanup levels.

Permanent and temporary monitoring wells in the area of the WOD that were sampled prior to the pilot study injection of ORC<sup>®</sup> will serve as baseline levels for the RA. The post-injection sampling of monitoring wells will be addressed in a report under separate cover.

Prior to the commencement of RA activities, the temporary monitoring wells that were installed as a part of the pilot study will be plugged and abandoned in accordance with Tetra Tech standard methods.

## 2.0 FIELD OPERATIONS

#### 2.1 FIELD OPERATIONS SUMMARY

The RA consists of the following field activities:

- Plugging and Abandonment of the 6 temporary monitoring wells that were installed during the pilot study.
- Collection of groundwater elevation measurements from the monitoring wells in the vicinity of the WOD AOC prior to the injection of ORC Advanced<sup>®</sup>.
- Installation of 52 DPT soil borings in the area upgradient and downgradient of monitoring well WFF15-GW7, and upgradient of monitoring well WFF16-GW2. These DPT locations will be used to inject ORC Advanced<sup>®</sup>.

The six temporary monitoring wells installed prior to the pilot study will be plugged and abandoned using Tetra Tech standard methods prior to the injection of ORC Advanced<sup>®</sup>.

The RA will be completed in one injection event; which includes the installation of 52 injection borings to an anticipated approximate total depth of 30 ft bgs. The injection borings will be spaced on 15-foot centers in an upgradient radius perpendicular to the direction of groundwater flow. A detailed plan view of the proposed DPT/injection point spacing is presented as Figure 2-1. The injection locations are intended to actively treat the majority of the area suspected to contain concentrations of COC above cleanup criteria and to create an oxygen-enriched barrier and an aerobic reaction zone to reduce residual benzene concentrations in the treatment area.

Based on calculations made using Regenesis software, it is estimated that during the injection event 6 pounds of ORC Advanced<sup>®</sup> will be applied per foot of each borehole below the water table (a thickness of approximately 10 feet in each borehole). Therefore, a total of 3,120 pounds of ORC Advanced<sup>®</sup> will be required. Approximately 884 gallons of water will be required for mixing of the ORC<sup>®</sup>, approximately 17 gallons per injection point, and 1.7 gallons per foot. ORC Advanced<sup>®</sup> requirement calculations are presented in Appendix B.

## 2.2 MOBILIZATION/DEMOBILIZATION

Following approval of this work plan, TtNUS will procure the required subcontractors and begin mobilization activities. Mobilization/demobilization may include multiple events and each event will include the following as needed:

- Approval of all subcontractors by the TtNUS Health and Safety Department
- Utility clearances in the proposed boring areas.
- Mobilization of subcontractors, equipment, and materials to the site.
- Receipt of drilling and/or well permits via subcontractor.
- Conducting an approximately 1-hour long site-specific health and safety review meeting.
- Delineation of the work zones (exclusion zone, contamination reduction zone, and support zone) as required by the Health and Safety Plan (HASP) (See Appendix E).
- Arrangement of an area to perform decontamination procedures.
- Demobilization of equipment and materials from the site.
- Performance of general site clean-up and removal of trash.

Field team members will review the Work Plan and the HASP. Mobilization includes attendance at a sitespecific health and safety kick-off meeting during the initiation of on-site activities. This meeting will also include field team orientation in order to familiarize personnel with the scope of the field activities.

The Field Operations Leader (FOL) will coordinate the mobilization activities. These activities include responsibilities such as initiating and conducting equipment inventories to ensure equipment is available, purchasing equipment as required, staging equipment for efficient loading and transport from the TtNUS office to the site, and after field activities are completed, demobilizing the equipment.

The drilling subcontractors will furnish a DPT rig, support crew, all necessary tools required, personal protective equipment (PPE) for their crew, and any miscellaneous equipment and materials required to complete the described activities. The down-hole equipment, sampling tools, and the rear of the rig will be steam-cleaned prior to arrival on site. Safety shut-off equipment will be in full working condition and will be tested by the FOL prior to initiating DPT activities.

#### 2.3 BASELINE GROUNDWATER SAMPLING

A baseline groundwater monitoring event was performed prior to the Pilot Study (see Appendix A). The data collected from the baseline sampling event will serve as the baseline data for the site, with no additional baseline sampling being required prior to commencing RA field activities. However, water level and DO and ORP levels will be measured in permanent monitoring wells WFF16-GW8, WFF15-MW3R, WFF15-GW7, WFF15-GW1, WFF15-GW2, WFF16-GW2S, WFF16-GW2D, and WFF16-GW5 prior to the injection event.

#### 2.4 INJECTION POINT INSTALLATION

Fifty two injection points will be installed via DPT to a depth of 30 feet bgs on 15-feet centers in an upgradient radius perpendicular to groundwater flow direction, as depicted on Figure 2-1. Groundwater contamination is assumed to extend to a depth of approximately 30 feet bgs, based on the data collected during the construction of WFF15-GW7.

## 2.5 ORC ADVANCED<sup>®</sup> MIXING AND INJECTION

The ORC Advanced<sup>®</sup> powder will be shipped to the site from the Regenesis manufacturing facility in Inwood, New York. For each injection boring, 17 gallons of water will be mixed with 60 pounds of ORC Advanced<sup>®</sup> using a standard environmental slurry mixer or grout pump. The slurry will be injected from the bottom of the borehole to one foot above the water table through the DPT rig's pump or a slurry/grout pump. Mixing and injection will be performed in general accordance with the Regenesis instructions in Appendix C. As with any chemical compound, proper health and safety procedures must be followed when handling ORC Advanced<sup>®</sup> Material Safety Data Sheets (MSDS) for the ORC Advanced<sup>®</sup> is provided in Appendix D.

#### 2.6 POST-INJECTION GROUNDWATER SAMPLING

Following the ORC Advanced<sup>®</sup> injection, a Long-Term Monitoring (LTM) Program will be implemented in accordance with the requirements of the ROD. The LTM Pan will be prepared and submitted for review and approval under separate cover.

#### 2.7 DECONTAMINATION

The field team's PPE will be disposed as required. These items, such as Tyvek<sup>™</sup> suits, disposable latex gloves, and paper towels will be disposed of using procedures required by the HASP. Personnel will also perform decontamination procedures as required by the HASP. The equipment involved in field sampling activities will be decontaminated prior to and upon completion of drilling and sampling activities. This equipment includes down-hole tools, augers, and all non-dedicated sampling equipment. Drilling rigs will not require decontamination because surface soils do not present a risk and they will be positioned on undisturbed ground. The rigs will be inspected and any loose debris removed prior to traversing the runway area.

#### Major Equipment

All down-hole HSA/DPT equipment and sampling tools will be decontaminated by the subcontractor prior to beginning work. HSA/DPT equipment will be decontaminated at the completion of the installation/injection

program (due to the nature of this study and previous delineation of impacted groundwater, the DPT equipment will not be decontaminated between injection points). The decontamination procedures will consist of high pressure wash with laboratory-grade detergent solution and clean water rinse completed in a 55-gallon drum. The drum will be used to capture and contain the decon water that will be treated as IDW.

#### Sampling Equipment

Sampling equipment used for collecting the groundwater samples will be disposable equipment. Therefore, no decontamination of this equipment will be required. Field analytical equipment such as water level probes, and water quality meters will be first wiped down with laboratory-grade detergent solution, then rinsed with a isopropanol and distilled water mix, and then with a final rinse of distilled water.

#### 2.8 INVESTIGATION-DERIVED WASTE (IDW) MANAGEMENT

All IDW accumulated during HSA/DPT installation, well purging and sampling, and decontamination proceedings will be collected, containerized, and stored in Department of Transportation (17C)/UN (1A2)-approved, 55-gallon drums. The drums will be labeled and temporarily stored in the NASA hazardous material consolidation area pending receipt of analytical results.

Upon receipt of the analytical results (approximately 35 days after completion of sampling), TtNUS will provide the results to NASA, who will be responsible for off site disposal. NASA personnel will sign all manifests and bills of lading for transportation off site. TtNUS will coordinate with NASA personnel for completion of this activity.

## 3.0 PROJECT MANAGEMENT

The management and technical aspects of this project are the ultimate responsibility of TtNUS. Each contractor assigned to individual tasks has the responsibility to fulfill the objectives of that task and to ensure the quality of the data generated by the task. At the direction of NASA, TtNUS has overall responsibility for the activities to be performed at the WOD Site.

#### 3.1 PROJECT ORGANIZATION

The various quality assurance and management responsibilities of key TtNUS project personnel are defined in the following paragraphs.

<u>Project Manager</u> - The Project Manager is responsible for project performance, budget, and schedule, and for ensuring the availability of necessary personnel, equipment, subcontractors, and services. He/she will direct the development of the field program, evaluation of findings, determination of conclusions and recommendations, and preparation of technical reports. The TtNUS Project Manager is Mr. Garth Glenn.

<u>FOL</u> - The FOL is responsible for providing on-site supervision of day-to-day activities on the project. The FOL serves as the primary on-site contact with the client and subcontractors. In addition, the FOL is responsible for all field QA/QC and safety-related issues as defined in the HASP. The FOL for this project will be designated later by the Project Manager.

<u>Health and Safety Manager (HSM)</u> - The Program HSM will review and internally approve the HASP tailored to the specific needs of the investigation. In consultation with the Project Manager/FOL, the HSM will ensure that an adequate level of personal protection exists for anticipated potential hazards for all field personnel. As the HSM does not report to either the Program or Project Manager, his/her actions are not dictated by Program or project constraints (such as budget and schedule) other than the assurance of appropriate safeguards while conducting investigation activities. The TtNUS HSM is Mr. Matthew Soltis, Certified Industrial Hygienist.

<u>QA Manager/Sampling Coordinators</u> - The Project Manager/FOL will coordinate the schedule of field sampling activities with the schedule and capacity requirements of the selected analytical laboratory. All sampling will be coordinated to assure that environmental sampling is conducted in a manner that complies with all QA/QC requirements and is in compliance with holding time and analytical procedure requirements. All Program-wide, QA issues are the responsibility of the QA Manager. The TtNUS QA Manager for NASA activities will be designated later by the Project Manager.

<u>Project Laboratory</u> – The project laboratory will be identified prior to the field sampling event and will be selected from the list of Navy and NELAP certified laboratories approved under the Administrative Agreement on Consent between EPA and NASA [USEPA Docket Number RCRA-03-2004-0201TH].

## 3.2 PROJECT RESPONSIBILITIES

Throughout the field activities, NASA personnel, as described below, will provide various support functions:

- Locate and mark underground utilities and issue digging or other required permits prior to the commencement of digging or drilling operations.
- Take custody of all drill cuttings, well development fluids, decontamination fluids, or drill cuttings.
- Secure staging areas for decontamination operations and for storing equipment and supplies. It is anticipated that access can be gained to the WOD Site.
- Supply electricity and potable water for equipment cleaning, slurry mixing, etc.

## 3.3 CONTINGENCY PLAN

In the event of problems that may be encountered during the injection activities, the TtNUS Project Manager will notify the NASA Project Manager and the NASA WFF Point of Contact. The TtNUS Project Manager will determine a course of action so as to minimize impacts to the project schedule and/or budget. Contingency plans will be approved through the NASA Project Manager and the NASA WFF Point of Contact before being enacted.

## 3.4 REPORTING

Upon completion of the full scale injection, a Remedial Action Completion Report will be prepared and submitted for review and approval. The report will describe the ORC Advanced<sup>®</sup> installation procedures, document the pounds of ORC Advanced<sup>®</sup> and volume of water injected, present the field data collected, and summarize the injection activities performed at the Site.

## REFERENCES

TtNUS, 2004. Supplemental Remedial Investigation Report. NASA Wallops Flight Facility, Wallops Island, Virginia. December.

TtNUS, 2005. Feasibility Study, Waste Oil Dump Site. NASA Wallops Flight Facility, Wallops Island, Virginia. October.

TtNUS, 2008. Record of Decision Former Fire Training Area NASA Wallops Flight Facility, Wallops Island, Virginia. December.

TtNUS, 2008a. Pilot Study Work Plan for Waste Oil Dump Site, NASA Wallops Flight Facility. Wallops Island, Virginia. October.

Regenesis, 2007. Regenesis Bioremediation Products website, <u>www.regenesis.com</u>, 2007.

FIGURES









#### Figure 1-3 Field Geochemical Results - Dissolved Oxygen Waste Oil Dump (WOD) NASA Wallops Flight Facility Wallops Island, Virginia

## D.O.

	baseline	2 day	1 week	1 month
TW1	3.65	5.68	0.58	0.81
TW2	0.92	4.6	2.81	0
TW3	0.4	6.68	1.28	0.77
TW4	1.16	5.65	2.37	0
TW5	2.27	19.99	10.65	4.82
TW6	2.44	0.5	3.32	0.94
15-GW7	0.73		0.85	4.12
MW3R	7.72		13.79	8.56





#### Figure 1-4 Field Geochemical Results - Oxidation Reduction Potential Waste Oil Dump (WOD) NASA Wallops Flight Facility Wallops Island, Virginia

# ORP

	baseline	2 day	1 week	1 month
	12/9/2008	12/12/2008	12/18/2008	1/14/2009
TW1	-53	39	-71	13
TW2	-123	-1	38	108
TW3	-470	-17	-27	-10
TW4	-81	8	77	-5
TW5	-107	162	40	-6
TW6	-95	-281	-75	-64
15-GW7	-192		-40	58
MW3R	206		194	75







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APPENDIX A

PILOT STUDY REPORT

#### **1.0 INTRODUCTION**

This Pilot Study Report has been prepared by Tetra Tech NUS, Inc. (TtNUS) for the National Aeronautics and Space Administration (NASA) under Contract Task Order (CTO) 0012 issued by the Naval Facilities Engineering Command Mid-Atlantic under the Comprehensive Long-Term Environmental Action Navy (CLEAN III) contract number N62472-03-D-0057. The purpose of this report is to summarize the field activities conducted and present the data collected during implementation of the remedial action Pilot Study at Waste Oil Dump (WOD) Site at the NASA Goddard Space Flight Center (GSFC) Wallops Flight Facility (WFF) located in Accomack County, Virginia.

The purpose of the Pilot Study was to determine if the application of Oxygen Releasing Compound (ORC<sup>®</sup>), a proprietary formulation of phosphate intercalated magnesium peroxide manufactured by Regenesis Bioremediation Products (Regenesis), could significantly reduce the impact of volatile organic compounds (VOC) in site groundwater. The objective of the Pilot Study was to determine the number and spacing of ORC<sup>®</sup> injection points required for full scale remediation. In addition, the Pilot Study data were to be used to determine the amount of ORC<sup>®</sup> required for full scale implementation provided it proved successful. The Pilot Study was to be determined successful if the dissolved oxygen (DO) levels in monitoring well WFF15-GW7 increased after ORC<sup>®</sup> injection. The concentrations of contaminants of concern (COC) were also to be reviewed.

#### 2.0 FIELD INVESTIGATION

The Pilot Study at the WOD site was conducted from December 8, 2008 through January 14, 2009. Field activities were conducted in accordance with the approved Pilot Study Work Plan (TtNUS, 2008) with minor deviations as presented in Section 2.1

## 2.1 <u>Deviations</u>

According to the WOD Pilot Study Work Plan, the 6 temporary wells, WFF15-GW7, and WFF15-MW3R were to be characterized using field geochemical test kits 1 day after the ORC<sup>®</sup> slurry was added. The ORC<sup>®</sup> injection event was conducted on December 10, 2008, and on December 11 a lightning advisory was issued, causing the airstrip and adjacent areas (e.g., the WOD) to be closed to all outdoor operations. Due to the inclement weather, the 1 day sampling event at the WOD was conducted on December 12, 2008, 2 days after the ORC<sup>®</sup> injection event.

The Work Plan called for six temporary monitoring wells to be installed at the WOD site. Each of these wells was to be completed flush with the ground, with no sand pack added, and protected by steel well head covers. The proposed layout of these wells can be found in the Pilot Study Work Plan on Figure 2-1 (TtNUS, 2008). During field activities, the temporary wells were installed with PVC riser pipes extending approximately two feet above ground surface and without protective steel head covers, and with sand pack added due to the incomplete collapse of the sediment around the screen. Additionally the proposed temporary monitoring well layout was adjusted to ensure that the injection points and monitoring wells were installed perpendicular to the apparent groundwater flow direction (Figure 2-1).

Field Task Modification Request Forms can be found in Attachment 1.

## 2.2 Field Activities

## Monitoring Well Installation

On December 8 and 9, 2008, one permanent monitoring well (WFF16-GW8) was installed at the WOD using a hollow-stem auger (HSA) with a 4-inch borehole diameter. A 2-inch diameter schedule 40 polyvinyl chloride (PVC) pipe with a 0.10-inch x 10-foot PVC screen and a 2-foot riser was assembled, and lowered down the borehole through the auger to a total depth of approximately 28 ft bgs. A clean medium grained sand pack was added around the screen interval as the auger was raised in increments. Once the sand was added to approximately 3 feet above the top of the screen, the borehole was backfilled with bentonite to a few inches below the ground level. At the surface, a 4-inch diameter steel

surface casing, sticking up approximately 2.5-feet, was mounted into a cement grout surface seal. The location of this well is down gradient of the known extent of the impacted groundwater and was installed to expand the groundwater monitoring network in the deeper zone of the Columbia aquifer.

After completion of WFF16-GW8, the well was developed using a peristaltic pump and a whale pump, and was surged as necessary to remove the fines accumulated during well installation. Boring logs, well construction details, and well development records for WFF16-GW8 are presented in Attachment 2.

On December 9 and 10, 2008, in addition to the installation of WFF16-GW8, 6 direct-push technology (DPT) soil borings were installed as temporary monitoring wells up gradient of WFF15-GW7 to a depth of approximately 30 feet bgs. All of the temporary wells were installed using a 3-inch diameter drive casing with a disposable tip, in which a 1.5-inch diameter schedule 40 PVC pipe was inserted with 10 feet of 0.02-inch slotted screen and a 2-foot riser pipe. After installation, the sediment was allowed to collapse around the screened interval and so a sand pack was added as necessary to fill voids. A bentonite seal was placed above the sandpack to ground surface.. Unlike WFF16-GW8, these 6 temporary wells were left undeveloped.

#### **Baseline Groundwater Sampling**

Baseline sampling for the WOD began on December 8, 2008 and concluded on December 10, 2008 prior to the ORC<sup>®</sup> injection. In total 14 wells were sampled at the WOD. Low flow sampling techniques were utilized, as per USEPA Region 3 protocol and guidelines, using a standard peristaltic pump, and medical grade silicone tubing. An in-line flow-through meter and separate turbidity meter were used during purging to collect field readings for turbidity, dissolved oxygen, pH, specific conductivity, temperature, and oxidation reduction potential (ORP). Groundwater sampling was not initiated until stabilization of pH, ORP, and specific conductivity parameters occurred, at which time the flow through cell was disconnected. For each well the following samples were collected: 3-40 milliliter VOA vials with a hydrochloric acid preservative for VOCs, 2-1 liter amber glass containers for SVOCs, and a 1-125 milliliter polyethylene bottle with a nitric acid preservative for dissolved metals. If the turbidity was over 10 NTU an additional 125 milliliter sample was filtered using an inline 0.45-micron filter, preserved, and submitted for dissolved metals analysis. Samples collected from WFF15-GW7, WFF15-MW3R, and the 6 temporary wells at the WOD site were analyzed for a quick turnaround (7 day) analysis, while the remaining 6 were analyzed on a standard (21) day turn around. Once sampling was completed at each well, field geochemical kits were used to measure dissolved oxygen, alkalinity, dissolved carbon dioxide, ferrous iron, and hydrogen sulfide. Detailed groundwater sample log sheets, low-flow purge sheets, and field analytical log sheets were completed for each well to document sampling conditions. Low-flow purge data sheets and groundwater sample log sheets are included in Attachment 3.

The purge water generated during the sampling event was collected in 5 gallon buckets and consolidated into 55-gallon drums that were transported to the NASA temporary storage facility (B-29) and transferred to NASA for ultimate disposal.

All groundwater samples were sent to Katahdin Laboratories in Scarborough, Maine and analyzed for benzene, tetrachloroethene, xylenes (total), m+p-xylenes, o-xylene, 1,2,4-trimethylbenzene, 3&4-methylphenol, naphthalene, total arsenic, and dissolved arsenic.

## ORC<sup>®</sup> Injection

On December 10, 2008, 3 DPT soil boring injection points were used to inject the Regenesis ORC<sup>®</sup> slurry. At the WOD, each well received a slurry consisting of 35 gallons of water and 124 lbs of ORC<sup>®</sup> for a final ratio of 3.5 gallons of slurry per foot. In total, 372 lbs of ORC<sup>®</sup> and 105 gallons of water were injected at the WOD. The process consisted of pumping the ORC<sup>®</sup> through a standard Geoprobe<sup>®</sup> rod inserted at the target depth of 30' bgs and incrementally raised to 20' bgs. After completion of the injection, the injection points were backfilled with bentonite and capped with a plug of coarse sand up to the ground surface.

Mixing and injection of the ORC<sup>®</sup> was performed in general accordance with the Regenesis instructions (TtNUS, 2008).

## Post Injection Groundwater Sampling

## 1 Day Sampling Event

The first groundwater sampling event after the injection of the ORC<sup>®</sup> slurry was conducted on December 12, 2008. As detailed in Section 2.1 this event took place 2 days after injection at the WOD. As a result of this delay and time constraints only the 6 temporary wells (TW1-TW6) were characterized, with each well having the equivalent of 1 well volume of water purged from it while the field parameters were recorded from the Horiba<sup>®</sup> U-22 flow through cell and Turbidity Meter. After the required amount of water was purged, the flow through cell was disconnected and the geochemical kits were used to measure the concentrations of dissolved oxygen, carbon dioxide, alkalinity, hydrogen sulfide, and ferrous iron in the groundwater.

## 1 Week Sampling Event

On December 18, 2008, the 1 week sampling event took place. Low flow sampling procedures, as described for the baseline event, were used and samples were collected from the six temporary wells and permanent monitoring wells WFF15-GW7 and WFF15-MW3R at the WOD. Field analytical log sheets and low flow purge sheets were used to note geochemical conditions measured by the flow through cell, turbidity meter, and geochemical field kits (see Attachment 3)

#### Groundwater Level Measurements

A synoptic round of groundwater level measurements was conducted from 19 WOD site monitoring wells on January 12, 2009. Groundwater level measurement and elevation data is provided in Table 2-1 and presented in Figure 2-2. The projected groundwater contour lines and flow direction noted in January 2009 is consistent with previous findings, and indicate a radial flow from the higher elevation at the southern end of the Site.

#### 1 Month Sampling Event

From January 13 to January 15, 2009, the 1 month sampling event took place. The previously described low flow sampling procedure was carried out with the same equipment as the baseline sampling event. Samples were collected from 8 monitoring wells and shipped to Katahdin Laboratories in Scarborough, Maine to be analyzed for the VOCs, SVOCs, and dissolved metals parameters. Then geochemical field kits were used to measure dissolved oxygen, alkalinity, dissolved carbon dioxide, ferrous iron, and hydrogen sulfide. Detailed groundwater sample log sheets, low-flow purge sheets, and field analytical log sheets were completed for each well to document sampling conditions. Low-flow purge data sheets and groundwater sample log sheets 3.

## 2.3 <u>Field Observations</u>

As referenced above, log sheets were completed for well installation, development, and groundwater sampling activities and are presented in Attachment 3. The following bulleted items summarize the notable field observations made during the investigation.

- Turbidity readings remained high in all 6 temporary monitoring wells. Samples were collected for total and dissolved arsenic from all 6 wells.
- 4.35 inches of rainfall was recorded at Wallops Island, VA for the period of December 11 through the early morning of December 12, 2008, approximately 1 day after the ORC<sup>®</sup> injections.

#### 3.0 FIELD AND ANALYTICAL RESULTS

#### 3.1 Field Geochemical Results

Field parameters were collected at eleven monitoring wells prior to and following the ORC<sup>®</sup> injection event using low-flow sampling techniques and test kits. Table 3-1 presents a summary of the field geochemical analyses performed during all groundwater monitoring events (baseline, two day, one week, and one month events).

An analysis of the field geochemical data shows several trends in the parameters that were collected. At all but one (TW-6) of the six temporary monitoring wells, the DO readings collected during the Day 2 sampling event were higher than the values recorded during the baseline sampling event. Wells 15-GW7 and MW3R were not sampled on day two. For the one week sampling event, all but one (TW1) locaton contained DO above the baseline results, however, the majority of the DO values had declined significantly from the Day 2 results. The one month DO readings showed additional decline in DO, with only three of the seven down gradient locations reporting DO levels higher than the baseline readings. Background sample MW3R showed an increase in DO at the one week sampling event, and subsequent decline at the one month event to a level still higher than baseline. Results from the test kit samples showed similar trends when compared to the data from the in-line flow-through meter samples.

ORP values collected at the study area wells during the two day event showed an increase from baseline at all but one (TW6) location. For the one week samples, all but one (TW1) sample reported an ORP value higher than the baseline level. Wells 15-GW7 and MW3R were not sampled on day two. For the one week sampling event, all but one (TW1) location had ORP values above the baseline results, with some sample values still increasing. The one month ORP readings showed mixed results, with some samples reporting increasing levels of ORP, while some wells had decreasing values. However, all seven down gradient wells reported values at the one month sampling event higher than the baseline values. Background sample MW3R showed a decrease in ORP at the one week sampling event, and continued decline at the one month event.

Turbidity readings were high in the temporary wells, with readings of 790 NTU or higher reported in the wells. The temporary wells were installed without sand pack, and this is thought to be the reason for the high turbidity readings. By the time the one month sampling event was conducted, all but one (TW1) temporary well had readings below 50 NTU, with two of the wells (TW2 and TW4) below 10 NTU.

Groundwater measurements collected for pH showed an overall trend of decreasing values, especially at the one month sampling event. For 15-GW7 and the six temporary wells, the initial ph readings ranged between 5.37 and 6.52. For the two day and one week sampling events the ph readings were mixed, but the results of the one month sampling event reported all locations having decreased pH values when compared to baseline values.

#### 3.2 Analytical Results

A total of fourteen groundwater monitoring wells were sampled prior to the ORC<sup>®</sup> injection event, with eight of the wells samples again a month after the injection event. The samples were analyzed by a Navy-certified laboratory as mention above in section 2.2 in accordance with the approved work plan (TtNUS, 2008). Laboratory analytical results were not validated and laboratory reports are presented in Attachment 4. Table 3-2 presents a summary of the analytical data for constituents analyzed in the groundwater samples.

Benzene is the only organic COC at the WOD for which a cleanup goal (5  $\mu$ g/L) has been established. For the wells in the area of the Pilot Study injection, benzene decreased at five of the seven locations, with minor increases reported at TW3 and TW6. At TW1, benzene decreased from 32  $\mu$ g/L to 2  $\mu$ g/L, below the cleanup goal. Significant decreases were reported at TW2, where benzene decreased from 120  $\mu$ g/L to 12  $\mu$ g/L, and at TW4, where benzene decreased from 250  $\mu$ g/L to 120  $\mu$ g/L.

All other VOCs (tetrachloroethene, xylenes (total), m+p xylenes, o-xylene and 1,2,4-trimethylbenzene) reported decreased values from the baseline sample to the one month sample with the exception of the o-xylene sample at TW 3.

Reported values of naphthalene decreased from the baseline sampling to the one month sampling event in all seven monitoring wells in the area of the WOD Pilot Study. The constituent 3&4 methylphenol was only detected in the baseline sample of TW4. Analysis was not conducted for other SVOC constituents.

Based on the analytical results, arsenic was detected at elevated concentrations at the site. Total arsenic was detected in the baseline samples at all seven Pilot Study wells at levels above the cleanup goal of 10  $\mu$ g/L. Five of the wells reported a decrease in arsenic at the one month sampling event compared to the baseline analytical data, with 15GW7 reporting a one month value (9.7  $\mu$ g/L) below the cleanup goal. Values for dissolved arsenic were reported for the six temporary monitoring wells for the baseline study, with four of the temporary wells being resampled for dissolved arsenic at the one month sampling event. Of the four wells that were resampled for dissolved arsenic, three reported a decrease compared to the baseline values. It two of the wells (TW3 and TW7) the values for the dissolved arsenic

reported for the one month sampling event were higher than the reported values for total arsenic (59  $\mu$ g/L dissolved vs. 56.4  $\mu$ g/L total, and 117  $\mu$ g/L dissolved vs. 116  $\mu$ g/L total respectively).

## 4.0 CONCLUSIONS AND RECOMMENDATIONS

The Pilot Study conducted at the Waste Oil Dump Site has adequately addressed the objectives set out for this study, including determining if the application of ORC<sup>®</sup> could significantly reduce the impact of volatile organic compound (VOC) in site groundwater. The Pilot Study is considered a success due to the dissolved oxygen (DO) levels in monitoring well WFF15-GW7 increased after ORC<sup>®</sup> injection.

Based on the Pilot Study Investigation findings, the following conclusions can be made for groundwater:

- As a result of the injection of ORC<sup>®</sup>, the level of DO increased in the Pilot Study wells, although it decreased rapidly following the initial increase,
- Concentrations of VOCs and SVOCs were reduced following the ORC<sup>®</sup> injection,
- Reported concentrations of arsenic were reduced following the ORC<sup>®</sup> injection.

Based on these conclusions, it is recommended that a full scale implementation of ORC<sup>®</sup> injection be conducted at the WOD, with four rows, each containing thirteen injection points at fifteen foot spacings. However, due to the decline of DO recorded between the one week and one month sampling events, it is recommended that ORC Advanced<sup>®</sup> be used instead of ORC<sup>®</sup>. ORC Advanced<sup>®</sup> releases oxygen slower and is 70% more efficient than ORC<sup>®</sup>, As a result of using ORC Advanced<sup>®</sup>, less material will need to be injected, and the cost of the full scale injection event will be less.

## REFERENCES

TtNUS, 2008. Pilot Study Work Plan for Waste Oil Dump Site, NASA Wallops Flight Facility. Wallops Island, Virginia. October.

TABLES

## Table 2-1 Groundwater Level Measurements From January 12, 2009 Waste Oil Dump (WOD) NASA Wallops Flight Facility Wallops Island, Virginia

Monitoring Well	Monitoring Well (actual)	Screened Interval (ft bgs)	Total Depth BTOC (ft)	Surveyed Elevation Top of Casing (ft)	Static Water Level Measurement BTOC (ft)	Water Level Elevations (ft MSL)
WFF09-GW1	09-MW001		30.22	28.58	18.59	9.99
WFF09-GW2	WFF9-MW2		12.35	8.94	2.52	6.42
WFF09-GW3	WFF9-MW3		12.12	14.16	5.15	9.01
MW-4	WOD-MW004-1	3-23	24.82	10.33	6.65	3.68
15-MW3R	WOD-MW003R	21-31	32.33	32.42	26.58	5.84
15-GW1	15-MW001	1-5	10.33	6.27	3.12	3.15
15-GW2	15-MW002	1-5	8.75	9.21	4.7	4.51
15-GW3	15-MW003	7-12	10.35	8.7	3.79	4.91
15-GW7	15-MW007	15-30		30.58	25.02	5.56
16-GW1	WOD-MW001	17-22	26.54	30.39	25.23	5.16
16-GW2D	WOD-MW002D	23-28		21.36	16.73	4.63
16-GW2S	WOD-MW002S	9-19		21.26	16.31	4.95
16-GW3	WOD-MW003	7-12	12.20	16.18	11.67	4.51
16-GW4	WOD-MW004-2	6-11	13.88	14.94	10.68	4.26
16-GW5	WOD-MW005	3-8	11.56	12.47	8.36	4.11
16-GW6	WOD-MW006	4-9	10.97	9.66	6.05	3.61
16-GW7	WOD-MW007	4-9	11.52	8.96	5.46	3.5
16-GW8	WOD-MW008	18-28	30.80		9.05	
FTA-MW104S	FFTA-MW104S	3-13	15.40	8.92	5.82	3.1

Notes MSL: Mean Sea Level BTOC: Below Top of Casing UK: Unknown bgs: below ground surface --- : Date Unavailable

## TABLE 3.1 FIELD GEOCHEMICAL PARAMETERS WASTE OIL DUMP NASA WALLOPS FLIGHT FACILITY WALLOPS ISLAND, VIRGINIA

	TW 1	TW 1	TW 1	TW 1	TW 2	TW 2	TW 2	TW 2	TW 3	TW 3
	Baseline	2 Day	1 Week	1 Month	Baseline	2 Day	1 Week	1 Month	Baseline	2 Day
	12/9/2008	12/12/2008	12/18/2008	1/14/2009	12/10/2008	12/12/2008	12/18/2008	1/14/2009	12/10/2008	12/12/2008
Horiba Readings										
pH (S.U.)	6.33	5.85	5.77	4.93	5.98	6.02	5.73	4.36	6.16	5.76
Sp. Cond. (mS/cm)	0.382	0.247	0.377	0.25	0.569	0.393	0.982	0.385	0.61	0.58
D.O. (mg/L)	3.65	5.68	0.58	0.81	0.92	4.6	2.81	0	0.4	6.68
Temp. (°C)	15.94	15.67	15.86	13.9	18.08	16.35	16.37	15.8	16.91	17.16
ORP (mV)	-53	39	-71	13	-123	-1	38	108	-470	-17
Test Kits										
D.O. (mg/L)	2.5	4	0.3	1	0.9	3	1	0.8	0	3.5
CO <sub>2</sub> (ppm)	160	70	100	70	250	200	70	130	50	250
Alk. (ppm)	200	110	200	70	225	250	110	<10	250	250
Fe <sup>2+</sup> (ppm)	2.9	1.8	2.4	1.6	2.8	3.1	2.6	1.8	2.6	1.8
H <sub>2</sub> S (ppm)	0	0	0	0	0	0	0	0	0	0
LaMotte										
Turbid (NTU)	1060	550	1000	764	(+1000)	750	55	3.61	(+1000)	Er2

NOTES

Er2 will be displayed when measured turbidity is over range (1100 NTU).
#### TABLE 3.1 FIELD GEOCHEMICAL PARAMETERS WASTE OIL DUMP NASA WALLOPS FLIGHT FACILITY WALLOPS ISLAND, VIRGINIA

	TW 3	TW 3 1	TW 4	TW 4	TW 4	TW 4	TW 5	TW 5	TW 5	TW 5
	1 Week	Month	Baseline	2 Day	1 Week	1 Month	Baseline	2 Day	1 Week	1 Month
	12/18/2008	1/14/2009	12/9/2008	12/12/2008	12/18/2008	1/14/2009	12/10/2008	12/12/2008	12/18/2008	1/14/2009
Horiba Readings										
pH (S.U.)	5.56	5.18	5.97	6.01	4.92	4.97	6.46	6.82	6.67	5.14
Sp. Cond. (mS/cm)	0.49	99.4	0.602	0.513	0.301	0.406	0.999	1.31	0.69	0.52
D.O. (mg/L)	1.28	0.77	1.16	5.65	2.37	0	2.27	19.99	10.65	4.82
Temp. (°C)	16.25	15.3	16.51	?	15.65	14.2	16.26	16.93	17.54	13.8
ORP (mV)	-27	-10	-81	8	77	-5	-107	162	40	-6
Test Kits										
D.O. (mg/L)	2	1.5	0.5	3.5	1	0.6	2	9	5.5	8
CO <sub>2</sub> (ppm)	160	70	225	180	200	200	230	30	120	70
Alk. (ppm)	250	150	250	225	110	100	250	400	260	150
Fe <sup>2+</sup> (ppm)	2.5	1.8	2.1	2.1	1	1.2	2	0.8	2.8	2
H <sub>2</sub> S (ppm)	0	0	0	0	0	0	0	0	0	0
LaMotte										
Turbid (NTU)	520	13.5	758	790	19	2.78	Er2	270	320	25.5

NOTES Er2 will be displayed w

#### TABLE 3.1 FIELD GEOCHEMICAL PARAMETERS WASTE OIL DUMP NASA WALLOPS FLIGHT FACILITY WALLOPS ISLAND, VIRGINIA

	TW 6 Baseline 12/10/2008	TW 6 2 Day 12/12/2008	TW 6 1 Week 12/18/2008	TW 6 1 Month 1/14/2009	15-GW7 Baseline 12/8/2008	15-GW7 2 Day	15-GW7 1 Week 12/18/2008	15-GW7 1 Month 1/14/2009	MW3R Baseline 12/8/2008	MW3R 2 Day
Horiba Readings										
pH (S.U.)	6.52	6.16	6.5	5.38	5.37	-	5.48	4.18	6.28	-
Sp. Cond. (mS/cm)	0.999	0.658	0.668	0.69	0.0173	-	0.317	0.1	0.093	-
D.O. (mg/L)	2.44	0.5	3.32	0.94	0.73	-	0.85	4.12	7.72	-
Temp. (°C)	15.96	16.58	15.62	15.2	16.38	-	16.44	15.7	14.02	-
ORP (mV)	-95	-281	-75	-64	-192	-	-40	58	206	-
Test Kits										
D.O. (mg/L)	0.3	0.05	0.3	0.1	0.9	-	0.7	3.5	6	-
CO <sub>2</sub> (ppm)	160	125	55	80	100	-	170	70	16	-
Alk. (ppm)	200	260	140	250	150	-	225	40	20	-
Fe <sup>2+</sup> (ppm)	1.9	2.2	2.5	3.8	3.8	-	1.6	2.4	0	-
H <sub>2</sub> S (ppm)	0	0	0	0	0.4	-	0	1.5	0	-
LaMotte							-			
Turbid (NTU)	290	800	230	42.2	9.15	-	11	4.46	4.8	-

NOTES

Er2 will be displayed

#### TABLE 3.1 FIELD GEOCHEMICAL PARAMETERS WASTE OIL DUMP NASA WALLOPS FLIGHT FACILITY WALLOPS ISLAND, VIRGINIA

	MW3R	MW3R
	1 Week	1 Month
	12/18/2008	1/14/2009
Horiba Readings		
pH (S.U.)	4.86	5.65
Sp. Cond. (mS/cm)	0.093	0.17
D.O. (mg/L)	13.79	8.56
Temp. (°C)	16.29	15.3
ORP (mV)	194	75
Test Kits		
D.O. (mg/L)	7	5.5
CO <sub>2</sub> (ppm)	18	10.5
Alk. (ppm)	32	22
Fe <sup>2+</sup> (ppm)	0.2	0
H <sub>2</sub> S (ppm)	0	0
LaMotte		
Turbid (NTU)	17	1.18

NOTES Er2 will be displayed

#### TABLE 3.2 LAB ANALYTICAL RESULTS WASTE OIL DUMP NASA WALLOPS FLIGHT FACILITY WALLOPS ISLAND, VIRGINIA

Parameter	Cleanup Goal (µg/L)	WOD-15GW	1-1	WOD-15GW2	2-1	WOD-15MW3F	<b>R-1</b>	WOD-15MW3F	₹-4	WOD-15GW	7-1	WOD-15GW	7-4	WOD-16GW2	D-1
Sample Date		12/5/2008	3	12/5/2008		12/8/2008		1/14/2009		12/8/2008		1/14/2009	)	12/5/2008	
VOCs (ug/L)		•													
Benzene	5	1	U	1	U	1	U	1	U	32		2		3	Τ
Tetrachloroethene	NA	1	U	1	U	1	U	1	U	3		2		1	U
Xylenes (total)	NA	3	U	3	U	3	U	3	U	330		120		3	U
m+p-Xylenes	NA	2	U	2	U	2	U	2	U	240		74		2	U
o-Xylene	NA	1	U	1	U	1	U	1	U	95		50		1	U
1,2,4-Trimethlybenzene	NA	1	U	1	U	1	U	1	U	73		54		1	U
SVOCs (ug/L)															
3&4-Methylphenol	NA	10	U	11	U	11	U	9	U	11	U	11	U	11	U
Naphthalene	NA	10	U	11	U	11	U	9	U	96		55		11	U
Metals (ug/L)															
Total Arsenic	10	3.3		4.8	В	1.45		1.45	U	27		9.7		12.3	
Dissolved Arsenic	NA	NA		4.1	В	NA		NA		NA		NA		NA	
Field Parameters															
pH (S.U.)		4.66		5.49		6.28		5.65		5.37		4.18		6.17	
S. Conductivity (mS/cm)		0.191		0		0.093		0.17		0.0173		0.1		0.168	
Dissolved Oxygen (mg/L)		0.32		9.01		7.72		8.56		0.73		4.12		1.84	
Temperature (°C)		14.56		12.61		14.02		15.3		16.38		15.7		15.16	
Oxygen Reduction Potential (mV)		41		52		206		75		-192		58		-19	
Turbidity (NTU)		0.79		16		4.8		1.18		9.15		4.46		0.7	

NA - not analyzed

J - Estimated Value

U - Compound was analyzed for bu not detected above the lab Practical Quantitation Limit (PQL)

U\* - Analyte was not detected in the sample at a level greater than the instument detection limit or greater than the Method Detection Limit (MDL)

B - The analyte was detected in the sample at a concentration greater than the instrumment detection limit or greater than the MDL, but less than the lab PQL

#### TABLE 3.2 LAB ANALYTICAL RESULTS WASTE OIL DUMP NASA WALLOPS FLIGHT FACILITY WALLOPS ISLAND, VIRGINIA

Parameter	WOD-16GW2	S-1	WOD-16GV	V5-1	WOD-16GW8-	-1	WOD-TW1	-1	WOD-TW1	-4	WOD-TW	2-1	WOD-TW2	2-4	WOD-TW	3-1	WOD-TW	3-4
Sample Date	12/5/2008		12/5/200	8	12/10/2008		12/9/200	8	1/14/200	9	12/10/20	08	1/14/200	9	12/10/20	08	1/14/200	)9
VOCs (ug/L)																		
Benzene	5		1	U	1	U	90		36		120		12		87		93	
Tetrachloroethene	1	U	1	U	1	U	2		1	J	0.5	J	1	J	0.7	J	0.6	J
Xylenes (total)	3	U	3	U	3	U	700		360		1200		590		1300		870	
m+p-Xylenes	2	U	2	U	2	U	560		270		930		420		1000		670	
o-Xylene	1	U	1	U	1	U	140		89		270		160		180		200	
1,2,4-Trimethlybenzene	1	U	1	U	1	U	140		81		190		140		170		120	
SVOCs (ug/L)																		
3&4-Methylphenol	13	U	11	U	9	U	4	J	11	U	11	U	12	U	6	J	10	U
Naphthalene	13	U	11	U	9	U	190		51		210		130		200		110	
Metals (ug/L)																		
Total Arsenic	18.4		2.2	В	6.3		51.8		22.3		103		10.3		65.7		56.4	
Dissolved Arsenic	16		1.45	U*	NA		42		19.3		72.6		NA		63.9		59	
Field Parameters																		
pH (S.U.)	6.44		4.79		5.77		6.33		4.93		5.98		4.36		6.16		5.18	
S. Conductivity (mS/cm)	0.233		0.689		0.12		0.382		0.25		0.569		0.385		0.61		99.4	
Dissolved Oxygen (mg/L)	5.73		3.36		1.98		3.65		0.89		0.92		0		0.4		0.77	
Temperature (°C)	13.95		15.42		15.17		15.94		13.9		18.08		15.8		16.91		15.3	
Oxygen Reduction Potential (mV)	-14		104	_	84		-53		13		-123		108		-470		-10	
Turbidity (NTU)	19		36.5		7.1		1060		764		>1100		3.61		>1100		13.5	

NA - not analyzed

J - Estimated Value

U - Compound was analyzed for bu

U\* - Analyte was not detected in the limit or greater than the Method

B - The analyte was detected in the detection limit or greater than the

#### TABLE 3.2 LAB ANALYTICAL RESULTS WASTE OIL DUMP NASA WALLOPS FLIGHT FACILITY WALLOPS ISLAND, VIRGINIA

Baramatar		1		Λ		- 1		- 1		1		1
Parameter	VVOD-1VV4	- 1	VVOD-1VV4	-4	VVOD-1VV3	)- I	VVOD-1VV3	)-4	VVOD-1VV0	- 1	VVOD-1VV0-	4
Sample Date	12/9/2008	3	1/14/2009	9	12/10/200	)8	1/14/200	9	12/10/200	8	1/14/2009	
VOCs (ug/L)												
Benzene	250		120		92		20		44		46	
Tetrachloroethene	1	U	0.4	J	1	U	0.4	J	1		0.3	J
Xylenes (total)	1400		900		1700		440		1600		1200	
m+p-Xylenes	1000		660		1400		310		1200		840	
o-Xylene	390		250		320		130		430		340	
1,2,4-Trimethlybenzene	170		110		300		85		170		160	
SVOCs (ug/L)												
3&4-Methylphenol	31		11	U	2100	U	10	U	10	U	11	U
Naphthalene	320		83		20000		73		400		280	
Metals (ug/L)											-	
Total Arsenic	135		203		102		72.8		27.7		116	
Dissolved Arsenic	138		NA		95.5		62		16.2		117	
Field Parameters												
pH (S.U.)	5.97		4.97		6.46		5.14		6.52		5.38	
S. Conductivity (mS/cm)	0.602		0.406		0.999		0.52		0.999		0.69	
Dissolved Oxygen (mg/L)	1.16		0		2.27		4.82		2.44		0.94	
Temperature (°C)	16.51		14.2		16.26		13.8		15.96		15.2	
Oxygen Reduction Potential (mV)	-81		-5		-107		-6		-95		-64	
Turbidity (NTU)	758		2.78		>1100		25.5		290		42.2	

NA - not analyzed

J - Estimated Value

U - Compound was analyzed for bu

U\* - Analyte was not detected in the limit or greater than the Method

B - The analyte was detected in the detection limit or greater than the

FIGURES

112G00086\0210\112G00086GM32.DWG 05/07/08 MKB



P:\MW\_mainbase 11x17\_land.MXD MMC 03122009



ATTACHMENT 1

Field Task Modification Request Forms



# TETRA TECH NUS FIELD TASK MODIFICATION REQUEST FORM

P:lat St	nety	
NASA WFF FFTA-WOD	CTO 012 Project #12GN	1612
Project/Installation Name	CTO & Project Number	Task Mod. Number
	TT+A . Lak	10/01-0
Work Plan	FFTA+WOD	12/8/2008
Modification To (e.g. Work Plan)	Site/Sample Location	Date
Activity Description: <u>Rearran</u> <u>Proposed Pilot Study u</u>	ged Temp, Well + I Birkplan	injection Well set up from
Reason for Change: <u>Revised</u> <u>up gradient and down</u> by on site geologist.	set up allows te gradient of groundwa	mporary Wells to be directly Ler Flow. Labling was coordinated
Recommended Disposition: <u>New</u> properly monitared	u set up allows the with known ground	e ORC injection to be more Luciter flow
Field Operations Leader (Signatur	re)	12/08 Date
Approved Disposition:	_	
	· · · · · · · · · · · · · · · · · · ·	
··	<u> </u>	
Hand		12/0/08
Project/Task Order Manager (Sig	nature)	Date
Distribution:		
Drogram (Droject File		
Project/Task Order Manager -	,	
Field Operations Leader –		22-20
· · · · · · · · · · · · · · · · · · ·	2	18
· · ·	-	



1 square = 1 Foot Temporary Well . Injection Point Monitoring Well egend



# TETRA TECH NUS FIELD TASK MODIFICATION REQUEST FORM

CTO OI2 Project #112GMGD CTO & Project Number NASA WFF Project/Installation Name Task Mod. Number 12/11/2008 Work olan EFTANWON Modification To (e.g. Work Plan) Site/Sample Location Date postORC injection sampling for WOD postponed I day due possible to mobilize on site. Hence a 2 Activity Description: 1 δα site. Hence a Leather which impossible Made : 12/12/2008 occured on sampling event Reason for Change: NASA WFF tower control denied access down runway due to alightning advisory in the area. Recommended Disposition: 1 day event for NASA WFF WO sampling event changed to a 2 day sampling Field Operations Leader (Signature) Date Approved Disposition: Project/Task Order Manager (Signature) Date Distribution: Program/Project File -Other: Project/Task Order Manager -Field Operations Leader -

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ATTACHMENT 2

Soil Boring, Monitoring Well Construction, and Development Log Sheets



OVERBURDEN MONITORING WELL SHEET STICK-UP

Tetra Tech NUS, Inc.



	Æ	Tetra	Tech N	IUS, Inc		BC	ORING LO	G		Paç	le _		of _	_/
PRO PRO DRIL DRIL	JECT JECT LING LING	NAME NUME COME RIG:	E: BER: PANY: GEOf	112 112 2-E MOBE	- p,10 GN16 BIRA -6620	<u>rs7</u> 27 207	<u>usy</u>	BORING No DATE: GEOLOGIS DRILLER:	o.: ST:	WFF-16-GU 12/8/08 J.S. Tamp D.FERREL	<u>v</u> { <u>e/x</u> /	d W	<i>46</i>	
					N	<b>IATE</b>	RIAL DESCRIPT	ION			PID/FI	D Rea	ding (	ppm)
Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	Soil Density/ Consistency or Rock Hardness	Color	Material Class	ification	U S C S *	Remarks	Sample	Sampler BZ	Borehole**	Driller BZ**
	0			0	LOOSE	Ber	F. SAND					Ö	0	0
				9										
	0				•					WATER Q'				
	10			9	LOCKE	47.	F. SAND	WET						
				<b>]</b> ,	TO									
					FIRM									
				1/						STIFF@ 17'				
				11							Γ			
	20	$\square$		22		AT.	SANDY	Clari						
				22	FILM	78								$\square$
		$\square$		1 1	1.1.000	TAN								
		$\square$		1										
	2.0	$\sim$		30										
	30		1											
		$\checkmark$		-		1				۰. د				
		$\sim$	1	1							1			
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		1	<u> </u>								T			
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		$\checkmark$	1	-							┢			
		$\vdash$	1								+	+		
		$\checkmark$									+	1		
		$\vdash$	┨────	-					<u> </u>		1			
* Whe	n rock c	coring, en	er rock br	okeness.	<u>l</u>				1			1	<u> </u>	<u> </u>
** Indi Rerr	ude mo 1arks:	nitor read	ing in 6 fo	ot intervals $\overline{-\chi_{3}}$	@ borehole.	Increas	e reading frequency if e	elevated reponse	read.	Drilli Background	ng A I (pp	vrea m):		0
0					245	ω¥	No. SEN		<u>א</u> ר די			Ω		
Con	verte	a to We	en:	res			INO	vveir1.t	J. #:	WFF10 5	w	0	-	<del></del>

of		(odor,				WUULA									
Page /	4 lavabe	color, etc.)				TO WHATE		ClENK	/						
	1, 1, 1, 10m	Remarks				Switter)		WISUAN				1	/		
ECORD	sonnel: Sound S	Turbidity (NTU)					l		!			Ì			
OPMENT RI	Responsible Per Drilling Co.: Project Number: Project Number:	Specific Conductance (Units)							\ }						
EVEL(	80	Hd			\	ľ	V	(	ļ			 			
g well di	t.): <u>Z. C. 30</u> Before (ft.): <u>S</u> After (ft.): <u>S</u>	Temperature (Degrees C)			$\backslash$	$\mathbf{n}$									
MONITORIN	Depth to Bottom (f Static Water Level Static Water Level Screen Length (ft.) Specific Capacity: Casing ID (in.):	Water Level Readings (Ft. below TOC)	8,65	10.70	13.35	04,02	2265	26.30	8.80						
US, Inc.	6 0 mp	Cumulative Water Volume (Gal.)	0	/	2	11	27	30							
Tetra Tech N	<u>- 16-610 с</u> - <u>whare e</u> ed: 12/8 di <u>ри</u> м bezisman	Estimated Sediment Thickness (Ft.)	010			1		0	(						
ľ	Well: <u>2007</u> Site: <u>2007</u> Date Install Date Devel Dev. Metho Pump Type	Time	0740	0080	0810	0400	0927	0940	1015						

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# ATTACHMENT 3

Low Flow Purge, Field Analytical, and Groundwater Sample Log Sheets

C		
	F	J
		_

QA SAMPLE LOG SHEET

<u> </u>			Page	<u></u>
Project Site Name: Project Number: Sample Location: QA Sample Type: ↓ ↓ ↓ Trip [] Sou	A-ゆWDD 2GW 1612 1ASA-WFF Blank Irce Water Blank	Sample ID Number Sampled By: C.O.C. Number: [] Rinsate Blank [] Other Blank	: TBOI LAB	
SAMPLING DATA:		WATER SOURCE		
Date:     11/26/08       Time:     1305       Method:     1.415 pr	epered	Laboratory Prepare Purchased Other	d [] Tap [] Fire Hyd	drant
PURCHASED WATER IN (If Applicable as Source or	FORMATION Rinsate Water):	RINSAT (If	TE INFORMATION Applicable):	
Product Name: Supplier: Manufacturer: Order Number: Lot Number: Expiration Date:		Media Type: Equipment Used: Equipment Type: [	] Dedicated ] Reusable	
SAMPLE COLLECTION INFOR	MATION:			
Analysis	Preservative	Container Re	quirements	Collected
Volatiles	Cool 4°C & HCl	3×40ml U	ials	YES⊄NO)
Semivolatiles	Cool 4°C			YES / NO
Pesticide / PCB				YES/NO
Metals	Cool 4°C & HINU <sub>3</sub>			YES/NO
Cyanide			 	YES/NO
OBSERVATIONS / NOTES				
CAB Prepared Samples collect Shipped 12/5/5	Trip Blank ed & W	: for shippi 00 PFFTA	ng VOC 7 (NASA-	WFF)
	~	Signature(s):	A	
	section of the sectio	~		

Tetra Tech NUS	i, Inc.	GROU	NDWA	IER SAF		O ONEE	•	1 I
<u> </u>							Page	of
roject Site Name: roject No.:	NASA WFF-\ 112GN1612	WOD			Sample Sample Sample	ID No.: Location: I By:	WEF-WOB	DD GUT B
<ol> <li>Domestic Well Data</li> <li>Monitoring Well Data</li> <li>Other Well Type:</li> <li>QA Sample Type:</li> </ol>	a 			·······	C.O.C. N Type of [ Low [ High	No.: Sample: Concentra Concentra	ition ation	
MPLING DATA:								
e: 12/5/2000	Color	рH	S.C.	Temp.		DO	Salinity	Other
e: (0) ]	(Visual)	(S.U.)	(mS/cm)	14.56	(UTU) ().79	(mg/l) 0.32	(70)	
GE DATA	CWAY	يرانيا ت						
e: [2/5/2008	Volume	рН	S.C.	Temp.	Turbidity	DO	Salinity	Other
Il Casing Diameter & Materia						sheet		
He: ZTV-				<del>{</del>	Pala	<u><u><u></u></u></u>		
	a			i X		2 		
Cooling Mature (VVL): 나. / *	7		6.00	<u></u>	~**			
t Duran (bra)	Dga		St			· .		
Purge (hrs): $1()$								
al Purge Time (min): 43 m	in /							
al Vol. Purged (gal/L): 1,5°	100	1						
MPLE COLLECTION INFOF	MATION:							
Analysis		Preser	vative		Container R	equirements		Collected
<u>TCL VOCs</u>		HC			1 40ml V	<u>0</u> A		VES
TAL Metals		4,00	<u>'3</u>		1, 122 mL	<u>Volu</u>		475
ICL SVOUS					mp is an	<u>~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ </u>		
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		1						[ E
		· · · · · · · · · · · · · · · · · · ·						
							······································	
3SERVATIONS//NOTES:								
BSERVATIONS/NOTES	eld analytic	al los	sheet ?	Fo( sjuecher	mical par	interpr 5		
See fi	eld analytic	ul locy	sheet ?	Fo( sjæches	mical par	ameter S		
SERVATIONS / NOTES	eld analytic	a) los	sheet 1	Fo( zjuoche)	mί(α) pat	inne for S 5):		

			LOW FL		RGE D/	ATA SH	IEET		15	-Gw1-1
PROJECT	SITE NAME: NUMBER:	NASA WFF 112GN1612	-WOD				WELL ID.: DATE:		WFF-WID15	-GW1-1
Time	Water Level	Flow	рн	S. Cond.	Turb.	DO	Temp.	ORP	Salinity	Comments
(Hrs.)	(Ft. below TOC)	(mL/Min.)	(S.U.)	(mS/cm)	(NTU)	(mg/L)	(Celcius)	mV	% or ppt	
1540	3.71									Hornber battery drad
527	3 951	188	1460	10C 10	10.67	1.42	11.59	(شوا	0,0	(eplerced
0446	LO'M	160	29.4	0,193	5,38	1,14	25.51	63	0.0	
17950	4,13		4.62	0,194	401	6,48	13,43	Ê	0.0	
6.66.0	1 (1)		4.6.2	540	3.95	18.0	13.40	53	Ó,Ó	
0956	٩,,,,,	150	4.62	0.193	349	0,69	13.24	26	ò ¢ Ò	2,5 4 Miged
0959	4.42		4.61	0,19 4	$\frac{1}{2}, \frac{1}{2}$	0,01	0141	54		
5 QVI	55° H	2	4.63	0 19%	581	15'0	1 21, 1 52' 12	с н И	>c >`	1 C Purg ser
1006	11/2 12/12	140	5°) h	0.141	1.2.2	1 1 1 1 1	14.40	44	0.(	
	9,79		4.66	11:0	0.79	032	95,14	41	00	6 < total pura no
	5 - L ~ J - We ( 2									
	Slaw del alour ->	N/00								
0011	HIJ REV	tick-test k	its/ Kern	What a hi	Te.					
	10:10:12									
										PAGE OF
				ł						
	-									



Tetra Tech NUS	, Inc.					EIER3		Page 1	of _3
Project Site	Name:	NASA V	VFF-WOD	)		Sample ID	No.: WFF	WON IS CO	11-1
Project No.:		112GN1	612			Sample Lo	cation: LJF	FF-WAL	
Sampled By	/:	<u> 568</u>	<u> </u>			Duplicate:		,	<u>ــــــــــــــــــــــــــــــــــــ</u>
Field Analys	st:	JBB	RS			Blank:			
Field Form (	Checked as per (	QA/QC Che	ecklist (init	ials):					
SAMPLING DAT	A								
Date: 12[5]	08	Color	pН	\$.C.	Temp.	Turbidity			
Time: 1019		(Visual)	(S.U.)	(mS/cm)	(°C)	OTTO		Salinity	ORP (Eh)
Method: しひい	Flow	clear	4.60	0,191	1450	0.79	(mg/l)	(%)	(+/- mv)
SAMPLE COLLE	CTION/ANALYSIS	NFORMATIO	N						) 41
ORP (Eh) (+/-	· mv)		Electrode	Make & Mo	del:				
			Referenc	e Electrode (	(circle one):	Silver-Silver Chio	rido / Colem		
Dissolved Ox	ygen:						ide / Calom	ei / Hydrogen	
Equipment: Chem	etrics Test Kit				_	Concentration:	1,6	ppm	
Kange Used:	Range	Method	Concentra	ation ppm	1				
<u></u>	0 to 1 ppm	K-7510	_ <u></u>	6		Analysis Time:	1037		
	1 to 12 ppm	K-7512	<u> </u>	t					
Equipment:	HACH Digital Titra	tor OX-DT				-	Analysis Tim	9,	
Range Used:	Range	Sample Vol.	Cartridge	Multiplier	1	Theretic		<u> </u>	
	1-5 mg/L	200 ml	0.200 N	0.01		Titration Count	Multiplier	Concentratio	n
	2-10 mg/L	100 ml	0.200 N	0.02			x 0.01	mg/	<u>L</u>
lotes:					ł		x 0.02	mg/	<u>[</u> ]
Carbon Dioxid	le:								
quipment: Cheme	trics Test Kit					Concentration:	60	ppm	
Range Used:	Range	Method	Concentrat	ion ppm					
<u> </u>	10 to 100 ppm	K-1910	60			Analysis Time	1050		
	100 to 1000 ppm	K-1920				, anoryois finte.	1020	<u></u>	
	250 to 2500 ppm	K-1925							
quipment:	HACH Digital Titrato	or CA-DT							
Range Used:	Range	Sample Vol.	Cartridge	Multiplier		Titration Count		Constant	
	10-50 mg/L	200 ml	0.3636 N	0.1			<b>x</b> 0 1		-
	20-100 mg/L	100 ml	0.3636 N	0.2			x 0.2	<u> </u>	
<u> -   -  </u>	100-400 mg/L	200 ml	3.636 N	1.0			x 1.0	- mg/L	-
	200-1000 mg/L	100 ml	3.636 N	2.0	ľ		x 2.0	<u> </u>	-
	Titrant I	Molarity:		Digits Requir	ed: 1st.:	2nd.:	3rd :	- mg/L	-
, andard Additions:							010		
tes:						Warmen Streem			
tes: /drogen, diss	olved								
tes: /drogen, diss ulpment: Bubble	olved strip sampling field m	nethod							
andard Additions: tes: /drogen, diss uipment: Bubble	<b>olved</b> strip sampling field m Start stripper at	nethod (tin	ie)						
andard Additions: tes: /drogen, diss uipment: Bubble S	<b>olved</b> strip sampling field m Start stripper at End stripper at	nethod (tin (tir	ne) ne)						
andard Additions: tes: /drogen, diss /dipment: Bubble g E	<b>olved</b> strip sampling field m Start stripper at End stripper at Fotal stripper time	nethod (tin (tin	ne) ne)						



Tetra Tech NUS, II	nc.						Page	<u>of_</u>	2
Project Site N	lame:	NASA WE	F-WOD		Sample ID N	o.: WFF	-WOD	-15-GL	J1-1
Project No.:		112GN16 <sup>,</sup>	12	-	Sample Loca	tion: { J F	F- W	015	
Sampled By:	7	BB RS		_	Duplicate:				
Field Analyst:		JBB RS		-	Blank:				
Alkalinity:									
Equipment: Cheme	etrics Test Kit				Concentration:	_50	_ppm		
Range Used:	Range	Method	Concentral	ion ppm					
	10 to 100 ppm	K-9810	50	)	Analysis Time:	1042			
	50 to 500 ppm	K-9815					-		
	100 to 1000 ppm	K-9820						Filtered:	
Equipment:	HACH Digital Titrat	or AL-DT				•			
Range Used:	Range	Sample Vol.	Cartridge	Multiplier	Titration Count	Multiplier	Conce	entration	
	10-40 mg/L	100 ml	0.1600 N	0.1	&	<b>x</b> 0.1	=	mg/L	
	40-160 mg/L	25 ml	0.1600 N	0.4	&	<b>x</b> 0.4	Ξ	mg/L	
	100-400 mg/L	100 ml	1.600 N	1.0	<u> </u>	<b>x</b> 1.0	=	mg/L	
	200-800 mg/L	50 ml	1.600 N	2.0	&	x 2.0	=	mg/L	
	500-2000 mg/L	20 ml	1.600 N	5.0	&	x 5.0	=	mg/L	
	1000-4000 mg/L	10 mi	1.600 N	10.0	<u> </u>	x 10.0	=	mg/L	
	Parameter:	Hydroxide	Carbo	onate	Bicarbonate	Ī			
	Relationship:				Biodi Bonardo				
Standard Additions:	Titran	t Molarity:		Digits Requi	red: 1st.: 2nd.:	3rd.:			
Notes.	- 2+1-								
Ferrous from (r	-e ):					29			
Equipment:	DR-850	DR-8	Range: 0 -	3.00 mg/L	Concentration:	<u></u>	_ppm		
	Program/Module:	500nm	33			1042			
					Analysis Time:	1015	-		
Equipment:	IR-18C Color Whee		Range: 0 -	10 mg/L					
Notes:								Filtered:	
nyurogen sun			Range: 0 -	5 mg/L					
Equipment: (	HS-C	Other:			Concentration:	010	ppm		
	Exceeded 5.0 mg/L	range on colo	r chart:		Analysis Time:	1050	-		
Sulfide (S <sup>-</sup> ):									
Equipment: Chemet	trics Test Kit		Range: 0 - '	10 mg/L	Concentration:		ppm		
Range Used:	Range	Method	Concentrati	on ppm					
	0 to 1 ppm	K-9510			Analysis Time:		-		
	1 to 10 ppm	K-9510							
								Filtered:	$\Box$
Equipment:	DR-850	DR-8	Range: 0 - (	).70 mg/L					
Program/Module:	610nm	93							
Notes:			***						

GROUNDWATER	SAMPLE	LOG	SHEET

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Tetra Tech NUS, Inc.

							Page	<u></u>
Design City Manage			_			155 5 1 4 14		
Project Sile Name:	NASA W	$\frac{1}{1}$	100		Sample	ID No.: M	4-1000-151	5W2-1_
Project No	IL CANT	612			- Sample	Location:	15GW	2
Domestic Well Data						u by: No :		
Monitoring Well Data					Type of	Sample		
1 Other Well Type						Concentra	ation	
1 QA Sample Type:					- П. Ніай	Concentra	ation	
<b>.</b>						r oonoona.		
SAMPLING DATA:								
Date: 12/5/08	Color	pН	S.C.	Temp.	Turbidity	DO	Salinity	Other
Time: (310	(Visual)	(S.U.)	(mS/cm)	( <sup>0</sup> C)	(NTU)	(mg/l)	(%)	
Method: Low Fron	clear	5,49	6,000	12.61	16	9,01	0,0	
PURGE DATA:								
Date: 12 5 08	Volume	рН	s.c.	Temp.	Turbidity	DO	Salinity	Other
Method: Low FLOW	Szz	Low	Rau	PURGE	SHEZ T			
Monitor Reading (ppm):								
Well Casing Diameter & Material								
Trans 2" DVA								
Type: - TVC								
Total Well Depth (TD): 0(5								
Static Water Level (WL): 5.2-								
One Casing Volume(gal/L): (),54	a							
Start Purge (hrs): 1230 J								
End Purge (hrs): 1300								
Total Purge Time (min): 30 min								
Total Vol. Purged (gal/L):								
SAMPLE COLLECTION INFORMA	TION							
Analysis	<u>1815 616(6)81+(616)+(618)</u>	Preser	vative		Container R	equirements		Collected
TEL VOC		HEL		13) 40	METERS	5		U.CJ
TEL SUDE				(2) ]	L Am	ben		Jes
TAL METALS		<b>HNO</b>	3	250	ml POL	. Y		yei
Filtered Metals		HNO	3	250 n	-1 POLY	•		Les
								U
			:					
						·		
			*1*1*1*1*1*1*1*1*1*1		******			
OBSERVATIONS NOTES								
Circle if Applicable:					Signature(s	):		
MS/MSD Duplicate ID No.						·		
	-							
	-							

PROJECT	NUMBER:	112GN1612					DATE:	•	12 5 0 8	
Time	Water Level	Flow	рН	S. Cond.	Turb.	DO	Temp.	ORP	Salinity	Comments
(Hrs.)	(Ft. below TOC)	(mL/Min.)	(S.U.)	(mS/cm)	(NTU)	(mg/L)	(Celcius)	mV	% or ppt	
1230	5.20	521	4.93	0,000	120	9.76	11.33	153	0,0	
1235	キャ・シ	150	5.30	0.000	کر 33	9.44	11.94	137	0,0	
1240	5.96	150	5.48	0,000	70	9.20	12.56	20	0,0	
1246	6.28	150	5.49	0,000	17	9,13	12.55	49	0 0	
1250	6.37	051	5.49	0,000	14	9.07	12.59	50	0,0	
1255	6.40	150	5.50	0,000	μ	9,06	12.61	51	0,0	
1500	9F-9	150	5.49	2,000	16	9.01	12.61	SX	0,0	
								-		
ş										
		N								
SIGNAT		K								

WFFWOD-15-GWZ

LOW FLOW PURGE DATA SHEET

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Tetra	Tech	NUS.	Inc.
1000	1000	,	

Tetra Tech NUS, Inc	, ,	GEC						Page <u>/</u> of _	2-
Project Site Na	mortinasa	et v	s.			Sample ID No	. WEEW	00 - 15/1	)2-I
Project No : Ì	12 (JN) 11.	$\frac{n+\omega}{2}$				Sample Local	tion $156$	- <u></u> 	
Sampled By:	<u> </u>					Duplicate:			
Field Applyet:		= w/	25			Blank <sup>1</sup>			
Field Form Che	cked as per QA	VOC Check	list (initia	ls):					
SAMPLING DATA									
Date: 12/5/09	3	Color	рH	S.C.	Temp.	Turbidity	DO	Salinity	ORP (Eh)
Time: /310		(Visual)	(S.U.)	(mS/cm)	(°C)	(NTU)	(mg/l)	(%)	(+/- mv)
Method: ເວເລ F	1.000	clear	5.44	0.000	12.61	16	9.01	0.0	52
SAMPLE COLLECT	ION/ANALYSIS INI	ORMATION:							
ORP (Eh) (+/- m	IV) 50		Electrode I	Make & Mod	lel: HURZS	<u>+ UZZ</u>			
	)2		Reference	Electrode (d	circle one): S	Silver-Silver Chlorid	de / Calomei	/ Hydrogen	
Dissolved Oxy	gen:						1.5		
Equipment: Chemetr	ics Test Kit					Concentration:		_ppm	
Range Used:	Range	Method	Concentrat	tion ppm			1272		
	0 to 1 ppm	K-7510				Analysis Time:	1 22 T	-	
	1 to 12 ppm	K-7512	1.5						
Equipment:	HACH Digital Titrate	or OX-DT					Analysis Time:		_
Range Used:	Range	Sample Vol.	Cartridge	Multiplier	]	Titration Count	Multiplier	Concentration	
	1-5 mg/L	200 ml	0.200 N	0.01			x 0.01	= mg/L	
	2-10 mg/L	100 ml	0.200 N	0.02			<b>x</b> 0.02	= mg/L	
Notes:									
Carbon Dioxide	<b>e:</b>								
Equipment: Chemet	rics Test Kit				1	Concentration:	0.45	_ppm	
Range Used:	Range	Method	Concentra	tion ppm			1230		
	10 to 100 ppm	K-1910	0.45	>	-	Analysis Time:	1530	-	
	100 to 1000 ppm	K-1920			4				
	250 to 2500 ppm	K-1925			<u> </u>				
Equipment:	HACH Digital Titrate	or CA-DT			_				-
Range Used:	Range	Sample Vol.	Cartridge	Multiplier		Titration Count		Concentration	
	10-50 mg/L	200 ml	0.3636 N	0.1	-		<b>x</b> 0.1	= mg/L	-
	20-100 mg/L	100 ml	0.3636 N	0.2			x 0.2	= mg/L	-
	100-400 mg/L	200 ml	3.636 N	1.0			x 1.0	= mg/L	-
	200-1000 mg/L	100 ml	3.636 N	2.0	j virodu 4et v		X 2.0	= mg/L	
Standard Additions:		t Molanty:		Digits Req	uirea: ist.:	200.;			
Hydrogen, diss	solved								
Equipment: Bubble	e strip sampling field	method							
	Start stripper at	(t	ime)						
	End stripper at	(	time)						
	Total stripper time								
	Pump rate	milliliter	s/minute						



Tetra Tech NUS, In	C.						Page	<u>~ of _ </u>	
Project Site N	ame: NASA wi	FF			Sample ID N	O.: WFFW	≥j ~ Q¢	GW2-1	I
Project No.:	12GNILLZ	-			Sample Loca	tion: 156	102		
Sampled By:	EN			_	Duplicate:				
Field Analyst:	Jacob-Birkett-	EW/R	S	-	Blank:				
Alkalinity:		•							
Equipment: Cheme	trics Test Kit				Concentration:	14.5	_ppm		
Range Used:	Range	Method	Concentrat	tion ppm		. <u>.</u>			
	10 to 100 ppm	K-9810	14.5	5	Analysis Time:	1235	-		
	50 to 500 ppm	K-9815							_
	100 to 1000 ppm	K-9820						Filtered:	
Equipment:	HACH Digital Titrat	or AL-DT							
Range Used:	Range	Sample Vol.	Cartridge	Multiplier	Titration Count	Multiplier	Conce	entration	
	10-40 mg/L	100 ml	0.1600 N	0.1		x 0.1	=	mg/L	
	40-160 mg/L	25 ml	0.1600 N	0.4	<u> </u>	x 0.4	=	mg/L	
	100-400 mg/L	100 ml	1.600 N	1.0	&	x 1.0	=	mg/L	
	200-800 mg/L	50 ml	1.600 N	2.0	&	x 2.0	=	mg/L	
<u> </u>	500-2000 mg/L	20 ml	1.600 N	5.0	&	<b>x</b> 5.0	=	mg/L	
	1000-4000 mg/L	10 ml	1.600 N	10.0	&	x 10.0	=	mg/L	
		•	<del>.</del>			7			
	Parameter:	Hydroxide	Carb	onate	Bicarbonate				
	Relationship:					]			
Standard Additions Notes:	: L Titran	t Molarity:	<u></u>	Digits Requ	lired: 1st.: 2nd.:	3rd.:			
Ferrous Iron (I	Fe <sup>2+</sup> ):				·/···				
Equipment:	DR-850	DR-8	Range: 0 -	3.00 ma/l	Concentration	4.8	nnm		
сцартен.	Dreason (Madula)	E00nm	nange. v -	0.00 mg/L	concentration.		- <sup>ppm</sup>		
	Program/Module:	muuuc	33		Analysis Time:	1335			
				10	Analysis fille.	14- 42	-		
Equipment:	IR-18C Color Whee	81	Range: 0 -	10 mg/L					_
Notes:					· ·····			Filterea:	
Hydrogen Sun	nde (H <sub>2</sub> 5):		Range: 0 -	5 mg/L					
Equipment:	HS-C	Other:			Concentration:		ppm		
	Exceeded 5.0 mg/L	, range on cold	or chart:	L	Analysis Time:		_		
Notes:				<u>.</u>					
Sulfide (S <sup>2-</sup> ):									
Equipment: Cheme	trics Test Kit		Range: 0 -	10 mg/L	Concentration:	<del></del>	_ppm		
Range Used:	Range	Method	Concentra	tion ppm					
	0 to 1 ppm	K-9510			Analysis Time:		_		
	1 to 10 ppm	K-9510							_
								Filtered:	
Equipment:	DR-850	DR-8	Range: 0 -	0.70 mg/L					
Program/Module:	610nm	93		_					

ŦŁ	Tetra Tech NUS, Inc.
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# **GROUNDWATER SAMPLE LOG SHEET**

							Page	of
Project Site Name: Project No.:	WFF -し ド入Gy)l(。	12 12 12	Pilat St.	ndy	Sample Sample Sample	ID No.: Location: I By:	WFF-WO WFF-W	<u>N-15-21W38-1</u> 1010
<ul> <li>Domestic Well Data</li> <li>Monitoring Well Data</li> <li>Other Well Type:</li> <li>QA Sample Type:</li> </ul>					C.O.C. I Type of Tow [] High	No.: Sample: Concentra Concentra	tion	
CAMPENIC DATA								
	Color	nH	S.C.	Temp.	Turbidity	DO	Salinity	Other
Time: 10103 1136	(Visual)	(S.U.)	(mS/cm)	( <sup>0</sup> C)	(NTU)	(mg/l)	(%)	
Method: Letter Flaw	clast	622	0.035	14,02	4.8	7.72	C.O	
PURGE DATA								
Date: 12/2/2005	Volume	pН	S.C.	Temp.	Turbidity	DÖ	Salinity	Other
Method: Law Flam								
Monitor Reading (nom):								
Woll Cosing Diameter & Material			· · · · ·		_		and the second second	
					CI.	Name		
					1 1	,		
Total Well Depth (TD): うえいシー		l		P 10		1		
Static Water Level (WL): X ( 607)			12 - 10-	and and and a second se	- Nor	1	1	
One Casing Volume(gal/L): 0 ، الوطر One Casing Volume			201	1111	7			
Start Purge (hrs): (C) 7			<u> </u>	<u> </u>				1
End Purge (hrs): 103		and the second			ļ			
Total Purge Time (min): 4 G	and the second						<u></u>	
Total Vol. Purged (gal/L): 2.5gn/	marine							
SAMPLE COLLECTION INFORMA	TION:							1
Analysis		Prese	rvative		Container R	equirements	\$	Collected
Tel voc		HC		(3) -	$\frac{10.1L}{10.1}$	KA VILL	5	105
FAL Metals		H /.	<u>K 1</u>	(1)	115.46	Dely_		1 Jones
TEL SUDES				$-\omega$	IL MAR	3~1		1/1-3
· · · · · · · · · · · · · · · · · · ·		<u> </u>						
OBSERVATIONS / NOTES:								
see f	ield a	naly ti	cal l	og sh	eet f	or go	ochemi	Ca
pa	rane ter	5						
Circle if Applicable: MS/MSD Duplicate ID No	.:				Signature(	s):	1	
· · ·					Vach	WW Roll	1	
					<u> </u>			

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PROJECT SITE NAME: PROJECT NUMBER:

# LOW FLOW PURGE DATA SHEET

NASA WFF-WOD 112GN1612 TN 32.33

WELL ID.: DATE:

WFF-WOD-15-MW3R-1

PAGE OF								Ind T	EIN. Mail A	
								× .	4	
					~					
										1
outer 2.5 and	6,0	206	14.62	7.72	N 1	0.013	500			6003
	0.0	707	14.01	7,70	ن ک	0.094	5.27			8501
	0.0	210	13.81	7.44	4,5	ن ن ۹۹	C. J.Z.			1053
2 steld rate 2 an	たいへ	いろ	13,54	7.72	5.4	P10.0	$\sigma \mathcal{L} \phi$		27.45	8.49
Le contra de la co	2.0	A 3	13,22	7.24	4.2	0.013	é.M			54.01
1 × 1	$\sim \sim \sim$	512	13.14	1.8.1	54	ь V V	14,0	7 25 0		11-01
	0 - O	51%	1317	1,2,64	いい	े , <del>८</del> १४	612			1037 7
Prove 1	$\mathcal{O}$	216	13,17	H.O.'S	_ل_ 	HIS O	L1,0		として	5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5
	C.O	$\mathcal{P}_{\mathfrak{S}}$	25~ 1	2316	С'L.	51,2 0	$\alpha \tau \cdot \gamma$	らたん	くびして	5:00
	· · ·	212	1272	00'2	6 a	7000	57 3	212	57.12	1017
	% or ppt	mV	(Celcius)	(mg/L)	(NTU)	(mS/cm)	(S.U.)	(mL/Min.)	(Ft. below TOC)	(Hrs.)
Comments	Salinity	ORP	Temp.	DO	Turb.	S. Cond.	рН	Flow	Water Level	Time



Tetra Tech NUS, In	с.							Page <u>\</u> of _	3
Project Site Na	ame: WFF-We	B Gul	. lot St.	.1.		Sample ID N	0.:UFF-	UCHIC ML	130-1
Project No.:	12611612	· · · · ·	<u>,,,,,</u> ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	2.1 Y		Sample Loca	tion: WE		
Sampled By:	ABB			-		Dunlicate:			
Field Analyst:	lacob Birkett			-		Blank:			
Field Form Ch	ecked as ner O/	VOC Chec	klist (initis	- ale):					
SAMPLING DATA:				10 <i>7</i> .					
Date: 12 /2 / 3	225	Color		60	Tomp	Turbidity	<b>DO</b>	Calinity	
Time: 1134		(Visual)		5.0. (m 0 (mm)	Penip.			Sannity	
Mathadt	Flair	(Visual)	(5.0.)	(ms/cm)			(mg/l)	(%)	(+/- mv)
SAMPLE COLLECT	TION/ANALYSIS IN	FORMATION							$\chi O \varphi$
ORP (Eh) (+/- n	nv)		Electrode I	Make & Mod	el·				***************
	,		Reference	Electrode (r	vircle one) <sup>,</sup> S	ilver-Silver Chlori	de / Calomei		
Dissolved Oxy	den.		Terendo					- Hydrogen	
Equipment: Chemet	gen. rics Test Kit					Concentration:	Ca		
		T	1			Concentration.		.ppm	
Range Used:	Range	Method	Concentra	tion ppm			157		
	0 to 1 ppm	K-7510	71			Analysis Time:	112 %	~~ •	
	1 to 12 ppm	K-7512	0	۶ 					
Equipment:	HACH Digital Titrato	or OX-DT					Analysis Time:		_
Range Used:	Range	Sample Vol.	Cartridge	Multiplier		Titration Count	Multiplier	Concentration	1
	1-5 mg/L	200 ml	0.200 N	0.01			x 0.01	= ma/L	
	2-10 mg/L	100 ml	0.200 N	0.02			<b>x</b> 0.02	= ma/L	
Notes:	······································								Ĵ
									Ĩ
Carbon Dioxid	e:								
Equipment: Chemet	rics Test Kit					Concentration:	- 16	ppm	
Range Used:	Range	Method	Concentral	tion ppm				_	
X	10 to 100 ppm	K-1910	i6			Analysis Time:	152	3	
	100 to 1000 ppm	K-1920							
	250 to 2500 ppm	K-1925							
									i i i
Equipment:	HACH Digital Titrato	or CA-DT							
Range Used:	Range	Sample Vol	Cartridge	Multiplier		Titration Count		Concentration	
	10-50 ma/L	200 ml	0.3636 N			Thration Count	v 0 1		
	20-100 mg/L	100 ml	0.3636 N	0.1			×02	- mg/L	
	100-400 mg/L	200 ml	3.636 N	1.0			x 1.0	- mg/L	
	200-1000 ma/L	100 ml	3,636 N	2.0			x 2 ft	- my/L	
Standard Additions:	Titrant	Molarity:		Digits Regu	ired: 1st	2nd ·	3rd -	- iiig/L	
Notes:		· · · · · · · · · · · · · · · · · · ·				AIIG	010		ŀ
Hydrogen, diss	olved								
Equipment: Bubble	strip sampling field	method							
	Start stripper at	(ti	me)						
	End stripper at	(t	ime)						
	Total stripper time	·							
	Pump rate	milliliters	/minute						



Tetra Tech NUS, li	ю.						Page	<u>}</u> of _	3
Project Site N	lame: WFF-L	JOD C	w Pilo	t Study	Sample ID N	o.: UFF	- We	3.5	MUSSA
Project No.:	IDGNI61	<u>ス</u>		- ,	Sample Loca	tion: WFJ	=-W	00	
Sampled By:	JSB			_	Duplicate:				
Field Analyst:	Jacob Birkett				Blank:				
Alkalinity:									
Equipment: Cheme	etrics Test Kit				Concentration:	20	_ppm		
Range Used:	Range	Method	Concentra	tion ppm		11/11			
	10 to 100 ppm	K-9810	20		Analysis Time:		_		
	50 to 500 ppm	K-9815							_
	100 to 1000 ppm	K-9820						Filtered:	
Equipment:	HACH Digital Titrat	or AL-DT							
Range Used:	Range	Sample Vol.	Cartridge	Multiplier	Titration Count	Multiplier	Conc	entration	
	10-40 mg/L	100 ml	0.1600 N	0.1	&	<b>x</b> 0.1	=	mg/L	
	40-160 mg/L	25 ml	0.1600 N	0.4	&	<b>x</b> 0.4	=	mg/L	
	100-400 mg/L	100 ml	1.600 N	1.0	&	x 1.0	=	mg/L	
	200-800 mg/L	50 ml	1.600 N	2.0	&	<b>x</b> 2.0	=	mg/L	
	500-2000 mg/L	20 ml	1.600 N	5.0	&	<b>x</b> 5.0	=	mg/L	
	1000-4000 mg/L	10 ml	1.600 N	10.0	&	x 10.0	=	mg/L	
	· · · · · · · · · · · · · · · · · · ·	1	1			1			
	Parameter:	Hydroxide	Carb	onate	Bicarbonate				
	Relationship:			. l.,					
Standard Additions Notes:	: LJ Titrani	t Molarity:		Digits Requir	red: 1st.: 2nd.:	3rd.:			
Ferrous Iron (I	Fe <sup>2+</sup> ):					-			
Equipment:	DR-850	DR-8	Range: 0 -	3.00 mg/l	Concentration:	6	որա		
	Program/Module:	500nm	33	0.00 mg/2					
	i rogrami modalo.	0001111	00		Analysis Time:	148			
Equipment	-IR-18C Color W/bee		Papas: 0	10 ma/l	Analysis time,	1110	-		
Notes:			rtange. 0 -	to high				Eiltorodi	
Hydrogen Sulf	ide (H <sub>2</sub> S):		Pange: 0 -	5 ma/l	······			Fillereu.	
Equipment:		Others	Range. 0 -	o mg/L	0	$\alpha$			
	Eveneded 5.0 "	Outer.			Concentration:	1171	_ppm		
Notes	Exceeded 5.0 mg/L	range on colo	r chart:		Analysis Time:	11.26	-		
Rulfido (8 <sup>2-</sup> ).				-					
Equipment: Cheme	trics Test Kit		Range: 0 -	10 mg/L	Concentration:		ppm		
Range Used:	Range	Method	Concentrat	ion pom					
	0 to 1 ppm	K-9510			Analysis Time:				
	1 to 10 ppm	K-9510			,, <u></u>		-		
		•	<b>L</b>					Filtered	
Equipment:	DR-850	DR-8	Range: 0 -	0.70 ma/L					
Program/Module	610nm	93		· · · · · <del>.</del> · -					
Notes:									

