Prepared for

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# REDUCTIVE STABILIZATION OF CCA METALS BENCH TEST REPORT Former Collstrup Facility Hillerød, Denmark

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#### TABLE OF CONTENTS

1.	INTRODUCTION	1
	1.1 Study Objectives	
2.	BACKGROUND	
	<ul><li>2.1 Site Description.</li><li>2.2 Technology Description.</li></ul>	
3.	FIELD SAMPLING OF STUDY MATERIALS	6
	3.1 Soil Sampling	
4.	BENCH TEST METHODS	7
	<ul> <li>4.1 Batch Reactor/Microcosm Construction and Incubation.</li> <li>4.2 Treatments and Doses.</li> <li>4.3 Sampling and Analysis.</li> </ul>	7
5.	RESULTS	9
	<ul><li>5.1 Baseline Characterization</li><li>5.2 Abiotic Treatment</li><li>5.3 Biotic Treatment</li></ul>	9
6.	CONCLUSIONS AND RECOMMENDATIONS	21
7.	REFERENCES	22



#### LIST OF TABLES

Table 1: Baseline Characterization of Site Materials

Table 2: Geochemical Data for Reductive Sequestration Bench Tests

Table 3: Volatile Fatty Acids (VFAs) in Biotic Treatment of Reductive Sequestration Bench Tests

#### LIST OF FIGURES

Figure 1: Site Map with Hydrology and Extent of Contamination

Figure 2: Dissolved Metal Trends in Abiotic Treatment

Figure 3: Total Metal Trends in Abiotic Treatment

Figure 4: Dissolved Metal Trends in Biotic Treatment

Figure 5: Total Metal Trends in Biotic Treatment

#### LIST OF APPENDICES

Appendix A: COWI A/S Field Sampling Report

Appendix B: Analytical Reports

Appendix C: Collstrup CCA Bench-Scale Treatability Study Work Plan



#### 1. INTRODUCTION

This report presents the results of a laboratory bench test evaluation of reductive stabilization (also known as reductive sequestration) for treating chromium, copper, and arsenic (i.e., chromated copper arsenate [CCA] metals] in soil and groundwater at the former Collstrup wood treatment facility in Hillerød, Denmark (Site). Geosyntec Consultants Inc. (Geosyntec) performed the treatability test and wrote this report as an innovation project that was jointly funded by Geosyntec and the Capital Region of Denmark (CRD). COWI A/S collected Site soil and groundwater samples used in the bench test; COWI also assisted in the development of the conceptual site model (CSM) of CCA contamination impacts at the Site. CRD is evaluating the feasibility of a variety of technologies for remediating the Site, and the results of this treatability test are intended to provide a basis for determining the feasibility of reductive stabilization as remedial option for the Site.

CCA is used to treat wood to protect it against insect and fungi damage (Buchireddy et al., 2009). It is a highly acidic (pH 1-2) solution of salts (CrO<sub>3</sub> and CuO) and arsenic acid (H<sub>3</sub>AsO<sub>4</sub>) that is pressure-injected into the wood (Nielsen, 2013). Collstrup was once one of Denmark's largest wood impregnation companies with 13 operating facilities across the country. Estimates indicate that CCA-treated waste wood in Denmark increased from 17,000 tons in 1992 to 100,000 in 2010 (Christensen et al., 2006). Many of the former wood treatment sites in Denmark are heavily contaminated with organic and inorganic chemicals used in wood treatment, and have been either abandoned or left as brownfield sites that presently have not been remediated (Nielsen, 2013).

The reductive stabilization technology evaluated in the treatability test described herein represents a state-of-the-practice method for in situ treatment of CCA metals (arsenic, chromium, and copper) and other heavy metals. In 2014 CRD contracted Geosyntec to perform a literature review of state-of-the-practice technologies for treating CCA contamination. That review determined that reductive stabilization already has been demonstrated in published bench- and field-scale studies in the United States and is sufficiently mature for testing at the Site (Geosyntec, 2014).

The bench test was performed in accordance with a bench test work plan (Work Plan) prepared by Geosyntec (Geosyntec, 2015). The overall goal of this bench test was to evaluate the performance of the technology for treating CCA metals in soil and groundwater under Site-specific conditions and to assess its suitability for pilot testing at the Site. This report provides a brief description of the Site background, scientific and technical merits of reductive sequestration technology, the treatability study methods, results, and conclusions.

#### 1.1 Study Objectives

The bench tests were performed to evaluate the Site-specific performance of two different types of reducing agents and treatment processes: 1) Abiotic chemical reduction using calcium polysulfide and ferrous sulfate, and 2) biotic reduction using lactate and ferrous sulfate. The specific objectives of bench tests were:



- Measure the effectiveness of test amendments on treatment of CCA metals, and
- Identify the most effective treatment agent(s) for potential future pilot-scale tests.

#### 1.2 Report Organization

The remainder of this report is organized into the following sections:

- 2. *Background*: This section provides a brief summary of the conditions, extent of onsite contamination, and CSM for the Site. The section also provides an overview of the reductive sequestration technology.
- 3. *Field Sampling*: This section summarizes the methods employed to collect Site soil and groundwater samples used in the bench tests. A memorandum prepared by COWI A/S, which performed the field sampling activities, is included as **Appendix A**.
- 4. *Bench Test Methods*: This section includes a brief description of construction and operation of test reactors, and collection and analysis of samples. Analytical reports are provided as **Appendix B**.
- 5. *Study Results*: The discussion in this section focuses on the analysis of test results for each of the two treatments and includes a description of concentration trends of CCA metals as well as their overall percent removal.
- 6. *Conclusions*: This section presents the overall conclusions that were drawn based on the test results for both abiotic and biotic treatments. In the discussion, the performance of the two treatments across the different CCA metals is compared to evaluate the feasibility of reductive sequestration.
- 7. *References*: Included here are citations of the Site-related documents and peer-reviewed literature used in preparation of this report.



#### 2. BACKGROUND

The following sub-sections present a brief description of the Site conditions and the reductive sequestration technology.

#### 2.1 Site Description

The Site is located in Hillerød, Denmark, adjacent to Esrum Lake. The Site is owned by the Danish EPA (Forest and Nature Agency) and is not currently in use. The property covers a 73,000 square meters (m²) (7 hectares) area, is fenced to prevent public access, and is largely overgrown with vegetation and trees (**Figure 1**). From 1936 to 1976, the Site was used as a facility for processing and treatment of wood lumber. During certain periods in its operational history, wood at the Site was pressure-treated with CCA. The abundant use of CCA at the Site resulted in extensive impacts of arsenic (As), chromium (Cr), and copper (Cu) in soils and groundwater (Nielsen, 2013). As is the primary metal of concern, and an estimated 35 to 44 tons of As remain within waste bark/mulch on the ground surface, soil, and groundwater at the Site. The majority of As mass occurs in the soils above the water table, within 0.5 meters (m) below ground surface (bgs).

The shallow geology at the Site mainly consists of fluvial sediments with some clay interlayering occurring from 0 to 5 m bgs. Rainwater infiltration has mobilized vertical spreading of CCA contamination, with significant concentrations of As occurring down to 4 m bgs. A perched water table occurs between 3 to 5 m bgs. A clay till layer that occurs between 5 to 20 m bgs is believed to serve as an aquitard or a partial barrier that limits vertical migration of CCA contamination (Nielsen et al., 2011; Danish EPA, 2011). A secondary aquifer (upper sand layer) occurs beneath the clay till at depths ranging from 20 to 40 m bgs; data indicate that contamination in this layer is relatively low.

#### 2.2 Technology Description

Reductive stabilization consists of applying simple organic and/or inorganic chemicals to soil/groundwater to create strongly anaerobic conditions that reduce the redox states of CCA metals and precipitate (immobilize/stabilize) the reduced metals as metal-sulfides and metal-hydroxides. Abiotic reagents such as sulfide and polysulfide salts have been widely used to treat sites contaminated with metal contaminants (USEPA, 2011). In accordance with thermodynamic chemical equilibrium relationships, As(III) and Cu(II) in the presence of sulfides and polysulfides precipitate as metal-sulfide solids, thereby reducing the aqueous-phase concentration, metal mobility and bioavailability (Petersen and Hedquist, 2006; Zawislanski et al. 2010).