# **GROUNDWATER SAMPLE LOG SHEET**

							Page	<u>of</u>
Project Site Name:	NASA W		JOD		Sample	<i>سلا</i> ت ۳۰ : ID No	:war - 150 15	707-1
Project No.:	112600	612			Sample	Location:	15607	r
	<u></u>			· ·	Sample	d By:	EW	
Domestic Well Data					C.O.C.	No.:		
Monitoring Well Data					Type of	Sample:		
<ol> <li>Other Well Type:</li> </ol>					] Low	Concentra	ation	
[] QA Sample Type:	·				_ [] High	r Concentra	ation	
SAMPLING DATA:								
Date: 12 8 0 8	Color	pН	S.C.	Temp.	Turbidity	DO	Salinity	Other
Time: 1120	(Visual)	(S.U.)	(mS/cm)	( <sup>0</sup> C)	(NTU)	(mg/l)	(%)	
Method: Low FLOW	Clear	5.37	0.173	16.38	9.15	0.73	0,0	
PURGE DATA								
Date: 12 8 08	Volume	pН	S.C.	Temp.	Turbidity	DO	Salinity	Other
Method: LOW FLOW	See	lead	flow	purge	109	sheet		
Monitor Reading (ppm):				<u> </u>	Ľ Š			
Well Casing Diameter & Material								
Type: 2" PVC								
Total Well Depth (TD): $30$								
Static Water Level (WL): 26.04							ļ	
One Casing Volume(gal/L): 0, 5	ie							
Start Purge (hrs): 1040 0								
End Purge (hrs): パンの								
Total Purge Time (min): 40 ゅう								
Total Vol. Purged (gal/L):								
SAMPLE COLLECTION INFORM	ATION							
Analysis		Preser	vative		Container R	equirements	<b>;</b>	Collected
TEL VOC		Her		(3) 40,	al glass			ices
TEL SVOC				(2) /	L Ante	- stess		ye (
TAL METERS		1003		(i) <u>2</u> 3	OINT P	VEY		yes
					•			
		· · · ·						
		<u> </u>						
		[		•	•			
OBSERVATIONS / NOTES								
ali								
Sight Stroleum	oder							
Circle if Applicable:					Signature(s	5):		
MS/MSD Duplicate ID No.					$\leq$			>
							C	

PROJECT ( PROJECT ) Time (Hrs.) //652 //65	SITE NAME: UMBER: UMBER: (Ft. below TOC) 24.77 27.21 27.21 27.34	NASA WFF- 112GN1612 Flow パーレMin.) フラロ フラロ フラロ フラロ フラロ フラロ フラロ フラロ フラロ フラロ	WOD pH <u>5,00</u> <u>5,27</u> <u>5,27</u>	S. Cond. (mSicm) 0,216 0,184 6,153 0,193	Turb. (NTU) 152 32.6 /3.8 /3.8 /2.0	DO (mg/L) 1.516 1.716 0.64 0.77/	WELL ID.: DATE: Temp. (Celcius) (5, 19 パン・ティ パン・ティ パン・ティ	ORP mV -165 -165 -165 -167	WFF - 15 1218 (28) Salinity % or ppt 0, 0 0, 0 0, 0 0, 0
1/00/	32,40	025	1219	0,143 CP1.0	12.0	690	16.67	-192	0.0
3/1/	もた、たい	2 7 7 8 7 7	532	0.151 0.151	12/20/	0,72 0,72	16,63	-193	0,0
1//5	27.79	200	5,35	0.16%	9.67	0,73	16.40	-194	0.0
0211	27,83	200	5.37	0,173	'9.15	0,-73	16.38	-192	0.0
SIGNATUR	E(S):								
			/						



LOW FLOW PURGE DATA SHEET



Tetra Tech NUS, Inc.		GEO						Page <u>/</u> of _	2
			Van			Sample ID N	. WI - WI	DD-15GL	J7-1
Project Site Na	me: NADA -					Sample Loca	$\frac{1}{100}$		<u> </u>
Project No.: 1	1201V1012	-				Duplicato		/ /	<u> </u>
Sampled By:	EL	····· \				Duplicate:			
Field Analyst:	Jacob-Birkett-		<u></u>			Biank:			
Field Form Che	cked as per QA	VQC Check	list (initial	s):					
SAMPLING DATA:									
Date: 12/8/0	8	Color	рН	S.C.	Temp.	Turbidity	DO	Salinity	ORP (Eh)
Time: 1 2.3	A I	(Visual)	(S.U.)	(mS/cm) ひ /フ つ	(°C)	(NTU)	(mg/l) ス ごフス		(+/- mv)
Method:	FION	Clean	5.5 +	0.113	16,50	1 1.15	0,73		
SAMPLE COLLECT	IONANALYSIS INI	CRMATIONS			1-4-0-				<u>                                     </u>
ORP (En) (+/- m	<sup>(V)</sup> -/'	92	Electrode N	nake & Mod	el: <u>, 708.2</u>				
	<u> </u>		Reference	Electrode (c	arcle one): 8	Silver-Silver Chlori	de / Calomei	/ Hydrogen	
Dissolved Oxyg	jen:					0	nG		
Equipment: Chemetr	ics Test Kit					Concentration:		_ppm	
Range Used:	Range	Method	Concentrat	ion ppm			see la		
	0 to 1 ppm	K-7510	0,9	•		Analysis Time:	_//90_	-	
	1 to 12 ppm	K-7512	ator	( cinge_					
				_		÷			
Equipment:	HACH Digital Titrate	or OX-DT					Analysis Time:		_
Range Used:	Range	Sample Vol.	Cartridge	Multiplier		Titration Count	Multiplier	Concentration	
	1-5 mg/L	200 ml	0.200 N	0.01			x 0.01	= mg/L	
	2-10 mg/L	100 ml	0.200 N	0.02			x 0.02	= mg/L	
Notes:									
Carbon Dioxide	<b>e:</b>								
Equipment: Chemetr	rics Test Kit					Concentration:	100	ppm	
Range Used:	Range	Method	Concentral	lion ppm	]				
.Z	10 to 100 ppm	K-1910	100			Analysis Time:	1148	_	
	100 to 1000 ppm	K-1920							
	250 to 2500 ppm	K-1925							
Equipment:	HACH Digital Titrat	or CA-DT							
Range Used:	Range	Sample Vol.	Cartridge	Multiplier	]	Titration Count		Concentration	
	10-50 mg/L	200 ml	0.3636 N	0.1			x 0.1	= mg/L	
	20-100 mg/L	100 ml	0.3636 N	0.2			<b>x</b> 0.2	= mg/L	
	100-400 mg/L	200 ml	3.636 N	1.0			<b>x</b> 1.0	= mg/L	
	200-1000 mg/L	100 ml	3.636 N	2.0			x 2.0	= mg/L	
Standard Additions:	Titran	t Molarity:		Digits Req	uired: 1st.:	2nd.:	3rd.:		
Notes:							1		
Hydrogen, diss	solved								
Equipment: Bubble	e strip sampling field	method							
	Start stripper at	(t	ime)						
	End stripper at		time)						
	Total stripper time								
	Pump rate	milliliter	s/minute						



Tetra Tech NUS, In	C.	UL					Page	<u></u>	~
Project Site Na	ame: NAS4 (	WFF /	and		Sample ID N	o.: WZ-U	100 - 00	ISGU	7-1
Project No.:	1126121612	-	~~~	-	Sample Loca	tion: $159$	W7	•	/
Sampled By:	EW			-	Duplicate:				
Field Analyst:	Jacob-Birkett	ΞIJ		-	Blank:				
Alkalinity:									
Equipment: Cheme	trics Test Kit				Concentration:	150	ppm		
Range Used:	Range	Method	Concentra	tion ppm					
	10 to 100 ppm	K-9810			Analysis Time:		-		
	50 to 500 ppm	K-9815	150						
	100 to 1000 ppm	K-9820	I.,					Filtered:	
Equipment:	HACH Digital Titrat	or AL-DT							
Range Used:	Range	Sample Vol.	Cartridge	Multiplier	Titration Count	Multiplier	Conce	entration	
	10-40 mg/L	100 ml	0.1600 N	0.1	&	x 0.1	=	mg/L	
	40-160 mg/L	25 ml	0.1600 N	0.4		<b>x</b> 0.4	=	mg/L	
	100-400 mg/L	100 ml	1.600 N	1.0	&	x 1.0	=	mg/L	-
	200-800 mg/L	50 ml	1.600 N	2.0	&	x 2.0	=	mg/L	-
	500-2000 mg/L	20 ml	1.600 N	5.0	&	× 5.0	=	mg/L_	-
	1000-4000 mg/L	10 ml	1.600 N	10.0	&	<b>x</b> 10.0	=	mg/L	]
	Parameter	Hydroxide	Carb	ionate	Bicarbonate	1			
	Relationship:	Thydroxide	00.0		Didibolitico				
Standard Additions:	Titran	t Molarity:		Digits Requ	ired: 1st.: 2nd.:	3rd.:			
Notes:									
Ferrous Iron (F	<sup>=</sup> e <sup>2+</sup> ):								
Equipment:	DR-850	DR-8	Range: 0 -	3.00 mg/L	Concentration:	3,8	_ppm		
	Program/Module:	500nm	33						
					Analysis Time:	<u>1145</u>	-		
Equipment:	IR-18C Color Whee	əl	Range: 0	10 mg/L					_
Notes:								Filtered:	
Hydrogen Sulf	ide (H <sub>2</sub> S):		Range: 0 -	- 5 mg/L					
Equipment:	HS-C	Other:			Concentration:	0.4	_ppm		
	Exceeded 5.0 mg/L	. range on colo	or chart:		Analysis Time:	<u>    11 58</u>	-		
Notes:									
Sulfide (S <sup>2-</sup> ):									
Equipment: Cheme	trics Test Kit		Range: 0 -	- 10 mg/L	Concentration:		_ppm		
Range Used:	Range	Method	Concentra	tion ppm					
	0 to 1 ppm	K-9510			Analysis Time:				
	1 to 10 ppm	K-9510							
								Filtered	
Equipment:	DR-850	DR-8	Range: 0 ·	- 0.70 mg/L					
Program/Module:	610nm	93							
Notes:									

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# **GROUNDWATER SAMPLE LOG SHEET**

							Page	<u>/</u> of <u>/</u>
Project Site Name: Project No.:	NOD 112GN16	12			Sample Sample	ID No.: <i>W</i> Location:	Eluod-166 GwZD	<u>iw2D-1</u>
<ul> <li>Domestic Well Data</li> <li>Monitoring Well Data</li> <li>Other Well Type:</li> <li>QA Sample Type:</li> </ul>					C.O.C. I Type of [] Low [] High	o By: No.: Sample: Concentra Concentra	ation	
SAMPLING DATA:								
Date: 12/5/08	Color	рН	S.C.	Temp.	Turbidity	DO	Salinity	Other
Time: 1005	(Visual)	(S.U.)	(mS/cm)	( <sup>0</sup> C)	(NTU)	(mg/l)	(%)	Temp
Method: Low FLow	CLEAR	6.17	0.168	5.7	0.7	1.84	0.0	15.16
PURGE DATA:								
Date: 12/5/08	Volume	рН	S.C.	Temp.	Turbidity	DO	Salinity	Other
Method: Low FLOW	SEE	6000	FLOW	PURGE	D47.4	SHEET		
Monitor Reading (ppm):								
Well Casing Diameter & Material								
Type: 2"PVC								
Total Well Depth (TD): 23								
Static Water Level (WL)* (7, 31								
One Casing Volume(cal/L): 174 ca								
Chart Durge (bro): 0220								
Start Purge (ms): 0750								
End Purge (hrs): 7003								
Total Purge Time (min): ンン								1
Total Vol. Purged (gal/L): /c 4								
SAMPLECOLLECTION INFORMA	HON	Dragar		ana ana ana ang ang ang ang ang ang ang	Container B			Collected
		Preser	vative	13 Un.	Container R	equirements		
			-	172 1	Aubu	- Glass		1.2
TAL Metals		JW0	· ج	AF 25	TO PUL	- <u>(7(~)</u> V		Vei
		i	#					
·					·····			、
	····							
		<u> </u>						
OBSERVATIONS NOTES								
		19999999999999999999999 	399993999999999999999 					
Circle if Applicable:					Signature(s	s):		
MS/MSD Duplicate ID No.	:		Tin	κ n	<u></u>			
	mon Habler	n - 1	1 /	29001	· · · · · · · · · · · · · · · · · · ·	C	ر -	
	1000	10	<i>L L</i>	1001			~~C>	
PROJECT SITE NAME: PROJECT NUMBER:	5							
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NASA WFF-WOD 112GN1612

WELL ID.: DATE:

WFF-12/5/08

PAGE / OF /								K.	E(S):	SIGNATUR
	-									
	0,0	-19	15.16	184	5.0	0.168	617	רא שיר	17.64	1000
	0,0	-19	15.17	184	1.1	291.0	6.17	250	17.64	5569
	0,0	-15	15,21	1.85	0.9	821.0	81.2	250	59,41	0360
	0,0	-13	15.14	387	1.2	0,190	6.19	250	17.63	5460
	0,0	£	14.97	1.91	5	0.155	6.19	250	17.61	0440
	0,0	-4	14.63	201	6,3	0:150	6.19	250	17.60	5890
	0,0	-4-	13.36	2.51	<i>t.</i>	0.169	6.29	250	17.31	0860
	% or ppt	mV	(Celcius)	(mg/L)	(UTU)	(mS/cm)	(S.U.)	(mL/Min.)	(Ft. below TOC)	(Hrs.)
Comments	Salinity	ORP	Temp.	Б	Turb.	S. Cond.	Нď	Flow	Water Level	Time

PAGE / OF /



Tetra Tech NUS, In	C.							Page /_ of _	2
Project Site N	ame:	NASA WF	FF-FFTA	_		Sample ID N	0.: <i>WFF=100</i>	<i>&gt;−leGw</i> 27	<u>- 7</u>
Project No.:		112GN16	12	_		Sample Loca	ition: GNU	-20	
Sampled By:	Ew			_		Duplicate:			
Field Analyst:	EN					Blank:			
Field Form Ch	ecked as per Q/	A/QC Chec	klist (initia	- IIS):		1			
SAMPLING DATA									
Date: 12/5/08	3	Color	рH	S.C.	Temp.	Turbidity	DO	Salinity	ORP (Eh)
Time: 1005	-	(Visual)	(S.U.)	(mS/cm)	(°C)	(NTU)	(mg/l)	(%)	(+/- mv)
Method: Low	[={_2,0}]	CLEAR	6,17	0,168	15,16	0.7	1.84	0,0	-19
SAMPLE COLLEC	TION/ANALYSIS IN	FORMATION							
ORP (Eh) (+/- r	nv) -19		Electrode I Reference	Make & Moc Electrode (c	iel: <u>Harz</u> circle one): {	エ <u>ら</u> ろ し〜 Silver-Silver Chlori	2.2 de / Calomel	/ Hydrogen	
Dissolved Oxy	den:			·····				,	
Equipment: Cheme	trics Test Kit					Concentration:	0.25	ppm	
Range Used:	Range	Method	Concentra	tion ppm					
	0 to 1 ppm	K-7510	0,25			Analysis Time:	1036	-	
	1 to 12 ppm	K-7512	014 07	Range					
Equipment:	HACH Digital Titrat	or OX-DT		v			Analysis Time:		_
Range Used:	Range	Sample Vol.	Cartridge	Multiplier		Titration Count	Multiplier	Concentration	
	1-5 mg/L	200 ml	0.200 N	0.01			x 0.01	.≕ mg/L	
	2-10 mg/L	100 ml	0.200 N	0.02			x 0.02	= mg/L	
Notes: Carbon Dioxid	e:								
Equipment: Chemel	rics Test Kit					Concentration:	40	ppm	
Range Used:	Range	Method	Concentrat	tion ppm					
Ą	10 to 100 ppm	K-1910	40			Analysis Time:	1039		
	100 to 1000 ppm	K-1920						-	
	250 to 2500 ppm	K-1925							
Equipment:	HACH Digital Titrat	or CA-DT							
Range Used:	Range	Sample Vol.	Cartridge	Multiplier		Titration Count		Concentration	
	10-50 mg/L	200 ml	0.3636 N	0.1			<b>x</b> 0.1	= mg/L	
	20-100 mg/L	100 ml	0.3636 N	0.2			x 0.2	= mg/L	
	100-400 mg/L	200 ml	3.636 N	1.0			x 1.0	= mg/L	
	200-1000 mg/L	100 ml	3.636 N	2.0			x 2.0	= mg/L	
Standard Additions:	L Titran	t Molarity:		Digits Requ	ired: 1st.:	2nd.:	3rd.:		
Notes:									
Hydrogen, diss	solved								
Equipment: Bubble	strip sampling field	method							
	Start stripper at	(t	ime)						
	End stripper at	(	time)						
	Total stripper time								
	Pump rate	milliliter	s/minute						



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Tetra Tech NUS, I	nc.						Page	≥ <u></u> of	2
Project Site N	lame:	NASA WF	F-FFTA	_	Sample ID N	O .: WFF_W	00- II	6GW2	0-1
Project No.:		112GN16	12	_	Sample Loca	ation: -P1	Gu	)-20	
Sampled By:	$\in \mathcal{N}$			_	Duplicate:				
Field Analyst:	EW				Blank:				
Alkalinity:						<u> </u>			
Equipment: Cheme	etrics Test Kit				Concentration:	50	_ppm		
Range Used:	Range	Method	Concentra	tion ppm					
	10 to 100 ppm	K-9810	30		Analysis Time:	1043			
	50 to 500 ppm	K-9815							_
	100 to 1000 ppm	K-9820						Filtered:	
Equipment:	HACH Digital Titrat	tor AL-DT							
Range Used:	Range	Sample Vol.	Cartridge	Multiplier	Titration Count	Multiplier	Conc	entration	· ·
	10-40 mg/L	100 ml	0.1600 N	0.1	&	<b>x</b> 0.1	=	mg/L	
	40-160 mg/L	25 ml	0.1600 N	0.4	&	x 0.4	=	mg/L	
	100-400 mg/L	100 ml	1.600 N	1.0	&	x 1.0	=	mg/L	
	200-800 mg/L	50 ml	1.600 N	2.0	&	x 2.0	=	mg/L	
· · ·	500-2000 mg/L	20 ml	1.600 N	5.0	&	x 5.0	=	mg/L	
	1000-4000 mg/L	10 ml	1.600 N	10.0	&	x 10.0	=	mg/L	
	Parameter:	Hydroxide	Carb	onate	Bicarbonate	]			
Standard Additions	Titran	t Molarity:		Digits Regui	ired: 1st.: 2nd.:	1 3rd -			
Notes:		-		5 1.		0.011			
Ferrous Iron (	Fe <sup>2+</sup> ):								
Equipment:	DR-850	DR-8	Range: 0 -	3.00 mg/L	Concentration:	2,15	ppm		
	Program/Module:	500nm	33						
					Analysis Time:	1033			
Equipment:	IR-18C Color Whee	el	Range: 0 -	10 mg/L			-		
Notes:								Filtered:	
Hydrogen Sulf	fide (H₂S):		Range: 0 -	5 mg/L					
Equipment:	HS-C	Other:			Concentration:	0	ppm		
	Exceeded 5.0 mg/L	range on colo	or chart:		Analysis Time:	1047	-		
Notes:				•			-		
Sulfide (S <sup>2-</sup> ):									
Equipment: Cheme	trics Test Kit		Range: 0 -	10 mg/L	Concentration:		_ppm		
Range Used:	Range	Method	Concentral	ion ppm					
	0 to 1 ppm	K-9510	<u> </u>		Analysis Time:		_		
	1 to 10 ppm	K-9510	<u> </u>						
								Filtered:	
Equipment:	DR-850	DR-8	Range: 0 -	0.70 mg/L					
Program/Module:	610nm	93							
Notes:			·						

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### **GROUNDWATER SAMPLE LOG SHEET**

							Page	<u>    l  of    l   </u>
Project Site Name: , Project No.:	NIISA WF= <u>112 GNUI (</u>	WOD 12			Sample Sample	ID No.: 🗸	FW00-16₩ 	25'-1 5
[] Domestic Well Da	ata				Sample C.O.C.	d By: No.:	ēω	
Other Well Type:     OA Sample Type	· · · · · · · · · · · · · · · · · · ·	•			Low	Concentra	ation	
	·				. Uriigi	Concentra	auon	
SAMPLING DATA:								
Date: $\frac{12}{5}/c$	Color (Visual)	pH	S.C.	Temp.		DO	Salinity	Other
Method: Law Flaw	(Visual)	6.44	(ms/cm) 2.2.3.3	13.95	19 19	(mg/l)	(%) 0.0	
PURGE DATA:								
Date: (2/5/08	Volume	рH	S.C.	Temp.	Turbidity	DO	Salinity	Other
Method: From Flow	Re	low	flow	sheet				
Monitor Reading (ppm):				<u> </u>				
Well Casing Diameter & Mate	rial							
Type: 2" PVC								
Total Well Depth (TD): 19								
Static Water Level (WL): 17.	09							
One Casing Volume(gal/L): ()	31901							
Start Purge (hrs): D815	3							
End Purge (hrs): $\mathcal{OB3O}$								
Total Purge Time (min): 15	min							
Total Vol. Purged (gal/L): 22	-							
SAMPLE COLLECTION INFO	ORMATION							
Analysis		Preser	vative		Container R	equirements		Collected
A TCC U		HCL		<u>(3) 40</u>	in Gla	22	- 12 4	Jer
TAL Met	-ls	HNU	3	(2) 250	PDL-M	NOC GU		<u>yes</u>
Dissolved Me	talls	HNU	3	250	POLY			Lie.
			-					- <del>}</del>
· · · · · · · · · · · · · · · · · · ·								
				-				
OBSERVATIONS / NOTES:				<u>/////////////////////////////////////</u>				
MW went de	y allow to	stur :	no je :	from ap	prox O	930 ti	11 111	0
	- ici sum		$-u \in f$	on lust	poge 1	eading	EXCQ/	tén
lurb, rur	5 19 20 -	liste .	hilter	for me	Tals			
				/				
Circle if Applicable:					Signature(s	):		
MS/MSD Duplicate II	) No.:	<u></u>		************************			h <b>A</b> n (annua)	
						······	$\bigcirc$	
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	ש		LOW FL		RGE D/	ATA SH	IEET			
PROJECT	SITE NAME:	NASA WFF	-WOD				WELL ID.:	UFF-WOD	-Gw25-	
PROJECT	NUMBER:	112GN1612					DATE:		12/5/08	
Time	Water Level	Flow	рH	S. Cond.	Turb.	Ø	Temp.	ORP	Salinity	Comments
(Hrs.)	(Ft. below TOC)	(mL/Min.)	(S.U.)	(mS/cm)	(UTU)	(mg/L)	(Celcius)	ηV	% or ppt	
08/5	17.09	300	6.58	0.22	58. 1	2.19	14,82	10	0,0	
0320	13.08	& 0 0	6.58	0.217	60	21.15	14.30	10	0,0	
0825	21.42	150	6.55	0.268	51	2.14	14.75	\$	0,0	
0630	51.72	Cal	6.44	0,223		5.73	13,95	-14	0.0	
									-	
		:								
					^					
SIGNATUR	RE(S):		$\mathbb{N}$	1						

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### FIELD ANALYTICAL LOG SHEET **GEOCHEMICAL PARAMETERS**

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Tetra Tech NOS, Inc									
Project Site Na	ime:	NASA WF	F-FFTA			Sample ID N	o.:WFFWC	0-166622	<u>3-1</u>
Project No.:		112GN161	2	-		Sample Loca	tion: Gl	J-25	
Sampled By:	εw			-		Duplicate:			
Field Analyst:	EN			•		Blank:			
Field Form Che	ecked as per QA	VQC Check	dist (initia	ls):		7			
SAMPLING DATA				Ú					
Date: 12/5/0	30	Color	Hq	S.C.	Temp.	Turbidity	DÓ	Salinity	ORP (Eh)
Time: 1110		(Visual)	(SID	(mS/cm)	രാ	ONTU	(me/l)	(%)	(+/- mv)
Method: (000	fiors	CLEOF	6.44	0.233	13.95	19	5.73	0,0	-14
SAMPLE COLLECT	ION/ANALYSIS IN	FORMATION							
ORP (Eh) (+/- m	1V) . / /		Electrode I	Make & Moo	lel: Itor	z84 U-2	2		
	-19		Reference	Electrode (d	circle one): S	Silver-Silver Chlori	de / Calomel	/ Hydrogen	
Dissolved Oxy	gen:								
Equipment: Chemet	rics Test Kit				1	Concentration:	0.45	_ppm	
Range Used:	Range	Method	Concentral	tion ppm			·		
	0 to 1 ppm	K-7510	0.4	5		Analysis Time:	1/40	_	
	1 to 12 ppm	K-7512							
Equipment:	HACH Digital Titrate	or OX-DT				,	Analysis Time	-	
Range Used:	Range	Sample Vol.	Cartridge	Multiplier		Titration Count	Multiplier	Concentration	
	1-5 mg/L	200 ml	0.200 N	0.01			x 0.01	= mg/L	_
	2-10 mg/L	100 ml	0.200 N	0.02			x 0.02	= mg/L	
Notes:									
Carbon Dioxide	e:						~		
Equipment: Chemet	rics Test Kit					Concentration:	<u>تح</u>	_ppm	
Range Used:	Range	Method	Concentrat	tion ppm	]				
	10 to 100 ppm	K-1910	30			Analysis Time:	1143		
	100 to 1000 ppm	K-1920							
	250 to 2500 ppm	K-1925							
Equipment:	HACH Digital Titrat	or CA-DT							
Range Used:	Range	Sample Vol.	Cartridge	Multiplier	]	Titration Count		Concentration	
	10-50 mg/L	200 ml	0.3636 N	0.1	]		x 0.1	=mg/L	
	20-100 mg/L	100 mi	0.3636 N	0.2			<b>x</b> 0.2	= mg/L	
	100-400 mg/L	200 ml	3.636 N	1.0			<b>x</b> 1.0	= mg/L	
	200-1000 mg/L	100 mi	3.636 N	2.0			<b>x</b> 2.0	= mg/L	
Standard Additions:	Titran'	t Molarity:		Digits Req	uired: 1st.:	2nd.:	3rd.:		
Notes:									
Hydrogen, diss	solved								
Equipment: Bubble	strip sampling field	method							
	Start stripper at	(t	ime)						
	End stripper at	(	time)						
	Total stripper time								
	Pump rate	milliliter	s/minute						



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Tetra Tech NUS, In	С.						Page	<u>Z of Z</u>
Project Site Na	ame:	NASA WF	F-FFTA		Sample ID N	0.:WI - U	)00	16GW28-1
Project No.:		112GN161	2		Sample Loca	tion: Gu	J - 2	5
Sampled By:	$\epsilon \omega$			-	Duplicate:			
Field Analyst:	EW			-	Blank:			
Alkalinity:								
Equipment: Cheme	trics Test Kit				Concentration:	(20)	_ppm	
Range Used:	Range	Method	Concentral	tion ppm				
	10 to 100 ppm	K-9810	601		Analysis Time:	146		
	50 to 500 ppm	K-9815	ļ					
	100 to 1000 ppm	K-9820						Filtered:
Equipment:	HACH Digital Titrate	or AL-DT						
Range Used:	Range	Sample Vol.	Cartridge	Multiplier	Titration Count	Multiplier	Conce	entration
	10-40 mg/L	100 ml	0.1600 N	0.1	&	x 0.1	=	mg/L
	40-160 mg/L	25 ml	0.1600 N	0.4	&	<b>x</b> 0.4	=	mg/L
	100-400 mg/L	100 ml	1.600 N	1.0	&	x 1.0	=	mg/L
	200-800 mg/L	50 ml	1.600 N	2.0	&	x 2.0	=	mg/L
	500-2000 mg/L	20 ml	1.600 N	5.0	&	<b>x</b> 5.0	=	mg/L
	1000-4000 mg/L	10 ml	1.600 N	10.0	&	x 10.0		mg/L
					<b>m</b> t	1		
	Parameter:	Hydroxide	Carb	onate	Bicarbonate	-		
Standard Additions	Relationship.	l t Molority:	<u> </u>	Digite Regui	ired: 1ct · 2nd ·	_l 3rd ∙		
Notes:	. <u> </u>	t woranty.		Digita Nequi		010		
Ferrous Iron (I	=e <sup>2+</sup> ):							
Fauinment:	- ,. DR-850	DR-8	Range: 0 -	3.00 ma/L	Concentration:	1.6	maa	
Equipmont	Program/Module:	500nm	33	oreo migre				
	r rogrammodale.	000	00		Analysis Time:	1130	•	
Equipment:	IR-18C Color Whee	-	Rance: () -	10 ma/l	,			
Notes:			i kunger e	· • ···g. =				Filtered:
Hydrogen Sulf	ide (H₂S):		Range: 0 -	- 5 ma/L				
Equipment:	HS-C	Other	-0	<u>}_</u>	Concentration:	0	nnm	
Equipment	Excooded 5.0 mg/l	range on col			Analysis Time:	1150		
Notes:	Exceeded 5.0 mg/c	- Tange on con	a onara	•				
Sulfide (S <sup>2-</sup> )		<u> </u>						
Equipment: Cheme	trice Test Kit		Range: 0 -	10 ma/l	Concentration:		nnm	
		<u> </u>						
Range Used:	Range	Method	Concentra	tion ppm	• • • • • • • • • • • • • • • • • • •			
		K-9510			Analysis Time:			
	1 to 10 ppm	K-9510	1					
Caulan			Deners C	0.70				rinteseu.
Equipment:	DK-800	UK-0	rkange: 0 -	- 0.70 mg/L				
Program/Module:	610nm	93						
Notes:								

Tetra Tech NUS, Ir	ю.	GROU	INDWA		MPLE LC	G SHEE	Т	
							Page	of
Project Site Name: Project No.:	NASA WFF-\ 112GN1612	NOD			Sample Sample Sample	ID No.: Location: d By:	WFF-WO WFF-WO DBB	<u>D-16-GW5-1</u> D
<ul> <li>Domestic Well Data</li> <li>Monitoring Well Data</li> <li>Other Well Type:</li> <li>QA Sample Type:</li> </ul>	<b>6</b> -17				C.O.C. I Type of [] Low [] Higł	No.: Sample: Concentra Concentra	tion ation	
SAMPLING DATA:								
Date: <u>\ລ \$ 3000</u> Time:	Color (Visual)	рН (S.U.)	<b>S.C.</b> (mS/cm)	Temp. ( <sup>0</sup> C)	Turbidity (NTU)	DO (mg/l)	Salinity (%)	Other
Method: Low Flow	slightly brown	4,79	0,689	15,42	36.5	3.36	6.0	
PURGE DATA:				1999 (1999) I				
Date: $1 \times 5 \times 0$	Volume	рН	S.C.	Temp.	Turbidity	DO	Salinity	Other
Method: Low Flow						-		
Monitor Reading (ppm):								
Well Casing Diameter & Material								
					$\neg $			
						heet	-	
Static Water Lever (VVL). 0,007			1 de		ae.	-		
One Casing Volume(gaint): 0.7034				F OW	1-0			
Start Purge (nrs): 101 119			Fine	<u>₽</u>				
End Purge (nrs): $U^{1}O_{3}$ 1259	128 misto total		F 10-					
Total Purge Time (min): $T_{M_{i_{A}}} = 1/n_{i_{A}}$								
SAMPLE COLLECTION INFORMA	TION							
Analysis		Preser	vative		Container R	equirements		Collected
ATCL NOCS		HCI			(3) 40ml	VOA via	ls	yrs
TAL Metals (filleved	(unfillered)	НNС	>s	(1) filler (1	Justillad 125m	L poly		415
TCL SUDC,	/		*		(2) IL	Anbre		yes
		-						
·								
ORSERVATIONS/NOTES								
	<u>, , , , , , , , , , , , , , , , , , , </u>	<u></u>		<u>1999</u>	<u>99999999999999</u>			
4.02 × 1	old analyt	ical lo	in Sheet	( hay age	ochemical	putting	4	
-(			/	• )		1	·/	
Circle if Applicable:					Signature(s	):	_	
MS/MSD Duplicate ID No.	:				Λ.	101	//	
	ی اور این اور این				i jî G	Wolke	V	
L					k			

NASA WFF-WOD 112GN1612

WELL ID.: DATE:

11 FF- WOD-16-GW5-1

						34 34
	1257	1249	1 35 1140 1150	20102	2345 2345 2345 2345	(Hrs.)
<i>A</i>	11.53 540		10.26 11.30 11.30	noved to 11	bry down to TD 10,53	(Ft_below TOC)
	off fle	AP Flow	1005 - 1	SGWI to	320	(mLMin)
	w due	al art Sul	4,79 4,29	Sample		(S.U.)
	to drawy	11 ambri Visuulaun	his cut	wel fet		(mS/cm)
		(1 combet	365 i	(-w5 V2		(NTU)
		+ 1 Filher	3.36 1346 ;	cher ge		(mg/L)
		ad metal ke	* 15.42	* * * * * * * * * * * * * * * * * * *		(Celcius)
		Ft to colled		F in Floribi,		mV
		t) e	0,0	بوما زرستها ۲۰ ۱۲	-	% or ppt
	36 total purged	let recharge 16 paraged Since 1140	Sturt up hump	ter to flow buck into Lus	Floating suspended even went dry skurd ta shul off fomp let rate	Sev rate

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Tetra Tech NUS, Inc	-			<u></u>				Page <u></u> of	3
Project Site Na	me:	NASA WFI	F-WOD			Sample ID No	.: WFF-L	JOD-16-6-1	<u> 15 - 1</u>
Project No.:		112GN161	2			Sample Locat	tion: WFF	-WOD	
Sampled By:		7BB				Duplicate:			
Field Analyst		1B9				Blank:			
Field Form Che	ecked as per QA	VQC Check	list (initia	s):		٦			
SAMPLING DATA									
Date: 1251	2003	Color	ъH	S.C.	Temp.	Turbidity	DÓ	Salinity	ORP (Eh)
	1	(Visual)	(\$11)	(mS/cm)	(°C)	(NTU)	(mg/l)	(%)	(+/- mv)
Mothod:		(visual)	(3.0.)	(morenty	( 0)	(110)	(		· · · · · · · · · · · · · · · · · · ·
SAMPLE COLLECT	ION/ANALYSIS IN	FORMATION:							
ORP (Eh) (+/- m	יעו)		Electrode N	vake & Mod	el:				
••••• (=••) (*••••	,		Reference	Electrode (c	/ Hydrogen				
Dissolved Oxy	gen:			`	· · ·				
Equipment: Chemet	rics Test Kit					Concentration:	2.5	_ppm	
Range Used:	Range	Method	Concentrat	tion ppm			1		
	0 to 1 ppm	K-7510	2.	5		Analysis Time:	51/	_	
	1 to 12 ppm	K-7512							
Equipment	HACH Digital Titrate	or OX-DT				<b>.</b> .	Analysis Time		_
Range Used:	Range	Sample Vol.	Cartridge	Multiplier		Titration Count	Multiplier	Concentration	
	1-5 mg/L	200 ml	0.200 N	0.01			x 0.01	= mg/L	_
	2-10 mg/L	100 ml	0.200 N	0.02			x 0.02	= mg/L	
Notes:									
Carbon Dioxid	e:		A1181			Concentration	55	200	
Equipment: Chemet	rics lest kit	F.			1	Concentration.		_ <sup>thbus</sup>	
Range Used:	Range	Method	Concentral	tion ppm			1771		
	10 to 100 ppm	K-1910	55	•	1	Analysis Time:	1724	-	
	100 to 1000 ppm	K-1920							
	250 to 2500 ppm	K-1925			ļ				
Equipment:	HACH Digital Titrat	or CA-DT			_				
Range Used:	Range	Sample Vol.	Cartridge	Multiplier		Titration Count		Concentration	_
	10-50 mg/L	200 ml	0.3636 N	0.1 .			<b>x</b> 0.1	= mg/L	
	20-100 mg/L	100 ml	0.3636 N	0.2			<b>x</b> 0.2	<u> </u>	_
	100-400 mg/L	200 ml	3.636 N	1.0	1		<b>x</b> 1.0	= mg/L	4
	200-1000 mg/L	100 ml	3.636 N	2.0			<b>x</b> 2.0	= mg/L	
Standard Additions:	Titran	t Molarity:		Digits Req	uired: 1st.:	2nd.:	3rd.:		
Notes:									
Hydrogen, dis	solved								
Equipment: Bubble	e strip sampling field	l method							
	Start stripper at	(t	time)						
	End stripper at	(	(time)						
	Total stripper time								
	Pump rate	milliliter	rs/minute						



Tetra Tech NUS, In	с.	GEC			INAIVIE I ENS		Page	<u>∼ of _</u>	3
Droiget Site N					Sample ID N	OF TEE-1		1/00	Ent
Project No 1	ame.	112GN161	2		Sample Loca	tion: WFA	<u>-ω</u>	<u>16.Gw</u> 7N	<u> </u>
Sampled By:		JR B	-		Duplicate:				
Field Analyst:		JBB	# #	-	Blank:				
Alkalinity:						0			
Equipment: Cheme	trics Test Kit				Concentration:	256	ppm		
Range Used:	Range	Method	Concentrat	tion ppm					
	10 to 100 ppm	K-9810	<10	<u>)()</u>	Analysis Time:	1320	_		
	50 to 500 ppm	K-9815	25	50					
	100 to 1000 ppm	K-9820						Filtered:	
Equipment:	HACH Digital Titrat	or AL-DT							
Range Used:	Range	Sample Vol.	Cartridge	Multiplier	Titration Count	Multiplier	Conce	entration	
	10-40 mg/L	100 ml	0.1600 N	0.1		x 0.1	=	mg/L	
	40-160 mg/L	25 ml	0.1600 N	0.4	&	x 0.4	=	mg/L	
	100-400 mg/L	100 ml	1.600 N	1.0	&	x 1.0	=	mg/L	
	200-800 mg/L	50 ml	1.600 N	2.0	&	x 2.0	=	mg/L	
	500-2000 mg/L	20 ml	1.600 N	5.0	&	x 5.0		mg/L	
	1000-4000 mg/L	10 88	1.000 N	10.0	α	<u> </u>	-	1119/L	
	Parameter:	Hydroxide	Carb	onate	Bicarbonate	]			
	Relationship:								
Standard Additions	: Titran	t Molarity:		Digits Requi	red: 1st.: 2nd.:	3rd.:			
Notes:									
Ferrous Iron (	Fe <sup>2+</sup> ):								
Equipment:	DR-850	DR-8	Range: 0 -	3.00 mg/L	Concentration:	1.0	_ppm		
	Program/Module:	500nm	33			1210			
	and the second	~			Analysis Time:	1510	-		
Equipment: (	IR-18C Color Whee	el>	Range: 0 -	10 mg/L					
Notes:	B.J. (11 O).							Filtered:	
Hydrogen Sun			Range: 0 -	· 5 mg/L		$\bigcirc$			
Equipment:	(HS-C >	Other:			Concentration:	1216	_ppm		
	Exceeded 5.0 mg/L	_ range on colo	or chart:	لسبيا	Analysis Time:		-		
Notes:									
Sumde (S ):	trice Test Kit		Range: 0 -	10 ma/i	Conceptration:		იილ		
		1			oshochildion.				
Range Used:	Range	Method	Concentra	tion ppm					
	0 to 1 ppm	K-9510			Analysis Time:		-		
		K-9510						Filtered	
Equipment:	DR-850	DR-8	Range: 0	- (), 7() mm/l				i illorodi	
Program/Module:	610nm	93	runge. v	ou o aigre					
r rogrammioouie.	<b>STOLIN</b>	~~							
Notes:									
1									

Æ	Tetra Tech NUS, I	nc.	GROL	INDWA	TER SA	MPLE LC	G SHEE	ET		
							1.1.1.57	Page	<u>/ of /</u>	
Project Site	e Name:	NASA WFF-	WOD			Sample	ID No.:	WOD-166	WB	
Project No.	.: .	112GN1612				Sample	Location:	GW	8	
<b>#</b> D						Sample	d By:	Ams		
	estic well Data					<u>C.O.C.</u>	No.:			
	Mall Type:					Type of	Sample:	- 41 .		
	ample Type.				·····	Br LOW	Concentra	ation		
	ampie i ype.			•			Concentr	allon		
SAMPLING DA	VTA:									
Date: /allo/	०९	Color	pН	S.C.	Temp.	Turbidity	DO .	Salinity	Other	
Time: 0900		(Visual)	(S.U.)	(mS/cm)	( <sup>0</sup> C)	(NTU)	(mg/l)	(%)		
Method: Lor	» flow	clear	5.77	0,120	15.17	7.10	1.98	0.0		
PURGE DATA										
Date: 12/0	108	Volume	нq	S.C.	Temp.	Turbidity	DO	Salinity	Other	
Method: Lou	flow									
Monitor Readin	(ppm):				•		,			
Well Coping Di	amotor 8 Motorial			<u>├</u>	FF	h				
			<u> </u>			MRE.	e	1		
Type: 2					<u> </u>		<u>- 54</u>	Fr		
Total Well Dept	th (TD): よう				10	K	· · ·	FEL		
Static Water Le	evel (WL): 9,4(				Ľ K	Fr.				
One Casing Vo	اume(gal/L): كي 54مه					-1AJ	75			
Start Purge (hrs	s): 0804									
End Purge (hrs	1: 0855							1	>	
Total Purge Tim	ne (min): <i>51</i>									
Total Vol. Puro	ed (call) > 74							+	<u> </u>	
SAMPLE COLL	ECTION INFORMA	TON								
	Analysis		Precer	vativo		Container Br			Callestad	
TOL VOC	<u>^</u>		110301	J	(3) 4		A	<b>&gt;</b>	Conected	
TCL SVO	<u>- ,</u> X <		<u> </u>	-		1 1.6	n viers		yes	
TAI Me	itals		HIC	20		5 Amper	<u>41455</u>		<u>yes</u>	
			16/0~	<u>-&gt;</u>	(1)10	EJMC P	<u>ay</u>		Yes	
			~		· · · · · · · · · · · · · · · · · · ·			<b>*</b> .**		
									:	
OBSERVATION	NS / NOTES:									
									:	
Circle if Annlic	able					Signatura	•			
MS/MSD	Duplicate ID No -					Signature(S)				
mormou							$\sim$	- T		
						1/1	2	Ó		
						V				

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SIGNATURE(S): V

									Total		5280	0580	2843	5830	0830	5280	0820	5180	0180	h0&0	(Hrs.)	Time
									2 1/2 gallons	Sample a	9.31	9,71	9.71	9.70	۹, <b>۳ ۳</b>	<b>१</b> .२०	9.80	٩٢,7٦	9.81	૧,મા	(Ft. below TOC)	Water Level
J								-	or 86 p	ollected	120	170	041	041	061	ot1	200	200	220	220	(mL/Min.)	Flow
N									20	0900	5.77	84.5	5t.5	89.5	5.66	2.54	54.5	58.5	5,41		(S.U.)	рH
											0.120	0120	0.120	6.121	5.122	0,123	0.130	0.139	0.146		(mS/cm)	S. Cond.
	*										01.4	18.5	9.55	18.1	Sire	24.0	26.9	5'61	32.9		(NTU)	Turb.
					 -						1,98	1.99	61 و	9t.18	3.00	3.21	3.52	50'h	58'h		(mg/L)	DO
											15.17	15,18	91:51	15.11	15,15	15.14	15.09	50.51	15.08		(Celcius)	Temp.
											84	83	<b>t</b> 8	<b>4</b> 9	201	801	4	123	120		W	ORP
											0. ŵ	0,0	0,0	0,0	010	6. 0	°,0	0.D	0.0		% or ppt	Salinity
		· · ·																		Start		Comments



PROJECT SITE NAME: PROJECT NUMBER:

NASA WFF-WOD 112GN1612

8 M991-000

20/01/21

WELL ID.: DATE:



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### FIELD ANALYTICAL LOG SHEET GEOCHEMICAL PARAMETERS

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Tetra Tech NUS, Inc	<u>.</u>							rageor			
Project Site Na	me:		F-WOD			د Sample ID N	o.: WOD	166W8			
Project No.:		112GN161	2			Sample Loca	ition: Gw	8			
Sampled By:		RMS				Duplicate:					
Field Analyst		<u> </u>				Blank:					
Field Form Che	ecked as per QA	VQC Check	dist (initial	ls):		1	—				
SAMPLING DATA											
Date: 1510	108	Color	вН	S.C.	Temp.	Turbidity	DO	Salinity	ORP (Eh)		
Time: 09^/	2	(Visual)	(SU)	(mS/cm)	(°C)	NTID	(mg/l)	(%)	(+/- mv)		
Method:	FINI	A lan #	5,77	0,120	15.17	7,10	1,98	0.0	84		
SAMPLE COLLECT	ION/ANALYSIS IN	FORMATION:									
ORP (Eh) (+/- m	<u></u>	<u>,</u>	Electrode N	/ake & Mod	iel:						
(/ (			Reference	Electrode (d	circle one): S	Silver-Silver Chloride / Calomel / Hydrogen					
Dissolved Oxvo	aen:				, -						
Equipment: Chemetr	rics Test Kit				•	Concentration:	2.0	ppm			
			<u> </u>		1			• · ·			
Range Used:	Range	Concentrat	ion ppm		A	0912					
	U to 1 ppm	K-7510	$\vdash \checkmark$	. <u>u</u>		Analysis Time:		-			
	1 to 12 ppm	ј К-7512	<u> </u>	0							
Equipment:	HACH Digital Titrate	or OX-DT			_		Analysis Time		_		
Range Used:	Range	Sample Vol.	Cartridge	Multiplier		Titration Count	Multiplier	Concentration	]		
	1-5 mg/L	200 ml	0.200 N	0.01			x 0.01	= mg/L			
	2-10 mg/L	100 ml	0.200 N	0.02			<b>x</b> 0.02	= mg/L			
Notes:					-						
· · · · · · · · · · · · · · · · · · ·											
Carbon Dioxide	e:										
Equipment: Chemet	rics Test Kit	<del></del>			1	Concentration:	23	_ppm			
Range Used:	Range	Method	Concentrat	ion ppm			ngib				
	10 to 100 ppm	K-1910	1 33	>		Analysis Time:	0110	-			
	100 to 1000 ppm	K-1920	<u> </u>	•	-						
	250 to 2500 ppm	K-1925			ļ						
Equipment:	HACH Digital Titrat	or CA-DT									
Range Used:	Range	Sample Vol.	Cartridge	Multiplier	]	Titration Count		Concentration	]		
	10-50 mg/L	200 ml	0.3636 N	0.1	Į		x 0.1	= mg/L			
	20-100 mg/L	100 ml	0.3636 N	0.2			x 0.2	= mg/L			
	100-400 mg/L	200 ml	3.636 N	1.0			<b>x</b> 1.0	= mg/L			
	200-1000 mg/L	100 ml	3.636 N	2.0			<b>x</b> 2.0	= mg/L			
Standard Additions:	Titran	t Molarity:		Digits Req	uired: 1st.:	2nd.:	3rd.:				
Notes:											
Hydrogen, diss	solved										
Equipment: Bubble	strip sampling field	i method									
	Start stripper at	(t	ime)								
	End stripper at	(	time)								
	Total stripper time	<u> </u>									
	Pump rate	milliliter	s/minute								



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### ELEL D ANAL VTICAL LOC SHEET

Tetra	Tech	NUS.	Inc.
icua	ICON	1400	1110.

FIELD	ANALYT	ICAL L	OG S	HEET
GEOC	HEMICAL	. PARA	METI	ERS

Tetra Tech NUS, In	с.						Page	of
Project Site N	ame:	NASA WF	F-WOD		Sample ID No	D.: 160	5W8	
Project No.:		112GN161	2		Sample Loca	tion:		
Sampled By:	<u> </u>	ms		-	Duplicate:			
Field Analyst:					Blank:			
Alkalinity:								
Equipment: Cheme	trics Test Kit				Concentration:	_35_	_ppm	
Range Used:	Range	Method	Concentrat	tion ppm				
	10 to 100 ppm	K-9810	3	5	Analysis Time:	0719	_	
	50 to 500 ppm	K-9815						_
	100 to 1000 ppm	K-9820					Filt	ered:
Equipment:	HACH Digital Titrate	or AL-DT						
Range Used:	Range	Sample Vol.	Cartridge	Multiplier	Titration Count	Multiplier	Concentra	ation
	10-40 mg/L	100 ml	0.1600 N	0.1		x 0.1	= n	ng/L
	40-160 mg/L	25 ml	0.1600 N	0.4	&	<b>x</b> 0.4	= n	ng/L
	100-400 mg/L	100 ml	1.600 N	1.0	<u> </u>	x 1.0	= n	ng/L
	200-800 mg/L	50 ml	1.600 N	2.0	&	<b>x</b> 2.0	= n	ng/L
	500-2000 mg/L	20 ml	1.600 N	5.0	&	x 5.0	= r	ng/L
	1000-4000 mg/L	10 ml	1.600 N	10.0	<u> </u>	x 10.0	= r	ng/L
	r		1			1		
	Parameter:		Carb	onate	Bicarbonate	-		
	Relationship:							
Standard Additions	: L Titran	t Molarity:		Digits Requ	ired: 1st.: 2nd.:	3rd.:		
Notes:	_ 2+.							
Ferrous Iron (I	-e-):				<b>A</b>	29		
Equipment:	DR-850	DR-8	Range: 0 -	3.00 mg/L	Concentration:		_ppm	
	Program/Module:	500nm	33			1000		
					Analysis Time:	0708	-	
Equipment:	IR-18C Color Whee		Range: 0 -	10 mg/L				[]
Notes:							Fil	tered:
Hydrogen Sulf	fide (H <sub>2</sub> S):		Range: 0 -	5 mg/L				
Equipment:	HS-C	Other:			Concentration:		_ppm	
	Exceeded 5.0 mg/L	. range on cok	or chart:		Analysis Time:			
Notes:								
Sulfide (S <sup>2-</sup> ):								
Equipment: Cheme	etrics Test Kit		Range: 0 -	· 10 mg/L	Concentration:		_ppm	
Range Used:	Range	Method	Concentra	tion ppm				
	0 to 1 ppm	K-9510			Analysis Time:		_	
	1 to 10 ppm	K-9510						
							Fil	tered:
Equipment:	DR-850	DR-8	Range: 0 -	0.70 mg/L				
Program/Module:	610nm	93						
Notes:								
L								

Tetra Tech NUS, I	nc.	GROU	INDWA	TER SA	MPLE LC	G SHEE	т	. 1
							Page	<u>of</u>
Project Site Name: Project No.:	NASA WFF-I 112GN1612	FFTA			Sample Sample	ID No.: Location:	WFF-WO	5-7W1-1 WFF
[] Domestic Well Data [] Monitoring Well Data ∽∰Other Well Type: [] QA Sample Type:	Tempora	ry			C.O.C. I Type of [] Low	No.: Sample: Concentra Concentra	tion	
SAMPLING DATA								
<u> </u>	Color	oH	S.C.	Temp.	Turbidity	DO	Salinity	Other
Time: 1505	(Visual)	(S.U.)	(mS/cm)	(°C)	(NTU)	(mg/l)	(%)	
Method: Low Flow	nurkybown	6.33	0,382	15,94	1060	3.65	0.0	slight oil shern
PURGE DATA								
Date: $ \lambda ^{q} 2003$ Method: $ z _{q} \in E_{q}$	Volume	рН	S.C.	Temp.	Turbidity	DO	Salinity	Other
Menitor Pooding (npm):			<u> </u>					and the second
Well Casing Diameter & Material								
Type: 12/2 1V	<b>[</b>		ļ		100			
Total Well Depth (TD): 30 H				- Jul	[			
Static Water Level (WL): 27.0		ļ,	pe	1000	theel			
one Casing Volume(gal/L): <sup>0</sup> ,276 <sub>7</sub>	1		P	rae.	1			
Start Purge (hrs): 3.40 FL		/	r pu					
End Purge (hrs): ISOO								
Total Purge Time (min): 80								
Total Vol. Purged (gal/L): 2,5 m	/							
SAMPLE COLLECTION INFORM	ATION							
Analysis		Preser	vative		Container R	equirements		Collected
TCL VOCS		<u> </u>		(3)	40 mL	<u>VoA viels</u>	:	Yes
TAL Metals		HNO	03	(1)	125 mL	Poly		yes
ILL SVOCS	****			<u>ل</u> لاً		nber		ye 5
			·····	·····				
ADREDVATIONS MATES			******					
ODDERVATIONS THOTES								
See field o	inalytical	log 3	sheet	for good	chemical f	Darameter	3	
	1	<u> </u>		م	3			
					Signature/e	ŀ		
MS/MSD Duclingto ID No						111	1	
					1 head	12/kill		
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NASA WFF-WOD 112GN1612

PROJECT SITE NAME: PROJECT NUMBER:

WELL ID.: DATE:

WFF-WOD-TW1-1

H									1505	1500	14 55 2J.O.	1451	14471	1443	1439	52 hI	0.LC 1501	1423	1418 SIM	51141	1411 26.05	59.55 LPH	1404 Jun /	5, CC 04C1	(Hrs.) (Ft. below 7	Time Water Le
J 11 - 1 - 1	/ /								collect :		S						0		-4		05 30 30	3   2	2	) Qoe	TOC) (mL/Min.) (	vel Flow
		•							samples	6.33 0.382	2.33 0.3.34	45, 33 0, 384	4,32 0.382	NE'0 EE'3	233 0.41	6.32 0378	45,0 22/	6.32 0.573	6,36 0,490	6 36 0 448	538 0,409	5.39 0.377	12 0 21	575,0 14,373	S.U.) (mS/cm)	pH S. Cond.
			 	 						1060 3.0	Er 2 30	15 5 3	1Er3 31	5 2 3	Er3 3,	でいい	5 3	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	ドンゴ	ドレット	12 213	Er3 2.	(て ビュオ	E'C 6'3	(NTU) (mg	Turb. DC
						 				C5 15.94	20 15,94	54 16.00	46 16.00	120.21 KH	47 16.04	30,21 [23	33 16.12	35 16.70	16, 89	3 17,04	80.71 21	6 17,06	11.11 00	TC 'LI 25	/L) (Celcius)	) Temp.
										9 55-	-54 0	-54 0	0 55-	- 50 0	-53 0	-59 0	-59 O	-76 0.	0   LL-	-75 0	-74 0	0 51-	0 2.1-	- 67   0	mV %o	ORP Sa
							S Mells	Non SaM	. It some pet	0 21/2 o	,C	.0	ò	» م	č	Õ	Ò	C cleand	,0 cleared	Ċ	Č	0		, O mudd	or ppt	linity Co
<b>د</b> ا							 1. Ke petroloun	ples	Coleun Sheen Seen	a purejed								all hersba	2/3 horiba					, tes turbed to mess	-	omments
		•																5/cs .	two turt	5- W			,	the mean	11. <u>.</u>	

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### FIELD ANALYTICAL LOG SHEET **GEOCHEMICAL PARAMETERS**

Tetra Tech NUS	. Inc.
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Tetra Tech NUS, Inc	2.	GEC				IENO		Page <u></u> of	3
Project Site Na	ime:	NASA WFI	F-WOD			Sample ID N	o.: WFF-h	JOB-TWI	- 1
Project No.:		112GN161	2			Sample Loca	tion: NASA	WFF	
Sampled By:	1	BB				Duplicate:	$\Box$		
Field Analyst:		RB				Blank:	$\square$		
Field Form Ch	ecked as per QA	VQC Check	list (initia	ls):		7			
SAMPLING DATA									
Date: 12/	9/2000	Color	рН	S.C.	Temp.	Turbidity	DO	Salinity	ORP (Eh)
Time: 15	50	(Visual)	(S.U.)	(mS/cm)	(°C)	(NTU)	(mg/l)	(%)	(+/- mv)
Method: L	ou Flow	Murky H, bread	633	0,382	15.94	1040	3.65	0.0	-53
SAMPLE COLLEC	TION/ANALYSIS IN	FORMATION:							
ORP (Eh) (+/- n	יע)		Electrode N	Aake & Mod	iel:				
			Reference	Electrode (	circle one): \$	Silver-Silver Chlor	ide / Calomel	/ Hydrogen	
Dissolved Oxy	gen:						<b>)</b> –		
Equipment: Chemet	rics Test Kit					Concentration:	<u> </u>	_ppm	
Range Used:	Range	Method	Concentrat	ion ppm	]		1.~		
	0 to 1 ppm	K-7510				Analysis Time:	1600	_	
×	1 to 12 ppm	K-7512	2.5	5				-	
					-				
Equipment:	HACH Digital Titrate	or OX-DT				~ ·	Analysis Time:		
Range Used:	Range	Sample Vol.	Cartridge	Multiplier	]	Titration Count	Multiplier	Concentration	 n
	1-5 mg/L	200 ml	0.200 N	0.01			x 0.01	= mg/l	
	2-10 mg/L	100 ml	0.200 N	0.02	1		x 0.02	= mg/l	L
Notes:	· · · · · · · · · · · · · · · · · · ·				-				
Carbon Dioxid	e:						NBA	160	
Equipment: Chemet	rics Test Kit					Concentration:		ppm	
Range Used:	Range	Method	Concentral	tion ppm					
Ž.	10 to 100 ppm	K-1910	>10	>0		Analysis Time:	622		
	100 to 1000 ppm	K-1920	16	.0				-	
	250 to 2500 ppm	K-1925			]				
					_				
Equipment:	HACH Digital Titrat	or CA-DT							
Range Used:	Range	Sample Vol.	Cartridge	Multiplier	]	Titration Count		Concentratio	n
	10-50 mg/L	200 ml	0.3636 N	0.1			x 0.1	= mg/	L
	20-100 mg/L	100 ml	0.3636 N	0.2			x 0.2	= mg/	L
	100-400 mg/L	200 ml	3.636 N	1.0			x 1.0	= mg/	L
	200-1000 mg/L	100 ml	3.636 N	2.0	]		<b>x</b> 2.0	= mg/	L
Standard Additions:	Titran	t Molarity:		Digits Req	uired: 1st.:	2nd.:	3rd.:		
Notes:									
Hydrogen, diss	solved								
Equipment: Bubble	e strip sampling field	l method							
	Start stripper at	(t	ime)						
	End stripper at	(1	ime)						:
	Total stripper time								
	Pump rate	milliliters	s/minute						



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Tetra Tech NUS, In	с.						Page 👱	<u>_of</u>
Project Site Na	ame:	NASA WF	F-WOD	_	Sample ID N	o.: WFF-	WOD-7	W -
Project No.:		112GN161	2	-	Sample Loca	tion: NAS	5A - U	IFF
Sampled By:		JBB		-	Duplicate:			
Field Analyst:		1BB			Blank:			
Alkalinity:								
Equipment: Chemel	trics Test Kit				Concentration:	0	ppm	
Range Used:	Range	Method	Concentra	tion ppm		1.26.3		
	10 to 100 ppm	K-9810	>	00	Analysis Time:	[610	-	
	50 to 500 ppm	K-9815	20	<i>v</i>	-			<u> </u>
	100 to 1000 ppm	K-9820					Fi	Itered:
Equipment:	HACH Digital Titrate	or AL-DT						
Range Used:	Range	Sample Vol.	Cartridge	Multiplier	Titration Count	Multiplier	Concenti	ation
	10-40 mg/L	100 ml	0.1600 N	0.1	&	x 0.1	=	mg/L
	40-160 mg/L	25 ml	0.1600 N	0.4	&	<b>x</b> 0.4	=	mg/L
	100-400 mg/L	100 ml	1.600 N	1.0	&	x 1.0	=	mg/L
	200-800 mg/L	50 ml	1.600 N	2.0	&	x 2.0	=	mg/L
	500-2000 mg/L	20 ml	1.600 N	5.0	&	x 5.0	=	mg/L
	1000-4000 mg/L	10 ml	1.600 N	10.0	&	x 10.0	=	mg/L
		I.,			Dianakananta	7		
	Parameter:	Hydroxide	Carb	onate	Bicarbonate	-		
Standard Additional	Relationship:	t Malaritur	1	Diaita Doai	irod: 1at :	3		
Notes:		. wolanty		Digits Requ	11eu. 1st 210	310		
Ferrous Iron (F	<sup>2</sup> e <sup>2+</sup> ):							
Fouinment:	DR-850	DR-8	Ranne: 0 -	- 3 00 ma/l	Concentration:	29	nnm	
Equipmont.	Program/Module:	500nm	33	0.00 mg/2	esticontation			
	r rogrammodule.	ooonn	00		Analysis Time:	1550		
Fouipment:	IR-18C Color Whee	$\sum$	Range: 0 -	10 ma/l			-	
Notes:		<i>y</i>	r tangar a	. og			. Fi	itered:
Hydrogen Sulf	ide (H <sub>2</sub> S):		Range: 0 -	5 mg/l.				
Equinment		Other			Concentration:	$\langle \rangle$	0000	
	Fuended 6 0 mg/l			<u> </u>		1555		
Mataa	Exceeded 5.0 mg/L	. range on cold	ir chan.		Analysis fille.		-	
Rulfido (8 <sup>2</sup> ")								
Suinde (S. ):	trica Toot Kit		Dense: 0	10 mail	Concentration			
Equipment. Cheme		1		· To my/L	Concernation.		_ppm	
Range Used:	Range	Method	Concentra	tion ppm				
	0 to 1 ppm	K-9510			Analysis Time:		-	
	1 to 10 ppm	K-9510						
							F	itered:
Equipment:	DR-850	DR-8	Range: 0 -	0.70 mg/L				
Program/Module:	610nm	93						
Notes:								

Ŧ	fetra Tech NUS, In	IC.	GROU	INDWA	TER SAN	MPLE LO	G SHEE	T Page	_/_of_/	_
Project Site N Project No.: ] Domest Honitori ] Other W ] QA Sam	Name: ic Well Data ing Well Data Vell Type: nple Type:	NASA WFF-V 112GN1612	NOD			Sample Sample Samplec C.O.C. I Type of [] Low [] High	ID No.: <b>WF</b> Location: 1 By: No.: Sample: Concentra 1 Concentra	<u>రాలు - 7</u> <u>బరా - 71</u> కాలు ation	<u>شعہ ہ</u> مع	
CAMDEING DAT										
Date: 12/16/	Neeleeseeseeseese I d R	Color	Ha	S.C.	Temp.	Turbidity	DO DO	Salinity	Other	9999
Time: (010	<u> </u>	(Visual)	(S.U.)	(mS/cm)	(°C)	(NTU)	(mg/l)	(%)	ORP	
Method: /ew	flow	Turbid	5.98	0.569	18.08	+100	0.92	0.0	-123	
PURGE DATA										
Date: 12/10/0	28	Volume	pН	S.C.	Temp.	Turbidity	DO	Salinity	Other	
Method: Low	Flow	See	Low	Flow	purge	103				
Monitor Reading (	(maa):				1 0	0	i			
Well Casing Diam	neter & Material			1	1					
Tune: 1.5 "	Dur	1		1	1					
Total Well Denth	/TD): 3()		<del> </del>		1		1			
Ctatin Mator Love	- 101. 20 MT				<b> </b>		[			—
	$\frac{1}{1} ( \frac{1}{1} ) \frac{1}{1} $	<b> </b> '					[		<u> </u>	
One Casing volue	me(gal/L): U, MAG	<b> </b> '					i			
Start Purge (nrs):	0710		1		1		· · · · · · · · · · · · · · · · · · ·	<u> </u>	ļ	
End Purge (hrs):	0450							<u></u>	<b> </b>	
Total Purge Time	(min): 20 Min	<u> </u>	Ļ					+		
Total Vol. Purged	l (gal/L): 22									
SAMPLE COLLE	CTION INFORMA	TION	<u> </u>							
	Analysis		Preser	vative	(7) (0)	Container Re	aquirements		Collected	
	<u> </u>		Hee	<u></u>	(3) 40 =	ni giass			44	
TAL A	1.1.0		410	<u> </u>	(2) 770	<u> </u>	Meer yee	222	yes.	
Filsonal	The Mab	- /) .	HNO	<u> </u>		UMI PO	<u>1 L Y</u>		The set	
			10.00	3		¥			7-5	
			1		<u> </u>				1	
						······	*********			
			<u> </u>							
									<u></u>	
			<u> </u>						<u> </u>	
		*****								aren en
UBSERVATIONS	S NULED									37.336
Circle if Applica	ble:					Signature(s	,):			
MS/MSD	Duplicate ID No.:	:						>		
<u> </u>								$\rightarrow$		

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	~~~~	162	12,00	0:14	2014	10101	5.70		7.30	0/20 0
tory north	0,0	1203	18.14	2.27	100	0.571	5.92		121	0200
Very Forbid	2.0	-/35	12.91	£5.0	400	0.514	5.95	00)	5,4 +	19-19-
	% or ppt	mV	(Celcius)	(mg/L)	(NTU)	(mS/cm)	(S.U.)	(mL/Min.)	below TOC)	(Hrs.) (Ft
Comments	Salinity	ORP	Temp.	DO	Turb.	S. Cond.	рH	Flow	later Level	Time V
N	WOD - TW		WELL ID.:		·		WOD	NASA WEF	NAME:	PROJECT SITE
			HEET	ATA SI	JRGE D		LOW F			5



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### FIELD ANALYTICAL LOG SHEET **GEOCHEMICAL PARAMETERS**

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Tetra Tech NUS, In	С.							rage <u>rage</u> of _	
Project Site N	ame:	NASA WF	F-WOD	-		Sample ID N	o.: WFF-	WOD-TW	2-1
Project No .:		112GN16	12			Sample Loca	ation: Wo	D-TWZ-	-
Sampled By:	ξw		•	-		Duplicate:			
Field Analyst:	En			-		Blank:	$\square$		
Field Form Ch	ecked as per Q/	A/QC Chec	klist (initia	- ils):		7			
SAMPLING DATA									
Date: 12/10/04	8	Color	рН	S.C.	Temp.	Turbidity	DO	Salinity	ORP (Eh)
Time:		(Visual)	(S.U.)	(mS/cm)	(°C)	(NTU)	(mg/l)	(%)	(+/- mv)
Method: Low 1	Flow	tuchid	5.98	0.569	18.08	+ 600	0.92	6.0	-128
SAMPLE COLLEC	TION/ANALYSIS IN	FORMATION							
ORP (Eh) (+/- r	nv) -123	3	Electrode i	Make & Mor	del: <b>Horil</b>	Silver-Silver Chlori	de / Calomel		
Dissolved Oxv	den:		1 1010101100	Lioonodo (				, nyalogen	
Equipment: Cheme	trics Test Kit				_	Concentration:	0.9	_ppm	
Range Used:	Range	Method	Concentra	tion ppm					
	0 to 1 ppm	K-7510	0.	9		Analysis Time:	(100	_	
	1 to 12 ppm	K-7512	outof	rage					
Equipment:	HACH Digital Titrat	or OX-DT		-			Analysis Time		-
Range Used:	Range	Sample Vol.	Cartridge	Multiplier	]	Titration Count	Multiplier	Concentration	1
	1-5 mg/L	200 ml	0.200 N	0.01			x 0.01	= mg/L	
	2-10 mg/L	100 ml	0.200 N	0.02			x 0.02	= ma/L	1
Carbon Dioxid	<b>e:</b> trics Test Kit					Concentration:	250	ppm	
Range Used:	Range	Method	Concentra	tion ppm	]				
2	10 to 100 ppm	K-1910	Getof	Scine		Analysis Time:	1/13		
Z	100 to 1000 ppm	K-1920	250	G	1	•		_	
	250 to 2500 ppm	K-1925			1				
Equipment:	HACH Digital Titrate	or CA-DT		1	1		1		٦
Range Used:	Kange	Sample Vol.	Cartridge	Multiplier		Titration Count		Concentration	
	10-50 mg/L	200 mi	0.3636 N	0.1			x 0.1	= mg/L	
	20-100 mg/L	100 mi	0.3636 N	0.2		· · · · · · · · · · · · · · · · · · ·	x 0.2	= mg/L	-
	100-400 mg/L	200 mi	3.636 N	1.0			x 1.0	= mg/L	-
	200-1000 mg/L	100 mi	3.636 N	2.0	] 		x 2.0	= mg/L	J
Notes:		t iviolarity:		Digits Requ	ured: 1st.:	2nd.:	3rd.:		
Hydrogen dise	olved								
Fruipment: Rubble	e strip sampling field	method							
aquipment. Dubble	Start stripper at	eu Iou /4	ime)						
	End stripper at	(t	lime)						
	Total stripper time	(							
	Pump rate	milliliter	s/minute						



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Tetra Tech NUS, I	Inc.						Page 2 o	f_Z
Project Site N	Name:	NASA W	F-WOD		Sample ID N	0.:WFF-0	NOD- TW	2-1
Project No.:		112GN16	12		Sample Loca	ation: 600	D-TW2	~1
Sampled By:	Éw				Duplicate:			
Field Analyst	: En				Blank:			
Alkalinity:								
Equipment: Chem	etrics Test Kit				Concentration:	225	ppm	
Range Used:	Range	Method	Concentrat	ion ppm				
	10 to 100 ppm	K-9810	atofi	ange	Analysis Time:	118		
	50 to 500 ppm	K-9815	225					
	' 100 to 1000 ppm	K-9820					Filter	ed:
Equipment:	HACH Digital Titra	tor AL-DT			,			
Range Used:	Range	Sample Vol.	Cartridge	Multiplier	Titration Count	Multiplier	Concentratio	on
	10-40 mg/L	100 ml	0.1600 N	0.1	&	x 0.1	= mg	/L
	40-160 mg/L	25 ml	0.1600 N	0.4	&	<b>x</b> 0.4	= mg	/L
	100-400 mg/L	100 ml	1.600 N	1.0	&	x 1.0	= mg	/L
	200-800 mg/L	50 ml	1.600 N	2.0	&	x 2.0	= mg	/L
	500-2000 mg/L	20 ml	1.600 N	5.0	8	x 5.0	= .mg	/L
	1000-4000 mg/L	10 ml	1.600 N	10.0	&	<b>x</b> 10.0	= mg	/L
	Parameter:	Hydroxide	Carbo	onate	Bicarbonate	-		
	Relationship:	<u> </u>						
Standard Additions	s: 🛄 Titran	t Molarity:		Digits Requi	red: 1st.: 2nd.:	3rd.:		
Ferrous Iron (	'Fe <sup>2+</sup> ):							
Equipment:	DR-850	DR-8	Range: 0 - 3	3.00 ma/l.	Concentration	2.8	0000	
	Program/Module:	500nm	33		o on o on a distance of the	<u> </u>		
		-			Analysis Time	1124		
Equipment:	IR-18C Color Whee	$\sim$	Range: 0 - 1	• 10 ma/l	nitalysis nine,	/_	-	
Notes:			runge. o	10 1119/2			Filton	
Hydrogen Sul	fide (H <sub>2</sub> S):		Range: 0 - {	5 mg/L			1 Incen	<del>50.</del>
Equipment:	HS-C	Other:			Concentration:	О	naa	
	Exceeded 5.0 mg/L	range on colo	or chart:		Analysis Time:	112.8	- re	
Notes:	Ū.	·		_			-	
Sulfide (S <sup>2-</sup> ):					·····			
Equipment: Cheme	etrics Test Kit		Range: 0 - 1	10 mg/L	Concentration:		_ppm	
Range Used:	Range	Method	Concentrati	on ppm				
	0 to 1 ppm	K-9510			Analysis Time:		_	
	1 to 10 ppm	K-9510						_
							Filtere	ed:
Equipment:	DR-850	DR-8	Range: 0 - (	).70 mg/L				
Program/Module:	610nm	93						
Notes:								

PROJECT SITE NAME: PROJECT NUMBER:

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NASA WFF-WOD 112GN1612

Well ID.: Date: .

NFF. Wa 0-TW3-

					_		_	_			_		_		_		_	_	 	_	_	_	 	 _	
	Comments		Testing at i a	well is him werd		SWL AROPS NO	watter how stow you	purat well					the wheels												•         
	Salinity	% ar ppt	Ø, Ö	0,0	ð. O	0,0	0,0					and Slic	i A Haver												
	ORP	тN	を14-	-433	-450	010 h -	<i>つ t h -</i>		3 044	,		celle ct													
	Temp.	(Celcius)	17,55	17.13	12,02	16.91	16.31		r to goin			acse ta													
4	DO	(mg/L)	0.46	6,48	0.48	0,39	0,40		le aria	1		de cue													
	Turb.	(NTU)	>≬00	2122	>100	001 C	2100	-	X XAMO	*		5 27											Are -		
	S. Cond.	(mS/cm)	0.583	0:599	0,600	0,595	0,610		ی ددالدم			/ Waited													
	Hq	(S.U.)	6,09	6.16	6.15	6.14	6.16		-01.00			awallan													
	Flow	(mL/Min.)	ow 1-2100	001 > ,	<100	<10 C	Sido	*	Neep	- (	D	durres													
	Water Level	(Ft. below TOC)	23.4	26.4	5.25	68.48	10'82		WEII ~ 30		(C) (Q)	VENT ONY													
	Time	(Hrs.)	1020	1030	F035	1040	1045																		

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SIGNATURE(S):



Tetra Tech NUS, Inc								Page of	
Project Site Na	ame:	NASA WF	F-REA	ƥv		Sample ID N	W.FE WOL	<u>)-TW3-</u>	-1
Project No.:		112GN161	12	_		Sample Loca	ition:		
Sampled By:				_		Duplicate:			
Field Analyst:				-		Blank:			
Field Form Ch	ecked as per QA	VQC Chec	klist (initia	uls):		7			
SAMPLING DATA:			an à an a						
Date: 1み1/010	8	Color	Ha	S.C.	Temp.	Turbidity	ро	Salinity	ORP (Eh)
Time: 1650	•	(Visual)		(mS/cm)	ീ	ONTED	(mg/l)	(%)	(+/- mv)
Method: 1 cm	4ml	(visual)	(0.0.)	(ind/ent)			(ung/t)	(/0)	()/- mv)
SAMPLE COLLECT	TON/ANALYSIS IN	FORMATION							
ORP (Eh) (+/- n	יע)		Electrode	Make & Moo	iel:				
()(	,		Reference	Electrode (c	circle one):	Silver-Silver Chlor	ide / Calomel	/ Hydrogen	
Dissolved Oxy	gen:							,,	
Equipment: Chemet	rics Test Kit					Concentration:	0,6	maa	
		<b>I</b>	1		1	00110011120011			
Range Used:	Range	Method	Concentra	tion ppm			1130		
	0 to 1 ppm	K-7510				Analysis Time:			
	1 to 12 ppm	K-7512			J				
Equipment:	HACH Digital Titrate	or OX-DT					Analysis Time	:	_
Range Used:	Range	Sample Vol.	Cartridge	Multiplier		Titration Count	Multiplier	Concentration	, T
	1-5 mg/L	200 ml	0.200 N	0.01			x 0.01	= mg/L	
	2-10 mg/L	100 ml	0.200 N	0.02			x 0.02	= mg/L	
Notes:					•				-
Carbon Dioxide	<u>.</u>								
Equipment: Chemet	rics Test Kit		<u>.</u>			Concentration:	50	_ppm	
Range Used:	Range	Method	Concentra	tion ppm					
	10 to 100 ppm	K-1910				Analysis Time:	1147	>	
	100 to 1000 ppm	K-1920							
	250 to 2500 ppm	K-1925							
Equipment:	HACH Digital Titrate	or CA-DT							
Range Used:	Range	Sample Vol.	Cartridge	Multiplier		Titration Count		Concentration	]
	10-50 mg/L	200 ml	0.3636 N	0.1			× 0.1	= mg/L	1
	20-100 mg/L	100 ml	0.3636 N	0.2			x 0.2	= mg/L	
	100-400 mg/L	200 ml	3.636 N	1.0	1		<b>x</b> 1.0	= mg/L	
	200-1000 mg/L	100 ml	3.636 N	2.0			<b>x</b> 2.0	= mg/L	
Standard Additions:	Titrant	Molarity:		Digits Requ	uired: 1st.:	2nd.:	3rd.:		_
Notes:									
Hydrogen, diss	olved								
Equipment: Bubble	strip sampling field	method							
	Start stripper at	(t	ime)						
	End stripper at	(	time)						
	Total stripper time _								
	Pump rate	milliliter	s/minute						



Tetra Tech NUS, In	C.						Page	of	
Project Site N	ame:	NASA WF	F-5627A 1	NOD	Sample ID N	o.:			
Project No.:		112GN161	2		Sample Loca	ition:			
Sampled By:				_	Duplicate:				
Field Analyst:					Blank:				
Alkalinity:						~~ ^			
Equipment: Cheme	trics Test Kit				Concentration:	250	_ppm		
Range Used:	Range	Method	Concentral	tion ppm					
	10 to 100 ppm	K-9810			Analysis Time:	1150			
X	50 to 500 ppm	K-9815	2:	50	·		-		
	100 to 1000 ppm	K-9820						Filtered:	
Equipment:	HACH Digital Titrat	or AL-DT							
Range Used:	Range	Sample Vol.	Cartridge	Multiplier	Titration Count	Multiplier	Conc	entration	
	10-40 mg/L	100 ml	0.1600 N	0.1	&	x 0.1	=	mg/L	
	40-160 mg/L	25 ml	0.1600 N	0.4	&	<b>x</b> 0.4	=	mg/L	
	100-400 mg/L	100 ml	1.600 N	1.0	&	x 1.0	=	mg/L	
	200-800 mg/L	50 ml	1.600 N	2.0	&	<b>x</b> 2.0	=	mg/L	
	500-2000 mg/L	20 ml	1.600 N	5.0	&	x 5.0	=	mg/L_	
	1000-4000 mg/L	10 ml	1.600 N	10.0	&	<b>x</b> 10.0	=	mg/L	
	L					1			
	Parameter:	Hydroxide	Carb	onate	Bicarbonate	4			
Out of the second second second				Disite Desi		]			
Notes		t woanty		Digits Requ	ilied. 1st 2nd	эго			
Ferrous Iron (I	Fe <sup>2+</sup> )·								
Fouinment:	DR-850	DR-8	Range: 0 .	3.00 mg/l	Concentration:	2.6	որա		
Equipment.	Brogram/Module:	500pm	33	0.00 mg/c	Concentration.	<u> </u>	- <sup>ppm</sup>		
×	r rogrammodule.	Soonin	55		Analysis Time:	1135			
Equipment:	IP-18C Color Whee		Range: 0 -	10 mg/l	raidiyolo fano.		-		
Notes'		)	Range. 0 -	TO HIGHE				Filtered	
Hydrogen Sulf	ide (H <sub>o</sub> S):		Ranne: 0 -	5 ma/l				T MOTOR	
Equipmont:		Other:	Tungo. o	o mg/L	Concentration	0.0	<b>DDD</b>		
	Eveneeded 5.0 mg/l		- aborti		Analysis Times	1140	_ppm		
Notes ? Dul	Liked Songh			1.0	1 POM lad-mort		-		
Sulfido $(S^2)$ :	1 PALION 10	yenor.	<u> </u>	se .		<u>)</u>			
Sumue (3).	trice Test Kit		Rance: 0 -	10 ma/l	Concentration		0000		
		1	Trange. 0 -	io ingre	Concentration.	<u></u>	- <sup>ppm</sup>		
Range Used:	Range	Method	Concentra	tion ppm					
	0 to 1 ppm	K-9510			Analysis Time:		-		
	1 to 10 ppm	K-9510	<u> </u>		ν.				
								Filtered:	ليسا
Equipment:	DR-850	DR-8	Range: 0 -	0.70 mg/L					
Program/Module:	610nm	93							
Notes:									

Ft Tetra Tech NUS, Inc.

### **GROUNDWATER SAMPLE LOG SHEET**

600

Page / of /

Project Site Project No.:	Name:	NASA WFF- 112GN1612	6000 <del>FTA</del>	· · · ·		Sample Sample Sample	ID No.:₩# Location: d By:	1000-700 7004 EU	4-1
[] Domes Monito [] Other \ [] QA Sa	stic Well Data ring Well Data Well Type: mple Type:			1		C.O.C. I Type of [] Low [] High	No.: Sample: Concentra Concentra	ation	
SAMPLING DA	TA								
Date: 12 9 0	8	Color	рН	S.C.	Temp.	Turbidity	DO	Salinity	Other
Time: 15	10	(Visual)	(S.U.)	(mS/cm)	( <sup>0</sup> C)	(NTU)	(mg/l)	(%)	
Method: 100	s FLOW	Turbiel	5.97	0,602	16.51	758	1.16	0,0	
PURGE DATA:									
Date: 12 9 0	≥ <u>β</u>	Volume	рН	S.C.	Temp.	Turbidity	DO	Salinity	Other
Method: low	flow	Sec	low	flow	log	Sheet	•		
Monitor Reading	(ppm):								
Well Casing Dia	meter & Material						·····		
Type:	RC								
Total Well Depth	(TD) 29 51								
Static Water Lev	rel (10/1.) · 2499 /								
One Casing Vol	100(001/1): 1 44								
Chert Durre (her)									
Start Purge (hrs)	15:0								
End Purge (nrs):	1010								
Total Purge Tim	e (min): <u>5</u>								
Total Vol. Purge	d (gal/L): 82						*************************		
SAMPLE COLL	EGIION INFORMA	HON:							
	Analysis		Preser	vative	(2) (1)	Container R	equirements		Collected
701	SVAC				(3) 70	MI GIAD	1		
 	Mato Os		HNO	¢	(1) 20	- made	$\frac{1}{2}$		yes wi
TAL A	Acto Os Filk	ford	HNO	2 2	(1) 25	onel 1	Poli		Ere.i
		<u> </u>		<u>.</u>			$\sigma$		
						·			
OBSERVATION	S/NOTES								
- 5/1	the sloven r.	, puze u	ato						
-stiste	<del>/</del>	/ -							
- 0									
The sector water to				000000000000	*****	Signature/-	۱.		
Meilleo						Signature(S	J•	> _	
WS/WSD	Duplicate ID NO.:	•							

Ę		_	LOW FL	OW PU	RGE DA	TA SH				
PROJECT SITE PROJECT NUN	IBER:	NASA WFF-V	WOD				NELL ID.: DATE:	WEF	WOD - TWL 12/9/08	4-1 (TD 29.81
Time W	/ater Level	Flow	рН	S. Cond.	Turb.	DO	Temp.	ORP	Salinity	Comments
(Hrs.) (Ft.	below TOC)	(mL/Min.)	(S.U.)	(mS/cm)	(NTU)	(mg/l_)	(Celcius)	πV	% or ppt	
1415 24	1.99	150	653	- 865 '0	+ 8 ×	1.12	1743	-63-	0,0	Very turbed
1420 26	, 27 7	150	5.99	0,592	* Cal +	0.64	17,22	-76	<i>e</i> .0	gw dearn, but still turbid
1430 27	2.26	150	5.82	0,568	661	1.07	16.69	-61	0.0	0
1435 27	2.86	150	5,86	145'0	735	0.77	16.64	-76	0,0	
2 2441	8,02	150	5.89	6,578	718	18.0	16.59	- 84	0,0	
2 Shhl	45'8'	e51	5.9	0,580	8.32	26,0	16.51	12-	0,0	
E 051	447	120	76.5	0,601	732	20 20 2	16,42	-83	0,0	
C 55M	<i>th</i> 6	150	5.96	0,595	743	1,12	16,53	58-	0,0	
2 005!	84.P	150	597	0.602	758	911	16,51	12-	0,0	
		,,								
									-	
						-				
					*					
			V	×	ĩ	•				
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### FIELD ANALYTICAL LOG SHEET **GEOCHEMICAL PARAMETERS**

Tetra Tech NUS, I	nc.		••••					Page <u>[</u> of _	2
Project Site N	lame:	NASA WE	F-WOD	_		Sample ID N	o.: టిI- ట	00-7W4	- )
Project No.:		112GN16	12			Sample Loca	ition: Tu	)4	
Sampled By:	Eω			-		Duplicate:			
Field Analyst	ĒŴ			-		Blank			
Field Form C	hecked as per Q/	A/QC Chec	klist (initia	-		7	نــــــا		
SAMPLING DATA									
Date: 1290	3	Color			Tomp	Turbidity			
		(Viewel)		6.0.	lemp.	amu		Sannity	ORP (EII)
Method: Louis	<u>francia</u>	(visual)	(5.0.)	(mS/cm)			(mg/t)	(%)	(+/- mv)
SAMPLE COLLEC	TION/ANALYSISIN	FORMATION	<u>  つ                                </u>	01602	16.21	<u>  /&gt;</u>	1.1 <i>6</i>		<i>2</i> 43 aaaaaaaa
ORP (Eh) (+/-	mv)		Electrode i	Maka & Mor	del: Hart	- 12-72			
	243		Deference		oimle analı C				
Discolved Ox		·····	Reference	Electrode (	circle one): a	siver-Silver Chlon	de / Calomei	/ Hydrogen	
Equipment: Chom	ygen.					<b>•</b> • • •	0.5		
		1			7	Concentration:		ppm	
Range Used:	Range	Method	Concentra	tion ppm	_		سد د در و		
	0 to 1 ppm	K-7510	0,5			Analysis Time:	1457	- 1557	
	1 to 12 ppm	K-7512	out of	1ange				-	
				9					
Equipment:	HACH Digital Titrat	or OX-DT					Analysis Time:		_
Range Used:	Range	Sample Vol.	Cartridge	Multinlier	1	Titration Count	Multiplier	Concentration	]
	1-5 mg/L	200 ml	0.200 N	0.01	-	Thatlan Oodin			-
	2-10 mg/l	100 ml	0.200 N	0.02			× 0.01	- mg/L	•
Notes:									
Carbon Dioxic	le:								
Equipment: Cheme	etrics Test Kit				_	Concentration:	225	ppm	
Range Used:	Range	Method	Concentrat	ion ppm	1				
	10 to 100 ppm	K-1910	aut of	ra-182	1	Analysis Time:	1608		
	100 to 1000 ppm	K-1920	225			·			
	250 to 2500 ppm	K-1925							
Equipment:	HACH Digital Titrato	or CA-DT							
Range Used:	Range	Sample Vol	Cartridge	Multiplier	1	Titration Count		Canaaniraiian	1
	10-50 mg/l	200 ml	0 3636 M			TRACOT COUNT	v 0 1		
	20-100 mg/L	100 ml	0.3030 N	0.7			X 0.1	= mg/L	
	100-400 mg/L	200 ml	3 636 N	1.0			x U.2	= mg/L	
	200-1000 mg/L	100 ml	3 626 N	2.0			x 1.0	<u> </u>	
Standard Additions		Molarity	N 000.0	Z.V	irodu 1-t-	<u> </u>	X 2.U	= mg/L	1
Notes:	. 🖵 nuanu	. moiettty:		orgits requ	eu. 15(.:	2nd.:	3ra.;		
Hydrogen, dis	solved								
Equipment Bubbl	e strin sampling field	method							
-qeepmont Dobbi	Start stripper et	741 741	me)						
	End stripper at	(u /ł	ime)						
	Total stripper at	(i							
	Pumn rate	millilitere	minute						
			*******						



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Tetra Tech NUS, In	IC.						Page 2-o	f_<
Project Site N	ame:	NASA WF	F-WOD	_	Sample ID N	D.: WI-L	)00- Tu	1-1
Project No.:		112GN161	2	_	Sample Loca	tion: 🖚	ł	
Sampled By:	゠ッ			_	Duplicate:			
Field Analyst:	EV	J			Blank:			
Alkalinity:								
Equipment: Cheme	trics Test Kit				Concentration:	250	_ppm	
Range Used:	Range	Method	Concentra	tion ppm				
	10 to 100 ppm	K-9810	whole	ronge	Analysis Time:	1613	-	
	50 to 500 ppm	K-9815	250	>				_
	100 to 1000 ppm	K-9820					Filter	ed:
Equipment:	HACH Digital Titrat	or AL-DT						
Range Used:	Range	Sample Vol.	Cartridge	Multiplier	Titration Count	Multiplier	Concentratio	n
	10-40 mg/L	100 ml	0.1600 N	0.1	&	<b>x</b> 0.1	= mg	/L
	40-160 mg/L	25 ml	0.1600 N	0.4	&	<b>x</b> 0.4	= mg	/L
	100-400 mg/L	100 ml	1.600 N	1.0	&	<b>x</b> 1.0	<u>= mg</u>	/L
	200-800 mg/L	50 ml	1.600 N	2.0	&	x 2.0	= mg	/L
	500-2000 mg/L	20 ml	1.600 N	5.0	&	x 5.0	= mg	/L
	1000-4000 mg/L	10 mi	1.600 N	10.0	<u> </u>	<b>x</b> 10.0	= mg	/L
	Parameter:	Hydroxide	Carb	onate	Bicarbonate			
	Relationship:							
Standard Additions:	: 🗌 Titrani	t Molarity:	·	Digits Requ	ired: 1st.: 2nd.:	3rd.:		
Notes:								
Ferrous Iron (I	=e <sup>2+</sup> ):					_		
Equipment:	DR-850	DR-8	Range: 0 -	3.00 mg/L	Concentration:	2. (	_ppm	
	Program/Module:	500nm	33				11.001	
					Analysis Time:	+440-	1604	
Equipment:	IR-18C Color Whee	el	Range: 0 -	10 mg/L				
Notes:							Filter	ed:
Hydrogen Sulf	ide (H <sub>2</sub> S):		Range: 0 -	5 mg/L		0		
Equipment:	HS-C	Other:			Concentration:	$\frac{V}{V}$	_ppm	
	Exceeded 5.0 mg/L	range on colo	or chart:		Analysis Time:	10 20	-	
Notes:								
Sulfide (S <sup>-</sup> ):				40				
Equipment: Cheme			Range: 0 -	10 mg/L	Concentration:		_ppm	
Range Used:	Range	Method	Concentra	tion ppm				
	0 to 1 ppm	K-9510			Analysis Time:			
	1 to 10 ppm	K-9510						
				• <b>-</b> • "			Filter	ed:
Equipment:	UR-850	DR-8	Range: 0 -	0.70 mg/L				
Program/Module:	610nm	93						
Notes:								

Tetra Tech NUS,	Inc.	GROU	INDWA	TER SAI	MPLE LC	G SHEE	Т	
							Page_	of
Project Site Name: Project No.: ] Domestic Well Data ] Monitoring Well Data }Other Well Type:	NASA WFF- 112GN1612	мо <u>р</u> Ле (1			Sample Sample Sample C.O.C. I Type of [ Low	نا ID No.: Location: d By: No.: Sample: Concentra	IEF-WOB NASA- JBB	, j-TWS- I WFF
QA Sample Type:	T				[] High	Concentra	ation	
SAMPLING DATA:								
Date: $\frac{2}{0200}$ Time: $\frac{125}{000}$	Color (Visual)	pH (S.U.)	S.C. (mS/cm)	Temp. ( <sup>0</sup> C)	Turbidity (NTU)	DO (mg/l)	Salinity (%)	Other
PURGE DATA:	T. Drown	ما المرحما	0,911	14.24		2.27	0,0	
Date: 12/10/2008 Method: Law Flaw	Volume	рН	S.C.	Temp.	Turbidity	DO	Salinity	- Other
Monitor Reading (ppm):							-	
Well Casing Diameter & Material Type:					$\geq$			
Total Well Depth (TD): ろの			. ł	000				
Static Water Level (WL): 26,6	<u>198</u>	1 01	00	The t				
One Casing Volume(gal/L)	TO, 3 28 gal	1	Linfac	She				
Start Purge (hrs): 1050	-		poil			·		
End Purge (hrs): パンク	/	<u> </u>						
Total Purge Time (min): 35 min								
Total Vol. Purged (gal/L): 1/L qa					<u></u>	*****	(*********************	
SAWPEE CULLECTION INFORM		Procor	liitiitiitiitiitiitiitiitiitiitiitiitiit		Container P	nguiremente		Collected
Tel Voc			valive	/2)	40 J_ V	oA vials		ile S
TAL Motals		HUO	2	/1) [	ilfered (1) 4st	illowed 125	mh poly	<u>y-</u> )
TCL SUDCS				(2	$  _{-}^{-}A$	Aber	<u>,,,- p.c.y</u>	Ve S
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	-							
		<u> </u>						
······································								
OBSERVATIONS / NOTES								
6					<b>`</b>			
1 p. field	a analy	fical	log	sheet to	ov			
SEE		. 1	J.	ſ.				
	geoche	Mical	para	meter 5				
	$\sim$							
Circle If Applicable:					Signature(s	):		
MS/MSD Duplicate ID N	D.:					/ < /	Ħ	
					Moral	Ipullal	1	
1 magazina 1			······		7			
					/			

PROJECT SITE NAME: PROJECT NUMBER:	NASA WFF 112GN1612			RGE D/	ATA SH	IEET WELL ID.: DATE:		WFF-WO	30-TWS-1 JBQ-TW JBQ-TWS-1
Time Water Level	Flow (mL/Min.)	рН (S.U.)	S. Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celcius)	ORP mV	Salinity % or ppt	Commen
0201 5501	2	6,48	8thig	tos turbid	6.10	16,34		>¢ 0	- sray blown
CALC NULL	× 50	5.52	0,428	~	25.27	25'91 25'91	6,6- 2 L -	0 ¢ ó ¢	teo turbid Sp. (
2,52 104	C	6,48	L15 0		2,30	16.31	- 104	0,0 (	parts durad
1110 26,01		6,41	6,999	*	2,24	16.44	-105	ÓÒ	
		11' J	09,00		55,5	16,42	501-	6.1	2 2 1 2 you
lins Stad	H SamAli		() 5.		1 21 2				
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### FIELD ANALYTICAL LOG SHEET **GEOCHEMICAL PARAMETERS**

Tetra Tech NUS, In	с.	ULC.						Page <u>1</u> of _	3
Project Site Na	ame:	NASA WF	F-WOD			Sample ID N	o.: WFF-U	JOD-TWS-	1
Project No.:		112GN161	2	-		Sample Loca	ation: NAS	4 WFF	
Sampled By:		1BB		-		Duplicate:	$\Box$		
Field Analyst		<b>BB</b>		-		Blank:			
Field Form Ch	ecked as per QA	VQC Check	dist (initia	- ls):		7			
SAMPLING DATA									
Date: 12/10/-	2008	Color	рН	s.c.	Temp.	Turbidity		Salinity	ORP (Fh)
Time: 1157	)	(Visual)	(\$11)	(mS/cm)	്റ	NTU	(ma/l)	(%)	(+/_m))
Method:	Flow	It. brown	6.41.	0,999	16,24	(((10))	2,27	0.0	-107
SAMPLE COLLEC	TION/ANALYSIS IN	FORMATION:							
ORP (Eh) (+/- r	nv)	<u></u>	Electrode 1	Make & Moo	del:			<u>te în între de contrat de la între</u> te	
	·		Reference	Electrode (	circle one): S	Silver-Silver Chlor	ide / Calomel	/ Hydrogen	
Dissolved Oxy	gen:								
Equipment: Cheme	trics Test Kit					Concentration:	$\geq$	ppm	
	Bango	Mathod	Concentral	lian nom	1				
Range Used:	Range		Concentral	lion ppm		Apolysia Timer	17 78		
	1 to 12 ppm	N-7510	5			Analysis Time:	1~ 20	<u> </u>	
		K-7012			J				
Equipment:	HACH Digital Titrato	or OX-DT					Analysis Time	:	
Bance Lised	Range	Sample Vol	Cartridoe	Multiplier	1	Titration Count	Multiplier	Concentration	7
	1-5 mg/l	200 ml	0 200 N				<u>x 0 01</u>		
	2-10 mg/l	100 ml	0.200 N	0.01			¥ 0.02	= mg/L	-
Notes:	1,				3	L			1
						-			
Carbon Dioxid	e:								
Equipment: Cheme	trics Test Kit					Concentration:	230	_ppm	
Range Used:	Range	Method	Concentrat	tion ppm	1				
R-	10 to 100 ppm	K-1910	>10	50		Analysis Time:	1209		
<b>X</b>	100 to 1000 ppm	K-1920	23	30				-	
	250 to 2500 ppm	K-1925							
					-				
Equipment:	HACH Digital Titrate	or CA-DT							
Range Used:	Range	Sample Vol.	Cartridge	Multiplier	1	Titration Count		Concentration	7
	10-50 mg/L	200 ml	0.3636 N	0.1			x 0.1	= mg/l	
	20-100 mg/L	100 ml	0.3636 N	0.2			x 0.2	= mg/L	
	100-400 mg/L	200 ml	3.636 N	1.0	÷		× 1.0	= ma/L	
	200-1000 mg/L	100 ml	3.636 N	2.0	f 443	·	x 2.0	= mg/L	
Standard Additions:	: 🗌 Titrant	Molarity:		Digits Requ	- uired: 1st.:	2nd.;	3rd.:		-
Notes:									
Hydrogen, dis	solved								
Equipment: Bubbl	e strip sampling field	method							
	Start stripper at	(ti	me)				·		
	End stripper at	(t	ime)						
	Total stripper time _				,				
	Pump rate	milliliters	s/minute						
1					· •,				



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Tetra Tech NUS, In	¢.						Page	<u> 2 of 3</u>
Project Site N	ame:	NASA WF	F-WOD	_	Sample ID N	O.: WFF.	WOD	-tw5-1
Project No.:		112GN161	2	-	Sample Loca	ition: NA	SA (	<i> 」 「 「 「 」</i>
Sampled By:		JBB		_	Duplicate:			
Field Analyst:		JBB			Blank:			
Alkalinity:							~	
Equipment: Cheme	trics Test Kit				Concentration:	250	2ppm	
Range Used:	Range	Method	Concentra	tion ppm				
	10 to 100 ppm	K-9810	<u>&gt;i</u>	00	Analysis Time:	1200		
	50 to 500 ppm	K-9815	2	50				_
	100 to 1000 ppm	K-9820						Filtered:
Equipment:	HACH Digital Titrat	or AL-DT						
Range Used:	Range	Sample Vol.	Cartridge	Multiplier	Titration Count	Multiplier	Conc	entration
	10-40 mg/L	100 ml	0.1600 N	0.1	&	x 0.1	=	mg/L
	40-160 mg/L	25 ml	0.1600 N	0.4	&	x 0.4	=	mg/L
	100-400 mg/L	100 ml	1.600 N	1.0	&	x 1.0	=	mg/L
	200-800 mg/L	50 ml	1.600 N	2.0	&	x 2.0	=	mg/L
	500-2000 mg/L	20 ml	1.600 N	5.0	&	× 5.0	=	mg/L
	1000-4000 mg/L	10 ml	1.600 N	10.0	&	<b>x</b> 10.0	=	mg/L
	Parameter:	Hydroxide	Carb	onate	Bicarbonate	1		
	Relationship:					1		
Standard Additions:	Titran	t Molarity:		Digits Requ	ired: 1st.: 2nd.:	3rd.:		
Notes:								
Ferrous Iron (F	<sup>=</sup> e <sup>2+</sup> ):					$\sim$		
Equipment:	DR-850	DR-8	Range: 0 -	3.00 mg/L	Concentration:		ppm	
	Program/Module:	500nm	33					
					Analysis Time:	1220	)	
Equipment: <	IR-18C Color Whee	>	Range: 0 -	10 mg/L				_
Notes:	~							Filtered:
Hydrogen Sulf	i <u>de (H</u> ₂S):		Range: 0 -	5 mg/L		$\sim$		
Equipment:	HS-C>	Other:			Concentration:	$\underline{\bigcirc}$	_ppm	
	Exceeded 5.0 mg/L	range on colo	r chart:		Analysis Time:	1215	-	
Notes:						,	-	
Sulfide (S <sup>2-</sup> ):								
Equipment: Chemel	rics Test Kit		Range: 0 -	10 mg/L	Concentration:		ppm	
Range Used:	Range	Method	Concentra	tion ppm				
	0 to 1 ppm	K-9510			Analysis Time:		_	
	1 to 10 ppm	K-9510						_
								Filtered:
Equipment:	DR-850	DR-8	Range: 0 -	0.70 mg/L				
Program/Module:	610nm	93						
Notes:								

Tetra Tech NUS,	Inc.	GROL	INDWA	TER SA	MPLE LC	OG SHEE	T	~ I
Project Site Name: Project No.:	NASA WFF- 112GN1612	WOD			Sample Sample Sample	ID No.: Location: d By:	WFF-WO NASA W	<u>l_of_}</u> D-TW6-1 FF
[] Domestic Well Data [] Monitoring Well Data 張_Other Well Type: [] QA Sample Type:	Temp. u	Je []			C.O.C. I Type of [] Low [] High	No.: Sample: Concentra Concentra	ation	
SAMPLING DATA:								
Date: 12 10 200 8	Color	pН	S.C.	Temp.	Turbidity	DO	Salinity	Other
Time: 0855	(Visual)	(S.U.)	(mS/cm)	(°C)	(NTU)	(mg/l)	(%)	
Method: Jow Flow	Hbrown	6,52	0,999	15.96	190	ス,44	0,0	
		10000000000000000000000000000000000000						
Mathed: $L_{10}$ , $Elarr$	voiume	рн	5.0.	i emp.	Turbidity	DO	Salinity	Other
Volitor Reading (ppn):	-				C			
					Flow-			
				100-	·			
I otal Well Depth (TD): 30 + 1			1181	0	1 t			
Static Water Level (WL): A C	1		,e	5	pic c			
Dne Casing Volume(gal/L): D +> g*			ENF	ac				
Start Purge (hrs): 0140			$\gamma$	<u> </u>				
End Purge (hrs): 0355			<u> </u>					
rotal Purge Time (min): フク								
Total Vol. Purged (gal/L): ไร่จุด)								
SAMPLE GOLLECTION INFORM	ATION							
		Preser	vative	1-	Container Re	equirements	(.	Collected
TAI Mable		HNC	Ĵ.,		- 10 AL	J inc	<u>als</u>	¥ ~ 5
TCL SVOLS				( <u>1</u> ) Fillevea	11 AA	a insmi	. poly	405
				<u> </u>	<u> </u>			<u> </u>
				•				
DBSERVATIONS / NOTES								
C.	; 1 I	1. 1	1	1	$\cap$	ſ	. /	
see tie	old analy	rtical	10g 51	neeT	tor q	eocheM	ucal	
Ωa	ramoto	15	-		J			
P	1							
Circle if Applicable:					Signature(s)	):	1.	
MS/MSD Duplicate ID No.	:				1	11-1.	M	
					Upla	17auhr		
					<u>بر</u>			

		LOW FL	-OW PU	RGE D/	ATA SH	IEET			
PROJECT SITE NAME: PROJECT NUMBER:	NASA WFF- 112GN1612	WOD				WELL ID.: DATE:		UFF- WO	1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-
Time Water Le	vel Flow	ΡŦ	S. Cond.	Turb.	DO	Temp.	ORP	Salinity	Comments
(Hrs.) (Ft. below <sup>-</sup>	[OC) (mL/Min.)	(S.U.)	(mS/cm)	(NTU)	(mg/L)	(Celcius)	۳V	% or ppt	
0740 75,52	Michsis fast Ha	6.36	0.548	Er 3	526	16,46	511-	0.0	muddy
L5.76 0520		,					ł		lest flog pullup tubing and
Jr.Jc L510	SO	853	083:0	Er 3	18.2	58:51	-120	0 Õ	oil small, bis of air in hubing "
1080		6,50	952'0	トィア	82.2	15,64	-116	0,0	dil sheen in sediment
2 080	< 50	6.46	0. 89 B	E, 3	529	15,53	/ E	0,0	DO reading probably inaccurate
0311		6.43	0,819	613	15.2	15,42	- 107	0,0	Sediment accumulation at both m
0315		6.43	0.715	5 47	2,38	15,43	-105	0.0	1/4 gel purged inchas
0817	Dunded Horiba	to clear	out acc	innulated	sedimat	and then	Feconnected	tubes (k	ept purprise
1280		6,46	25.0		102	15,73	58-	.0. 0	no out Flow yet
2280	<50	6,48	885,0	400	2,31	15.72	123	0,0	floating fibrous organics (17mm)
0832 2690		6,50	0.738	W CO	1972	15.70	16-	0. 0	
()337		6.57	0.999	330	<i>35</i> .C	15.24	- 94	0 Ò	
11291		646	6,999	0) tr	2.50	15.91	-95	0,1	
0245		1.53	0,999	びるで	7,94	15,92	53-	0.0	
580	Starl+ Sampli	£		1			1		
				and the second sec					
				North Contraction of the contrac	50				
				/ //	111				
				- 116		_			
	<u> </u>				6				
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	1191	ţ,							
SIGNATURE(S):	AM FLORAD		I						PAGE OF


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Tetra Tech NUS, Inc								_ <u>Page _</u> of _	<u> </u>
Project Site Na	ime:	NASA WF	F-WOD	_		Sample ID N	0.: WFF-4	UCD - TLUG -	-1
Project No.:		112GN161	12	-		Sample Loca	ition: wor	D-TW6-1	
Sampled By:	# JB					Duplicate:			
Field Analyst:	EN			•		Blank:			
Field Form Che	ecked as per QA	VQC Check	klist (initia	ıls):		1			
SAMPLING DATA:									
Date: 12/10/0	ଷ	Color	pН	S.C.	Temp.	Turbidity	DO	Salinity	ORP (Eh)
Time:		(Visual)	(S.U.)	(mS/cm)	(°C)	(NTU)	(mg/l)	(%)	(+/- mv)
Method: Low f	1040	<u>, , , , , , , , , , , , , , , , , , , </u>	<u>, ,</u> ,	,	· · ·			<u> </u>	,, ,
SAMPLE COLLECT	ION/ANALYSIS IN	FORMATION							
ORP (Eh) (+/- m	ער)		Electrode I	Make & Mod	let: Horder	0-22			
-	·		Reference	Electrode (r	circle one): {	Jilver-Silver Chlori	de / Calomel	/ Hydrogen	
Dissolved Oxy	gen:			P		<u>.</u>			
Equipment: Chemet	rics Test Kit	r			1	Concentration:	0,3	_ppm	
Range Used:	Range	Method	Concentral	tion ppm	1				
	0 to 1 ppm	K-7510	0.3		1	Analysis Time:	1205	_	
	1 to 12 ppm	K-7512			- No 1	reaching post	sible ver	y turbid	
Equipment:	HACH Digital Titrate	or OX-DT			- 2nd at	tempt Gen 3	Analysis Time	l, but a little	-clearer
Deves Used	-				I		T., watar		1
Range Useo:	Kange	Sample vol.			•	Titration Count	Multiplier	Concentration	4
	1-5 mg/L	200 mi	0.200 N	0.01			<u>x 0.01</u>	mg/L	4
	2-10 mg/L	100 mi	0.200 N	0.02	l		X 0.02	mg/L	]
Notes:									
Carbon Dioxide	ə:						3.3.65		
Equipment: Chemet	rics Test Kit					Concentration:	100	_ <sup>ppm</sup>	
Range Used:	Range	Method	Concentra	tion ppm					
	10 to 100 ppm	K-1910	arof	range		Analysis Time:	1213		ļ
	100 to 1000 ppm	K-1920	160	) 0				-	
	250 to 2500 ppm	K-1925							
					,				
Equipment:	HACH Digital Titrato	or CA-DT			1	r	-1		7
Range Used:	Raлge	Sample Vol.	Cartridge	Multiplier		Titration Count		Concentration	
	10-50 mg/L	200 ml	0.3636 N	0.1	1		x 0.1	= mg/L	
	20-100 mg/L	100 ml	0.3636 N	0.2	1		x 0.2	= mg/L	
	100-400 mg/L	200 ml	3.636 N	1.0			<b>x</b> 1.0	= mg/L	
	200-1000 mg/L	100 ml	3.636 N	2.0			<b>x</b> 2.0	= mg/L	
Standard Additions:	Titrant	Molarity:		Digits Requ	uired: 1st.:	2nd.:	3rd.:		
Notes:									
Hydrogen, diss	olved								
Equipment: Bubble	strip sampling field	method							
	Start stripper at	(t <sup>i</sup>	ime)						
	End stripper at	(†	time)						
	Total stripper time _								
	Pump rate	milliliter	s/minute						



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Tetra Tech NUS, I	nc.						Page	e <u>~</u> of _~	•
Project Site N	lame:	NASA WF	F-WOD		Sample ID No	.: WPF-	പംറ	- 7-226-	1
Project No.:		112GN16	12	-	Sample Loca	tion: wa	0~7	<u>.</u>	
Sampled By:	<del>662</del> 5	JR		•	Duplicate:	$\square$	<u>×                                     </u>		
Field Analyst	Ew			•	Blank:				
Alkalinity:									
Equipment: Cheme	etrics Test Kit				Concentration:	200	_ppm		
Range Used:	Range	Method	Concentrat	tion ppm					
	10 to 100 ppm	K-9810			Analysis Time:	1215	_		
	50 to 500 ppm	K-9815	200						
	100 to 1000 ppm	K-9820						Filtered:	
Equipment:	HACH Digital Titra	tor AL-DT							
Range Used:	Range	Sample Vol.	Cartridge	Multiplier	Titration Count	Multiplier	Cond	centration	
	10-40 mg/L	100 ml	0.1600 N	0.1	&	x 0.1	=	mg/L	
	40-160 mg/L	25 ml	0.1600 N	0.4	&	<b>x</b> 0.4	=	mg/L	
	100-400 mg/L	100 mľ	1.600 N	1.0	&	<b>x</b> 1.0	=	mg/L	
	200-800 mg/L	50 ml	1.600 N	2.0	&	<b>x</b> 2.0	=	mg/L	
	500-2000 mg/L	20 ml	1.600 N	5.0	&	x 5.0	=	mg/L	
	1000-4000 mg/L	10 ml	1.600 N	10.0	&	x 10.0	=	mg/L	
			T						
	Parameter:	Hydroxide	Carbo	onate	Bicarbonate				
Chandrad & ddlling		4 8 8-121				<b>-</b> .			
Notes:	s. L. Illian	it molarity:		Digits Requi	red: 1st.: 2nd.:	3rd.:			
Ferrous Iron (	Fe <sup>2+</sup> ):								
Fouismont:	DB 850	00 0	Bangai 0	2.00 mall	Constanting	1.9			
Equipment	Brogsom/Madula:	500nm	Nange. U -	5.00 mg/L	Concentration:	- 1	_ppm		
	Frogram/Module.	5001111	33			1771			
Fauinmont	IR 19C Color Whee		Depart 0	10	Analysis hine.	(	-		
Notoci	IN-18C COIDE WHEE	31	Range: 0 -	TO mg/L				<b></b>	7
Hudrogon Sul			Daras 0	<b>F</b>				Fillered: L	
nyarogen our	nue (1120).	÷	Range: 0 -	o mg/L		• •			
Equipment:	HS-C	Other:		<u> </u>	Concentration:	0.0	_ppm		
	Exceeded 5.0 mg/L	range on colo	or chart:		Analysis Time:	/226	_		
Notes:				·					
Sulfide (S* ):									
Equipment: Cheme	etrics Test Kit		Range: 0 -	10 mg/L	Concentration:		_ppm		
Range Used:	Range	Method	Concentrat	ion ppm					
	0 to 1 ppm	K-9510			Analysis Time:		_		
	1 to 10 ppm	K-9510					_		
								Filtered:	
Equipment:	DR-850	DR-8	Range: 0 -	0.70 mg/L					
Program/Module:	610nm	93		-					
_									
Notes:									



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Tetra Tech NUS, In	с.	GE				1EK5		Page of _	3
Project Site Na	ame:	NASA WF	F-WOD			Sample ID No.: WFF-WOD-TWG-1			6-1
Project No.:		112GN16	12			Sample Loca	tion: MAS	A WFF	· · · · · · · · · · · · · · · · · · ·
Sampled By:		7BB		-		Duplicate:			
Field Analyst:		JBB		-		Blank:			
Field Form Ch	ecked as per QA	VQC Chec	klist (initia	als):		7			
SAMPLING DATA									
Date: 12/10/	2000	Color	рH	S.C.	Temp.	Turbidity	БО	Salinity	ORP (Eh)
Time: 019	5	(Visual)	(S.U.)	(mS/cm)	(°C)	(NTU)	(mg/l)	(%)	(+/- mv)
Method: Low	Flow								
SAMPLE COLLEC	TION/ANALYSIS IN	FORMATION							
ORP (Eh) (+/- n	nv)		Electrode	Make & Moo	del:				
			Reference	Electrode (	circle one):	Silver-Silver Chlori	de / Calomel	/ Hydrogen	
Dissolved Oxy	gen:								
Equipment: Chemet	trics Test Kit	1	T	0.000	1	Concentration:		_ppm	
Range Used:	Range	Method	Concentra	tion ppm					
	0 to 1 ppm	K-7510				Analysis Time:		_	
	1 to 12 ppm	K-7512			l				
Equipment:	HACH Digital Titrate	or OX-DT					Analysis Time		-
Range Used:	Range	Sample Vol.	Cartridge	Multiplier		Titration Count	Multiplier	Concentration	
	1-5 mg/L	200 ml	0.200 N	0.01			<b>x</b> 0.01	= mg/L	
	2-10 mg/L	100 ml	0.200 N	0.02			x 0.02	= mg/L	
Notes:									
Carbon Dioxide	e:			· · .					
			1		T	Concentration:		_ppm	
Range Used:	Range	Method	Concentra	tion ppm					
	10 to 100 ppm	K-1910				Analysis Time:		-	
	100 to 1000 ppm	K-1920							
	250 to 2500 ppm	K-1925	<u> </u>						
Equipment:	HACH Digital Titrato	or CA-DT		_					
Range Used:	Range	Sample Vol.	Cartridge	Multiplier		Titration Count		Concentration	
	10-50 mg/L	200 ml	0.3636 N	0.1			<b>x</b> 0.1	= mg/L	
	20-100 mg/L	100 ml	0.3636 N	0.2			x 0.2	= mg/L	
	100-400 mg/L	200 ml	3.636 N	1.0			x 1.0	= mg/L	
	200-1000 mg/L	100 ml	3.636 N	2.0			<b>x</b> 2.0	= mg/L	J
Standard Additions:	L Titrant	Molarity:	· <u> </u>	Digits Requ	ired: 1st.:	2nd.:	3rd.:		
nyarogen, diss	solvea								
⊏quipment: Bubble	e strip sampling field	method							
	Start suppor at	(ti	me) ime)						
	End supper at	(t	une)						
	Pumo rate	mitiliter	minuto						
	· •••••• •••••		a manule						



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Tetra Tech NUS, In	G.	GLC					Pageof	3		
Project Site Na	ame:	NASA WF	F-WOD		Sample ID N	10.: WFF-WOD-TWG-1				
Project No.:		112GN161	2	-	Sample Loca	ation: NAS	AUFF			
Sampled By:		7B B			Duplicate:					
Field Analyst:		JBB		_	Blank:					
Alkalinity:										
Equipment: Chemet	rics Test Kit				Concentration:		_ppm			
Range Used:	Range	Method	Concentrat	lion ppm						
	10 to 100 ppm	K-9810			Analysis Time:		_			
	50 to 500 ppm	K-9815						<b></b>		
	100 to 1000 ppm	K-9820					Filtered	:		
Equipment:	HACH Digital Titrat	or AL-DT								
Range Used:	Range	Sample Vol.	Cartridge	Multiplier	Titration Count	Multiplier	Concentration	1		
	10-40 mg/L	100 ml	0,1600 N	0.1	&	x 0.1	= mg/L			
	40-160 mg/L	25 ml	0.1600 N	0.4	&	<b>x</b> 0.4	= mg/L			
	100-400 mg/L	100 ml	1.600 N	1.0		x 1.0	= mg/L			
	200-800 mg/L	50 ml	1.600 N	2.0	&	x 2.0	= mg/L	_		
	500-2000 mg/L	20 ml	1.600 N	5.0	&	x 5.0	= mg/L	_		
	1000-4000 mg/L	10 ml	1.600 N	10.0	&	x 10.0	= mg/L			
Standard Additions:	Parameter: Relationship:	Hydroxide	Carb	onate Digits Requ	Bicarbonate	] 3rd.:				
Notes:										
Ferrous Iron (F	<sup>-</sup> e <sup>2+</sup> ):									
Equipment:	DR-850	DR-8	Range: 0 -	3.00 mg/L	Concentration:		_ppm			
	Program/Module:	500nm	33							
					Analysis Time:		_			
Equipment:	IR-18C Color Whee	) 	Range: 0 -	10 mg/L						
Notes:							Filtered	: 🛛		
Hydrogen Sulf	ide (H <sub>2</sub> S):	H. brow	Range: 0 -	5 mg/L	filler so either Q	r 0.4) ci	s read			
Equipment:	HS-C	Other:			Concentration:	<u></u>	ppm			
	Exceeded 5.0 mg/L	range on colo	or chart:		Analysis Time:	1020	_			
Notes:										
Sulfide (S <sup>2*</sup> ):										
Equipment: Chemet	rics Test Kit	-	Range: 0 -	10 mg/L	Concentration:		_ppm			
Range Used:	Range	Method	Concentrat	iion ppm						
	0 to 1 ppm	K-9510			Analysis Time:		-			
	1 to 10 ppm	K-9510								
							Filtered	: 🖵		
Equipment:	DR-850	DR-8	Range: 0 -	0.70 mg/L						
Program/Module:	610nm	93								
								,		
Notes:		i.								

PROJECT SITE NAME: PROJECT NUMBER:	<b>F</b>
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# LOW FLOW PURGE DATA SHEET

NASA WFF-WOD 112GN1612

WELL ID.: DATE:

UFF- WOD-TW (-2

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PAGE I OF I



#### FIELD ANALYTICAL LOG SHEET **GEOCHEMICAL PARAMETERS**

Tetra Tech NUS, In	с.

Tetra Tech NUS, Inc	2.							Page <u>1</u> of	2
Project Site Na	ime:	NASA WF	F-WOD			Sample ID N	0.: WFF-n	20 - Twi - 3	z
Project No.:		112GN161	2	•		Sample Loca	ation: wod	-TW1-	
Sampled Bv:	EW			-		Duplicate:			
Field Analyst	EW			•		Blank:			
Field Form Ch	ecked as ner O4	A/OC Check	dist (initia	-  s)·					
SAMPLING DATA									
Data (7/12/DB		Color	nti	60	Tomp	Turbidity	<b>DO</b>	Colinity	
			рп	3.0. (0/)	oo			Samily	
	<b>T</b> 2.	(Visual)	(S.U.)	(ms/cm)	15.67		(mg/l)	(%)	(+/- mv)
SAMPLE COLLECT	ION/ANALYSIS IN	FORMATION	2, 05	v. 47 F					37
ORP (Eb) (+/- n	<u></u>		Electrode (	Make & Mor	tel: Ancila	<u>0-55</u>	*****************	************************	****************
			Deference	Electrode (	nirole one): S	Rilver-Silver Chlor	ide / Colomel		
Disselved Ow			Reference	Electione (	uncie une). a	Silver-Silver Childr		/ Hydrogen	
Dissolved Oxy	yen:					0	ビカ		
Equipment: Chemet					1	Concentration:	710	ppm	
Range Used:	Range	Method	Concentral	tion ppm			~-		
	0 to 1 ppm	K-7510			4	Analysis Time:	0750		
	1 to 12 ppm	K-7512	4.0						
ν.									
Equipment:	HACH Digital Titrat	or OX-DT			_		Analysis Time		
Range Used:	Range	Sample Vol.	Cartridge	Multiplier		Titration Count	Multiplier	Concentration	
	1-5 mg/L	200 ml	0.200 N	0.01			x 0.01	= mg/L	
	2-10 mg/L	100 ml	0.200 N	0.02			<b>x</b> 0.02	= mg/L	
Notes:									
Carbon Dioxide	e:		<u> </u>						
Equipment: Chemet	rics Test Kit					Concentration:	70	ppm	
Range Used:	Range	Method	Concentra	tion ppm	]				
Ź	10 to 100 ppm	K-1910	70			Analysis Time:	0753		
	100 to 1000 ppm	K-1920					•	_	
	250 to 2500 ppm	K-1925							
			1		1				
Equipment:	HACH Digital Titrat	or CA-DT							
Range Used:	Ranne	Sample Vol	Cartridge	Multiplier	1	Titration Count		Concentration	7
		200 ml	0.3636 %		1		_L v 0 1		-
	20-100 mg/L	100 ml	N 3636 N	0.1			¥ 0.2	= mc/l	-
	100-400 mg/L	200 ml	3 626 N	1.0			¥10	— mg/⊑	-
	200-1000 mg/l	100 mi	3 636 N	1.0 2 A	1 ·		x 1.0		-
Standard Additions:	Titron	t Molarity:	0.000 N	Digits Reg	J uired: 1et :	2nd -	3rd -	- ng/L	
Notes:		. woanty		oigita neqi	unou, 18t	4114			
Hydrogen dise	solved								
Fouinment: Bubble	strin sampling field	method							
	Start stringer at	- 1460 IOU /#	ime)						
	End stringer at		time)						
	Total stripper at	(	ane)						
1	con outbher mue								

Pump rate \_\_\_\_\_ milliliters/minute



Tetra	Tech	NUS,	Inc.

Tetra Tech NUS, Ir	ıс.							Page	<u></u>	<u>_</u> <
Project Site N	lame:	NASA WF	F-WOD	_		Sample ID N	0.: <b>()</b> FF-	200.	-Tw1-	2
Project No.:		112GN161	2	-	-	Sample Loca	ition: 🕬	2-70	اد.	
Sampled By:	えい			_		Duplicate:				
Field Analyst:	En					Blank:				
Alkalinity:										
Equipment: Cheme	etrics Test Kit					Concentration:	110	_ppm		
Range Used:	Range	Method	Concentra	tion ppm						
	10 to 100 ppm	K-9810	outof	range		Analysis Time:	0757	, _		
	50 to 500 ppm	K-9815	110							<u> </u>
	100 to 1000 ppm	K-9820							Filtered:	
Equipment:	HACH Digital Titrat	tor AL-DT			·					
Range Used:	Range	Sample Vol.	Cartridge	Multiplier	Titratic	on Count	Multiplier	Conce	ntration	
	10-40 mg/L	100 ml	0.1600 N	0.1		&	x 0.1	=	mg/L	
	40-160 mg/L	25 ml	0.1600 N	0.4		& &	<b>x</b> 0.4	=	mg/L	
	100-400 mg/L	100 ml	1.600 N	1.0		&	x 1.0	=	mg/L	
	200-800 mg/L	50 ml	1.600 N	2.0	6	&	x 2.0	=	mg/L	
	500-2000 mg/L	20 ml	1.600 N	5.0		&	x 5.0	=	mg/L	
	1000-4000 mg/L	10 ml	1.600 N	10.0		&	<b>x</b> 10.0	=	mg/L	
		1	Т	I			1			
	Parameter:	Hydroxide	Carb	onate	Bicar	rbonate	-			
	Relationship:						]			
Standard Additions Notes:	: 🛄 Titran	it Molarity:		Digits Requ	iired: 1st.:	2nd.:	3rd.:			
Ferrous Iron (	Fe <sup>2+</sup> ):									
Equipment:	DR-850	DR-8	Range: 0 -	3.00 ma/L	(	Concentration:	6.8	maa		
	Program/Module:	500nm	33	<b>3</b>						
						Analysis Time:	0803			
Fauipment:	IR-18C Color Whee	el	Range: 0 -	10 ma/i		,		-		
Notes:			rianger e	io ingiz					Filtered	
Hydrogen Sul	fide (H₂S):		Range: 0 -	5 mg/L						
Equipment:	HS-C	Other:			(	Concentration:	6	maa		
	Exceeded 5.0 mg/L	. range on cold	or chart:			Analysis Time:	1806	-		
Notes:							0004	-		
Sulfide (S <sup>2-</sup> ):										
Equipment: Cheme	trics Test Kit		Range: 0 -	10 mg/L	(	Concentration:		ppm		
Rance Lised	Bange	Method	Concentral							
		K-9510	COncentrat							
	1 to 10 ppm	K-9510				Analysis fille.		-		
		1. 10-0010	<u>I</u>						Filtered	
Faulpmont			Danca: A	0.70					rillered:	tumumuf
Equipment.	010-000	UR-0	rtange: 0 -	v. / v mg/L						
rogram/Mödule:	61Unm	93								
Natao										
INOLES:										

PAGE OF				provid	* Rith n		/ ~	A	RE(S):	SIGNATU
					4					
									-	
C			,		052					
3/4 garl	0,0	-1	16.35	4.60	Erz	.393	6.02		27.92	sh60
	0.0	8	16.35	4.55	そろ	0.375	6,05		25.51	
V2 cal	0.0	-25	16.29	3,36	400	0,553	6.10		24.74	,
	0, 0	-24	15.59	2.81	4100	0.472	6.0	150	23.51	5860
	% or ppt	M	(Celcius)	(mg/L)	(NTU)	(mS/cm)	(S.U.)	(mL/Min.)	(Ft. below TOC)	(Hrs.)
Comments	Salinity	ORP	Temp.	DO	Turb.	S. Cond.	рH	Flow	Water Level	Time
	12/12/08		DATE:				2	112GN161;	NUMBER:	PROJECT
5-TW3-2	WFF-WO		WELL ID.:				-WOD	NASA WFF	SITE NAME:	PROJECT

LOW FLOW PURGE DATA SHEET



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Tetra Tech NUS, Inc	>.							Page <u>1</u> of <u>`</u>	<u> </u>
Project Site Na	ime:	NASA WF	F-WOD			Sample ID N	o.: WFF-1	000-TW	3-2
Project No.:		112GN161	2	_		Sample Loca	tion: ພວຍ	)-TW3	
Sampled By:	ēω			_		Duplicate:			
Field Analyst:	Ēw					Blank:			
Field Form Che	ecked as per QA	VQC Check	dist (initia	ls):		]			
SAMPLING DATA									
Date: 12/12/0	B	Color	рН	s.c.	Temp.	Turbidity	DO	Salinity	ORP (Eh)
Time:		(Visual)	(S.U.)	(mS/cm)	(°C)	(NTU)	(mg/l)	(%)	(+/- mv)
Method: ( our ·	flow	Turbert	6.02	, 393	16.35	750	4.40	0.0	-1
SAMPLE COLLECT	ION/ANALYSIS IN	FORMATION							
ORP (Eh) (+/- m	v) ,		Electrode I	Make & Mod	iei: hard	ba U-22			
	-/		Reference	Electrode (d	circle one): S	Silver-Silver Chlori	de / Calomel /	/ Hydrogen	
Dissolved Oxy	gen:								
Equipment: Chemet	rics Test Kit	F			1	Concentration:	3.0	ppm	
Range Used:	Range	Method	Concentral	tion ppm					
	0 to 1 ppm	K-7510				Analysis Time:	0953		
X	1 to 12 ppm	K-7512							
Equipment:	HACH Digital Titrate	or OX-DT					Analysis Time:		-
Range Used:	Range	Sample Vol.	Cartridge	Multiplier	]	Titration Count	Multiplier	Concentration	1
	1-5 mg/L	200 ml	0.200 N	0.01	ĺ	·	x 0.01	= mg/L	1
	2-10 mg/L	100 ml	0.200 N	0.02			x 0.02	= mg/L	1
Notes:									
Carbon Dioxide Equipment: Chemet	e: rics Test Kit				_	Concentration:	200	ppm	
Range Used:	Range	Method	Concentral	tion ppm					
	10 to 100 ppm	K-1910				Analysis Time:	1000	_	
X	100 to 1000 ppm	K-1920	200						
	250 to 2500 ppm	K-1925							
Equipment:	HACH Digital Titrat	or CA-DT							_
Range Used:	Range	Sample Vol.	Cartridge	Multiplier		Titration Count	]	Concentration	
	10-50 mg/L	200 ml	0.3636 N	0.1			x 0.1	= mg/L	
	20-100 mg/L	100 ml	0.3636 N	0.2	1		x 0.2	= mg/L	
	100-400 mg/L	200 ml	3.636 N	1.0			<b>x</b> 1.0	= mg/L	-
	200-1000 mg/L	100 ml	3.636 N	2.0			x 2.0	= mg/L	
Standard Additions:	Titrani	t Molarity:		Digits Requ	uired: 1st.:	2nd.:	3rd.:		
Notes:									
Hydrogen, diss	solved	•							
Equipment: Bubble	e strip sampling field	method							
	Start stripper at	(t	ime)						
	End stripper at	(	time)						
	Total stripper time								
	Pump rate	milliliter	s/minute						



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# FIELD ANALYTICAL LOG SHEFT (

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G	E	0	CI	HE	M	IC,	AI		P/	٩F	RA	M	E	TE	R	S	

Tetra Tech NUS, In	с.						Page	<u>≥ of </u> 2
Project Site Na	ame:	NASA WF	F-WOD	_	Sample ID No	.: WFF-	woD	- 7w3
Project No.:		112GN161	2		Sample Loca	ion:		
Sampled By:	ZW			-	Duplicate:			
Field Analyst:	EW				Blank:			
Alkalinity:								
Equipment: Chemel	trics Test Kit				Concentration:	250	_ppm	
Range Used:	Range	Method	Concentrat	tion ppm		<b>b</b> _1 <b>e</b> _2		
	10 to 100 ppm	K-9810			Analysis Time:	1007	_	
<u> </u>	50 to 500 ppm	K-9815	250			•		_
X	100 to 1000 ppm	K-9820	250					Filtered:
Equipment:	HACH Digital Titrat	or AL-DT		F			- <b>-</b>	
Range Used:	Range	Sample Vol.	Cartridge	Multiplier	Titration Count	Multiplier	Conc	entration
	10-40 mg/L	100 ml	0.1600 N	0.1	&	<b>x</b> 0.1	=	mg/L
<u> </u>	40-160 mg/L	25 ml	0.1600 N	0.4	&	x 0.4	=	mg/L
	100-400 mg/L	100 ml	1.600 N	1.0	&	x 1.0	=	mg/L
	200-800 mg/L	50 ml	1.600 N	2.0	&	x 2.0	=	mg/L
	500-2000 mg/L	20 ml	1.600 N	5.0	<u> </u>	x 5.0		mg/L
	1000-4000 mg/L	10 mi	1.600 N	10.0	<u> </u>	<b>X</b> 10.0		mg/L
	Parameter:	Hydroxide	Carb	onate	Bicarbonate			
	Relationship:			onato				
Standard Additions:	Titran	t Molarity:	·	Digits Requ	ired: 1st.: 2nd.:	3rd.:		
Notes:	24.							
Ferrous Iron (F	=e*'):					21		
Equipment:	DR-850	DR-8	Range: 0 -	3.00 mg/L	Concentration:		ppm	
	Program/Module:	500nm	33					
					Analysis Time:	/01/.		
Equipment:	IR-18C Color Whee	el .	Range: 0 -	10 mg/L				<u> </u>
Notes:								
Hydrogen Sulf	ide (H <sub>2</sub> S):		Range: 0 -	5 mg/L		0.0		
Equipment:	HS-C	Other:			Concentration:		ppm	
	Exceeded 5.0 mg/L	. range on colo	or chart:		Analysis Time:	1015		
Notes:								
Sulfide (S <sup>2*</sup> ):								
Equipment: Cheme	trics Test Kit	1	Range: 0 -	10 mg/L	Concentration:		ppm	
Range Used:	Range	Method	Concentra	tion ppm				
	0 to 1 ppm	K-9510			Analysis Time:			
	1 to 10 ppm	<u> </u> К-9510						
								Filtered:
Equipment:	DR-850	DR-8	Range: 0 -	0.70 mg/L				
Program/Module:	610nm	93						
Notes:								

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									T112.7	
PROJECT SITE NAME: PROJECT NUMBER:	NASA WFF 112GN1612	WOD				WELL ID.: DATE:		-2012-19W	- CM -	
Time Water Level	Flow	pН	S, Cond.	Turb.	DO	Temp.	ORP	Salinity	Comments	
(Hrs.) (Ft. below TOC	) (mL/Min.)	(S.U.)	(mS/cm)	(UTV)	(mg/L)	(Celcius)	mV	% or ppt		
5730 23,67	96)	5,77	885:0	340	5.67	8121	-22 -	6.0	turbid brown	
0735 26.17		5.67	0.558	370	6.87	17.35	~	0.0		
0740		2.72	0,560	756	7.70	17,48	1'4	0,0		
26.97		12.5	0,580	よう	6.68	17.16	-17	0.0	a little more than 12 and part	ic d
twys Shut	aff pr	of aw	a low ra	charge +	san	olt				
	•			ر	ł					
		æ								
						×				
SIGNATURE(S):	1 S. 1	X								
	0									

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Tetra Tech NUS, I	nc.	GLV				TENO		Page $\underline{1}$ of _	3
Project Site N	lame:	NASA WF	F-WOD			Sample ID N	NFF. WOR		
Project No.:		112GN161	12	-		Sample Loca	ation: MAS	A-WFF-G	JON
Sampled By:		IBB		•		Duplicate:		·	
Field Analyst		IBB		-		Blank:			
Field Form C	hecked as per Q/	VQC Checl	klist (initia	Is):		7	L		
SAMPLING DATA									
Date:		Color	pH	S.C.	Temp.	Turbidity	ро	Salinity	ORP (Eh)
Time:		(Visual)	(S.U.)	(mS/cm)	(°C)	ONTU	(mg/l)	(%)	(+/- mv)
Method:		() ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( )					(		(.,)
SAMPLE COLLE	TION/ANALYSIS IN	FORMATION							
ORP (Eh) (+/-	mv)		Electrode I	Make & Moo	iel:				<u> </u>
			Reference	Electrode (d	circle one):	Silver-Silver Chlor	ide / Calomel	/ Hydrogen	
Dissolved Ox	ygen:								
Equipment: Chem	etrics Test Kit				1	Concentration:	3.5	_ppm	
Range Used:	Range	Method	Concentrat	ion ppm			~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		
	0 to 1 ppm	K-7510		-		Analysis Time:	0 156	<u> 6</u> .5	
	1 to 12 ppm	K-7512	07	76-35		reday	0820	35	
Equipment:	HACH Digital Titrate	or OX-DT	ال	215			Analysis Time		
			<u> </u>		1	<u> </u>		·	-
Range Used:	Range	Sample Vol.	Cartridge	Multiplier		Titration Count	Multiplier	Concentration	-
<b>├</b> ──├┤	1-5 mg/L	200 ml	0.200 N	0.01			x 0.01	= mg/L	-
	2-10 mg/L	100 mi	0.200 N	0.02			x 0.02	= mg/L	Ţ
Notes:									
Carbon Dioxid	de:								
Equipment: Cheme	etrics Test Kit					Concentration:	250	ppm	
Range Used:	Range	Method	Concentrat	ion ppm					
	10 to 100 ppm	K-1910	>10	ିତ		Analysis Time:	0815	_	
	100 to 1000 ppm	K-1920	25	0					
	250 to 2500 ppm	K-1925							
Equipment:	HACH Digital Titrate	or CA-DT							
Range Used:	Range	Sample Vol.	Cartridge	Multiplier		Titration Count		Concentration	]
	10-50 mg/L	200 ml	0.3636 N	0.1			x 0.1	= mg/L	
	20-100 mg/L	100 ml	0.3636 N	0.2			x 0.2	= mg/L	
	100-400 mg/L	200 ml	3.636 N	1.0			<b>x</b> 1.0	= mg/L	
	200-1000 mg/L	100 ml	3.636 N	2.0			<b>x</b> 2.0	= mg/L	
Standard Additions	s: 🛄 Titrant	Molarity:		Digits Requ	ired: 1st.:	2nd.:	3rd.:		
Notes:									
Hydrogen, dis	solved								
Equipment: Bubb	le strip sampling field	method							
	Start stripper at	(ti	ime)						
	End stripper at	(t	ime)						
	Fotal stripper time _								
	Pump rate	milliliters	s/minute						



Tetra Tech NUS, In	c.						Pag	eof
Project Site Na	ame:	NASA WF	F-WOD		Sample ID N	0.:WFF.	wo	S-TW3-2
Project No.:		112GN161	2		Sample Loca	$\frac{1}{2}$	SA-h	IFF-WON
Sampled By:		JRR			Duplicate:			
Field Analyst:		JBB			Blank:			
Alkalinity:						100		
Equipment: Chemel	trics Test Kit				Concentration:	-720	ppm	
Range Used:	Range	Method	Concentral	ion ppm				
	10 to 100 ppm	K-9810			Analysis Time:	631	<u>0</u>	
	50 to 500 ppm	K-9815	250	ر				
	100 to 1000 ppm	K-9820						Filtered:
Equipment:	HACH Digital Titrat	or AL-DT				1	··· •	
Range Used:	Range	Sample Vol.	Cartridge	Multiplier	Titration Count	Multiplier	Con	centration
	10-40 mg/L	100 ml	0.1600 N	0.1	&	x 0.1	=	mg/L
	40-160 mg/L	25 ml	0.1600 N	0.4	&	x 0.4	=	mg/L
	100-400 mg/L	100 ml	1.600 N	1.0	&	× 1.0	Ξ	mg/L
	200-800 mg/L	50 ml	1.600 N	2.0	&	× 2.0	=	mg/L
	500-2000 mg/L	20 ml	1.600 N	5.0	&	x 5.0	=	mg/L
	1000-4000 mg/L	10 mi	1.600 N	10.0	<u> </u>	<b>X</b> 10.0	=	mg/L
	Parameter	Hydroxide	Carb	onate	Bicarbonate	1		
	Relationship:	Tiyaroxiac		-	Dicarboniace	-		
Standard Additions:	Titrani	1 I Molarity:		Digits Regu	ired: 1st · 2nd ·	J Brd ·		
Notes:		······				0.0	· · · · · ·	
Ferrous Iron (F	<sup>-</sup> e <sup>2+</sup> ):						woder	turbid tinteFers
Equipment:	, DR-850	DR-8	Range: 0 -	3.00 ma/L	Concentration:	1.8	maa	w/ rending
• ,	Program/Module:	500nm	33	<b>.</b>				/
					Analysis Time:	080	5	
Equipment:	IR-18C Color Whee		Rance: 0 -	10 ma/L	,		<u> </u>	
Notes:				· • · · · g				Filtered:
Hydrogen Sulf	ide (H₂S):		Range: 0 -	5 mg/L			611612	
Equipment:	HS-C	Other:			Concentration:	$\mathcal{O}$	ppm	Most likely due
	Exceeded 5.0 mg/L	range on colo	r chart:		Analysis Time:	0300		to turbid brown
Notes:	-	-		•				water
Sulfide (S <sup>2-</sup> ):								
Equipment: Chemel	trics Test Kit		Range: 0 -	10 mg/L	Concentration:		ppm	
Range Used:	Range	Method	Concentral	ion ppm				
	0 to 1 ppm	K-9510			Analysis Time:			
	1 to 10 ppm	K-9510						
Fouinment	DR-850	DR-8	Range: 0 -	0.70 mg/l				Filtered:
Program/Module:	610pm	93		on o mgre				
r rogrammwudule:	O FORM	ý.						
Notes:								

SIGNATURE(S):													28.8H	2.7.95	25.21	(Hrs.) (Ft. below 1	Time Water Lev	PROJECT NUMBER:	PROJECT SITE NAME.
A											 	 				70C) (mL/Min.)	vel Flow	112GN161	NASA WE
									 				6.01	96.5	6.06	) (s.u.)	рH	2	
													\$13	0.492	05.5	(mS/cm)	S. Cond.		
51-sht													790	-750	000	(NTU)	Turb.		
ž vinuc							 		 				59:5	7,16	58.5	(mg/L)	DO		_
odor Petro																(Celcius)	Temp.	DATE:	
in purge u													Ø	N N		лγ	ORP		そから
other													0.0	0.0		% or ppt	Salinity	12/12/08	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
PAGE L OF													3/4 gal purge	<u>clovely</u>			Comments		54-2

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LOW FLOW PURGE DATA SHEET

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Tetra Tech NUS, Inc	с.							Page <u>l</u> of _	_2
Project Site Na	ame:	NASA WF	F-WOD			Sample ID N	o.:WFF-W	D-TW4-	2
Project No.:		112GN161	2			Sample Loca	ition: woo	-Tw4	
Sampled By:	GW					Duplicate:			
Field Analyst	2u/					Blank:			
Field Form Ch	ecked as ner QA	VQC Check	dist (initia	s):		1			
SAMPLING DATA:									
Data: 12/12/0	180	Color	H	SC	Temp	Turbidity		Salinity	ORP (Eh)
				(0()		OTUD	(mail)	(9/)	(in/ mai)
	Y	(Visual)	(5.0.)	(m5/cm)	(0)		(៣២/1)	(70)	(+/- ШV)
	TIONIANALYSISIN	FORMATION							
	nul		Electrode N	John & Mod	del:	****************************	****************	******************	*********************
				Floatrado (a		Ribber Ribber Obler	ida / Calamal		
			Reference	Electrode (c	sircle one): a	Silver-Silver Chior		/ Hydrogen	
Dissolved Oxy	gen:					0	3.5		
Equipment: Chemel	trics Test Kit					Concentration:		_ppm	
Range Used:	Range	Method	Concentrat	ion ppm					
	0 to 1 ppm	K-7510				Analysis Time:		_	
Ŕ	1 to 12 ppm	K-7512	3.5						
Equipment:	HACH Digital Titrate	or OX-DT					Analysis Time		
	Pange	Sample Vol	Cartridae	Multiplier	]	Titration Count	Multiplier	Concentration	
Nange Osed.	1-5 mg/l	200 ml		0.01		Thirdien Count	x 0.01	= ma/l	_
	2.10 mg/L	100 ml	0.200 N	0.07			¥ 0.02	= mg/L	
	2-10 mg/L	100 111	0.20014	0.02	l	Announcement of the second			
110(05.									
Carbon Dioxid	e:								
Equipment: Cheme	trics Test Kit					Concentration:	180	ppm	
		<b>NZ</b> , (1,]	0		1			-	
Range Used:	Range	Method	Concentra	lion ppm	-		DRUZ		
	10 to 100 ppm	K-1910	180		-	Analysis Time:	-010	-	
		K-1920	100		•				
	250 to 2500 ppm	K-1925			J				
Equipment:	HACH Digital Intrate	or CA-D1			-				-
Range Used:	Range	Sample Vol.	Cartridge	Multiplier		Titration Count		Concentration	
	10-50 mg/L	200 ml	0.3636 N	0.1 -			x 0.1	= mg/L	
	20-100 mg/L	100 ml	0.3636 N	0.2			<b>x</b> 0.2	= mg/L	
	100-400 mg/L	200 ml	3.636 N	1.0			x 1.0	= mg/L	
	200-1000 mg/L	100 mi	3.636 N	2.0			<b>x</b> 2.0	= mg/L	
Standard Additions	: 🗌 Titran	t Molarity:		Digits Req	uired: 1st.:	2nd.:	3rd.:		
Notes:									
Hydrogen, dis	solved								
Equipment: Bubbl	e strip sampling field	method							
ŧ	Start stripper at	(t	ime)						
	End stripper at	(	time)						
	Total stripper time								
	Pump rate	milliliter	s/minute						
1									



Tetra Tech NUS, In	ic.						Page <u>Z</u> of	2
Project Site N	ame:	NASA WF	F-WOD		Sample ID N	0.: WFF-L	200-72	-1-2_
Project No.:		112GN161	2	-	Sample Loca	ation WOO-	-TW4	
Sampled By:	ΞW			_	Duplicate:			
Field Analyst:	EW				Blank:			
Alkalinity:						225		
Equipment: Cheme	trics Test Kit				Concentration:	TES-	_ppm	
Range Used:	Range	Method	Concentra	tion ppm				
	10 to 100 ppm	K-9810			Analysis Time:	0846	_	
<u>N</u>	50 to 500 ppm	K-9815	225	<b>`</b>				
	100 to 1000 ppm	K-9820					Filtered	: 📙
Equipment:	HACH Digital Titrat	or AL-DT						
Range Used:	Range	Sample Vol.	Cartridge	Multiplier	Titration Count	Multiplier	Concentration	
	10-40 mg/L	100 ml	0.1600 N	0.1	&	x 0.1	= mg/L	
	40-160 mg/L	25 ml	0.1600 N	0.4		x 0.4	≕ mg/L	
	100-400 mg/L	100 ml	1.600 N	1.0	&	x 1.0	= mg/L	_
	200-800 mg/L	50 ml	1.600 N	2.0	&	x 2.0	= mg/L	4
	500-2000 mg/L	20 ml	1.600 N	5.0	&	x 5.0	= mg/L	4
	1000-4000 mg/L	10 ml	1.600 N	10.0	&	<b>x</b> 10.0	≕ mg/L	
		<u> </u>			<b>D</b> I ( )	7		
	Parameter:	Hydroxide	Carb	onate	Bicarbonate	-		
Standard Additions	Titran	I		Digits Regul	ired: 1st · 2nd ·	3:4 -		
Notes:		e molanty		Digito Fieldo				
Ferrous Iron (I	Fe <sup>2+</sup> ):							
Equipment:	DR-850	DR-8	Range: 0 -	3.00 mg/L	Concentration:	2.1	ppm	
	Program/Module:	500nm	33			·	<b>_</b>	
					Analysis Time:	0350		
Equipment:	IR-18C Color Whee	el	Rarige: 0 -	10 ma/L			-	
Notes:			Ŭ	Ŭ			Filtered	: 🗆
Hydrogen Sulf	īde (H₂S):		Range: 0 -	5 mg/L				
Equipment:	HS-C	Other:			Concentration:	0	ppm	
	Exceeded 5.0 mg/l	range on colo	or chart:		Analysis Time:	0854	-	•
Notes:	-	-			-		-	
Sulfide (S <sup>2-</sup> ):		<u></u>						
Equipment: Cheme	trics Test Kit		Range: 0 -	10 mg/L	Concentration:		_ppm	
Range Used:	Rance	Method	Concentra	tion ppm				
	0 to 1 ppm	K-9510			Analvsis Time:			
	1 to 10 ppm	K-9510			·····,		-	
							Filtered	н 🗆
Equipment:	DR-850	DR-8	Range: 0 -	0.70 ma/L				
Program/Module	610nm	 93		· .a. –				
Notes:								

E			LOW FL	OW PU	RGE DA	<b>NTA SH</b>	EET			
PROJECT SI PROJECT N	TE NAME: UMBER:	NASA WFF- 112GN1612	WOD				NELL ID.: DATE:		$\frac{WFF}{12/12/20}$	101-TW5-2
Time	Water Level	Flow	рң	S. Cond.	Turb.	Do	Temp.	ORP	Salinity	Comments
(Hrs.) (	Ft. below TOC)	(mL/Min.)	(S.U.)	(mS/cm)	(NTU)	(mg/L)	(Celcius)	ΨV	% or ppt	
0957	25.57	<b>7</b> t	, , ,	61			· · · /	· / ·		initial brown stag
0959	27.59.	160	1. 1. 3	1.10.	550	1,51	15:97		0,1	claring up It brown
1001	23-53		28.9	1,52	340	1-1-74	16.79	136	0,0	to blinking
1005	33,58		7.06	1.36	200	19.99	16 90	194	0,1	Do blink .
1006	30.34	•	697		. 270	191,919	17.03	139	¢ È	
1009	wint dry		58.9	1.31		19,97	16.93	162	0,1	flow stopped
										IPT PECMAPAR TO DO
					<u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u></u>	2	52.0			G vo chem
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d.

# FIELD ANALYTICAL LOG SHEET **GEOCHEMICAL PARAMETERS**

Tatra Tech NUS In	c	GEO	OCHEM	ICAL P	ARAME	TERS		Page \of	3
			_					·	
Project Site Na	ame:	NASA WF	F-WOD			Sample ID No	$\omega = \omega + F - \omega + E - \omega + \omega$	WOD I	$\underline{WS}^{-1}$
Project No.:		112GN161	2			Sample Loca	$\frac{100}{2}$	SAWE	<u> </u>
Sampled By:		-101	5	-		Duplicate:			
Field Analyst:		JBB		<del>.</del> .		Blank:			
Field Form Ch	ecked as per QA	VQC Checl	klist (initia	ls):					
SAMPLING DATA:		8888888888888888 I							
Date:		Color	рH	S.C.	Temp.	Turbidity	DO	Salinity	ORP (Eh)
Time:		(Visual)	(S.U.)	(mS/cm)	(°C)	(NTU)	(mg/l)	(%)	(+/- mv)
Method:									
SAMPLE COLLEC	TION/ANALYSIS IN	FORMATION							
ORP (Eh) (+/- n	nv)		Electrode I	Make & Moo	lel:				
			Reference	Electrode (	circle one): S	Silver-Silver Chlori	de / Calomel	/ Hydrogen	
Dissolved Oxy	r <b>gen:</b> trics Test Kit					Concentration:	9	maa	
		1	1		1				
Range Used:	Range	Method	Concentra	tion ppm			VAL 1		
	0 to 1 ppm	K-7510	-			Analysis Time:	041		
	1 to 12 ppm	K-7512	<u> </u>						
Equipment:	HACH Digital Titrat	or OX-DT					Analysis Time:		_
Range Used:	Range	Sample Vol.	Cartridge	Multiplier		Titration Count	Multiplier	Concentration	7
	1-5 mg/L	200 ml	0.200 N	0.01			x 0.01	= mg/L	1
	2-10 mg/L	100 ml	0.200 N	0.02			x 0.02	= mg/L	
Notes:					•				_
Carbon Dioxid	e:								
Equipment: Cheme	trics Test Kit				_	Concentration:	_>0	ppm	
Range Used:	Range	Method	Concentra	tion ppm			· /		
Ŕ	10 to 100 ppm	K-1910	30			Analysis Time:	1044	<u>-</u>	
	100 to 1000 ppm	K-1920							
	250 to 2500 ppm	K-1925			ļ				
Equipment:	HACH Digital Titrat								
Ranne Used	Range	Sample Vol	Cartridge	Multiplier	]	Titration Count		Concentration	7
	10-50 mg/L	200 ml	0.3636 N	0.1	-		x 0.1	= ma/L	-
	20-100 mg/L	100 ml	0.3636 N	0.2	-		x 0.2	= ma/L	
	100-400 mg/L	200 ml	3.636 N	1.0	1		<b>x</b> 1.0	= mg/L	
	200-1000 mg/L	100 ml	3.636 N	2.0			<b>x</b> 2.0	= mg/L	1
Standard Additions	: D Titran	t Molarity:		Digits Req	• uired: 1st.:	2nd.:	3rd.:		<b></b> •
Notes:	•			- ·					
Hydrogen, dis	solved								
Equipment: Bubbl	e strip sampling field	l method							
	Start stripper at	(t	time)						
	End stripper at	(	time)						
	Total stripper time								
	Pump rate	milliliter	s/minute						



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d.

# FIELD ANALYTICAL LOG SHEET GEOCHEMICAL PARAMETERS

Project Site Name:       NASA WFF-WOD       Sample ID No::       UF F-USA-TuS-Q         Sample ID No::       UF F-USA-TuS-Q       Sample ID No::       UF F-USA-TuS-Q         Sample ID No::       UF F-USA-TUS-Q       Sample ID No::       UF F-USA-TUS-Q         Sample ID No::       UF F-USA-TUS-Q       Sample ID No::       UF F-USA-TUS-Q         Sample ID No::       UF F-USA-TUS-Q       Sample ID No::       UF F-USA-TUS-Q         Sample ID No::       UF F-USA-TUS-Q       Sample ID No::       UF F-USA-TUS-Q         Sample ID No::       UF F-USA-TUS-Q       Sample ID No::       UF F-USA-TUS-Q         Alkalinity:       Sample ID No::       UF F-USA-TUS-Q       Sample ID No::       UF F-USA-TUS-Q         Range Used:       Range Used:       Range Used:       National Sample ID No::       UF F-USA-TUS-Q         ID ID 100 ppm       K4815       4000       Origon ID	Tetra Tech NUS, In	с.	GLU					Page	<u>2-of</u> _	3
Project No.:       112GN1612       Sample Location:       MASA WAFF         Sample Location:       NASA WAFF         Duplicate:	Project Site Na	ame:	NASA WF	F-WOD		Sample ID N	o.: WF1	=-U	015-	TU5-2
Sampled By:       A B B       Duplicate:	Project No.:		112GN161	2	-	Sample Loca	tion: N/	45A	WF	ΥF
Field Analyst:       JSB       Blank:       Image lead         Alkalinity:       Concentration ppm       460 ppm         Range Uest:       100 to 100 ppm       K-9810       Analysis Time:       103 2	Sampled By:		ABB		-	Duplicate:				
Alkalinity:       Concentration:       4.00 ppm         Equipment:       Concentration:       4.00 ppm         Pange Usad:       Range Method       Concentration ppm         Analysis Time:       100 10 000 ppm       K-9815         Equipment:       HACH Digital Tirator AL-DT         Range Usad:       Range Sample Vol. Catridge Multiplier       Titration Count       Multiplier         Concentration:       40-160 mgL       28 mi       0.1600 N       0.4       8       x 0.1       =       mgL         Concentration:       100-400 mgL       100 mi       1.600 N       0.4       8       x 0.4       =       mgL         Concentration:       20-360 mgL       20 mi       1.600 N       0.4       8       x 1.0       =       mgL         Concentration:       100-10 mi       1.600 N       0.0       8       x 1.0       =       mgL         Concentration:       100-10 mill       1.600 N       0.0       8       x 10.0       =       mgL         Concentration:       100-10 mill       1.600 N       10.0       8       x 10.0       =       mgL         Concentration:       100-8       x 10.0       =       mgL       Rationalistic       Rationalist	Field Analyst:		JBB	;	-	Blank:				
Equipment: Chemetrics Test Kit         Concentration:         4.0         ppm           In to 100 ppm         K-9810         Analysis Time:         10.3         Image: Concentration ppm           Image: Used:         Range         Method         Concentration ppm         Analysis Time:         10.3         Image: Concentration         Filtered:         Image: Concentration         Filtered:         Image: Concentration         Image: Con	Alkalinity:						1.			
Range Used:         Range         Method         Concentration ppm           10 to 100 ppm         K-3810         Analysis Time:         LOS 2	Equipment: Cheme	trics Test Kit				Concentration:	460	_ppm		
10 to 100 ppm       K-9810       Analysis Time:       L0 5 Z_         Equipment:       HACH Digital Titrator AL-DT       Filtered:	Range Used:	Range	Method	Concentra	tion ppm					
S0 0 500 ppm       K-9816       4600         I 000 to 1000 ppm       K-9820       Filteret:         Equipment:       HACH Digital Titrator AL-DT         Range Used:       Range       Sample Vol.         I 00 ml       0.1600 N       0.1       & x 0.4 = mgl.         I 00 ml       0.1600 N       0.1       & x 0.4 = mgl.         I 00 ml       0.1600 N       0.1       & x 0.4 = mgl.         I 00 ml       0.1600 N       0.4       & x 1.0 = mgl.         I 00 ml       0.1600 N       0.4       & x 1.0 = mgl.         I 00 ml       1.600 N       2.0       & x 1.0. = mgl.         I 00 ml       1.600 N       5.0       & x 1.0. = mgl.         I 00 ml       1.600 N       0.0       & x 1.0. = mgl.         I 00 ml       1.600 N       0.0       & x 1.0. = mgl.         I 00 ml       1.600 N       0.0       & x 1.0. = mgl.         I 00 ml       1.600 N       5.0       & x 1.0. = mgl.         I 00 ml       1.600 N       5.0       & x 1.0. = mgl.         I 10 00 ml       I.600 N       5.0       I 1.0.0       & mgl.         I 10 00 ml       I.600 N       5.0       I 1.0.0       & mgl.       I 1.0.0 <td></td> <td>10 to 100 ppm</td> <td>K-9810</td> <td>ļ,</td> <td></td> <td>Analysis Time:</td> <td>1032</td> <td>_</td> <td></td> <td></td>		10 to 100 ppm	K-9810	ļ,		Analysis Time:	1032	_		
Image: Index 1000 ppm       K-9820       Filtered: Image:		50 to 500 ppm	K-9815	402	2					
Equipment:       HACH Digital Titrator AL-DT         Range Used:       Range       Sample Vol.       Cartridge       Multiplier       Titration Count       Multiplier       Concentration         10-40 mg/L       100 ml       0.1600 N       0.1       &       x 0.1       =       mg/L         10-40 mg/L       100 ml       0.1600 N       0.4       &       x 0.4       =       mg/L         10-400 mg/L       100 ml       0.1600 N       0.4       &       x 0.4       =       mg/L         10-400 mg/L       100 ml       1.600 N       0.0       &       x 1.0       =       mg/L         10-100-4000 mg/L       10 ml       1.600 N       5.0       &       x 5.0       =       mg/L         100-4000 mg/L       10 ml       1.600 N       10.0       &       x 10.0       =       mg/L         100-4000 mg/L       10 ml       1.600 N       10.0       &       x 10.0       =       mg/L         100-4000 mg/L       10 ml       1.600 N       10.0       &       x 10.0       =       mg/L         Standard Additionstip:       Dirationstip:       Dirationstip:       Dirationstip:       Standard Additionstip:       3rd.		100 to 1000 ppm	K-9820						Filtered:	
Range       Sample Vol.       Cartridge       Multiplier       Titration Count       Multiplier       Concentration         10-40 mg/L       100 ml       0.1600 N       0.1       &       x 0.1       =       mg/L         40-160 mg/L       25 ml       0.1600 N       0.4       &       x 0.4       =       mg/L         100-400 mg/L       50 ml       1.600 N       2.0       &       x 1.0       =       mg/L         200-800 mg/L       50 ml       1.600 N       2.0       &       x 5.0       =       mg/L         100-4000 mg/L       10 ml       1.600 N       5.0       &       x 5.0       =       mg/L         100-4000 mg/L       10 ml       1.600 N       5.0       &       x 5.0       =       mg/L         100-4000 mg/L       10 ml       1.600 N       1.0.0       &       x 10.0       =       mg/L         Notes:       Titrant Molarity:       Digits Required: 1st:       2 nd.       3rd.:           Notes:       Dr.850       DR.8       Range: 0 - 10 mg/L       Concentration:             Hydrogen Sulfide (HzS):       Range: 0 - 5 mg/L       Concentration: <td>Equipment:</td> <td>HACH Digital Titrat</td> <td>or AL-DT</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>	Equipment:	HACH Digital Titrat	or AL-DT							
Image:       100 mi       0.1600 N       0.1       & x 0.1       = mg/L         Image:       40-160 mg/L       25 mi       0.1600 N       0.4       & x 0.4       = mg/L         Image:       100-400 mg/L       100 mi       1.600 N       0.4       & x 1.0       = mg/L         Image:       100-400 mg/L       100 mi       1.600 N       2.0       & x 1.0       = mg/L         Image:       200-800 mg/L       20 mi       1.600 N       2.0       & x 2.0       = mg/L         Image:       500-2000 mg/L       20 mi       1.600 N       1.0       & x 2.0       = mg/L         Image:       1000-4000 mg/L       10 mi       1.600 N       1.0       & x 2.0       = mg/L         Image:       1000-4000 mg/L       10 mi       1.600 N       1.0       & x 2.0       = mg/L         Image:       1000-4000 mg/L       10 mi       1.600 N       1.0       & x 2.0       = mg/L         Standard Additions:       Iterationship:       Digits Required: 1st:       2 nd:       xid:       rd:         Standard Additions:       Iterationship:       Digits Required: 1st:       2 nd:       3 nd:       rd:       rd:         Standard Additions:       Iterationship:	Range Used:	Range	Sample Vol.	Cartridge	Multiplier	Titration Count	Multiplier	Сопсе	ntration	
□       40-160 mg/L       25 ml       0.1600 N       0.4		10-40 mg/L	100 ml	0.1600 N	0.1	&	x 0.1	=	mg/L	
Image: 100-400 mg/L       100 mt       1.600 N       1.0       &       x 1.0       =       mg/L         Image: 200-800 mg/L       50 mt       1.600 N       2.0       &       x 2.0       =       mg/L         Image: 500-2000 mg/L       20 mt       1.600 N       2.0       &       x 10.0       =       mg/L         Image: 500-2000 mg/L       20 mt       1.600 N       10.0       &       x 10.0       =       mg/L         Image: 500-2000 mg/L       10 mt       1.600 N       10.0       &       x 10.0       =       mg/L         Image: 500-2000 mg/L       10 mt       1.600 N       10.0       &       x 10.0       =       mg/L         Image: 5000 mg/L       10 mt       1.600 N       10.0       &       x 10.0       =       mg/L         Notes:       Itan Molarity:       Digits Required: 1st.:       2 nd.:       Sind.:       Sind.: <t< td=""><td></td><td>40-160 mg/L</td><td>25 ml</td><td>0.1600 N</td><td>0.4</td><td>&amp;</td><td><b>x</b> 0.4</td><td>=</td><td>mg/L</td><td></td></t<>		40-160 mg/L	25 ml	0.1600 N	0.4	&	<b>x</b> 0.4	=	mg/L	
200-800 mg/L       50 ml       1.600 N       2.0       & x2.0       = mg/L         500-2000 mg/L       20 ml       1.800 N       5.0       & x5.0       = mg/L         1000-4000 mg/L       10 ml       1.800 N       10.0       & x10.0       = mg/L         Parameter:       Hydroxide       Carbonate       Bicarbonate       mg/L       mg/L         Standard Additions:       Titrant Molerity:       Digits Required: 1st.:       2nd.:       3rd.:          Notes:       Titrant Molerity:       Digits Required: 1st.:       2nd.:       3rd.:          Ferrous Iron (Fe <sup>21</sup> ):       Equipment:       Range: 0 - 3.00 mg/L       Concentration:       0       0          Program/Module:       500nm       33        Analysis Time:           Hydrogen Sulfide (H <sub>2</sub> S):       Range: 0 - 10 mg/L       Concentration:             Notes:       Sulfide (S <sup>2</sup> ):       Equipment:       HSe       Other:             Notes:       Sulfide (S <sup>2</sup> ):       Equipment:       Range: 0 - 10 mg/L       Concentration:            Sulfide (S <sup>2</sup> ):		100-400 mg/L	100 ml	1.600 N	1.0	&	<b>x</b> 1.0	=	mg/L	
s00-2000 mg/L       20 ml       1.600 N       5.0       &       x 5.0       =       mg/L         Image: Indication of the second of th		200-800 mg/L	50 ml	1.600 N	2.0	&	x 2.0	=	mg/L	
I 000-4000 mg/L       10 ml       1.600 N       10.0       & x 10.0 = mg/L         Parameter:       Hydroxide       Carbonate       Bicarbonate         Relationship:		500-2000 mg/L	20 ml	1.600 N	5.0		<b>x</b> 5.0	=	mg/L	
Parameter:       Hydroxide       Carbonate       Bicarbonate         Relationship:       Itrant Molarity:       Digits Required: 1st.:       2nd.:       3rd.:         Notes:       Titrant Molarity:       Digits Required: 1st.:       2nd.:       3rd.:         Ferrous Iron (Fe <sup>2r</sup> ):       Equipment:       DR-8		1000-4000 mg/L	10 ml	1.600 N	10.0	&	x 10.0	=	mg/L	
Relationship:		Parameter:	Hydroxide	Carb	onate	Bicarbonate	]			
Standard Additions:       Titrant Molarity:       Digits Required: 1st.:       2nd.:       3rd.:         Notes:       Ferrous Iron (Fe <sup>2*</sup> ):       Equipment:       DR-850       DR-8		Relationship:								
Ferrous Iron (Fe <sup>2+</sup> ):         Equipment:       DR-850       DR-8       Range: 0 - 3.00 mg/L       Concentration:       Original Superior	Standard Additions: Notes:	Titrani	t Molarity:		Digits Requ	ired: 1st.: 2nd.:	3rd.:			
Equipment:       DR-850       DR-8       Range: 0 - 3.00 mg/L       Concentration:       Omega Superstandard       Omega Superstandard         Equipment:       IR 180 Color WHeel       Range: 0 - 10 mg/L       Analysis Time:       IO 30         Notes:       IR 180 Color WHeel       Range: 0 - 5 mg/L       Filtered:       IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII	Ferrous Iron (F	e <sup>2+</sup> ):								
Equipment:       Dr. 600       Dr. 700       Nating::       Concentration:	Fouinment:	DR-850	DR-8	Ranne: 0 -	3.00 mg/l	Concentration:	0.8	nnm		
Analysis Time:       1030         Analysis Time:       1030         Analysis Time:       1030         Analysis Time:       1030         Hydrogen Sulfide (H2S):       Range: 0 - 10 mg/L         Equipment:       HS.0       Other:       Concentration:       ppm         Equipment:       HS.0       Other:       Concentration:       037         Notes:       Sulfide (S <sup>2</sup> ):       Equipment:       Concentration ppm       Analysis Time:       037         Notes:       Sulfide (S <sup>2</sup> ):       Equipment:       Range: 0 - 10 mg/L       Concentration:       ppm         Range Used:       Range       Method       Concentration ppm       Analysis Time:       Program/L         I to 10 ppm       K-9510       Analysis Time:       Filtered:       Filtered:         Equipment:       DR-850       DR-8       Range: 0 - 0.70 mg/L       Filtered:       Filtered:         Filtered:       I       0.0.70 mg/L       Filtered:       I       Filtered:       I         Notes:       I       Notes:       I       I       I       I       I       I       I       I       I       I       I       I       I       I       I       I       I		Program/Module:	500nm	44 44	0.00 mg/L	Concernization.				
Equipment: IR_18C Color Wheel Range: 0 - 10 mg/L   Notes: Filtered:     Hydrogen Sulfide (H2S): Range: 0 - 5 mg/L   Equipment: HS-0   Other: Concentration:   Exceeded 5.0 mg/L range on color chart: Analysis Time:   Notes: Notes:     Sulfide (S <sup>2</sup> ):   Equipment:: Concentration:   Image: 0 - 10 mg/L   Range: 0 - 10 mg/L   Concentration:    Image: 0 - 10 mg/L   Concentration:    Image: 0 - 10 mg/L   Concentration:    Ppm   Analysis Time: ppm   Filtered:   Image: 0 to 1 ppm   K-9510 Image:   Filtered: Filtered: Filtered:		Fiogrammodule.	Soonin	55		Analysis Time:	1030			
Notes: Filtered:   Hydrogen Sulfide (H <sub>2</sub> S):   Range: 0 - 5 mg/L   Equipment:   HS-0   Other:   Exceeded 5.0 mg/L range on color chart:   Notes:   Sulfide (S <sup>2</sup> ):   Equipment: Chemetrics Test Kit   Range   Method   Concentration:   ppm   Analysis Time:   Ot on ppm   K-9510   Filtered:   Filtered:   Filtered:   Filtered:   Notes:   Notes:	Equipment: <	-IR-18C Color Whee	l	Range: 0 -	10 ma/L	,		-		
Hydrogen Sulfide (H <sub>2</sub> S):       Range: 0 - 5 mg/L         Equipment:       HS-O       Other:       Concentration:       ppm         Equipment:       Exceeded 5.0 mg/L range on color chart:       Analysis Time:       037         Notes:       Sulfide (S <sup>2</sup> ):       Equipment: Chemetrics Test Kit       Range: 0 - 10 mg/L       Concentration:       ppm         Range Used:       Range       Method       Concentration ppm	Notes:								Filtered:	
Equipment:       HS-C       Other:       Concentration:       ppm         Exceeded 5.0 mg/L range on color chart:       Analysis Time:       D3 7         Notes:       Sulfide (S <sup>2</sup> ):       Equipment: Chemetrics Test Kit       Range: 0 - 10 mg/L       Concentration:       ppm         Range Used:       Range       Method       Concentration ppm       Analysis Time:       ppm         0 to 1 ppm       K-9510       Analysis Time:       ppm         Image Used:       Range       Method       Concentration ppm         1 to 10 ppm       K-9510       Analysis Time:       Filtered:         Equipment:       DR-850       DR-8 Range: 0 - 0.70 mg/L       Filtered:         Program/Module:       610nm       93       Notes:       Solution	Hydrogen Sulf	ide (H <sub>2</sub> S):		Range: 0 -	5 mg/L		$\overline{\Delta}$			
Exceeded 5.0 mg/L range on color chart:       Analysis Time:	Equipment: 🤇	HS-G-	Other:			Concentration:	$\mathcal{O}$	ppm		
Notes:         Image Concentration         Image Concentratin         Image Concentration         Im		Exceeded 5.0 ma/L	rance on colo	or chart:		Analysis Time:	1037	7		
Sulfide (S <sup>2-</sup> ):         Equipment: Chemetrics Test Kit       Range: 0 - 10 mg/L       Concentration:ppm         Range Used:       Range       Method       Concentration ppm         0 to 1 ppm       K-9510       Analysis Time:         1 to 10 ppm       K-9510       Filtered:         Filtered:       Program/Module:       610nm       93	Notes:	0	5				<u> </u>	-		,
Equipment: Chemetrics Test Kit       Range: 0 - 10 mg/L       Concentration:ppm         Range Used:       Range       Method       Concentration ppm         0 to 1 ppm       K-9510       Analysis Time:         1 to 10 ppm       K-9510       Filtered:         Equipment:       DR-850       DR-8       Range: 0 - 0.70 mg/L         Program/Module:       610nm       93       93	Sulfide (S <sup>2-</sup> ):									
Range Used:         Range         Method         Concentration ppm           0 to 1 ppm         K-9510         Analysis Time:	Equipment: Cheme	trics Test Kit		Range: 0 -	10 mg/L	Concentration:		_ppm		
O to 1 ppm         K-9510         Analysis Time:           1 to 10 ppm         K-9510         Filtered:	Range Used:	Range	Method	Concentra	tion ppm					
1 to 10 ppm         K-9510           Filtered:         Filtered:   Filtered:           Equipment:         DR-850           DR-8         Range: 0 - 0.70 mg/L   Program/Module: 610nm 93 Notes:		0 to 1 ppm	K-9510			Analysis Time:		_		
Filtered: L Equipment: DR-850 DR-8 Range: 0 - 0.70 mg/L Program/Module: 610nm 93 Notes:		1 to 10 ppm	K-9510							_
Equipment: DR-850 DR-8 Range: 0 - 0.70 mg/L Program/Module: 610nm 93 Notes:									Filtered:	
Program/Module: 610nm 93 Notes:	r=quipment:	046-900	DK-8	Kange: 0 -	0.70 mg/L					
Notes:	Program/Module:	610nm	93							
	Notes:									