Microorganisms are known to directly or indirectly cause reductive transformation of metal species through redox reactions, including reduction of Cr(VI) to Cr(III) and As(V) to As(III) (Waybrant et al., 2002; USEPA, 2000). In situ biosequestration consists of amending the subsurface environment with simple, fermentable organic electron donors (lactate, methanol, etc.) and sulfate to stimulate microbial activity and create sulfate-reducing conditions leading to the formation of metal-sulfide and -polysulfide solids. Sulfate-reducing bacteria utilize sulfate as



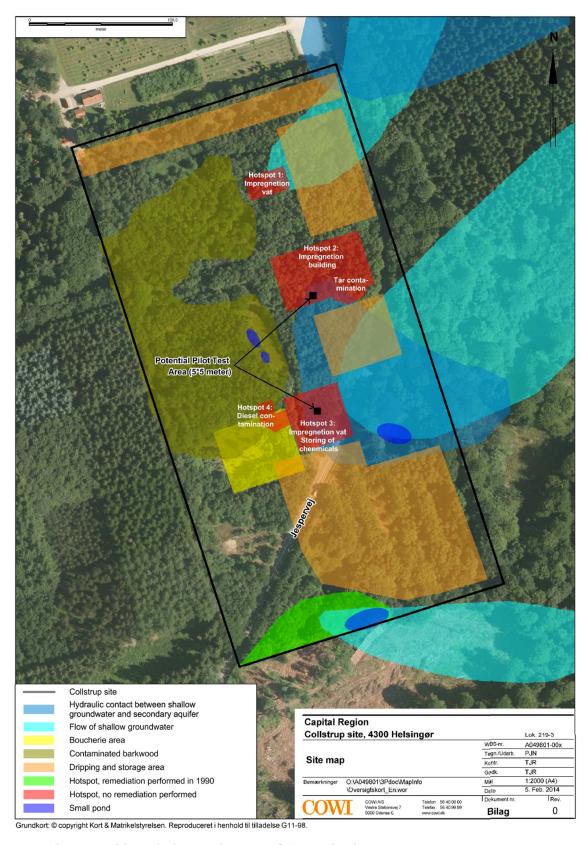


Figure 1. Site Map with Hydrology and Extent of Contamination



the electron acceptor leading to the formation of sulfide species. Numerous studies have shown that under these conditions Cr(VI) and As(V) reductively precipitate to Cr(III) and  $As_2S_3(s)$  respectively while Cu precipitates as CuS(s) (e.g., Blowes et al., 2000; Mulligan et al., 2001; Deflaun et al., 2009).

As noted in Section 1.1, this treatability test evaluated the treatment performance of two methods for precipitating/immobilizing CCA metals: 1) abiotic chemical reduction/sequestration (using calcium polysulfide and ferrous sulfate) and 2) biotic reduction/stabilization (using lactate and ferrous sulfate). Although the mechanisms for metal reduction differ slightly between the two methods, in general the reaction end product for the two methods is the same — reduced CCA metals precipitated as metal-sulfide and metal-hydroxide complexes.



#### 3. FIELD SAMPLING OF STUDY MATERIALS

In March 2015, COWI A/S collected Site geologic core material and groundwater samples that were used to construct the bench test reactors. Based on historic and recent Site data on CCA metal concentrations along with vegetation and monitoring well conditions observed during a pre-sampling Site visit, Hotspot 1 area (**Figure 1**) was identified for the collection of Site materials. The following sub-sections briefly describe the investigation methods and procedures that were used to collect field samples. A memorandum prepared by COWI A/S also presents a summary of the field sampling approach and methodology (see **Appendix A**).

#### 3.1 Soil Sampling

Composite samples of shallow surface and subsurface geologic material were collected using a hand auger from four locations in Hotspot 1 area (**Figure 1 in Appendix A**) up to depth of 0.3 m bgs. The samples were homogenized in the field and collected in Rilsan bags. The bags were stored on ice in the field prior to sample shipment.

#### 3.2 **Groundwater Sampling**

Groundwater was collected at a depth of 0.5 - 1.8 m bgs from an existing onsite well in the Hotspot 1 area proximal to where the soils samples were collected. The groundwater was retrieved using low-flow/minimal drawdown purge methods with a submersible pump. After purging three well volumes, the groundwater for the treatability test was collected in clean and sterile HDPE bottles and stored on ice in the field prior to sample shipment. Subsequently, the samples of geologic material and groundwater were express-shipped under chain-of-custody to Geosyntec's laboratory in Knoxville, Tennessee, where the treatability tests were performed.



#### 4. BENCH TEST METHODS

Details regarding the bench test design, treatment dosages, sampling schedule, and analyses were previously described in the Bench Test Work Plan (Geosyntec, 2015; **Appendix C**). The bench test was performed in accordance with the Work Plan, with a few exceptions described below. The sub-sections below summarize the laboratory methods utilized in implementing the bench tests.

#### 4.1 <u>Batch Reactor/Microcosm Construction and Incubation</u>

Prior to initiation of the tests, identical control and treatment reactors were constructed using conical-bottom polypropylene / HDPE bottles comprising of 50 g of Site geologic material and 200 mL of Site groundwater. The untreated control reactors did not receive any amendments and served as the experimental controls against which the effects of the chemical and biological treatments were measured. After addition of amendments to start the tests, the reactors were capped and incubated under anaerobic conditions on a rotary shaker at room temperature (~22°C) for the duration of the period.

#### 4.2 <u>Treatments and Doses</u>

The bench testing of in situ reductive stabilization involved two separate treatments; the abiotic treatment with calcium polysulfide and ferrous sulfate, and the biotic treatment with lactate and ferrous sulfate. The dosing concentrations of the amendments for the two treatments were determined based on the background concentration of the CCA metals determined during the baseline characterization. The dosing concentrations incorporated the stoichiometric requirements along with a safety factor for demand by non-target constituents in the Site materials.

Abiotic Reactors: Initially, each reactor in the abiotic treatment was amended with Calamet® (24-29% calcium polysulfide solution) and 1M ferrous sulfate solution to achieve a desired dose of 400 mg/L calcium polysulfide and 1 g/L ferrous sulfate, respectively. While reducing conditions were quickly reached with this dosage, the conditions did not achieve the target redox level for the sulfate-sulfide redox regime (i.e. oxidation reduction potential (ORP) < -100 mv). Consequently, a new set of treatment reactors were prepared for the study in which the reactors were titrated with the Calamet® solution amendments until the ORP exceeded -100 mv. The reactors were buffered using sodium bicarbonate and pH was adjusted to near neutral. The final dosage of calcium polysulfide and ferrous sulfate was about 1.68 g/L and 1 g/L, respectively.

Biotic Reactors: Each reactor was initially amended with 10 g/L sodium lactate and 1M ferrous sulfate solution to achieve a desired dose of 30 mg/L lactate and 2 g/L ferrous sulfate. The biotic reactors were titrated with 1M (84 g/L) sodium bicarbonate to adjust pH to near neutral, resulting in a final concentration of sodium bicarbonate of 0.046 M (3.86 g/L). Since the desired redox potential was not achieved during incubation, the lactate dose was sequentially increased to 180 mg/L. Additionally, in order to achieve the desired sulfate-reducing conditions, the reactors were bioaugmented on two separate events- once with sulfate-reducing bacteria isolated and enriched



from creek sediments and a second time with anaerobic digester sludge from a municipal wastewater treatment plant in Knoxville, Tennessee.

#### 4.3 **Sampling and Analysis**

An initial baseline characterization of the Site geologic material and groundwater was conducted to establish background geochemical conditions and concentrations of CCA metals. During each sampling event, reactors from each treatment and control (as needed) were uncapped and sacrificed to collect geologic material and groundwater in laboratory provided bottles. Aqueous samples for dissolved metals analysis were filtered using a 0.45 micrometer (µm) syringe filter and preserved with nitric acid prior to analysis. The solids were analyzed for total metals (U.S. EPA method SW-846 3051/6020) whereas the aqueous samples were analyzed for dissolved metals (ICP-MS), volatile fatty acids (GC-MS), anions (U.S.EPA method 9056), hexavalent Cr (U.S.EPA method 7196) and geochemical parameters (temperature, pH, ORP, and dissolved oxygen). The sample analysis were performed externally by TestAmerica, Inc., a certified commercial laboratory that utilizes U.S.EPA approved standard analytical methods and QA/QC procedures. Volatile fatty acids analyses were performed internally by Geosyntec's SiREM laboratory in Guelph Ontario.