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SIGNATURE(S):													Var L C VVBO	5 b'1 2 1 690	3.50	1242 J. 48	0847 25.4cg	(Hrs.) (Ft. below TOC)	Time Water Level		PROJECT SITE NAME: PROJECT NUMBER:		5
Pakutte											L pmp					130		(mL/Min.)	Flow		NASA WFF		
											ro ler		(,,,)	6.24	6.02	5.82		(S.U.)	рН		-WOD	LOW F	
I										10 TO	الصريرا	<u>0, 08</u>	0.60	153	4754	6.683		(mS/cm)	S. Cond.			LOW PU	
											<u>echarg</u>	-200	2	() ()	550	011		(UTV)	Turb.			JRGE D	
												5,0	52.0	0,76	0,97	7.88		(mq/L)	DO			ATA SH	
												00,01	16.77	81.91	08.91	16.20		(Celcius)	Temp.	DATE:	WELL ID.:	HEET T	
												- 2.0	292	-353	505	-160		νm	ORP			ţ Ţ	
												0,0	0 0	0,0	Ø Ø	0,0		% or nnt	Salinity	<u>=121 /21</u>	Var Ine	UFFI	
PAGE 1 dF											1/2 gal purged			Sand in tubina	darker It brass	Clear 17 Loan		Comments	Composto	200	- Ala-	Two-Two-L	

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		GLU						Page \ of	5
Tetra Tech NOS, Inc				- <u> </u>			WFF	······································	7
Project Site Na	ime:	NASA WFI	-WOD			Sample ID No	s. Won	-106-2	
Project No.:		112GN161	2			Sample Loca	tion: NASA	-WrF-h	100
Sampled By:		JBB				Duplicate:			
Field Analyst:		JBB				Blank:			
Field Form Che	ecked as per QA	VQC Check	list (initial	s):					
SAMPLING DATA									
Date:		Color	рН	S.C.	Temp.	Turbidity	DO	Salinity	ORP (Eh)
Time:		(Visual)	(S.U.)	(mS/cm)	( <sup>0</sup> C)	(NTU)	(mg/l)	(%)	(+/- mv)
Method:							ļ		
SAMPLE COLLECT	TON/ANALYSIS IN	FORMATION							
ORP (Eh) (+/- π	1 <b>v</b> )		Electrode N	Aake & Mod	el:				
			Reference	Electrode (d	circle one): S	Silver-Silver Chlori	de / Calomel /	/ Hydrogen	
Dissolved Oxy	gen:						100		
Equipment: Chemet	rics Test Kit					Concentration:	0,05	ppm	
Range Used:	Range	Method	Concentrat	ion ppm					
ţX	0 to 1 ppm	K-7510	0,0	>5		Analysis Time:	<u>()930</u>		
	1 to 12 ppm	K-7512		_					
Equipment:	HACH Digital Titrat	or OX-DT					Analysis Time:		-
Range Used:	Range	Sample Vol.	Cartridge	Multiplier		Titration Count	Multiplier	Concentration	
	1-5 mg/L	200 ml	0.200 N	0.01	]		× 0.01	= mg/L	
	2-10 mg/L	100 ml	0,200 N	0.02			<b>x</b> 0.02	= mg/L	
Notes:	<u></u>				-				
Carbon Dioxid	e:						120		
Equipment: Cheme	trics Test Kit					Concentration:	125	_ppm	
Range Used:	Range	Method	Concentra	tion ppm					
	10 to 100 ppm	K-1910				Analysis Time:	093	2	
	100 to 1000 ppm	K-1920	125	>					:
	250 to 2500 ppm	K-1925							
Equipment:	HACH Digital Titra	tor CA-DT							
Range Used:	Range	Sample Vol.	Cartridge	Muitiplier	]	Titration Count		Concentration	
	10-50 mg/L	200 ml	0.3636 N	0.1			<b>x</b> 0.1	= mg/L	
	20-100 mg/L	100 ml	0.3636 N	0.2	1	6	x 0.2	= mg/L	_
	100-400 mg/L	200 ml	3.636 N	1.0			<b>x</b> 1.0	= mg/L	
	200-1000 mg/L	100 ml	3.636 N	2.0			<b>x</b> 2.0	= mg/L	
Standard Additions	: 🔲 Titrar	nt Molarity:		Digits Rec	uired: 1st.:_	2nd.:	3rd.:		
Notes:									
Hydrogen, dis	solved								
Equipment: Bubbl	le strip sampling field	d method							
	Start stripper at		time)						
	End stripper at		time)						
	Total stripper time								
	Pump rate	milliliter	s/minute						
1									



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# FIELD ANALYTICAL LOG SHEET GEOCHEMICAL PARAMETERS

Tetra Tech NUS, Ir	IC.						Page	of	_ )
Project Site N	ame:	NASA WF	F-WOD		Sample ID N	o.: UFF-	WOD	-TW	6-2
Project No.:		112GN161	2		Sample Loca	ation: NAS	<u>5A - L</u>	JFF-L	100
Sampled By:		JBB			Duplicate:				
Field Analyst:		78G			Blank:				
Alkalinity:									
Equipment: Cheme	trics Test Kit		<i></i>		Concentration:	260	_ppm		
Range Used:	Range	Method	Concentrat	ion ppm		~ Q I I			
	10 to 100 ppm	K-9810			Analysis Time:	0911	_		
	50 to 500 ppm	K-9815	20	~ <i>∂</i>					_
	100 to 1000 ppm	K-9820						Filtered:	
Equipment:	HACH Digital Titrat	or AL-DT							
Range Used:	Range	Sample Vol.	Cartridge	Multiplier	Titration Count	Multiplier	Conce	entration	
	10-40 mg/L	100 ml	0.1600 N	0.1	&	x 0.1	=	mg/L	
	40-160 mg/L	25 ml	0.1600 N	0.4	&	<b>x</b> 0.4	=	mg/L	
	100-400 mg/L	100 ml	1.600 N	1.0	&	<b>x</b> 1.0	=	mg/L	
	200-800 mg/L	50 ml	1.600 N	2.0	<u> </u>	x 2.0	=	mg/L	
	500-2000 mg/L	20 ml	1.600 N	5.0	&	x 5.0	=	mg/L	
	1000-4000 mg/L	10 ml	1.600 N	10.0	<u> </u>	x 10.0	=	mg/L	
	<b></b>	1	1	1		٦			
	Parameter:	Hydroxide	Carb	onate	Bicarbonate	4			
	Relationship:								
Standard Additions Notes:	: Li Titrani	t Molarity:	<u>.                                    </u>	Digits Requ	ired: 1st.: 2nd.:	3rd.:			
Ferrous Iron (	Fe <sup>2+</sup> ):								
Fauipment <sup>.</sup>	DR-850	DR-8	Range: () -	3 00 ma/l	Concentration:	22	> nom		
adorprise i Ki	Program/Module:	500nm	33	0.00g	ourosmadon.		<u>-</u> pp		
	Program/woodule.	0001111	55		Applycic Time:	0935	-		
Estimate 4	ID 400 Color Whee	>	Dense 0	10	Analysis Time.		_		
Equipment:	R-18C Color Whee	1	Range: 0 -	to mg/L				Eilfean de	
Hudrogon Sulf			Bangai 0	E mail				Fillerea.	
Hydrogen Sun	ilue (H <sub>2</sub> S).	-	Range: 0 -	o mg/L		$\langle \rangle$			
Equipment:	HS-C	Other:	·		Concentration:	<u></u>	ppm		
	Exceeded 5.0 mg/L	range on colo	or chart:		Analysis Time:	0120	<u>&gt;</u>		
Notes:									
Sulfide (S <sup>2*</sup> ):									
Equipment: Cheme	trics Test Kit		Range: 0 -	10 mg/L	Concentration:	·	ppm		
Range Used:	Range	Method	Concentrat	tion ppm					
	0 to 1 ppm	K-9510			Analysis Time:				
	1 to 10 ppm	K-9510					-		
								Filtered:	
Equipment:	DR-850	DR-8	Range: 0 -	0.70 mg/L					
Program/Module:	610nm	93	-	2					
	· -	-							
Notes:									

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					~						
(120 ly (3/4)	0,0	- 71	15,86	0.58	000	0.377	5.77	1 1	16.26		5560
eter (1/2 goul)	0	-572	15.30	0.30	200	.o. 395	5.69		24.93		0950
clear	0.0	-34	14.24	2.00	58	0.403	5.43	175	52 22.77×	244.	0460
	% or ppt	mV	(Celcius)	(mg/L)	(NTU)	(mS/cm)	(S.U.)	(mL/Min.)	below TOC)	) (Ft.	(Hrs.
Comments	Salinity	ORP	Temp.	DO	Turb.	S. Cond.	рН	Flow	ater Level	w e	Time
	12/18/08		DATE:					112GN1612	BER:		PROJE
\$	wed-Twl	££ ا	WELL ID .:				÷ S S S S S S S S S S S S S S S S S S S	NASA WFF	NAME:		PROJE
			HEET	ATA SH	IRGE D	LOW PL	LOW F			h	
										)	

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Tetra Tech NUS, Inc	3.							<u>Page _/ of _</u>	<u> </u>
Project Site Na	ame:	NASA WFI	F-WOD	-		Sample ID N	0.: <i>WFF</i> -4	100-741-	3
Project No.:		112GN161	2	-		Sample Loca	tion: 000	-TWI	
Sampled By:	£ω			_		Duplicate:			
Field Analyst:	EW					Blank:			
Field Form Ch	ecked as per QA	VQC Check	dist (initia	ls):					
SAMPLING DATA:									
Date: 12/18/0	) <b></b> 8	Color	рН	S.C.	Temp.	Turbidity	DÖ	Salinity	ORP (Eh)
Time:		(Visual)	(S.U.)	(mS/cm)	( <sup>0</sup> C)	(NTU)	(mg/l)	(%)	(+/- mv)
Method: 🖊 🗛	How	Claudy	5.77	0.377	15.86	1000	0.58	0.0	-71
SAMPLE COLLECT	FION/ANALYSIS IN	FORMATIONS							
ORP (Eh) (+/- n	(v) - 7/		Electrode 1	Make & Mod	iel: <u>//o<i>e.</i>z.(</u>	<u>84 ()-22</u>			
			Reference	Electrode (r	circle one): S	Silver-Silver Chlori	de / Calomel ,	/ Hydrogen	
Dissolved Oxy	gen:						- 7		
Equipment: Chemet	rics Test Kit				_	Concentration:	0.7	_ppm	
Range Used:	Range	Method	Concentra	tion ppm	]				
	0 to 1 ppm	K-7510	0.3	>		Analysis Time:	0958	-	
	1 to 12 ppm	K-7512	<u> </u>						
Equipment:	HACH Digital Titrate	or OX-DT				· .	Analysis Time:		-
Range Used:	Range	Sample Vol.	Cartridge	Multiplier		Titration Count	Multiplier	Concentration	]
	1-5 mg/L	200 ml	0.200 N	0.01			<b>x</b> 0.01	= mg/L	]
	2-10 mg/L	100 ml	0.200 N	0.02	]		x 0.02	= mg/L	]
Notes: Carbon Dioxide	<b></b>								
Equipment: Chemet	rics Test Kit		<b>.</b>		٦	Concentration:	100	ppm	
Range Used:	Range	Method	Concentral	tion ppm	1				
	10 to 100 ppm	K-1910	100	> 		Analysis Time:	(000	-	
	100 to 1000 ppm	K-1920	+		-	,	0		
	250 to 2500 ppm	K-1925			- Col	br change j	out 6/f a	eaching 100	ppn
Equipment:	HACH Digital Titrat	or CA-DT			- 5100	shy just be	low 1001	rrm	
Range Used:	Range	Sample Vol.	Cartridge	Multiplier		Titration Count		Concentration	
	10-50 mg/L	200 ml	0.3636 N	0.1	_	<u>.</u>	x 0.1	= mg/L	<u> </u>
	20-100 mg/L	100 ml	0.3636 N	0.2	_	440000 and a second and a second and a second a	<b>x</b> 0.2	= mg/L	
	100-400 mg/L	200 ml	3.636 N	1.0	-		<b>x</b> 1.0	= mg/L	
	200-1000 mg/L	100 ml	3.636 N	2.0			<b>x</b> 2.0	= mg/L	
Standard Additions:	L Titrani	t Molarity:	<u> </u>	Digits Req	uired: 1st.:	2nd.:	3rd.:		
Notes:									
Hydrogen, diss	solved								
Equipment: Bubble	strip sampling field	method							
	Start stripper at	(ti	me)						
	End stripper at		ime)						
	Total stripper time		· • •						
	Pump rate	milliliters	s/minute						



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Tetra Tech NUS, Ir	nc.						Page	<u>2of</u> 2	<u> </u>
Project Site N	ame:	NASA WF	F-WOD	-	Sample ID N	0.:			
Project No.:		112GN161	12	_	Sample Loca	tion: دەن	~ Tù	) t	
Sampled By:	కట			-	Duplicate:				
Field Analyst:	En			-	Blank:				
Alkalinity:									
Equipment: Cheme	etrics Test Kit				Concentration:	_200	ppm		
Range Used:	Range	Method	Concentra	tion ppm					
	10 to 100 ppm	K-9810			Analysis Time:	1003	_		
<u>x</u>	50 to 500 ppm	K-9815	200						_
	100 to 1000 ppm	K-9820						Filtered:	
Equipmeлt:	HACH Digital Titrat	tor AL-DT	1			r	- <b>I</b>		
Range Used:	Range	Sample Vol.	Cartridge	Multiplier	Titration Count	Multiplier	Conc	entration	
	10-40 mg/L	100 ml	0.1600 N	0.1	&	x 0.1	=	mg/L	
	40-160 mg/L	25 ml	0.1600 N	0.4	&	<b>x</b> 0.4	=	mg/L	
	100-400 mg/L	100 ml	1.600 N	1.0	&	<b>x</b> 1.0	=	mg/L	
	200-800 mg/L	50 ml	1.600 N	2.0	&	x 2.0	=	mg/L	
	500-2000 mg/L	20 ml	1.600 N	5.0	&	x 5.0	=	mg/L	
	1000-4000 mg/L	10 ml	1.600 N	10.0	&	<b>X</b> 10.0		mg/L	
	Parameter:	Hydroxide	Carb	onate	Bicarbonate	]			
	Relationship:								
Standard Additions	:: 🗌 Titran	nt Molarity:		Digits Requi	red: 1st.: 2nd.:	3rd.:			
Notes:									
Ferrous Iron (	Fe <sup>2+</sup> ):								
Equipment:	DR-850	DR-8	Range: 0 -	3.00 mg/L	Concentration:	2.4	_ppm		
	Program/Module:	500nm	33						
					Analysis Time:	(008	_		
Equipment:	IR-18C Color Whe	el	Range: 0 -	10 mg/L					
Notes:								Filtered:	
Hydrogen Sul	fide (H₂S):		Range: 0 -	5 mg/L					
Equipment:	HS-C	Other:			Concentration:	0	ppm		
	Exceeded 5.0 mg/l	L range on cold	or chart:		Analysis Time:	10009			
Notes:									
Sulfide (S <sup>2-</sup> ):									
Equipment: Cheme	etrics Test Kit		Range: 0 -	10 mg/L	Concentration:		ppm		
Bango Llood:	Banaa	Mathed	Concentra	tion opm					
	Range		Concentra	tion ppm	Analysis Time:				
	1 to 10 ppm	K-9510			Analysis nine.				
		1 10-8010						Filtered	
Faulamont		00 0	Banca: 0	0.70 ma/				i iiteidu.	—
	C10-m	DIX*0	nange: 0 -	· v. ro mg/L					
rogram/wodule:	חוחטו ס	90							
Notes									
notes.									

tew byboles over 1/2 gal putyof	0000	38	16,19 16,19 16,37 16,37	3,05 2,30 2,30	45 45 110	0,502 0,678 0,982	4,10 5,93 5,73	240 12-1	20.92 26.92	1141 1142 1141 1141
WOD-TW 2-3 12008 Comments Few bubbles Few bubbles	<i>uFF</i> - 12/18/ % or ppt	28-23-2-25 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-5 -28-	WELL ID.: DATE: Temp. (Celcius) 16.19 16.37 16.37	(mg/L) コーズ コーズ し の	NTU (NTU)	S. Cond. (mS/cm) 0,422 0,522 0,678	5,93 5,73 5,73	NASA WFF 112GN1612 Flow (mLMin) フィレ	SITE NAME: NUMBER: Water Level (Ft. below TOC) 25, 60 26,51 26,51 26,78 54art greech	PROJECT PROJECT Time (Hrs.) 1136 1136 1136 1145 1145 1147
				ATA SI						



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#### FIELD ANALYTICAL LOG SHEET GEOCHEMICAL PARAMETERS

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Tetra Tech NUS, Inc								Page of _	<u> </u>
Project Site Na	me:	NASA WF	F-WOD			Sample ID N	0.: JNFF-6	JOD-TW2-	<u>.</u> 3
Project No.:		112GN161	2			Sample Loca	tion: NAS	AUFF	
Sampled By:	1	BB		_		Duplicate:			
Field Analyst:		BB				Blank:			
Field Form Che	ecked as per QA	VQC Check	dist (initia	Is):		7			
SAMPLING DATA									
Date: 17/18	12008	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	ORP (Eh)
Time:	12200	(Vigual)	(\$11)	(mS/cm)	ന	(NTII)	(mg/l)	(%)	(+/- mv)
Method: 1 - (	A.v. i	(Visual)	573	0.982	16.37	55	2.2	6.0	38
SAMPLE COLLECT	ION/ANALYSIS IN	FORMATION							
ORP (Eh) (+/- m	ıv)		Electrode I	Make & Moc	lel:				<u></u>
(, (			Reference	Electrode (	circle one): S	Silver-Silver Chlori	de / Calomel /	/ Hvdrogen	
Dissolved Oxy	ren:				/		£		
Equipment: Chemetr	rics Test Kit				_	Concentration:		ppm	
Range Used:	Range	Method	Concentral	tion ppm					
	0 to 1 ppm	K-7510				Analysis Time:	1201		
X	1 to 12 ppm	K-7512	1				······		
Equipment:	HACH Digital Titrate	or OX-DT					Analysis Time:		-
Range Used:	Range	Sample Vol.	Cartridge	Multiplier		Titration Count	Multiplier	Concentration	
	1-5 mg/L	200 ml	0.200 N	0.01			x 0.01	= mg/L	
	2-10 mg/L	100 ml	0.200 N	0.02			x 0.02	= mg/L	
Notes:									
Carbon Dioxide	ə:						$\neg \land$		
Equipment: Chemeti	rics Test Kit					Concentration:	<u> 70</u>	ppm	
Range Used:	Range	Method	Concentrat	tion ppm	]				
X	10 to 100 ppm	K-1910	70	>	]	Analysis Time:	1203		
	100 to 1000 ppm	K-1920							
	250 to 2500 ppm	K-1925			]				
					-				
Equipment:	HACH Digital Titrate	or CA-DT			1				
Range Used:	Range	Sample Vol.	Cartridge	Multiplier	ļ	Titration Count		Concentration	
	10-50 mg/L	200 ml	0.3636 N	0.1			<b>x</b> 0.1	= mg/L	
	20-100 mg/L	100 ml	0.3636 N	0.2			x 0.2	= mg/L	
	100-400 mg/L	200 ml	3.636 N	1.0		ļ	x 1.0	= mg/L	4
	200-1000 mg/L	100 ml	3.636 N	2.0			<b>x</b> 2.0	= mg/L_	
Standard Additions:	L Titran	t Molarity:		Digits Req	uired: 1st.:	2nd.:	3rd.:		
Notes:									
Hydrogen, diss	olved								
Equipment: Bubble	strip sampling field	method							
	Start stripper at	(t	ime)						
	End stripper at	(	time)						
	Total stripper time								
	Pump rate	milliliter	s/minute						



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#### FIELD ANALYTICAL LOG SHEET GEOCHEMICAL PARAMETERS

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Tetra Tech NUS, Ir	c.						Page	Lof _
Project Site N	ame:	NASA WF	F-WOD		Sample ID No	o.: WFF	-ωυ	N-TW2-3
Project No.:		112GN161	2		Sample Loca	tion: ∖\A≤	<u>SA W</u>	FF
Sampled By:	ź	JBB		<u>.</u>	Duplicate:			
Field Analyst:		JBB			Blank:			
Alkalinity:		~				1 2 4		
Equipment: Cheme	trics Test Kit	-			Concentration:	110	_ppm	
Range Used:	Range	Method	Concentral	tion ppm		1711		
	10 to 100 ppm	K-9810			Analysis Time:	1209	-	
	50 to 500 ppm	K-9815	$\downarrow 10$					[]
	100 to 1000 ppm	K-9820						Filtered:
Equipment:	HACH Digital Titrat	or AL-DT				<u>.</u>		
Range Used:	Range	Sample Vol.	Cartridge	Multiplier	Titration Count	Multiplier	Conce	entration
	10-40 mg/L	100 ml	0.1600 N	0.1	&	x 0.1	=	mg/L
	40-160 mg/L	25 ml	0.1600 N	0.4	&	<b>x</b> 0.4	=	mg/L
	100-400 mg/L	100 ml	1.600 N	1.0	&	x 1.0	-	mg/L
	200-800 mg/L	50 ml	1.600 N	2.0	&	x 2.0	=	mg/L
	500-2000 mg/L	20 ml	1.600 N	5.0	&	<b>x</b> 5.0	=	mg/L
	1000-4000 mg/L	10 ml	1.600 N	10.0	&	x 10.0	=	mg/L
	<b></b>	F				1		
	Parameter:	Hydroxide	Carb	onate	Bicarbonate	-		
	Relationship:							
Standard Additions	: L Titrani	t Molarity:		Digits Requ	ired: 1st.: 2nd.:	3rd.:		
Forroug from (								
	-e ).		<b>-</b>	a		AC.		
Equipment:	DR-850	DK-8	Range: U -	3.00 mg/L	Concentration:		_ppm	
	Program/Module:	500nm	33			1150		
					Analysis Time:	11/6	-	
Equipment:	R-18C Color Whee		Range: 0 -	10 mg/L				
Notes:								Filtered:
Hydrogen Sulf	ide (H <sub>2</sub> S):		Range: 0 -	5 mg/L		$\sim$		
Equipment: 🔨	HS-C	Other:	<u></u>		Concentration:		_ppm	
	Exceeded 5.0 mg/L	, range on colo	or chart:		Analysis Time:	1158	_	
Notes:								
Sulfide (S <sup>2-</sup> ):								
Equipment: Cheme	trics Test Kit		Range: 0 -	10 mg/L	Concentration:		_ppm	
Range Used:	Range	Method	Concentrat	tion ppm				
	0 to 1 ppm	K-9510			Analysis Time:		_	
	1 to 10 ppm	K-9510						
								Filtered:
Equipment:	DR-850	DR-8	Range: 0 -	0.70 mg/L				
Program/Module:	610nm	93	-	-				
-								
Notes:								

			LOW FI		RGE D/	ATA SH	IEET			
PROJECT SI	TE NAME:	NASA WFF	Ħ ₽				WELL ID .:	ufj	- Uach - 4	, w 3-3
									1-11-21	
Time	Water Level	Flow	pН	S. Cond.	Turb.	DO	Temp.	ORP	Salinity	Comments
(Hrs.) (	Ft. below TOC)	(mL/Min.)	(S.U.)	(mS/cm)	(NTU)	(mg/L)	(Celcius)	Ψ	% or ppt	Contraction
050	23.12	190-175	5.57	0.507	e B	4.30	16.07	-21	0.0	chady/brown
260/	25.62		5.40	0.516	550	1.03	16.36	B	0,0	cloudy 1/2 gal
1040	27.58		5.56	0.490	520	1.28	(6.25	-27	0.2	
					<i>n</i> .				-	
SIGNATURE(	(S):	6		I	NS115 X	t Sheen	on purper	meter		PAGE / OF /
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#### FIELD ANALYTICAL LOG SHEET **GEOCHEMICAL PARAMETERS**

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Tetra Tech NUS, In	ic.							Page <u>/</u> of	Z
Project Site N	ame:	NASA WF	F-WOD	-		Sample ID N	0.: ωFF-	woD-Tw3-	3
Project No.:		112GN161	2	_		Sample Loca	ition: 200	- TW 3	
Sampled By:	$\leq \omega$			-		Duplicate:			
Field Analyst:	εω			-		Blank:			
Field Form Ch	ecked as per QA	VQC Check	dist (initia	lis):		]			
SAMPLING DATA									
Date: 12/11	5/08	Color			Tomp	Turbiditu		Colinity	
	500			3.0.	l remp.			Samily	OKP (EII)
	/	(Visual)	(S.U.)	(mS/cm)		(NTU)	(mg/l)	(%)	(+/- mv)
Method: 100 TO	TIONIANALYSISIN	CIONDY	<u> </u>             	0.990	16.45	220	1.48	0.0	-27
	and a constraint of the second se	CON001101	Fie etee de l		HORI	7AA 17-2	) )		
	"" - 27		Electrode		iel: <u>///////</u>		<u> </u>		
			Reference	Electrode (	circle one): S	liver-Silver Chlori	de / Calomel	/ Hydrogen	
Dissolved Oxy	gen:						20		
Equipment: Cheme	trics Test Kit				_	Concentration:	<u> </u>	_ppm	
Range Used:	Range	Method	Concentrat	tion ppm					
Ľ.	0 to 1 ppm	K-7510	1.0			Analysis Time:	1048		
	1 to 12 ppm	K-7512						-	
					-				
Equipment:	HACH Digital Titrate	or OX-DT				ч.	Analysis Time:	:	_
Range Used:	Range	Sample Vol.	Cartridge	Multiplier	1	Titration Count	Multiplier	Concentration	]
	1-5 mg/l.	200 ml	0.200 N	0.01	1		x 0.01	= mo/l	1
	2-10 mg/l	100 ml	0.200 N	0.02			× 0.02	- mg/L	1
Notes:		100 111	0.20011	0.02	1		X 0.02		J
140163.									
Carbon Dioxid	e:								
Equipment: Cheme	trics Test Kit					Concentration:	160	_ppm	
Range Used:	Range	Method	Concentrat	tion ppm	1				
	10 to 100 ppm	K-1910			1	Analysis Time:	1055		
⊠-	100 to 1000 ppm	K-1920	160	>	1			-	
	250 to 2500 ppm	K-1925			1				
	-	•							
Equipment:	HACH Digital Titrato	or CA-DT							
Banga Llead:	Panaa	Comple Val	Contridato	Muttiplier	]	Titration Count		Connection	]
Range Osed.		200 ml				Titration Count	× 0.1		
	20_100 mg/l	100	0.3030 N	0.1			x 0.1	- mg/L	
	100 400 ma/l		2.626 N	1.2			x v.2	- mg/L	
	200 1000 mg/L		3.030 N	1.0			x 1.0	- mg/L	
		Motoriter	3.030 N	Z.U	j virodu đat :	0-4.	X 4.U	– mg/L	L
Notes:		. wotanty:		Digits Red	unea: ISt.:	2na.:	3ra.:		
Hydrogen dies	solved								
Fauinmont Bubble	oviveu	mothed							
Equipment: Buddie	Stort stringer of	memod							
	Start supper at	(til	ine)						
	Totol atmost firm	(t	me)						
	Dump								
	-ump rate	multiters	AMINULE						



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Tetra Tech NUS, Ir	ıc.						Page	<u>_2 of _2</u>	
Project Site N	ame:	NASA WF	F-WOD		Sample ID No	ο.: <b>ωρ∈</b> ~ι	UTD - 7	rw 3-3	
Project No.:		112GN161	2	_	Sample Loca	tion: $\omega_{0}$	) - TU	3	_
Sampled By:	いう			-	Duplicate:				
Field Analyst:	Ew			•	Blank:				
Alkalinity:									
Equipment: Cheme	etrics Test Kit				Concentration:	250	ppm		
Range Used:	Range	Method	Concentrat	iion ppm					
	10 to 100 ppm	K-9810			Analysis Time:	1052	_		
<u> </u>	50 to 500 ppm	K-9815	250					_	
	100 to 1000 ppm	K-9820						Filtered:	
Equipment:	HACH Digital Titra	or AL-DT					- <b>-</b>	······	
Range Used:	Range	Sample Vol.	Cartridge	Multiplier	Titration Count	Multiplier	Conce	ntration	
<u> </u>	10-40 mg/L	100 ml	0.1600 N	0.1	&	x 0.1	=	mg/L	
	40-160 mg/L	25 ml	0.1600 N	0.4	&	x 0.4	<b></b>	mg/L	
	100-400 mg/L	100 ml	1.600 N	1.0	&	x 1.0	=	mg/L	
	200-800 mg/L	50 ml	1.600 N	2.0	&	x 2.0	=	mg/L	
	500-2000 mg/L	20 ml	1.600 N	5.0	<u> </u>	<b>x</b> 5.0	<u></u>	mg/L	
	1000-4000 mg/L	10 ml	1.600 N	10.0	&	x 10.0		mg/L	
	Parameter:	Hydroxide	Carb	onate	Bicarbonate	I			
	Relationship:								
Standard Additions	: D Titrar	t Molarity:	1	Digits Requir	red: 1st.: 2nd.:	1 3rđ.:			
Notes:				•					
Ferrous Iron (	Fe <sup>2+</sup> ):								
Equipment:	DR-850	DR-8	Range: 0 -	3.00 mg/L	Concentration:	2.5	ppm		
	Program/Module:	500nm	33	-					
	Ū				Analysis Time:	1102			
Equipment:	IR-18C Color Whe	el	Range: 0 -	10 mg/L					
Notes:			0	5				Filtered:	
Hydrogen Sul	fide (H₂S):		Range: 0 -	5 mg/L					
Equipment:	HS-C	Other:			Concentration:	0.0	maa		
	Exceeded 5.0 mg/l	rance on cold	r chart		Analysis Time	1103			
Notes:	Exceeded the might	- 1011go ori oolo			rangolo (ano.				
Sulfide (S <sup>2-</sup> )									
Equipment: Cheme	etrics Test Kit		Range: 0 -	10 mg/L	Concentration:		ppm		
Dange Llead	Bassa	Mathad	Cancenter						
		K-0510	Concentral	uon ppm	Apphysic Times				
	1 to 10 ppm	K-9510			Analysis nille:				
		1 10-0010	<u> </u>						
Fauinment	DD-850	DD.8	Danco: 0	0.70 mall					
Equipment:	040	UK-0	rtange: 0 -	0.70 mg/E					
Program/Module:	610nm	93							
h									
Notes:									

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A CONTRACT AN ADDRESS AND

	SITE NAME:	NASA WFF. 112GN1612		LOW PU	RGE D,	ATA SH	<b>IEET</b> WELL ID.: DATE:	۲. Fr	80 81/21	
Time (Hrs)	Water Level (Ft. below TOC)	Flow (mL/Min.)	рН (S.U)	S. Cond. (mS/cm)	Turb. (NTU)	DO (mg/L)	Temp. (Celcius)	ORP mV	Salinity % or ppt	Comments
09050905	27.70	150 - 175	5.25	0,470	te t	5.11	13.54	DE NC	0, D	clear
0710	29.83	· · ·	4.52	0.327	19	2.37	15,33	44	0.0 0.0	some Hy cal.
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							-			



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Tetra Tech NUS, Ind	3.							Page _ of _	<u> </u>
Project Site Na	ame:	NASA WF	F-WOD	_		Sample ID N	0.: WFF- 1	woo - TW3 -	.3
Project No.:		112GN161	12			Sample Loca	tion: WOD	-TW3	
Sampled By:	£ω			-		Duplicate:			
Field Analyst:	EW			-		Blank:			
Field Form Ch	ecked as per Q/	A/QC Chec	klist (initia	- IIS):		]			
SAMPLING DATA									
Date: 12/18/08	,	Color	рН	S.C.	Temp.	Turbidity	DO	Salinity	ORP (Eh)
Time:		(Visual)	(S.U.)	(mS/cm)	(°C)	(NTU)	(mg/l)	(%)	(+/- mv)
Method: $/ \cdot - f/ \cdot$	· w	Clear	4.92	0.30/	15.65	19	2.37	0.0	77
SAMPLE COLLECT	FION/ANALYSIS IN	FORMATION							
ORP (Eh) (+/- m	1V) 77		Electrode I	Make & Moo	iel:_ <u>Ho</u> P	2BA U-0	2		
	11		Reference	Electrode (	circle one): S	Silver-Silver Chlori	de / Calomel	/ Hydrogen	
Dissolved Oxy	gen:								
Equipment: Chemet	rics Test Kit					Concentration:	1.0	_ppm	
Range Used:	Range	Method	Concentra	tion ppm	]				
	0 to 1 ppm	K-7510	1.0		1	Analysis Time:	0920		
	1 to 12 ppm	K-7512	1.0		1			-	
					•				
Equipment:	HACH Digital Titrat	or OX-DT					Analysis Time	:	-
Range Used:	Range	Sample Vol.	Cartridge	Multiplier	]	Titration Count	Multiplier	Concentration	]
	1-5 mg/L	200 ml	0.200 N	0.01	1		x 0.01	= ma/L	
	2-10 mg/L	100 ml	0.200 N	0.02			x 0.02	= mo/l	
Carbon Dioxide	e: rics Test Kit					Concentration:	200	ppm	
Range Lised:	Pange	Method	Concentral	tion nom	1				
	10 to 100 ppm	K-1910	Concentia	loti ppin			1923		
	100 to 1000 ppm	K-1920	20 0			Analysis fille.	012-	-	
	250 to 2500 ppm	K-1025	<u> </u>	•					
	200 to 2000 ppm	1 1020	1		1				
Equipment:	HACH Digital Titrat	or CA-DT							
Range Used:	Range	Sample Vol.	Cartridge	Multiplier		Titration Count		Concentration	]
	10-50 mg/L	200 ml	0.3636 N	0.1			<b>x</b> 0.1	= mg/L	]
	20-100 mg/L	100 ml	0.3636 N	0.2			<u>x 0.</u> 2	=mg/L	]
	100-400 mg/L	200 ml	3.636 N	1.0			<b>x</b> 1.0	= mg/L	
	200-1000 mg/L	100 ml	3.636 N	2.0			<b>x</b> 2.0	= mg/L	
Standard Additions:	Titran	t Molarity:		Digits Requ	uired: 1st.:	2nd.:	3rd.:		
Notes:	<u></u>								
Hydrogen, diss	olved								
Equipment: Bubble	strip sampling field	method							
	Start stripper at	(ti	ime)						
	End stripper at	(t	ime)						
	Total stripper time	·							
	Pump rate	milliliters	s/minute						



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Tetra Tech NUS, II	າດ.						Page	<u></u>	<u></u>
Project Site N	lame:	NASA WF	F-WOD	-	Sample ID N	o.: WFF-U	-200-T	w3.3	
Project No.:		112GN161	2		Sample Loca	ation: $\omega_{0D}$	- TW	3	
Sampled By:	EW				Duplicate:				
Field Analyst:	EW				Blank:				
Alkalinity:									
Equipment: Cheme	etrics Test Kit		-		Concentration:	110	_ppm		
Range Used:	Range	Method	Concentral	tion ppm					
	10 to 100 ppm	K-9810			Analysis Time:	0926	_		
	50 to 500 ppm	K-9815	110						_
	100 to 1000 ppm	K-9820						Filtered:	
Equipment:	HACH Digital Titrat	or AL-DT							
Range Used:	Range	Sample Vol.	Cartridge	Multiplier	Titration Count	Multiplier	Conc	entration	
	10-40 mg/L	100 ml	0.1600 N	0.1	<u> </u>	x 0.1	=	mg/L	
	40-160 mg/L	25 ml	0.1600 N	0.4	&	<b>x</b> 0.4	=	mg/L	
	100-400 mg/L	100 ml	1.600 N	1.0	&	x 1.0 ·	=	mg/L	
	200-800 mg/L	50 ml	1.600 N	2.0	&	x 2.0	=	mg/L	
	500-2000 mg/L	20 ml	1.600 N	5.0	&	x 5.0	=	mg/L	
	1000-4000 mg/L	10 ml	1.600 N	10.0	&	x 10.0	=	mg/L	
	Parameter:	Hydroxide	Carb	onate	Bicarbonate	1			
	Relationship:								
Standard Additions	: D Titrani	t Molarity:	·	Digits Requi	red: 1st.: 2nd.:	3rd.:			
Notes:									
Ferrous Iron (	Fe <sup>2+</sup> ):								
Equipment:	DR-850	DR-8	Range: 0 -	3.00 mg/L	Concentration:	/.0	_ppm		
	Program/Module:	500nm	33				_		
					Analysis Time:	0931			
Equipment:	IR-18C Color Whee	2	Range: 0 -	10 mg/L					
Notes:								Filtered:	
Hydrogen Sul	fide (H₂S):		Range: 0 -	5 mg/L					
Equipment:	HS-C	Other:			Concentration:	0.0	maa		
	Exceeded 5.0 mg/l	range on colo	r chart.		Analysis Time	0933			
Notes:	j_								
Sulfide (S <sup>2-</sup> ):						<u> </u>			
Equipment: Cheme	etrics Test Kit		Range: 0 -	10 mg/L	Concentration:		_ppm		
Range Used:	Range	Method	Concentrat	tion ppm					
	0 to 1 ppm	K-9510			Analysis Time:				
	1 to 10 ppm	K-9510							_
								Filtered:	
Equipment:	DR-850	DR-8	Range: 0 -	0.70 mg/L					
Program/Module:	610nm	93	-	-					
Notes:									

PROJECT SITE NAME: PROJECT NUMBER:	NASA WFF 112GN1612	LOW FL	_OW PU	RGE D/	ATA SH	I <b>EET</b> NELL ID.: DATE:		WFF-WC	>b-TW 5-3
Time Water Level (Hrs.) (Ft. below TOC)	Flow (mL/Min.)	рH	S. Cond. /mS/cm)	Turb. (NTU)	DO	Temp. (Celcius)	ORP mV	Salinity % or ppt	Comment
0956 25.07		*	1		~1/~	, , ) )	) 1	»	
20420 27.50 2400	 סבר	201	LL12.0	20 20 20 20		CZ 71 2131	λ Nov N		
$1 \sim 10^{-1}$		6,70	1 ( N N )	226	14.57	17,15	<u>e</u> v		
1005 200,89		6,70	C 639	270	12,00	17.37	53	0 Ó	product seen
8001		6.67	0,00	320	507 01	17,54	40	0,0	Stad Jab B/2
$\frac{\omega c \lambda r}{\lambda r}$	ALT OTT PW	hp a llow	recharge	then	as or	chem			
Veplace tu	V at build	o kils	due to p	reduct p	amped	h ybray	evid		
	(					(	1		
<i>v v</i>									
SIGNATINESS Wind	Charles H								PA
1. 40	14		ŀ						



# FIELD ANALYTICAL LOG SHEET **GEOCHEMICAL PARAMETERS**

Tetra Tech NUS, Inc	5.							Page _ of _	2
Proiect Site Na	ame:	NASA WE	F-WOD			Sample ID N	0.: 1_)FF-	inpl-tw:	5-3
Project No.:		112GN161	2	•		Sample Loca	ition: NAS	AWFF	
Sampled Bv:		JBB		•		Duplicate:			
Field Analyst:		JBP		•		Blank:	Π		
Field Form Ch	ecked as per QA	VQC Check	dist (initia	(Is):	[	1			
SAMPLING DATA			<u>in èn </u>						
Date: 12/18/:	2008	Color	рН	S.C.	Temp.	Turbidity	DO	Salinity	ORP (Eh)
Time:		(Visual)	(S.U.)	(mS/cm)	(°C)	(NTU)	(mg/l)	(%)	(+/- mv)
Method:	Flow	Clear	6.67	0.690	17,54	320	10,65	0.0	40
SAMPLE COLLECT	FION/ANALYSIS INF	FORMATION:							
ORP (Eh) (+/- m	nv)		Electrode I	Make & Moc	iel:				
	<u> </u>		Reference	Electrode (r	circle one): S	Silver-Silver Chlori	ide / Calomel /	/ Hydrogen	
Dissolved Oxy	gen:								
Equipment: Chemet	rics Test Kit				_	Concentration:	5,7	. ppm	
Range Used:	Range	Method	Concentral	tion ppm			1000		
	0 to 1 ppm	K-7510				Analysis Time:	1122	-	
	1 to 12 ppm	K-7512	5.5	5	]				
Equipment:	HACH Digital Titrato	эг ОХ-DT			_	 	Analysis Time:		_
Range Used:	Range	Sample Vol.	Cartridge	Multiplier		Titration Count	Multiplier	Concentration	
	1-5 mg/L	200 ml	0.200 N	0.01			x 0.01	= mg/L	
	2-10 mg/L	100 ml	0.200 N	0.02	]		x 0.02	= mg/L	] [
Notes:									
Carbon Dioxid	e:								
Equipment: Chemet	arics Test Kit				7	Concentration:	120	ppm	
Range Used:	Range	Method	Concentra	tion ppm	-		リンズ		
Ľ ⊠	10 to 100 ppm	K-1910	>1	20		Analysis Time:	112	-	
<u> </u>	100 to 1000 ppm	K-1920	120	<u>د</u>	-				
	250 to 2500 ppm	K-1925			]				
Equipment:	HACH Digital Titrat	or CA-DT			_				
Range Used:	Range	Sample Vol.	Cartridge	Multiplier		Titration Count		Concentration	-
	10-50 mg/L	200 ml	0.3636 N	0.1			<b>x</b> 0.1	= mg/L	
	20-100 mg/L	100 ml	0.3636 N	0.2	4		x 0.2	= mg/L	4
	100-400 mg/L	200 ml	3.636 N	1.0	-		<b>x</b> 1.0	= mg/L	-
	200-1000 mg/L	100 ml	3.636 N	2.0	J		x 2.0	= mg/L	
Standard Additions:	Titrant	i Molarity:		Digits Req <sup>i</sup>	uired: 1st.:	2nd.:	3rd.:		
Notes:									
Hydrogen, aiss	solved								
Equipment: Bubble	e strip sampling tield	method	*1						
	Start stripper at	(u	ime)						
	End stripper at	(i	ame)						
	Pumo rate	milliliter	elminute						
		(110)40(613	2/minute						
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Tetra Tech NUS, In	с.						Page	$\leq of \leq$	_
Project Site Na	ame:	NASA WF	F-WOD	-	Sample ID N	o.: WFF	-wob	1-TU5-3	
Project No.:		112GN161	2	_	Sample Loca	tion:			
Sampled By:	JE	3B		_	Duplicate:				
Field Analyst:		BB			Blank:				
Alkalinity:						<u> </u>			
Equipment: Cheme	trics Test Kit		·		Concentration:	260	ppm		
Range Used:	Range	Method	Concentrat	tion ppm					
	10 to 100 ppm	K-9810			Analysis Time:	1112	_		
	50 to 500 ppm	K-9815	26	0				<b>[</b> ]	
	100 to 1000 ppm	K-9820						Filtered:	
Equipment:	HACH Digital Titrate	or AL-DT				1			
Range Used:	Range	Sample Vol.	Cartridge	Multiplier	Titration Count	Multiplier	Conce	entration	
	10-40 mg/L	100 m <b>i</b>	0.1600 N	0.1	&	x 0.1	=	mg/L	
	40-160 mg/L	25 ml	0.1600 N	0.4		x 0.4	=	mg/L	
	100-400 mg/L	100 ml	1.600 N	1.0	&	x 1.0	=	mg/L	
	200-800 mg/L	50 ml	1.600 N	2.0	&	x 2.0	=	mg/L	
	500-2000 mg/L	20 ml	1.600 N	5.0	<u> </u>	x 5.0	=	mg/L	
	1000-4000 mg/L	10 ml	1.600 N	10.0	&	x 10.0	=	mg/L	
	r	1	<u> </u>			7			
	Parameter:	Hydroxide	Carb	onate	Bicarbonate				
	Relationship:								
Standard Additions:	Titran	t Molarity:		Digits Requ	uired: 1st.: 2nd.:	3rd.:			
	- 2+,								-
Ferrous Iron (F	-e-):					フヌ			
Equipment:	DR-850	DR-8	Range: 0 -	3.00 mg/L	Concentration:	<u> </u>	_ppm		
	Program/Module:	500nm	33		Analysis Time:	035	_		
Equipment:	IR-18C Color Whee	el	Range: 0 -	10 mg/L					
Notes:								Filtered:	
Hydrogen Sulf	ide (H₂S):		Range: 0 -	5 mg/L		~	-		
Equipment:	HS-C	Other:			Concentration:	$\mathcal{O}$	ppm		
	Exceeded 5.0 mg/L	range on colo	or chart:		Analysis Time:	1035	2		
Notes:							_		
Sulfide (S <sup>2-</sup> )									
Equipment: Cheme	trics Test Kit		Range: 0 -	10 mg/L	Concentration:		_ppm		
Range Used:	Range	Method	Concentra	tion ppm		•			
	0 to 1 ppm	K-9510			Analysis Time:		_		
	1 to 10 ppm	K-9510							
								Filtered:	
Equipment:	DR-850	DR-8	Range: 0 -	0.70 mg/L					
Program/Module	610nm	93	-	-					
Notes:									
L						·····			_

			LOW FL	_OW PU	RGE DA	<b>NTA SH</b>	EET			
PROJECT SI	re name: Mber: س/ ۲۰۶۴	NASA WFF- 112GN1612	WOD			□ <	VELL ID.: )ATE:		WFF-WC	003
Time	Water Level 🤻	Flow	рH	S. Cond.	Turb.	DO	Temp.	ORP	Salinity	Comments
(Hrs.) (F	t below TOC)	(mL/Min.)	(S.U.)	(mS/cm)	(UTN)	(mg/L)	(Celcius)	ΠV	% or ppt	
0900	25.00			Ļ			-		-	
2000	26.42	072	619	845,0	031	525	15.20	- 3/	0 C	
0908	27.11		¢, 55	0379	130	4,40	9 H SI	100-	0	
0942			6.54	0,420	450	4,10	15,56	67	000	
0916	27,24		6.50	0,460	980	3.34	15.54	-76	0	
09191			6,50	0,66x	230	3,32	15,02	-75	0,0	Sand in water
	Start	collect	geo ch	S.S.	310	1/2 cont	Drugad			
			C			С	-   			
-					*					
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#### FIELD ANALYTICAL LOG SHEET **GEOCHEMICAL PARAMETERS**

Tetra Tech NUS, Inc	D.	GEC						Page <u>l</u> of _	2
Project Site Na	ame:	NASA WF	F-WOD			Sample ID N	o.: WFFWC	D-TWG-	3
Project No.:		112GN161	2	-		Sample Loca	ition: NA	SAWFF	
Sampled By:		JBB		-		Duplicate:			
Field Analyst:		JBB		-		Blank:			
Field Form Ch	ecked as per QA	VQC Check	klist (initia	- Ils):					
SAMPLING DATA:									
Date: 12/18/20	008	Color	рН	S.C.	Temp.	Turbidity	DO	Salinity	ORP (Eh)
Time:		(Visual)	(S.U.)	(mS/cm)	(°C)	(NTU)	(mg/l)	(%)	(+/- mv)
Method: Low F	low	It brown	6,50	0,668	15,62	230	3.32	0.0	-75
SAMPLE COLLECT	TION/ANALYSIS IN	FORMATION							
ORP (Eh) (+/- n	nv)		Electrode I	Make & Moo	lel:				
			Reference	Electrode (d	circle one): S	Silver-Silver Chlori	de / Calomel	/ Hydrogen	
Dissolved Oxy	gen:						$\sim$		
Equipment: Chemet	rics Test Kit				1	Concentration:	0.5	_ppm	
Range Used:	Range	Method	Concentral	tion ppm			600		
	0 to 1 ppm	K-7510	0/]	3		Analysis Time:	439	-	
<u>×</u>	1 to 12 ppm	K-7512	1						
Equipment:	HACH Digital Titrato	or OX-DT					Analysis Time:		
Range Used:	Range	Sample Vol.	Cartridge	Multiplier		Titration Count	Multiplier	Concentration	
	1-5 mg/L	200 ml	0.200 N	0.01			<b>x</b> 0.01	= mg/L	1
	2-10 mg/L	100 ml	0.200 N	0.02			x 0.02	= mg/L	
Notes:									-
Carbon Dioxide	<u></u>								
Equipment: Chemet	rics Test Kit					Concentration:	55	ppm	
Range Used:	Range	Method	Concentrat	tion ppm					
<u>×</u>	10 to 100 ppm	K-1910	55	5		Analysis Time:	<u>935</u>	_	
	100 to 1000 ppm	K-1920							
	250 to 2500 ppm	K-1925	t						
Equipment:	HACH Digital Titrato	or CA-DT							
Range Used:	Range	Sample Vol.	Cartridge	Multiplier		Titration Count		Concentration	
	10-50 mg/L	200 ml	0.3636 N	0,1		·	<b>x</b> 0.1	= mg/L	
	20-100 mg/L	100 ml	0.3636 N	0.2			x 0.2	= mg/L	
	100-400 mg/L	200 ml	3.636 N	1.0		<u></u>	<b>x</b> 1.0	= mg/L	
	200-1000 mg/L	100 ml	3.636 N	2.0			<b>x</b> 2.0	= mg/L	
Standard Additions:	L Titrant	Molarity:		Digits Requ	uired: 1st.:	2nd.:	3rd.:		
Notes:									
Hydrogen, diss	olved								
Equipment: Bubble	surp sampling field	method							
	Start stripper at	(ti 	me) ima)						
	Total stripper at	(t	ime)						
	Pumo rate	millilitere	minute						
	r ump rais	minuters	21111112LC						



Tetra Tech NUS, Ir	ю.	GEU					Page	<u>2 of -</u>	2
Project Site N	ame:	NASA WF	F-WOD		Sample ID No	s.: WFF	-000	,-+W	63
Project No.:		112GN161	2	•	Sample Loca	tion: NAS	SA h	JFF	
Sampled By:		JBB		•	Duplicate:				
Field Analyst:		JBB			Blank:				
Alkalinity:						h.			
Equipment: Cheme	etrics Test Kit				Concentration:	148	_ppm		
Range Used:	Range	Method	Concentral	tion ppm		<b>^</b>			
	10 to 100 ppm	K-9810			Analysis Time:	<u> 433</u>	-		
	50 to 500 ppm	K-9815	140						
	100 to 1000 ppm	K-9820	<u> </u>					Filtered:	
Equipment:	HACH Digital Titrat	or AL-DT							
Range Used:	Range	Sample Vol.	Cartridge	Multiplier	Titration Count	Multiplier	Conce	ntration	
	10-40 mg/L	100 ml	0.1600 N	0.1	<u> </u>	x 0.1	=	mg/L	
	40-160 mg/L	25 ml	0.1600 N	0.4	&	<b>x</b> 0.4	=	mg/L	
	100-400 mg/L	100 ml	1.600 N	1.0	&	<b>x</b> 1.0	=	mg/L	
	200-800 mg/L	50 ml	1.600 N	2.0	&	x 2.0	=	mg/L	
	500-2000 mg/L	20 ml	1.600 N	5.0	&	x 5.0	=	mg/L	
l	1000-4000 mg/L	10 ml	1.600 N	10.0	&	<b>X</b> 10.0	=	mg/L	
	Parameter:	Hydroxide	Carb	onate	Bicarbonate	]			
Standard Additions Notes:	: D Titran	t Molarity:	I	Digits Requi	ired: 1st.: 2nd.:	1 3rd.:			
Ferrous Iron (	Fe <sup>2+</sup> ):					$\gamma c$			
Equipment:	DR-850	DR-8	Range: 0 -	3.00 mg/L	Concentration:		_ppm		
	Program/Module:	500nm	33			477			
Equipment:	IR-18C Color Whee	el	Range: 0 -	10 mg/L.	Analysis Time:		-		
Notes:								Filtered:	
Hydrogen Sul	fide (H <sub>2</sub> S):		Range: 0 -	5 mg/L		$\frown$			
Equipment:	HS-C	Other:			Concentration:	$\underline{\bigcirc}$	ppm		
	Exceeded 5.0 mg/l	range on colo	or chart:		Analysis Time:	426	-		
Notes:				·					
Sulfide (S <sup>2*</sup> ):					_				
Equipment: Cheme	etrics Test Kit		Range: 0 -	10 mg/L	Concentration:		_ppm		
Range Used:	Range	Method	Concentrat	tion ppm					
	0 to 1 ppm	K-9510			Analysis Time:		-		
	1 to 10 ppm	K-9510	1						
								Filtered:	L
Equipment:	DR-850	DR-8	Range: 0 -	0.70 mg/L					
Program/Module:	610nm	93							
Notes:								-	

SIGNATU													4	0611	STI	0211	5/1/	(Hrs.)	Time	
RE(S):												-		27 21	28.22	28 32 28 32	25.57	(Ft. below TOC)	Water Level	
A				•													300	(mL/Min.)	Flow	
ע ק														5.48	2.50	5.61	69:5	(S.U.)	pH	
														6.317	4.267	0.255	0.321	(mS/cm)	S. Cond.	
	,													//	12-	12-	+ 30	(NTU)	Turb.	
														6.85	960	0.87	5×-1	(mg/L)	DO	
														44:71	16.37	16.36	16.20	(Celcius)	Temp.	
														-40	- 39	11-41	<u>-S</u> 0	mV	ORP	
														0,0	0 0	0. 0	0.0	% or ppt	Salinity	
PAGE (OF)													¢	1.25 sal	1 cal		clear		Comments	

TD - 32.90' 1.2 Jul Ival

LOW FLOW PURGE DATA SHEET

WELL ID.: DATE:



PROJECT SITE NAME: PROJECT NUMBER:



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Tetra Tech NUS, Inc	с.				-			Page <u> </u> of _	2
Project Site Na	ame:	NASA WF	F-WOD	_		Sample ID N	0.: WFF-W	00-15GW7	3
Project No.:		112GN161	2	•		Sample Loca	ition: 15Gu	57	
Sampled By:	500			•		Duplicate:			
Field Analyst:	EN			•		Blank:	$\overline{\Box}$		ļ
Field Form Ch	ecked as per QA	VQC Check	dist (initia	ls):		]			1
SAMPLING DATA									
Date: 12/18/0	8	Color	рН	s.c.	Temp.	Turbidity	БО	Salinity	ORP (Eh)
Time:		(Visual)	(S.U.)	(mS/cm)	(°C)	(NTU)	(mg/l)	(%)	(+/- mv)
Method: 10	flow	Clear	5.48	0.317	16.44	11	0.85	0.0	-40
SAMPLE COLLEC	TION/ANALYSIS IN	FORMATION							
ORP (Eh) (+/- n	nv) _4		Electrode I	Make & Mor	del: HoRz,	BA U-22			
	76	ر 	Reference	Electrode (	circle one): S	Silver-Silver Chlori	ide / Calomel	/ Hydrogen	
Dissolved Oxy	gen:								
Equipment: Chemet	rics Test Kit				_	Concentration:	0.7	ppm	
Range Used:	Range	Method	Concentrat	tion ppm					
	0 to 1 ppm	K-7510	0.7	7		Analysis Time:	(135		
	1 to 12 ppm	K-7512			]				
Equipment:	HACH Digital Titrato	or OX-DT			_		Analysis Time:		_
Range Used:	Range	Sample Vol.	Cartridge	Multiplier		Titration Count	Multiplier	Concentration	
	1-5 mg/L	200 ml	0.200 N	0.01			x 0.01	= mg/L	
	2-10 mg/L	100 ml	0.200 N	0.02			<b>x</b> 0.02	= mg/L	
Notes:									
Carbon Dioxid	e:						<u></u>		
Equipment: Chemet	rics Test Kit					Concentration:	170	_ppm	
Range Used:	Range	Method	Concentrat	tion ppm					
	10 to 100 ppm	K-1910				Analysis Time:	1144	_	
<u> </u>	100 to 1000 ppm	K-1920	170						
	250 to 2500 ppm	K-1925		-					
Equipment:	HACH Digital Titrato	or CA-DT							
Range Used:	Range	Sample Vol.	Cartridge	Multiplier		Titration Count		Concentration	
	10-50 mg/L	200 ml	0.3636 N	0.1			x 0.1	= mg/L	]
	20-100 mg/L	100 ml	0.3636 N	0.2	]		x 0.2	= mg/L	
	100-400 mg/L	200 ml	3.636 N	1.0	]		<b>x</b> 1.0	= mg/L	
	200-1000 mg/L	100 ml	3.636 N	2.0	]		x 2.0	= mg/L	
Standard Additions:	Titrant	Molarity:		Digits Req	uired: 1st.:	2nd.:	3rd.:		
Notes:									
Hydrogen, diss	solved								
Equipment: Bubble	strip sampling field	method							
	Start stripper at	(t)r	me)						
	End stripper at	(1)	ime)						
	Total stripper time _		fasta da						
	Pump rate	milliliters	;/minute						



Tetra	Tech	NUS,	Inc.
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Tetra Tech NUS, Ir	IC.						Page	<u>of</u>	<u> </u>
Project Site N	ame:	NASA WF	F-WOD	-	Sample ID No	).: WFF - L	<u>၂</u> ၂ ၂	's <i>G</i> w'	<u></u> -S
Project No.:		112GN161	2	-	Sample Loca	<del>îصب :tion</del>	) IS	<u>GW7</u>	
Sampled By:	٤ω			-	Duplicate:				
Field Analyst:	Ew				Blank:				
Alkalinity:									
Equipment: Cheme	trics Test Kit	1	T	1	Concentration:	225	_ppm		
Range Used:	Range	Method	Concentra	tion ppm		1120			
	10 to 100 ppm	K-9810			Analysis Time:	00	-		
	50 to 500 ppm	K-9815	225						[]
	100 to 1000 ppm	K-9820						Filtered:	
Equipment:	HACH Digital Titrat	or AL-DT							
Range Used:	Range	Sample Vol.	Cartridge	Multiplier	Titration Count	Multiplier	Conce	entration	
	10-40 mg/L	100 ml	0.1600 N	0.1	&	x 0.1	=	.mg/L	
	40-160 mg/L	25 ml	0.1600 N	0.4	<u> </u>	x 0.4	=	mg/L	
	100-400 mg/L	100 ml	1.600 N	1.0	&	x 1.0	=	mg/L	
	200-800 mg/L	50 ml	1.600 N	2.0	&	<b>x</b> 2.0	=	mg/L	
	500-2000 mg/L	20 ml	1.600 N	5.0	<u> </u>	<b>x</b> 5.0	=	mg/L	
	1000-4000 mg/L	10 ml	1.600 N	10.0		x 10.0	=	mg/L	
			1						
	Parameter:	Hydroxide	Carb	onate	Bicarbonate				
	Relationship:								
Standard Additions	: 🗌 Titran	t Molarity:		Digits Requ	ired: 1st.: 2nd.:	3rd.:			
Notes:									
Ferrous Iron (I	Fe <sup>2+</sup> ):								
Equipment:	DR-850	DR-8	Range: 0 -	3.00 mg/L	Concentration:	(,6	ppm		
	Program/Module:	500nm	33						
					Analysis Time:	(150	_		
Equipment:	IR-18C Color Whee	) J	Range: 0 -	10 mg/L					
Notes:								Filtered:	
Hydrogen Sulf	ide (H <sub>2</sub> S):		Range: 0 -	5 mg/L					
Equipment:	HS-C	Other:	-	-	Concentration:	0.0	nnm		
	Excooded 5.0 mg/l	rango on colo		$\square$	Analysis Timer	140			
Notes	Exceeded 5.0 mg/L	. range on cold	n onarc.		Anaiysis Time.	<u>u 10</u>	-		
Culture (C <sup>2</sup> )				······	<u></u>				
Suinde (S):	h-' T 1/1		D	40	<b>A</b>				
Equipment: Cheme		·····	Range: 0 -	10 mg/L	Concentration:		_ppm		
Range Used:	Range	Method	Concentra	tion ppm					
	0 to 1 ppm	K-9510			Analysis Time:		_		
	1 to 10 ppm	K-9510							_
								Filtered:	
Equipment:	DR-850	DR-8	Range: 0 -	0.70 mg/L					
Program/Module:	610nm	93							
Notes:									

				$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	vel         Flow         pH         S. Cond.         Turb.         DO         Temp.           IOC)         (mL/Min.)         (S.U.)         (mSicm)         (NTU)         (mgl.)         (Celciu           320         5:55         6.093         32         14         13:60         14:87         14:52           1111         1126         0.093         17         13:60         14:25         14:25         14:25         14:25         14:25         14:25         14:25         14:25         14:25         14:25         14:25         14:25         14:25         14:25         14:25         14:25         14:25         14:25         14:25         14:25         14:25         14:25         14:25         14:25         14:25         14:25         14:25         14:25         14:25         14:25         14:25         14:25         14:25         14:25         14:25         14:25         14:25         14:25         14:25         14:25         14:25         14:25         14:25         14:25         14:25         14:25         14:25         14:25         14:25         14:25         14:25         14:25         14:25         14:25         14:25         14:25         14:25         14:25         14:25 <td< th=""></td<>
				5.55 0.093 32 4.89 16.36 9.86 0.093 17 13.79 16.25 9.86 0.093 17 13.79 16.25 9.86 0.093 17 13.79 16.29 1.86 0.093 17 13.79 16.29 1.86 0.093 17 13.79 16.29 1.86 0.093 17 13.79 16.29 1.86 0.093 17 13.79 16.26 1.86 0.093 16.26 1.86 0.094 16.26 1.86	pH         S. Cond.         Turb.         DO         Temp.           I))         (SU))         (mS/cm)         (NTU)         (mg/L)         (Ceiciu           S:SS         0093         32         /487         /634           Y.86         0093         17         /3.79         /625           Y.86         0093         17         /3.79         /425           Y.86         0093         17         /3.79         /429           Y.86         0093         17         /3.79         /429           Y.86         0093         14         1379         /429           Y.86         0093         14         1379         /429           Y.86         0093         14         14         14           Y.87         1429         1429         1429         1429           Y.86         0093         14         1429         1429         1429           Y.87         1429         1429         1429         1429         1429         1429         1429         1429         1429         1429         1429         1429         1429         1429         1429         14.
				0     5.55     0.093     32     12.89     16.36       11     186     0.093     17     13.79     16.25       11     186     0.093     17     13.79     16.25       11     186     0.093     17     13.79     16.25       11     186     18     18     18     18       11     186     17     13.79     16.25       11     18     18     18     18       11     18     18     18     18       11     18     17     13.79     16.25       11     18     18     18     18       11     18     18     18     18       12     18     18     18     18       13     18     18     18     18       14     18     18     18     18       15     18     18     18     18       16     18     18     18     18       17     18     18     18     18       18     18     18     18     18       18     18     18     18     18       18     18     18     18     18	Iow         pH         S. Cond.         Turb.         DO         Temp           Min.)         (SU)         (mS/cm)         (MTU)         (mg/L)         (Celcu           2         555         5093         32         489         %34           4         ½.86         0093         17         1369         %34           1         ½.86         0093         17         1379         1425           1         ½.86         0093         17         1379         1425           1         1         1         1         1         1         1           1         1         1         1         1         1         1         1           1         1         1         1         1         1         1         1         1           1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1
				$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	Flow         pH         S. Cond.         Turb.         DO         Temp           nL/Min.)         (S.U.)         (mS/cm)         (MTU)         (mg/L)         (Cdcl)           arr         ½%         0.093         32         32         4.87         ½.32           arr         ½%         0.093         17         3.79         ½.52         2.003         12         1.4         1.3.99         14.25         1.52         1.52         1.52         1.52         1.52         1.52         1.52         1.52         1.52         1.52         1.52         1.52         1.52         1.52         1.52         1.52         1.52         1.52         1.52         1.52         1.52         1.52         1.52         1.52         1.52         1.52         1.52         1.52         1.52         1.52         1.52         1.52         1.52         1.52         1.52         1.52         1.52         1.52         1.52         1.52         1.52         1.52         1.52         1.52         1.52         1.52         1.52         1.52         1.52         1.52         1.52         1.52         1.52         1.52         1.52         1.52         1.52         1.52         1.52         1.
				$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	Flow         pH         S. Cond.         Turb.         DO         Temp           mL/Min.)         (S.U.)         (mS/cm)         (NTU)         (mg/L)         (Celcling)           30 <sup>-0</sup> 5.55         0.093         32.         '4.86         0.0972         16         15.6-0         /4.36           ''.'.'         Y.86         0.093         17         '3.79         '4.25           ''.'.'         Y.86         0.093         17         '3.79         '4.25           ''.'.'         Y.86         0.093         17         '3.79         '4.25           ''.'.'         Y.86         0.093         17         '3.79         '4.2           ''.'.'         Y.86         0.093         17         '3.79         '4.2           ''.'.'         Y.86         0.093         ''.'.'         ''.'.'.'         ''.'.'.'.'         ''.'.'.'.'.'.'.'.'.'.'.'.'.'.'.'.'.'.'
				300 5.55 0.093 32 1.89 16.36 11 11 1.86 0.093 17 13.79 16.25 12 12 13.79 16.25 14 1.86 0.093 17 13.79 16.25 14 13.79 16.25 14 13.79 16.25 14 13.60 16.25 14 13.79 16.25 14 14 16.25 14 14 16.25 14 14 16.25 14 14 16.25 14 14 16.25 14 14 16.25 14 16 16.25 14	Flow         pH         S. Cond.         Turb.         DO         Temp           3000         5.55         3.093         32.         4.89         (Geloi)           """"         7.86         0.092         16         13.60         14.89         7.53           """"         7.86         0.093         17         73.79         7.53         7.53         7.53         7.53         7.53         7.53         7.53         7.53         7.53         7.53         7.53         7.53         7.53         7.53         7.53         7.53         7.53         7.53         7.53         7.53         7.53         7.53         7.53         7.53         7.53         7.53         7.53         7.53         7.53         7.53         7.53         7.53         7.53         7.53         7.53         7.53         7.53         7.53         7.53         7.53         7.53         7.53         7.53         7.53         7.53         7.53         7.53         7.53         7.53         7.53         7.53         7.53         7.53         7.53         7.53         7.53         7.53         7.53         7.53         7.53         7.53         7.53         7.53         7.53         7.53         7.5
				$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	Flow         pH         S. Cond.         Turb.         DO         Temp           (mL.Min.)         (S.U.)         (mS/cm)         (NTU)         (mg/L)         (Celch           3000         5:55         0.093         33.         /4.89         /6.36           "."         ½.86         0.093         17.         /3.79         /6.25           "."         ½.86         0.093         17.         /3.79         /6.25           "."         ½.86         0.093         17.         /3.79         /6.25           "."         ½.86         0.093         17.         /3.79         /6.25
				300 5.55 0.093 32 1.89 16.36 11 11 1.86 0.093 17 13.79 16.25 12 11 1.86 0.093 17 13.79 16.25 14 1.8.6 1.8.6 1.8.6 1.6.25 14 1.8.6 1.8.6 1.8.6 1.6.25 14 1.8.6 1.8.6 1.8.6 1.8.5 1.6.25 14 1.8.6 1.8.6 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8.5 1.8	Flow         pH         S. Cond.         Turb.         DO         Temp           (mL/Min)         (SU)         (mS/cm)         (NTU)         (mg/L)         (Celoti           3000         5:55         0.093         32         32         4.89         /6.36           """"         ½86         0.093         17         /3.79         /6.25         /6.25           """         ½.86         0.093         17         /3.79         /6.25         /6.25           """         ½.86         0.093         17         /3.79         /6.25         /6.25           """         ½.86         0.093         17         /3.79         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25
				$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	Flow         pH         S. Cond.         Turb.         DO         Temp           (mL/Min.)         (S. U.)         (mS/cm)         (NTU)         (mg/L)         (ceiciu           3000         5:55         6.093         33.         7.89         /6.32           "."."         ½.86         0.093         17.         /3.79         /6.25           "."."         ½.86         0.093         17.         /3.79         /6.25           "."."         ½.86         0.093         17.         /3.79         /6.25           "."."         ½.86         0.093         17.         /3.79         /6.25
				$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	Flow         pH         S. Cond.         Turb.         DO         Temp.           (mL/Min.)         (S.U.)         (mS/cm)         (NTU)         (mg/L)         (Celciu)           3000         5:55         6.093         32         32         /4.89         /6.326           "."         '!.86         0.093         17         /3.79         /6.25         /6.25           "."         '!.86         0.093         17         /3.79         /6.25         /6.25           "."         '!.86         0.093         17         /3.79         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25
				$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	Flow         pH         S. Cond.         Turb.         DO         Temp.           (mL/Min.)         (S.U.)         (mS/cm)         (NTU)         (mg/L)         (Celciu)           3000         5.55         0.093         32         32         4.89         /6.36           ". "."         ½.86         0.092         16         /3.79         /6.25         /6.25           ". "."         ½.86         0.093         17         /3.79         /6.25         /6.25           ". "."         ½.86         0.093         17         /3.79         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25         /6.25 </td
				$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	Flow         pH         S. Cond.         Turb.         DO         Temp           1         (mL/Min)         (S.U.)         (mS/cm)         (NTU)         (mg/L)         (Celciu)           30 <sup>ro</sup> 5.5 <sup>s</sup> 0.093         32.         /4.89         /6.36           "."."         ½.86         0.093         17.         /3.79         /6.25           "."."         ½.86         0.093         17.         /3.79         /6.26           ".".".         ½.86         0.093         17.         /3.79         /6.29           "."
				300 5:55 0.093 32 12.89 16.36 11 11 1.86 0.092 16 13.60 16.25 11 11 1.86 0.093 17 13.79 16.25 14 13.79 16.25 14 13.79 16.25 14 13.79 16.25 14 13.79 16.25	I     Flow     pH     S. Cond.     Turb.     DO     Temp       G)     (mL/Min.)     (S.U.)     (mS/cm)     (NTU)     (mg/L)     (Celciu)       30 <sup>-10</sup> 5 <sup>-15</sup> 5.093     32     32     4.89     /6.36       ""     '!     ½86     0.0972     16     /3.60     /6.25       ""     '!     ½.86     0.093     17     /3.79     /6.25       ""     '!     ½.86     0.093     17     /3.79     /6.25       ""     '!     ½.86     0.093     17     /3.79     /6.26       ""     '!     ½.86     0.093     17     /3.79     /6.27       ""     '!     '!     '!     '!     '!     '!
				300 5.55 0.093 32 12.89 16.36 """ 1,86 0.092 16 13.60 16.25 "1,11 1.86 0.093 17 13.79 16.29 16 13.60 16.25	Vel         Flow         pH         S. Cond.         Turb.         DO         Temp.           IOC)         (mL/Min.)         (S.U.)         (mS/cm)         (NTU)         (mg/L)         (Celciu)           30-0         5.55         6.093         32.         '4.89         '6.34           "."."         ½.86         0.097.2         16         '3.79         '6.25           "."."         ½.86         0.093         17.         '3.79         '6.29           "."."         ½.86         0.093         17.         '3.79         '6.29           "."."         ½.86         0.093         1.7         '3.79         '6.29
				300 5.55 0.093 32 12.89 16.36 11 11 4.86 0.092 16 13.60 16.25 11 1.29 16.25 12 12 13.79 16.25	Vel         Flow         pH         S. Cond.         Turb.         DO         Temp.           IOC)         (mL/Min.)         (S.U.)         (mS/cm)         (NTU)         (mg/L)         (Celciu)           300         5.55         0.093         32         4.89         %.34           """         4.86         0.093         14         13.60         /6.25           """         4.86         0.093         17         /3.79         /4.29
			·	- 300 5.55 0.093 32 12.89 16.36 """ 4.86 0.092 16 13.60 16.25 """ 4.86 0.093 17 13.79 16.29	Vel         Flow         pH         S. Cond.         Turb.         DO         Temp           IOC)         (mL/Min.)         (S.U.)         (mS/cm)         (NTU)         (mg/L)         (Celciu)           30-0         5.55         6.093         32         4.89         /6.36           """         ½.86         0.093         14         /3.79         /6.25           """         ½.86         0.093         17         /3.79         /6.29
				300 5.55 0.093 32 12.89 16.36 "" 4.86 0.092 16 13.60 16.25	vel         Flow         pH         S. Cond.         Turb.         DO         Temp.           FOC)         (mL/Min.)         (S.U.)         (mS/cm)         (NTU)         (mg/L)         (Celciu)           30-0         5.55         6.093         32.         4.89         /6.34           "."         ½.86         0.092         16         /3.60         /6.25
" " " " " " " " " " " " " " " " " " "	" " ¥.86 0.093 17 13.79 14.29	" " 4.86 0.093 17 13.79 14.29	" " ¥.86 0.093 17 13.79 14.29	300 5:55 0.093 32 12.89 16.36	vel Flow pH S. Cond. Turb. DO Temp. TOC) (mL/Min.) (S.U.) (mS/cm) (NTU) (mg/L) (Celciu 300 ジェック クロック
n. n.       Y.86       O.092       I6       I3.60       /6.25         n. n.       Y.86       0.093       I7       J3.79       /6.29         n. n.       Y.86       0.093       I7       J3.79       /6.29         n. n.       Y.86       0.093       I7       J3.79       /6.29         n.       I.1       Y.86       I.1       I.1       J.1       J.1         n.       I.1       Y.86       I.1       I.1       J.1       J.1       J.1         n.       I.1       I.2       I.1       I.1       J.1       J.1	"""       Y.86       0.092       16       13.60       16.25         """       Y.86       0.093       17       13.79       16.29	""" 4.86 0.092 16 13.60 16.25 """ 1 4.86 0.093 17 13.79 14.29	"" 4.86 0.092 16 13.60 16.25 "1 1 4.86 0.093 17 13.79 16.29 14.29		vel Flow pH S. Cond. Turb. DO Temp. FOC) (mL/Min.) (S.U.) (mS/cm) (NTU) (mg/L) (Celciu
IOC)       (mL/Min.)       (S.U.)       (mS/cm)       (NTU)       (mg/L)       (Celciu         300       5:55       0.093       32       7.89       /6.34         """       4:86       0.092       16       /3.60       /6.34         """       4:86       0.093       17       /3.79       /6.25         """       4:86       0.093       17       /3.79       /6.25         """       4:86       0.093       17       /3.79       /6.25         """       4:86       0.093       17       /3.79       /6.25         """       4:86       0.093       17       /3.79       /6.25         """       4:86       0.093       17       /3.79       /6.25         """       4:86       0.093       17       /3.79       /6.25         """       4:86       0.093       14       14       14         """       4:86       0.093       17       13.79       /6.25         """       14       14       14       14       14       14         """       14       15       14       14       14       14         """       15	TOC)         (mL/Min.)         (S.U.)         (mS/cm)         (NTU)         (mg/L)         (Celciu           3cro         5.55         5.093         32         4.89         %.34           ".".         ½.86         0.092         16         /3.60         /4.25           ".".         ½.86         0.093         17         /3.79         /4.25           ".".         ½.86         0.093         17         /3.79         /4.25           ".".         ½.86         0.093         17         /3.79         /4.25           ".".         ½.86         0.093         17         /3.79         /4.25	TOC)       (mL/Min.)       (S.U.)       (mS/cm)       (NTU)       (mg/L)       (Celciu         300       5.55       0.093       32       7.87       /6.34         """       ½.86       0.092       16       13.60       /6.32         """       ½.86       0.093       17       /3.79       /6.25         """       ½.86       0.093       17       /3.79       /6.25         """       ½.86       0.093       17       /3.79       /6.25         """       ½.86       0.093       17       /3.79       /6.25         """       ½.86       0.093       17       /3.79       /6.25	TOC)         (mL/Min)         (S.U.)         (mS/cm)         (NTU)         (mg/L)         (Celciu           300         5.55         0.093         32.         4.89         /6.36           ".".         7.86         0.092         16         13.60         /6.25           ".".         7.86         0.093         17         /3.79         /6.25           ".".         7.86         0.093         17         /3.79         /6.25           ".".         7.86         0.093         17         /3.79         /6.25		

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LOW FLOW PURGE DATA SHEET

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Tetra Tech NUS, Inc	o.							Page _/ of _	<u> </u>
Project Site Na	ame:	NASA WF	F-WOD	_		Sample ID No	.: WFF-16	MW3R-3	
Project No.:		112GN161	2			Sample Loca	tion: IGM	W3R	
Sampled By:	Guil	নিচ				Duplicate:			
Field Analyst:	Engl.	32				Blank:			
Field Form Ch	ecked as per QA	VOC Check	dist (initia	ls):		7	ليست		
SAMPLING DATA									
Date: 12/18 08		Color	nH	s.c.	Temp.	Turbidity	по	Salinity	ORP (Eh)
Timer	·	(Visual)	(8.11.)	(mS/cm)	(°C)	(NTL)	(mo/{)	(%)	(+/- my)
Method: Low -A	1,	Clear	4.86	0.093	16.29	17	13.79	0.0	194
SAMPLE COLLECT	TION/ANALYSIS INT	FORMATION:						L	
ORP (Eh) (+/- m	nv) ,		Electrode I	Make & Mor	del: Horis	ha U-22			
· · · ·	194		Reference	Electrode (	circle one): S	Silver-Silver Chlori	de / Calomel	/ Hydrogen	
Dissolved Oxy	gen:								
Equipment: Chemet	rics Test Kit		<u>.</u>		-	Concentration:	7	_ppm	
Range Used:	Range	Method	Concentrat	lion ppm					
	0 to 1 ppm	K-7510	<u> </u>			Analysis Time:	12.30	_	
	1 to 12 ppm	K-7512	7		J				
Equipment:	HACH Digital Titrato	or OX-DT					Analysis Time:		_
Range Used:	Range	Sample Vol.	Cartridge	Multiplier	]	Titration Count	Multiplier	Concentration	1
	1-5 mg/L	200 ml	0.200 N	0.01			x 0.01	= mg/L	
	2-10 mg/L	100 ml	0.200 N	0.02	]		x 0.02	= mg/L	
Notes:									
Carbon Dioxid	e:						, ຄ		
Equipment: Chemet	rics Test Kit					Concentration:	[0	_ppm	
Range Used:	Range	Method	Concentral	tion ppm	]				
<u>X</u>	10 to 100 ppm	K-1910	18			Analysis Time:	1232	_	
	100 to 1000 ppm	K-1920							
	250 to 2500 ppm	K-1925	<u> </u>						
Equipment:	HACH Digital Titrato	or CA-DT							
Range Used:	Range	Sample Vol.	Cartridge	Multiplier	1	Titration Count	[	Concentration	]
	10-50 mg/L	200 ml	0.3636 N	0.1	1		x 0.1	= mg/L	1
	20-100 mg/L	100 ml	0.3636 N	0.2	1		x 0.2	= mg/L	1
	100-400 mg/L	200 ml	3.636 N	1.0			x 1.0	= mg/L	1
	200-1000 mg/L	100 ml	3.636 N	2.0	]		<b>x</b> 2.0	= mg/L	
Standard Additions:	Titrant	t Molarity:		Digits Req	uired: 1st.:	2nd.:	3rd.:		
Notes:									
Hydrogen, diss	solved								
Equipment: Bubble	e strip sampling field	method							
	Start stripper at	(ti	ime)						
	End stripper at	(t	lime)						
	Total stripper time _	. <u> </u>							
	Pump rate	milliliters	s/minute						



Tetra Tech NUS, In	IC.						Page	<u>2 of 2</u>
Project Site N	ame:	NASA WF	F-WOD		Sample ID N	o.: WFF~(	6MW	3R-3
Project No.:		112GN161	2		Sample Loca	ition: 161	ЛWЭ	R.
Sampled By:	EW/FB				Duplicate:			
Field Analyst:	2w/3D				Blank:			
Alkalinity:								
Equipment: Cheme	trics Test Kit				Concentration:	32	_ppm	
Range Used:	Range	Method	Concentratio	on ppm				
	10 to 100 ppm	K-9810	32		Analysis Time:	1234	_	
	50 to 500 ppm	K-9815	ļ <u></u>					_
	100 to 1000 ppm	K-9820						Filtered:
Equipment:	HACH Digital Titrat	or AL-DT						
Range Used:	Range	Sample Vol.	Cartridge	Multiplier	Titration Count	Multiplier	Conc	entration
	10-40 mg/L	100 ml	0.1600 N	0.1	&	<b>x</b> 0.1	=	mg/L
	40-160 mg/L	25 ml	0.1600 N	0.4	&	<b>x</b> 0.4	Ξ	mg/L.
	100-400 mg/L	100 ml	1.600 N	1.0	&	x 1.0	=	mg/L
	200-800 mg/L	50 ml	1.600 N	2.0	&	x 2.0	=	mg/L
	500-2000 mg/L	20 ml	1.600 N	5.0	&	x 5.0	=	mg/L
	1000-4000 mg/L	10 ml	1.600 N	10.0	&	<b>x</b> 10.0	=	mg/L
	Parameter:	Hudrovido	Carbo	inate	Bicarbonata	1		
	Relationship:	Tiyaroxiac	00100		Discroonato	1		
Standard Additions	: D Titrani	t Molarity:	1	Digits Requi	ired: 1st.: 2nd.:	3rd.:		
Notes:								
Ferrous Iron (I	Fe <sup>2+</sup> ):							
Equipment:	DR-850	DR-8	Range: 0 - 3	3.00 mg/L	Concentration:	0.2	_ppm	
	Program/Module:	500nm	33				_	
					Analysis Time:	1237	_	
Equipment:	IR-18C Color Whee	el	Range: 0 - 1	10 mg/L			_	
Notes:								Filtered:
Hydrogen Sulf	fide (H <sub>2</sub> S):		Range: 0 - 5	5 mg/L				
Equipment:	HS-C	Other:			Concentration:	6.0	ppm	
	Exceeded 5.0 mg/L	range on colo	or chart:		Analysis Time:	1240		
Notes:								
Sulfide (S <sup>2-</sup> ):								
Equipment: Cheme	trics Test Kit		Range: 0 - 1	10 mg/L	Concentration:		_ppm	
Range Used:	Range	Method	Concentrati	on ppm				
	0 to 1 ppm	K-9510			Analysis Time:		_	
	1 to 10 ppm	K-9510						
								Filtered:
Equipment:	DR-850	DR-8	Range: 0 - (	0.70 mg/L				
Program/Module:	610nm	93						
Notes:								

Æ	Tetra Tech NUS, Ir	1C.	GROU	INDWA	TER SA	MPLE LC	G SHEE	T Page	of
Project Site Project No.: ] Domes ] Monitor [] Other V [] QA Sat	Name: stic Well Data ring Well Data Well Type: mple Type:	NASA WFF- 112GN1612	WOD			Sample Sample Sample C.O.C. Type of Structure Low	ID No.: $ u $ Location: d By: No.: Sample: Concentra Concentra	-F-WD() 	TW1-4 W1
SAMPLING DAT	TA.	Color	nH	SC	Temn	Turbidity	DO	Salinity	Other
Time: 132 Method: Lo	o no flore	(Visual)	(S.U.) 4. 43	(mS/cm)	(°C) (3.9	(NTU) 764	(mg/l) 0.89	(%)	ORP 13
Date: \	tl09	Volume	рН	s.c.	Temp.	Turbidity	DO	Salinity	Other
Method: low Monitor Reading Well Casing Diau Type: 1.5 ''	ン <u>Hoい</u> (ppm): meter & Material NC	<u>51e</u>	100	flui	pize	105-			
Total Well Depth Static Water Lev	n (TD): 30 vel (WL): 22								
One Casing Volu Start Purge (hrs)	ume(gal/L): 0,73/yza ): 1225								
End Purge (hrs): Total Purge Time	: 1320 e (min): 55								
Total Vol. Purge	d (gal/L): ۲۷۹مما ECTION INFORMA	TION				 			
TEL	VOC SVOC		(+1C)	<u>L</u>	(3) $(4)$	<u>OML</u> VO L Amber	<u>A vials</u>	• 	
	Metals escal Meta	Q,	HNO	) <sub>3</sub>	1	25 mL 1	æly		<u>」</u> レ
		······					····		
OBSERVATION	SUNOTES								
OBSERVATION	<u>GUNCES</u>								
Circle if Applic	able					Signature(s	5):		
MS/MSD	Duplicate ID No.	:				<u> </u>	<u> </u>		$\geq$

PROJECT S	ITE NAME:	NASA W	FF WOD				WELL ID.:	WF/=	MOD - Tw	51-4
	IOMBER:	11 AGN	6						مليدار	
Time	Water Level	Flow	рH	S. Cond.	Turb.	Do	Temp.	ORP	Salinity	Comments
(Hrs.)	(Ft. below TOC)	(mL/Min.)	(S.U.)	(mS/cm)	(NTU)	(mg/L)	(Celcius)	mV	% or ppt	
1225	22,50	220	4.78	41.0	162	1.22	14,3	90	0,0	
1230	23.92	c5 /	4.71	0.17	495	1.16	1%7	9 2 9	0,0	
1235	25,75	asi	4.72	810	292	1.13	9.41	28	0,0	
1240	26.18	150	4,75	0,18	510	1.14	14.8	67	0,0	
1245		150	492	0,18	238	1.19	14:7	Ýc	0.0	
1253	いたって	s loutel rate	4,95	5.23	229	6.96	13,7	24	o ò	
1302	36.00		4,93	Se'O	492	0,3Ĩ	13,9	Ŵ	0,0	
1320	S	54 5	anding	J/4	aal Dure	e 				
	•			-	С - С					
	st w/o ris	20								
SIGNATURI	E(S):	h	N	I						PAGEOF

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LOW FLOW PURGE DATA SHEET



### FIELD ANALYTICAL LOG SHEET **GEOCHEMICAL PARAMETERS**

Tetra Tech NUS, Inc	c.	GLC						Page / of	?
Project Site Na	ame: NASA W	FF WO	D			Sample ID N	D.: WFF -	WOD-TC	21-4
Project No.: [	12GNILO12		-	-		Sample Loca	tion:		· ·
Sampled By:	EW			•		Duplicate:			
Field Analyst:	Jacob-Birkett	こう		•		Blank:	$\overline{\square}$		
Field Form Ch	ecked as per QA	VQC Check	dist (initia	ls):		]			
SAMPLING DATA									
Date: 11409		Color	рн	s.c.	Temp.	Turbidity	DO	Salinity	ORP (Eh)
Time: 1320		(Visual)	(S.U.)	(mS/cm)	(°C)	(NTU)	(mg/l)	(%)	(+/- mv)
Method: (au	flow	e loudy	4.93	0,25	13.9	764	0.89	0.0	13
SAMPLE COLLEC	TION/ANALYSIS IN	FORMATION							
ORP (Eh) (+/- n	<sup>nv)</sup> /3		Electrode N	Make & Moo	lel: Horib	a U-22			
	/-		Reference	Electrode (	circle one): S	Silver-Silver Chlori	de / Calomel	/ Hydrogen	
Dissolved Oxy	gen:						10		
Equipment: Chemet	rics Test Kit				_	Concentration:		ppm	
Range Used:	Range	Method	Concentrat	tion ppm			(2.2.2.		
	0 to 1 ppm	K-7510				Analysis Time:	1330	-	
	1 to 12 ppm	K-7512	1.	0					
<b>-</b>							A		
Equipment:			1	r	1		Analysis Time:		-
Range Used:	Range	Sample Vol.	Cartridge	Multiplier		Titration Count	Multiplier	Concentration	
	1-5 mg/L	200 ml	0.200 N	0.01			x 0.01	= mg/L	
	2-10 mg/L	100 ml	0.200 N	0.02	J		x 0.02	= mg/L	
Notes:									
Carbon Dioxid	e.								
Equipment: Chemel	rics Test Kit					Concentration:	<u>70</u>	_ppm	
Range Used:	Range	Method	Concentrat	tion ppm	]				
	10 to 100 ppm	K-1910	70	)		Analysis Time:	345		
	100 to 1000 ppm	K-1920			1	·		-	
	250 to 2500 ppm	K-1925			]				
Equipment:	HACH Digital Titrate	or CA-DT							
Range Used:	Range	Sample Vol.	Cartridge	Multiplier	]	Titration Count		Concentration	
	10-50 mg/L	200 ml	0.3636 N	0.1	]		x 0.1	= mg/L	
	20-100 mg/L	100 ml	0.3636 N	0.2			x 0.2	= mg/L	-
	100-400 mg/L	200 ml	3.636 N	1.0			<b>x</b> 1.0	= mg/L	
	200-1000 mg/L	100 ml	3.636 N	2.0			<b>x</b> 2.0	= mg/L	
Standard Additions:	Titrani	t Molarity:		Digits Req	uired: 1st.:	2nd.:	3rd.:		
Notes:									
Hydrogen, diss	solved								
Equipment: Bubble	e strip sampling field	method							
	Start surpper at	(t	ine)						
	Total stripper at	(	unie)						
	Pump rate	milliliter	s/minute						
	, amp race								



Tetra Tech NUS, In	с.	GEC					Page <u>2</u> o	f <u>~</u>
Project Site Na	ame: NASA ()	JEF W	101		Sample ID N	O.: WEE-V	JOD-TU	12-4
Project No.:	112GN1612	<u> </u>			Sample Loca	tion: WOD -	$-\pi u/2$	
Sampled By:	EN				Duplicate:			
Field Analyst:	Jacob-Birkett	<del>a</del> w			Blank:			
Alkalinity:						* ~		
Equipment: Chemel	trics Test Kit				Concentration:	40	_ppm	
Range Used:	Range	Method	Concentral	ion ppm		12110		
	10 to 100 ppm	K-9810	-70	; 	Analysis Time:	Bra	-	
	50 to 500 ppm	K-9815						
	100 to 1000 ppm	K-9820					Filter	red: 🗀
Equipment:	HACH Digital Titrat	or AL-DT						
Range Used:	Range	Sample Vol.	Cartridge	Multiplier	Titration Count	Multiplier	Concentrati	on
	10-40 mg/L	100 ml	0.1600 N	0.1	&	x 0.1	≂ mg	ı/L
	40-160 mg/L	25 ml	0.1600 N	0.4	&	<b>x</b> 0.4	= mg	/L
	100-400 mg/L	100 ml	1.600 N	1.0	&	x 1.0	= mg	<u>//</u>
	200-800 mg/L	50 ml	1.600 N	2.0	&	x 2.0	= mg	ν/L
	500-2000 mg/L	20 ml	1.600 N	5.0	&	<b>x</b> 5.0	= mg	VL_
	1000-4000 mg/L	10 ml	1.600 N	10.0	&	x 10.0	= mg	ı∕L
Standard Additions:	Parameter: Relationship:	Hydroxide t Molarity:	Carb	onate Digits Requ	Bicarbonate	] 3rd.:		
Notes:		•						
Ferrous Iron (F	<sup>-</sup> e <sup>2+</sup> ):					,		
Equipment:	DR-850	DR-8	Range: 0 -	3.00 mg/L	Concentration:	1.6	ppm	
	Program/Module:	500nm	33			1000	-	
	-				Analysis Time:	1334	_	
Equipment:	IR-18C Color Whee	el	Range: 0 -	10 mg/L			-	
Notes:							Filter	red:
Hydrogen Sulf	ide (H₂S):		Range: 0 -	5 mg/L				
Equipment:	HS-C	Other:			Concentration:	0.0	ppm	
	Exceeded 5.0 mg/L	. range on colo	or chart:		Analysis Time:	1335	_	
Notes:								
Sulfide (S <sup>2-</sup> ):								
Equipment: Cheme	trics Test Kit		Range: 0 -	10 mg/L	Concentration:		_ppm	
Range Used:	Range	Method	Concentra	tion ppm				
	0 to 1 ppm	K-9510			Analysis Time:		_	
	1 to 10 ppm	K-9510						
							Filter	red:
Equipment:	DR-850	DR-8	Range: 0 -	0.70 mg/L				
Program/Module:	610nm	93						
Notes:								

# GROUNDWATER SAMPLE LOG SHEET

							Page	<u> </u>
Project Site Name: Project No.: [] Domestic Well Data	NASH WI 112GDI	FF 612	wDD		Sample Sample Sample C.O.C. I	ID No.: <i>W</i> Location: d By: No.:	HF-WOD WOD- EW	-TW2-4 TW2-
Monitoring Well Data [] Other Well Type: [] QA Sample Type:					Type of [] Low [] High	Sample: Concentra Concentra	ation ation	
SAMPLING DATA:								
Date: 1/14/0%	Color	pН	S.C.	Temp.	Turbidity	DÓ	Salinity	Other
Time: 030	(Visual)	(S.U.)	(mS/cm)	( <sup>0</sup> C)	(NTU)	(mg/l)	(%)	(RA)
Method: low flow	Elec v-	4,36	0.185	15.6	3.61	0.0	0.0	108
PURGE DATA								
Date: 1/14/04	Volume	Нq	S.C.	Temp.	Turbidity	DO	Salinity	Other
Method: 13101 Flaval	all	line	Flui	deta	1.00			
Method: 7000 71000		7000	1.000	690.16	giver			
Well Casing Diameter & Material								
								1
Total Well Depth (TD): 10								
Static Water Level (WL): 22,60							<u> </u>	
One Casing Volume(gal/L): X0,5 ca	i				``			
Start Purge (hrs): 0950								
End Purge (hrs): 1030								
Total Purge Time (min):								
Total Vol. Purged (gal/L): 13/4 cc	í							
SAMPLE COLLECTION INFORMA	TION							
Analysis		Preser	vative		Container R	equirements	3	Collected
TEL VOC		Ηc	6	(3)	40 ml gl	ess		
TEL SVOC				(2)	i L An	iber Gla	<u>ا</u> ل	-
TAL Metals		HNL	3	(1) 1	25 ml ;	20/./		-
						/		
								<u> </u>
ODSEDVATIONS								
COSENAL AND AN A LAND								
Circle if Applicable:					Signature(s	):		
MS/MSD Duplicate ID No.			_				$\rightarrow$	
						- <b>-</b>	-50	
					L			<u> </u>

IGNATURE(S):									-				Star	1030 245	122 24.5	1020 24,52	015 24.5	4.45 010	12 SOU	1000 24.0	2940- 22.52	(Hrs.) (Ft. beic	Time Water	ROJECI NUMBER	ROJECT SITE NAI	5
	 	_							 			-	t samblin	: 0		*	~	4 Q	ύι :	3 1	22.60 17	w TOC) (mL	Level F	:		
Â.												r 461	a Maran	15 1 1.	4,32	v 434	432	96.7 "	25%	~ 430	15 4.10	/Min.) (S.U.)	low pH	3 GENILO 12	ISA WAFE- L	LOW
4													parged	566.0	0-19-	0,376	0,362	0,329	0,90	141	0.91	(mS/cm)	S. Cond.		500	FLOW PUF
fish fin u														3.61 8.0	4.76 0.0	5,23 0,0	6.13 0.0	2.41 0.0	13.8 0.00	24.50 2.00	27.8 2.74	(NTU) (mg/	Turb. DO			RGE DATA
Pe														8.51 0	5.9	15.9	15.7	15.6	15.4	15,0	1 11.9	L) (Celcius)	Temp.	DAIE:	WELL ID .:	SHEET
				~.										108	110	109 0	107	107	105	109	chll	mV	ORP	ľ	لا بريل	
														20	0,0	0,0	0,0	0.0	0 0	8 8	0.1	% or ppt	Salinity	1,01411	VOD- Tred	
PAGE (OF(															0.367	v* .				5010 Q			Comments		+ Tw2-4	

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Tetra Tech NUS, Ind	2.	GEO	CHEIMI			1 ER3		Page / of _	2
Project Site Na	ame.	NASA WEE	-wop			Sample ID N	o.: WFF-60	20-Tw2.	-4
Project No.:		112GN1612	2			Sample Loca	tion: WOD	-TINZ	
Sampled By:	Gul					Dunlicate:			
Field Analyst	GAL					Blank:			
Field Form Ch	ecked as per QA	VQC Check	list (initia	ls):			L		
SAMPLING DATA									
Date: 1/14/09	······	Color	pН	s.c.	Temp.	Turbidity	DO	Salinity	ORP (Eh)
Time: 103	0	(Visual)	(S.U.)	(mS/cm)	(°C)	(NTU)	(mg/l)	(%)	(+/- mv)
Method: 1064	+ How	clour	4.36	0.3835	15.8	3.61	0.0	0.0	1083
SAMPLE COLLEC	TION/ANALYSIS IN	FORMATION:							
ORP (Eh) (+/- n	nv) (DG		Electrode N	Make & Moo	iei: <u>hurib</u>	a V-22			
			Reference	Electrode (	circle one): S	Silver-Silver Chlori	de / Calomel	/ Hydrogen	
Dissolved Oxy	gen:								
Equipment: Chemet	rics Test Kit				_	Concentration:	0.8	_ppm	
Range Used:	Range	Method	Concentrat	lion ppm					
	0 to 1 ppm	K-7510	0.6	3		Analysis Time:	1045	_	
	1 to 12 ppm	K-7512	میں ا						
Equipment:	HACH Digital Titrate	or OX-DT			_		Analysis Time:		
Range Used:	Range	Sample Vol.	Cartridge	Multiplier		Titration Count	Multiplier	Concentration	
	1-5 mg/L	200 ml	0.200 N	0.01			<b>x</b> 0.01	= mg/L	
	2-10 mg/L	100 ml	0.200 N	0.02			x 0.02	= mg/L	j
Notes:									
Carbon Dioxid	e:								
Equipment: Chemet	rics Test Kit					Concentration:	130	_ppm	
Range Used:	Range	Method	Concentrat	tion ppm	]		• (-		
	10 to 100 ppm	K-1910				Analysis Time:	1100	_	
	100 to 1000 ppm	K-1920	130						
	250 to 2500 ppm	K-1925							
Equipment:	HACH Digital Titrat	or CA-DT			-				-
Range Used:	Range	Sample Vol.	Cartridge	Multiplier		Titration Count		Concentration	4
	10-50 mg/L	200 ml	0.3636 N	0.1			<b>x</b> 0.1	= mg/L	
	20-100 mg/L	100 ml	0.3636 N	0.2	-		<b>x</b> 0.2	= mg/L	
	100-400 mg/L	200 ml	3.636 N	1.0			x 1.0	= mg/L	-
	200-1000 mg/L	100 ml	3.636 N	2.0	]	L	x 2.0	mg/L	J
Standard Additions:	Titran	t Molarity:		Digits Req	uired: 1st.:	2nd.:	3rd.:		
Hydrogen die	olved								
Equipment Bubble	e strin samnling field	method							
Laophone Dubble	Start stripper at	/ti	me)						
	End stripper at	(ti	ime)						
	Total stripper time	```````````````````````````````````````							
	Pump rate	milliliters	/minute						



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		GEC	JCHEIM	ICAL PA	ARAIVIETERS		_	2.	)
Tetra Tech NUS, Inc	S.						Page	of	
Project Site Na	ame:	NASA WF	F-WOD		Sample ID N	o.: WFF-n	<u>/////////////////////////////////////</u>	TWZ	-4
Project No.:		112GN161	2		Sample Loca	ition: WOD	-71	<u></u>	
Sampled By:	600				Duplicate:				
Field Analyst:	えい				Blank:				
Alkalinity:						- 1 -			
Equipment: Chemet	rics Test Kit	<b></b>			Concentration:	<10	_ppm		
Range Used:	Range	Method	Concentrat	ion ppm					
	10 to 100 ppm	K-9810	<1	C	Analysis Time:	1101	_		
	50 to 500 ppm	K-9815							
	100 to 1000 ppm	K-9820		-				Filtered:	
Equipment:	HACH Digital Titrat	or AL-DT							
Range Used:	Range	Sample Vol.	Cartridge	Multiplier	Titration Count	Multiplier	Conce	entration	
	10-40 mg/L	100 ml	0.1600 N	0.1	&	x 0.1	=	mg/L	
	40-160 mg/L	25 ml	0.1600 N	0.4	&	x 0.4	=	mg/L	
	100-400 mg/L	100 ml	1.600 N	1.0	&	x 1.0	=	mg/L	
	200-800 mg/L	50 ml	1.600 N	2.0	&	x 2.0	=	mg/L	
	500-2000 mg/L	20 ml	1.600 N	5.0	&	<b>x</b> 5.0	=	mg/L	
	1000-4000 mg/L	10 ml	1.600 N	10.0	<u> </u>	<b>x</b> 10.0	=	mg/L	
Standard Additions: Notes:	Parameter: Relationship:	Hydroxide t Molarity:	Carb	onate Digits Requ	Bicarbonate	] 3rd.:			
Ferrous Iron (F	<sup>2</sup> e <sup>2+</sup> ):								
Equipment:	, DR-850	DR-8	Rance: 0 -	3.00 ma/L	Concentration:	1.8	ppm		
	Program/Module:	500nm	33						
	r rogrammodale.	0001111	00		Analysis Time:	1053			
Equipment:	IR-18C Color Whee	1	Range: 0 -	10 ma/l			-		
Notes:		21	Range. 0 -	10 mgrE				Filtered <sup>.</sup>	
Hydrogen Sulf	ide (H.S).		Papae: 0 -	5 mg/l					
		<b>O</b>	Range. 0 -	o myre	<b>Ö</b> r an eine fra eine	00			
Equipment:	HS-C	Other:			Concentration:		_ppm		
	Exceeded 5.0 mg/L	. range on colo	or chart:		Analysis Time:	<u> 46462 /(</u>	250		
Notes:									
Sulfide (S <sup>2"</sup> ):									
Equipment: Cheme	trics Test Kit		Range: 0 -	10 mg/L	Concentration:		_ppm		
Range Used:	Range	Method	Concentra	tion ppm					
	0 to 1 ppm	K-9510			Analysis Time:		_		
	1 to 10 ppm	K-9510							
					-			Filtered:	
Equipment:	DR-850	DR-8	Range: 0 -	0.70 ma/L					
Program/Module	610nm	93	Q. 1	5 -					
, regranithodala.		~~							
Notes:									

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								Page_	of
Project Site	Name:	NASA WFF-	WOD			Sample	ID No.:	WFF-L	JOD-TU3
Project No.:		112GN1612				Sample	Location:		
						Sampleo	d By:	<u> 1863</u>	
U Domes	tic Well Data					C.O.C. I	NO.: Somplo:		
1 Other V	Nell Type	Toul	1			-Q~Low	Concentra	tion	
[] QA Sar	mple Type:		/			- [] High	Concentra	ation	
SAMPLING DAI									
Jate: 1/14/2	5	Color (Viewal)	рн	S.C.			DU (mm/l)	Salinity	Other
		(Visual)	(3.0.)	99,4	15 3	(13.5	(mg/1) 077	(%) 40	-10
URGE DATA			0210	enshe				enste	
)ate: 1/14/	109	Volume	рН	s.c.	Temp.	Turbidity	DO	Salinity	Other
Aethod:	· Flow								
Applitar Reading	(nnm):							and the second second	
Noli Casina Diar	meter & Material						معرسين الم		
	h		<u> </u>			500	1		
iype. バル	· · · · · · · · · · · · · · · · · · · ·				1.0	and the second s			
total well Depth	$\frac{1}{1} \frac{1}{1} \frac{1}$								
Static Water Lev	rel (WL): ベス, 15	4	4	100	2	Sher	~ 1		
Dhe Casing Volu	<u>ume(gal/L): ۲٬۵۱</u>	4		1 OV	1 Carlo	~~~ ·			
Start Purge (hrs)	1224	<u> </u>							
End Purge (hrs):	1335		d.	1					
Fotal Purge Time	e (min): 69	and a second second							
Total Vol. Purge	d (gal/L): 21/2qn/	<u> </u>							
SAMPLE COLLI	ECTION INFORM	ATION	I						
	Analysis		Preser	vative	1-1-1	Container Ro	equirements	,	Collected
$\frac{1}{2}$	$\frac{1}{1}$		HL	<u> </u>	(3)	$\frac{10}{11}$	der Und	\$	Ves
TAL M	$\frac{1}{1}$			0-	CILCLE	125.00	Deli		yes use
1/14 / 1				<u> </u>	- III CAR	iltered	1 /		1000
		-							
DESERVATION	S/NOTES								
<u></u>					1				
	Lapp	Field o	Neilti	cal	og sh	out to	v		
		ic ter er	• • •	t	J -''				
		Geoci	henic	red f	) al forma	eter s			
Sircle if Applica	able:					Signature(s	):		
Circle If Applica	ble: Duplicate ID No.	- 				Signature(s	); []]	/ A/	
Sircle If Applica MS/MSD	able:	:				Signature(s	): Brik		

LOW FLOW PURGE DATA SHEET

WELL ID.: DATE:

WFF-WOD-TW3-4

SIGNATU				-	×				-		1225	1317	1310	ž Ž	0261	9551	19	1246	141	226	しんぞう	しょう	5 261	(Hrs.)	Time
RE(S):	A				CI D/W						A	チャッチシ		15.20		52.25	26.16	20.06	P.0. 5C	25.19	L H ( H C	53 5.6	51,25	(Ft. below TOC)	Water Level
with-					0					1	(LCCM)	4 200									011	QLI		(mL/Min.)	Flow
						.*		-				16 00	212	8		2	h1/5	r V V	80 S	らいて	110.4	いべて		(S.U.)	рĤ
I							, <i>d</i> i			Ĺ		C 22 N	h'b l,	1, 1, 1, b	5, L -	9.15	5 V V V	311	1.25	61.4.	49.7.94	87H0		(mS/cm)	S. Cond.
							-			-	5.000	51 C	5.61	x 12 20 7	5 1 1	5	と、七	5	5 61	50.10	08'8	15.0		(UTU)	Turb.
											20.		いた	0.34	0 1 1 1	いいい	81.0	s v v	520	S S	000	136		(mg/L)	Ø
ø													۲. S	5:51	50	is Y	5	5 C	14 c	14.9	9.4	12.6		(Celcius)	Temp.
													-10	ć	Ł	.6			01	رد <sup>م</sup>	.17	12		mV	ORP
													40	÷ Ó	<u>ب</u> بر	3	0	, , , ,	0.1	0 10 10	4.0	0,0		% or ppt	Salinity
PAGE OF															ORPASEL ensire						air bubbles in tube				Comments

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Tetra Tech NUS, Inc								Page <u>\</u> of _	<u>_</u>
Project Site Na	me: NASA	WFFL	JOD			Sample ID N	о.: WFF-L	JOD-TW:	3-4
Project No.:	112GN16	12				Sample Loca	ition:		
Sampled By:	7B					Duplicate:			
Field Analyst:	JB					Blank:			
Field Form Che	ecked as per QA	VQC Check	dist (initia	ls):		]			
SAMPLING DATA:									
Date: 1/14/0	2	Color	рН	S.C.	Temp.	Turbidity	DO	Salinity	ORP (Eh)
Time: 1334	5	(Visual)	(S.U.)	(mS/cm)	( <sup>0</sup> C)	(UTV)	(mg/l)	(%)	(+/- mv)
Method:	Flow	clear	5,18	99.4.	15,3	13,5	0,77	4.0	-10
SAMPLE COLLECT	ION/ANALYSIS IN	FORMATION:		enat,	<b>C</b>			17 stic	
ORP (Eh) (+/- m	ıv)		Electrode N	Make & Mod	el:				
			Reference	Electrode (d	ircle one): S	ilver-Silver Chlori	ide / Calomel .	/ Hydrogen	
Dissolved Oxy	gen:						<i>.</i>		
Equipment: Chemetr	rics Test Kit				L	Concentration:	1.2	ppm	
Range Used:	Range	Method	Concentrat	ion ppm			1010		
	0 to 1 ppm	K-7510	>			Analysis Time:	1316		
	1 to 12 ppm	K-7512	1.5	,			·		
Equipment:	HACH Digital Titrate	or OX-DT					Analysis Time:	<b></b>	
Range Used:	Range	Sample Vol.	Cartridge	Multiplier		Titration Count	Multiplier	Concentration	
	1-5 mg/L	200 ml	0.200 N	0.01		******	<b>x</b> 0.01	= mg/L	
	2-10 mg/L	100 ml	0.200 N	0.02			<b>x</b> 0.02	= mg/L	
Notes:					-				
Carbon Dioxide	ə:						<b>4</b>		
Equipment: Chemeti	rics Test Kit		1			Concentration:	9.70	ppm 70	
Range Used:	Range	Method	Concentrat	ion ppm			1770		
	10 to 100 ppm	K-1910				Analysis Time:	1230	-	
	100 to 1000 ppm	K-1920							
	250 to 2500 ppm	K-1925							
Equipment:	HACH Digital Titrat	or CA-DT							
Range Used:	Range	Sample Vol.	Cartridge	Multiplier		Titration Count		Concentration	]
	10-50 mg/L	200 ml	0.3636 N	0.1			<b>x</b> 0.1	= mg/L	
	20-100 mg/L	100 ml	0.3636 N	0.2			<b>x</b> 0.2	= mg/L	
	100-400 mg/L	200 ml	3.636 N	1.0			x 1.0	= mg/L	
	200-1000 mg/L	100 ml	3.636 N	2.0			<b>x</b> 2.0	= mg/L	
Standard Additions:	Titrani	t Molarity:		Digits Req	uired: 1st.:	2nd.:	3rd.:		
Notes:									
Hydrogen, diss	olved								
Equipment: Bubble	strip sampling field	method							
	Start stripper at	(t	ime)						
	End stripper at	(i	time)						
	Total stripper time								
	Pump rate	milliliter	s/minute						

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Tetra Tech NUS, In	c.						Page		
Project Site Na	ame: NASA	WFF	WOD		Sample ID N	o.: WFF	-wor	S-TW	3-4
Project No.:	112GN16	12		_	Sample Loca	tion:			
Sampled By:	7B			_	Duplicate:				
Field Analyst:	75				Blank:				
Alkalinity:									
Equipment: Cheme	trics Test Kit				Concentration:	60	ppm		
Range Used:	Range	Method	Concentrat	tion ppm		1000			
	10 to 100 ppm	K-9810	>10	20	Analysis Time:	1325	>		
	50 to 500 ppm	K-9815	150	$\circ$					_
	100 to 1000 ppm	K-9820						Filtered:	
Equipment:	HACH Digital Titrat	or AL-DT				- <b>-</b>			
Range Used:	Range	Sample Vol.	Cartridge	Multiplier	Titration Count	Multiplier	Солсе	ntration	
	10-40 mg/L	100 ml	0.1600 N	0.1	&	x 0.1	=	mg/L	
	40-160 mg/L	25 ml	0.1600 N	0.4	&	<b>x</b> 0.4	=	mg/L	
	100-400 mg/L	100 ml	1.600 N	1.0	&	<b>x</b> 1.0	=	mg/L	
	200-800 mg/L	50 ml	1.600 N	2.0	&	x 2.0	=	mg/L	
	500-2000 mg/L	20 ml	1.600 N	5.0	&	x 5.0	=	mg/L	
<u>L</u>	1000-4000 mg/L	10 ml	1.600 N	10.0	&	<b>x</b> 10.0	=	mg/L	
	<b></b>					1			
	Parameter:	Hydroxide	Carb	onate	Bicarbonate				
	Relationship:					]			
Standard Additions:	: L Titrani	Molarity:		Digits Requ	ired: 1st.: 2nd.:	3rd.:			
Notes:	<u>Э</u>								
Ferrous Iron (F	=e²⁺):					17	>		
Equipment:	DR-850	DR-8	Range: 0 -	3.00 mg/L	Concentration:	1.0	_ppm		
	Program/Module:	500nm	33		Analysis Time:	1314			
Equipment:	IR-18C Color Whee		Range: 0 -	10 ma/L					
Notes:	مر می وارد در این و با این از می و می و بی و این و			<b>y</b>				Filtered:	
Hydrogen Sulf	ide (H <sub>2</sub> S):		Range: 0 -	5 mg/l					
Faviaments (		Other	range. e	o mgre	Concentration	$\sim$			
Ednibillieur (		other.				1217	ppin		
Makaa	Exceeded 5.0 mg/L	range on colo	or chart:		Analysis time:	1712	_		
Sulfide (S <sup>-</sup> ):					<b>•</b>				
Equipment: Cheme	trics Test Kit	1	Range: 0 -	10 mg/L	Concentration:		_ppm		
Range Used:	Range	Method	Concentrat	tion ppm					
	0 to 1 ppm	K-9510			Analysis Time:		_		
	1 to 10 ppm	K-9510							
Fourinment	DR-850	DR-8	Rance: 0 -	0 70 mg/l				Filtered:	
Brogram/Madula	610om	03		erre mare					
rogrammiddule:	GIUIIII								
Natas									
NOLES:									

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# **GROUNDWATER SAMPLE LOG SHEET**

							Page	<u>of</u>
Project Site Name: Project No.:	FF WC	<u>&gt;D</u>		Sample Sample Sample	ID No.: <i>W</i> Location: d By:	F-WOD-7 WOD-7W E. WV	īW4-4 '4	
<ul> <li>Domestic Well Data</li> <li>Monitoring Well Data</li> <li>Other Well Type:</li> <li>QA Sample Type:</li> </ul>					C.O.C. I Type of [] Low [] High	No.: Sample: Concentra Concentr	ation	
SAMPLING DATA								
Date: // /////09	Color	nH	s.c.	Temp.	Turbidity	DO	Salinity	Other
Time: ARIO	(Visual)	(S.U.)	(mS/cm)	( <sup>0</sup> C)	(NTU)	(mg/l)	(%)	ORD
Method: low Flow	Clear	4,97	0,406	14,2	2.78	0,0	0,0	~ 5
PURGE DATA								
Date: 1/14/09	Volume	рН	s.c.	Temp.	Turbidity	DO	Salinity	Other
Method: 10w flam	110_	low	flour	Dra	loc		1	
Monitor Reading (ppm):			1 1 020		20	······································	·····	
Well Casing Diameter & Material Type:							<u> </u>	-
Total Well Depth (TD): 30								
Static Water Level (WL) 24.33								
One Casing Volume(gal/L)-0.52	1							
Start Burgo /brs): 0730							<u> </u>	
End Purge (nrs): 0810	- <u></u>							
Total Purge Time (min): 90 Min								
Total Vol. Purged (gal/L): 172 get			*****					
SAMPLE COLLECTION INFORM	ATION:							
Analysis		Preser	vative	(2) 10	Container R	equirements	ĵ	Collected
The Glos		ACC		(3) 40	m cillas	all at		· /
The Met His		14.10	•	(2)	- Amor	<u>GRE.SS</u>		
IML INCEPACES		171003		11) 102	- mi por	/		
						·····		
· · · · · · · · · · · · · · · · · · ·								
OBSERVATIONS / NOTES:								
Circle if Applicable:					Signature(s	):		
MS/MSD Duplicate ID No.	••••••••••••••••••••••••••••••••••••••			$\subset$			R	>
					1			

PROJECT SI	UMBER:	NASA W					WELL ID.: DATE:	WFF	た CaN	04-4 4
Time	Water Level	Flow	рН	S. Cond.	Turb.	DO	Temp.	ORP	Salinity	Cor
(Hrs.) (	Ft. below TOC)	(mL/Min.)	(S.U.)	(mS/cm)	(UTU)	(mg/L)	(Celcius)	mV	% or ppt	
6730 .	24.33	150775	1 <u>0,</u> 0	1.03	13.1	0,05	13,7	<del>**</del> *3	0.0	
0735 0	25.44	1.50	16.14	0.98	88.8	00 0	13.9	6 CI	0,0	
5440	25,52	~ ~	96%	0,93	6.30	0,00	14.5	3/	0,0	
5445	25.71	ži 11	イロナ	66 0	19:51	00'8	14.4	セ	0.0	
0750 2	5.81	i. 1.	4.99	16:0	4.63	00 'O	14.3	i Vi	0.0	
5550	19:44	*	4.99	16:0	3.44	0,00	143	۱ N	6. C	
2080	25.91	с г	オシア	9.409	3.26	040	14.2	ŝ	00	
· 5080	25.95		えるお	0.406	846	0.0	14.2	5	C.C	
0810	Sample	$e_{\langle i \rangle}$	22 04	e d						
			C -							
	-	-								
					`					
SIGNATIRE	·/s·									
SIGNATURE	:(S):									

LOW FLOW PURGE DATA SHEET

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Tetra Tech NUS, Inc	C.	GEOCI				IERO		Page ( of _	2
Project Site Na	ame:	NASA WFF-W	OD			Sample ID N	0.:WFF-1	100-TT = 100	1-4
Project No.:	<u>.</u> .	112GN1612				Sample Loca	tion: ND)	- TW4	
Sampled By:	E4)					Duplicate:			
Field Analyst:	200					Blank:			
Field Form Ch	ecked as per QA	VQC Checklist	(initia	ls):					
SAMPLING DATA									
Date: 1 14 09		Color	pН	s.c.	Temp.	Turbidity	DO	Salinity	ORP (Eh)
Time: DBIO		(Visual) (S	S.U.)	(mS/cm)	( <sup>0</sup> C)	(NTU)	(mg/l)	(%)	(+/- mv)
Method: 100 (	101	clear 4.	97	0.406	14.2	2.78	0.0	0.0	-5
SAMPLE COLLEC	FION/ANALYSIS IN	FORMATION							
ORP (Eh) (+/- n	<sup>nv)</sup> -5	Elec	ctrode N	/lake & Mod	iel: <u>170-766</u>	U-22		<u> </u>	
		Refe	erence	Electrode (d	circle one): S	Silver-Silver Chlori	de / Calomel	/ Hydrogen	
Dissolved Oxy	gen:					Canadartic	0.6		
Equipment: Chemet					1	Concentration:	<u> </u>	hhim	
Range Used:	Range	Method Cor	ncentrat	ion ppm			-0.0		
	0 to 1 ppm	K-7510	0.6			Analysis Time:	0815	-	
	1 to 12 ppm	K-7512							
Equipment:	HACH Digital Titrate	or OX-DT					Analysis Time:		-
Range Used:	Range	Sample Vol. Car	tridge	Multiplier		Titration Count	Multiplier	Concentration	]
	1-5 mg/L	200 ml 0.2	200 N	0.01			x 0.01	= mg/L	
	2-10 mg/L	100 ml 0.2	200 N	0.02			x 0.02	= mg/L	
Notes:									
Carbon Dioxid	8:								
Equipment: Chemet	rics Test Kit					Concentration:	200	ppm	
Range Used:	Range	Method Cor	ncentrat	ion ppm					
	10 to 100 ppm	K-1910	أنريزى	- Streng	र	Analysis Time:	<u> 8843</u>	_	
	100 to 1000 ppm	К-1920 💪	200	) 0					
	250 to 2500 ppm	K-1925			ļ				
Equipment:	HACH Digital Titrate	or CA-DT							
Range Used:	Range	Sample Vol. Car	tridge	Multiplier	]	Titration Count		Concentration	
	10-50 mg/L	200 ml 0.3	636 N	0.1	]		x 0.1	= mg/L	]
	20-100 mg/L	100 ml 0.3	3636 N	0.2	· ·		<b>x</b> 0.2	= mg/L	
	100-400 mg/L	200 ml 3.0	636 N	1.0	ļ		x 1.0	= mg/L	-
	200-1000 mg/L	100 ml 3.0	636 N	2.0			<b>x</b> 2.0	= mg/L	
Standard Additions:	Titran	t Molarity:		Digits Requ	uired: 1st.:	2nd.:	3rd.:		
Notes:									
Fouriemont: Bubble	SOIVEQ	mathad							
Edanhuneur: Robbie	surp sampling lield. Start stripper at	method (time)							
	End stripper at	(time)							
	Total stripper time	(ano)							
	Pump rate	milliliters/min	nute						



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Tetra Tech NUS, Ir	ıc.						Page	<u>2 of 2</u>	2
Project Site N	ame:	NASA WF	F-WOD	-	Sample ID No	).: WFF-1	20P-	7W4-	-24
Project No.:		112GN161	2	-	Sample Locat	tion: いつひ	- TW	+	·
Sampled By:	ÉLU			_	Duplicate:				
Field Analyst:	ÉW				Blank:				
Alkalinity:	·								
Equipment: Cheme	etrics Test Kit				Concentration:	100	_ppm		
Range <u>U</u> sed:	Range	Method	Concentrat	tion ppm					
	10 to 100 ppm	K-9810	100		Analysis Time:	<u>0837</u>	-		
	50 to 500 ppm	K-9815	100						_
	100 to 1000 ppm	K-9820						Filtered:	
Equipment:	HACH Digital Titrat	tor AL-DT							
Range Used:	Range	Sample Vol.	Cartridge	Multiplier	Titration Count	Multiplier	Conce	entration	
	10-40 mg/L	100 ml	0.1600 N	0.1	&	<b>x</b> 0.1	=	mg/L	
	40-160 mg/L	25 ml	0.1600 N	0.4	&	<b>x</b> 0.4	=	mg/L	
	100-400 mg/L	100 ml	1.600 N	1.0	&	x 1.0	=	mg/L	
	200-800 mg/L	50 ml	1.600 N	2.0	&	x 2.0	=	mg/L	
	500-2000 mg/L	20 ml	1.600 N	5.0	&	<b>x</b> 5.0	=	mg/L	
	1000-4000 mg/L	10 ml	1.600 N	10.0	&	x 10.0	=	mg/L	
	ſ <u></u>			<u> </u>	-	l			
	Parameter:	Hydroxide	Carb	onate	Bicarbonate				
		<u> </u>				0			
Standard Additions		it Molarity:		Digits Requir	ea: 1st.: 2na.:	3ra.:			
Ferrous Iron (	Ee <sup>2+</sup> ):								
Fauinmont:			Bango: 0	3.00 ma/l	Concentration	1.2	000		
Equipment	Dresser Madula	E00mm	nange. v -	5.00 mg/L	Concentration.		_ <sup>ppm</sup>		
	Program/Module:	SUUNM	33		Analysis Time	<del>297975</del>	082	23	
		-1	Deness 0	10 mail	Analysis fille.			_	
	IR-18C Color Whe	el	Range: U -	10 mg/E				Ciliana di	
Notes:	5do /U_S\.		Deservo	f				ritereu.	
nyarogen Sur	nde (n <sub>2</sub> 5):		Kange: 0 -	5 mg/L		00			
Equipment:	HS-C	Other:			Concentration:	2020	_ppm		
	Exceeded 5.0 mg/l	range on colo	or chart:		Analysis Time:				
Notes:									
Sulfide (S <sup>2-</sup> ):									
Equipment: Cheme	etrics Test Kit		Range: 0 -	10 mg/L	Concentration:		ppm		
Range Used:	Range	Method	Concentra	tion ppm					
	0 to 1 ppm	K-9510			Analysis Time:		_		
	1 to 10 ppm	K-9510							_
								Filtered:	$\Box$
Equipment:	DR-850	DR-8	Range: 0 -	0.70 mg/L					
Program/Module:	610nm	93							
Notes:									

Tetra T	ech NUS, Inc.
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# GROUNDWATER SAMPLE LOG SHEET

-								Page	of
	Project Site Name: Project No.:	<u></u>	WFF VIG12	WOD		Sample Sample Sample	ID No.: Location: d By:	LUFF-L	<u>10D-TWS-4</u>
	[] Donnestic Wein ;]]≺[Monitoring Wein [] Other Weil Typ [] QA Sample Typ	Data I Data e: pe:				Type of Low High	Sample: Concentra Concentra	ation ation	
	SAMPLING DATA:								
	Date: 1/12/01	Color	рН	S.C.	Temp.	Turbidity	DO	Salinity	Other
	Time: 0345	(Visual)	(S.U.)	(mS/cm)	( <sup>0</sup> C)	(NTU)	(mg/l)	(%)	ORP
	Method: Low Fla	~ clegr	5,14	0.52	13,8	25,5	4,82	0.0	- 6
	PURGE DATA							T	
	Date: 1/3/09	Volume	рН	S.C.	Temp.	Turbidity	DO	Salinity	Other
	Method: Low Flo	$\sim$						· · ·	
	Monitor Reading (ppm):					$\Box_{\mu}$	and the second sec		
	Well Casing Diameter & M	aterial			1 1	T Kreat			
	Type: パイス``				INN	and the stand			
	Total Well Depth (TD): 3	0F		DE	Contraction of the second s	0			
	Static Water Level (WL):	24.60	4	70	41	CC			
¥	One Casing Volume(gal/L)	:0,47 al	U	6.5	al I				
w/riser	Start Purge (hrs): どうう	30	العن	- Dur					
-	End Purge (hrs); 0男4	5	and a second		3				
	Total Purge Time (min):	75 /		ł			······································		
	Total Vol. Purged (gal/L):	13/4 0							
	SAMPLE COLLECTION I	NFORMATION:							
	Analysis		Preser	vative		Container R	equirements		Collected
	TCL VOCS		HC		(3)%	Unit via	<u>ls</u>		V-5
	TEL SVOCS			1.3	(2)1	it liter 1	AMber		(10-5
	TAL Metal	5	<u> </u>	10- <u>3</u>	tillered that	1175 M	L poly		<u>yoş</u>
						- wed	·····		
	·								
	OBSERVATIONS INOTE								
	ODSERVATIONSTINOTE				. /				
		See fiel	d or,	raly to	al lo	g sho.	et top		
		DP-	scha	Mica	Dar	nal			
		$\int c$		1.0-[1	pare	7/010/00			
	Circle if Applicable					Signature(s	): _		
	MS/MSD Duplicat	e ID No.:			**********	jh:c	1/20	h	
						11.00	1 2 00 10		

SIGNATUR	21 									5480	》 シン つ	0814	0130			0 766		747	5 24 2	えれてい	6732	105.4	(Hrs.)	Time	PROJECT N	PROJECT (	
E(S): 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1								•	A w ( rised			20.22	いとうと		والمحمد والمحم	30,62	24.40	7 5 7 7	15,22	57.23	29.90	071 PC	(Ft. below TOC)	Water Level 🤻	NUMBER:	SITE NAME:	נ <b>ה</b> ב
										start a	TANK				shut.					l S S	نړ د لر		(mL/Min.)	Flow	127	NASA (	
								 		molinal	142 Ver 10	5,14	5,19		3577	503	らいな	t, 15 17	56 F	12 Si 4	H0 5		(S.U.)	Рd	V 161 7	WFF W	LOW FL
I											· ~	0.52	C 26	11/2×cd	Spert	2.5.0 7	2h. O	54.0	0,38	2.35	25.0		(mS/cm)	S. Cond.		101	-OW PU
									J.	المهم ملاح		25.5	25 621	Outard	102	4. 10 L	× 4.8	<u>5, 29</u>	う、 イ ト		30,1		(NTU)	Turb.	ŀ		RGE DA
				 	 				1 . 1	กษณฑ	11/2 al	4,82	4.90		A.V.	3.24	ドッグ	した、わ	5.32	1/ 0	58 P		(mg/L)	DO	_		<b>NTA SH</b>
											nr.rc. vo	8.21	18,4			- 1 2 2	ε, pi	14 4	14,71	2,4	8.4	· · ·	(Celcius)	Temp.	DATE:	VELL ID.:	EET
										-	4	۱ ۲	9~	. ] -	rochari	ز لر		در در	75	κL.	א ב		mV	ORP			
												a, a	0,0			0,0	0	00	0,0	0.0	0.0		% or ppt	Salinity	- athtt	WFF-UC	
PAGE OF										<u> </u>			<u>*</u>				<i>900</i>	* Sheen		few hubbles in tubini	0.04 Ft arodust			Comments		N-TWS-4	



### FIELD ANALYTICAL LOG SHEET **GEOCHEMICAL PARAMETERS**

Tetra Tech NUS, Inc	;, 							Page <u></u> of <u></u>	2
Project Site Na	ime:	NASA WF	F-WOD			Sample ID No	s.: WFF-i	JOD-TW	54
Project No.:		112GN161	2	•		Sample Loca	tion:		
Sampled By:		SC		-		Duplicate:			
Field Analyst		1P3		-		Blank:			
Field Form Che	ecked as per QA	VOC Check	dist (initia	ls):		]			
SAMPLING DATA									
Date: 1/14/10	دا	Color	пН	s.c.	Temp.	Turbidity	ро	Salinity	ORP (Eh)
	45	(Visual)	(SU)	(mS/cm)	ീ	(NTID	(mg/l)	(%)	(+/- mv)
Method: 1 200	Flow	(Visual)	5.14	057	13.8	255	4.82	00	-6
SAMPLE COLLECT	ION/ANALYSIS IN	FORMATION:							
ORP (Eh) (+/- m	יע)		Electrode I	Make & Mod	lel:				<u> </u>
			Reference	Electrode (d	circle one): S	ilver-Silver Chlori	de / Calomel /	/ Hydrogen	
Dissolved Oxy	gen:	. de	1	1 :	CIL	11			
Equipment: Chemet	rics Test Kit	questio	MAG	alot o	F publ	Concentration:	<u> </u>	ppm	
Range Used:	Range	Method	Concentra	tion ppm			S20/		
	0 to 1 ppm	K-7510	مرد المور			Analysis Time	0000		
	1 to 12 ppm	K-7512	3						
Equipment:	HACH Digital Titrat	or OX-DT					Analysis Time:		
Range Used:	Range	Sample Vol.	Cartridge	Multiplier		Titration Count	Multiplier	Concentration	
	1-5 mg/L	200 ml	0.200 N	0.01			<b>x</b> 0.01	= mg/L	
	2-10 mg/L	100 ml	0.200 N	0.02			<b>x</b> 0.02	= mg/L	
Notes:									
Carbon Dioxide	e:						~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		
Equipment: Chemet	rics Test Kit					Concentration:	-70	ppm	
Range Used:	Range	Method	Concentra	tion ppm					
Ŋ,	10 to 100 ppm	K-1910	70			Analysis Time:	083		
	100 to 1000 ppm	K-1920							
	250 to 2500 ppm	K-1925							
Equipment:	HACH Digital Titrat	or CA-DT							
Range Used:	Range	Sample Vol.	Cartridge	Multiplier		Titration Count		Concentration	]
	10-50 mg/L	200 ml	0.3636 N	0.1			<b>x</b> 0.1	= mg/L	
	20-100 mg/L	100 ml	0.3636 N	0.2			x 0.2	= mg/L	
	100-400 mg/L	200 ml	3.636 N	1.0			<b>x</b> 1.0	= mg/L	
	200-1000 mg/L	100 ml	3.636 N	2.0			x 2.0	= mg/L	J
Standard Additions:	L Titran	t Molarity:		Digits Req	uired: 1st.:	2nd.:	3rd.:		
Notes:									
Hydrogen, diss	solved								
Equipment: Bubble	strip sampling field	method							
	Start stripper at	(ti	ime)						
	End stripper at	(t	ime)						
	Total stripper time								
~	Pump rate	milliliters	s/minute						



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Tetra Tech NUS, Inc						<u></u>	Page 🟒	_of	
Project Site Na	ime:	NASA WF	F-WOD		Sample ID No	:: WFF-	WOD	TWS-	4
Project No.:		112GN161	2		Sample Loca	tion:			-
Sampled By:		JBB			Duplicate:				
Field Analyst:		JBP	>	_	Blank:				
Alkalinity:						101			
Equipment: Chemet	rics Test Kit				Concentration:	120	ppm		
Range Used:	Range	Method	Concentral	tion ppm		1777	7		
× X	10 to 100 ppm	K-9810	210	2	Analysis Time:	0050			
	50 to 500 ppm	K-9815	150	2					
	100 to 1000 ppm	K-9820					Fi	tered:	
Equipment:	HACH Digital Titrat	or AL-DT							
Range Used:	Range	Sample Vol.	Cartridge	Multiplier	Titration Count	Multiplier	Concentr	ation	
	10-40 mg/L	100 ml	0.1600 N	0.1	&	x 0.1	=	mg/L	
	40-160 mg/L	25 ml	0.1600 N	0,4	&	<b>x</b> 0.4	=	mg/L	
	100-400 mg/L	100 ml	1.600 N	1.0	&	x 1.0	=	mg/L	
	200-800 mg/L	50 ml	1.600 N	2.0	&	x 2.0	=	mg/L	
	500-2000 mg/L	20 ml	1.600 N	5.0	&	x 5.0	=	mg/L	
	1000-4000 mg/L	10 ml	1.600 N	10.0	&	<b>x</b> 10.0	<b>E</b>	mg/L	
	_				<b>D</b> ia a la anti-	1			
	Parameter:	Hydroxide	Carb	onate	Bicarbonate	_			
Clanderd Additions:	Relationship:	I		Digits Reg	uired:1st: 2nd:	J 3rd.:			
Notes:	nuan	( Wokanty		Digito Fiord					
Ferrous Iron (F	e <sup>2+</sup> ):					~ 1			
Equipment:	DR-850	DR-8	Range: 0 -	- 3.00 mg/L	Concentration:	20	_ppm		
	Program/Module:	 500nm	33	-			-		
	<b>j</b>				Analysis Time:	0223	2		
Equipment:	IR-18C Color Whe	èl.	Range: 0	- 10 mg/L					
Notes:	an a						F	iltered:	
Hydrogen Sulf	ide (H <sub>2</sub> S):		Range: 0	- 5 mg/L		~			
Equipment:	HS-C	Other:			Concentration:	$\bigcirc$	ppm		
-4-1-	Exceeded 5.0 mg/l	range on col	or chart:		- Analysis Time:	08265	-		
Notes:	j.				·		-		
Sulfide (S <sup>2-</sup> ):									
Equipment: Cheme	trics Test Kit		Range: 0	- 10 mg/L	Concentration:		ppm		
Range Used:	Range	Method	Concentra	ation ppm					
	0 to 1 ppm	K-9510			Analysis Time:		_		
	1 to 10 ppm	K-9510						_	
							F	iitered: 🗌	
Equipment:	DR-850	DR-8	Range: 0	- 0.70 mg/L					
Program/Module:	610nm	93							
					•				
Notes:									

	Tetra Tech NUS, Inc.
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# **GROUNDWATER SAMPLE LOG SHEET**

							Page_	of
Project Site Name: Project No.: Domestic Well Data Monitoring Well Data Other Well Type: U OA Sample Type:	NASA NZGA	WFF MG12	wol	>	Sample Sample Sample C.O.C. I Type of :[] <low< td=""><td>ID No.: Location: d By: No.: Sample: Concentra</td><td></td><td>D-TW6-4</td></low<>	ID No.: Location: d By: No.: Sample: Concentra		D-TW6-4
					. U '''9'	roonoonus		
SAMPLING DATA:								
Date: 1/14/07	Color	рΗ	S.C.	Temp.	Turbidity	DO	Salinity	Other
Time: 030	(Visual)	(S.U.)	(mS/cm)	(°C)	(NTU)	(mg/l)	(%)	ORT
Method: Low Flor	Clori	5.32	0.69	5,2	42,2	0,94	0.0	-64
PURGE DATA:								
Date: 1/14/09	Volume	рН	S.C.	Temp.	Turbidity	DO	Salinity	Other
Method: Low Flow		,						
Monitor Reading (ppm):								
Well Casing Diameter & Material								
Туре: 1/2'					(	(1, 1)		
Total Well Depth (TD): 309+				i	4	- 000		
Static Water Level (WL): 24.85			1	20	Ou -			
One Casing Volume/gal/L): 0.47	f		2	and a second	/	eet		
Start Burge (brs): ()136		1		OUNC	De F			
		الان <u>م</u>	e na		5			
				ļ				
Total Vol. Purged (gal/L): スイベ(	ATIONICESCE							
		Preser	vativo		Container R	equirements		Collected
TCI 1000		H	~ (	/31	40ml	JOA via	/ / <	lines.
TCI SUDCS				125	1/ /	9 mber	·	Vros
TAL Metals		HN	03	Filferedu	infilled 125 n	at polu		115
			~			- ( <del>)</del> /		Ŷ.
······································								
· · · · · · · · · · · · · · · · · · ·								
OBSERVATIONS / NOTES								, 
		******************		r			$\sim$	
12		a'A a	VIE		$a \leq l$	pet	Test	
500	, lette		9	· · · · ·	5 01	· - 1	•	
	QP/	2/10	MICO	Do	alame	279		
		-ne		Γ		- /		
	~~							
Circle if Applicable					Signature(s	s):		
MS/MSD Dunlicate ID Nr	anterenten in der statet. Nation	1424342913931313131	***************			"And	1.1	
mormos - Baphoate IB Rt	and the second				head	12/1	AT	
					I INVER	gurpe.	$\mathcal{L}\mathcal{U}^{\alpha}$	
					1			

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PROJECT SITE	NAME: BER:	NINSA I	WFF IN	Not			NELL ID.: DATE:		WFF-WC	30-Tw6-4
Time W	ater Level	Flow	рН	S. Cond.	Turb.	DO	Temp.	ORP	Salinity	0
(Hrs.) (Ft.	below TOC)	(mL/Min.)	(S.U.)	(mS/cm)	(NTU)	(mg/L)	(Celcius)	mV	% or ppt	
C 5110	14 A A									
0936	~ 15° • (	200	154 5	9970	こった	7.461	E-F-	-31	0,0	0.1 S.7.8 1.
5 11 PPO	いよった	170	125.291	LL O	162	0,65	14,2	-4 S	0,0	lets bubble
CA46 .	$\gamma_{1,4}$		5,32	0.75	150	0.63	14,6	15-	0,0	0,0171 Fil
0951	15.72		5.34	てどつ	137	890	19.6	+5-	0,0	
6955	1.2.1		5,35	040	241	0.79	j4 ,S	57	0,0	
1000	1 6942		152.5	070	60,2	032	14.8	-57	0,0	
1004	-		5 36	0.69	51,1	0,39	15 0 -	6263	¢ Ò	
1008.			12,5,5	12.0	42,2	0.94	15,2	-64	сò Ò	
00	Start and	shem 14	15 10	2 and	Dulcyer			-		
020	Start Usa	molina	2 9-1							
			C	- ر	~					
										*
							-			
	Λ .									
	· WK									ρv
	<u>1</u>	<b>*</b>		I						
	×	I Visad								
	-	NJV/N/~								
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LOW FLOW PURGE DATA SHEET

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Tetra Tech NUS. In	c.	GEC				IEKS		Page \ of	2
							1.00	· INN TIL	
Project Site Na	ame:	NASA WF	F-WOD			Sample ID N	<u>o.: WPP-</u>	wob-two	<u>~~~</u>
Project No.:		112GN161	2			Sample Loca			
Sampled By:		<u>780</u>				Duplicate:			
Field Analyst:		75402				Blank:			
Field Form Ch	ecked as per QA	VQC Check	dist (initia	ls):				***************************************	
SAMPLING DATA			lininininini I					80000000000000000000000000000000000000	
Date: 1/14/0		Color	pН	S.C.	Temp.	Turbidity	DO	Salinity	ORP (Eh)
Time: V	50	(Visual)	(S.U.)	(mS/cm)	(°C)	(NTU)	(mg/l)	(%)	(+/- mv)
Method: Low	-6.1	Clear	5.38	0,69	15,2	1 42,2	0.94	0,0	-64
SAMPLE COLLEC	HON/ANALYSIS IN	FORMATION:							
ORP (En) (+/- n	nv)		Electrode M	Make & Mod	el:			<u> </u>	
			Reference	Electrode (c	ircle one): 3	Silver-Silver Chlor	ide / Calomel	/ Hydrogen	
Dissolved Oxy	gen:					0	1023-		
Equipment: Chemet	trics Test Kit	•				Concentration:	400-	_ppm	
Range Used:	Range	Method	Concentrat	ion ppm			1000		
	0 to 1 ppm	K-7510	0/1			Analysis Time:	1020	-	
	1 to 12 ppm	K-7512							
Equipment:	HACH Digital Titrate	or OX-DT	•			~	Analysis Time:		-
Range Used:	Range	Sample Vol.	Cartridge	Multiplier		Titration Count	Multiplier	Concentration	-
	1-5 mg/L	200 ml	0.200 N	0.01			<b>x</b> 0.01	= mg/L	_
	2-10 mg/L	100 ml	0.200 N	0.02			<b>x</b> 0.02	= mg/L	
Notes:									
Carbon Dioxid	e'								
Equipment: Chemel	trics Test Kit				l	Concentration:	ZO	_ppm	
Range Used:	Range	Method	Concentrat	ion ppm			1075	-	
	10 to 100 ppm	K-1910	20	0		Analysis Time:	102	-	
	100 to 1000 ppm	K-1920							
	250 to 2500 ppm	K-1925							
Equipment:	HACH Digital Titrat	or CA-DT				_			
Range Used:	Range	Sample Vol.	Cartridge	Multiplier		Titration Count		Concentration	
	10-50 mg/L	200 ml	0.3636 N	0.1			x 0.1	= mg/L	
	20-100 mg/L	100 ml	0.3636 N	0.2		L	<b>x</b> 0.2	= mg/L	
	100-400 mg/L	200 ml	3.636 N	1.0			x 1.0	= mg/L	_
	200-1000 mg/L	100 ml	3.636 N	2.0		have been a second and a second s	<b>x</b> 2.0	= mg/L	
Standard Additions:	Titran	t Molarity:		Digits Requ	uired: 1st.:	2nd.:	3rd.:		
Notes:	· ·								
Hydrogen, diss	solved								
Equipment: Bubble	e strip sampling field	method							
	Start stripper at	(ti	ime)						
	End stripper at	(t	ime)						
	Lotal stripper time		lantarite						
	Pump rate	milliliters	siminute						

Æ	Tetra Tech NUS, Inc.
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# **GROUNDWATER SAMPLE LOG SHEET**

							Page_	of
Project Site Name: Project No.:	NASA W 112GN16	HF W	10D		Sample Sample	ID No.: Wi Location:	F-WOD17 15GW7	<u>56w7-4</u>
<ul> <li>Domestic Well Data</li> <li>Monitoring Well Data</li> <li>Other Well Type:</li> <li>QA Sample Type:</li> </ul>					C.O.C.   Type of [] Low [] High	No.: Sample: Concentra Concentra	ation ation	
SAMPLING DATA:								
Date: 1 14 09	Color	pН	S.C.	Temp.	Turbidity	DO	Salinity	Other
Time: 13-1435	(Visual)	(S.U.)	(mS/cm)	( <sup>0</sup> C)	(NTU)	(mg/l)	(%)	ORP
Method: (b) f[v]	Clear	4110	0,0	> 7	4.46	4.12	010	<u> </u>
Date: 119107	Volume	pH	S.C.	Temp.	Turbidity	DO	Salinity	Other
Method: $[0ii] + [0ii]$	ે રહે	1000	HOW	puge	109			
Monitor Reading (ppm):								
Well Casing Diameter & Material Type: $2'' PVC$								
Total Well Depth (TD): ろの								
Static Water Level (WL): 25.14								
One Casing Volume(gal/L): 0.7%	,]							
Start Purge (hrs): 1400					ĺ			
End Purge (hrs): 1435								
Total Purge Time (min): 35								
Total Vol. Purged (gal/L): 3 4-4							1	
SAMPLE COLLECTION INFORM	ATION							
Analysis		Preser	vative		Container R	equirements	;	Collected
TZ L VOC		HLL	****	(3)40	SAL VOA	vials		
TEL SNOC		۲ <u>. م</u>	-	(2) 1	L Amb	e e		
TAL Metal		100	<u> </u>	13	45 mL po	<u>ly</u>		
					*	-		
							·····	
			•					
	****							
· · · · · · · · · · · · · · · · · · ·								
OBSERVATIONS / NOTES								
Circle If Applicable:					Signature(s	a):		
MS/MSD Duplicate ID No	<u>, 2010-10-10-10-10-10-10-10-10-10-10-10-10-</u>	****************		***********************			5	$\overline{}$
						(	R	
					1			

PROJECT	SITE NAME: NUMBER:	NASA W	N TI E O				WELL ID.: DATE:	WFF-wob	15GW 7	
Time	Water Level	Flow	pН	S. Cond.	Turb.	DO	Temp.	ORP	Salinity	Comments
(Hrs.)	(Ft. below TOC)	(mL/Min.)	(S.U.)	(mS/cm)	(NTU)	(mg/L)	(Celcius)	mV	% or ppt	
Qohi	ちょうち	ගි	4ov	60.09	3,19	4.72	15,5	68	0,0	
1405	50,90	300	1.03	20%	243	4.54	16.1	11	0.0	
014	24.72	370	4.15	0,10	5.17	585	16,2	73	0,0	
1415	26.91	Эæ	4.22-	0.10	4.19	4.10	16.1	65	0,0	
1420	27.11	3-8-200	4119	0,10	3,89	4.27	16.1	66	0,0	
17 23 17	27.23	200	4-14	0,10	5,34	4,26	15.9	59	0,0	71.4 4,17
1430		200	4.18	0,10	4,46	4.12	15,7	58	0, O	
435		Start S	ampling	4	-					
			AU	al pur	ard					
			Ĺ	-	L					
					:					
SIGNATUR	RE(S):		A	l						PAGEOF

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LOW FLOW PURGE DATA SHEET

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Tetra Tech NUS, In	،C.							Page _ of _	<u> </u>
Project Site Na	ame:	NASA WF	F-FFTA	WOD	_	Sample ID N	0.: WFF - W	ND-156W	7-4
Project No.: 112GN16		112GN161	12	-		Sample Loca	ition: 15 (	<u> 5w7</u>	
Sampled By: をい				-		Duplicate:			
Field Analyst: En						Blank:			
Field Form Checked as per QA/QC Checklist (initial				ils):	[	1			
SAMPLING DATA									
Date: 1114/09		Color	рН	s.c.	Temp.	Turbidity	DO	Salinity	ORP (Eh)
Time: 1435		(Visual)	(S.U.)	(mS/cm)	(°C)		(mg/l)	(%)	(+/- mv)
Method: mut flow		Clear	4.18	0.10	15.7	4.46	4.12	D.D	58
SAMPLE COLLEC	TION/ANALYSIS IN	FORMATION							
ORP (Eh) (+/- mv) Electrode Make & Model: Hora U-22									
···· ( ) (	58		Reference	Electrode (	circle one): 5	Rilver-Silver Chlori	ide / Calomel	/ Hvdrogen	
Equipment: Cheme	trics Test Kit				_	Concentration:	3,5	_ppm	
Range Used:	Range	Method	Concentra	tion ppm			21 <b>1</b> 1		
	0 to 1 ppm	K-7510			1	Analysis Time:	14 30		
	1 to 12 ppm	K-7512			1			•	
	<u> </u>	L			1				
Equipment:	HACH Digital Titrato	or OX-DT			-		Analysis Time:	:	-
Range Used:	Range	Sample Vol.	Cartridge	Multiplier		Titration Count	Multiplier	Concentration	_
	1-5 mg/L	200 ml	0.200 N	0.01			x 0.01	= mg/L	_l
	2-10 mg/L	100 ml	0.200 N	0.02			x 0.02	≕ mg/L	.]
Notes:					-				
Carbon Dioxid	e:								
Equipment: Cheme	trics Test Kit	T	-1		٦	Concentration:	70	_ppm	
Range Used:	Range	Method	Concentrat	tion ppm	4		mug		
	10 to 100 ppm	K-1910	70	<u>}</u>	4	Analysis Time:	17.0	-	
	100 to 1000 ppm	K-1920			1				
	250 to 2500 ppm	K-1925			J				
Equipment:	HACH Digital Titrat	or CA-DT							
Range Used:	Range	Sample Vol.	Cartridge	Multiplier	]	Titration Count		Concentration	]
	10-50 mg/L	200 ml	0.3636 N	0.1			x 0.1	= mg/L	
	20-100 mg/L	100 ml	0.3636 N	0.2	1		x 0.2	= mg/L	1
	100-400 mg/L	200 ml	3.636 N	1.0	1		x 1.0	= mg/L	1
	200-1000 mg/L	100 ml	3.636 N	2.0	1		x 2.0	= mg/L	
Standard Additions:	: Titran	t Molarity:		Digits Reg	uired: 1st.:	2nd.:	3rd.:		-
Notes:				-					
Hydrogen, dissolved									
Equipment: Bubble strip sampling field method									
	Start stripper at		time)						
	End stripper at		time)						
	Total stripper time	· · · · · · · · · · · · · · · · · · ·	,						
	Pump rate	milliliter	/s/minute						
	·								
Note: Analyte, method, and/or equipment may be deleted from form if not being performed.



Range Used:

Standard Additions:

Ferrous Iron (Fe<sup>2+</sup>):

Hydrogen Sulfide (H<sub>2</sub>S):

Equipment: Chemetrics Test Kit

Notes:

Equipment:

Equipment:

Equipment:

Sulfide (S<sup>2-</sup>):

Range Used:

Notes:

Notes:

# FIELD ANALYTICAL LOG SHEET **GEOCHEMICAL PARAMETERS**

Project Site N	ame:	NASA WE	- <b>F-FFTA</b> _ ωο
Project No.:		112GN16	12
Sampled By:	Ēω		
Field Analyst:	EU		
Alkalinity:			
Equipment: Cheme	etrics Test Kit		
		<b></b>	
Range Used:	Range	Method	Concentration bt
Range Used:	Range 10 to 100 ppm	Method K-9810	4-0
Range Used:	Range 10 to 100 ppm 50 to 500 ppm	K-9810 K-9815	4-0

2.	GEC				IEKS		Page	$\frac{2}{2}$ of $\frac{2}{2}$	<u>}</u>
ime:	NASA WF	F-FFTA-	WOD		Sample ID N	o.:WFF-	WOD	-150	<u>w'7-4</u>
	112GN161	2			Sample Loca	tion: WUD-	SGW	17-4	
Eω					Duplicate:				
EN					Blank:	$\Box$			
rics Test Kit	<b>.</b>				Concentration:	40	_ppm		
Range	Method	Concentrat	ion ppm			1444			
10 to 100 ppm	K-9810	40			Analysis Time:	····	-		
50 to 500 ppm	K-9815								
100 to 1000 ppm	K-9820							Filtered:	
HACH Digital Titrat	or AL-DT					<b></b>			
Range	Sample Vol.	Cartridge	Multiplier	Titra	tion Count	Multiplier	Conc	entration	
10-40 mg/L	100 ml	0.1600 N	0.1		&	x 0.1	=	mg/L	
40-160 mg/L	25 ml	0.1600 N	0.4		& &	<b>x</b> 0.4	=	mg/L	
100-400 mg/L	100 ml	1.600 N	1.0		& &	x 1.0	=	mg/L	
200-800 mg/L	50 ml	1.600 N	2.0		& &	<b>x</b> 2.0	=	mg/L	
500-2000 mg/L	20 ml	1.600 N	5.0		& &	x 5.0	=	mg/L	
1000-4000 mg/L	10 ml	1.600 N	10.0		&	x 10.0	=	mg/L	
						-			
Parameter:	Hydroxide	Carb	onate	Bio	arbonate				
Relationship:									
Titran	t Molarity:		Digits Requ	uired: 1st.:	2nd.:	3rd.:			
e <sup>2+</sup> ):									
DR-850	DR-8	Range: 0 -	3.00 mg/L		Concentration:	2.4	_ppm		
Program/Module:	500nm	33			Analysis Time:	1439			
IR-18C Color Whee	-	Range: 0 -	10 ma/L		-		-		
		,	, •g					Filtered:	
de (H <sub>2</sub> S):		Range: 0 -	5 mg/L			4			
HS-C	Other:				Concentration:	1,5	ppm		
Exceeded 5.0 mg/L	range on colo	or chart:			Analysis Time:	1442	-		
rics Test Kit		Range: 0 -	10 mg/L		Concentration:		_ppm		
Range	Method	Concentral	ion ppm						
0 to 1 ppm	K-9510				Analysis Time:		-		
1 to 10 ppm	K-9510								

				Filtered:	
Equipment:	DR-850	DR-8	Range: 0 - 0.70 mg/L		
Program/Module:	610nm	93			
Notes:					

Æ	Tetra Tech NUS, Ir	าC.	GROU	INDWA <sup>.</sup>	TER SAI	MPLE LO	G SHEE	ET Page	) of [
Project Site Project No.:	Name:	NASA WFF-V 112GN1612	VOD		· · · · · · · · · · · · · · · · · · ·	Sample Sample Sample	ID No.: Location: d By:	WFF-WO	D - MW3R-
[] Domes <u>_</u> [_Monitor [] Other \ [] QA Sa	tic Well Data ring Well Data Well Type: mple Type:					C.O.C. I Type of [] Low [] High	No.: Sample: Concentra Concentr	ation ration	
SAMPLING DAT	TA								
Date: 1/14	109	Color	рН	S.C.	Temp.	Turbidity	DO	Salinity	Other
Time: 1510	ò	(Visual)	(S.U.)	(mS/cm)	(°C)	(NTU)	(mg/l)	(%)	ORP
	N FLOW	Clear	5,65	0,170	<u>15,5</u>	<u> </u>	<u> </u>	O,O	45
	1								
Date: 1/14	$10^{\circ}$	Volume	рн	S.C.	Temp.	Turbidity	DO	Salinity	Other
Method:	- Flow							and the second	
Monitor Reading	) (ppm):			-			and desired in the second	. and the second second	
Nell Casing Dia	meter & Material					401	ALL DE		
Гуре: 🕹					1 1				
otal Well Depth	n (TD):***				05	J_			
Static Water Lev	/el (WL): 교요, (주고			10	- A	eer			
One Casing Volu	ume(gal/L): (),(3, <sub>9=</sub>		6	E.C.	N/	`			
Start Purge (hrs)	): 1417°		T.V. Marking Street and Street	PM	1				
End Purge (hrs):	: 1510`	and the second	5 4 4 <sup>1</sup>		ノ				
Total Purge Tim	e (min): 53								
Total Vol. Purge	d (gal/L): ス <sup>3</sup> /4 <sub>91</sub>			ľ					
SAMPLE COLL	ECTION INFORMA	ATION:							
	Analysis		Preser	vative	······	Container Re	equirement	s	Collected
TCL VC	<u>265                                    </u>		HC_		<u> </u>	) 40ml	<u>VOA</u>	Vierts	yes
TCL SI	<u>10Cs</u>		1	~	(2	ILA.	mber		yes
TAL M	letals		<u>HN</u>	03		<u>125 m</u>	L po	<u>لا</u>	Ye S
ODECOVATION									
DESCRIMINON	O ( NOI EOI						1		
	/		-	1	· ] [	~~~ C	100	+	
	500		$\wedge $ $Q$ .	nerty i	ICC ( )			r	
		10	ir g	eoch	enic	-Tpa	fame	ters	
DESERTENCE						Signaturole	}• ×		
Circle If Applic	able:	•	-			Signature(s	* / ^	-111	
Sircle If Applic MS/MSD	able: Duplicate ID No.					Signature(s	» AB	the H	

PROJECT SITE NAME: PROJECT NUMBER:	5
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LOW FLOW PURGE DATA SHEET

WELL ID.: DATE:

WFF-WOD-MW3R-4

SIGNATU											15/12	1500	1455	- 2 1 2 1	<b>たわわ</b>	S H H	8, c µl	433	9 2 2 9	日代で	0 5 11	L1H1	(Hrs.)	Time
RE(S): ()waji ()M	-																4	31.92		クトうた	26,70	ためっして	(Ft. below TOC)	Water Level
	vian.										` <del>`</del> }≶	star						130			0 <u>8</u>		(mL/Min.)	Flow
											25 t	It appo	5.65	5,64	たから	5,61	S. 65	200	53 5	1-9'5	600		(S.U.)	pН
ļ					-						Moline	chon	0,170	5.91.0	Sh10	19110	35,0	121.0	211 O	081.0	0154		(mS/cm)	S. Cond.
										Ĺ	アベカルビ	ZV4 an		21.1	0.8.1	1,2; C	1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1	رب مرب	انطط	5,34	らって		(NTU)	Turb.
										۲ ر	Dertand	nura	S. S.	10.6	81.8	9,05	42.8	39'S	rs, z	85 B	15.01		(mg/L)	ō
												6.5	15.3	15:2	b' h/	8141	14 A	5	l S l	9 8, PI	0,21		(Celcius)	Temp.
													75	アー	ч С	5	55	Sh	S ₹	ale a	- 7		ηV	ORP
													С, d	0 Ó	0 0	0 0	00	م م	0,0	0 O	a,c		% or ppt	Salinity
																								Comments

Note: Analyte, method, and/or equipment may be deleted from form if not being performed.



# FIELD ANALYTICAL LOG SHEET GEOCHEMICAL PARAMETERS

		GEC	CHEM	ICAL P/	ARAME	TERS			I
Tetra Tech NUS, Inc	2.							Page <u></u> of _	
Project Site Na	ame: MASA	WFF (	NON	)		Sample ID N	o.: WFF-(	WOD MW3	R-4
Project No.:	112 G NI61	2				Sample Loca	ition:	······································	
Sampled By:	788					Duplicate:			
Field Analyst:	Jacob Birkett			•		Blank:			
Field Form Ch	ecked as per QA	VQC Check	dist (initia	ls):					
SAMPLING DATA									
Date: 1/14/c	2	Color	рH	S.C.	Temp.	Turbidity	DO	Salinity	ORP (Eh)
Time: 1510	$\circ$	(Visual)	(S.U.)	(mS/cm)	(°C)	(NTU)	(mg/l)	(%)	(+/- mv)
Method:	Flow	clear	5,65	0.170	15,3	1.18	8,56	0.0	75
SAMPLE COLLECT	TION/ANALYSIS IN	FORMATION:							
ORP (Eh) (+/- n	nv)		Electrode N	vlake & Mod	lel:				
			Reference	Electrode (d	circle one): S	Silver-Silver Chlori	ide / Calomel	/ Hydrogen	
Dissolved Oxy	gen:						y		
Equipment: Chemet	rics Test Kit					Concentration:	<u></u> 5	ppm	
Range Used:	Range	Method	Concentrat	ion ppm					
	0 to 1 ppm	K-7510				Analysis Time:	1503	_	
N.	1 to 12 ppm	K-7512	5.4	>				-	
Equipment:	HACH Digital Titrate	or OX-DT				·	Analysis Time:		_
Range Used:	Range	Sample Vol.	Cartridge	Multiplier		Titration Count	Multiplier	Concentration	]
	1-5 mg/L	200 ml	0.200 N	0.01			x 0.01	≕ mg/L	
	2-10 mg/L	100 ml	0.200 N	0.02			x 0.02	= mg/L	
Notes:						t			-
Carbon Dioxid	e:						100		
Equipment: Chemet	rics Test Kit				_	Concentration:	_10,5	_ppm	
Range Used:	Range	Method	Concentrat	tion ppm			1 <b>-</b>	_	
Ř	10 to 100 ppm	K-1910	10.	5		Analysis Time:	1509	0	
	100 to 1000 ppm	K-1920							
	250 to 2500 ppm	K-1925							
Equipment:	HACH Digital Titrate	or CA-DT							
Range Used:	Range	Sample Vol.	Cartridge	Multiplier		Titration Count		Concentration	1
	10-50 mg/L	, . 200 ml	0.3636 N	0.1			x 0.1	= mg/L	
	20-100 mg/L	100 ml	0.3636 N	0.2	1		x 0.2	= mg/L	1
	100-400 mg/L	200 ml	3.636 N	1.0	1		x 1.0	= mg/L	1
	200-1000 mg/L	100 ml	3.636 N	2.0	1		<b>x</b> 2.0	= mg/L	]
Standard Additions:	Titran	t Molarity:		Digits Requ	uired: 1st.:	2nd.:	3rd.:		
Notes:				- /					
Hydrogen, diss	solved								
Equipment: Bubble	e strip sampling field	method							
	Start stripper at	(t	ime)						
	End stripper at		time)						
	Total stripper time	``	·						
	Pump rate	milliliter	s/minute						
	,								

Note: Analyte, method, and/or equipment may be deleted from form if not being performed.



# FIELD ANALYTICAL LOG SHEET GEOCHEMICAL PARAMETERS

Tetra Tech NUS, In	C.						Page	<u>of</u>	<u> </u>
Project Site N	ame: NASA	WFF L	JOD	2	Sample ID No	s.: WFF-	. (10]	>Mh	13R-4
Project No.:	112 GN1617	2			Sample Loca	tion:			
Sampled By:	1BB				Duplicate:				
Field Analyst:	Jacob Birkett				Blank:				
Alkalinity:									
Equipment: Cheme	trics Test Kit	•			Concentration:	<u> </u>	ppm		
Range Used:	Range	Method	Concentrat	ion ppm		1511			
	10 to 100 ppm	K-9810	2	2	Analysis Time:	<u>O</u>	_		
	50 to 500 ppm	K-9815							_
	100 to 1000 ppm	K-9820						Filtered:	$\Box$
Equipment:	HACH Digital Titrat	or AL-DT							
Range Used:	Range	Sample Vol.	Cartridge	Multiplier	Titration Count	Multiplier	Conc	entration	
	10-40 mg/L	100 ml	0.1600 N	0.1	&	<b>x</b> 0.1	=	mg/L	
	40-160 mg/L	25 ml	0.1600 N	0.4	&	<b>x</b> 0.4	=	mg/L	
	100-400 mg/L	100 ml	1.600 N	1.0	&	x 1.0	=	mg/L	
	200-800 mg/L	50 ml	1.600 N	2.0	&	x 2.0	=	mg/L	
	500-2000 mg/L	20 ml	1.600 N	5.0	&	x 5.0	=	mg/L	
	1000-4000 mg/L	10 ml	1.600 N	10.0	&	x 10.0	=	mg/L	
	<b></b>	1	1			1			
	Parameter:	Hydroxide	Carb	onate	Bicarbonate				
	Relationship:								
Standard Additions: Notes:	: Titran	t Molarity:		Digits Requ	ired: 1st.: 2nd.:	3rd.:			
Ferrous Iron (F	<sup>-</sup> e <sup>2+</sup> ):								
Equipment:	DR-850	DR-8	Range: 0 -	3.00 ma/L	Concentration:	$\langle \rangle$	naa		
Equipmont	Program/Module:	500nm	33	0.00 mg. L					
	r rogram/woode.	5001111	00		Analysis Time:	502			
<b>Facilitations</b>		5	Deres 0	10	Analysis Time.	<u>~~~~</u>	-		
	IR-16C COIOL MILLE	<u>.</u>	Range. 0 -	To mg/L				Filtorodi	П
Notes.	ide (11 C).			~				Fillered.	
nyurogen Sun	ide (п <sub>2</sub> 5).		Range: 0 -	5 mg/L		0			
Equipment:	HS-C	Other:			Concentration:		_ppm		
	"Exceeded 5.0 mg/L	, range on colo	or chart:		Analysis Time:	1500	_		
Notes:									
Sulfide (S <sup>2*</sup> ):									
Equipment: Cheme	trics Test Kit		Range: 0 -	10 mg/L	Concentration:		_ppm		
Range Used:	Range	Method	Concentral	ion ppm					
	0 to 1 ppm	K-9510			Analysis Time:		_		
	1 to 10 ppm	K-9510							<b></b>
								Filtered:	
Equipment:	DR-850	DR-8	Range: 0 -	0.70 mg/L					
Program/Module:	610nm	93							
Notes:									

# ATTACHMENT 4

Lab Analytical Results

**Baseline Analytical Results** 

Client: Tetra Tech NUS, Inc Project: CTO 12 NASA Wallops PO No: Sample Date: 12/03/08 Received Date: 12/06/08 Extraction Date: Ana)ysis Date: 11-DEC-2008 17:06 Report Date: 12/29/2008 Matrix: WATER % Solids: NA

.