#### 5. RESULTS

This section presents a summary and analysis of the analytical data provided in the TestAmerica and SiREM reports (**Appendix B**). The discussion of experimental results focuses primarily on the behavior of the CCA metals observed in the two treatments. **Figures 2** and **3** depict the CCA metal concentration trends in the abiotic treatment while **Figures 4** and **5** depict the CCA metal concentration trends in the biotic treatment.

#### 5.1 <u>Baseline Characterization</u>

The baseline characterization of the Site soil and groundwater was conducted to establish the background concentrations of the CCA metals prior to initiation of the bench tests. These baseline concentrations served as the time zero data for the bench tests. Both filtered and unfiltered samples of the Site groundwater were analyzed for metals in order to evaluate the contribution of suspended solids to the CCA metal concentrations. The results of the baseline characterization are provided in **Table 1**. The groundwater results indicated that As was the dominant of the CCA metals, with its concentration being over an order of magnitude greater than that of Cu and over two orders of magnitude greater than that of Cr. Cr speciation in filtered samples indicated that total dissolved Cr comprised 30% Cr(VI) with the rest being Cr(III), presumably as soluble Cr(III)-inorganic or -organic complexes. For all analyzed metals, the difference between the dissolved and total metal concentration was < 20%, suggesting that the effect of suspended solids on metal concentrations was negligible. Therefore, the aqueous samples in the bench test were analyzed only for dissolved metals. The groundwater also contained appreciable amounts of nitrate and sulfate, indicating that baseline redox conditions in the groundwater were relatively oxidizing.

The total metal concentrations in soils include both the sorbed and the solid metal species. These results for Site soils showed that Cu was the dominant CCA metal in the soils followed by As and Cr. The soil samples were rich in Fe, with Fe concentrations being greater than three times that of Cu and As. Overall, CCA metal concentrations observed in the baseline characterization were consistent with those observed during other recent monitoring activities at the Site.

#### 5.2 Abiotic Treatment

In the initial treatment, in which the test reactors were amended with 400 mg/L calcium polysulfide and 1 g/L ferrous sulfate, significant reductions in the aqueous concentrations of CCA metals were evident within 24 hours of the treatment as shown in the table below.

Dissolved Metals in Groundwater in Abiotic Treatment with 0.4 g/L Calcium Polysulfide and 1 g/L Ferrous Sulfate								
Sample ID Time As Cr Cr(VI) Cu Fe Nitrate Sulfate (hours) (mg/L) (mg/L) (mg/L) (mg/L) (mg/L) (mg/L) (mg/L) (mg/L)								
<b>Control Samples</b>								
C-1-1* 24 34 5.18 0.014 36.5 135 1.57 13.3								
C-2-1*	48	22.9	2.61	0.005	18.9	71	1.56	14.9



Dissolved Metals i	Dissolved Metals in Groundwater in Abiotic Treatment with 0.4 g/L Calcium Polysulfide and 1 g/L Ferrous Sulfate									
Sample ID	Time (hours)	As (mg/L)	Cr (mg/L)	Cr(VI) (mg/L)	Cu (mg/L)	Fe (mg/L)	Nitrate (mg/L)	Sulfate (mg/L)		
Treatment Samples										
A-1-1	24	0.026	0.061	0	0.070	788	2.04	2730		
A-1-2	24	0.222	0.061	0.037	0.188	840	2.09	2440		
Average	24	0.124	0.061	0.019	0.129	814	2.07	2585		
A-2-1	48	0.231	0.659	0.049	9.69	681	1.25	2870		
A-2-2	48	0.094	0.644	0.036	7.44	745	1.2	2920		
Average	48	0.162	0.652	0.043	8.57	713	1.23	2895		

Total Metals in Solids in Abiotic Treatment with 1.68 g/L Calcium Polysulfide and 1 g/L Ferrous Sulfate									
Sample ID	Time (days)	As (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)				
Control Samples									
C-1-1*	24	243	47.2	354	1790				
C-2-1*	48	138	31.1	237	1820				
Treatment Samples									
A-1-1	24	494	67	640	3630				
A-1-2	24	401	73.1	579	4550				
Average	24	448	70.1	610	4090				
A-2-1	48	387	67.7	525	3710				
A-2-2	48	271	48.1	350	2630				
Average	48	329	57.9	438	3170				

The blue text denotes a non-detect where the value is considered as 1/2 reporting limit

As - arsenic; Cr - chromium; Cr(VI) - hexavalent Cr; Cu - copper; Fe - iron; mg/L - milligram per liter

However, the desired redox conditions were not achieved in these reactors (**Table 2**). Therefore, new test reactors were constructed where the dosage of calcium polysulfide was increased to 1.68 g/L upon titration of the reactors with the amendment. As can be seen in the table below, the aqueous concentrations of CCA metals in these new reactors declined rapidly to at or below detection levels within the first four hours of the treatment period (**Figure 2**). In comparison to the baseline concentrations and those observed in the controls, As concentrations decreased by over two orders of magnitude while Cr concentrations decreased by over an order of magnitude. Cr speciation analysis showed that Cr(VI) concentration reduced from baseline levels to at or below detection levels (0.01 mg/L) in both control and the treatment reactors. For the remainder of the 14-day test duration, the aqueous concentrations of the CCA metals stayed mostly at or below detection levels with only few sporadic instances of trace level detections.

<sup>\*</sup> Initial control for abiotic treatment with 400 mg/L calcium polysulfide and 1 g/L ferrous sulfate; 5x higher dilution used in comparison to treatment reactors for As and Cu analysis



Dissolved Metals in Groundwa	ter in Abi		nent with Sulfate	1.68 g/L C	Calcium Po	lysulfide a	and 1 g/L	Ferrous
Sample ID	Time (hours)	As (mg/L)	Cr (mg/L)	Cr(VI) (mg/L)	Cu (mg/L)	Fe (mg/L)	Nitrate (mg/L)	Sulfate (mg/L)
Control Samples								
Abiotic_Control_050615#	4	3.07	0.126	0.005	0.919	3.39	1.61	12.3
Abiotic Control_051315#	168	4.86	0.041	0.005	0.293	0.063	1.16	9.05
Treatment Samples								
Abiotic_4hr_050615	4	0.01	0.01	0.005	0.01	903	1.5	3120
Abiotic_4hr_Dup_050615	4	0.01	0.01	0.005	0.01	946	1.5	3090
Average	4	0.01	0.01	0.005	0.01	925	1.5	3105
Abiotic_8hr_050615	8	0.01	0.01	0.005	0.01	833	1.77	3040
Abiotic_8hr_Dup_050615	8	0.01	0.01	0.005	0.01	918	1.72	3150
Average	8	0.01	0.01	0.005	0.01	876	1.75	3095
Abiotic_24HR_05072015	24	0.21	0.01	0.005	0.087	813	1.62	3070
Abiotic_24HR_DUP_05072015	24	0.01	0.01	0.005	0.01	921	1.73	3240
Average	24	0.11	0.01	0.005	0.049	867	1.68	3155
Abiotic_48HR_050815	48	0.148	0.01	0.005	0.01	882	1.36	3170
Abiotic_48HR_DUP_050815	48	0.01	0.01	0.005	0.01	893	1.43	3140
Average	48	0.079	0.01	0.005	0.01	888	1.40	3155
Abiotic_Day 7_051315	168	0.027	0.001	5	0.008	828	1.09	3130
Abiotic_Day 7_Dup_051315	168	0.023	0.005	0.005	0.005	739	1.14	3150
Average	168	0.025	0.003	2.503	0.007	784	1.12	3140
Abiotic_Day 14_052015	336	0.027	0.01	5	0.026	821	1.87	3180
Abiotic_Day 14_Dup_052016	336	0.029	0.01	0.005	0.028	851	0.61	3150
Average	168	0.028	0.01	2.503	0.027	836	1.24	3165