Lab ID: \$37036-2RA Client ID: WI-WOD-15GW1-1 SDG: CT012-2 Extracted by: Extraction Method: SW646 5030 Analyst: TTC Analysis Method: SW846 8260B Lab Prep Batch: WG59016 Units: ug/1

CAS#	Compound		Flage	Results	DF	PQL	Adj.PQL	Adj.MDL
71-43-2	Benzene		υ	1	1.0	2	1	0.3
127-18-1	Tetrachloroethene		ป	1	1.0	1	1	0.3
1330-20-7	Xylenes (total)		ប	3	1.0	З	3	0.3
	m+p-Xylenes		σ	2	1.0	2	2	0.7
95-47-6	o-Xylene		υ	1	1.0	1	1	0.3
95~63-6	1,2,4-Trimethylbenzene		υ	1	1.0	1	1	0.2
1868-53-7	Dibromofluoromethane			84%				
17060-07-0	1,2-Dichloroethane-D9			75%				
2037-26-5	Toluene-DB			98%				
460-00-4	P-Bromofluorobenzene			B9%				
	Page	61 OZ	ΟI	\$4693.D				

Client: Tetra Tech NUS, Inc Project: CTO 12 NASA Wallops PO No: Sample Date: 12/05/08 Received Date: 12/06/08 Extraction Date: 12/09/08 Analysis Date: 17-DEC-2006 16:22 Report Date: 12/18/2008 Matrix: WATER \$ Solids: NA

.

Lab ID: \$87036-2 Client ID: WI-WOD-15GWL-1, SDG: CT012-2 Extracted by: KF Extraction Method: \$W846 3510 Analyst: JLP Analysis Method: \$W946 82700 Lab Prep Batch: WG58922 Units: ug/L

CA\$#	Compound	Plage	Results	DF	PQL	Adj.PQL	Adj.MDL
65794-96-9	3&4-Methylpherol	σ	10	1.0	10	10	3
91-20-3	Naphthaleae	υ	10	1.0	10	10	2
367-32-4	2-Fluorophenol		318				
13127-88-3	Phenol-D6		19*				
4165-60-0	Nitrobenzene-DS		77%				
321-60-8	2-Fluorobiphenyl		80%				
118-79-6	2,4,6-Tribromophenol		74%				
1738-51-0	Terphenyl-D14		95%				
	Page	01, OT 01.	G3520.D				

Lab Name: Katahdin Analytical Scr	viecs Client Field ID:	WI-WOD-1	5GW1-1	
Matrix: WATER	SDG Name:	CT012-2		
Percent Solids: 0.00	1			
	Concentration Units : ug/L			
CAS No. Analyte	Concentration C Q	M DF	Adjusted PQL.	Adjusted MDL
7440-38-2 ARSENIC, TOTAL	3.3 B	MS S	5.0	1.45

# I INORGANIC ANALYSIS DATA SHEET

Comments:

Bottle ID: D

# KATAHDIN ANALYTICAL SERVICES

Report of Analytical Results

Client: Tetra Tech NUS, Inc Project: CTC 12 NASA Wallops PO No: Sample Date: 12/05/08 Received Date: 12/06/08 Extraction Date: Analysis Date: 11-DEC-2006 17:37 Report Date: 12/29/2008 Matrix: WATER % Solids: NA

-

Lab ID: SB7036-7RA Client ID: WJ-WOD-150W2 SDG: CT012-2 Extracted by: Extraction Method: SWB45 5030 Analyst: TTC Analysis Method: SW846 82603 Lab Prep Batch: WG59016 Units: wg/1

Cas#	Compound	Flags	Results	DF	PQL	Adj.PQL	Adj.MDL
72-43-2	Benzene	τ	1	1.0	2	1	0.3
127-18-4	Tetrachloroethere	Ū	2	1.0	1	1	С.Э
1330-20-7	XyLenes (total)	ч	3	1,0	3	3	0.3
	m+p-Xylenes	Ū	2	1.0	2	2	0.7
95-47-6	o-Xylene	σ	Ι	1.0	<u>3</u>	1	D.3
95-63-6	1,2,4-Trimethylbenzene	ប	Ъ	1.0	1	1	0.2
1868-53-7	Dibromofluoremethane		90%				
17060-07-0	1,2-Dichloroethane-D4		76%				
2037-26-5	Toluene-D8		988				
460-00-4	P-Bromofluorobenzene		89%				
	Page	01 of 01	54694.D				

.

Sample Data Summary A0000008

Cliant: Tetra Tech NUS, Inc Project: CTO 12 NASA Wallops PO No: Sample Date: 12/05/08 Received Date: 12/06/08 Extraction Date: 12/09/08 Analysis Date: 17-DEC-2006 21:56 Report Date: 12/18/2008 Matrix: WATER \$ Solids: NA Lab ID: 987036-7 Client ID: WI-WOD-15GW2 SDG: CT012-2 Extracted by: KP Extraction Method: SW046 3510 Analyst: JCG Analysis Method: SW046 9270C Lab Prep Batch: WG68922 Units: ug/L

CAS#	Compound	¥lags	Results	DF	POL	Adj.PQL	Adj.MDL
65794-96-9	3&4-Kerhylphenol	σ	11	1.0	10	12	3
91-20-3	Naphthalene	σ	11	1.0	10	17	2
367-12-4	2-Pluorophenol		33%				
13127-88-3	Phenol-D6		17%				
4165-60-0	Nitrcbenzene-D5		62%				
321~60+8	2-Fluorobiphenyl		69%				
118-79-6	2,4,6-Tribromophenol		748				
1718-51-0	Terphenyl-D14		95%				
	Page	01 of D1	G3527.D				

Lab Nag	Lab Name: Katahdin Analytical Services			dl D	: WI-W	OD-150	SW2		
Matrix:	Matrix: WATER			SDG Name: CTO12-2					
Percent	Solids: 0.00	Lab S	Samj	ple ID	: SB703	6-007			
		Concentration Units	: ug	L					
CAS No.	Analyte	Concentration	C	Q	м	DF	Adjusted PQL Adjusted MDL		
7440-38-2	ARSENIC, TOTAL	4.8	в		MS	5	5.0 1.45		

] INORGANIC ANALYSIS DATA SHEET

### Comments:

Bottle ID: D

Lab Nar	ne: Katahdin Analytical Servic	es Client Field I	D: WI-W	0D-150	3W2	
Matrix:	WATER	SDG Name:	CTOI	2-2		
Percent	Solids: 0.00	Lab Sample I	D: SB703	6-008		
		Concentration Units : ug/L				
CAS No.	Analyte	Concentration C Q	M	DF	Adjusted PQLAdj	justed MDL
7440-38-2	ARSENIC, DISSOLVED	4,1 B	MS	5	5.0	1.45

1 INORGANIC ANALYSIS DATA SHEET

Comments:

.

Bottle ID: A

Client: Tetra Tech NUS, Inc Project: CTO 12 NASA Wallops PO No: Sample Date: 12/08/08 Received Date: 12/11/08 Extraction Date: Analysis Date: 17-DEC-2008 00:30 Report Date: 12/18/2008 Matrix: WATER % Solids: NA

.

Lab ID: SB7125-2 Client ID: WFF-WOD-15MW3R-1 SDG: CT012-3 Extracted by: Extraction Method: SW846 503C Analyst: TTC Amalysis Method: SW846 B26DB Lab Prep Batch: WG59135 Units: ug/1

CAS#	Compound	Flags	Results	DF	⊅gr	Adj.PQL	Adj.MDL
71-43-2	Benzere	Π	1	1.0	1	1	0.3
127-18-4	Tetrachlorosthene	U	1	1.0	l	1	0.4
1330-20-7	Xylenes (total)	υ	3	1.0	Э	3	0.3
	m+p-Xylenes	Ц	2	1.0	2	2	D.7
95-47-6	o-Xylene	U	1	1.0	1	1	0.3
95-63-6	1,2,4-Trimethylbenzene	υ	1	1.0	1	1	0.2
1868-53-7	Dibromofluoromethane		94%				
17060-07-0	1,2-Dichlorcethane-D4		87%				
2037-26-5	Toluere-D8		95%				
460-00-4	P-Bramofluorabenzene		90%				

Page 01 of 01 \$4761.D

Client: Tetra Tech NUS, Inc Project: CTO 12 NASA Wallops PO No: Sample Date: 12/08/08 Received Date: 12/11/08 Extraction Date: 12/14/08 Analysis Date: 17-DBC-2008 03:36 Report Date: 12/18/2008 Matrix: WATER \$ Solids: NA Lab ID: SB7125-2 Client ID: WFF-WOD-15MW3R-3 SDG: CT012-3 Extracted by: GN Extraction Method: SW646 3510 Analyst: JCG Analysis Method: SW846 0270C Lab Prep Batch: NG59045 Units: ug/L

CAS#	Compound	Flags	Results	DF	PQL	Adj.PQL	Adj.MDL
65794-96-9	3@4-MethylphenoL	σ	11	1.0	IO	11	3
91-20-3	Naphthalene	ប	11	1.0	10	11	2
367-12-4	2-Fluorophenal		338				
13127-99-3	PhenolD6		22%				
4165-60-0	Nitrobenzene-D5		578				
321-69-8	2-Fluorobiphenyl		52%				
118-79-6	2,4,6-Tribromophenol		66%				
1718-51-0	Terphenyl-D14		88%				

Page 03 of 03. G3504.D

Sample Data Summary A0000051

Lab Naz	Lab Name: Katabdin Analytical Services			'ield III	: WFF	-WOD	-15MW3R-1	
Matrix:	Matrix: WATER			me:	CTC	)12-3		
Percent	Percent Solids: 0.00			nple II	): SB7	125-002	2	
		Concentration Unit	<b>s:</b> u	g/L				
CAS No.	Analyte	Concentration	С	Q	м	DF	Adjusted CRDL	Adjusted MDL
7440-38-2	ARSENIC, TOTAL	Į.45	υ		MS	5	5.0	1.45

Comments:

Bottle JD: F

FORM I - IN

Client: Tetra Tech NUS, Inc Project: CTO 12 NASA Wallops PO No: Sample Date: 12/08/08 Received Date: 12/11/D8 Extraction Date: Analysis Date: 16.DEC-2008 23:58 Report Date: 12/19/2008 Matrix: WATER % Solids: NA Lab ID: SB7125-3 Client ID: WFF-WOD-15GW7-1 SDG: CT012-3 Extracted by: Extraction Method: SW846 5030 Analyst: TTC Analysis Method: SW846 8260B Lab Frep Batch: WE59135 Units: cg/1

Cast	Compound	Tlage	Results	DF	PQL	Adj.PQL	Adj.MOL
71-43-2	Benzene		32	1.0	1	l	0.3
127-18-4	Tetracbloroethene		3	1.0	1	l	0.4
1330-20-7	Xylenes (total)		330	1.0	з	3	0.3
	æ+p-Xylenes		240	1.0	Ż	2	0.7
95-47-6	o-Xylene		96	2.0	1	구	0.3
95-63-6	1,2,4-Trimethylbenzene		73	1.0	1	1	0.2
1868-53-7	Dibromofluoromethane		89%				
17060-07-0	1,2-Dichloroethane-D4		66\$				
2037-26-5	Toluene-D6		93 %				
460-00-4	P-Bromofluorobenzene		B9%				
	Page	01 of 01	S4760.D				

Sample Data Summary A0000004

Client: Tetra Tech NUS, Inc Project: CTO 12 NASA Wallops PO No: Sample Date: 12/08/08 Received Date: 12/11/08 Extraction Date: 12/14/08 Analysis Date: 17-DEC-2008 04:19 Report Date: 12/19/2008 Matrix: WATER \$ Solids: NA

.

Lab TD: SB7125-1 Client ID: WFF-WOD-15GW7-1 SDG: CTO12-3 Extracted by: GN Extraction Method: SW846 3510 Analyst: JCG Analysis Method: SW846 8270C Lab Prep Batch: WG59045 Units: ug/L

CA8#	Compound	Flags	Results	₽₽	ъõг	Adj.PQL	Adj.MDL
65794-96-9	344-Methylphenol	υ	11	1.0	10	Il	3
91-20-3	Naphthalene		96	1.0	10	11	2
367-12-4	2-Fluorophenol		39%				
131,27-98-3	Phenol-D6		33%				
4165-60-0	Nitrobenzene-D5		761				
321-60-8	2-Finorobiphenyl		80%				
118-79-6	2,4,6-Tribromophenol		97%				
1,718-51-0	Terphenyl-D14		98%				
	Page	C1 of 01	G3505.D				

Lab Nau	ne: Katahdin Analytical Se	rvices Clis	eot F	ield B	D: WEE	-wod	-15GW7 <b>-</b> 1	
Matrix: WATER		SD	G Na	me:	CTO	012-3		
Percent Solids: 0.00			Sai	nple I	D: SB7	125-00	1	
		Concentration Unit	s : ú	g/L				
CAS No.	Analyte	Concentration	С	Q	М	DF	Adjusted CRDL	Adjusted MDL
7440-38-2	ARSENIC, TOTAL	26.9			MS	5	5.0	1.45

1 INORGANIC ANALYSIS DATA SHEET

Comments:

Bottle ID: F

Client: Tetre Tech NUS, Inc Project: CTO 12 NASA Wallops PO No: Sample Date: 12/05/08 Received Date: 12/06/08 Extraction Date: Analysis Date: 11-DEC-2008 16:35 Report Date: 12/29/2009 Metrix: WATER \$ Solids: WA Lab ID: SE7036-1RA Client ID: WI-WOD-16GWZD SDG: CT012-2 Extracted by: Extraction Method: SW846 5030 Analyst: 100 Analysis Method: SW846 62608 Lab Prep Batch: WG59016 Units: ug/1

CA9#	Compound	Flago	Results	D?	PQL	Adj.PQL	Adj.MDL
71-43-2	Benzene		3	1.0	l	1	0.3
127-18-4	Tetrachloroethene	U	l	1.0	l	1	0.3
1330-20-7	Xylenes (total)	υ	3	1.0	3	з	0.3
	a+p-Xylenes	ប	2	1.0	2	2	0.7
95-47-6	o-Xylene	υ	1	3, . 0	ī	1	0.3
95-63-6	1,2,4-Trimethylbenzene	σ	Ē	1.0	2	Э.	0.2
1068-53-7	Dibromoflucromethane		988				
17060-07-0	1,2-Dichloroethane-D4		758				
2037-26-5	Toluene-D8		106%				
460-00-4	P-Bromofluorobenzene		918				
	Page	01 af 01	S4692.D				

Sample Data Summary A0000004

Client: Tetra Tech NUS, Inc Project: CTO 12 NASA Wallops PO No: Sample Date: 12/05/08 Received Date: 12/06/08 Extraction Date: 12/09/08 Analysis Date: 17-DEC-2008 19:49 Report Date: 12/18/2008 Matrix: WATER % Solids: NA Lab ID: SB7036-1 Client ID: WI-WOD-16GW2D SDG: CT012-2 Extracted by: KF Extraction Method: SW846 3510 Analyst: JCG Analysis Method: SW846 8270C Lab Prep Batch: WG58922 Units: ug/L

CA\$#	Compound	Flags	Results	DF	PQL	Adj.PQL	Adj.MDL
65794-96-9	3&4-Methylphenol	U	11	1.0	10	21	3
91-20-3	Naphthalene	υ	11	1.0	10	21	2
367-12-4	2-Fluorophenol		40%				
13127-98-3	Phenol-D6		23*				
4165-60-0	Nitrobenzene-D5		72%				
321-60-8	2-Fluorobiphenyl		83%				
118-79-5	2,4,6-lxibromophenol		97%				
1718-51-0	Terphenyl-D14		105%				
	Page	01 of 01	G3524.D				

Lab Nar	ne: Katahdin Analytical Ser	vices Clien	t Fic	ld ID	: WI-W	OD-160	GW2D	
Matrix:	Matrix: WATER		Nan	le:	CTO1	2-2		
Percent	Solids: 0,00	LabS	ទឹងអារ	ole ID	: SB703	6-003		
		Concentration Units	: ug/	Ľ		·.		-
CAS No.	Analyte	Concentration	С	Q	м	DF	Adjusted PQL	Adjusted MDL
7440-38-2	ARSENIC, TOTAL	12.3			MS	5	5.0	1.45

I INORGANIC ANALYSIS DATA SHEET

Comments:

Bottle ID: D

FORM 1 - IN

Sample Data Summary A0000072

.

Client: Tetra Tech NUS, Inc Project: C10 12 NASA Wallops PO No: Sample Date: 12/05/08 Received Date: 12/06/08 Extraction Date: Analysis Date: 10-DEC-2009 21:06 Report Date: 12/29/2009 Matrix: WATER % Solids: NA

.

Lab ID: SB7036-5 Client ID: WI-WOD-16GW2S-1 SDG: CT012-2 Extracted by: Extraction Method: SW846 5030 Analyst: HCG Analysis Method: SW846 8260B Lab Prep Batch: WG58976 Units: ug/l

CAS#	Compound	F	lags	Results	DF	PQL	Adj.PQL	Adj.MDL
71-43-2	Benzene			5	エ.0	1	1	0.3
127-18-4	Tetrachloroethene		ਹ	ļ	1.0	J.	il.	0.3
1330-20-7	Xylenes (total)		σ	3	1.0	3	3	0.3
	m+p-Xylenes		U	2	1.0	2	2	0.7
95-47-6	a-Xylene		ਹ	ı	1.0	1	1	0.3
95-63-6	1,2,4-Trimethylbenzene		σ	1	1.0	1	1	0.2
1868-53-7	Dibromofluoromethane			113\$				
17860-07-D	1,2-Dichloroethane-D4			124%				
2037-26-5	Toluene-D8			103%				
460-00-4	P-Bromofluorobensene			104%				
	Page	01 of	בס	M9062.D				

Client: Tetra Tech NUS, Inc Project: CTO 12 NASA Wallops PO No: Sample Date: 12/05/08 Received Date: 12/06/08 Extraction Date: 12/09/08 Analysis Date: 17-DEC-2008 21:13 Report Date: 12/18/2008 Matrix: WATER % Solids: NA

.

Leb ID: SB7036-5 Client ID: WI-WOD-16GW2S-1 SDG: CT012-2 Extracted by: KP Extraction Method: SW846 3510 Amalyst: JCG Analysis Method: SW846 8270C Lab Prep Batch: WG58922 Units: ug/L

CAS#	Compound	Flags	Results	DF	PQL	Adj.PQL	Adj.MDL
65794~96~9	3&4-Methylphenol	ŭ	13	1.D	10	13	4
92-20-3	Naphthalene	U	13	2.0	10	13	2
367-12-4	2-7luorophenol		44%				
13127-88-3	Phenol-D6		26%				
41.65-60-0	Nitrobenzene-D5		65%				
321-60-8	2-Fluorobiphenyl		693				
118-79-6	2,4,6-Tribromophenol		07%				
1718-51-0	Terphenyl-D14		90%				
	Page	01 of 01	G3526.D				

Lab Name: Katabdin Analytical Servic	ces Client Field II	WI-W	OD-16G	W2S-1	
Matrix: WATER	SDG Name:	CTO1	2-2		
Percent Solids: 0.00	Lab Sample II	: SB703	6-005		
	Concentration Units : ug/L				
- CAS No. Analyte	Concentration C Q	Ŵ	DF	Adjusted PQLA	djusted MDL
7440-38-2 ARSENIC, TOTAL	18.4	MS	5	5.0	1.45

1 INORGANIC ANALYSIS DATA SHEET

Comments:

Bottle ID: D

FORM I - IN

Sample Data Summary A0000076

Lab Name: Katahdin Analytical Services		es Client F	ield TD	: WJ-W	OD-16G	W2S-1	
Matrix: WATER		SDG Na	nje:	CTOI	2-2		
Percent Solids: 0.00		Lab Sar	nple ID	: SB703	6-006		
		Concentration Units : u	g/L				
CAS No.	Analyte	Concentration C	Q	М	DF	Adjusted PQLA	djusted MDL
7440-38-2	ARSENIC, DISSOLVED	16.0		MS	5	5.0	1.45

I INORGANIC ANALYSIS DATA SHEET

### Comments:

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Bottle ID: A

Client: Tetra Tech NUS, Inc Project: CTO 12 NASA Wallops PO No: Sample Date: 12/05/08 Received Date: 12/06/08 Extraction Date: Analysis Date: 10-DEC-2008 20:32 Report Date: 12/29/2008 Matrix: WATER % Solids: NA

.

Lab ID: SP7036-3 Client ID: WI-WOD-16GW5-1 SDG: CT012-2 Extracted by: Extraction Method: SW846 5030 Analysi: HCG Analysis Method: SW846 82608 Lab Prep Batch: WG58976 Units: ug/1

CAS#	Cospound	Flags	Results	DF	PQL	Adj.PQL	Adj.MDL
71-43-2	Benzene	U	그	2.0	Д.	1	¢.3
127-18-4	Tetrachloroethene	ט	1	1.0	l	l	0.3
1330-20+7	Xylenes (total)	U	3	3.0	3	3	0.3
	m+p-Xylenes	υ	2	I,Q	2	2	0.7
95-47-6	o-Xylene	σ	<u>1</u>	1.0	1	1	0.3
95-63-6	1,2,4-Triathylbenzees	п	I	1.0	<u> </u>	1	0.2
1868-53-7	Dibromofluoromethane		1098				
17060-07-0	1,2-Dichloroethane-D4		121%				
2037-26-5	Toluene-D8		101\$				
460-00-1	P-Brogofluorobenzene		39%				

Page 01 of 01 M9D61.D

Client: Tetra Tech NUS, Inc Project: CTO 12 NASA Wallops PO No: Sample Date: 12/05/08 Received Date: 12/06/08 Extraction Date: 12/09/08 Analysis Date: 17-DEC-2008 20:31 Report Date: 12/18/2008 Matrix: WATER \$ Solids: NA Leb JD: SB7036-3 Client ID: WI~WOD-16GN5-1 SDG: CT012-2 Extracted by: KF Extraction Method: SN846 3510 Analyst: JCG Analysis Method: SW846 B270C Lab Prep Batch: WG58922 Onits: ug/L

CAS#	Compound	Flags	Results	DF	PQL	Adj.FQL	Adj.MDL
65794-96-9	3\$4-Methylphenol	ប	11	1.0	10	11	3
91-20-3	Naphthalene	ប	11	1.0	10	11	2
367-12-4	2-Fluorophenol		338				
33127-88-3	Pherol-D6		20%				
4165-60-0	Nitrobenzene-D5		72 %				
321-60-8	2-Fluorobiphenyl		79%				
118-79-6	2,4,6-TribramophernJ		75%				
1738-51-0	Temphenyl-D14		94%				
	Page	01 of 01	G3525.D				

Lab Nar	ne: Katahdin Analytical Scr	vices Clien	t Fie	dl ID:	: WI-W	OD-16G	)W5-1	
Matrix:	WATER	SDG	Nan	le:	CTO1	2-2		
Percent	Percent Solids: 0.00			ple ID	: SB703	6-003		
		Concentration Units	: ug	L				
CAS No.	Analyte	Concentration	С	Q	M	DF	Adjusted PQLAdj	usted MDL
7440-38-2	ARSENIC, TOTAL	2.2	в		MS	5	5.0	1.45

# 1 INORGANIC ANALYSIS DATA SHEET

Comments:

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Bottle JD: D

Lab Nan Matriy	Lab Name: Katahéin Analytical Services Matrix: WATER		t Fia Nan	id D	WI-W	WI-WOD-16GW5-1 CT012-2				
Percent Solids: 0.00		Lab :	Lab Sample ID: SB7		: SB703	6-004				
CAS No.	Analyte	Concentration	. « <sub>Б</sub> /	Q	M	DF	Adjusted PQL	Adjusted MDL		
7440-38-2	ARSENIC, DISSOLVED	1.45	U		MS	5	5.0	1.45		

] INORGANIC ANALYSIS DATA SHEET

## Comments:

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Bottle ID: A

FORM J - IN

Client: Tetra Tech NUS, Inc Project: CTO 12 NASA Wallops PO No: Sample Date: 12/10/08 Raceived Date: 12/12/08 Extraction Date: Analysis Date: 18-DEC-2008 00:13 Report Date: 12/29/2008 Matrix: WATER V Solids: NA Lab ID: SB7177-1 Client ID: WFF-WOD-16GW9-1 SDG: CD012-2 Extracted by: Extraction Method: SW846 503D Analyst: TTC Analysis Method: SW846 8260E Lab Frep Batch: WG59203 Onits: ug/1

CAS#	Compound	Flags	Results	DF	PQL	Adj.PQL	Adj.MDL
71-43-2	Benzene	U	;2	1.0	l	1	D.3
127-18-0	Tetrachloroethene	σ	I	1.0	l	1	0.3
1339-20-7	Xylenes (total)	U	3	1.0	3	з	0.3
	m+p-Xylenes	đ	2	1.0	2	2	D.7
95-47-6	o-Xylene	σ	1	1.0	l	1	0.3
95-63-6	1,2,4-Trimethylbenzene	υ	l	1.0	1	1	0.2
1868-53-7	Dibromofluoromethane		92%				
17060-07-0	1,2-Dichloroethane-D4		38\$				
2037-26-45	Tolucnz-D8		98%				
460-00-4	P-Bromofluorobeazene		98%				

Page 01 of 01 T2760.D

Client: Tetra Tech NUS, The Project: CTO 12 NASA Wallops PO No: Sample Date: 12/10/08 Received Date: 12/12/08 Extraction Date: 12/16/08 Analysis Date: 17-DEC-2008 19:06 Report Date: 12/18/2008 Matrix: WATER % Solids: NA Lab ID: SB7177-1 Client ID: WFF-WOD-16GWB-1 SDG: CT012-2 Extracted by: KF Extraction Method: SWB46 3520 Analyst: JCG Analysis Method: SWB46 B27DC Lab Frep Batch: WG59113 Units: ug/L

CAE#	Compound	Flags	Results	DF	PQL	Adj.PQL	Adj.MDL
65794-96-9	3&4-Methylphenol	U	ð	1.0	10	9	2
91-20-3	Naphthalene	υ	9	1.0	ΞĐ	9	2
367-12-4	2-Fluorophenol		28%				
13127-88-3	Phenol-D6		1.6%				
4165-60-0	Nitrobenzene-D5		67%				
321~60-8	2-Fluorobiphenyl		71%				
118-79-6	2,4,6-Tribromophenol		73%				
1718-51-0	Terphenyl-D14		85%				
	Page	01. of 01.	G3523.D				

Lab Name: Katahdin Analytical Services		vices Client	t Field	D:	WFF-V	VOD-16	6GW8-1	
Matrix: WATER		SDG	Name	:	CTOI	2-2		
Percent Solids: 0.00		Lab S	sample	ED:	SB717	7-001		
		Concentration Units	: ug/L					
CAS No.	Analyte	Concentration	C +	Q	м	DF	Adjusted PQL	Adjusted MDL
7440-38-2 ARSENIC, TOTAL		6.3			MS	5	5.0	J.45

I INORGANIC ANALYSIS DATA SHEET

Comments:

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Bottle ID: A

Client: Tetra Tech NUS, Inc Project: CTO 12 NASA Wallops PO No: Sample Date: 12/09/08 Received Date: 12/11/08 Extraction Date: Analysis Date: 17-DEC-2008 01:02 Report Date: 12/18/2008 Matrix: WATER % Solida: NA

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Lab ID: SE7125-3 Client ID: WFF-WOD-TW2-1 SEG: CT012-3 Extracted by: Extraction Method: SW046 5030 Analyst: TTC Analysis Method: SW046 9260B Lab Prep Batch: WG59135 Units: ug/1

CAS#	Compound	I	7lags	Results	DF	PQL	Adj.PQL	Adj.1001
71-43-2	Eenzene			90	1.0	2	1	0.3
127-18-4	Tetrachloroethene			2	1.0	1	1	0.4
1330-20-7	Xylenes (total)		Е	620	1.0	Э	3	0.3
	w+p-Xylenes		В	490	1.0	2	2	0.7
95-47-6	o-Xylene			140	1.0	l	1	Q.3
95-63-6	1,2,4-Trimethylbonzone			140	1.0	1	l	0.2
1969-53-7	Dibromofluoromethane			92%				
17060-07-0	1,2-Dichloroethane-D4			89%				
2037-26-5	Toivene-D8			92%				
460-00-4	P-Brompfluorobeazene			86%				
	Page	01 of	01	54762.D				

Client: Tetra Tech NOS, Inc Project: CTO 12 NASA Wallops PO No: Sample Date: 12/09/08 Received Date: 12/11/06 Extraction Date: Analysis Date: 17-DEC-2008 10:06 Report Date: 12/18/2008 Matrix: WATER % Solids: NA Lab ID: SE7125-3DL Client 1D: WFF-WOD-TW1-1 SDG: CT012-3 Extracted by: Extraction Method: SW046 5030 Analyst: TTC Analysis Method: SW046 8260B Lab Prep Batch: WG59149 Units: ug/l

CAS#	Cospound	Flags	Results	DF	Р <u>о</u> ь	Adj.PQL	Adj.MDL
71-43-2	Benzene		85	5.0	1	5	1
127-18-4	Teirachloroethene	σ	5	5.0	1	5	2
1330-20-7	Xylenes (total)		700	5.0	3	15	1
	a+p-Xylenes		560	5.0	2	10	з
95-⊊7-6	o-Xylene		150	5.0	l	5	1
95-63-6	1,2,4-Trimethylbenzene		160	5.0	l	5	1
1868-53-7	Dibromofluoromethane		89%				
17060-07-0	1,2-Dichloroethane-D4		83%				
2037-26-5	Toluene-D8		95%				
460-00-4	P-Bromofluorobenzene		86%				
	Page	01 of 01	\$477B.D				
Client: Tetra Tech NUS, Inc Project: CTO 12 NASA Wallops PO No: Sample Date: 12/09/08 Received Date: 12/11/08 Extraction Date: 12/14/08 Analysis Date: 17-DEC-2008 05:43 Report Date: 12/18/2009 Matrix: WATER \$ Solids: NA Lab ID: SE7125-3 Client JD: WFF-WOD-TW1-1 SD2: CT012-3 Extracted by: GN Extraction Method: SW846 3510 Analyst: JCG Analysis Method: SW845 8270C Lab Prep Batch: WG59045 Units: ug/L

ÇA\$#	Compound	Flags	Results	DF	PQL	Adj.PQL	Adj.MDL
65794-96-9	3&4-Methylphenol	ъ	Ŧ	1.10	10	3.1	3
91-20-3	Naphthalene		190	1.0	10	11	2
357-12-4	2-Fluoropheaol		47%				
13127-88-3	Phenol-DS		428				
4165-60-0	Nitrobenzene-Dā		87%				
321-60-8	2-Fluorobiphenyl		89%				
119-79-6	2,4,6-Cribromophenol		96%				
1718-51-0	Terphonyl-D14		101%				

Page 01 of 01 G3507.D

Lab Name: Katahdin Analytical Ser	rvices Clie	nt Fi - No	ield III	: WFF	-WOD	-TW1-)	
Percent Solids: 0.00	Lab	San	nie: Iple II	): SB7	12-5 125-00:	3	
	Concentration Unit	s: 1ų	уĽ				
CAS No. Analyte	Concentration	С	Q	м	DF	Adjusted CRDL	Adjusted MDL
7440-38-2 ARSENIC, TOTAL	51.8			MS	5	5.0	1.45

# Comments:

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Bottle ID: E

INORGANIC ANALYSIS DATA SHEET

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FORM I - IN

Lab Nar	ge: Katabdin Analytical Servic	es Clie	ent (f	Teld M	: WFI	-wod	-TW1-1	
Matrix:	WATER	SDO	G Na	ime:	CTC	)12-3		
Percent	Solids: 0.00	Lat	o Sai	nple II	): SB7	125-004	4	
		Concentration Unit	ta:u	ıg/L				
CAS No.	Analyte	Concentration	С	Q	М	DF	Adjusted CRDL	Adjusted MDL
7440-38-2	ARSENIC, DISSOLVED	42.0			MS	5	5.0	1.45

Comments:

Bottle ID: A

I INORGANIC ANALYSIS DATA SHEET

FORM I - IN

Client: Tetra Weck NUS, Inc Project: CTO 12 NASA Wallops PO No: Sample Date: 12/10/D8 Received Date: 12/12/08 Extraction Date: Analysis Date: 17-DEC-2008 04:12 Report Date: 12/18/2008 Matrix: WATER % Solids: NA Lab ID: SE7173-3 Client ID: MPF-WOD-TWZ-1 SEG: CTO12-3 Extracted by: Extraction Method: SW846 5030 Analyst: TTC Analysis Method: SW846 8260B Lab Prep Batch: WG59135 Units: ug/1

Compound	Flags	Results	DF	PQL	Adj.FQL	Adj.MDL
Benzene		120	1.0	l	1	0.3
Tetrachloroethene	J	0.5	1.0	1	2	0.4
Xylenes (total)	E	930	1.0	3	з	0.3
m+p-Xylenes	E	660	2.0	2	2	0.7
o-Xylene	E	270	L.0	1	1	0.3
1,2,4-Trimethylbenzenc		190	1.0	1.	1	0.2
Dibromofluoromethane		878				
1,2-Bichloroethane-D4		888				
Toluene-D3		96%				
P-Bramofluorobenzene		85¥				
	Compound Benzene Tetrachloroethene Xylenes (total) m+p-Xylenes o-Xylene 1,2,4-Trimethylbenzene Dibromofluoromethane 1,2-Dichloroethane-D4 Toluene-D3 P-Bromofluorobenzene	Compound Flags Benzene Tetrachloroethene J Xylenes (total) E m+p-Xylenes E 0-Xylene E 1,2,4-Trimethylbenzene Dibromofluoromethane \$,2-Dichloroethane-D4 Toluene-D8 P-Bromofluorobenzene	CompoundFlagsResultsBenzene120TetrachloroetheneJTetrachloroetheneJXylenes (total)Em+p-Xylenes%o-XyleneE1,2,4-Trimethylbenzene190Dibromofluoromethane87%1,2-Dichloroethane-D488%Toluene-D896%P-Bromofluorobenzene85%	CompoundFlagsResultsDFBenzene1.201.0TetrachloroetheneJ0.51.0Xylenes (total)E9301.0m+p-Xylenes%6602.0o-XyleneE2701.01,2,4-Trimethylbenzene1901.6Dibromofluoromethane87%1,2-Dichloroethane-D488%Toluene-D396%P-Bromofluorobenzene85%	Compound Flags Results DF PQL   Benzene 120 1.0 1   Tetrachloroethene J 0.5 1.0 1   Xylenes (total) E 930 1.0 3   m+p-Xylenes E 660 2.0 2   o-Xylene E 270 1.0 1   1,2,4-Trimethylbenzene 190 1.6 1   Dibromofluoromethane 97% 1.2-Dichloroethane-D4 88%   Foluene-D3 96% 96% 96%	Compound Flags Results DF PQL Adj.FQL   Benzene 1.20 1.0 1 1   Tetrachloroethene J 0.5 1.0 1 2   Xylenes (total) E 930 1.0 3 3   m+p-Xylenes F 660 2.0 2 2   o-Xylene E 270 1.0 1 1   l, 2, 4-Trimethylbenzene 190 1.6 1 1   Dibromofluoromethane 97% 1.2 1 1   pibromofluoromethane-D4 88% 5 5% 5%

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Sample Data Summary A0000013

Client: Tetra Tech NUS, Inc Project: CTO 12 NASA Wallops FO No: Sample Date: 12/10/08 Received Date: 12/12/08 Extraction Date: Analysis Date: 17-DEC-2008 12:11 Report Date: 12/10/2008 Matrix: WATER % Solids: NA Lab ID: SB7173.3DL Client ID: WFF-WOD-TW2-1 SDG: CTOI2-3 Extracted by: Extracted by: Extraction Method: SW846 5D30 Analyst: TTC Analysis Method: SW846 82602 Lab Prep Batch: WG59149 Units: ug/1

CAS#	Çonpound	Flags	Recults	$\mathbf{DF}$	PQL	Adj.PQL	Adj.MDL
71-43-2	Zenzene		100	10	1	10	3
3.27-3.8-4	Tetrachloroethene	σ	10	10	2	10	4
1330-20-7	Xylenes (total)		1200	10	з	30	3
	m+p-Xylenes		930	10	2	20	7
95-47-6	o-Xylene		270	10	1	10	3
95-63-6	1,2,4-Trimethylbenzene		270	10	l	10	2
1868-53-7	Dibromofluoromethane		90%				
17060-07-0	1,2-Dichloroethane-D4		B4%				
2037-26-5	Toluene-D8		50%				
460~00-4	P-Bromofluorobenzene		798				
	Page	01 of 01	S47B2.D				

Chient: Tetra Tech NUS, Inc Project: CDO 12 NASA Wallops PO No: Sample Date: 12/10/08 Received Date: 12/12/08 Extraction Date: 12/16/08 Analysis Date: 10-DEC-2008 04:14 Report Date: 12/18/2008 Matrix: WAYER % Solids: NA

.

Lab TD: SD71.73-3 Client ID: WFF-WOD-TW2-1 SDG: CT012-3 Extracted by: KP Extraction Method: SW846 3510 Analyst: JCG Analysis Method: SW846 8270C Lab Prep Batch: WG59113 Units: ug/L

.

CAS#	Compound	Flags	Results	DF	þõt	Adj.PQL	Adj.MDL
65794-96-9	3&4-Methylphenol	σ	11	1.0	10	11	3
91-20-3	Naphthalene		210	Ŀ.0	10	11	2
3\$7-12-4	2-Fluorophenol		42%				
13127-88-3	Phenol-D6		33%				
4165-60-0	Nitrobenzene-D5		72 🕏				
321-60-8	2-Fluorobiphenyl		75%				
118-79-6	2,4,6-Tribromophenol		87%				
1718-51-0	Terohenyl, -D14		75%				
	Page	01 of 01	G3535.D				

Lab Nan	ne: Katahdin Analytical Se	rvices Client Field I	D: WFF	-WOD-TW2	2-1	
Matrix:	WATER	SDG Name:	CTC	012-3		
Percent	Solids: 0.00	Lab Sample 1	D: SB7	173-003		
		Concentration Units : ug/L			n	
CAS No.	Analyte	Concentration C Q	Μ	DF Adjı	isted CRDL A	ljusted MDL
7440-38-2	ARSENIC, TOTAL	103	MS	5	5.0	1.45

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Comments:

Bottle ID: A

FORM I - IN

	IN	ORGANIC ANALY	SIS I	DATA S	HEET	•				
Lab Nan	ae: Katahdin Analytical Servi	ces Clie	nt F	ïeld ID:	WFF	WOD	-TW2-1			
Motrix:	WATER	SDC	G Na	me:	сто	12-3				
Percent	Solids: 0.00	Lab	Sat	nple ID:	SB7.	173-004	4			
		Concentration Unit	<b>ន</b> ដេ	g/ī.						
CAS No.	Analyte	Concentration	С	Q	м	DF	Adjusted	CRDL	Adjusted	MDL
7440-38-2	ARSENIC, DISSOLVED	72.6			MS	5		5.0		1.45

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### **Comments:**

Bottle ID: A

Client: Tetra Tech NUS, Inc Project: CTO 12 NASA Wallops FO No: Sample Date: 12/10/08 Received Date: 12/12/08 Extraction Date: Analysis Date: 17-DEC-2008 04:43 Report Date: 12/18/2008 Matrix: WATER \$ Solids: NA Lab ID: SB7173-5 Client ID: WFF-WOD-TW3-1 SDG: CT012-3 Extracted by: Extraction Method: SW846 5030 Analyst: TTC Aualysis Method: SW846 8260B Lab Frep Batch: WG59135 Units: ug/l

CAS#	Compound	Flags	Results	DF	PQL	Adj.PQL	Adj.MDL
72-43-2	Benzete		87	1.0	1	1	0.3
127-18-4	Tetrachlozoethene	J	0.7	£.0	l	I	0.≙
1330-20-7	Xylenes (total)	E	750	I.0	з	Э	0.3
	m+p-Xylenes	E	570	1.0	2	2	0.7
95-47-6	o-Xylene		180	1.0	l	1	0.3
95-63-6	1,2,4-Trimethylbenzene		170	1.0	1	1	0.2
1868-53-7	Dibromofluorozethane		90%				
17060-07-0	1,2-Dichloroethane-D4		86*				
2037-26-5	Toluene-D8		92%				
460-0D-4	P-Bromofluorobenzete		85\$				
	Page	01 of 81	\$4769.D				

Client: Tetra Tech NUS, Inc Project: CTO 12 NASA Wallops PO No: Sample Date: 12/10/08 Received Date: 12/12/08 Extraction Date: Analysis Date: 18-DEC-2008 00:09 Report Date: 12/18/2008 Matrix: WATER \$ Solids: NA Lab ID: 337173-5DLRA Client ID: WFF-WOD-TW3-1 SDG: CTO12-3 Extracted by: Extraction Method: SW046 5030 Analyst: TTC Analysis Method: SW046 0260B Lab Prep Batch: WG59204 Units: ug/1

CAS#	Compound	Flags	Results	DF	PQL	Adj.PQL	Adj.MDL
71-43-2	Benzene		87	10	1	10	Э
127-18-4	Tetrachloroethene	Π	10	10	1.	10	4
1330-20-7	Xylenes (total)		1300	10	З	30	3
	m÷p-Xylenes		1000	10	2	20	7
95-47-6	o-Xylene		260	10	1	10	3
95-63-6	1,2,4-Trimethylbenzere		320	10	1	10	2
1868-53-7	Dibromofluoromethane		86%				
17060-07-0	1,2-Dichloroethane-D4		85%				
2037-26-5	Toluene-D8		94%				
460-00-4	P-Bramofluoroberzene		86\$				
	Page	01 oř 01	S4803.D				

Client: Tetra Tech NUS, Inc Project: CNO 12 NASA Wallopa PO No: Sample Date: 12/10/08 Received Date: 12/12/08 Extraction Date: 12/16/08 Analysis Date: 10-DEC-2008 04:56 Report Date: 12/18/2008 Matrix: WAYER \$ Solids: NA

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Lab ID: SB7173-5 Client ID: WFF-WOD-TW3-1 SDG: CT012-3 Extracted by: KF Extraction Method: SWB46 3510 Analyst: JCG Analysis Method: SWB46 8270C Lab Prep Batch: WG59113 Units: ug/L

CAS#	Compound	Flags	Results	DF	PQL	Adj.PQL	Adj.MDL
65794-96-9	344-Methylphenol	r	6	1.0	2.0	11	3
91-20-3	Naphthalene		200	1.0	10	11	2
367-12-4	2-Fluorophenol		42%				
13127-88-3	Phenol-D6		33%				
4165-60-0	Nitrobenzene-DS		72%				
321-60-8	2-Fluorobiphenyl		78\$				
118-79-6	2,4,6-Tribromophenol		86%				
1719-51-0	Terphenyl-D14		84%				
	_						
	Page	01 of 01	G3537.D				

Lab Name: Katahdin Analytical Ser	vices Client Fie	d ID: WFF	-WOD-TW3	-1	
Matrix: WATER	SDG Nan	ie: CTO	)]2-3		
Percent Solids: 0.00	Lab Samj	ple ID: SB7.	173-005		
	Concentration Units : ug/	น			
CAS No. Analyte	Concentration Units : ag/	l QM	DF Adju	sted CRDL	Adjusted MDL

1 INORGANIC ANALYSIS DATA SHEET

Comments:

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Bottle ID: A

Lab Nome: Katahdin Analytical Services Matrix: WATER			- Client Field ID: WI				WFF-WOD-TW3-1				
			SDG Name:			CT012-3					
Percent Solids: 0.00			Sai	nple II	D: SB7	173-00	6				
		Concentration Unit	8 : U	ıg/L							
CAS No.	Analyte	Concentration	С	Q	м	ĎF	Adjusted CRDI	Adjusted MDJ			
7440-38-2	ARSENIC, DISSOLVED	63.9			MS	5	5.0	1.45			

Comments:

Bottle ID: A

# 1 INORGANIC ANALYSIS DATA SHEET

Client: Tetra Tech NUS, Inc Project: CTO 12 NASA Wallops FO No: Sample Date: 12/09/08 Received Date: 12/11/08 Extraction Date: Analysis Date: 17-DEC-2008 01:33 Report Date: 12/18/2008 Matrix: WATER % Solids: NA

.

Lab ID: SB7125-5 Client ID: W/P-WOD-TW4-1 SDG: CT012-3 Extracted by: Extraction Method: SW846 5030 Analyst: TTC Analysis Method: SW846 82603 Lab Prep Batch: WG59135 Units: ug/1

CAS#	Compound	Flago	Results	$\mathbf{DF}$	PQL	Adj.FQL	Adj.MDL
71-43-2	Benzene	E	260	1.0	<u>٦</u>	1	0.3
3,27-28-4	Tetrachloroetheme	U	1	1.0	ı	1	0.4
1330-20-7	Xylenes (total)	Е	930	1.0	Э	3	0.3
	m÷p-%ylenes	Е	650	1.0	2	2	0.7
95-47-6	o-Xylene	E	290	1.0	1	1	0.3
95-63-8	1,2,4-Trimethylbenzene		170	1.0	l	1	0,2
1868-53-7	Dibromofluoromethane		88\$				
27060-07-0	1,2-Dichlorosthane-D4		86%				
2037-26-5	Tçluené-D8		76%				
460-00-4	P-Bromofluorobenzene		83%				
	Page	01 of 01	\$4763.D				

Client: Tetra Tech NUS, Inc Project: CTO 12 NASA Wallops PO No: Sample Date: 12/09/08 Received Date: 12/11/08 Extraction Date: Analysis Date: 17-DEC-2008 10:37 Report Date: 12/18/2008 Matrix: WATER % Solids: NA Lab ID: SB7125-5DL Client ID: WFF-WOD-TW4-1 SDG: CT012-3 Extracted by: Extraction Method: SW846 5030 Analyst: TTC Analysis Method: SW846 8260B Lab Prep Batch: WG59149 Units: ug/1

CAS#	Compound	Flage	Results	DF	PQL	Adj.PQL	Adj.MDL
71-43-2	Benzene		250	10	1	10	3
127-18-4	Tetrachlorosthene	U	10	10	1	10	4
1330-20-7	Xylenes (total)		1400	10	3	30	3
	m+p-Xylenes		1000	10	2	20	7
95-47-6	o-Xylene		390	10	1	10	3
95-63-6	1,2,4-Trimethylbenzene		260	10	1	10	2
1868-53-7	Dibromofluoromethane		92∜				
17050-07-0	1,2~Dichloroethane-D4		日本分				
2037-26-5	Toluene-D8		058				
466-80-4	P-Bromofluorobenzene		07.%				
	Page	01 of 01	\$4779.D				

Client: Tetra Tech NUS, Inc Project: CTO 12 NASA Wallops PO No: Sample Date: 12/09/08 Received Date: 12/11/08 Extraction Date: 12/14/08 Analysis Date: 17-DEC-2008 05:01 Report Date: 12/18/2008 Matrix: WATER % Solids: NA Lab ID: SB7125-5 Client ID: WFF-WOD-TW4-1 SDG: CT012-3 Extracted by: GN Extraction Method: SW846 3510 Analyst: JCG Analysis Method: SW846 8270C Lab Prep Batch: WG59045 Units: ug/L

CAS#	Compound	Flags	Results	DF	PQL	Adj.PQL	Adj.MDL
65794-96-9	3&4-MethyLphenol		31.	1.0	10	12	3
91-20-3	Naphthalene	Ë	340	1.0	10	12	2
367-12-4	2-Fluoropherol		48%				
13127-88-3	Phenol-D6		* 53%				
4165-60-0	Nitrobenzene-D5		* 89%				
321-60-9	2-9Luorobiphenyl		*128%				
118-79-5	2,4,6-Tribromophenol		*123\$				
1718-51-0	Terphonyl-D14		* 56%				
	Page	01 of 01	G3506.D				

Client: Tetra Tech NUS, Inc Project: CTO 12 NASA Wallops PO No: Sample Date: 12/09/08 Received Date: 12/11/08 Extraction Date: 12/14/08 Analysis Date: 17-DEC-2008 27:05 Report Date: 12/18/2008 Matrix: WATER % Solids: NA

.

Lab ID: SB7125-5DL Client ID: WFF-WOD-TW4-1 SDG: CTC12-3 Extracted by: GN Extraction Method: SW946 3510 Analyst: JZP Analysis Method: SW846 9270C Lab Prep Batch: WG59045 Units: ug/L

CAS#	Compound	Flags	Result:	s D)	F	PQL	Adj.PQL	Adj.MDL
65794-96-9	3&&-Nethylphenol		21	в 2	. כ	10	24	6
91-20-3	Naphthalene		321	0 2	. Q	10	24	4
387-12-4	2-Fluorophenol		44	<b>u</b>				
13127-88-3	Phenol-D6		* 46	5				
4165-60-0	Nitrobeazene-D5		73	S <sup>.</sup>				
321-60-8	2-Fluorobiphanyl		68	5				
118-79-6	2,4,6-Tribromophenol		60	\$				
1718-51-0	Terphenyl-D14		* 52	8				

Page 01 of 01 G3521.D

INC	RGANIC ANALY	SIS )	DATA	SHEE	Г		
Lab Name: Kataadin Analytical Servic	es Clie	Client Field ID: WFF-WOD-TW4-1					
Matrix: WATER		G Na	ame:	CTC	)12-3		
Percent Solids: 0.00			Lab Sample ID:			5	
(	Concentration Unif	s:ນ	g/L				
CAS No. Analyte	Concentration	С	Q	М	DF	Adjusted CRDL	Adjusted MDL
7440-38-2 ARSENIC, TOTAL	135			MS	5	5.0	1.45

]

Comments:

Bottle JD: E

Lab Name: Katahdin Analytical Services	s Client Field ID:	t Field ID: WFF-WOD-TW4-1				
Matrix: WATER	SDG Name:	SDG Name: CTO12-3				
Percent Solids: 0.00	Lab Sample ID:	SB7125-00	6			
C	oncentration Units : ug/L					
CAS No. Analyte	Concentration C Q	M DF	Adjusted CRDL	Adjusted MDL		
7440-38-2 ARSENIC, DISSOLVED	138	MS 5	5.0	1.45		

I INORGANIC ANALYSIS DATA SHEET

Comments:

Bottle ID: A

FORM I - IN

Client: Tetra Tech NUS, Inc Project: CTO 12 NASA Wallops 90 No: Sample Dare: 12/10/08 Received Date: 12/12/08 Extraction Date: Analysis Date: 17-DEC-2008 13:13 Report Date: 12/18/2008 Matrix: WATER \$ Solids: NA

.

Lab ID: SS7173-7 Client ID: WFF-WOD-TW5-1 SDG: CT012-3 Extracted by: Extraction Mathod: SW846 5030 Analyst: TTC Analysis Mathod: SW846 82608 Lab Prep Batch: WG59149 Units: ug/1

CA3#	Compound	Flags	Results	DF	PQL	Adj.PQL	Adj.MDL
71-43-2	Benzene		92	1.0	1	1	D.3
127-18-4	Tetrachloroethene	U	1	1.0	1	1	D.4
1330-20-7	Xylenes (total)	E	1000	1.0	З	3	0.3
	m÷p-Xyleneş	Е	760	1.0	2	2	0.7
95-47-6	o-Xylene	E	250	1.0	1	1	0.3
95-63-6	1,2,4-Trimethylbenzene	互	220	1.0	1	Э.	0.2
1868-53-7	Dibromofluoromethane		91%				
17060-07-0	1,2-Dichloroethane-D4		86%				
2037-26-5	Toluere-D9		92%				
460-00-4	P-Bronofluorobenzene		84%				

Page 01 of 01 \$4704.D

Sample Data Summary A0000017

Client: Tetra Tech NUS, Inc Project: CTO 12 NASA Wallops PO No: Sample Date: 12/10/08 Received Date: 12/12/08 Extraction Date: Analysis Date: 18-DEC-2008 00:41 Report Date: 12/18/2008 Matrix: WATER \$ Solids: N8

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.

Lab ID: SB7173-7D, Client ID: WFF-WOD-TW5-1 SDG: CT012-3 Extracted by: Extraction Method: SW846 5030 Analyst: TTC Analysis Method: SW846 8260B Lab Prep Batch: WG69204 Units: ug/1

CAS#	Compound	Flags	Results	Df	FQL	Adj.PQL	Adj.MDL
71-43-2	Beizene		94	10	1	10	3
127-18-4	Tetrachloroethene	τ	10	10	1	10	4
1330-20-7	Xylenes (total)		1700	10	3	30	3
	m÷p-Xylènes		1400	10	2	20	7
95-47-6	o-Xylene		320	10	1	10	3
95-63-6	1,2,4-Trimethylbenzene		300	20	1	10	2
1868-53-7	Dibromofluoromethane		94%				_
17060-07-0	1,2-Dichloroethane-D4		84%				
2037-26-5	Toluene-DB		92%				
460-00-4	P-Bromofluorobenzepe		05%				
	Page	31 of 01	54804.D				

Client: Tetra Tech NUS, Inc Project: CTO 12 NASA Wallops FO No: Sample Date: 12/10/08 Received Date: 12/12/08 Extraction Date: 12/16/08 Analysis Date: 17-DEC-2008 22:38 Report Date: 12/18/2008 Matrix: WATER % Solids: NA

.

Lab ID: SE7173-7DL2 Chient ID: WFY-WOD-1W5-1 SDG: CT012-3 Extracted by: KF Extraction Method: SW846 3510 Analyst: JCG Analysis Method: SW846 8270C Lab Prep Batch: WG59113 Units: ug/L

CAS#	Compound	Flage	Results	DF	PQL	Adj.FQL	Adj.MDL
65794-96-9	3&4-Methylphenol	σ	3100	10	10	2100	550
91-20-3	Naphthalenc		20000	10	10	2100	360
367-12-4	2-Fluorophenol		D				
13127-88-3	Phenol-96		ĴĴ				
4165-60-0	Nitrobenzene-D5		D				
321-60-8	2-Fluorobiphenyl		D				
118-79-6	2,4,6-Tribromophenol		D				
1718-51-0	Terphenyl-D14		Ð				
	Page	01 of 01	G3528.D				

Lab Name: Katahdin Analytical Ser	rvices Client Field I	D: WFF	-WOD-TW5	- I			
Matrix: WATER	SDG Name:	SDG Name: CTO12-3					
Percent Solids: 0.00	Lab Sample I	D: SB7.	173-007				
	Concentration Units : ug/L						
CAS No. Analyte	Concentration C Q	M	DF Adju	isted CRDL Adju	sted MDL		
7440-38-2 ARSENIC, TOTAL	102	MS	5	5.0	1,45		

# Comments:

Bottle ID: A

# I INORGANIC ANALYSIS DATA SHEET

Sample Data Summary A0000097

FORM I - IN

# 1 INORGANIC ANALYSIS DATA SHEET

Lab Name: Katakdin Analytical Services	Client Field ID:	WFF-WOD-TW5-I
Matrix: WATER	SDG Name:	CTO12-3
Percent Solids: 0.00	Lab Sample ID:	SB7173-008

# Concentration Units : ug/L

CAS No.	Analyte	Concentration C Q	Μ	DF Ad	ljusted CRDL Adju	sted MDL							
7440-38-2	ARSENIC, DISSOLVED	95.5	MS	5	5.0	1.45							

Comments:

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Bottle ID; A

Client: Tetra Tech NUS, Inc Project: CTO 12 NASA Wallops PO No: Sample Date: 12/10/08 Received Date: 12/12/08 Extraction Date: Analysis Date: 17-DEC-2008 03:40 Report Date: 12/18/2008 Matrix: WATER % Solids: NA

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.

Lab ID: SB7173-1 Client ID: NPF-WOD-TW6-1 SDG: CT012-3 Extracted by: Extraction Method: SW846 5030 Aralyst: TTC Analysis Method: SW846 82608 Lab Prep Batch: WG59135 Units: ug/1

CAS#	Compound	F	lags	Results	DF	PQL	Adj.PQL	Adj.MDL
71-43-2	Benzene			44	1.0	1	1	0.3
127-18-4	Tetrachloroethene		σ	1	1.0	l	1	0.a
1,330-20-7	Xylenes (total)		Е	89D	1.0	Э	3	D.3
	m+p-Xylenes		Έ	620	1.0	2	2	D.7
95-47-6	o-Xylene		Е	250	1.0	1	1	0.3
95-63-6	1,2,4-Trimethylbenzene			170	1.0	1.	1	0.2
1968-53-7	Dibromofluoromethane			898				
17060-07-0	1,2-Dichloroethane-D4			86%				
2037-26-5	Toluena-D8			90%				
460-00-4	P-Bromofluorobenzene			84%				
	Page	01. of	01	\$4767.D				

Sample Data Summary A0000011

Client: Tetra Tech NUS, Inc Project: CTO 12 NASA Wallops PO No: Sample Date: 12/10/08 Received Date: 12/12/08 Extraction Date: Analysis Date: 17-DEC-2008 23:38 Report Date: 12/18/2008 Matrix: WATER § Solids: NA Lab ID: SB7173-1DLRA Client ID: WFF-WOD-TW6-1 SDG: CT012-3 Extracted by: Extraction Method: SW846 5D30 Analyst: TTC Analysis Method: SW846 8260B Lab Prep Batch: WG59204 Units: ug/l

Cas#	Compound	Flags	Results	DF	PQL	Adj.PQL	Adj.MOL
71-43-2	Benzene		47	10	l	10	з
127-18-4	Tetrachloroethene	υ	10	10	l	10	4
2330-20-7	Xylenes (total)		1600	10	3	30	3
	m-p-Xylenes		1200	10	2	20	7
95-47-6	o-Xylene		430	20	2	10	3
95-63-6	3,2,4-Trimethylbenzene		410	10	1	10	2
1868-53-7	Dibromofluoromethane		B9∜				
17060-07-0	l,2-Dichloroethane-D4		85%				
2037-26-5	Toluene-D8		95%				
460-00-4	P-Bromofluorobenzene		B7ზ				
	Page	01 of 01	\$4802.D				

Sample Data Summary A0000012

Client: Tetra Tech NUS, Iac Project: CTO 12 NASA Wallops PO No: Sample Date: 12/10/08 Received Date: 12/12/08 Excraction Date: 12/16/08 Analysis Date: 18-DEC-2008 05:38 Report Date: 12/18/2009 Matrix: WATER % Solids: NA

.

Lab 1D: SB7173-1 Client ID: WFF-WOD-TW6-1 SEG: CT012-3 Extracted by: KF Extraction Method: SW846 3510 Analysis JCG Analysis Method: SW846 8270C Lab Prep Batch: NG59113 Units: ug/L

CAS#	Compound	Flags	Results	DF	PQL	Adj.PQL	Adj.MDL
65794-96-9	344-Methylphenol	σ	10	1.0	10	10	3
92-20-3	Naphthalene	E	370	1.0	10	10	2
367-12-4	2-Fluorophenol		36%				
13127-88-3	Fhenol-D5		26%				
\$165-50-0	Nitrobenzene-D5		65%				
321-60-8	2-Fluorobiphenyl		101%				
118-79-6	2,4,6-Tribcomophenol		106%				
1718-51-0	Terphanyl-D14		63%				
	Page	01 of 01	G3538.D				

Client: Tetra Tech NOS, Inc Project: CTO 12 NASA Wallops PO No: Sample Date: 12/10/08 Received Date: 12/12/09 Extraction Date: 12/16/08 Analysis Date: 18-DEC-2008 10:38 Report Date: 12/18/2009 Matrix: WATER % Solids: NA

.

Lab JD: SB7173-1DL Client ID: WFF-WOD-TW6-1 SDG: CTO12-3 Extracted by: KP Extraction Method: SW846 3510 Analyst: JLP Analysis Method: SW846 8270C Lab Prep Batch: WG59113 Units: ug/L

CAS#	Compound	Flags	Results	DF	FQL	Adj.PQL	Adj.MDL
65794-98-9	3&4-Methylphenol	U	49	5.0	10	49	13
91-20-3	Naphthalene		400	5.0	10	49	8
367-12-4	2-Fluorophenol		358				
13127-88-3	Phencl-D6		24%				
4165-60-0	Nitrobenzene-D5		65%				
321-60-8	2-Fluorobiphenyl		75%				
118-79-6	2,4,6-Tribromophenol		70%				
1718-51-0	Terphenyl-D14		66%				
	Page	01 ož 01	G3543.D				

Lao war Matrix:	WATER	SDG Name:	CTC	)12-3				
Percent	Percent Solids: 0.00		Lab Sample ID: SB7173-001					
		Concentration Units : ug/L						
CAS No.	Analyte	Concentration C Q	M	DF A	djusted CRDL	Adjusted MDL		

**Comments:** 

.

Bottle ID: A

Sample Data Summary A0000091

FORM I - IN

Lab Nat	Lab Name: Katabdin Analytical Services			'ield ll	): WFI	-WOD-1	FW6-1	
Matrix:	Matrix: WATER			ame:	CTC	)12-3		
Percent Solids: 0.00			Lab Sample 1D: SB7173-00			173-002		
		Concentration Unit	<b>s</b> :u	ıg/Г.			<u> </u>	
CAS No.	Analyte	Concentration	С	Q	M	DF A	Adjusted CRDL	Adjusted MDL
7440-38-2	ARSENIC, DISSOLVED	16.2			MS	5	5.0	1.45

1 INORGANIC ANALYSIS DATA SHEET

# Comments:

Bottle ID: A

1 Month Analytical Results

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Client: Tetre Tech NUS, Inc Sroject: CTO 12 NASA Wallops PO No: Sample Date: 01/14/09 Received Date: 01/15/09 Extraction Date: Analysis Date: 20-JAN-2009 19:55 Report Date: 01/27/2009 Matrix: WATER % Solids: NA

.

Lab ID: SC0219-2 Chient ID: WFF-WCD-L5-MW3R-4 SDG: CT012-6 Extracted by: Extraction Method: SW846 5030 Analyst: JSS Analysis Method: SW846 82600 Lab Prep Batch: WG66010 Units: ug/1

CAS#	Compound	Flags	Results	DF	PQL	Adj.PQL	Adj.MDL
71-43-2	Benzeue	ប	l	1.0	1	1	0.3
127-18-4	Tetrachloroethene	U	1	3, . O	.1	1	0.3
1330-20-7	Xylenes (total)	Π	3	1.0	з	з	0.3
	m+p-Xylenes	Π	2	1.0	2	2	0.7
95-47-6	a-Xylene	υ	1	1.0	1	1	0.3
95-63-8	1,2,4-Trimethylberzene	σ	l	1.0	1	l	0.2
1868-53-7	Dibromofluoromethane		103%				
17060-07-0	1,2-Dichlorosthame-D4		100%				
2037-26-5	Toluene-D8		93\$				
46D-DD-4	P-Bromofluorobenzene		90%				
	Page	01 of 01	13077.D				

Client: Tetra Tech NUS, Inc Project: CTO 12 NASA Wallops PO No: Sample Date: 01/14/09 Received Date: 01/15/09 Extraction Date: 01/16/09 Analysis Date: 19-JAN-2009 21:55 Report Date: 01/23/2009 Matrix: WATER % Solids: NA

.

Lab.ID: SC0219-2 Client ID: WFF-WQD-15-MW3R-4 SDG: CT012-6 Extracted by: CB Extraction Method: SWB45 3510 Analyst: JLP Analysis Method: SW946 8270C Lab Prep Batch: WG59859 Units: ug/L

CAS#	Compound	Flags	Results	DF	PQL	Adj.9QL	Adj.MDL
65794-95-9	3&4-Methylphenol	σ	9	1.0	10	9	2
91-20-3	Naphthalene	σ	9	$\mathbb{Z}$ , $\mathbb{D}$	10	9	2
357-12-4	2-Fluorophenol		318				
13127-88-3	Phenol-D6		178				
4165-60-0	Nitrobenzene-D5		* 48%				
321-60-В	2-Fluorobiphenyl		62%				
178-79-6	2,4,6-Tribromophenal		68%				
1718-51-0	Terphenyl-D14		97%				
	Page	01 of 01	G4057.D				

Bottle ID: D

# 1 INORGANIC ANALYSIS DATA SHEET

Lab Name: Katahdin Analyticał Services	Client Field ID:	WFF-WOD-15-MW3R-4
Matrix: WATER	SDG Name:	CTO12-6
Percent Solids: 0.00	Lab Sample ID;	SC0219-002
Concentration	Units ; ug/L	

CAS No.	Analyte	Concentration	С	Q	м	DF	Adjusted PQL Adjus	ted MDL				
7440-38-2	ARSENIC, TOTAL	1.45	U		MS	5	5.0	1.45				

Comments:

Client: Tetra Tech NUS, Inc Project: CTO 12 NASA Wallops PO No: Sample Date: 01/14/09 Received Date: 01/15/09 Extraction Date: Analysis Date: 20-JAN-2009 19:22 Report Date: 01/27/2009 Matrix: WATER § Solids: NA Lab ID: SC0219-1 Client ID: WFF-WOD-15-GW7-4 SDG: CT012-6 Extracted by: Extraction Method: SW846 5030 Analyst: JSS Analysis Method: SW846 8260B Lab Frep Batch: WG60010 Units: ug/1

CAS#	Compound	Flags	Recults	DF	⊒Ör	Adj.FQL	Adj.MOL
71~43-2	Beazene		2	1.0	1	1	0.3
127-18-4	Tetrachloroethene		2	1.0	1	1	D.3
1330-20-7	Xylenes (total)		120	1.0	3	з	0.3
	m+p-Xylenes		74	1.0	2	2	0.7
95-47-6	o-Xylene		50	1.0	1	1	0.3
95-63-6	1,2,4-Trimethylbenzene		54	1.0	1	1	0.2
1669-53-7	Dibromofluoromethane		108%				
17060-07-0	1,2-Djchloroethane-D4		109%				
2037-26-5	Toluene-D8		96%				
460-00-4	P-Bromofluorobenzene		34%				
	Page	01 of 01	23076.D				

# KATAHDIN ANALYTICAL SERVICES

Report of Analytical Results

Client: Tetra Tech NUS, Inc Project: CTO 12 NASA Wallops PO No: Sample Date: 01/14/09 Received Date: 01/15/09 Extraction Date: 01/16/09 Analysis Date: 19-JAN-2009 21:13 Report Date: 01/23/2009 Matrix: WATER % Solids: NA

.

Lab ID: SC0219-1 Client ID: WFF-WOD-15-GW7-4 SDG: CT012-6 Extracted by: CB Extraction Method: SW846 3510 Analyst: JLP Analysis Method: SW646 0270C Lab Prep Batch: WG59859 Units: ug/L

CAS#	Compound	Flags	Resulto	DF	PQL	Adj.PQL	Adj.MDL
65794-96-9	3&4-Methylphenol	U	11	1.0	10	1.1	3
91-20-3	Naphthalene		55	1.0	10	11	2
367-12-4	2-Fluorophenol		40%				
13127-88-3	Phenol-D6		28%				
4165~60~0	Nitrobenzene-D5		69%				
321-60-8	2-Fluorobiphenyl		76%				
118-79-5	2,4,6-Tribromophenol		92%				
1718-51-0	Terphenyl-D14		106%				
	Page	01 of 01	G4056.D				
Lab Name: Katahdin Analytical S	ervices Client Field ID	: WFF-	WOD-1.	5-GW7-4			
---------------------------------	-----------------------------	---------	--------	--------------------------			
Matrix: WATER	SDG Name:	CTOI	2-6				
Percent Solids: 0.00	Lab Sample 1D	: SC021	9-001				
	Concentration Units : ug/i.						
CAS No. Analyte	Concentration C Q	М	DF	Adjusted PQLAdjusted MDL			
7440-38-2 ARSENIC, TOTAL	9.7	MS	5	5.0 ).45			

1 INORGANIC ANALYSIS DATA SHEET

Comments:

Bottle ID: D

FORM J - JN

Client: Tetra Tech NUS, Inc Project: CTO 12 MASA Wallops PO No: Sample Date: 01/14/09 Received Date: 01/15/09 Extraction Date: Analysis Date: 20-JAN-2009 20:27 Report Date: 01/27/2009 Matrix: WATER % Solids: NA

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.

Lab ID: SC0219-3 Client ID: WPP-WOD-TWD-4 SD2: CT012-6 Extracted by: Extraction Method: SW846 5030 Analyst: JSS Analysis Method: SW846 8260B Lab Prep Batch: WG60010 Units: ug/1

¢A\$#	Compound	Flags	Results	DF	PQL	Adj.PQL	Adj.MDL
71-43-2	Benzene		39	1.40	1	1	0.3
127-18-4	Tetrachloroethene		l	1.0	ī	1	0.3
1330-20-7	Xylenes (total)		370	1.0	З	з	0.3
	m+p-Xylenes		270	1.0	2	2	0.7
95-47+6	o-Xylene		94	1.0	1	1	0.3
95-63-6	1,2,4-Trimethylbenzene		86	1.0	l	1	0.2
1868-53-7	Dibromofluoromethane		103%				
17060-07-0	1,2-Dichloroethanz-D4		98%				
2037-26-5	Toluene-D0		94%				
460-00-1	E-Bromofluorobenzene		ሃዑዩ				
	Page	01 of 01	T3078.D				

Client: Tetra Tech NUS, Inc Project: CTO 12 NASA Wallops FO No: Sample Date: 01/14/09 Received Date: 01/15/09 Extraction Date: Analysis Date: 22-JAN-2009 15:47 Report Date: 01/27/2009 Matrix: WATER \$ Solids: NA Lab ID: SC0219-3DL Client ID: WFF-WOD-TW1-4 SDG: CT012-6 Extracted by: Extraction Method: SW846 5030 Analyst: JSS Analysis Method: SW846 82608 Lab Prep Batch: WG50080 Units: ug/1

CA6#	Compound		1	lags?	Results	DF	PQL	Adj.PQL	Adj.MDL
71-43-2	Benzone				36	2.0	З.	2	0.5
127-18-4	Tetrachloroethene			J	1	2.0	1	2	0.3
1330-20-7	Xylenes (total)				360	2.0	З	6	Q.Ş
	w+p-Xyleacs				270	2.0	3	4	1
95-47-5	o-Xylene				89	2.0	1	2	0.5
95-63-6	I,2,4-Trimethylbenzene				81	2.0	1	2	0.5
1868-53-7	Dibromofluoromethane				96%				
17060-07-0	1,2-Dichloroethane-D4				94%				
2037-26-5	Toluene-D8				94%				
460-08-4	P-Bromofluorobenzene				91%				
	Page	01	of	01	T3108.D				

Client: Tetra Tech NUS, Inc Project: CTO 12 NASA Wallops PO No: Sample Date: 01/14/09 Received Date: 01/15/09 Extraction Date: 01/16/09 Analysis Date: 19-JAN-2009 22:38 Report Date: 01/23/2009 Matrix: WATEK % Solids: NA Lab ID: SC0219-3 Client ID: WFF-WOD-TW1-4 SDG: CT012-6 Extracted by: CB Extraction Method: SWB46 3510 Analyst: JLP Analysis Method: SWB46 B27DC Lab Frep Batch: WG59859 Units: ug/L

CAS#	Compound	Flags	Results	DF	ÞQL	Adj.PQL	Adj.MDL
65794-96-9	3&4-Methylphenol	ţ	11	1.0	10	11	З
91-20-3	Naphthalene		51	1.0	10	11	2
367-12-4	2-Fluorophenol		24%				
13127-88-3	Phemol-D6		23%				
4165-60-0	Nitrobenzene-D5		52%				
321-60-8	2-Fiuorobiphenyl		578				
1,1.8-79-6	2,4,6-Tribromophenol		81%				
1718-51-0	Terphenyl-D14		102%				
	Zage	01 of 01	G4058.D				

Lab Nan	ne: Katabdin Analytical Ser	vices Client	Field III	: WFF-	WOD-Т	W1-4	
Matrix:	WATER	SDG I	Name:	CTOU	2-6		
Percent	Solids: 0.00	Lab S	ample II	): SC021	9-003		
		Concentration Units :	ug/L				
CAS No.	Analyte	Concentration	C Q	М	DF	Adjusted PQL.	Adjusted MDL
7440-38-2	ARSENIC, TOTAL	22.3		MS	5	5.0	1.45

I INORGANIC ANALYSIS DATA SHEET

### Comments:

Bottle ID: D

Lab Nat	ne: Katahdin Analytical Servic	es Clien	t Fie	Id ID	: WFF-	WOD-T	W1-4		
Matrix:	WATER	SDG	Narr	ie:	CTOI	2-6			
Percent	Solids: 0.00	Lab S	Samj	ole ID	: SC021	9-004			
	(	Concentration Units	: ug/	Ľ.					
CAS No.	Analyte	Concentration	С	Q	м	DF	Adjusted PQL	Adjusted	MDL
7440-38-2	ARSENIC, DISSOLVED	19.3			MS	5	5.0		1.45

I INORGANIC ANALYSIS DATA SHEET

Comments:

Bottle ID: A

FORM 1 - IN

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Client: Tetra Tech NUS, Inc Project: CTO 12 NASA Wallops PO No: Sample Date: 01/14/09 Received Date: 01/15/09 Extraction Date: Analysis Date: 20-JAN-2009 20:59 Report Date: 01/27/2009 Matrix: WATER % Solids: NA

.

Lab ID: SC0219-5 Client ID: WFF-WOD-TW2-4 SDG: CT012-6 Extracted by: Extraction Method: SW846 5030 Analyst: JSS Analysis Method: SW846 02600 Lab Prep Batch: WG60010 Units: ug/1

CAS#	Compound	Flags	Results	DF	PQL	Adj.PQL	Adj.MDI
71-43-2	Benzene		12	1.0	1	1	0.3
127-18-0	Tetrach:oroethene		l	1.0	1	1	0.3
1330-20-7	Xylenes (total)	E	600	1.0	З	3	α.3
	n+p-Xylenes	E	430	1.0	2	2	0.7
95-47-6	o-Xylenê		170	1.0	1	1	0.3
95-63-6	1,2,4-Trimethylbenzenc		220	1.0	1	1	0.2
1868-53-7	Dibromofluoromethane		97%				
17060-07-0	1,2-Dichloroethane-D4		95%				
2037-26-5	Toluene-Da		545				
460-00-4	P-Bromofluorobenzene		928				
	Page	01 of 01	T3079.D				

Client: Tetra Tech NUS, Inc Project: CTO 12 NASA Wallops PO No: Sample Date: 01/14/09 Received Date: 01/15/09 Extraction Date: Analysis Date: 22-JAN-2009 16:19 Report Date: 01/27/2009 Matrix: WATER % Solids: NA Lab ID: SC0219-SDL Client ID: WFF-WOD-TW2-4 SD3: CT012-6 Extracted by: Nxtraction Method: SW846 5030 Analyst: JSS Analysis Method: SW846 82603 Lab Prep Batch: WF60080 Units: ug/l

CA8#	Compound	Flage	Results	DF	PQL	Adj.PQL	Adj.MDL
71-43-2	Benzene		12	2.0	þ	2	0.5
127-18-4	Tetrachloroethene	J	1.0	2.0	l	Z	0.5
1330-20-7	Xylenes (total)		590	2.0	з	6	0.5
	π+p-Xylèn≙s		420	2.0	2	4	3
95-47-6	o-Xylene		160	2.0	l	2	0.5
95-63-6	1,2,4-Trimethylbenzene		140	2.0	Ţ	2	0.5
1668-53-7	Dibromofluoromethane		93%				
17060-07-0	1,2-Dichloroethane-D4		91%				
2037-26-5	Toluene-D8		96\$				
460-00-4	P-Bromofluorobenzene		91%				
	Page	10 10 10	T3109.D				

Client: Tetra Tech NUS, Inc Project: CTO 12 NASA Wallops NO No: Sample Date: 01/14/09 Received Date: 01/15/09 Extraction Date: 01/16/09 Analysis Date: 19~JAN-2009 23:20 Report Date: 01/23/2009 Matrix: WATER % Solids: NA

.

Lah ID: SC0219-5 Client ID: WFF-WOD-TW2-4 SDG: CTD12-5 Extracted by: CB Extraction Method: SW846 3510 Analyst: JLP Analysis Method: SW846 8270C Lab Prep Batch: WG59859 Units: ug/L

CAS#	Compound	Flage	Results	DF	POL	Adj.PQL	Adj.WDL
65794-96-9	3&4-Methylphenol	υ	12	1.0	10	12	З
91-20-3	Naphthalene		230	1.0	10	12	2
367-12-4	2-Fluorophenol		27%				
13127-88-3	Phenol-D6		228				
4165-60-0	Nitrobenzene-D5		70%				
321-60-8	2-Fluorobiphenyl		81. <b>7</b>				
11B-79-6	2,4,6-Tribramophenol		77%				
1718-51-0	Texphenyl-D14		111%				
	Page	01 of 01	G4059.D				

Lab Name: Katahdin Analytical Serv	fices Client Field ID;	WFF-	WOD-T	W2-4
Matrix: WATER	SDG Name:	CTOI	2-6	
Percent Solids: 0.00	Lab Sample ID	SC021	9-005	
	Concentration Units : ug/L			
CAS No. Analyte	Concentration C Q	м	DF	Adjusted PQL Adjusted MDL
7440-38-2 ARSENIC, TOTAL	10.3	MS	5	5.0 1.45

# I INORGANIC ANALYSIS DATA SHEET

Comments:

Bottle ID: D

Client: Tetra Tech NOS, Inc Project: CTO 12 NASA Wallops PO No: Sample Date: 01/14/09 Received Date: 01/15/09 Extraction Date: Analysis Date: 20-JAN-2009 21:31 Report Date: 01/27/2009 Matrix: WATER & Solids: NA

.

Lab ID: SC0219-6 Client ID: WFF-WOD-TW3-4 SDF: CT012-6 Extracted by: Extraction Method: SW846 5030 Analyst: JSS Analysis Method: SW846 82608 Lab Prep Batch: WG60010 Units: ug/I

CAS#	Compound	I	lage	Results	DF	ъõт	Adj.PQL	Adj.MDL
71-43-2	Benzene			93	1.0	l	l	0.3
127-18-4	Tetrachloroothene		J	0.6	1.0	1	l	0.3
1330-20-7	Xylenes (total)		E	640	1.0	3	З	0.3
	m+p-Xylenes		Е	480	Ι.Ο	2	2	0.7
95-47-6	o-Xylene			3,70	1.0	1	1	D.3
95-63-6	1,2,4-Trimethylbenzene			120	1.0	1	1.	0.2
1868-53-7	Dibromofluorcaethane			100%				
17060-07-0	1,2-Dichlorcethane-D4			96%				
2037-26-5	Toluene-D8			95%				
460-00-4	P-Bromofluoroberzene			88\$				
	Page	01 of	01	T3080.D				

Client: Tetra Tech NUS, The Project: CTO 12 NASA Wallops PO No: Sample Date: 01/14/09 Received Date: 01/15/09 Extraction Date: Analysis Date: 22-JAN-2009 16:51 Report Date: 01/27/2009 Matrix: WATER % Solids: NA

.

Lab ID: SC0219-6DL Client ID: WFF-WOD-TN3-4 SDG: CT012-6 Extracted by: Extraction Method: SW846 5030 Analysi: JSS Analysis Method: SW846 82606 Lab Prep Batch: WG60080 Units: ug/L

Cas#	Compound	Flags	Results	DF	PQL	Adj.PQL	Adj.MDL
71.43-2	Benzene		110	10	1	10	з
127-18-4	Tetrachlorostheme	п	10	10	1	10	Э
1330-20-7	Xylenes (total)		870	10	3	30	Э
	m+p-Xylenes		670	10	2	20	7
95-47-6	o-Xylene		200	10	1	10	3
95-63-6	1,2,4-Trimethylbenzene		150	10	1	10	2
1868-53-7	Dibromofluoromethane		92%				
17066-07-0	1,2-Dichloroethane-D4		88%				
2037-26-5	Toluere-D8		94%				
460-00-4	P-Bromofluorobenzene		91%				
	Page	01 of 01	T3110.D				

Client: Tetra Tech NUS, Inc Project: CTO 12 NASA Wallops PO No: Sample Date: 01/14/09 Received Date: 01/15/09 Extraction Date: 01/16/09 Analysis Date: 20-JAN-2009 D0:02 Report Date: 01/23/2009 Matrix: NATER % Solids: NA

.

Lab ID: SC0219-6 Client ID: WFF-WOD-TW3-4 SDG: CT012-6 Extracted by: CB Extraction Method: SW846 3510 Analyst: JLP Analysis Method: SW846 8270C Lab Prep Batch: WG59859 Units: ug/L

CAS#	Compound	Flags	Results	DF	PQL	Adj.PQL	Adj.MDL
65794-96-9	344-Methylphenol	Π	10	1.0	10	10	З
91-20-3	Naphthalene		110	1.0	10	10	2
367-12-4	2-Fluorophenol		45%				
13127-88-3	Phenol-D6		38\$				
4165-60-0	Nitrobenzene-D5		76%				
321-60-8	2-fluorobiphenyl		52%				
118-79-6	2,4,6-Tribromophenol		518				
1718-51-0	Terphenyl-Di4		99%				

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Lab Nan	Lab Name: Katahdin Analytical Services		t Fie	ld ID	: WFF-	NOD-T	W3-4	
Matrix:	WATER	SDG	Nап	ie:	CTOI	2-6		
Percent Solids: 0.00			amj	ple 1D	: SC021	9-006		
		Concentration Units	: ug/	L				
CAS No.	Analyte	Concentration	$\mathbf{c}$	Q	м	DF	Adjusted PQLAd	justed MDL
7440-38-2	ARSENIC, TOTAL	56.4			MS	5	5.0	1.45

] INORGANIC ANALYSIS DATA SHEET

### Comments:

Bottle ID: D

# Sample Data Summary A0000076

.

Lab Nan	Lab Name: Katahdin Analytical Services		t Fie	ata ID	: WFF-Y	₩OD-T	W3-4	
Matrix: WATER		SDG	Nan	ne:	CTO1	2-6		
Percent	Solids: 0.00	Lab S	Sam	ple ID	: SC021	9-007		
	(	Concentration Units	: ug	۲L				
CAS No.	Analyte	Concentration	С	Q	М	DF	Adjusted PQL	Adjusted MDL
	ABSENIC DISSOLVED	50.0			MS	5	5.0	1.45

1 INORGANIC ANALYSIS DATA SHEET

Comments:

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Bottle ID: A

Client: Tetra Tech NUS, Inc Project: CTO 12 NASA Wallops PO No: Sample Date: 01/14/09 Received Date: 01/15/09 Extraction Date: Analysis Date: 20-JAN-2009 22:03 Report Date: 01/27/2009 Matrix: WATER % Solids: NA Lab ID: SC0219-9 Client ID: WFF-WOD-TW4-4 SDG: CT012-6 Extracted by: Extraction Method: SW846 5030 Analyst: JSS Analysis Method: SW846 82609 Lab Prep Batch: WG60010 Units: ug/1

CAS#	Compound	Flags	Results	DF.	PQL	Adj.PQL	Adj.MDL
71-43-2	Berzene		120	1.0	1	1	0.3
127-19-4	Tetrachloroethene	3	0.4	1.0	l	1	0.3
1330-20-7	Xylenes (total)	E	760	1.0	Э	3	0.3
	a+p-Xylenes	E	530	1.0	2	2	0.7
95-47-6	o-Xylena	Е	240	1,, 0	l	1	0.3
95-63-6	1,2,4-Trimethylbenzene		210	1.0	1	1	0.2
1858-53-7	Dibromofluoromethane		99%				
17060-07-0	1,2-Dichloroethane-D4		99%				
2037-26-5	Toluene-DB		938				
460-00-4	P-Bromofluorobenzene		89%				
	Page	01 of Cl	13001.D				

.