The blue text denotes a non-detect where the value is considered as  $\frac{1}{2}$  reporting limit \*Reestablished control for abiotic treatment with 1.68 g/L calcium polysulfide and 1 g/L ferrous sulfate As - arsenic; Cr - chromium; Cr(VI) - hexavalent Cr; Cu - copper; Fe - iron; mg/L - milligram per liter

As shown in the table below, total concentrations of CCA metals in the abiotic treatment solids increased in comparison to the total metal concentrations observed in the baseline characterization and in the control reactors (**Figure 3**). This increase in the solid-phase concentration of the CCA metals is indicative of CCA metal removal via reductive precipitation. Under anaerobic conditions in the presence of sulfide and polysulfide, aqueous As and Cu species are known to precipitate as metal sulfide (AsS, As<sub>2</sub>S<sub>3</sub>, CuS) solids while Cr(VI) is reduced to Cr(OH)<sub>3</sub> precipitates. The predominance of such conditions in the test reactors is indicated by the negative ORP and low DO values (**Table 2**). Based on the aqueous and solid phase concentrations of the CCA metals and the geochemical data (**Table 2**), it appears that such reductive sequestration processes were dominant in the abiotic treatment reactors. Overall, the

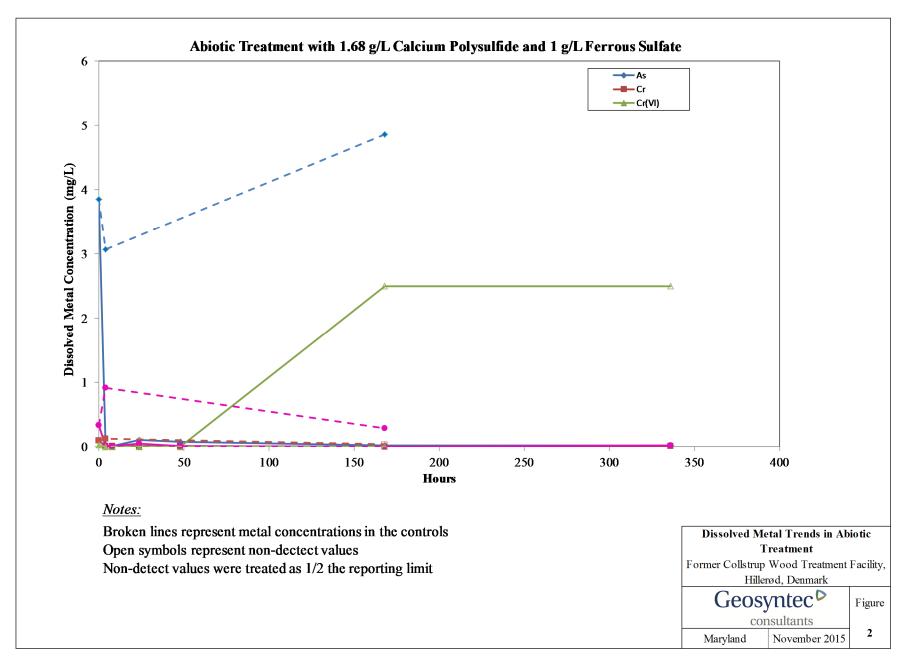


abiotic treatment achieved greater than 90% removal of CCA metals from the aqueous phase within the first four hours of the treatment period.<sup>1</sup>

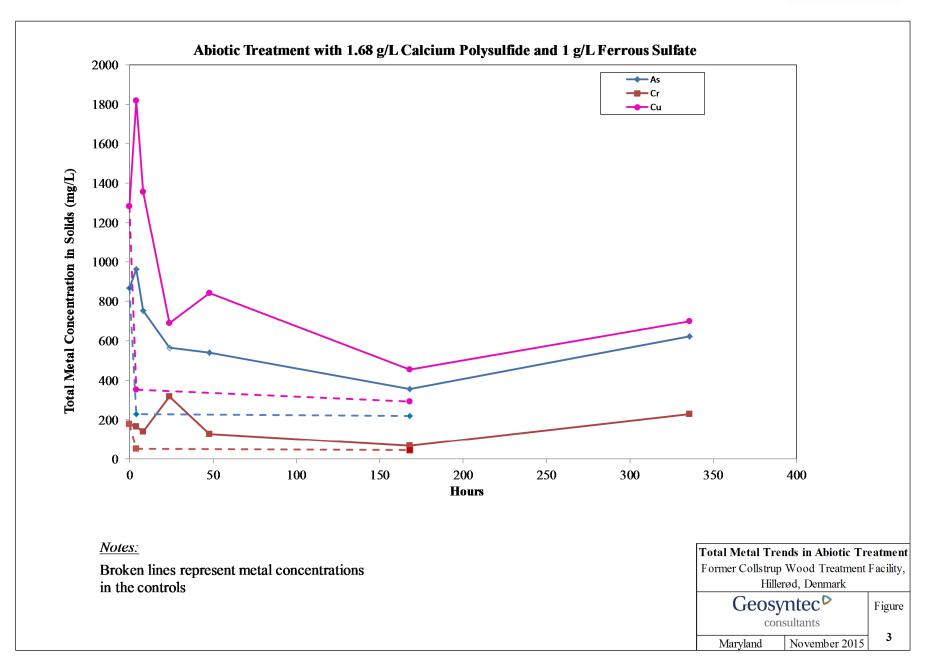
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<sup>&</sup>lt;sup>1</sup> It should be noted that, as indicated in Figure 2 and the table above (page 11), Cr(VI) reporting/detection limits used by the external laboratory (TestAmerica) for the treatment samples changed between early time (0 − 50 hours) and late time (> 100 hours) during the course of the test. Although it would have been ideal if the reporting/detection limits had remained constant throughout the course of the test, this was not possible due to TestAmerica's sample handling procedures and requirements for sample dilution. Regardless, the Cr(VI) concentrations in the treatment were non-detect after the four hour sample.











C 1 ID	Time	As	Cr	Cu	Fe
Sample ID	(hours)	(mg/Kg)	(mg/Kg)	(mg/Kg)	(mg/Kg)
Control Samples					
Abiotic_Control_050615#	4	229	51.5	354	1960
Abiotic Control_051315#	168	221	46	293	1620
Treatment Samples					
Abiotic_4hr_050615	4	1160	211	2290	8580
Abiotic_4hr_Dup_050615	4	769	120	1350	5220
Average	4	965	166	1820	6900
Abiotic_8hr_050615	8	276	48.9	364	3110
Abiotic_8hr_Dup_050615	8	1230	233	2350	8480
Average	8	753	141	1357	5795
Abiotic_24HR_05072015	24	344	62.5	634	3960
Abiotic_24HR_DUP_05072015	24	786	574	747	4070
Average	24	565	318	691	4015
Abiotic_48HR_050815	48	334	62.2	403	3550
Abiotic_48HR_DUP_050815	48	746	194	1280	5910
Average	48	540	128.1	842	4730
Abiotic_Day 7_051315	168	311	62.6	459	3110
Abiotic_Day 7_Dup_051315	168	400	73.3	451	3690
Average	168	356	67.95	455	3400
Abiotic_Day 14_052015	336	887	340	1000	6000
Abiotic_Day 14_Dup_052016	336	362	121	402	3380
Average	336	625	231	701	4690

#### **5.3** Biotic Treatment

In the biotic treatment reactors, the initial dose of 30 mg/L lactate and 2 g/L ferrous sulfate resulted in decreases in aqueous As and Cr concentrations to levels at or near the detection limits (0.002 mg/L) within 13 days of the treatment period (refer to the table below). In comparison to the control and baseline concentrations, average aqueous As concentrations decreased by over two orders of magnitude whereas average aqueous Cr concentrations decreased by over an order of magnitude. Cr(VI) concentrations were reduced to at or below detection limits and it remained at this level for the remainder of the treatment period. The initial treatment dose, however, did not influence Cu removal and did not result in sulfate-reducing conditions as evidenced by the geochemical data (**Table 2**) and the substantial presence of sulfate in the reactors. Consumption of lactate early in the treatment period appeared to correlate with decline in nitrate concentrations, suggesting that indigenous bacteria were utilizing nitrate as the preferential electron acceptor instead of sulfate. Therefore, the lactate dose was sequentially increased to 180

December 2015

<sup>\*</sup>Reestablished control for abiotic treatment with 1.68 g/L calcium polysulfide and 1 g/L ferrous sulfate As - arsenic; Cr - chromium; Cr(VI) - hexavalent Cr; Cu - copper; Fe - iron; mg/L - milligram per liter



mg/L to stimulate native bacteria to create sulfate-reducing conditions conducive for metal sulfide precipitation, especially for removal of Cu and As. The VFAs analysis results (**Table 3**) show that even though excess donor was present in the reactors, the indigenous organisms were not able to utilize sulfate as the electron acceptor and reduce it to sulfide.