Client: Tetra Tech NUS, The Project: CTO 12 NAGA Wallops PO No: Sample Date: 01/14/09 Received Date: 01/15/09 Extraction Date: Analysis Date: 22-JAN-2009 17:23 Report Date: 01/27/2009 Matrix: WATER % Solids: NA

.

Lab ID: SC0219-8DL Client ID: WFF-WOD-TW4-4 SDG: C1012-6 Extracted by: Extraction Method: SW846 5030 Analyst: JSS Analysis Method: SW846 8250B Lab Prep Batch: WG60080 Units: ug/l

CAS#	Çompound	Flags	Results	DF	$\mathbf{FOT}$	Adj.PQL	Adj.MDL
71-43-2	Benzeue		100	20	1	20	5
127-18-4	Tetrachloroethene	υ	20	20	Э.	20	5
1330-20-7	Xylenes (zotał)		900	20	3	60	5
	m+p-Xylenes		660	20	2	4B	14
95-47-6	o-Xylené		250	50	1	20	5
95-63-6	1,2,4-Trimethylbenzene		120	20	1	20	5
1868-53-7	Dibromofluoromethane		95%				
17060-07-0	1,2-Dichloroethane-D4		91.%				
2037-26-5	loluene-D8		96%				
≜60-00-4	P-Bromofluorobenzene		90% 90%				
	Page	01 of 01	73111.D				

Client: Tetra Tech NUS, Inc Project: CTO 12 NASA Wailops VO No: Sample Date: 01/14/09 Received Date: 01/15/09 Extraction Date: 01/16/09 Analysis Date: 20-JAN-2009 00:44 Report Date: 01/23/2009 Matrix: WATER % Solids: NA

.

Lab ID: SC0239-8 Client ID: NFF-WOD-TW4-4 SDG: CT012-6 Extracted by: CB Extraction Method: SW846 3510 Analyst: JLF Analysis Method: SW846 8270C Lab Prep Batch: WG89859 Units: ug/L

.

CAS#	Compound	Flags	Results	DF	PQL	Adj.PQL	Adj.MDL
65794-96-9	3&4-Methylphenol	Ţ	12	I.D	10	11	3
91-20-3	Naphthalene		83	1.0	10	1,1	2
367-32-4	2-Fluorophenol		54%				
13127-88-3	Phenol -D6		* 48%				
4165~60-0	Nitrobeazene-D5		568				
321-60-8	2-Fluorobiphenyl		98∿				
118-79-6	2,4,6~Tribromophenol		*1318				
1718-51-0	Terphenyl-D14		60%				
	Page	01: ೧೯೦೧,	G4061.D				

Lab Nan	Lab Name: Katahdin Analytical Services		t Field	d ID:	WFF-V	VOD-T	W4-4	
Matrix:	WATER	SDG I	Name	::	CTOI	2-6		
Percent ?	Solids: 0.00	Lab S	anıpl	¢Ш	: SC021	9-008		
		Concentration Units :	: ug/L	,				
CAS No.	Analyte	Concentration	C	Q	м	DF	Adjusted PQL	Adjusted MDL
7440-38-2	ARSENIC, TOTAL	203			MS	5	5.0	1.45

I INORGANIC ANALYSIS DATA SHEET

Comments:

.

Bottle ID: D

Client: Tetra Tech NUS, Inc Project: CTO 12 NASA Wallops PO No: Sample Date: 01/14/09 Received Date: 01/15/09 Extraction Date: Analysis Date: 22-JAN-2009 19:00 Report Date: 01/27/2009 Matrix: WATER % Solids: NA

.

Lab ID: SC0219-9 Client ID: WFF-WOD-TW5-4 SDG: CT012-6 Extracted by: Extraction Method: SW846 5030 Analyst: JSS Analysis Method: SW846 82608 Lab Prep Batch: WG60080 Units: ug/L

CAS#	Compound	Flags	Results	DF	PQL	Adj.PQL	Adj.MDL
71-43-2	Bęnzené		20	1.0	1	ј.	0.3
127-18-4	Tetrachloroethene	J	0.4	1.0	1	l	0.3
1330-20-7	Xylenes (total)		440	1.0	З	З	0.3
	m+p~Xylenes		310	1.0	3	5	0.7
95-47-6	o-Xylene		130	1.0	1	1	0.3
95-63-6	1,2,4-Trimethylbenzene		85	1.0	1	1	0.2
1868-53-7	Dibromofluoromethane		89%				
17060-07-0	1,2-Dichloroethene-D4		87%				
2037-26-5	Toluene-D9		90 <del>8</del>				
460-00-4	P-Bromofluorobenzene		668				
	Page	01 of 01	T3114.D				

Client: Tetra Tech NUS, Inc Project: CTO 12 NASA Wallops PO No: Sample Date: 01/14/09 Received Date: 01/15/09 Extraction Date: 01/16/09 Analysis Date: 20-JAN-2009 01:26 Report Date: 01/23/2009 Matrix: WATER \$ Solids: NA

. '

Lab ID: SC0219-9 Client ID: WFF-WOD-TW5-4 SDG: CT012-6 Extracted by: CB Extraction Method: SW846 3510 Analyst: JLP Analysis Method: SW846 8270C Lab Prep Batch: WGS9859 Units: ug/L

CAE#	Compound	Flags	Regults	DF	rgr	Adj.PQL	Adj.MDL
65794-96-9	3&4-Methylphepol	U	10	1.0	10	10	З
91-20-3	Naphthaleze		73	2.0	10	3.0	2
367-12-4	2-Fluorophenol		44%				
13127-88-3	Phenol-D6		35%				
4165-50-0	Nitrobenzene-D5		62%				
321-6D-9	2-Fluorobiphenyl		69%				
118-79-6	2,4,5-Tribromophenol		95%				
1718-51-0	Terphenyl~D14		304%				
	Page	D1 of 01	G4062.D				

Lab Name: Katalıdın Analytical Servi	ces Client Field ID:	WFF-	WOD-T	W5-4
Matrix: WATER	SDG Name:	CTO	2-6	
Percent Solids: 0.00	Lab Sample ID	SC021	9-009	
	Concentration Units : ug/L			
CAS No. Analyte	Concentration C Q	м	DF	Adjusted PQLAdjusted MDL
7440-38-2 ARSENIC, TOTAL	72.8	MS	5	5.0 1.45

1 INORGANIC ANALYSIS DATA SHEET

Comments:

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Bottle ID: D

INC	DRGANIC ANALYSIS DATA S	HEET		
Lab Name: Katabdin Analytical Service	es Client Field ID:	WFF-	WOD-T	W5-4
Matrix: WATER	SDG Name:	CTO	2-6	
Percent Solids: 0.00	Lab Sample ID:	SC02.	19-010	
c	Concentration Units : ug/L			
CAS No. Analyte	Concentration C Q	М	DF	Adjusted PQLAdjusted MDL
7440-38-2 ARSENIC, DISSOLVED	62.0	MS	5	5.0 1.45

1

Comments:

Bottle ID: A

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Client: Tetra Tech NUS, Inc Project: CTO 12 NASA Wallops PO No: Sample Date: 01/14/09 Received Date: 01/15/09 Extraction Date: Analysis Date: 22-JAN-2009 19:32 Report Date: 01/27/2009 Matrix: WATER % Solids: NA

.

Lab ID: SC0219-11 Client ID: WFF-WOD-TW6-4 SDG: CT012-6 Extracted by: Sxtraction Method: SW846 5030 Analyst: JS5 Analysis Method: SW846 8260B Lab Prey Batch: WG60080 Units: Ug/l

CAS#	Cospound	Flags	Results	DF	PQL	Adj.PQL	Adj.MDL
71-43-2	Benzene		46	1,0	ī	1	0.3
127-18-4	Tetrachloroethene	J	0.3	1.0	l	1	0.3
1330-20-7	Xylenes (total)	Е	910	1.0	з	3	0.3
	m+p-Xylenes	Ĕ	630	1.0	2	Z	0.7
95-47-6	o-Xylene	Е	280	1.0	l	1	0.3
95-63-6	1,2,4-Trimethylbenzene		160	1.0	l	1	0.2
1868-53-7	Dibromofluoromethane		95%				
17060-07-0	1,2-Dichloroethane-D4		91%				
2037-26-5	Toluene - D8		93%				
460-00-4	P-Bromofluorobenzene		90%				
	Page	01 of 01	ТЭ115.0				

Client: Tetra Tech NUS, Inc Project: CTO 12 NASA Wallops FO No: Sample Date: 01/14/09 Received Date: 01/15/09 Extraction Date: Analysis Date: 23-JAN-2009 15:47 Report Date: 01/27/2009 Matrix: WATER \$ Solids: NA

.

Lab ID: SC0219-11DL Client ID: WFF-WOD-7W6-4 SDG: CT012-6 Extracted by: Extraction Method: SW846 5030 Analyst: JSS Analysis Method: SW846 8260B Lab Prep Batch: WG60135 Onits: ug/l

CAS	Compound	Flags	Results	$\mathbf{DF}$	PQL	Adj.PQL	Adj.MDL
71-43-2	Benzens		39	10	J.	1.0	3
127-18-4	Tetrachloroethene	Ţ	10	10	1	10	з
1330-20-7	Xylenes (total)		1200	10	З	30	3
	m+p-Xylenes		840	3.0	5	20	7
95-47-6	p-Xylene		340	10	1	10	3
95-63-6	1,2,4-Trimethylbenzene		190	10	1	10	2
1868-53-7	Dibromofluoromethane		93%				
17060-07-0	1,2-Dichloroethane-D4		91%				
2037-26-5	Woluene-D8		965				
460-00-4	P-Bromofiuorobenzene		978				
	Page	01 oī 01.	T3130.D				

Client: Tetra Tech NDS, Inc Project: CTO 12 NASA Wallops PC No: Sample Date: 01/14/09 Received Date: 01/15/09 Extraction Date: 01/16/09 Analysis Date: 20-JAN-2009 02:09 Report Date: 01/23/2009 Matrix: WATER % Solids: NA Lab ID: SC0219-11 Client ID: WFF-WOD-TW5-4 SJQ: CT012~6 Extracted by: CB Extraction Method: SW846 3510 Analyst: JLF Analysis Method: SW846 8270C Lab Prep Batch: WG59859 Unite: ug/L

CAS#	Compound	Flags	Results	DF	рõт	Adj.FQL	Adj.MOL
65794-96-9	3&4-Methylphenol	U	11	1.0	10	11	з
91~20-3	Naphthalene	E	230	1.0	10	11	2
367-12-4	2-Fluorophenol		48%				
13127-88-3	Phenol-D6		* 43\$				
4165-60-0	Nitrobenzene-D5		71%				
321-60-8	2-Fluorobiphenyī		88\$				
118-79-6	2,4,6-Tribromophenol		2015				
1728-51-0	Terphenyl-D14		968				
	Page	01 of 01	G4D63.D				

ĩ	NORGANIC ANALYSIS DATA	SHEET			
Lab Name: Katahdin Analytical Serv	vices Client Field I	D: WFF-	WOD-T	W6-4	
Matrix: WATER	SDG Name:	CTOI	2-6		
Percent Solids: 0.00	ent Solids: 0.00 Lab Sample ID: SC0219-011				
	Concentration Units : ug/L				
CAS No. Analyte	Concentration C Q	М	DF	Adjusted PQLAC	justed MDL
7440-38-2 ARSENIC, TOTAL	116	MS	5	5.0	1.45

]

Comments:

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Bottle (D; D

**APPENDIX B** 

**ORC ADVANCED® CALCULATIONS** 

ORC Advanced De Oxycen Relass compound Regenesis Technical Supp	oort: USA (949) 366-	8000		www.regenesis.c	<u>com</u>	, lugust 2004
Site Name: Wallops Island Location: WOD Consultant: W. Wright						
itimated Plume Requiring Treatment		52	T <sub>ff</sub>			
ength of plume (mersecting gw now direction)		162	ft	8.424	ft <sup>2</sup>	
epth to contaminated zone		20	ft		<b>_</b>	
nickness of contaminated saturated zone		10	ft			
ominal aquifer soil (gravel, sand, silty sand, silt, clay)		sand		r	-	
otal porosity		0.33	Effective porosity:	0.25	- <u>,</u>	
ydraulic conductivity		25	ft/day	8.8E-03	cm/sec	
ydraulic gradient		0.005	ft/ft	0.500	ft/dov/	
eepage velocity reatment Zone Pore Volume		27 799	fr <sup>3</sup>	207 966	gallons	
		21,100	_i.	201,000	Janona	
issolved Phase Oxygen Demand: dividual species that represent oxygen demand:		Contaminant Conc.	Contaminant Mass (Ib)	Stoichiometry (wt/wt	) ORC-Adv Dose (lb)	
enzene		0.25	0.4	3.1	8	
bluene		0.00	0.0	3.1	0	
thylbenzene		0.00	0.0	3.2	0	
ylenes		1.70	2.9	3.2	56	
TBE		0.00	0.0	2.7	0	
s-1,2-DCE		0.00	0.0	0.7	0	
nyl Chloride		0.00	0.0	1.3	0	
aphthalene		0.40	0.7	3.2	13	
2,4- minethylpenzene		20.00	0.5	3.2	20	
1,2,3-trimethylbenzene		<- pull-down menu		0.1	20	
easures of total oxygen demand						
otal Petroleum Hydrocarbons (see pull-down for Koc)		0.00	0.0	3.1	0	
iological Oxygen Demand (BOD)		0.00	0.0	1.0	0	
nemical Oxygen Demand (COD)		0.00	0.0	1.0	0	
arameters for Sorbed Phase Oxygen Demand:		4.70	7.3		<b>1</b>	
oil bulk density raction of organic carbon (foc)		1.76	g/cm <sup>°</sup> = range: 0.0001 to 0.0 <sup>°</sup>	110	lb/cf	
		0.002				
Estimated using sorbed phase = foc*Koc*Cgw)	Koc	Contaminant Conc.	Contaminant Mass	Stoichiometry (wt/wt	) ORC-Adv Dose	
enzene	(L/Kg) 123	0.06	(15)	3.1	(ID)	
bluene	267	0.00	0.0	3.1	0	
thylbenzene	327	0.00	0.0	3.2	0	
vlenes	298	1.01	9.4	3.2	177	
ITBE	12	0.00	0.0	2.7	0	
s-1,2-DCE	80	0.00	0.0	0.7	0	
inyl Chloride	2.5	0.00	0.0	1.3	0	
aphthalene	1000.0	0.80	7.4	3.2	140	
,2,4-Trimethylbenzene	884.0	0.53	4.9	3.2	93	
leasures of total oxygen demand	373	0.00	0.0	31	0	
	010	0.00	0.0	0.1	0	
ummary of Estimated ORC-Adv Requirements	Dissolved Phase	Sorbed Phase	Additional Demand	Total	OPC Adv Cost	
	(lbs)	(lbs)	(1 to 10x)	(lbs)	ONC-AUV COSI	
otal BTEX, MTBE, etc.	107	420	5.0	2.635	\$22,525	<-
otal Petroleum Hydrocarbons	0	0	2.0	0	\$0	
iological Oxygen Demand (BOD)	0	0	2.0	0	\$0	
hemical Oxygen Demand (COD)	0	0	1.5	0	\$0	
equired ORC-Adv quantity (in 25 lb increments)	>			2,650	pounds ORC-Adv	,
elivery Design for ORC-Adv Slurry		_				
pacing within rows (ft)	15.0	feet	Slurry Mixing Volum	ne for Injections	r	00
points per row	4	points/row	Pounds per location		-	2.4
pacing between rows (it)	11	IL rows	Buckets per location	t (20, 40% by set for i	ningtions)	2.4
dvective travel time bet, rows (days)	30	davs	Volume of water reg	ired per hole (gal)	ijections)	17
umber of points in grid	44	points	Total water for mixing	a all holes (gal)	-	741
RC-Adv application rate	6.0	lbs/foot	Simple ORC-Adv Ba	ckfilling: min hole dia.	for 67% slurry	4.1
otal ORC-Adv required	2,650	lbs of ORC-Adv	Feasibility for slurry i	njection in sand: ok u	p to 15 lb/ft	(ok)
			Feasibility for slurry i	njection in silt: ok up f	to 10 lb/ft	(ok)
roject Summary			Feasibility for slurry i	njection in clay: ok up	to 10 lb/ft	(ok)
umper of OKC-Adv delivery points (adjust as necessary f	or site)	44				
IRC-Adv bulk material for slurry injection (lbs)	5	2 650				
umber of 25 lb ORC-Adv buckets		2,000				
RC-Adv bulk material cost		\$ 8.50				
ost for bulk ORC-Adv material		\$ 22,525				
hipping and Tax Estimates in US Dollars	0.00%	\$				
otal Material Cost	. 0.00%	\$ 22.525				
hipping (call for amount)		\$ -	-			
otal Regenesis Material Cost		\$ 22,525	1			
RC-Adv Slurry Injection Cost Estimate (responsibility	of customer to contra	ct work)	]	Other Project Cost	Estimates	
ootage for each point = uncontaminated interval + ORC-A	Adv injection interval (ft)	30		Design		\$ -
otal length for direct push for project (ft)	CO fee dell'	1,320		Permitting and repor	ting	\$ -
sumated daily installation rate (ft per day: 300 for push, 1)	ou for arilling)	300		Construction manag	ement	ф -
sumated points per day (10 to 30 is typical for direct push	1)	10.0	5	Other	ing and rpts	- v
lob/demob cost for injection subcontractor		\$ 400	<u>,</u>	Other		\$ - \$
aily rate for injection subcontractor (\$1-2K for push, \$3-4	K for drill rig)	\$ 1,500		Other		\$ -
otal injection subcontrator cost for application	-	\$ 7,900	-	Other		\$ -
otal Install Cost (not including consultant, lab, etc.)		\$ 30,425		Total Project Cost		\$ 30,425

# APPENDIX C

# **ORC ADVANCED® MIXING & INJECTING INSTRUCTIONS**

(As retrieved from Regenesis' Website.)



# DIRECTIONS FOR ORC Advanced<sup>TM</sup> SLURRY MIXING

- 1. Open the 5-gallon bucket and remove the pre-measured bag of ORC *Advanced* (each bag contains 25 lbs of ORC *Advanced*).
- 2. Measure and pour water into the 5-gallon bucket according to the desired slurry consistency (a slurry calculation table is available on the Regenesis software in the Appendix tab):

% Solids	Quantity of ORC Advanced	Quantity of Water		
/ 0 000000	(lbs)	(gal)		
65	25	1.6		
60	25	2.0		
55	25	2.5		
50	25	3.0		
45	25	3.7		
40	25	4.5		
35	25	5.6		
30	25	7.0		
25	25	9.0		
20	25	12.0		

- 3. Add the corresponding quantity of water to the pre-measured quantity of ORC Advanced.
- 4. Use an appropriate mixing device to thoroughly mix the ORC *Advanced* and water together. A hand-held drill with a "jiffy mixer" or a stucco mixer on it may be used in conjunction with a small paddle to scrape the bottom and sides of the container. Standard environmental slurry mixers may also be used, following the equipment instructions for operation. For small quantities, the slurry can be mixed by hand if care is taken to blend all lumps into the mixture thoroughly.

<u>CAUTION</u>: ORC *Advanced* may settle out of slurry if left standing. ORC *Advanced* eventually hardens into a cement-like compound and cannot be re-mixed after that has occurred. Therefore, mix immediately before using to ensure that the mixture has not settled out. <u>Do not</u> let stand more than 30 minutes. If a mechanical slurry mixer attached to a pump is being used, the material may be cycled back through the mixer to maintain slurry suspension and consistency.



# Oxygen Release Compound (ORC<sup>®</sup>)

## &

# Advanced Formula Oxygen Release Compound (ORC Advanced<sup>™</sup>)

# **INSTALLATION INSTRUCTIONS**

## SAFETY

Pure ORC and ORC Advanced are shipped as fine white and pale yellow powders, respectively. ORC is considered to be a mild oxidizer while ORC Advanced is considered an oxidizer therefore both products should be handled with care while in the field. Field personnel should take precautions while installing either the ORC or ORC Advanced product. Typically, the operator should work upwind of the products as well as use the appropriate personal protection equipment (PPE) which includes eye, respiratory protection, and gloves as deemed appropriate by exposure duration and field conditions. In addition, personnel operating the field equipment utilized during installation activities should have appropriate training, supervision and experience.

### GENERAL GUIDELINES

ORC/ORC Advanced can be installed in the contaminated saturated zone in the ground utilizing handaugured holes, direct-push, hollow stem augers or air/mud-rotary drilling techniques. For optimum results, the ORC/ORC Advanced slurry should be installed across the entire vertical contaminated saturated thickness, including the capillary fringe and "smear zone."

Two general approaches are available for installation of these products. The first is to inject the ORC/ORC Advanced slurry through direct-push drive rods across the contaminated saturated zone and the second is to backfill the application points with the ORC/ORC Advanced slurry. Using the injection method should increase oxygen dispersion in the zone of interest over the life of the project because the ORC/ORC Advanced slurry affects a larger zone right from the start. If the backfill method is used more time may be required for the completion of the remediation process because oxygen distribution will be most likely be less.

It is important that the installation method and specific ORC/ORC Advanced slurry point location be established prior to field installation. It is also important that the ORC/ORC Advanced slurry volume and solids content for each drive point be pre-determined. The Regenesis Technical Services Group is available to discuss these issues. The Helpful Hints at the end of these instructions offers relevant information. Further information regarding ORC/ORC Advanced is available on the Regenesis website at <u>www.regenesis.com</u>.

# **SPECIFIC INSTALLATION PROCEDURES**

- 1. Identify the location of all underground structures, including utilities, tanks, and distribution piping, sewers, drains, and landscape irrigation systems.
- 2. Identify surface and aerial impediments.
- 3. Adjust planned installation locations for all impediments and obstacles.
- 4. Pre-mark the installation grid/barrier point locations, noting any that have special depth requirements.
- 5. Set up the unit over each specific point, following manufacturer recommended standard operating procedures (SOP).

The section below contains instructions for augured-hole (hollow stem or air/mud rotary) applications. For direct-push applications, go to the following section.

## **Instructions for Augured Whole Applications**

- 6. Hand augering and solid stem auger applications will generally require the soil matrix to stay open during auger removal. If this is the method being used, the ORC/ORC Advanced slurry should be installed immediately upon tool removal from the borehole.
- 7. Mix the appropriate quantity of ORC/ORC Advanced slurry for the current application point. Do not mix more slurry than will be used within a 30-minute period because the slurry could solidify and become useless.
- 8. Where soil conditions are unstable in the saturated zone, we recommend using a thicker ORC/ORC Advanced slurry. A solids content of 65-67% (consistency of toothpaste) is appropriate in these situations, since it comes relatively close to mimicking the density of soil.
- 9. <u>Tremie pipe option #1</u>: The slurry may be pumped through standard geotechnical slurry pumps and a tremie hose/pipe. We strongly recommend following the equipment manufacturer's standard operating instructions. Regenesis recommends that the tremie application be performed from the bottom of the hole up to the top of the capillary fringe. This is especially important if there is groundwater in the bottom of the installation hole, since it serves to maintain the densest portion of the ORC/ORC Advanced slurry mix.
- 10. <u>Tremie pipe option #2</u>: In relatively shallow situations, a tremie pipe may be used. Depending on the open hole diameter, a PVC tremie pipe with a one- to two-inch diameter may be used. The hole should be filled from the bottom of the hole to the top of the capillary fringe. It is normally a good idea, and may sometimes be a necessity, to use a "plunger" inside the tremie pipe to push the slurry through as the pipe is withdrawn. A funnel to pour slurry into the tremie pipe is advised.

1011 Calle Sombra • San Clemente, CA 92673 • tel: 949.366.8000 • fax: 949.366.8090

tech@regenesis.com • www.regenesis.com

- 11. <u>Hollow-stem auger option #1</u>: If the borehole being drilled would collapse during tool removal, augering applications require a hollow stem. By drilling with a plug in place, an open temporary source hole is created. The slurry may be installed with a tremie pipe or a tremie pump, following the pump manufacturer's operating instructions. Depending on the saturated zone soil conditions, it may be necessary to carefully coordinate the rate of auger withdrawal with the rate of slurry addition to preserve the hole void space for acceptance of the slurry.
- 12. <u>Hollow stem auger option #2 (auger as "tremie pipe")</u>: When soil conditions in the saturated zone are unstable and borehole collapse is likely, the hollow stem auger may be used as a tremie pipe. Prior to dropping the auger plug at the bottom of the hole, the ORC/ORC Advanced slurry is poured directly into the hollow stem, in a volume equal to the expected requirement for the hole. A plunger inside the auger is used to push the slurry down in the hole to keep it there as the auger is removed.

## Skip the next section and proceed to Step 13.

### **For Direct-Push Applications**

- 6. Push the drive rods (A 1.5-inch pre-probe can be used but is not recommended) with the detachable tip to the maximum desired depth. Standard drive rods (typically 1.25-inch O.D.) should be used. Pre-counted drive rods should be positioned prior to the installation driving procedure to assure the desired depth is reached.
- 7. Disconnect the drive rods from the implantable tip, following standard equipment procedures.
- 8. Mix the appropriate quantity of ORC/ORC Advanced slurry for the current injection point. Do not mix more slurry than will be used within a 30-minute period.
- 9. Set up and operate an appropriate slurry pump according to manufacturer's directions. Connect the pump to the probe puller/injector connector via a standard delivery hose. The hose is then attached to the drive rod with its quick disconnect fitting. Upon confirmation of all connections, add the ORC/ORC Advanced slurry to the pump hopper/tank.
- 10a. Injection Application (if this is a backfill application, go to step 10b): While slowly withdrawing the drive rods, pump the pre-determined amount of ORC/ORC Advanced slurry into the aquifer. Typically, ORC/ORC Advanced injection rates are based on pounds of material installed per foot of vertical treatment. Observe pump pressure levels for indications of slurry dispersion and/or slurry refusal into aquifer (increasing pressure indicates reduced acceptance of material by the aquifer). As an optional pre-treatment step, pump one to two gallons of tap water into the aquifer to enhance dispersion pathways from the probe hole.
- 10b. <u>Backfill Application</u>: Pump the pre-determined quantity of ORC/ORC Advanced slurry into the borehole being treated. Observe pump pressure levels for indications of slurry dispersion

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and/or slurry refusal into aquifer (increasing pressure indicates reduced acceptance of material by the aquifer).

- 11. Remove one four-foot section of the drive rod. If the drive rod contains slurry, return it to the ORC/ORC Advanced bucket/pump hopper for reuse.
- 12. Repeat steps 10 and 11 until treatment of the entire targeted thickness has been achieved. It is generally recommended that the procedure extend to the top of the capillary fringe/smear zone.
- 13. Place an appropriate seal, such as bentonite, above the ORC/ORC Advanced slurry through the entire vadose zone. This helps ensure that the slurry stays in place and prevents contaminants from migrating go the surface. Depending on soil conditions and local regulations, a bentonite seal can be pumped through the grout pump or added via chips or pellets after the drive rods have been removed.
- 14. Remove and decontaminate the drive rods and pre-probe (optional).
- 15. Finish the probe hole at surface as appropriate (concrete or asphalt cap, if necessary).
- 16. Move to the next injection point, repeating steps 5 through 15.

# HELPFUL HINTS

## 1) Physical characteristics

The ORC/ORC Advanced slurry is made using the dry ORC/ORC Advanced powder makes a smooth slurry, the consistency of which depends on the amount of water used.

A 65-67% solids content ORC/ORC Advanced slurry (consistency of toothpaste) is thick but can still be pumped easily. This solids content slurry is normally used for back filling a borehole or probe hole. It is especially useful in situations where maximum density is desired, such as when ground water is present in the hole or when there are heaving sands.

As a rule, it is best to mix the first batch of slurry at the maximum solids content one would expect to use. The slurry can then be thinned by adding water in small increments. By monitoring this process, the appropriate quantities of water for subsequent batches can be determined.

The slurry should be mixed at about the time it is expected to be used. It is best not to hold it for longer than 30 minutes. Thinner slurries can experience separation if they stand too long. All solids content ORC/ORC Advanced slurries have a tendency to form a weak cement when left standing for extended periods or time. If a slurry begins to thicken too much, it should be mixed again and additional water should be added.

The ORC/ORC Advanced slurry should not be left sitting inside a grout pump or hose for extended periods because it will begin to set-up and harden. This problem can generally be avoided by recirculating the slurry through the pump and hose back into the pump's hopper or mixing tank.

## 2) Pump Equipment Cleaning and Maintenance

Pumping equipment and drive rods can be lightly cleaned by circulating clear water through them. If necessary, further cleaning and decontamination should be performed according to the equipment supplier's standard procedures and local regulatory requirements.

## 3) General Operating Procedures for Backfill Applications

When performing a backfill installation, it is important to fill the appropriate portion of the hole with a thick (65-67% solids content) slurry that will solidify in place. Moderate amounts of pressure should be used to avoid fracturing the soil matrix or pumping slurry into the soil.

The operator should use care and monitor pumping pressures and quantities to ensure that the hole is being filled without pushing excess material into the soil matrix. Ideally, the rate of slurry pumping will be coordinated with the rate of drive rod withdrawal. It is usually important to install the slurry material to the top of the capillary fringe.

In addition, it is important that the entire contaminated saturated zone is treated (including the capillary fringe), as this is often the location of highest contaminant concentrations. Failure to properly treat this area can undermine an otherwise successful remediation effort.

## <sup>®</sup>ORC is a registered trademark of Regenesis Bioremediation Products
### APPENDIX D

### **ORC ADVANCED® MSDS Sheets**

(As retrieved from Regenesis' Website.)

Last Revised: March 13, 2007

Section 1 - Material Identification		
Supplier:		
P		
REGENESIS	5	
1011 Calle Sombra San Clemente, CA 926	673	
Phone:	949.366.8000	
Fax:	949.366.8090	
E-mail:	info@regenesis.com	
Chemical Description:	A mixture of Calcium OxyHydroxide $[CaO(OH)_2]$ and Calcium Hydroxide $[Ca(OH)_2]$ .	
Chemical Family:	Inorganic Chemical	
Trade Name:	Advanced Formula Oxygen Release Compound (ORC <i>Advanced</i> <sup>TM</sup> )	
Chemical Synonyms	Calcium Hydroxide Oxide; Calcium Oxide Peroxide	
Product Use:	Used to remediate contaminated soil and groundwater (environmental applications)	

Section 2 – Composition
-------------------------

CAS No.	Chemical
682334-66-3	Calcium Hydroxide Oxide [CaO(OH) <sub>2</sub> ]
1305-62-0	Calcium Hydroxide [Ca(OH) 2]
7758-11-4	Dipotassium Phosphate (HK <sub>2</sub> O <sub>4</sub> P)
7778-77-0	Monopotassium Phosphate (H <sub>2</sub> KO <sub>4</sub> P)

Section 3 – Physical Data		
Form:	Powder	
Color:	White to Pale Yellow	
Odor:	Odorless	
Melting Point:	527 °F (275 °C) – Decomposes	
<b>Boiling Point:</b>	Not Applicable (NA)	
Flammability/Flash Point:	NA	
Auto- Flammability:	NA	
Vapor Pressure:	NA	
Self-Ignition Temperature:	NA	
Thermal Decomposition:	527 °F (275 °C) – Decomposes	
Bulk Density:	0.5 – 0.65 g/ml (Loose Method)	
Solubility:	1.65 g/L @ 68° F (20° C) for calcium hydroxide.	
Viscosity:	NA	
pH:	11-13 (saturated solution)	
Explosion Limits % by Volume:	Non-explosive	
Hazardous Decomposition Products:	Oxygen, Hydrogen Peroxide, Steam, and Heat	
Hazardous Reactions:	None	

Section 4 – Reactivity Data		
Stability:	Stable under certain conditions (see below).	
Conditions to Avoid:	Heat and moisture.	
Incompatibility:	Acids, bases, salts of heavy metals, reducing agents, and flammable substances.	
Hazardous Polymerization:	Does not occur.	

Section 5 – Regulations		
TSCA Inventory List:	Listed	
CERCLA Hazardous Substance (40 CFR Part 302)		
Listed Substance:	No	
Unlisted Substance:	Yes	
Reportable Quantity (RQ):	100 pounds	
Characteristic(s):	Ignitibility	
RCRA Waste Number:	D001	
SARA, Title III, Sect Notification)	tions 302/303 (40 CFR Part 355 – Emergency Planning and	
Extremely Hazardous Substance:	No	
SARA, Title III, Sections 311/312 (40 CFR Part 370 – Hazardous Chemical Reporting: Community Right-To-Know		
Hazard Category:	Immediate Health Hazard Fire Hazard	

**Threshold Planning Quantity:** 10,000 pounds

Section 5 – Regulations (	(cont)
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SARA, Title III, Section 313 (40 CFR Part 372 – Toxic Chemical Release Reporting: Community Right-To-Know

Extremely Hazardous Substance:	No	
WHMIS Classification:	С	Oxidizing Material Poisonous and Infectious Material
	D	Material Causing Other Toxic Effects – Eye and Skin Irritant
Canadian Domestic Substance List:	Not Listed	

Section 6 – Protective Measures, Storage and Handling
-------------------------------------------------------

# Technical Protective<br/>MeasuresKeep in tightly closed container. Store in dry area, protected<br/>from heat sources and direct sunlight.Storage:Keep in tightly closed container. Store in dry area, protected<br/>from heat sources and direct sunlight.Handling:Clean and dry processing pipes and equipment before<br/>operation. Never return unused product to the storage<br/>container. Keep away from incompatible products. Containers<br/>and equipment used to handle this product should be used<br/>exclusively for this material. Avoid contact with water or<br/>humidity.

Personal Protective Equipment (PPE)		
Engineering Controls:	Calcium Hydroxide ACGIH <sup>®</sup> TLV <sup>®</sup> (2000) 5 mg/m <sup>3</sup> TWA OSHA PEL Total dust–15 mg/m <sup>3</sup> TWA Respirable fraction– 5 mg/m <sup>3</sup> TWA NIOSH REL (1994) 5 mg/m <sup>3</sup>	
<b>Respiratory</b> <b>Protection:</b>	For many conditions, no respiratory protection may be needed; however, in dusty or unknown atmospheres use a NIOSH approved dust respirator.	
Hand Protection:	Impervious protective gloves made of nitrile, natural rubbber or neoprene.	
Eye Protection:	Use chemical safety goggles (dust proof).	
Skin Protection:	For brief contact, few precautions other than clean clothing are needed. Full body clothing impervious to this material should be used during prolonged exposure.	
Other:	Safety shower and eyewash stations should be present. Consultation with an industrial hygienist or safety manager for the selection of PPE suitable for working conditions is suggested.	
Industrial Hygiene:	Avoid contact with skin and eyes.	
Protection Against Fire & Explosion:	NA	

### Section 6 – Protective Measures, Storage and Handling (cont)

		Section 7 – Hazards Identification
Emergency Overview:		Oxidizer – Contact with combustibles may cause a fire. This material decomposes and releases oxygen in a fire. The additional oxygen may intensify the fire.
Potential Effects:	Health	Irritating to the mucous membrane and eyes. If the product splashes in ones face and eyes, treat the eyes first. Do not dry soiled clothing close to an open flame or heat source. Any

Regenesis - ORC Advanced MSDS	S clothing that has been contaminated with this product should be submerged in water prior to drying.
Inhalation:	High concentrations may cause slight nose and throat irritation with a cough. There is risk of sore throat and nose bleeds if one is exposed to this material for an extended period of time.
Eye Contact:	Severe eye irritation with watering and redness. There is also the risk of serious and/or permanent eye lesions.
Skin Contact:	Irritation may occur if one is exposed to this material for extended periods.
Ingestion:	Irritation of the mouth and throat with nausea and vomiting.

Section 8 – Measures in Case of Accidents and Fire

After Spillage/Leakage/Gas Leakage:	Collect in suitable containers. Wash remainder with copious quantities of water.			
Extinguishing Media:	See next.			
Suitable:	Large quantities of water or water spray. In case of fire in close proximity, all means of extinguishing are acceptable.			
Further Information:	Self contained breathing apparatus or approved gas mask should be worn due to small particle size. Use extinguishing media appropriate for surrounding fire. Apply cooling water to sides of transport or storage vessels that are exposed to flames until the fire is extinguished. Do not approach hot vessels that contain this product.			
First Aid:	After contact with skin, wash immediately with plenty of water and soap. In case of contact with eyes, rinse immediately with plenty of water and seek medical attention. Consult an opthalmologist in all cases.			

Section 8 – Measures in Case of Accidents and Fire			
Eye Contact:	Flush eyes with running water for 15 minutes, while keeping the eyelids wide open. Consult with an ophthalmologist in all cases.		
Inhalation:	Remove subject from dusty environment. Consult with a physician in case of respiratory symptoms.		

### **Regenesis - ORC Advanced MSDS**

Ingestion:	If the victim is conscious, rinse mouth and admnister fresh water. DO NOT induce vomiting. Consult a physician in all cases.
Skin Contact:	Wash affected skin with running water. Remove and clean clothing. Consult with a physician in case of persistent pain or redness.
Special Precautions:	Evacuate all non-essential personnel. Intervention should only be done by capable personnel that are trained and aware of the hazards associated with this product. When it is safe, unaffected product should be moved to safe area.
Specific Hazards:	Oxidizing substance. Oxygen released on exothermic decomposition may support combustion. Confined spaces and/or containers may be subject to increased pressure. If product comes into contact with flammables, fire or explosion may occur.

## Section 9 – Accidental Release Measures

Precautions:	Observe the protection methods cited in Section 3. Avoid materials and products that are incompatible with product. Immediately notify the appropriate authorities in case of reportable discharge (> 100 lbs).
Cleanup Methods:	Collect the product with a suitable means of avoiding dust formation. All receiving equipment should be clean, vented, dry, labeled and made of material that this product is compatible with. Because of the contamination risk, the collected material should be kept in a safe isolated place. Use large quantities of water to clean the impacted area. See Section 12 for disposal methods.

Section 10 – Information on Toxicology		
Toxicity Data		
Acute Toxicity:	Oral Route, $LD_{50}$ , rat, > 2,000 mg/kg (powder 50%) Dermal Route, $LD_{50}$ , rat, > 2,000 mg/kg (powder 50%) Inhalation, $LD_{50}$ , rat, > 5,000 mg/m <sup>3</sup> (powder 35%)	
Irritation:	Rabbit (eyes), severe irritant	

### **Regenesis - ORC Advanced MSDS**

Sensitization:		No data
Chronic Toxicity:		In vitro, no mutagenic effect (Powder 50%)
Target Effects:	Organ	Eyes and respiratory passages.

	Section 11 – Information on Ecology
Ecology Data	
	$10 \text{ mg Ca}(\text{OH})_2/\text{L: } \text{pH} = 9.0$
	$100 \text{ mg Ca}(\text{OH})_2/\text{L: } \text{pH} = 10.6$
Acute Exotoxicity:	Fishes, Cyprinus carpio, LC <sub>50</sub> , 48 hrs, 160 mg/L
	Crustaceans, Daphnia sp., EC <sub>50</sub> , 24 hours, 25.6 mg/L
	(Powder 16%)
Mobility:	Low Solubility and Mobility
	Water – Slow Hydrolysis.
	Degradation Products: Calcium Hydroxide
Abiotic Degradation:	Water/soil – complexation/precipitation. Carbonates/sulfates present at environmental concentrations.
	Degradation products: carbonates/sulfates sparingly soluble
<b>Biotic Degradation:</b>	NA (inorganic compound)
Potential for Bioaccumulation:	NA (ionizable inorganic compound)

Section 11 – Information on Ecology (cont)			
	Observed effects are related to alkaline properties of the product. Hazard for the environment is limited due to the product properties of:		
Comments:	No bioaccumulation		
	• Weak solubility and precipatation as carbonate or sulfate in an aquatic environment.		
	Diluted product is rapidly neutralized at environmental pH.		
Further Information:	NA		

Section 12 – Disposal Considerations				
Waste Disposal Method:	Consult current federal, state and local the proper disposal of this material and its	regulations regarding emptied containers.		
Se	ction 13 – Shipping/Transport Informatio	n		
D.O.T Shipping Name:	<b>g</b> Oxidizing Solid, N.O.S [A mixture of Calcium OxyHydroxide [CaO(OH) <sub>2</sub> ] and Calcium Hydroxide [Ca(OH) <sub>2</sub> ].			
UN Number:	1479			
Hazard Class:	5.1			
Label(s):	5.1 (Oxidizer)			
Packaging Group: II				
STCC Number:	4918717			
	Section 14 – Other Information			
HMIS <sup>®</sup> Rating	Health – 2 Flammability – 0	Reactivity – 1 PPE - Required		
HMIS <sup>®</sup> is a registered trademark of the National Painting and Coating Association.				
<b>NFPA<sup>®</sup> Rating</b> Health $-2$ Flammability $-0$ Reactivity $-1$ OX		Reactivity – 1 OX		
NFPA <sup>®</sup> is a registered trademark of the National Fire Protection Association.				
<b>Reason for Issue:</b> Update toxicological and ecological da				

### **Section 15 – Further Information**

The information contained in this document is the best available to the supplier at the time of writing, but is provided without warranty of any kind. Some possible hazards have been determined by analogy to similar classes of material. The items in this document are subject to change and clarification as more information become available. APPENDIX E

HEALTH AND SAFETY PLAN

# **Health and Safety Plan**

For

# Former Fire Training Area and Waste Oil Dump Site 16 NASA Wallops Flight Facility Wallops Island, Virginia



National Aeronautics and Space Administration Goddard Space Flight Center Wallops Flight Facility

May 2008

### HEALTH AND SAFETY PLAN

### FOR

### FORMER FIRE TRAINING AREA AND WASTE OIL DUMP SITE 16 NASA WALLOPS FLIGHT FACILITY WALLOPS ISLAND, VIRGINIA

### COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY CONTRACT

### Submitted to:

National Aeronautics and Space Administration Goddard Space Flight Center Wallops Flight Facility Building F-160, Code 250.W Wallops Island, Virginia 23337

Submitted by: Tetra Tech NUS, Inc. 234 Mall Boulevard, Suite 260 King of Prussia, Pennsylvania 19406

### CONTRACT NO. N62472-03-D-0057 CONTRACT TASK ORDER 0012

### **MAY 2008**

PREPARED UNDER THE SUPERVISION OF:

GARTH GLENN PROJECT MANAGER TETRA TECH NUS, INC. NORFOLK, VIRGINIA **APPROVED FOR SUBMITTAL BY:** 

MATTHEW SOLTIS, CIH, CSP. CLEAN HEALTH & SAFETY MANAGER TETRA TECH NUS, INC. PITTSBURGH, PENNSYLVANIA

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### 1.0 INTRODUCTION

The objective of this Health and Safety Plan (HASP) is to provide the safety and health requirements, restrictions, practices and procedures for Tetra Tech NUS, Inc. (TtNUS) personnel participating in soil boring via Direct Push Technology (DPT), groundwater sampling and (ORC) Oxygen Release Compound injection at the Former Fire Training Area at NASA Wallops Flight Facility (WWF) Wallops Island, Virginia.

This HASP is to be used in conjunction with the Tetra Tech NUS Health and Safety Guidance Manual. The Guidance Manual provides detailed information pertaining to hazard recognition and control, and TtNUS standard operating procedures. This HASP and the contents of the Guidance Manual were developed to comply with the requirements stipulated in 29 CFR 1910.120 (OSHA's Hazardous Waste Operations and Emergency Response Standard). Both documents must be present at the site to satisfy these requirements.

This HASP has been written to support proposed tasks and techniques associated with the scope of work as presented in Section 4.0. It has been developed using the latest available information regarding known or suspected chemical contaminants and potential physical hazards associated with the proposed work at the site. Should the proposed work site conditions and/or suspected hazards change, or if new information becomes available, this document will be modified. Changes to the HASP will be made with the approval of the TtNUS Site Safety Officer (SSO) and the TtNUS Health and Safety Manager (HSM). Requests for modifications to the HASP will be directed to the SSO who will determine whether to make the changes. The SSO will notify the Project Manager (PM), who will notify the affected personnel of changes.

### 1.1 AUTHORITY

This work is authorized under the Comprehensive Long - Term Environmental Action Navy (CLEAN) contract, administered through the U.S. Navy Southeast, Naval Facilities Engineering Command, as defined under Contract No. N62467-04-D-0055; Contract Task Order Number 012.

### 1.2 KEY PROJECT PERSONNEL AND ORGANIZATION

This section defines responsibilities for site safety and health for TtNUS employees conducting the DPT soil boring, groundwater sampling and ORC Injection and other supporting field activities under this field effort. All personnel assigned to participate in the field work have the primary responsibility for performing all of their work tasks in a manner that is consistent with the TtNUS Health and Safety Policy, the health and safety training that they have received, the contents of this HASP, and in an overall manner that protects their personal safety and health and that of their co-workers. The following persons are the

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primary point of contact and have the primary responsibility for observing and implementing this HASP and for overall on-site health and safety.

- The TtNUS PM is responsible for the overall direction and implementation of health and safety for this work.
- The TtNUS Field Operations Leader (FOL) is responsible for implementation of this HASP. The FOL manages field activities, executes the Work Plan, and enforces safety procedures as applicable to the Work Plan. Specifically, the FOL will:
  - Verify training and medical status of on-site personnel in relation to site activities.
  - Assist and represent TtNUS with emergency services (if needed)
  - Provide elements site-specific training for on site personnel.
- The TtNUS Site Safety Officer (SSO) or his/her representative supports the FOL concerning the aspects of health and safety including, but not limited to:
  - Coordinating health and safety activities
  - Selecting, applying, inspecting, and maintaining personal protective equipment
  - Establishing work zones and control points
  - Implementing air monitoring procedures
  - Implementing hazard communication, respiratory protection, and other associated safety and health programs
  - Coordinating emergency services
  - Providing elements of site-specific training
- Compliance with these requirements is monitored by the Project Health and Safety Officer (PHSO) and is coordinated through the HSM.

### 1.3 SITE INFORMATION AND PERSONNEL ASSIGNMENTS

Site Name: NASA Wallops Flight Facility	Address: Wallops Island, Virginia		
Remedial Project Manager: Carolyn Turner	Phone Number: <u>747-824-1720</u>		
Site Contact: T.J. Meyer	Phone Number: <u>747-824-1987</u>		
Site Address: Wallops Island, Virginia 2333	7		
Purpose of Site Visit: Pilot study to determine if the application of Oxygen Releasing compounds can reduce SVOC's and VOC's			
Proposed Start-up Date: .May 2008 till completion			
Project Team:			
TtNUS Personnel:	Discipline/Tasks Assigned:		
Garth Glenn,	Project Manager (PM)		
Garth Glenn, TBD	Project Manager (PM) Field Operations Leader		
Garth Glenn, TBD Matthew M. Soltis, CIH, CSP	Project Manager (PM) Field Operations Leader Health and Safety Manager (HSM)		
Garth Glenn, TBD Matthew M. Soltis, CIH, CSP Clyde J. Snyder	Project Manager (PM) Field Operations Leader Health and Safety Manager (HSM) Project Health and Safety Officer (PHSO)		
Garth Glenn, TBD Matthew M. Soltis, CIH, CSP Clyde J. Snyder TBD	Project Manager (PM) Field Operations Leader Health and Safety Manager (HSM) Project Health and Safety Officer (PHSO) Site Safety Officer		

Prepared by: Clyde J. Snyder

### 2.0 EMERGENCY ACTION PLAN

### 2.1 INTRODUCTION

This section has been developed as part of a planning effort to direct and guide field personnel in the event of an emergency. In the event of an emergency, the field team will primarily evacuate and assemble to an area unaffected by the emergency and notify the appropriate local emergency response personnel/agencies. TtNUS personnel are not authorized to participate in any emergency response activities. Workers who are ill or who have suffered a non-serious injury may be transported by site personnel to nearby medical facilities, provided that such transport does not aggravate or further endanger the welfare of the injured/ill person. The emergency response agencies listed in this plan are capable of providing the most effective response, and as such, will be designated as the primary responders. These agencies are located within a reasonable distance from the area of site operations, which ensures adequate emergency response time. The Navy RPM will be notified if outside response agencies are contacted.

TtNUS personnel may participate in minor event response and emergency prevention activities such as:

- Initial fire-fighting support and prevention
- Initial spill control and containment measures and prevention
- Removal of personnel from emergency situations
- Provision of initial medical support for injury/illness requiring only first-aid level support
- Provision of site control and security measures as necessary

### 2.2 EMERGENCY PLANNING

Through the initial hazard/risk assessment effort, emergencies resulting from chemical, physical, or fire hazards are the types of emergencies which could be encountered during site activities. To minimize or eliminate the potential for these emergency situations, pre-emergency planning activities will include the following (which are the responsibility of the SSO and/or the FOL):

- Coordinating with the Municipal Emergency Response personnel to ensure that TtNUS emergency action activities are compatible with existing emergency response procedures.
- Establishing and maintaining information at the project staging area (support zone) for easy access in the event of an emergency. This information will include the following:
  - Chemical Inventory (of chemicals used onsite), with Material Safety Data Sheets.

- Onsite personnel medical records (Medical Data Sheets).
- A log book identifying personnel onsite each day.
- Hospital route maps with directions (these should also be placed in each site vehicle).
- Emergency Notification phone numbers.

The TtNUS FOL will be responsible for the following tasks:

- Identifying a chain of command for emergency action.
- Educating site workers to the hazards and control measures associated with planned activities at the site, and providing early recognition and prevention, where possible.
- Periodically performing practice drills to ensure site workers are familiar with incidental response measures.
- Providing the necessary equipment to safely accomplish identified tasks.

### 2.3 EMERGENCY RECOGNITION AND PREVENTION

### 2.3.1 <u>Recognition</u>

Emergency situations that may be encountered during site activities will generally be recognized by visual observation. Visual observation will also play a role in detecting potential exposure events to some chemical hazards. To adequately recognize chemical exposures, site personnel must have a clear knowledge of signs and symptoms of exposure associated with the principle site contaminants of concern as presented in this HASP. Tasks to be performed at the site, potential hazards associated with those tasks and the recommended control methods are discussed in detail in Sections 5.0 and 6.0. Additionally, early recognition of hazards will be supported by daily site surveys to eliminate any situation predisposed to an emergency. The FOL and/or the SSO will be responsible for performing surveys of work areas prior to initiating site operations and periodically while operations are being conducted. Survey findings are documented by the FOL and/or the SSO in the Site Health and Safety logbook; however, site personnel will be responsible for reporting hazardous situations. Where potential hazards exist, TtNUS will initiate control measures to prevent adverse effects to human health and the environment.

The above actions will provide early recognition for potential emergency situations, and allow TtNUS to instigate necessary control measures. However, if the FOL and the SSO determine that control

measures are not sufficient to eliminate the hazard; TtNUS will withdraw from the site and notify the appropriate response agencies listed in Table 2-1.

### 2.3.2 <u>Prevention</u>

TtNUS and subcontractor personnel will minimize the potential for emergencies by following the Health and Safety Guidance Manual and ensuring compliance with the HASP and applicable OSHA regulations. Daily site surveys of work areas, prior to the commencement of that day's activities, by the FOL and/or the SSO will also assist in prevention of illness/injuries when hazards are recognized early and control measures initiated.

### 2.4 EVACUATION ROUTES, PROCEDURES, AND PLACES OF REFUGE

An evacuation will be initiated whenever recommended hazard controls are insufficient to protect the health, safety or welfare of site workers. Specific examples of conditions that may initiate an evacuation include, but are not limited to the following: severe weather conditions; fire or explosion; monitoring instrumentation readings which indicate levels of contamination are greater than instituted action levels; and evidence of personnel overexposure to potential site contaminants.

In the event of an emergency requiring evacuation, personnel will immediately stop activities and report to the designated safe place of refuge unless doing so would pose additional risks. When evacuation to the primary place of refuge is not possible, personnel will proceed to a designated alternate location and remain until further notification from the TtNUS FOL. Safe places of refuge will be identified prior to the commencement of site activities by the SSO and will be conveyed to personnel as part of the pre-activities training session. This information will be reiterated during daily safety meetings. Whenever possible, the safe place of refuge will also serve as the telephone communications point for that area. During an evacuation, personnel will remain at the refuge location until directed otherwise by the TSNO will perform a head count at this location to account for and to confirm the location of site personnel. Emergency response personnel will be immediately notified of any unaccounted personnel. The SSO will document the names of personnel onsite (on a daily basis) in the site Health and Safety Logbook. This information will be utilized to perform the head count in the event of an emergency.

Evacuation procedures will be discussed during the pre-activities training session, prior to the initiation of project tasks. Evacuation routes from the site and safe places of refuge are dependent upon the location at which work is being performed and the circumstances under which an evacuation is required. Additionally, site location and meteorological conditions (i.e., wind speed and direction) may dictate evacuation routes. As a result, assembly points will be selected and communicated to the workers

2-3

relative to the site location where work is being performed. Evacuation should always take place in an upwind direction from the site.

### 2.5 EMERGENCY CONTACTS

Prior to initiating field activities, personnel will be thoroughly briefed on the emergency procedures to be followed in the event of an accident. Table 2-1 provides a list of emergency contacts and their associated telephone numbers. This table must be posted where it is readily available to site personnel. Facility maps should also be posted showing potential evacuation routes and designated meeting areas.

As soon as possible, Navy contact will be informed of any incident or accident that requires medical attention.

Any pertinent information regarding allergies to medications or other special conditions will be provided to medical services personnel. This information is listed on Medical Data Sheets filed onsite (See Attachment I). If an exposure to hazardous materials has occurred, provide hazard information from Table 6-1 to medical service personnel.

### TABLE 2-1 EMERGENCY CONTACTS

### WALLOPS FLIGHT FACILITY WALLOPS ISLAND, VIRGINIA

AGENCY	TELEPHONE
<b>EMERGENCY</b> (WFF Land Line) - Fire, Security, Emergency Medical Services	911
Site Emergency From a Cell Phone	(757) 824-1333
Peninsula Regional Medical Center	(410) 546-6400
Chemtrec	(800) 424-9300
National Response Center	(800) 424-8802
Virginia Utility One Call (Miss Utility of Virginia)	(800) 552-7001
Virginia Poison Control	(800) 222-1222
NASA Point of Contact, Carolyn Turner	(757) 824-1720
Base Safety Office:	
Alyson Cornell	(757) 824-1884
Terry Potterton	(757) 824-1498
Marvin Bunting	(757) 824-2030
Project Manager, Garth Glenn	(610) 491-9688
Project Health and Safety Officer, Clyde Snyder	412-921-8904
CLEAN Health and Safety Manager, Matthew M. Soltis, CIH, CSP	(412) 921-8912

### 2.6 EMERGENCY ROUTE TO HOSPITAL

### **ROUTE TO MEDICAL CENTER**

TtNUS will notify WFF Emergency Services of any serious illness or injury. However workers who are ill or who have suffered a non-serious injury may be transported to the Peninsula Regional Medical Center provided the transport can be completed in a safe manner for the injured or ill person.

### Peninsula Regional Medical Center 100 East Carroll Street Salisbury, MD 21801-5493 410-546-6400

Take Virginia Route 175 for 10.5 miles.

Turn right on US 13 North.

Continue straight into Maryland approximately 31 miles.

Take the ramp onto US 13 Business North toward Salisbury/Fruitland and go 5 miles.

At Carroll St turn left and the facility will be on the left.



### FIGURE 2-1 ROUTE TO MEDICAL CENTER

### 2.7 EMERGENCY ALERTING AND ACTION/RESPONSE PROCEDURES

TtNUS personnel will be working in close proximity to each other at NASA Wallops Island and other work sites associated with the ORC Pilot Study. As a result, hand signals, voice commands, and line of site communication will be sufficient to alert site personnel of an emergency.

If an emergency warranting evacuation occurs, the following procedures are to be initiated:

- Initiate the evacuation via hand signals, voice commands, or line of site communication
- Report to the designated refuge point where the FOL will account for all personnel
- Once non-essential personnel are evacuated, appropriate response procedures will be enacted to control the situation.
- Describe to the FOL (FOL will serve as the Incident Coordinator) pertinent incident details.

In the event that site personnel cannot mitigate the hazardous situation, the FOL and SSO will enact emergency notification procedures to secure additional assistance in the following manner:

Dial 911 and call other pertinent emergency contacts listed in Table 2-1 and report the incident. Give the emergency operator the location of the emergency, the type of emergency, the number of injured, and a brief description of the incident. Stay on the phone and follow the instructions given by the operator. The operator will then notify and dispatch the proper emergency response agencies.

### 2.8 PPE AND EMERGENCY EQUIPMENT

A first-aid kit, eye wash units (or bottles of disposable eyewash solution) and fire extinguishers (strategically placed) will be maintained onsite and shall be immediately available for use in the event of an emergency. This equipment will be located in the field office as well as in each site vehicle. At least one first aid kit supplied with equipment to protect against bloodborne pathogens will also be available on site. Personnel identified within the field crew with bloodborne pathogen and first-aid training will be the only personnel permitted to offer first-aid assistance.

### 2.9 DECONTAMINATION PROCEDURES / EMERGENCY MEDICAL TREATMENT

During any site evacuation, decontamination procedures will be performed only if doing so does not further jeopardize the welfare of site workers. Decontamination will not be performed if the incident warrants immediate evacuation. However, it is unlikely that an evacuation would occur which would require workers to evacuate the site without first performing the necessary decontamination procedures.

TtNUS personnel will perform rescue operations from emergency situations and may provide initial medical support for injury/illnesses requiring only "Basic First-Aid" level support, and only within the limits of training obtained by site personnel. Basic First-Aid is considered treatment that can be rendered by a trained first aid provider at the injury location and not requiring follow-up treatment or examination by a physician (for example; minor cuts, bruises, stings, scrapes, and burns). Not included as Basic First-Aid are second or third degree burns, cuts, lacerations requiring stitches or butterfly bandaging, heat exhaustion, severe poisonous plant or insect bite reactions. Personnel providing medical assistance are required to be trained in First-Aid and in the requirements of OSHA's Bloodborne Pathogen Standard (29 CFR 1910.1030). Medical attention above First-Aid level support will require assistance from the designated emergency response agencies. Attachment II provides the procedure to follow when reporting an injury/illness, and the form to be used for this purpose. If the emergency involves personnel exposures to chemicals, follow the steps provided in Figure 2-2.

### 2.10 INJURY/ILLNESS REPORTING

If any TtNUS personnel are injured or develop an illness as a result of working on site, the TtNUS "Incident Report Form" (Attachment II) must be followed. Filling out this form is necessary for documenting of the information obtained at the time of the incident. In addition any onsite injury must also be reported to NASA via the Mishap Report Form contained in Attachment II.

Any pertinent information regarding allergies to medications or other special conditions will be provided to medical services personnel. This information is listed on Medical Data Sheets filed onsite. If an exposure to hazardous materials has occurred, provide information on the chemical, physical, and toxicological properties of the subject chemical(s) to medical service personnel.

### FIGURE 2-2

### POTENTIAL EXPOSURE PROTOCOL

The purpose of this protocol is to provide guidance for the medical management of injury situations. In the event of a personnel injury or accident:

- Rescue, when necessary, employing proper equipment and methods.
- Give attention to emergency health problems -- breathing, cardiac function, bleeding, and shock.
- Transfer the victim to the medical facility designated in this HASP by suitable and appropriate conveyance (i.e. ambulance for serious events)
- Obtain as much exposure history as possible (a Potential Exposure report is attached).
- If the injured person is a Tetra Tech NUS employee, call the medical facility and advise them that the patient(s) is/are being sent and that they can anticipate a call from the WorkCare physician. WorkCare will contact the medical facility and request specific testing which may be appropriate. WorkCare physicians will monitor the care of the victim. Site officers and personnel should not attempt to get this information, as this activity leads to confusion and misunderstanding.
  - Call WorkCare at 1-800-455-6155 and enter Extension 109, being prepared to provide:
    - Any known information about the nature of the injury.
    - As much of the exposure history as was feasible to determine in the time allowed.
    - Name and phone number of the medical facility to which the victim(s) has/have been taken.
    - Name(s) of the involved Tetra Tech NUS, Inc. employee(s).
    - Name and phone number of an informed site officer who will be responsible for further investigations.
    - Fax appropriate information to WorkCare at (714) 456-2154.
- Contact Corporate Health and Safety Department (Matt Soltis) and Human Resources Department (Marilyn Duffy) at 1-800-245-2730.

As data is gathered and the scenario becomes more clearly defined, this information should be forwarded to WorkCare.

WorkCare will compile the results of data and provide a summary report of the incident. A copy of this report will be placed in each victim's medical file in addition to being distributed to appropriately designated company officials.

Each involved worker will receive a letter describing the incident but deleting any personal or individual comments. A personalized letter describing the individual findings/results will accompany this generalized summary. A copy of the personal letter will be filed in the continuing medical file maintained by WorkCare.

### FIGURE 2-2 (continued) WORKCARE

POTENTIAL	<b>EXPOSURE</b>	REPORT
-----------	-----------------	--------

Name:		D	Date of Exposure:
Social S	Security No.: Ag	je:	Sex:
Client C	Contact:		Phone No.:
Compa	ny Name:		
I.	Exposing Agent Name of Product or Chemicals (if known):		
	Characteristics (if the name is not known) Solid Liquid Gas Fu	me	Mist Vapor
11.	Dose Determinants What was individual doing? How long did individual work in area before signs/sy Was protective gear being used? If yes, what was the Was their skin contact? Was the exposing agent inhaled? Were other persons exposed? If yes, did they expe	ymptom the PPE	ns developed? E? symptoms?
III.	Signs and Symptoms (check off appropriate symp <u>Immediately With Ex</u> Burning of eyes, nose, or throat Tearing Headache Cough Shortness of Breath	itoms) I <b>posure</b>	<u>e:</u> Chest Tightness / Pressure Nausea / Vomiting Dizziness Weakness
	Delaved Svn	notoms	8:
	Weakness Nausea / Vomiting Shortness of Breath Cough		Loss of Appetite Abdominal Pain Headache Numbness / Tingling
IV.	Present Status of Symptoms (check off appropria Burning of eyes, nose, or throat Tearing Headache Cough Shortness of Breath Chest Tightness / Pressure Cyanosis Have symptoms: (please check off appropriate res	te symp ponse a	ptoms) Nausea / Vomiting Dizziness Weakness Loss of Appetite Abdominal Pain Numbness / Tingling and give duration of symptoms)
V.	Improved:       Worsened:         Treatment of Symptoms (check off appropriate resonance)         None:       Self-Medicated:	R sponse) Pl	Remained Unchanged:

### 3.0 SITE BACKGROUND

### 3.1 SITE HISTORY AND CURRENT OPERATIONS

The (WFF) is located in Accomack County, on the Eastern Shore of the Commonwealth of Virginia. The facility is comprised of three separate areas, the Main Base (MB), the Mainland (ML), and Wallops Island (WI). These three areas are in close proximity to each other and total approximately 5,000 acres of landmass and 1,000 acres of marshland. The most heavily developed area is the MB (about 1900 acres) which includes administrative and technical offices, tracking and data acquisition components, the range control center, rocket motor storage and processing facilities, research and development facilities, airfield and control tower, aircraft hangar and maintenance facilities, and Navy administration and housing areas.

### 3.2 INVESTIGATION AREAS

The Former Fire Training Area (FFTA) and the Waste Oil Dump (WOD) (Site 16) are both located within the MB area.

### 3.2.1 <u>FFTA</u>

Environmental investigations at the FFTA began in 1986 after a Virginia inspection noted the presence of possible petroleum products in the fire training area. NASA responded to this finding by conducting a soil excavation and disposal in that same year. From 1990 through 1992 additional investigations including soil gas surveys and soil and groundwater sampling were conducted at the FFTA. Based on the finding that a potential for groundwater contamination and exposure existed, NASA initiated Remedial Investigation (RI) activities in 1993. RI activities included the completion of soil gas surveys, soil boring and sampling programs, monitoring well installation and groundwater sampling, and surface soil sampling. Based on the findings of the RI an FS was completed in 1997. Additional groundwater sampling and further human health risk assessment evaluations were completed between 1997 and 2000.

The FFTA is located adjacent to an abandoned runway and was used for fire fighting training exercises from 1965 to 1987. Fuels, waste solvents, and other combustibles were released into an open tank or below grade pit and ignited as part of the exercises. The open tank and pit were removed by NASA and a soil excavation and disposal operation was completed in 1986. The area is an open grass field surround by areas of higher elevation. No samples were collected at the time of the removal. However, subsequent to the removal investigations conducted from 1988 through 2000 have included the performance of soil gas surveys, magnetometer surveys, surface and subsurface soil sampling, soil boring, monitoring well installation, and groundwater sampling. The analytical data from these

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investigations has been evaluated and presented in a series of reports including preliminary assessments, site investigations, remedial investigations, human and ecological risk assessments, and feasibility studies.

### 3.2.2 Waste Oil Dump Site (WOD) (Site 16)

The WOD Site 16 history is similar to that of the FFTA. NASA conducted a soils removal action at WOD Site 16 in 1986 shortly after an area of petroleum impacted soils were noted during a Virginia site inspection. In 1988 a preliminary assessment of the area was conducted. As a follow-up to the preliminary assessment, a site inspection, including soil, groundwater and sediment sampling and a soil gas survey was conducted in 1989. Based on the results of the soil gas study additional surveys and sampling were conducted in 1990. Based on these investigations it was concluded that no further action was necessary at Site 16. During the performance of a RI at an adjacent Former Used Defense Site (FUD) (Site 15) groundwater contamination was discovered and thought to be originating from the Site 16 area. Upon further investigation a previously unknown area of surface disposal was discovered at Site 16. In response to this finding a full RI was initiated at WOD Site 16 in 1998 and completed in 2000.

WOD Site 16 is located at the end of an active runway and is an unimproved open plot of land that extends out in a peninsula-like manner into marshland adjacent to Little Mosquito Creek. WOD Site 16 was the site of waste oil and solvent disposal for an unknown period of time from the mid-1940's to the mid-1950's. The exact quantity and nature of material disposed at WOD Site 16 is not documented. In 1986 an inspection of the area identified what appeared to be waste petroleum residues in the area. At that time NASA conducted an extensive excavation and off-site disposal operation that removed 180 cubic yards of petroleum impacted soils. No sampling was conducted at that time. Subsequent investigations in the area conducted from 1988 through 2000 have included the performance of soil gas surveys, magnetometer surveys, surface and subsurface soil sampling, soil boring, monitoring well installation, and groundwater sampling. The analytical data from these investigations has been evaluated and presented in a series of reports including preliminary assessments, site investigations, remedial investigations, human and ecological risk assessments, and feasibility studies.

### 4.0 SCOPE OF WORK

This section of the HASP addresses proposed site activities for the Pilot Study:

- Mobilization and Demobilization
- Installation of DPT soil borings in the area up gradient of monitoring wells MW-61I and 15GW-7. Three
  DPT locations will be used to inject ORC<sup>®</sup> and the six remaining locations will be installed between the
  injection points and completed as temporary 1.5-inch diameter monitoring wells to monitor the radius of
  influence of the injections. Influence will be determined though geochemical parameter measurements
  in MW-61I and 15GW-7 and the DPT monitoring locations.
- The injection and monitoring points will be surveyed by a surveyor licensed in the Commonwealth of Virginia.
- Sampling and analysis of groundwater at MW-61I and 15GW-7, the temporary monitoring points and a background monitoring wells to evaluate water quality parameters and contaminant concentrations, including one baseline sampling event prior to injection activities and three post-injection sampling events (one day, one week and one month following the injection event).
- Decontamination of DPT, ORC and sampling equipment.
- IDW Waste Management

No other activities are anticipated to be necessary. If it becomes apparent that additional or modified tasks must be performed beyond those listed above, the work is not to proceed until the FOL or SSO notifies the Project Manager and the HSM, so that any appropriate modifications to this HASP can first be developed and communicated to the intended task participants.

### 5.0 IDENTIFYING AND COMMUNICATING TASK-SPECIFIC HAZARDS AND GENERAL SAFE WORK PRACTICES

The purpose of this section is to identify the anticipated hazards and appropriate hazard prevention/hazard control measures that are to be observed for each planned task or operation. These topics have been summarized for each planned task through the use of task-specific Safe Work Permits (SWPs), which are to be reviewed in the field by the SSO with all task participants prior to initiating any task. Additionally, potential hazard and hazard control matters that are relevant but are not necessarily task-specific are addressed it the following portions of this section.

Section 6.0 presents additional information on hazard anticipation, recognition, and control relevant to the planned field activities.

### 5.1 GENERAL SAFE WORK PRACTICES

In addition to the task-specific work practices and restrictions identified in the SWPs attached to this HASP, the following general safe work practices are to be followed when conducting work on-site.

- Eating, drinking, chewing gum or tobacco, taking medication, or smoking in contaminated or potentially contaminated areas or where the possibility for the transfer of contamination exists is prohibited.
- Wash hands and face thoroughly upon leaving a contaminated or suspected contaminated area. If a
  source of potable water is not available at the work site that can be used for hands-washing, the use
  of waterless hands cleaning products will be used, followed by actual hands-washing as soon as
  practicable upon exiting the site.
- Avoid contact with potentially contaminated substances including puddles, pools, mud, or other such areas. Avoid, kneeling on the ground or leaning or sitting on equipment. Keep monitoring equipment away from potentially contaminated surfaces.
- Plan and mark entrance, exit, and emergency evacuation routes.
- Rehearse unfamiliar operations prior to implementation.
- Buddies should maintain visual contact with each other and with other on-site team members by remaining in close proximity to assist each other in case of emergency.

- Establish appropriate safety zones including support, contamination reduction, and exclusion zones.
- Minimize the number of personnel and equipment in contaminated areas (such as the exclusion zone). Non-essential vehicles and equipment should remain within the support zone.
- Establish appropriate decontamination procedures for leaving the site.
- Immediately report all injuries, illnesses, and unsafe conditions, practices, and equipment to the SSO.
- Observe co-workers for signs of toxic exposure and heat or cold stress.
- Inform co-workers of potential symptoms of illness, such as headaches, dizziness, nausea, or blurred vision.

### 5.2 DPT/DRILLING SAFE WORK PRACTICES

The following safe work practices are to be followed when working in or around drill rig/DPT operations.

- Identify underground utilities and buried structures before drilling. Use the Utility Locating and Excavation Clearance SOP provided in Section 7 of the Health and Safety Guidance Manual.
- Drill/DPT rigs will be inspected by the SSO or designee, prior to the acceptance of the equipment at the site and prior to the use of the equipment.
- Any repairs or deficiencies identified during the inspection will be corrected prior to use.
- The inspection will be documented using the Equipment Inspection Checklist provided in Attachment III.
- Equipment Inspections will be conducted once each shift (either 5 or 10 day) or following repairs.
- Equipment and staging lay down areas will be established keep the work area clear of clutter and slips, trips, and fall hazards.
- The drill operator shall verbally alert employees and visually ensure employees are clear from dangerous parts of equipment before starting or engaging equipment.

- One person shall be responsible for emergency shut-off switch operation during drilling operation, such that the machinery can be shutdown quickly if another person is in danger. The identity of this person will be made known to personnel in the drilling area.
- Secure frayed or loose clothing, hair, and jewelry when working with operating equipment.
- Minimize contact to the extent possible with contaminated tooling and environmental media.
- Support functions (sampling and screening stations) will be maintained a minimum distance from the drill/DPT rig of the height of the mast plus five feet to remove these activities from within physical hazard boundaries.
- Only qualified operators and knowledgeable ground crew personnel will participate in the operation of the drill/DPT rig.
- Only personnel absolutely essential to the work activity will be allowed in the exclusion zone. Site visitors will be escorted.
- Equipment that comes into direct contact with potentially contaminated media will undergo a complete decontamination prior to moving to the next location, exiting the site, or prior to down time for maintenance.
- Whenever possible, motorized equipment will be fueled prior to the commencement of the day's activities.
- During fueling operations on site, equipment will be shutdown and bonded to the fuel provider to prevent the potential accumulation of static charges.
- When not in use drill/DPT rigs will be shutdown, emergency brakes set, and wheels chocked where hilly terrain is present.

Areas subjected to subsurface investigative methods will be restored to equal or better condition than original to the extent practical to remove contamination brought to the surface and to remove physical hazards. In situations where these hazards cannot be removed these areas will be barricaded to minimize the impact on field crews working in the area.

### 6.0 HAZARD ASSESSMENT AND CONTROLS

This section provides reference information regarding the chemical and physical hazards which may be associated with activities that are to be conducted as part of the scope of work.

### 6.1 CHEMICAL HAZARDS

Previous analytical data determined the presence of various volatile organic compounds (VOCs). Based on an evaluation of these data, and historical information about the site, the primary contaminants of concern (COC) at this site are Benzene and Vinyl Chloride. Other VOCs have been detected, but an evaluation of the data indicate that will not likely be encountered at concentrations that would represent a reasonable exposure concern.

### Properties and Exposure Signs/Symptoms

### TABLE 6-1

### COMPARISON OF WORST-CASE PCE AIR CONCENTRATIONS WITH CURRENT OCCUPATIONAL EXPOSURE LIMITS

Contaminant of Concern	Highest Concentration Previously Detected in Water	Worst-Case Air Concentration That Could Be Encountered	Current OSHA PEL And ACGIH TLV
Benzene	28 ug/l	1.94	OSHA: 1 PPM TWA 1 PPM STEL ACGIH: 0.5 PPM TWA <sub>8</sub> 2.5 PPM STEL
Vinyl Chloride	6 ug/l	2.67	OSHA: 1 PPM TWA <sub>8</sub> 5 PPM STEL ACGIH: 1 PPM TWA <sub>8</sub> NA STEL

Table Notes:

TWA<sub>8</sub>: Average air concentration over an 8-hour work period that is not to be exceeded

OSHA STEL: Concentration in air that is not to be exceed for more than 5 minutes in any 3 hour period ACGIH STEL: Concentration in air that is not be exceeded for more than 15 minutes more than 4 times per day

### Benzene

Benzene is a highly flammable liquid the odor of benzene can be detected in water at 2 ppm. Brief exposure (5 to 10 minutes) to very high benzene air concentrations (10,000 to 20,000 ppm) can result in
death. Lower levels (700 to 3,000 ppm) can cause drowsiness, dizziness, tachycardia, headaches, tremors, confusion and unconsciousness. Exposure to high air concentrations (3,000 ppm or higher) may cause acute poisoning, characterized by the narcotic action of benzene on the CNS. The planned work area is outdoors, with ample natural ventilation that will reduce any airborne through dilution and dispersion,

#### Vinyl Chloride

Vinyl chloride is a flammable gas that depresses the <u>central nervous system</u>, and inhaling its vapors produces symptoms similar to alcohol <u>intoxication</u>. The nervous system is the primary target of vinyl chloride exposure. Signs and symptoms following ingestion include weakness; ataxia; inebriation; headache; fatigue; numbness; tingling and pallor or cyanosis of the extremities; nausea; abdominal pain; GI bleeding; visual disturbances; cardiac dysrhythmias; narcosis and death. Vinyl chloride is a severe irritant of the eyes, skin, and mucous membranes.

As a result of the data previously identified at this site, it is very unlikely that workers participating in this activity will encounter any airborne concentrations of benzene or vinyl chloride that would represent an occupational exposure concern. To monitor this route, real-time direct reading monitoring instruments will be used (as described in section 7.0).

**Ingestion and Skin Contact**: Potential exposure concerns to benzene and Vinyl chloride may also occur through ingesting or coming into direct skin contact with contaminated soils. The likelihood of worker exposure concerns through these two routes are also considered very unlikely, provided that workers follow good personal hygiene and standard good sample collection/sample handling practices, and wear appropriate PPE as specified in this HASP. Examples onsite practices that are to be observed that will protect workers from exposure via ingestion or skin contact include the following:

- No hand-to-mouth activities on site (eating, drinking, smoking, etc.)
- Washing hands upon leaving the work area and prior to performing any hand to mouth activities
- Wearing surgeon's-style gloves whenever handling potentially-contaminated media, including soils, hand tools, and sample containers.

#### <u>ORC®</u>

ORC<sup>®</sup> will be injected into specified soil borings using a pump and tremie method. This method introduces the ORC<sup>®</sup> from the bottom of the boring in a retracting up-ward fashion. The material to be injected is a registered material and the MSDS is provided in Appendix VII.

Health effects associated with overexposure to magnesium products are as indicated below.

#### 6.1.1.1 Chemical Hazards of ORC<sup>®</sup> include:

- Magnesium oxide fume Metal fume fever –Flu-like symptoms
- Magnesium particles or alloys which enter through perforations in the skin have been recorded to
  produce a severe local reaction (evolution of gas and severe irritation locally) resulting in necrosis or
  killing of the cells within the impacted area (See chemical gas gangrene for more information). These
  injuries are very slow to heal.
- It is estimated based on the physical properties and ingredients (magnesium oxide, magnesium peroxide, and magnesium hydroxide) evaluated that this material will be irritating to the eyes and skin and upper respiratory tract as well as other exposed mucous membranes.
- The material as indicated in the MSDS has a pH of 10 in solution. If swallowed, this material is slow to be absorbed, however, will result in vomiting and diarrhea.

The health effects reported above are considered acute responses to overexposure. Based on limited use and application chronic responses are not addressed. It is imperative to control the dust when dispensing this product.

#### 6.1.1.2 Physical Hazards of ORC<sup>®</sup> include:

- Incompatibilities with acids, certain bases and interhalogen compounds(i.e., maleic anhydride, sodium hydroxide, bromine pentafluoride, chlorine trifluoride). The result will be violent reaction and potentially ignition. This material should be maintained and used away from potential ignition sources because of the potential violent reaction (i.e., oxidizer + any fuel source/combustible material = fire and/or explosion) given suitable conditions (i.e., closed container; insufficient media to absorb the heat of reaction). This material will intensify a fire.
- This material (25-35% Magnesium peroxide) will react with water to release oxygen. The magnesium oxide component will react with water to create magnesium hydroxide, both of which will slowly release oxygen to the water. To control the release of oxygen and the reaction, it is recommended that this material, when mixing, is added slowly to the prescribed amount of water. Upon completing the mixture and the injection, flush the container and pump with copious amounts of water.

Specified control measures have been provided in the Safe Work Permit for this task (See Attachment IV).

Table 6-1 provides information on the most common and significant site contaminants that may be present at Wallops Island. Included is information on the toxicological, chemical, and physical properties of these substances.

# 6.2 PHYSICAL HAZARDS

The following is a list of physical hazards that may be encountered at the site or may be present during the performance of site activities.

- Injury due to overexertion from operating the hand auger
- Slip, trips, and falls
- Contact with underground (electric lines, gas lines, water lines, etc.)
- Strain/muscle pulls from heavy lifting
- Heat Stress
- Pinch/compression points
- Natural hazards (snakes, ticks, poisonous plants, etc.)
- Vehicular and equipment traffic
- Inclement weather
- Noise

These hazards are discussed further below, and are presented relative to each task in the task-specific Safe Work Permits.

#### 6.2.1 <u>Slips, Trips, and Falls</u>

During various site activities there is a potential for slip, trip, and fall hazards associated with wet, steep, or unstable work surfaces. To minimize hazards of this nature, personnel required to work in and along areas prone to these types of hazards will be required to exercise caution, and use appropriate precautions (restrict access, guardrails, life lines and/or safety harnesses) and other means suitable for the task at hand. Site activities will be performed using the buddy system.

#### 6.2.2 Contact with Underground Utilities

Underground utilities such as pressurized lines, water lines, telephone lines, buried utility lines, and high voltage power lines are known to be present throughout the facility. Clearance of underground utilities for

each boring injection location will be coordinated with the NASA WFF Facility Management Branch and a dig permit will be issued by the facility before any intrusive activities. The dig permit request will be completed by the PM or FOL a copy of the dig permit must be present at the site before any intrusive activities begin. The TtNUS Utility Locating and Excavation Clearance SOP found in Section 7.0 of the Health and Safety Guidance Manual and must also be completed to verify site clearance.

#### 6.2.3 Strain/Muscle Pulls from Heavy Lifting

During execution of planned activities there is some potential for strains, sprains, and/or muscle pulls due to the physical demands and nature of this site work. To avoid injury during lifting tasks personnel are to lift with the force of the load carried by their legs and not their backs. When lifting or handling heavy material or equipment use an appropriate number of personnel. Keep the work area free from ground clutter to avoid unnecessary twisting or sudden movements while handling loads.

#### 6.2.4 <u>Heat Stress</u>

Because of the geographical location of the planned work, the likely seasonal weather conditions that will exist during the planned schedule, and the physical exertion that can be anticipated with some of the planned tasks, it will be necessary for the field team to be aware of the signs and symptoms and the measures appropriate to prevent heat stress. This is addressed in detail in section 4.0 of the TtNUS Health and Safety Guidance Manual, which the SSO is responsible for reviewing and implementing as appropriate on this project.

In general, early signs of heat-related disorders include heat rash, cramps, heavy sweating which may be followed by the complete shutdown of a person's ability to sweat, pale/clammy skin, headaches, dizziness, incoordination, and other maladies. To prevent heat stress disorders, the following preventive measures are to be implemented by the SSO:

- When possible, schedule the most physically-demanding tasks so that they are performed during cooler periods of the day such as early morning or late afternoon
- Educate the field staff in heat stress signs and symptoms so that they can monitor themselves and their co-workers
- Schedule frequent breaks during the hottest parts of the day (such as a few minutes each hour).
   Breaks should be in shaded areas, and in a location where workers can remove PPE, wash their hands, and drink fluids

• Drinking fluids should be cool and non-caffeinated. Sports-drinks with electrolytes are acceptable provided that they do not contain alcohol. Water is also acceptable.

For more information on heat stress recognition and prevention, consult section 4.0 of the TtNUS Health and Safety Guidance Manual.

#### 6.2.5 <u>Pinch/Compression Points</u>

Handling of tools, machinery, and other equipment on site may expose personnel to pinch/compression point hazards during normal work activities. Where applicable, equipment will have intact and functional guarding to prevent personnel contact with hazards. Personnel will exercise caution when working around pinch/compression points, using additional tools or devices (e.g., pinch bars) to assist in completing activities.

#### 6.2.6 <u>Natural Hazards</u>

Natural hazards such as poisonous plants, bites from poisonous or disease carrying animals or insects (e.g., snakes, ticks, mosquitoes) are often prevalent at sites that are being investigated as part of hazardous waste site operations. Given the geographic location and the environment (marshes and lakes), alligators are also assumed to be potentially present at the NASA Wallops Island facility. To minimize the potential for site personnel to encounter these hazards, nesting areas in and about work areas will be avoided to the greatest extent possible. Work areas will be inspected to look for any evidence that dangerous animals may be present. Based on the planned location for the work covered by this HASP, encountering alligators is not a likely probability.

During warm months (spring through early fall), tick-borne Lyme Disease may pose a potential health hazard. The longer a disease carrying tick remains attached to the body, the greater the potential for contracting the disease. Wearing long sleeved shirts and long pants (tucked into boots and taped) will prevent initial tick attachment, while performing frequent body checks will help prevent long term attachment. Site first aid kits should be equipped with medical forceps and rubbing alcohol to assist in tick removal. For information regarding tick removal procedures and symptoms of exposure, consult Section 4.0 of the Health and Safety Guidance Manual.