Sample ID	Time (days)	As (mg/L)	Cr (mg/L)	Cr(VI) (mg/L)	Cu (mg/L)	Fe (mg/L)	Nitrate (mg/L)	Sulfate (mg/L)
Control Samples	(uays)	(IIIg/L)	(IIIg/L)	(IIIg/L)	(IIIg/L)	(IIIg/L)	(mg/L)	(mg/L)
Biotic Control_050615	13	7.94	0.164	0.032	1.32	4.44	1.53	15.7
Control_073015	98	88	10.6	0.014	93.6	218	1.66	30.8
Control_091715	147	13.3	0.158	0.014	1.58	2.72	1.44	20.5
Treatment Samples	l	l	l	<u> </u>	I	<u> </u>		
Biotic Dup_050615	13	0.005	0.005	0.005	0.49	111	1.41	2350
Biotic_050615	13	0.012	0.005	0.005	3.48	3.18	1.46	2350
Average	13	0.008	0.005	0.005	1.97	57.1	1.44	2350
Biotic_051315	20	0.005	0.001	0.005	0.694	98.8	1.23	2810
Biotic_Dup_051315	20	0.005	0.001	0.005	0.273	204	1.14	2820
Average	20	0.005	0.001	0.005	0.484	151	1.19	2815
Biotic_071315	81	19	0.057	0.005	2.55	4.68	0.05	2370
Biotic_Dup_071315	81	15.4	0.013	0.005	1.68	0.27	0.05	2250
Average	81	17.2	0.035	0.005	2.12	2.47	0.05	2310
Biotic_072315	91	24.6	0.0231	0.005	2.61	0.281	0.05	2200
Biotic_Dup_072315	91	21.5	0.0203	0.005	2.2	0.233	0.05	2280
Average	91	23.1	0.022	0.005	2.41	0.257	0.05	2240
Biotic_081115	110	32.7	0.05	0.05	2.59	0.625	0.05	2410
Biotic_Dup_081115	110	27.6	0.05	0.005	3.39	0.625	0.05	2440
Average	110	30.2	0.05	0.028	2.99	0.625	0.05	2425
Biotic_091715	147	22.9	0.067	0.005	0.44	2.52	0.118	1750
Biotic_Dup_091715	147	16.1	0.024	0.005	0.06	0.333	0.117	1950
Average	147	19.5	0.046	0.005	0.25	1.43	0.118	1850
Biotic_100815 <sup>&amp;</sup>	168	46.8	4.28	0.005	35.4	322	0.198	1970
Biotic_Dup_100815 <sup>&amp;</sup>	168	13.8	0.83	0.005	6.43	52.7	0.5	1670
Average	168	30.3	2.55	0.005	20.9	187	0.35	1820

#### *Notes:*

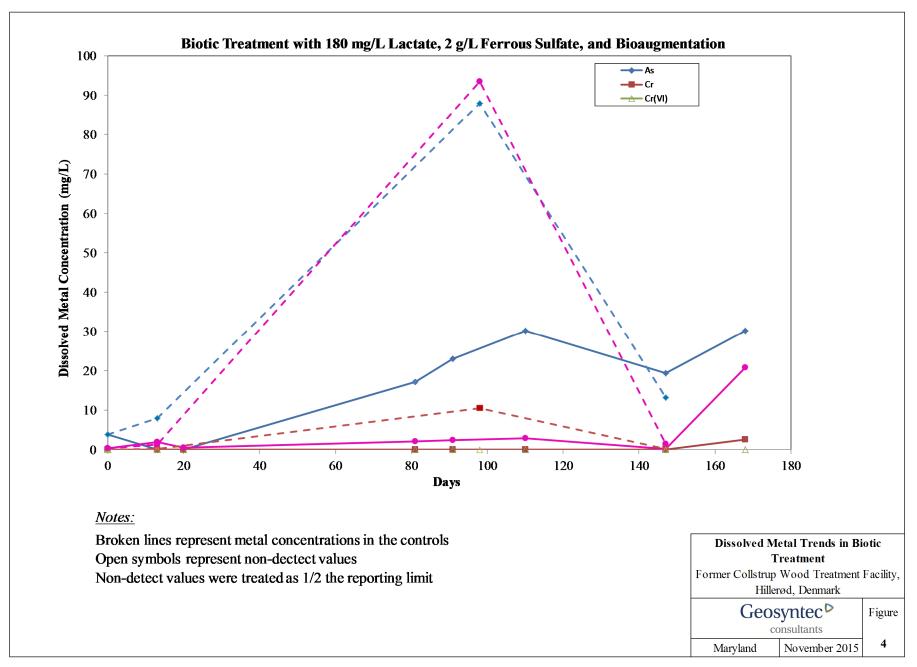
The blue text denotes a non-detect where the value is considered as 1/2 reporting limit

As - arsenic; Cr - chromium; Cr(VI) - hexavalent Cr; Cu - copper; Fe - iron; mg/L - milligram per liter

<sup>^</sup> Initially 30 mg/L of lactate added on 4/30/15; Additional 30 mg/L of lactate added on 5/13/15; 60 mg/L added on 6/4/15, and 60 mg/L added on 6/8/15.

<sup>&</sup>amp;Samples were filtered by the external laboratory







In order to establish sulfate-reducing conditions, the reactors were bioaugmented with enrichments of sulfate-reducing bacteria that were isolated from creek sediments. Since this bioaugmentation attempt also was not successful in achieving the desired redox conditions, the reactors subsequently were bioaugmented with anaerobic sludge from wastewater treatment plant. After the second bioaugmentation, the ORP in the bioaugmented reactors decreased to levels typical of sulfate reducing conditions (**Table 2**). However, the sulfate concentrations in the reactors remained fairly stable. One plausible explanation for the lack of sulfate reducing activity in the treatment reactors is the preferential use of nitrate and oxidized Fe species as electron acceptors by the native microorganisms. After 20 days in the treatment period, the increased lactate dose caused increases in aqueous concentration of CCA metals (Figure 4), suggesting the release of sorbed species from the Site matrix. This increase in As and Cu concentration may have inhibited the activity of sulfate-reducing bacteria. Studies have shown that aqueous Cu concentrations at levels similar to those observed in this study cause an inhibitory effect on the activity of sulfate- and nitrate-reducing bacteria (Sani et al., 2001; Utgikar, et al., 2001; Utgikar, et al., 2003; Ochoa-Herrera et al., 2011).

The total concentrations of CCA metals in the biotic treatment solids (refer to the table below) decreased overall during the treatment period in comparison to the total metal concentrations observed in the baseline characterization and control reactors. This decline in total metal concentrations combined with the increase in aqueous metal concentrations is indicative of the release of sorbed species (or solubilization of previously solid phases) from the solid matrix under the test conditions. It is possible that organic ligands (e.g., natural organic matter) in the municipal wastewater that was used for bioaugmentation also may have been a factor in the solubilization of CCA metals in the treatment.

Total Metals in Solids in Biological Treatment with 180 mg/L Lactate, 2 g/L Ferrous Sulfate, and Bioaugmentation^									
Sample ID	Time (days)	As (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)				
Control Samples	·								
Biotic Control_050615	13	254	48.4	324	1450				
Control_073015	98	142	36.2	314	1020				
Control_091715	147	214	85.9	347	1650				
Treatment Samples				•					
Biotic Dup_050615	13	725	152	1350	8240				
Biotic_050615	13	430	172	690	4100				
Average	13	578	162	1020	6170				
Biotic_051315	20	249	45.6	305	5020				
Biotic_Dup_051315	20	1400	88.9	1700	12600				
Average	20	825	67.3	1003	8810				
Biotic_071315	81	256	47	392	3180				
Biotic_Dup_071315	81	166	30.6	233	2130				
Average	81	211	38.8	313	2655				
Biotic_072315	91	198	45.7	233	3210				

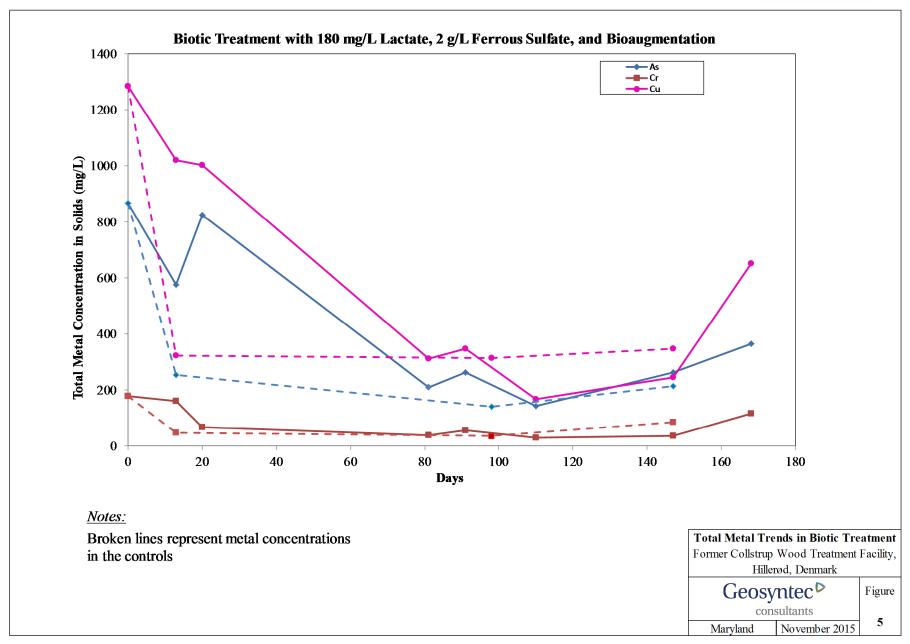


Total Metals in Solids in Biological Treatment with 180 mg/L Lactate, 2 g/L Ferrous Sulfate, and Bioaugmentation^									
Sample ID	Time (days)	As (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)				
Biotic_Dup_072315	91	327	65.6	462	4470				
Average	91	263	55.7	348	3840				
Biotic_081115	110	150	30.3	171	1950				
Biotic_Dup_081115	110	136	31.2	163	1990				
Average	110	143	30.8	167	1970				
Biotic_091715	147	156	28.2	163	2160				
Biotic_Dup_091715	147	371	45.6	326	3240				
Average	147	264	36.9	245	2700				
Biotic_100815	168	330	182	1100	3380				
Biotic_Dup_100815	168	400	53.1	202	2310				
Average	168	365	118	651	2845				

As - arsenic; Cr - chromium; Cr(VI) - hexavalent Cr; Cu - copper; Fe - iron; mg/L - milligram per liter

 $<sup>^{\</sup>wedge}$  Initially 30 mg/L of lactate added on 4/30/15; Additional 30 mg/L of lactate added on 5/13/15; 60 mg/L added on 6/4/15, and 60 mg/L added on 6/8/15.







#### 6. CONCLUSIONS AND RECOMMENDATIONS

The main objective of the bench tests was to assess the effectiveness of chemical and biological treatments to achieve in situ reductive stabilization of CCA metals in the Site matrix. The abiotic treatment with calcium polysulfide and ferrous sulfate was very effective in rapidly removing the CCA metals from the aqueous phase. Within the first four hours of the abiotic treatment period, the aqueous concentration of CCA metals including Cr(VI) approached at or below the detection levels. The removal of CCA metals from the aqueous phase was attributable to the reductive precipitation of metal sulfide solids as evident by the increase in total metal concentrations in the solid phase. Overall, dissolved As concentrations decreased by over two orders of magnitude while Cr and Cu decreased by over an order of magnitude in the abiotic treatment. Based on the results of this bench test, the abiotic treatment appears to exhibit significant promise for the in situ reductive stabilization of CCA metals at Hotspot area 1 and is therefore recommended for pilot-scale testing.

The biotic treatment with lactate and ferrous sulfate achieved an initial significant decrease in dissolved As and Cr concentrations; however, sulfate-reducing conditions were not established in the reactors even after increasing the lactate dose by six-fold and bioaugmenting the reactor twice, once with enrichments of sulfate-reducing bacteria from creek sediments and the second time with anaerobic sludge from wastewater treatment plant. Later in the treatment period, the biotic treatment appeared to result in the release of sorbed CCA metal species from the solid matrix in the test reactors. The lack of sulfate-reducing activity in the biotic treatment reactors was likely attributable to the inhibition of native organisms by high dissolved metal concentrations (e.g., Cu) or the presence of organic ligands in the municipal wastewater used to bioaugment the reactors.

While not included in the limited scope (and budget) for this study, additional analysis of As speciation, Fe(II), and heavy metals (other than CCA metals), and solid phase measurements of acid volatile sulfides (AVS) and simultaneously extracted metals (SEM) would further enable elucidation of mechanisms underlying the CCA metal behavior observed in the biotic treatment reactors and allow for determination of inhibitory agents in the Site materials. Moreover, additional long-term bench tests are recommended to assess the in situ stability of the precipitated metal sulfide solids (those formed by either abiotic or biotic treatment) under varying redox conditions, including re-aeration of previously anoxic conditions.



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# **TABLES**

#### Table 1. Baseline Characterization of Site Materials Former Collstrup Wood Treatment Facility Hillerød, Denmark

#### **Groundwater Analysis - Unfiltered**

Client Sample ID	Total As	Total Cr	Total Cu	Total Fe
Chefit Sample ID	(mg/L)	(mg/L)	(mg/L)	(mg/L)
Baseline GW	4.44	0.093	0.326	1.08
Baseline GW-Dup	4.12	0.090	0.314	0.92
Average	4.28	0.091	0.320	1

#### **Groundwater Analysis -Filtered**

Client Sample ID	Dissolved As (mg/L)	Dissolved Cr (mg/L)	Dissolved Cr(VI) (mg/L)	Dissolved Cu (mg/L)	Dissolved Fe (mg/L)	Nitrate (mg/L)	Sulfate (mg/L)
Baseline GW	3.84	0.1	0.032	0.329	1.17	1.29	5.73
Baseline GW-Dup	3.87	0.104	0.03	0.351	1.19	1.28	5.97
Average	3.855	0.102	0.031	0.34	1.18	1.29	5.85

#### **Soil Analysis**

Don marysis				
Client Sample ID	As (mg/Kg)	Cr (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)
Baseline Soil	731	155	1120	4490
Baseline Soil-Dup	624	123	885	3350
Average	678	139	1003	3920
Dry weight basis considering 78% solids based on %solids in test samples	869	178	1285	5026

#### Notes:

As - arsenic

Cr - chromium; Cr(VI) - hexavalent Cr

Cu - copper

Fe - iron

mg/L - milligram per liter

mg/Kg - milligram per kilogram

Table 2. Geochemical Data for Reductive Sequestration Bench Tests
Former Collstrup Wood Treatment Facility
Hillerød, Denmark