Contact with poisonous plants and bites or stings from poisonous insects are other potential natural hazards. Long sleeved shirts and long pants (tucked into boots), and avoiding potential nesting areas, will minimize the potential for exposure. Additionally, insect repellents may be used by site personnel. Personnel who are allergic to stinging insects (such as bees, wasps and hornets) must be particularly careful since severe illness and death may result from allergic reactions. As with any medical condition or allergy, information

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regarding the condition must be listed on the Medical Data Sheet (see Attachment I of this HASP), and the FOL or SSO notified.

# 6.2.7 <u>Inclement Weather</u>

Project tasks under this Scope of Work will be performed outdoors. As a result, inclement weather may be encountered. In the event that adverse weather (electrical storms, tornadoes, etc.) conditions arise, the FOL and/or the SSO will be responsible for temporarily suspending or terminating activities until hazardous conditions no longer exist.

# 7.0 AIR MONITORING

None of the contaminants are expected to be present in significant concentrations to present an inhalation hazard during planned site activities. As a precautionary measure to assure that such exposures are avoided and documented, a direct reading instrument will be used to monitor worker exposures to chemical hazards present at the site. For this project, based on the properties of the primary contaminants of concern (i.e., Benzene and vinyl chloride), a Photoionization Detector (PID) may be used to monitor the air.

#### 7.1 INSTRUMENTS AND USE

Instruments will be used primarily to monitor source points and worker breathing zone areas, while observing instrument action levels. The SSO shall obtain and document the daily background (BG) reading at an upwind, unaffected area and observe for readings above that BG level. The SSO shall monitor source areas (e.g., auger bore hole locations and above collected soil samples) for the presence of any reading above the daily-established BG level. If elevated readings are observed, the SSO shall monitor the workers breathing zone (BZ) areas with the PID

#### 7.1.1 <u>Action Level</u>

Based on the contaminant of concern, Benzene and vinyl chloride, workers must limit exposure to a maximum of 10 ppm in the BZ for no more than 15 minutes total in an 8 hour work day (e.g., 1 exposure for 15 minutes, 2 exposures for 7.5 minutes or 3 exposures for 5 minutes). If sustained readings above 10 ppm are measured, the following process will be followed:

- The SSO shall stop work and retreat upwind to a safe, unaffected area, where they will remain until further directed by the SSO.
- The SSO shall allow at least 5 minutes to pass so that the work area can ventilate, and will then reapproach the work area while continuously monitoring the BZ areas.
- Only when BG levels are regained in BZ areas will work be permitted to resume.
- If BG levels are not regained, the SSO will contact the HSM for additional direction.

**Instrument Action Levels**: The use of a PID will be acceptable, provided that the following action levels are observed:

• PID Action Level: 10 ppm above BG in BZ areas.

#### 7.2 INSTRUMENT MAINTENANCE AND CALIBRATION

Hazard monitoring instruments will be maintained and pre-field calibrated by the equipment provider (i.e., rental agency used). Operational checks and field calibration will be performed on site instruments each day prior to their use. Field calibration will be performed on instruments according to manufacturer's recommendations. These operational checks and calibration efforts will be performed in a manner that complies with the employees health and safety training, the manufacturer's recommendations, and with the applicable manufacturer standard operating procedure (which the SSO must assure are included with the instrument upon its receipt onsite). Field calibration efforts must be documented. Figure 7-1 is provided for documenting these calibration efforts. This information may instead be recorded in a field operations logbook, provided that the information specified in Figure 7-1 is recorded. This required information includes the following:

- Date calibration was performed
- Individual calibrating the instrument
- Instrument name, model, and serial number
- Any relevant instrument settings and resultant readings (before and after) calibration
- Identification of the calibration standard (lot no., source concentration, supplier)
- Any relevant comments or remarks

#### 7.3 DOCUMENTING INSTRUMENT READINGS

The SSO is responsible for ensuring that air monitoring instruments are used in accordance with the specifications of this HASP and with manufacturer's specifications/recommendations. In addition, the SSO is also responsible for ensuring that all instrument use is documented. This requirement can be satisfied either by recording instrument readings on pre-printed sampling log sheets or in a field log book.

This includes the requirement for documenting instrument readings that indicate no elevated readings above noted daily background levels (i.e., no-exposure readings). At a minimum, the SSO must document the following information for each use of an air monitoring device:

- Date, time, and duration of the reading
- Site location where the reading was obtained

- Instrument used (e.g., PID, etc.)
- Personnel present at the area where the reading was noted
- Other conditions that are considered relevant to the SSO (such as weather conditions, possible instrument interferences, etc.)

# FIGURE 7-1

# DOCUMENTATION OF FIELD CALIBRATION

SITE NAME:

PROJECT NO.:\_\_\_\_\_

Data of	Instrument	Instrument	Person	Instrument Settings		Instrument Readings		Calibration	Dementer/
Calibration	Name and Model	I.D. Number	Performing Calibration	Pre- Calibration	Post- Calibration	Pre- Calibration	Post- Calibration	Standard (Lot Number)	Comments

# 8.0 TRAINING/MEDICAL SURVEILLANCE REQUIREMENTS

#### 8.1 INTRODUCTORY/REFRESHER/SUPERVISORY TRAINING

This section is included to specify health and safety training and medical surveillance requirements for TtNUS personnel participating in on site activities. TtNUS personnel must complete 40 hours of introductory hazardous waste site training prior to performing work at the NASA Wallops Island. TtNUS personnel who have had introductory training more than 12 months prior to site work must have completed 8 hours of refresher training within the past 12 months before being cleared for site work. In addition, 8-hour supervisory training in accordance with 29 CFR 1910.120(e)(4) will be required for site supervisory personnel.

Documentation of TtNUS introductory, supervisory, and refresher training as well as site-specific training will be maintained at the site. Copies of certificates or other official documentation will be used to fulfill this requirement.

#### 8.2 SITE-SPECIFIC TRAINING

TtNUS SSO will provide site-specific training to TtNUS employees who will perform work on this project. Figure 8-1 will be used to document the provision and content of the project-specific and associated training. Site personnel will be required to sign this form prior to commencement of site activities. This training documentation will be employed to identify personnel who through record review and attendance of the site-specific training are cleared for participation in site activities. This document shall be maintained at the site to identify and maintain an active list of trained and cleared site personnel.

The TtNUS SSO will also conduct a pre-activities training session prior to initiating site work. This will consist of a brief meeting at the beginning of each day to discuss operations planned for that day, and a review of the appropriate Safe Work Permits with the planned task participants. A short meeting may also be held at the end of the day to discuss the operations completed and any problems encountered.

#### 8.3 MEDICAL SURVEILLANCE

TtNUS personnel participating in project field activities will have had a physical examination meeting the requirements of TtNUS's medical surveillance program. Documentation for medical clearances will be maintained in the TtNUS Pittsburgh office and made available, as necessary, and will be documented using Figure 8-1 for every employee participating in onsite work activities at this site.

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Each field team member, including visitors, entering the exclusion zone(s) shall be required to complete and submit a copy of the Medical Data Sheet (see Attachment I of this HASP). This shall be provided to the SSO, prior to participating in site activities. The purpose of this document is to provide site personnel and emergency responders with additional information that may be necessary in order to administer medical attention.

#### 8.4 SITE VISITORS

All site visitors to the site must be 100% escorted at all times and restricted from approaching any work areas where they could be exposed to hazards from TtNUS operations. If a visitor has authorization from the client and from the TtNUS Project Manager to approach our work areas, the FOL must assure that the visitor first provides documentation indicating that he/she/they have successfully completed the necessary OSHA introductory training, receive site-specific training from the SSO, and that they have been physically cleared to work on hazardous waste sites.

#### FIGURE 8-1

#### SITE-SPECIFIC TRAINING DOCUMENTATION

My signature below indicates that I am aware of the potential hazardous nature of performing field investigation activities at NASA Wallops Island, Virginia and that I have received site-specific training which included the elements presented below:

- Names of designated personnel and alternates responsible for site safety and health
- Safety, health, and other hazards present on site
- Use of personal protective equipment
- Safe use of engineering controls and equipment
- Medical surveillance requirements
- Signs and symptoms of overexposure
- Contents of the Health and Safety Plan
- Emergency response procedures (evacuation and assembly points)
- Incipient response procedures
- Review of the contents of relevant Material Safety Data Sheets
- Review of the use of Safe Work Permits

I have been given the opportunity to ask questions and all of my questions have been answered to my satisfaction. The dates of my training and my medical surveillance requirements indicated below are accurate to the best of my knowledge.

Name (Printed and Signature)	Site- Specific Training Date	40-Hour Training (Date)	8-Hour Refresher Training (Date)	8-Hour Supervisory Training (Date)	Medical Exam

# 9.0 SITE CONTROL

This section outlines the means by which TtNUS will delineate work zones and use these work zones in conjunction with decontamination procedures to prevent the spread of contaminants into previously unaffected areas of the site. It is anticipated that a three-zone approach will be used during work at this site. This approach will be comprised of an exclusion zone, a contamination reduction zone, and a support zone. It is also anticipated that this approach will control access to site work areas, restricting access by the general public, minimizing the potential for the spread of contaminants, and protecting individuals who are not cleared to enter work areas.

#### 9.1 EXCLUSION ZONE

The exclusion zone will be considered the areas of the site of known or suspected contamination. It is anticipated that the areas around the exhaust vents will have the potential for contaminants brought to the surface. These areas will be marked and personnel will maintain safe distances. Once intrusive activities have been completed and surface contamination has been removed, the potential for exposure is again diminished and the area can then be reclassified as part of the contamination reduction zone. Therefore, the exclusion zones for this project will be limited to those areas of the site where active work (hand augering and sample collection) is being performed plus a designated area of at least 15 feet surrounding the work area. Exclusion zones will be delineated as deemed appropriate by the FOL, through means such as erecting visibility fencing, barrier tape, cones, and/or postings to inform and direct personnel.

#### 9.1.1 Exclusion Zone Clearance

A pre-startup site visit will be conducted by members of the identified field team in an effort to identify proposed subsurface investigation locations, conduct utility clearances, and provide upfront notices concerning scheduled activities within the facility.

Subsurface activities will proceed only when utility clearance has been obtained. In the event that a utility is struck during a subsurface investigative activity, the emergency numbers provided in Section 2.0, Table 2-1, will be notified.

#### 9.2 CONTAMINATION REDUCTION ZONE

The contamination reduction zone (CRZ) will be a buffer area between the exclusion zone and any area of the site where contamination is not suspected. This area may also serve as a focal point in supporting exclusion zone activities. This area will be delineated using barrier tape, cones, and postings to inform

9-1

and direct facility personnel. Decontamination will be conducted at a central location. Equipment potentially contaminated will be bagged and taken to that location for decontamination.

#### 9.3 SUPPORT ZONE

The support zone for this project will include a staging area where site vehicles will be parked, equipment will be unloaded, and where food and drink containers will be maintained. The support zones will be established at areas of the site where away from potential exposure to site contaminants during normal working conditions or foreseeable emergencies.

#### 9.4 SAFE WORK PERMITS

Exclusion Zone work conducted in support of this project will be performed using Safe Work Permits (SWPs) to guide and direct field crews on a task by task basis. An example of the SWP to be used is provided in Figure 9-1. Partially completed SWPs for the work to be performed are attached to this HASP. These permits were completed to the extent possible as part of the development of this HASP. It is the SSO's responsibility to finalize and complete all blank portions of the SWPs based on current, existing conditions the day the task is to be performed, and then review that completed permit with all task participants as part of a pre-task tail gate briefing session. This will ensure that site-specific considerations and changing conditions are appropriately incorporated into the SWP, provide the SSO with a structured format for conducting the tail gate sessions, as well will also give personnel an opportunity to ask questions and make suggestions. All SWPs require the signature of the FOL or SSO.

#### 9.5 SITE VISITORS

Site visitors for the purpose of this document are identified as representing the following groups of individuals:

- Personnel invited to observe or participate in operations by TtNUS
- Regulatory personnel (i.e., NASA, EPA, VADEQ and OSHA)
- Authorized NASA Personnel
- Other authorized visitors

Non-NASA personnel working on this project are required to gain initial access to the base by coordinating with the TtNUS FOL or designee and following established base access procedures.

Once access to the base is obtained, personnel who require site access into areas of ongoing operations will be required to obtain permission from the PM. Upon gaining access to the site, site visitors wishing

to observe operations in progress will be escorted by a TtNUS representative and shall be required to meet the minimum requirements discussed below:

- Site visitors will be directed to the FOL/SSO, who will sign them into the field logbook. Information to be recorded in the logbook will include the individual's name (proper identification required), the entity which they represent, and the purpose of the visit.
- Site visitors wishing to enter the exclusion zone will be required to produce the necessary information supporting clearance to the site. This shall include information attesting to applicable training and medical surveillance as stipulated in Section 8.0 of this document. In addition, to enter the site operational zones during planned activities, visitors will be required to first go through site-specific training covering the topics stipulated in Section 8.2 of this HASP.

Once the site visitors have completed the above items, they will be permitted to enter the operational zone. Visitors are required to observe the protective equipment and site restrictions in effect at the site at the time of their visit. Visitors entering the exclusion zones during ongoing operations will be accompanied by a TtNUS representative. Visitors not meeting the requirements, as stipulated in this plan, for site clearance will not be permitted to enter the site operational zones during planned activities. Any incidence of unauthorized site visitation will cause the termination of on site activities until the unauthorized visitor is removed from the premises. Removal of unauthorized visitors will be accomplished with support from local law enforcement personnel.

#### 9.6 SITE SECURITY

Site security will be accomplished using TtNUS field personnel. TtNUS will retain complete control over active operational areas. As this activity takes place at a Navy facility open to public access, the first line of security will take place using exclusive zone barriers, site work permits, and any existing barriers at the sites to restrict the general public. The second line of security will take place at the work site referring interested parties to the Base Contact. The Base Contact will serve as a focal point for base personnel, interested parties, and serve as the final line of security and the primary enforcement contact.

#### 9.7 BUDDY SYSTEM

Personnel engaged in on site activities will practice the "buddy system" to ensure the safety of personnel involved in this operation.

# 9.8 MATERIAL SAFETY DATA SHEET (MSDS) REQUIREMENTS

TtNUS and subcontractor personnel will provide MSDSs for chemicals brought on site. The contents of these documents will be reviewed by the SSO with the user(s) of the chemical substances prior to any actual use or application of the substances on site. A chemical inventory of the chemicals used on site will be developed using the Health and Safety Guidance Manual. The MSDSs will then be maintained in a central location (i.e., temporary office) and will be available for anyone to review upon request.

# 9.9 COMMUNICATION

As personnel will be working in proximity to one another during field activities, a supported means of communication between field crew members will not be necessary.

External communication will be accomplished by using the telephones at predetermined and approved locations. External communication will primarily be used for the purpose of resource and emergency resource communications. Prior to the commencement of activities at the NASA Wallops Island, the FOL will determine and arrange for telephone communications.

#### FIGURE 9-1 SAFE WORK PERMIT

Permit I	No Date:	Time: From	to
I.	Work limited to the following (description, are	ea, equipment used):	
١١.	Primary Hazards: Potential hazards associated	with this task:	
III. IV.	Field Crew:	<ul><li>☐ No</li><li>☐ No</li><li>☐ No</li><li>☐ No</li><li>☐ Initials of Inspector</li></ul>	rTtNUS rTtNUS
٧.	Protective equipment required	Respiratory equipment require	ed
	Level D Level B Level C Level A Modifications/Exceptions:	Yes Specify on the re	verse
VI.	Chemicals of Concern Hazard Monitoring	Action Level(s)	Response Measures
	Primary Route(s) of Exposure/Hazard:		
VII.	(Note to FOL and/or SSO: Each item in Section Additional Safety Equipment/Procedures Hard-hat	ns VII, VIII, and IX must be chec Hearing Protection (Plugs/Mi Safety belt/harness Radio/Cellular Phone Barricades Gloves (Type – )) Work/rest regimen Chemical Resistant Boot Co Tape up/use insect repellent Fire Extinguisher Other	ked Yes, No, or NA)         Jffs)       Yes       No          Yes       No         vers       Yes       No          Yes       No
VIII.	Site Preparation Utility Locating and Excavation Clearance complet Vehicle and Foot Traffic Routes Established/Traff Physical Hazards Identified and Isolated (Splash Emergency Equipment Staged (Spill control fire)	eted fic Control Barricades/Signs in Pla and containment barriers) extinguishers, first aid kits, etc)	Yes         No         NA
IX.	Additional Permits required (Hot work, confined	d space entry, excavation etc.)	Yes No
Χ.	Special instructions, precautions:	66, Fillsburgh Onlog (+12)921-708	
<b></b>		<b>D</b>	
Permit I	ssued by:	Permit Accepted by:	

# 10.0 SPILL CONTAINMENT PROGRAM

#### 10.1 SCOPE AND APPLICATION

It is not anticipated that bulk hazardous materials (over 55-gallons) will be generated or handled at any given time as part of this scope of work. It is also not anticipated that such spillage would constitute a danger to human health or the environment. However, as the job progresses, some potential may exist for accumulating Investigative Derived Wastes (IDW) such as decontamination fluids, soil cuttings, disposable sampling equipment and PPE.

#### 10.2 POTENTIAL SPILL AREAS

Potential spill areas will be periodically monitored in an ongoing attempt to prevent and control further potential contamination of the environment. Currently, limited areas are vulnerable to this hazard including:

- Resource deployment
- Waste transfer
- Central staging

It is anticipated that the IDW generated as a result of this scope of work will be containerized, labeled, and staged to await further analyses. The results of these analyses will determine the method of disposal.

#### 10.3 LEAK AND SPILL DETECTION

To establish an early detection of potential spills or leaks, a periodic walk-around by the personnel staging or disposing of drums area will be conducted during working hours to visually determine that storage vessels are not leaking. If a leak is detected, the contents will be transferred, using a hand pump, into a new vessel. The leak will be collected and contained using absorbents such as Oil-Dry, vermiculite, or sand, which are stored at the vulnerable areas in a conspicuously marked drum. This used material, too, will be containerized for disposal pending analysis. Inspections will be documented in the project logbook.

#### 10.4 PERSONNEL TRAINING AND SPILL PREVENTION

Personnel will be instructed in the procedures for incipient spill prevention, containment, and collection of hazardous materials in the site-specific training. The FOL and the SSO will serve as the Spill Response Coordinators for this operation, should the need arise.

# 10.5 SPILL PREVENTION AND CONTAINMENT EQUIPMENT

The following represents the types of equipment that should be maintained at the staging areas for the purpose of supporting this Spill Prevention/Containment Program.

- Sand, clean fill, vermiculite, or other non combustible absorbent (Oil-dry)
- Drums (55-gallon U.S. DOT 1A 1 or 1 A 2)
- Shovels, rakes, and brooms
- Container labels

# 10.6 SPILL CONTROL PLAN

This section describes the procedures the TtNUS field crew members will employ upon the detection of a spill or leak.

- 1. Notify the SSO or FOL immediately upon detection of a leak or spill. Activate emergency alerting procedures for that area to remove non-essential personnel.
- 2. Employ the personal protective equipment stored at the staging area. Take immediate actions to stop the leak or spill by plugging or patching the container or raising the leak to the highest point in the vessel. Spread the absorbent material in the area of the spill, covering it completely.
- 3. Transfer the material to a new vessel; collect and containerize the absorbent material. Label the new container appropriately. Await analyses for treatment and disposal options.
- 4. Re-containerize spills, including 2-inch of top cover impacted by the spill. Await test results for treatment or disposal options.

It is not anticipated that a spill will occur that the field crew cannot handle. Should this occur, notification of the appropriate Emergency Response agencies will be carried out by the FOL or SSO in accordance with the procedures discussed in Section 2.0 of this HASP.

# 11.0 CONFINED-SPACE ENTRY

It is not anticipated, under the proposed scope of work, that confined space and permit-required confined space activities will be conducted. **Therefore, personnel under the provisions of this HASP are not allowed, under any circumstances, to enter confined spaces**. A confined space is defined as an area which has one or more of the following characteristics:

- Is large enough and so configured that an employee can bodily enter and perform assigned work.
- Has limited or restricted means for entry or exit (for example, tanks, manholes, sewers, vessels, silos, storage bins, hoppers, vaults, and pits are spaces that may have limited means of entry).
- Is not designed for continuous employee occupancy.

Additionally, a Permit-Required Confined Space must also have one or more of the following characteristics:

- Contains or has a potential to contain a hazardous atmosphere.
- Has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly caving walls or by a floor that slopes downward and tapers to a smaller cross-section.
- Contains any other recognized, serious, safety or health hazard.

For further information on confined space, consult the Health and Safety Guidance Manual or call the PHSO. If confined space operations are to be performed as part of the scope of work, detailed procedures and training requirements will have to be addressed.

# **12.0 MATERIALS AND DOCUMENTATION**

The TtNUS Field Operations Leader (FOL) shall ensure the following materials/documents are taken to the project site and used when required.

- A complete copy of this HASP
- Health and Safety Guidance Manual
- Incident Reports
- Medical Data Sheets
- Material Safety Data Sheets for chemicals brought on site, including decontamination solutions, fuels, sample preservatives, calibration gases, etc.
- A full-size OSHA Job Safety and Health Poster (posted in the site trailer)
- Training/Medical Surveillance Documentation Form (Blank)
- First-Aid Supply Usage Form
- Emergency Reference Form (Section 2.0, extra copy for posting)
- Directions to the Hospital

# 12.1 MATERIALS TO BE POSTED AT THE SITE

The following documentation is to be posted or maintained at the site for quick reference purposes. In situations where posting these documents is not feasible (such as no office trailer), these documents should be separated and immediately accessible.

- Chemical Inventory Listing (posted) This list represents all chemicals brought on-site, including decontamination solutions, sample preservations, fuel, etc. This list should be posted in a central area.
- MSDSs (maintained) The MSDSs should also be in a central area accessible to all site personnel. These documents should match all the listings on the chemical inventory list for all substances employed on-site. It is acceptable to have these documents within a central folder and the chemical inventory as the table of contents.
- The OSHA Job Safety & Health Protection Poster (posted) This poster should be conspicuously posted in places where notices to employees are normally posted, as directed by 29 CFR 1903.2 (a)(1). Each FOL shall ensure that this poster is not defaced, altered, or covered by other material. The law also states that reproductions or facsimiles of the poster shall be at least 8 1/2 by 14 inches with 10 point type.

- Site Clearance (maintained) This list is found within the training section of the HASP (Figure 8-1). This list identifies all site personnel, dates of training (including site-specific training), and medical surveillance. The list indicates not only clearance, but also status. If personnel do not meet these requirements, they do not enter the site while site personnel are engaged in activities.
- Emergency Phone Numbers and Directions to the Hospital(s) (posted) This list of numbers and directions will be maintained at all phone communications points and in each site vehicle.
- Medical Data Sheets/Cards (maintained) Medical Data Sheets will be filled out by on-site personnel and filed in a central location. The Medical Data Sheet will accompany any injury or illness requiring medical attention to the medical facility. A copy of this sheet or a wallet card will be given to all personnel to be carried on their person.
- **Personnel Monitoring (maintained)** All results generated through personnel sampling (levels of airborne toxins, noise levels, etc.) will be posted to inform individuals of the results of that effort.
- Placards and Labels (maintained) Where chemical inventories have been separated because of quantities and incompatibilities, these areas will be conspicuously marked using DOT placards and acceptable [Hazard Communication 29 CFR 1910.1200(f)] labels.

The purpose of maintaining or posting this information, as stated above, is to allow site personnel quick access. Variations concerning location and methods of presentation are acceptable providing the objective is accomplished.

# 13.0 ACRONYMS / ABBREVIATIONS

BG	Background
BZ	Breathing Zone
CFR	Code of Federal Regulations
CLEAN	Comprehensive Long-Term Environmental Action Navy
COC	Chain of Custody
CSP	Certified Safety Professional
CRZ	Contamination Reduction Zone
DPT	Direct Push Technology
FFTA	Former Fire Training Area
FOL	Field Operations Leader
HASP	Health and Safety Plan
HAZWOPER	Hazardous Waste Operations and Emergency Response
HSM	Health and Safety Manager
IDW	Investigation Derived Waste
MB	Mainbase
ML	Mainland
MSDS	Material Safety Data Sheet
N/A	Not Available
ORC	Oxygen Releasing Compounds
OSHA	Occupational Safety and Health Administration (U.S. Department of Labor)
PID	Photoionization Detector
PPM	Parts Per Million
PHSO	Project Health and Safety Officer
PPE	Personal Protective Equipment
SSO	Site Safety Officer
SWP	Safe Work Permit
TBD	To be determined
PM	Project Manager
TtNUS	Tetra Tech NUS, Inc.
VOCs	Volatile Organic Compounds
WWF	Wallops Flight Facility
WI	Wallops Island
WOD	Waste Oil Dump

# ATTACHMENT I MEDICAL DATA SHEET

# MEDICAL DATA SHEET

This Medical Data Sheet must be completed by on-site personnel and kept in the command post during the conduct of site operations. This data sheet will accompany any personnel when medical assistance is needed or if transport to hospital facilities is required.

Project				
Name			Home Telephone	
Address				
Age	Height		Weight	
Person to noti	ify in the event of an emergency:	Name:		
		Phon	e:	
Drug or other	Allergies:			
Particular Ser	nsitivities :			
Do You Wear	Contacts?			
What medicat	ions are you presently using?			
Name, Addres	ss, and Phone Number of persona	l physician:		

#### Note: Health Insurance Portability and Accountability Act (HIPAA) Requirements

HIPAA took effect April 14, 2003. Loosely interpreted, HIPAA regulates the disclosure of Protected Health Information (PHI) by the entity collecting that information. PHI is any information about health status (such as that you may report on this Medical Data Sheet), provision of health care, or other information. HIPAA also requires TtNUS to ensure the confidentiality of PHI. This Act can affect the ability of the Medical Data Sheet to contain and convey information you would want a Doctor to know if you were incapacitated. So before you complete the Medical Data Sheet understand that this form will not be maintained in a secure location. It will be maintained in a file box or binder accessible to other members of the field crew so that the can accompany an injured party to the hospital.

DO NOT include information that you do not wish others to know, only information that may be pertinent in an emergency situation or treatment.

Name (Print clearly)

# ATTACHMENT II INCIDENT REPORT FORM



Report Date	Report Prepared	d By	Incident Report Number		
<u>INSTRUCTIONS:</u> All incidents (including those involving subcontractors under direct supervision of Tetra Tech personnel) must be documented on the IR Form. Complete any additional parts to this form as indicated below for the type of incident selected.					
TYPE OF INCIDENT (Check all that apply	)	Additional Form	s) Required for this type of incident		
Near Miss (No losses, but could have resu damage)	ulted in injury, illness, o	or 🗌 Comp	plete IR Form Only		
Injury or Illness		Comp	olete Form IR-A; Injury or Illness		
Property or Equipment Damage, Fire, Spill	or Release	Comp Relea	olete Form IR-B; Damage, Fire, Spill or ase		
Motor Vehicle		Comp	blete Form IR-C; Motor Vehicle		
IN	FORMATION ABO		NT		
Description of Incident					
Dete of Incident	Time				
Date of Incident	Time	of Incident			
		AM [	PM OR Cannot be determined		
Weather conditions at the time of the inc	ident Was	there adequate lighti	ng?		
Lesation of Insident					
	Was location of inci	dopt within the employ			
Street Address		City. State. Zip Coo			
Project Name		Client:			
Tt Supervisor or Project Manager		Was supervisor on	the scene?		
			Yes 🗌 No 🗌		
WITNESS INFO	RMATION (attach	n additional shee	ts if necessary)		
Name		Company			
Street Address		City, State and Zip	Code		
Telephone Number(s)					



		CORRECTIVE A	CTIONS		
Corrective action(s	) immediately taken b	y unit reporting the incident:			
Corrective action(s	) still to be taken (by	whom and when):			
	R	DOT CAUSE ANALYSIS L	EVEL REQUIRED		
Root Cause Analysis	Level Required: Leve	el - 1 🗌 Level - 2 🗌 None			
Root Cause Analys	is Level Definitions				
Level - 1 Level - 2	Definition: A Level 1 RCA is conducted by an individual(s) with experience or training in root cause analysis techniques and will conduct or direct documentation reviews, site investigation, witness and affected employee interviews, and identify corrective actions. Activating a Level 1 RCA and identifying RCA team members will be at the discretion of the Corporate Administration office.         The following events may trigger a Level 1 RCA:         Work related fatality         Hospitalization of one or more employee where injuries result in total or partial permanent disability         Property damage in excess of \$75,000         When requested by senior management         Definition: A Level 2 RCA is self performed within the operating unit by supervisory personnel with assistance of the operating unit HSR. Level 2 RCA will utilize the 5 Why RCA methodology and document the findings on the tools provided.         The following events will require a Level 2 RCA:         OSHA recordable lost time incident         Near miss incident that could have triggered a Level 1 RCA				
Complete the Root	t Cause Analysis Wo	orksheet and Corrective Action	n form. Identify a corrective	action(s) for each	root cause
NOTIFICATIONS					
Title		Printed Name	Signature	Telephone Number	Date
Project Manager or S	Supervisor				
Site Safety Coordinator or Office H&S Representative					
Operating Unit H&S	Representative				
Other:					

The signatures provided above indicate that appropriate personnel have been notified of the incident.

<u>INSTRUCTIONS:</u> Complete all sections below for incidents involving injury or illness. Do NOT leave any blanks. Attach this form to the IR FORM completed for this incident.					
Incident Report Number: (From the IR Form	1)				
	EMPLOYEE I	NFORMATION			
Company Affiliation					
Tetra Tech Employee?  Tetra	Tech subcontractor emp	loyee (directly supervised by Tt personnel)?			
Full Name		Company (if not Tt employee)			
Street Address, City, State and Zip Code		Address Type			
		Home address (for Tt employees)			
		Business address (for subcontractors)			
Telephone Numbers					
Work:	Home:	Cell:			
Occupation (regular job title)		Department			
Was the individual performing regular job d	luties?	Time individual began work			
Yes	□ No □	AM  PM  OR Cannot be determined			
Safety equipment					
Provided? Yes No C Used? Yes No If no, expla	Type	!(s) provided:       Hard hat       Protective clothing         Gloves       High visibility vest         Eye protection       Fall protection         Safety shoes       Machine guarding         Respirator       Other (list)			
	NOTIFIC	ATIONS			
Name of Tt employee to whom the injury reported	/ or illness was first	Was H&S notified within one hour of injury or illness?			
		Yes 🗌 No 🗌			
Date of report		H&S Personnel Notified			
Time of report		Time of Report			
If subcontractor injury, did subcontractor's firm perform their own incident investigation?					
Yes No If yes, request a copy of their completed investigation form/report and attach it to this report.					

	INJURY / IL	LNESS DETAILS			
What was the individual doing just before a individual was using. Be specific. Examples: " "Daily computer key-entry"	t <b>he incident occur</b> Climbing a ladder v	red? Describe the activity vhile carrying roofing mat	/ as well as the tools, equ erials"; "Spraying chlorine	uipment, or material the e from a hand sprayer";	
What Happened? Describe how the injury or sprayed with chlorine when gasket broke durin	curred. Examples: g replacement"; Wo	"When ladder slipped on rker developed soreness	wet floor and worker fel in wrist over time"	l 20 feet"; "Worker was	
		dividuals Evennelses "Oos	erete fleev": "Oblerine": "[		
question does not apply to the incident, write "	Not Applicable".	dividual: Examples: Con	icrete noor; Chiorine; F	Radial Arm Saw . If this	
	MEDICAL (	CARE PROVIDED			
Was first aid provided at the site: Yes	No 🗌 If yes, des	cribe the type of first aid a	administered and by whom	1?	
Was treatment provided away from the site: Y	es 🗌 No 🗌	If yes, provide the information	ation below.		
Name of physician or health care profession	nal	Facility Name			
Street Address, City State and Zip Code		Type of Care?			
		Was individual treated in	a emergency room?		
		Was individual hospitaliz	zed overnight as an in-pat	tient? Yes $\Box$ No $\Box$	
		Did the individual die?		ves, date:	
Telephone Number		Will a worker's compens	sation claim be filed?	Yes No	
NOTE: Attach any police reports or related	diagrams to this re	port.			
	SIG	NATURES			
I nave reviewed this report and agree that all th	e supplied informat	ion is accurate			
(print)	Affected individu	ual (signature)	Telephone Number	Date	

This form contains information relating to employee health and must be used in a manner that protects the confidentiality of the employee to the extent possible while the information is being used for occupational safety and health purposes.

INSTRUCTIONS:						
Complete all sections	s below for inci	dents involving Do NOT leave	g property/ed	quipment dama	ige, fire, spill	or release.
	Attach this form	to the IR FOR	M complete	d for this incide	ent.	
Incident Report Number: (Fre	om the IR Form)					
	TYPE	OF INCIDENT (	Check all th	at apply)		
Property Damage	Equipment Da	amage	Fire or Exp	losion	Spill or Relea	ase
	-	INCIDENT	DETAILS		-	
Results of Incident: Fully des	cribe damages, loss	es, etc.				
Response Actions Taken:						
Beenending Ageney(e) (i.e. r	alias fire departm			ntest Neme(s)		
Responding Agency(s) (i.e. p	bolice, fire departine	ent, etc.)	Agency(s) Co	ntact Name(s)		
DAMAGED IT	EMS (List all da	maged items, e	extent of dar	nage and estim	ated repair c	ost)
Item:	Ext	tent of damage:		Estimated	repair cost	
SPILLS	S / RELEASES (	Provide inform	nation for sp	illed/released r	naterials)	
Substance	Estimated quantit	y and duration	Specify Re	eportable Quantity	(RQ)	
				Exceed	led? Yes 🗌 N	lo 🗌 NA 🗌
FIRES / EXPLOSIONS (Provide information related to fires/explosions)						
Fire fighting equipment used? Yes 🗌 No 🗌 If yes, type of equipment:						
NOTIFICATIONS						
Required notifications		Name of person	notified	By whom		Date / Time
Client:	Yes No					
Agency:	Yes No					
Other:	Yes 📋 No 🛄					
Who is responsible for reportin	g incident to outside	agency(s)? Tt	Client	Other Name:		
Was an additional written report on this incident generated? Yes 🗌 No 🗌 If yes, place in project file.						

<u>INSTRUCTIONS:</u> Complete all sections below for incidents involving motor vehicle accidents. Do NOT leave any blanks. Attach this form to the IR FORM completed for this incident.					
Incident Report Number: (	From the IR Form	)			
		INCIDENT	DETAILS		
Name of road, street, h	highway or loca	tion where accident	Name of intersecting	g road, street or highway if applicable	
County		City	1	State	
Did police respond to the a	accident?		Did ambulance respo	and to the accident?	
	Yes	□ No □		Yes 🗌 No 🗌	
Name and location of resp	oonding police de	partment	Ambulance company	name and location	
Officer's name/badge					
Did police complete an incid	dent report? Yes	No If yes, po	lice report number:		
Request a copy of complete	ed investigation repo	VEHICLE INE	n. FORMATION		
How many vehicles were inv	volved in the accide	ent?	_ (Attach additional she	eets as applicable for accidents involving more	
than 2 vehicles.)	Tach Vahiela		Vehicle Number 2 – Other Vehicle		
	Tech venicle		Vehicle Owner /		
Contact Information			Contact Information		
Color			Color		
Make			Make		
Model			Model		
Year			Year		
License Plate #			License Plate #		
Identification #			Identification #		
Describe damage to vehic	le number 1		Describe damage to vehicle number 2		
Insurance Company Name and Address			Insurance Company	Name and Address	
Agent Name			Agent Name		
Agent Phone No.			Agent Phone No.		
Policy Number			Policy Number		

	DRIVER INFORMATION							
Vehicle	Number 1 – Te	etra Tech Ve	hicle		Vehicle Number 2 – Other Vehicle			
Driver's	s Name				Driver's Name			
Driver's	s Address				Driver's Address			
Phone	Number				Phone Number			
Date of	Birth				Date of Birth			
Driver's	s License #				Driver's License #			
Licensi	ing State				Licensing State			
Gender	r I	Male	Female		Gender	Male 🗌 Female		
Was tra	offic citation issu	ed to Tetra T	ech driver?	Yes 🗌 No 🗌	Was traffic citation is	ssued to driver of other	vehicle? Yes 🗌 No	
Citatio	n #				Citation #			
Citation Descrip	n otion				Citation Description			
			PASS	ENGERS IN VEH	ICLES (NON-INJ	URED)		
lı	List all non-injured passengers (excluding driver) in each vehicle. Driver information is captured in the preceding section. Information related to persons injured in the accident (non-Tt employees) is captured in the section below on this form. Injured Tt employee information is captured on FORM IR-A							
Vehicle	Number 1 – Te	etra Tech Ve	ehicle		Vehicle Number 2 -	- Other Vehicle		
How ma	any passengers	(excluding d	river) in the v	vehicle?	How many passenge	ers (excluding driver) in the vehicle?		
Non-Inj Passen and Ad	jured nger Name dress				Non-Injured Passenger Name and Address	9		
Non-Inj Passer and Ad	jured nger Name dress				Non-Injured Passenger Name and Address	9		
Non-Inj Passen and Ad	jured nger Name dress				Non-Injured Passenger Name and Address	9		
			INJUR	IES TO NON-TE		OYEES		
Name o	of injured perso	on 1			Address of injured p	erson 1		
Age	Gender		Car No.	Location in Car	Seat Belt Used?	Ejected from car?	Injury or Fatality?	
	Male 🗌 Fe	emale			Yes 🗌 No 🗌	Yes 🗌 No 🗌	Injured 🗌 Died 🗌	
Name o	of injured perso	on 2			Address of injured person 2			
Age	Gender		Car No.	Location in Car	Seat Belt Used?	Ejected from car?	Injury or Fatality?	
	Male 🗌 Fe	emale			Yes 🗌 No 🗌	Yes 🗌 No 🗌	Injured 🗌 Died 🗌	
OTHER PROPERTY DAMAGE								
Describe damage to property other than motor vehicles								
Proper	ty Owner's Nar	ne			Property Owner's	Address		

COMPLETE AND SUBMIT DIAGRAM DEPICTING WHAT HAPPENED

National Aeronautics and Space Administration	NASA N	/lishap l	Report	MASTE	ER FILE NO.
NOTE: Fill in unshaded blocks within 24 hours. Please print or type. See reverse for instructions.					
1. NAME OF ORGANIZATION	GENER 2. MISHAP DATE	AL INFORMATIO	3. MISHAP TIME (24 hrs	.)	4. ORG. FILE NO.
5. MISHAP CATEGORY (Check as appropriate)  1. TYPE A TYPE B  1. DEATH 2. LOST TIME 2. LOST TIME 3. DEEMA DISABILITY		6. CLOSE CAL	L 7. LEVEL OF POTENTIA	ιL	8. BLDG. NO./LOCATION
2     LOST HIME     3     PERM. DISABLEHT       4     INJURY     4     INJURY       6     DAMAGE     5     HOSPITALIZATION       7     TEST FAILURE     6     DAMAGE       7     TEST FAILURE     7     TEST FAILURE	6 DAMAGE 7 TEST MISSIC FAILURE FAILUI	DN 10. MISSION A	FFECTED	11. PROG	SRAM IMPACT
12. DESCRIPTION OF MISHAP (Sequence of events, extent of damage and injuries, cause, if known, etc. Use additional sheets if necessary.)					
13 NAME (Last first middle initial)	PERSC	14 AGE	15 SEX	16 OF	RGANIZATION (CODE)/POSITION
17. SHIFT WORKED	18. HOURS OF CONTINUOUS DUTY BEFORE MISHAP	19. FIRST AID ONLY	20. FATALITY	] F 21. IN	JURY TYPE (Code)
	23. DAYS LOST NO. TOTAL CONTINUIN	24. CAUS PRIMARY IG	E(S) OF INJURY (Codes) CONTRIB. POTENTIAL	25. MI AGENCY	SHAP ENVIRONMENT (Codes)
26. HAS EMPLOYEE RECEIVED TRAINING/CERTIFICATION APPLICABLE TO TASK?					
27. CLASS OF EQUIPMENT/PROPERTY DAMAGED       28. SPECIFIC ITEM DAMAGED         1       FLIGHT HARDWARE       4       PRESSURE VESSEL       7       OTHER         2       GROUND SUPPORT EQUIPMENT (GSE)       5       MOTOR VEHICLE       4       AIRCRAFT         3       FACILITY       6       AIRCRAFT       4       AIRCRAFT					
29. SERIAL/NEMS NO.	30. SYSTEM/SUBSYSTEM AFFECTEL	,	31. CAUSE(S) OF DAMAG	GE <i>(Codes)</i> POTENTIAL	32. COST ESTIMATE FINAL
33. SUBMITTED BY (Name, title, mail code)	SIGNATUR	E	i	PHONE NO.	DATE
34. ACTION PLAN (Provide estimated completion dat	e ror each action. Use extra sheets if he	cessary)			
35. APPROVED (Name, title, mail code)	SIGNATUR	Ξ		PHONE NO.	DATE
36. NASA SA	FETY CONCURRENCE WITH		CTION PLAN (Branch	chief or higi	her)
UNOUR (rvame, ulle, main code)	SIGNATUR	-		F TIVINE INU.	DATE
NASA SAFETY OFFICE USE ONLY					
37. LESSONS LEARNED REF. NO. (If Yes) 40. APPROVAL FOR CLOSURE					D
38. TYPE OF INVESTIGATION 1 BOARD 2 TEAM 3 INVE	STIGATOR	TITLE			PHONE NO.
39. STATUS	SIGNATUR	E			DATE

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#### CODES

#### ITEM 21. INJURY TYPE - Enter one of the following codes to identify the category of injury:

(H01)	Abrasion	(H04)	Contusion, Bruise	(109)	Internal Injuries
(C02)	Avulsion	(103)	Dermatitis	(H06)	Laceration
(C01)	Amputation	(196)	Multiple Injuries	(P00)	Pain
(H02)	Bites, Stings	(E06)	Electrical Shock	(J00)	Oxygen Deficiency
(H07)	Punctures	(104)	Exhaustion	(Z68)	Shock, Trauma
(A00)	Burn, Chemical	(F07)	Fracture	(G03)	Strain, Sprain
(B00)	Burn, Thermal	(106)	Hernia	(T06)	Toxicosis
(Z76)	Concussion	(100)	Inhalation, Absorption,	(Z98)	Other/Unknown
(G06)	Exposure	. ,	Ingestion	. ,	

#### ITEM 22. BODY PART(S) AFFECTED - Enter up to 3 of the following body part codes. (The first code entered should indicate Section of Body.):

Section of Body		Part of I	Part of Body					
(A00) (D00) (B00) (E00) (F00)	Body in general Torso (Chest) Head/Facial Upper Extremities Lower Extremities	(D10) (F21) (E13) (D30) (F22) (B03) (E12) (B12) (B10) (E31)	Abdomen Ankle Upper Arm Back Calf/Skin Ear(s) Elbow Elbow Eye(s) Face Finger(s)	(F35) (E22) (D53) (E30) (D43) (F33) (D54) (B14) (F11) (F10)	Foot Forearm Groin Hand Heart Heel Hip Jaw Knee Leg	(B16) (C05) (B06) (E11) (D46) (D32) (F34) (D33) (E21)	Mouth/Teeth Neck Nose Shoulder Side/Rib(s) Spine Toe(s) Vertebra(e) Wrist	

ITEMS 24 AND 31. CAUSES OF INJURY AND/OR DAMAGE - Select up to 3 of the following codes to identify the causes of injury and/or damage: (Refer to NMI 8621.1E for definitions of Primary, Contributing and Potential Causes.) NOTE: Primary Cause <u>must</u> be indicated.

(E) Equipment Failure

(H) Human Factors

(2)

(3)

(4)

(5)

(6)

(7)

(8)

(1) Distraction

Fatigue

Safety Violation

Lack of Authority

Lack of Attention

Misjudgment of Conditions

Lack of Experience

Working Environment

(1) Design Deficiency

(2) Maintenance

(3) Material Failure

(4) Material Defects

(C) Communications

- (1) Paging Warning
- Inadequate (2) Problem Reporting/
- Tracking Inadequate
- Schedule Conflicts (3)
- (4) Task Coordination/
- Planning Inadequate
- (5) Task Supervision Inadequate
- (6) Test Team Briefing Inadequate
- (O) Hazardous Operation
  - Arrangement (1)
  - (2) Improper Illumination
  - Improper Ventilation (3)
  - Improper Clothing (4)
  - (5) Improper Guarding
  - (6) Unsafe Equipment
  - (7) Deviation from Procedure
  - (8) Improper Protection

#### (P) Procedure

- Requirements Inadequate (1)
- Procedure Deficiency (2)
- Technical Data Deficiency (3)

#### ITEM 25. MISHAP ENVIRONMENT AGENCY - Enter up to 3 Agency codes:

- (A) Animals (B) **Boilers/Pressure Vessels**
- (C) Chemicals
- (D) Conveyors
- (E) Dust
- (F) Electrical Apparatus
- (G) Elevators
- (H) Hand Tools
- Highly Flammable, Hot/ (I) Toxic Substances
- (J) Hoisting Apparatus
- Cranes, Winches, etc.) (K) Machines
- (L) Material (M) Mechanical Power/ Transmission Apparatus
- Prime Movers and Pumps (N)
- Radiation/Radiating (O)
- Substances
- Vehicles
- (Q) Working/Walking Surfaces
- (Stairs, Platforms, etc.)
- (S) **Temperature Extremes** Electrical Current
- (T) Agency Not Elsewhere (Z)
- Classified

#### (F) Fire/Explosion

- (1) Chemical Change
- Fuel/Oxidizer Near (2)
- Ignition Source
- (3) Pressure Release/Implosion
- (4) High Heat Source

- (1) Lightning
- Wind (2)
- (3) Rain

(M) Toxic Material

- (4) Hail
- (5) Earthquake

- (1) Design Deficiency
- (2) Improper Handling

#### ACTIVITY - Enter up to 3 Activity codes:

- (A) Striking Against
- (B) Struck By
- (C) Caught In/On/Between (D)
  - Fall on Same Level
- (E) Fall to Different Level
- (F) Slip (not fall)/Trip
- (N) Lifting, Moving Ascending/Descending

Dropped, Spilled, Splashed

- (P) (Q) Twisting/Turning
- (R) Over-Exertion
- (S) Pushing/Pulling

(M)

(Z) Activity Not Elsewhere Classified

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- (N) Natural Phenomenon

#### (T) Organizational Deficiency

- (1) Lack of Training
- Lack of Certification (2) (3) Expired Certification

**Design Deficiency** 

- Deviation from Procedure

(A) Handling

(1)

(2)

# ATTACHMENT III EQUIPMENT INSPECTION

Equipment Inspection Checklist for Drill Rigs Page 1

Unit/Serial No#	:			Inspection Date:	1	<u>/</u>
		Equipm	nent Inspection C	Checklist for Drill Rigs		
Company:				Unit/Serial No#:		
Inspection Date	e: <u>//</u> /	Time:	<u>:</u>	Equipment Type: (e.g, Drill Rigs Hollow Stem, Mud	Rotary, Direc	t Push, HDD)
Yes No	NΔ		Requirement		Con	ments

100	110	10/1	Koganomont	
			<ul> <li>Emergency Stop Devices</li> <li>Emergency Stop Devices (At points of operation)</li> <li>Have all emergency shut offs identified been communicated to the field crew?</li> <li>Has a person been designated as the Emergency Stop Device Operator?</li> </ul>	
			<ul> <li>Highway Use</li> <li>Cab, mirrors, safety glass?</li> <li>Turn signals, lights, brake lights, etc. (front/rear) for equipment approved for highway use?</li> <li>Seat Belts?</li> <li>Is the equipment equipped with audible back-up alarms and back-up lights?</li> <li>Horn and gauges</li> <li>Brake condition (dynamic, park, etc.)</li> <li>Tires (Tread) or tracks</li> <li>Windshield wipers</li> <li>Exhaust system</li> <li>Steering (standard and emergency)</li> <li>Wheel Chocks?</li> <li>Are tools and material secured to prevent movement during transport? Especially those within the cab?</li> <li>Are there flammables or solvents or other prohibited substances stored within the cab?</li> <li>Are tools or debris in the cab that may adversely influence operation of the vehicle (in and around brakes, clutch, gas pedals)</li> </ul>	

# Equipment Inspection Checklist for Drill Rigs Page 2

Unit/Serial No#:\_\_\_\_\_

#### Inspection Date: / /

Yes	No	NA	Requirement	Comments
			Fluid Levels: • Engine oil • Transmission fluid • Brake fluid • Cooling system fluid • Hoses and belts • Hydraulic oil	
			<ul> <li>High Pressure Hydraulic Lines</li> <li>Obvious damage</li> <li>Operator protected from accidental release</li> <li>Coupling devices, connectors, retention cables/pins are in good condition and in place</li> </ul>	
			Mast Condition <ul> <li>Structural components/tubing</li> <li>Connection points</li> <li>Pins</li> <li>Welds</li> <li>Outriggers</li> <li>Operational</li> <li>Plumb (when raised)</li> </ul>	
			<ul> <li>Hooks <ul> <li>Are the hooks equipped with Safety Latches?</li> <li>Does it appear that the hook is showing signs of wear in excess of 10% original dimension?</li> <li>Is there a bend or twist exceeding 10% from the plane of an unbent hook?</li> <li>Increase in throat opening exceeding 15% from new condition</li> <li>Excessive nicks and/or gouges</li> <li>Clips</li> <li>Number of U-Type (Crosby) Clips (cable size 5/16 - 5/8 = 3 clips minimum) (cable size 3/4 - 1 inch = 4 clips minimum) (cable size 1 1/8 - 1 3/8 inch = 5 clips minimum)</li> </ul> </li> </ul>	

# Equipment Inspection Checklist for Drill Rigs Page 3

Unit/Serial No#:\_\_\_\_\_

Inspection Date: / /

Yes	No	NA	Requirement	Comments
			<ul> <li>Power cable and/or hoist cable</li> <li>Reduction in Rope diameter π         (5/16 wire rope&gt;1/64 reduction nominal size -replace)</li> </ul>	
			<ul> <li>(3/8 to 1/2 wire rope&gt;1/32 reduction nominal size-replace)</li> <li>(9/16 to 3/4 wire rope&gt;3/64 reduction nominal size-replace)</li> <li>Number of broken wires</li> <li>(6 randomly broken wires in one rope lay)</li> </ul>	
			<ul> <li>(3 broken wires in one strand)</li> <li>Number of wire rope wraps left on the Running Drum at nominal</li> </ul>	
			<ul> <li>use (&gt;3 required)</li> <li>Lead (primary) sheave is centered on the running drum</li> <li>Lubrication of wire rope (adequate?)</li> <li>Kinks, bends – Flattened to &gt; 50% diameter</li> </ul>	
			Hemp/Fiber rope (Cathead/Split Spoon Hammer) <ul> <li>Minimum <sup>3</sup>/<sub>4</sub>; maximum 1 inch rope diameter (Inspect for</li> </ul>	
			<ul> <li>Physical damage)</li> <li>Rope to hammer is securely fastened</li> </ul>	
			<ul> <li>Safety Guards –</li> <li>Around rotating apparatus (belts, pulleys, sprockets, spindles, drums, flywheels, chains) all points of operations protected from</li> </ul>	
			<ul> <li>accidental contact?</li> <li>Hot pipes and surfaces exposed to accidental contact?</li> <li>High pressure lines</li> <li>Nip/pinch points</li> </ul>	
			<ul> <li>Operator Qualifications</li> <li>Does the operator have proper licensing where applicable, (e.g., CDL)2</li> </ul>	
			<ul> <li>Does the operator, understand the equipment's operating instructions?</li> </ul>	
			<ul> <li>Is the operator experienced with this equipment?</li> <li>Is the operator 21 years of age or more?</li> </ul>	

## Equipment Inspection Checklist for Drill Rigs Page 4

Unit/Serial No#:\_\_\_\_\_

#### Inspection Date: / /

Yes	No	NA	Requirement	Comments
			PPE Required for Drill Rig Exclusion Zone <ul> <li>Hardhat</li> <li>Safety glasses</li> <li>Work gloves</li> <li>Chemical resistant gloves</li> <li>Steel toed Work Boots</li> <li>Chemical resistant Boot Covers</li> <li>Apron</li> <li>Coveralls Tyvek, Saranex, cotton)</li> </ul>	
			Other Hazards <ul> <li>Excessive Noise Levels?dBA</li> <li>Chemical hazards (Drilling supplies - Sand, bentonite, grout, fuel, etc.) <ul> <li>MSDSs available?</li> <li>Will On-site fueling occur</li> <li>Safety cans available?</li> <li>Fire extinguisher (Type/Rating )</li> </ul> </li> </ul>	
Approv	ved for L	Jse [	Yes No See Comments	

Site Health and Safety Officer

Operator

# ATTACHMENT IV SAFE WORK PERMITS

#### SAFE WORK PERMIT FOR MOBILIZATION AND DEMOBILIZATION NASA WALLOPS FLIGHT FACILITY

Permit N	lo Date: Time: Fro	om to			
I.	Work limited to the following (description, area, equipment used): Mobilization and Der	mobilization activities			
II. III.	Primary Hazards lifting; pinches and compression; slip, trip, and fall hazards, heavy equ traffic; ambient temperature extremes; insect animal bites and stings and poisonous plants, a Field Crew:	uipment; ve hicle an d fo ot and inclement weather.			
IV.	On-site Inspection conductedYesNoInitials of InspectorEquipment Inspection requiredYesNoInitials of Inspector	TtNUS TtNUS			
V.	Protective equipment required       Respiratory equipment required         Level D       Level B       Yes         Level C       Level A       No         Modifications/Exceptions:       Yes       Specify on the reverse				
<b>VI.</b> N	Chemicals of Concern     Hazard Monitoring     Action Level(s)       one anticipated     None required	Response Measures			
Prima manut	ry Route(s) of Exposure/Hazard: Contaminants are not anticipated to be encountered durin acturer MSDS to deter mine necessary protective measures for any chemical brought on s	ig these tasks. Refer to ite in support of site activities			
VII. High First Safet	(Note to FOL and/or SHSO: Each item in Sections VII, VIII, and IX must be checked Yes         Additional Safety Equipment/Procedures         Hard-hat       Yes       No       Hearing Protection (Plugs/Muffs).         Safety Glasses       Yes       No       Safety belt/harness         Chemical/splash goggles       Yes       No       Radio/Cellular Phone         Splash Shield       Yes       No       Barricades         Splash suits/coveralls       Yes       No       Gloves (Type – (cotton/leather)         Impermeable apron       Yes       No       Chemical resistant boot covers         Steel toe Work shoes/boots       Yes       No       Tape up/use insect repellent         Aid Kit       Yes       No       Fire Extinguisher         y Shower/Eyewash       Yes       No       Other         Modifications/Exceptions:       Safety glasses will be required if eye hazard are present. Reflect         Tyvek cov erall if there is a potential for s oiling work clo thes.       Hard h ats at SSO discretion.	s, No, or NA) Yes No Yes No			
VIII.	Site Preparation       Yes No       NA         Utility Locating and Excavation Clearance completed       Image: Sign of Clearance completed       Image: Sign of Clearance completed       Image: Sign of Clearance completed         Vehicle and Foot Traffic Routes Established/Traffic Control Barricades/Signs in Place       Image: Sign of Clearance completed       Image: Sign of Clearance completed				
IX.	Additional Permits required (Hot work, confined space entry, excavation etc.)[ If yes, SHSO to complete or contact Health Sciences, Pittsburgh Office (412)921-7090	Yes No			
Х.	<b>Special instructions, precautions:</b> Obtain MSDS for chemicals brought on site, add the review them for any additional PPE requirements. Use s afe lifting practices. Preview work other hazards that need to be communicated to field personnel.	em to Che mical Inventory, and clocations for slip, trip, fall and			

Permit Issued by:\_\_\_\_\_ Permit Accepted by:\_\_\_\_\_

#### SAFE WORK PERMIT FOR MONITORING WELL INSTALLATION AND ORC<sup>®</sup> INJECTION NASA WALLOPS FLIGHT FACILITY

Permit N	lo Date:	Time: From	to
I. II.	Work limited to the following (description, area, equi and ORC <sup>®</sup> injection using direct push technology (DPT) to Primary Hazards: <u>Contact with site cont aminants; tra</u> systems; heavy lifting; slip, trip and fall; vehicular and for	pment used): <u>Monitoring well</u> echnique . nsfer of cont amination; pinc h pot traffic; ambient temper atu	installation using DPT technique /compression; noise; en ergized re extremes; insect/animal bites
III.	Field Crew:		
IV —	On-site Inspection conducted Ves N	lo Initials of Inspector	TINUIS
	Equipment Inspection required Yes	lo Initials of Inspector	TtNUS
V.	Protective equipment required     Respination       Level D I Level B I     Y       Level C I Level A I     N       Modifications/Exceptions:     Image: Construction of the second seco	ratory equipment required es ☐ Specify on the revers o ☑	e
VI.	Chemicals of Concern Hazard Monitoring	Action Level(s)	Response Measures
B	enzene and Vinyl PID with 10.6 eV lamp A	n <u>y sustained readings</u>	Evacuate area until
<u>c</u>	hiondebr	eath ing zone	levels return to
Dust _	from ORC	visible dust	ba <u>ckgr ound</u>
VII. High First	Primary Route(s) of Exposure/Hazard:       Inhalation         Incidental ingestion and contact with contaminants will be         Airborne dusts are unlikely to be generated during this ac         (Note to FOL and/or SSO: Each item in Sections VII, N         Additional Safety Equipment/Procedures         Hard-hat       Yes         No         Safety Glasses       Yes         No         Splash shield       Yes         Splash suits/coveralls       Yes         No         Steel toe work shoes/boots       Yes         No         Steel toe work shoes/boots       Yes         No         Aid Kit       Yes	d of airbor ne contaminants is e prevented through the use of tivity, if present control through /III, and IX must be checked `` Hearing Protection (Plugs/Mut Safety belt/harness Radio/Cellular Phone Barricades Gloves (Type – nitrile/work) Work/rest regimen Chemical resistant boot cover Tape up/use insect repellent Fire extinguisher	m ost likel y ro ute or e xposure.         PPE and safe work practices.         area wetting methods         Yes, No, or NA)         ffs)
Safet	y Shower/Eyewash	Other	
	conditions (rain gear, rubber boots, etc.)	S OWING WORK CIOLINING EXISTS. C	
VIII.	Site Preparation Utility Locating and Excavation Clearance completed Vehicle and Foot Traffic Routes Established/Traffic Contr Physical Hazards Identified and Isolated (Splash and con Emergency Equipment Staged (Spill control, fire extinguis	ol Barricades/Signs in Place tainment barriers) shers, first aid kits, etc)	Yes No NA 
IX.	Additional Permits required (Hot work, confined space If yes, SSO to complete or contact Health Sciences, Pitts	entry, excavation etc.) burgh Office (412)921-7090	Yes 🛛 No
Х.	Special instructions, precautions: Review MSDS for techniques. Inspect equipment prior to use. Ensure eme	or ORC Prod ucts in Atta chm ergency stop devices are function	ent VI. Use safe lifting/carr ying onal and test daily.

Permit Issued by:\_\_\_\_\_ Permit Accepted by:\_\_\_\_\_

#### SAFE WORK PERMIT FOR MULTIMEDIA SAMPLING NASA WALLOPS FLIGHT FACILITY

Permit	No Date:	Time: From	to
I.	Work limited to the following (description, groundwater and IDW.	area, equipment used): Multi-media sam p	ling including
Ш.	Primary Hazards: <u>Chemical contamin ation; trans</u> slips, trips and falls; vehi cular and foot t raffic poisonous plants and inclement weather.	s fer contamin ation; pi nches an d com pressions; amb ient temper ature extremes; i nsect/animal	<u>noi se; lifting;</u> b ites, stings,
III.	Field Crew:		
IV.	On-site Inspection conducted Yes	No Initials of Inspector	TtNUS
	Equipment Inspection required Yes	No Initials of Inspector	TtNUS
v.	Protective equipment required Level D	Respiratory equipment required Yes Specify on the reverse No S nclude sleeved shirt and long pants, safety shoes orn near insect/snake areas.	s, and surgical
VI. <u>E</u>	Chemicals of Concern Benzene and Vinyl Chloride	Action Level(s) Resp. An y sustained readings Evacuate > 10 ppmin the worker no dus	onse Measures area until t is visiblel
_ Dust _	from ORC	breath ing zone levels i visible dust backgr	ound
Prima	ary Route(s) of Exposure/Hazard: Inhalation.		
	(Note to FOL and/or SHSO: Each item in Section	ns VII, VIII, and IX must be checked Yes, No, o	r NA)
VII.	Additional Safety Equipment/Procedures         Hard-hat       Yes       No         Safety Glasses       Yes       No         Chemical/splash goggles       Yes       No         Splash Shield       Yes       No         Splash suits/coveralls       Yes       No         Impermeable apron       Yes       No         Steel toe Work shoes or boots       Yes       No	Hearing Protection (Plugs/Muffs) Y Safety belt/harness	es   No es   No es   No es   No es   No es   No es   No
High	Visibility vest⊠Yes ∐ No	Tape up/use insect repellent	
Safe			
Curci	Modifications/Exceptions: Minimum requirement in	nclude sleeved shirt and long pants, safety shoes	s, and surgical style
	gloves. Coveralls and snake chaps will be worn ne	ear insect/snake areas.	
VIII.	Site Preparation Utility Locating and Excavation Clearance complet Vehicle and Foot Traffic Routes Established/Traffic Physical Hazards Identified and Isolated (Splash a Emergency Equipment Staged (Spill control, fire est	Yes No ed c Control Barricades/Signs in Place nd containment barriers) ttinguishers, first aid kits, etc)	
IX.	Additional Permits required (Hot work, confined If yes, SHSO to complete or contact Health Science	space entry, excavation etc.)	🛛 No
Х.	<b>Special instructions, precautions:</b> Potential e prevented through the use of PPE and appropriat known or suspected insect/animal nesting or habite	e xposures via skin c ontact an d ha nd to mouth e decontamination and personal hygiene practice at, tape up, and use repellants.	activities will be es. Avoid areas of

#### SAFE WORK PERMIT FOR GEOGRAPHIC SURVEYING NASA WALLOPS FLIGHT FACILITY

Permit N	lo Date:	Time: From	to
I.	Work limited to the following (description, area	, equipment used): <u>Geographic Surve</u>	ey
П.	<b>Primary Hazards:</b> <u>Slips, tri ps and fa lls, a mbien</u> stings, poisonous plants.	t temper ature e xtremes, inclem ent we	ather, i nsect/animal b ites o r
III. IV.	Field Crew:         On-site Inspection conducted       Yes         Equipment Inspection required       Yes	No Initials of Inspector     No Initials of Inspector	TtNUS TtNUS
V.	Protective equipment required Level D 🛛 Level B 🗌 Level C 🗋 Level A 🗌 Modifications/Exceptions:	Respiratory equipment required         Yes       Specify on the reverse         No	
VI. <u>N</u> ta	Chemicals of Concern one expected during this ask. Hazard Monitoring	Action Level(s)	Response Measures
VII. High First Safet	(Note to FOL and/or SSO: Each item in Sections         Additional Safety Equipment/Procedures         Hard-hat       Yes ⊠ No         Safety glasses       Yes ⊠ No         Chemical/splash goggles       Yes ⊠ No         Splash shield       Yes ⊠ No         Splash suits/coveralls       Yes ⊠ No         Steel toe work shoes or boots       Yes ⊠ No         visibility vest       Yes ⊠ No         aid kit       Yes ⊠ No         y shower/eyewash       Yes ⊠ No         Modifications/Exceptions:       Yes ⊠ No	s VII, VIII, and IX must be checked Ye Hearing protection (Plugs/Mut Safety belt/harness	s, No, or NA) ffs)
VIII.	Site Preparation Utility Locating and Excavation Clearance complete Vehicle and Foot Traffic Routes Established/Traffic Physical Hazards Identified and Isolated (Splash a Emergency Equipment Staged (Spill control, fire established)	Y ed[ c Control Barricades/Signs in Place[ nd containment barriers)[ ktinguishers, first aid kits, etc)[	es No NA
IX.	Additional Permits required (Hot work, confined If yes, SHSO to complete or contact Health Science	space entry, excavation etc.) es, Pittsburgh Office (412)921-7090	🗌 Yes 📋 No
Х.	Special instructions, precautions:		
Permit Is	ssued by:	Permit Accepted by:	

#### SAFE WORK PERMIT FOR **DECONTAMINATION ACTIVITIES** NASA WALLOPS FLIGHT FACILITY

Permit No.	Date:

Time: From \_\_\_\_\_ to \_\_\_\_

#### I. Work limited to the following (description, area, equipment used): Decontamination sampling equipment activities

Primary Hazards: Chemical contamination; decontamination fluids; noise; lifting; flying projectiles; slip, trip, and fall; II. vehicle and foot traffic; ambient temperature extremes and inclement weather.

III. IV.	Field Crew: On-site Inspection condu Equipment Inspection re	ucted Yes quired Yes	□ No □ No	Initials of Insp Initials of Insp	DectorTtNUS DectorTtNUS
V.	Protective equipment re Level D 🛛 Level E Level C 🗌 Level A Modifications/Exceptions:	equired 3 A	<b>Respirato</b> Yes No	ry equipment required ☐ Specify on the reve ⊠	erse
VI. <u>E</u> Dust	Chemicals of Concern Benzene and Vinyl Chloride from ORC	Hazard Monitoring PID with 10.6 eV lamp	<u>o</u> An bre <u>ath</u>	Action Level(s) y sustained readings 10 ppmin the worker ing zone ible dust	Response Measures         Evacuate       area until         no dust is visiblel       levels return to         backgr       ound

Primary Route(s) of Exposure/Hazard: Contaminants are not anticipated to be present at concentrations that pose a health threat to site workers.

(Note to FOL and/or SHSO: Each item in Sections VII, VIII, and IX must be checked Yes, No, or NA)

#### VII. Additional Safety Equipment/Procedures

Hard-hat.		Yes 🖂 I	No	Hearing Protection (Plugs/Muffs)	🗌 Yes 🖂 No	0
Safety Gla	sses	Yes 🗌 I	No	Safety belt/harness[	🗌 Yes 🖾 No	C
Chemical/	splash goggles 🏹	Yes 🗌 I	No	Radio/Cellular Phone[	] Yes 🗌 No	С
Splash Sh	ield	Yes 🗌 I	No	Barricades	🗌 Yes 🔲 No	С
Splash sui	ts/coveralls	Yes 🗌 I	No	Gloves (Type – <u>Nitrile</u> )	🛛 Yes 🔲 No	С
Impermea	ble apron	Yes 🗌 I	No	Work/rest regimen[	🗌 Yes 🔲 No	С
Steel toe \	Vork shoes/boots⊠າ	res 🗌 I	No	Chemical Resistant Boot Covers	🛛 Yes 🔲 No	C
High Visib	ility vest⊠າ	res 🗌 I	No	Tape up/use insect repellent[	🗌 Yes 🔲 No	С
First Aid K	it	res 🗌 I	No	Fire Extinguisher[	🗌 Yes 🔲 No	C
Safet y Sho	ower/Eyewashוחי	res 🗌 I	No	Other[	🗌 Yes 🔲 No	С
Modificatio	ons/Exceptions: PPE sele	ction is la	argely deper	ident upon conditions and tasks being pe	formed.	

VIII.	Site Preparation	Yes No	NA
	Utility Locating and Excavation Clearance completed		
	Vehicle and Foot Traffic Routes Established/Traffic Control Barricades/Signs in Place	ce 🗌 🗌	
	Physical Hazards Identified and Isolated (Splash and containment barriers)		
	Emergency Equipment Staged (Spill control, fire extinguishers, first aid kits, etc)		

#### If yes, SHSO to complete or contact Health Sciences, Pittsburgh Office (412)921-7090

X. Special instructions, precautions: Potential exposures via skin contact and hand to mouth activities will be prevent through the use of PPE and appropriate decontamination and personal hygiene practices.

Permit Issued by:\_\_\_\_\_ Permit Accepted by:\_\_\_\_\_

\_\_\_\_\_

#### SAFE WORK PERMIT FOR DECONTAMINATION ACTIVITIES NASA WALLOPS FLIGHT FACILITY

Permit N	No Date: Time: From to			
I.	Work limited to the following (description, area, equipment used): IDW management, moving and storage			
.    .	Primary Hazards: Potential hazards associated with this task: spill; strains and sprains; back injuries compressions Field Crew:			
IV.	On-site Inspection conducted       Yes       No       Initials of Inspector       TtNUS         Equipment Inspection required       Yes       No       Initials of Inspector       TtNUS			
V.	Protective equipment required     Respiratory equipment required       Level D     Level B     Yes       Level C     Level A     No       Modifications/Exceptions:			
VI.	Chemicals of Concern       Hazard Monitoring       Action Level(s)       Response Measures         None expected during			
VII. High First Safet	(Note to FOL and/or SSO: Each item in Sections VII, VIII, and IX must be checked Yes, No, or NA)         Additional Safety Equipment/Procedures         Hard-hat       Yes       No         Safety Glasses       Yes       No         Safety Glasses       Yes       No         Safety Splash goggles       Yes       No         Splash Shield       Yes       No         Splash suits/coveralls       Yes       No         Gloves (Type – work)       Yes       No         Steel toe work shoes or boots       Yes       No         Aid Kit       Yes       No       Chemical Resistant Boot Covers         Aid Kit       Yes       No       Steet repellent       Yes         Modifications/Exceptions:       Yes       No       Fire Extinguisher       Yes			
VIII.	I. Site Preparation       Yes No       NA         Utility Locating and Excavation Clearance completed       Image: Completed       Image: Completed         Vehicle and Foot Traffic Routes Established/Traffic Control Barricades/Signs in Place       Image: Completed       Image: Completed         Physical Hazards Identified and Isolated (Splash and containment barriers)       Image: Completed       Image: Completed       Image: Completed         Emergency Equipment Staged (Spill control, fire extinguishers, first aid kits, etc)       Image: Completed       Image: Completed			
IX.	Additional Permits required (Hot work, confined space entry, excavation etc.)			
Х.	Special instructions, precautions: Inspect drums used to store IDW prior to use. Disperse IDW evenly. Use proper lifting practices and obtain assistance when handling heavy drums.			
Permit Is	ssued by: Permit Accepted by:			

ATTACHMENT V OSHA POSTER

# Job Safety and Health It's the law!

#### **EMPLOYEES:**

- You have the right to notify your employer or OSHA about workplace hazards. You may ask OSHA to keep your name confidential.
- You have the right to request an OSHA inspection if you believe that there are unsafe and unhealthful conditions in your workplace. You or your representative may participate in that inspection.
- You can file a complaint with OSHA within 30 days of retaliation or discrimination by your employer for making safety and health complaints or for exercising your rights under the OSH Act.
- You have the right to see OSHA citations issued to your employer. Your employer must post the citations at or near the place of the alleged violations.
- Your employer must correct workplace hazards by the date indicated on the citation and must certify that these hazards have been reduced or eliminated.
- You have the right to copies of your medical records and records of your exposures to toxic and harmful substances or conditions.
- Your employer must post this notice in your workplace.
- You must comply with all occupational safety and health standards issued under the OSH Act that apply to your own actions and conduct on the job.

#### **EMPLOYERS:**

 You must furnish your employees a place of employment free from recognized hazards.



Occupational Safety and Health Administration U.S. Department of Labor



Free assistance in identifying and correcting hazards or complying with standards is available to employers, without citation or penalty, through OSHA-supported consultation programs in each state.

 You must comply with the occupational safety and health standards issued under the OSH Act.

#### This free poster available from OSHA – The Best Resource for Safety and Health

### 1-800-321-OSHA

www.osha.gov

OSHA 3165-12-06R

# ATTACHMENT VI MSDS ORC INJECTION

Last Revised: March 13, 2007

Section 1 - Material Identification					
Supplier:	Supplier:				
P					
REGENESIS					
1011 Calle Sombra San Clemente, CA 926	573				
Phone:	949.366.8000				
Fax:	949.366.8090				
E-mail:	info@regenesis.com				
Chemical Description:	A mixture of Calcium OxyHydroxide [CaO(OH) <sub>2</sub> ] and Calcium Hydroxide [Ca(OH) <sub>2</sub> ].				
Chemical Family:	Inorganic Chemical				
Trade Name:	Advanced Formula Oxygen Release Compound (ORC Advanced <sup>TM</sup> )				
Chemical Synonyms	Calcium Hydroxide Oxide; Calcium Oxide Peroxide				
Product Use:	Used to remediate contaminated soil and groundwater (environmental applications)				

aposition

<u>CAS No.</u>	Chemical
682334-66-3	Calcium Hydroxide Oxide [CaO(OH) <sub>2</sub> ]
1305-62-0	Calcium Hydroxide [Ca(OH) 2]
7758-11-4	Dipotassium Phosphate (HK <sub>2</sub> O <sub>4</sub> P)
7778-77-0	Monopotassium Phosphate (H <sub>2</sub> KO <sub>4</sub> P)

Section 3 – Physical Data			
Form:	Powder		
Color:	White to Pale Yellow		
Odor:	Odorless		
Melting Point:	527 °F (275 °C) – Decomposes		
<b>Boiling Point:</b>	Not Applicable (NA)		
Flammability/Flash Point:	NA		
Auto- Flammability:	NA		
Vapor Pressure:	NA		
Self-Ignition Temperature:	NA		
Thermal Decomposition:	527 °F (275 °C) – Decomposes		
Bulk Density:	0.5 – 0.65 g/ml (Loose Method)		
Solubility:	1.65 g/L @ 68° F (20° C) for calcium hydroxide.		
Viscosity:	NA		
pH:	11-13 (saturated solution)		
Explosion Limits % by Volume:	Non-explosive		
Hazardous Decomposition Products:	Oxygen, Hydrogen Peroxide, Steam, and Heat		
Hazardous Reactions:	None		

Section 4 – Reactivity Data			
Stability:	Stable under certain conditions (see below).		
Conditions to Avoid:	Heat and moisture.		
Incompatibility:	Acids, bases, salts of heavy metals, reducing agents, and flammable substances.		
Hazardous Polymerization:	Does not occur.		

Section 5 – Regulations			
TSCA Inventory List:	Listed		
CERCLA Hazardous	Substance (40 CFR Part 302)		
Listed Substance:	No		
Unlisted Substance:	Yes		
Reportable Quantity (RQ):	100 pounds		
Characteristic(s):	Ignitibility		
RCRA Waste Number:	D001		
SARA, Title III, Sections 302/303 (40 CFR Part 355 – Emergency Planning and Notification)			
Extremely Hazardous Substance:	No		
SARA, Title III, Sections 311/312 (40 CFR Part 370 – Hazardous Chemical Reporting: Community Right-To-Know			
Hazard Category:	Immediate Health Hazard Fire Hazard		

**Threshold Planning Quantity:** 10,000 pounds

Section 5 – Regulations (	(cont)
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SARA, Title III, Section 313 (40 CFR Part 372 – Toxic Chemical Release Reporting: Community Right-To-Know

Extremely Hazardous Substance:	No	
WHMIS Classification:	С	Oxidizing Material Poisonous and Infectious Material
	D	Material Causing Other Toxic Effects – Eye and Skin Irritant
Canadian Domestic Substance List:	Not Listed	

Section 6 – Protective Measures, Storage and Handling
-------------------------------------------------------

# Technical Protective<br/>MeasuresKeep in tightly closed container. Store in dry area, protected<br/>from heat sources and direct sunlight.Storage:Keep in tightly closed container. Store in dry area, protected<br/>from heat sources and direct sunlight.Handling:Clean and dry processing pipes and equipment before<br/>operation. Never return unused product to the storage<br/>container. Keep away from incompatible products. Containers<br/>and equipment used to handle this product should be used<br/>exclusively for this material. Avoid contact with water or<br/>humidity.

Personal Protective Equipment (PPE)	
Engineering Controls:	Calcium Hydroxide ACGIH <sup>®</sup> TLV <sup>®</sup> (2000) 5 mg/m <sup>3</sup> TWA OSHA PEL Total dust–15 mg/m <sup>3</sup> TWA Respirable fraction– 5 mg/m <sup>3</sup> TWA NIOSH REL (1994) 5 mg/m <sup>3</sup>
<b>Respiratory</b> <b>Protection:</b>	For many conditions, no respiratory protection may be needed; however, in dusty or unknown atmospheres use a NIOSH approved dust respirator.
Hand Protection:	Impervious protective gloves made of nitrile, natural rubbber or neoprene.
Eye Protection:	Use chemical safety goggles (dust proof).
Skin Protection:	For brief contact, few precautions other than clean clothing are needed. Full body clothing impervious to this material should be used during prolonged exposure.
Other:	Safety shower and eyewash stations should be present. Consultation with an industrial hygienist or safety manager for the selection of PPE suitable for working conditions is suggested.
Industrial Hygiene:	Avoid contact with skin and eyes.
Protection Against Fire & Explosion:	NA

#### Section 6 – Protective Measures, Storage and Handling (cont)

Section 7 – Hazards Identification		
Emergency Overview:		Oxidizer – Contact with combustibles may cause a fire. This material decomposes and releases oxygen in a fire. The additional oxygen may intensify the fire.
Potential Effects:	Health	Irritating to the mucous membrane and eyes. If the product splashes in ones face and eyes, treat the eyes first. Do not dry soiled clothing close to an open flame or heat source. Any

Regenesis - ORC Advanced MSDS	S clothing that has been contaminated with this product should be submerged in water prior to drying.
Inhalation:	High concentrations may cause slight nose and throat irritation with a cough. There is risk of sore throat and nose bleeds if one is exposed to this material for an extended period of time.
Eye Contact:	Severe eye irritation with watering and redness. There is also the risk of serious and/or permanent eye lesions.
Skin Contact:	Irritation may occur if one is exposed to this material for extended periods.
Ingestion:	Irritation of the mouth and throat with nausea and vomiting.

Section 8 – Measures in Case of Accidents and Fire

After Spillage/Leakage/Gas Leakage:	Collect in suitable containers. Wash remainder with copious quantities of water.	
Extinguishing Media:	See next.	
Suitable:	Large quantities of water or water spray. In case of fire in close proximity, all means of extinguishing are acceptable.	
Further Information:	Self contained breathing apparatus or approved gas mask should be worn due to small particle size. Use extinguishing media appropriate for surrounding fire. Apply cooling water to sides of transport or storage vessels that are exposed to flames until the fire is extinguished. Do not approach hot vessels that contain this product.	
First Aid:	After contact with skin, wash immediately with plenty of water and soap. In case of contact with eyes, rinse immediately with plenty of water and seek medical attention. Consult an opthalmologist in all cases.	

Section 8 – Measures in Case of Accidents and Fire		
Eye Contact:	Flush eyes with running water for 15 minutes, while keeping the eyelids wide open. Consult with an ophthalmologist in all cases.	
Inhalation:	Remove subject from dusty environment. Consult with a physician in case of respiratory symptoms.	

#### **Regenesis - ORC Advanced MSDS**

Ingestion:	If the victim is conscious, rinse mouth and admnister fresh water. DO NOT induce vomiting. Consult a physician in all cases.
Skin Contact:	Wash affected skin with running water. Remove and clean clothing. Consult with a physician in case of persistent pain or redness.
Special Precautions:	Evacuate all non-essential personnel. Intervention should only be done by capable personnel that are trained and aware of the hazards associated with this product. When it is safe, unaffected product should be moved to safe area.
Specific Hazards:	Oxidizing substance. Oxygen released on exothermic decomposition may support combustion. Confined spaces and/or containers may be subject to increased pressure. If product comes into contact with flammables, fire or explosion may occur.

#### Section 9 – Accidental Release Measures

Precautions:	Observe the protection methods cited in Section 3. Avoid materials and products that are incompatible with product. Immediately notify the appropriate authorities in case of reportable discharge (> 100 lbs).
Cleanup Methods:	Collect the product with a suitable means of avoiding dust formation. All receiving equipment should be clean, vented, dry, labeled and made of material that this product is compatible with. Because of the contamination risk, the collected material should be kept in a safe isolated place. Use large quantities of water to clean the impacted area. See Section 12 for disposal methods.

Section 10 – Information on Toxicology		
Toxicity Data		
Acute Toxicity:	Oral Route, $LD_{50}$ , rat, > 2,000 mg/kg (powder 50%) Dermal Route, $LD_{50}$ , rat, > 2,000 mg/kg (powder 50%) Inhalation, $LD_{50}$ , rat, > 5,000 mg/m <sup>3</sup> (powder 35%)	
Irritation:	Rabbit (eyes), severe irritant	

#### **Regenesis - ORC Advanced MSDS**

Sensitization:		No data
Chronic Toxicity:		In vitro, no mutagenic effect (Powder 50%)
Target Effects:	Organ	Eyes and respiratory passages.

	Section 11 – Information on Ecology
Ecology Data	
	$10 \text{ mg Ca}(\text{OH})_2/\text{L: } \text{pH} = 9.0$
	$100 \text{ mg Ca}(\text{OH})_2/\text{L: } \text{pH} = 10.6$
Acute Exotoxicity:	Fishes, Cyprinus carpio, LC <sub>50</sub> , 48 hrs, 160 mg/L
	Crustaceans, Daphnia sp., EC <sub>50</sub> , 24 hours, 25.6 mg/L
	(Powder 16%)
Mobility:	Low Solubility and Mobility
	Water – Slow Hydrolysis.
	Degradation Products: Calcium Hydroxide
Abiotic Degradation:	Water/soil – complexation/precipitation. Carbonates/sulfates present at environmental concentrations.
	Degradation products: carbonates/sulfates sparingly soluble
<b>Biotic Degradation:</b>	NA (inorganic compound)
Potential for Bioaccumulation:	NA (ionizable inorganic compound)

Section 11 – Information on Ecology (cont)		
	Observed effects are related to alkaline properties of the product. Hazard for the environment is limited due to the product properties of:	
Comments:	No bioaccumulation	
	• Weak solubility and precipatation as carbonate or sulfate in an aquatic environment.	
	Diluted product is rapidly neutralized at environmental pH.	
Further Information:	NA	

Section 12 – Disposal Considerations		
Waste Disposal Method:	Consult current federal, state and local the proper disposal of this material and its	regulations regarding emptied containers.
Section 13 – Shipping/Transport Information		
D.O.T Shipping Name:	Oxidizing Solid, N.O.S [A mixture of Calcium OxyHydroxide [CaO(OH) <sub>2</sub> ] and Calcium Hydroxide [Ca(OH) <sub>2</sub> ].	
UN Number:	1479	
Hazard Class:	5.1	
Label(s):	5.1 (Oxidizer)	
Packaging Group:	II	
STCC Number:	4918717	
Section 14 – Other Information		
HMIS <sup>®</sup> Rating	Health – 2 Flammability – 0	Reactivity – 1 PPE - Required
HMIS <sup>®</sup> is a registered trademark of the National Painting and Coating Association.		
NFPA <sup>®</sup> Rating	Health – 2 Flammability – 0	Reactivity – 1 OX
NFPA <sup>®</sup> is a registered trademark of the National Fire Protection Association.		
Reason for Issue:	Update toxicological and ecological data	

#### **Section 15 – Further Information**

The information contained in this document is the best available to the supplier at the time of writing, but is provided without warranty of any kind. Some possible hazards have been determined by analogy to similar classes of material. The items in this document are subject to change and clarification as more information become available.