Sample ID	Time (hours)	ORP (mV)	DO (mg/L)	pН	Temp (°C)
<b>Controls for Abiotic Treatment</b>					
C-1-1*	24	162.8	9.35	5.99	21.5
C-2-1*	48	154	NM	6.31	NM
Abiotic_Control_050615#	4	NM	NM	NM	NM
Abiotic Control_051315#	168	120	8.32	5.96	21.5
Abiotic Treatment with 400 mg/I	1				
A-1-1	24	185.1	6.63	4.19	22
A-1-2	24	217.2	6.83	3.77	21.5
Average	24	201.15	6.73	3.98	21.75
A-2-1	48	258.3	3.4	3.75	23
A-2-2	48	248.6	3.5	3.59	22
Average	48	253.45	3.45	3.67	22.5
Abiotic Treatment with 1.68 g/L	Calcium Polysu		Z/L Ferrous S		
Abiotic_4hr_050615	4	-120	0.21	6.11	22
Abiotic_4hr_Dup_050615	4	-130	0.13	6.08	22
Average	4	-125	0.17	6.095	22
Abiotic_8hr_050615	8	-120	0.21	8.8	23
Abiotic_8hr_Dup_050615	8	-125	0.2	8.83	22.5
Average	8	-122.5	0.205	8.815	22.75
Abiotic_24HR_05072015	24	-40	0.82	5.05	23
Abiotic_24HR_DUP_05072015	24	-87	0.88	5.89	22
Average	24	-63.5	0.85	5.47	22.5
Abiotic_48HR_050815	48	-90	0.86	5.62	22
Abiotic_48HR_DUP_050815	48	-123	0.56	6.14	21.5
Average	48	-106.5	0.71	5.88	21.75
Abiotic_Day 7_051315	168	-80.7	0.94	5.67	23
Abiotic_Day 7_Dup_051315	168	-40	0.92	5.7	22
Average	168	-60.35	0.93	5.685	22.5
Abiotic_Day 14_052015	336	-100	0.65	5.62	19
Abiotic_Day 14_Dup_052015	336	-98.4	0.73	5.73	19.5
Average	336	-99.2	0.69	5.675	19.25
Sample ID	Time (days)	ORP(mV)	DO (mg/L)	pН	Temp (°C)
Controls for Biological Treatment	ıt				
Biotic Control_050615	13	NM	NM	NM	NM
Biotic Control_072315	98	69.4	8.32	6.44	NM
Biotic Control_091715	147	120	7.4	6.44	NM
Biological Treatment with 180 mg/L	Lactate, 2 g/L Fe	rrous Sulfate,	and Bioaugme	entation^	
Biotic Dup_050615	13	54.3	0.87	5.58	NM
Biotic_050615	13	-25.7	0.77	5.81	NM
Average	13	14.3	0.82	5.695	NM
Biotic_051315	20	-8.4	0.86	5.96	22
Biotic_Dup_051315	20	-35	0.62	5.74	21.5
Average	20	-21.7	0.74	5.85	21.75
Biotic_071315	81	-54.3	0.16	7.22	NM
Biotic_Dup_071315	81	-70	0.23	7.38	NM
Average	81	-62.15	0.195	7.3	NM
Biotic_072315	91	-103.9	0.56	7.12	NM
Biotic_Dup_072315	91	-118.2	0.44	7.06	NM
Average	91	-111.05	0.5	7.09	NM 20
Biotic_081115	110	-75.3	0.99	7.22	20
Biotic_Dup_081115	110	-88.5	0.8	7.15	20
Average	110	-81.9	0.895	7.185	20 NM
Biotic_091715	147	-200 -152.3	0.9 0.97	7.5 7.25	NM NM
				1/7	NM
Biotic_Dup_091715	147				
Average	147	-176.15	0.935	7.375	NM
Average Biotic_100815	<b>147</b> 168	<b>-176.15</b> -230	<b>0.935</b> 0.57	<b>7.375</b> 7.05	NM NM
Average	147	-176.15	0.935	7.375	NM

 $NM = not \ measured$ 

DO - dissolved oxygen; mg/L - milligram per liter; mv - millivolts

<sup>\*</sup> Initial control for abiotic treatment with 400 mg/L calcium polysulfide and 1 g/L ferrous sulfate

 $<sup>^{\#}</sup>$ Reestablished control for abiotic treatment with 1.68 g/L calcium polysulfide and 1 g/L ferrous sulfate

<sup>^</sup> Initially 30 mg/L of lactate added on 4/30/15; Additional 30 mg/L of lactate added on 5/13/15; 60 mg/L added on 6/4/15, and 60mg/L added on 6/8/15.

Table 3. Volatile Fatty Acids (VFAs) in Biotic Treatment of Reductive Sequestration Bench Tests

Former Collstrup Wood Treatment Facility

Hillerød, Denmark

Sample ID	Time (days)	Lactate (mg/L)	Acetate (mg/L)	Propionate (mg/L)	Formate mg/L)	Butyrate (mg/L)	Pyruvat e (mg/L)
<b>Controls for Biological Trea</b>	atment						
Biotic Control-050615	13	< 0.39	< 0.54	< 0.31	< 0.22	< 0.41	< 0.69
Control_073015	98	1450	<11	< 6.2	7.7	<8.2	<14
Control_091715	147	<7.8	<11	< 6.2	<4.4	<8.2	<14
Biological Treatment with 180 mg/L Lactate, 2 g/L Ferrous Sulfate, and Bioaugmentation^							
Biotic-050615	13	< 0.39	2.6	< 0.31	4.2	< 0.41	< 0.69
Biotic-Dup-050615	13	< 0.39	2.4	< 0.31	9.1	< 0.41	< 0.69
Average	13	<0.39	2.5	< 0.31	6.6	<0.41	<0.69
Biotic-051315	20	< 0.39	2.5	< 0.31	11	< 0.41	< 0.69
Biotic-Dup-051315	20	< 0.39	2.8	< 0.31	8.0	< 0.41	< 0.69
Average	20	<0.39	2.6	< 0.31	9.6	<0.41	<0.69
Biotic_072315	91	105	1912	< 6.2	9.4	<8.2	<14
Biotic_Dup_072315	91	95	1913	< 6.2	9.9	<8.2	<14
Average	91	100	1912	<6.2	9.7	<8.2	<14
Biotic_081115	110	93	2072	< 6.2	31	<8.2	<14
Biotic_Dup_081115	110	85	2476	20	14	<8.2	<14
Average	110	89	2274	13	22	<8.2	<14
Biotic_091715	147	162	815	<6.2	<4.4	<8.2	<14
Biotic Dup_091715	147	<7.8	1483	438	<4.4	<8.2	<14
Average	147	85	1149	222	<4.4	<8.2	<14

 $\overline{\ }^{\ }$  Initially 30 mg/L of lactate added on 4/30/15; Additional 30 mg/L of lactate added on 5/13/15; 60 mg/L added on 6/4/15, and 60mg/L added on 6/8/15.

mg/L - milligram per liter



# **APPENDIX A**



GEOSYNTEC CONSULTANTS

# PROCEDURE FOR SAMPLING COLLSTRUP SITE, DENMARK

ADDRESS COWI A/S
Parallelvej 2
2800 Kongens Lyngby
Denmark

TEL +45 56 40 00 00 FAX +45 56 40 99 99 WWW cowi.com

# **CONTENTS**

1	Aim	1
2	Preparation	2
3	Groundwater Sampling	2
4	Soil Sampling	2
5	Storage	2
6	Sampling Locations	2

# **APPENDICES**

Appendix A Field Data

Appendix B Sampling Locations

#### 1 Aim

The aim of this memorandum is to describe the method for sampling of shallow groundwater and soil at the Collstrup Site in Hillerød, Denmark. Details about preparation, storage and location of sampling is included.

PROJECT NO.

DOCUMENT NO.

VERSION

1

DATE OF ISSUE March 20, 2015
PREPARED Bente H. Hansen

CHECKED APPROVED

#### 2 Preparation

Generally, pre-cleaned HDPE equipment was used. However, when use of metal materials, the equipment was carefully acid-washed and pre-cleaned.

#### 3 Groundwater Sampling

The water level, depth and dimensions of the well was measured, see Appendix A. The sampling location is described in Section 6.

Prior to collection, the well was purged corresponding to three well volumes. For the sampling, a new, pre-cleaned submersible pump was used along with new PE tubing.

Each sample consisting of five liters was pumped directly into a HDPE bottle and sealed. The bottle was marked according to the order of the sampling, i.e. no. 1 being the first extracted sample. A total of 20 liters was sampled. Despite observation of particular matter in the extracted water, the samples were not filtered.

#### 4 Soil Sampling

Shallow soil samples from four different locations were collected, see location in Section 6. A hand auger was used for the sampling and the approximate sampling depth was 0.3 m. The top soil, plant material and rocks were discarded and samples were homogenized in a bucket. The prepared composite sample was transferred to Rilsan bags containing approximately 1 kg each. A total of 5 kg was sampled. In one sampling spot, discoloration of soil was observed in form of copper colored clods.

### 5 Storage

Soil and groundwater samples were kept in coolers to keep cold and to prevent exposure to daylight. Immediately after the sampling, the samples were express shipped to the Geosyntec Laboratory in Knoxville, USA.

#### 6 Sampling Locations

Prior to sampling, the previous investigations performed was examined to point out hotspot areas suitable for sampling. Then, the site was inspected. Based on knowledge of concentrations, observed vegetation conditions and well conditions, hotspot 1 was appointed as suitable. The sampling locations for groundwater and soil are illustrated in Figure 1 and Appendix B.



Figure 1. Sampling locations. The four front markers point out soil sampling spots while the marker in the back is where the shallow well is located.

# Appendix A Field Data





Sagsnavn: COLLSTEUP - GEOLOGICAL MATERIAL FOR TREATABILITY STUDIES Sagsnr.: PROJEET # MEM 1223/01/01

BOTTOM OF BOLING

COMMENT PREPUMPING GW TABLE

lnit	BEHD							
Bemærkninger	TEST AREA 1	The Properties of the Property of the Control of th						
Renpumning (1)	9	ı						
Pumpe sidst anvendt i	1							
Pejl sidst anvendt i	-							
Bund af boring (m u. MP)	1.805							
Vandspejl (m u. MP)	0.515							
Dimension (mm)	45							
Dato	MARCH 16 2015							2
Boring	F.A. 4 B.4							

# Appendix B Sampling Locations





# **APPENDIX B**



THE LEADER IN ENVIRONMENTAL TESTING

# **ANALYTICAL REPORT**

TestAmerica Laboratories, Inc.

TestAmerica Nashville 2960 Foster Creighton Drive Nashville, TN 37204 Tel: (615)726-0177

TestAmerica Job ID: 490-75398-1

Client Project/Site: Baseline Characterization

#### For:

Geosyntec Consultants, Inc. 10220 Old Columbia Road Suite A Columbia, Maryland 21046

Attn: Amar Wadhawan

Heather Baker

Authorized for release by: 4/6/2015 3:37:13 PM

Heather Baker, Project Manager I (615)301-5043

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This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

Client: Geosyntec Consultants, Inc. Project/Site: Baseline Characterization TestAmerica Job ID: 490-75398-1

# **Table of Contents**

Cover Page	1
Table of Contents	2
Sample Summary	3
Case Narrative	
Definitions	5
Client Sample Results	6
QC Sample Results	10
QC Association	14
Chronicle	16
Method Summary	18
Certification Summary	19
Chain of Custody	20
Receipt Checklists	22

# **Sample Summary**

Client: Geosyntec Consultants, Inc. Project/Site: Baseline Characterization

Baseline Soil-DUP

Lab Sample ID

490-75398-1

490-75398-2

490-75398-3

490-75398-4

TestAmerica Job ID: 490-75398-1

03/26/15 15:15

				3
Client Sample ID	Matrix	Collected	Received	
Baseline GW	Water	03/26/15 15:00	03/28/15 08:30	
Baseline GW-DUP	Water	03/26/15 15:00	03/28/15 08:30	
Baseline Soil	Soil	03/26/15 15:15	03/28/15 08:30	

Soil

03/28/15 08:30

#### **Case Narrative**

Client: Geosyntec Consultants, Inc. Project/Site: Baseline Characterization TestAmerica Job ID: 490-75398-1

Job ID: 490-75398-1

**Laboratory: TestAmerica Nashville** 

Narrative

Job Narrative 490-75398-1

#### Comments

No additional comments.

#### Receipt

The samples were received on 3/28/2015 8:30 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 5.6° C.

#### Except:

Method 7196A, Filtration: The following samples were received outside of holding time: Baseline GW (490-75398-1), Baseline GW-DUP (490-75398-2).

#### HPLC/IC

Method 9056: The following samples were received with insufficient holding time remaining for analysis. Baseline GW (490-75398-1), Baseline GW-DUP (490-75398-2).

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

#### Metals

Method 6020: The method blank for batch 237790 contained Iron above the reporting limit (RL). Associated samples were not re-extracted and/or re-analyzed because results were greater than 10X the value found in the method blank.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

#### **General Chemistry**

No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

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## **Definitions/Glossary**

Client: Geosyntec Consultants, Inc. Project/Site: Baseline Characterization

TestAmerica Job ID: 490-75398-1

## **Qualifiers**

## HPLC/IC

Qualifier	Qualifier Description
Н	Sample was prepped or analyzed beyond the specified holding time

#### **Metals**

Qualifier	Qualifier Description
4	MS, MSD: The analyte present in the original sample is greater than 4 times the matrix spike concentration; therefore, control limits are not
	applicable.
F1	MS and/or MSD Recovery exceeds the control limits
F2	MS/MSD RPD exceeds control limits
В	Compound was found in the blank and sample.
Conoral Ch	emietr.

#### **General Chemistry**

Qualifier	Qualifier Description
Н	Sample was prepped or analyzed beyond the specified holding time

## Glossary

RER

RL

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains no Free Liquid
DER	Duplicate error ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision level concentration
MDA	Minimum detectable activity
EDL	Estimated Detection Limit
MDC	Minimum detectable concentration
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control

RPD Relative Percent Difference, a measure of the relative difference between two points
TEF Toxicity Equivalent Factor (Dioxin)
TEQ Toxicity Equivalent Quotient (Dioxin)

Relative error ratio

Reporting Limit or Requested Limit (Radiochemistry)

TestAmerica Nashville

Client: Geosyntec Consultants, Inc. Project/Site: Baseline Characterization TestAmerica Job ID: 490-75398-1

Lab Sample ID: 490-75398-1

**Matrix: Water** 

Client Sample ID: Baseline GW Date Collected: 03/26/15 15:00

Date	Received:	03/28/15	08:30

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Nitrate as N	1.29	H	0.100		mg/L			04/01/15 00:19	1
Sulfate	5.73		1.00		mg/L			04/01/15 00:19	1
Method: 6020 - Metals (ICP/MS)									
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	4.44		0.0200		mg/L		03/31/15 10:17	04/02/15 18:00	10
Chromium	0.0928		0.00200		mg/L		03/31/15 10:17	04/01/15 23:50	1
Copper	0.326		0.00200		mg/L		03/31/15 10:17	04/01/15 23:50	1
Iron	1.08		0.0250		mg/L		03/31/15 10:17	04/01/15 23:50	1
Method: 6020 - Metals (ICP/MS) - Dis	ssolved								
•	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Analyte	Result 3.84	Qualifier		MDL	Unit mg/L	D	Prepared 04/01/15 15:24	Analyzed 04/02/15 15:37	Dil Fac
Analyte Arsenic		Qualifier		MDL		D			Dil Fac
Analyte Arsenic Chromium	3.84	Qualifier	0.00400	MDL	mg/L	<u>D</u>	04/01/15 15:24	04/02/15 15:37	1 1 1
Analyte Arsenic Chromium Copper	3.84 0.100	Qualifier	0.00400 0.00400	MDL	mg/L mg/L	<u>D</u>	04/01/15 15:24 04/01/15 15:24	04/02/15 15:37 04/02/15 15:37	1 1 1
Analyte  Arsenic Chromium Copper Iron	3.84 0.100 0.329	Qualifier	0.00400 0.00400 0.00400	MDL	mg/L mg/L mg/L	<u>D</u>	04/01/15 15:24 04/01/15 15:24 04/01/15 15:24	04/02/15 15:37 04/02/15 15:37 04/02/15 15:37	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
Analyte Arsenic Chromium Copper	3.84 0.100 0.329 1.17	Qualifier Qualifier	0.00400 0.00400 0.00400	MDL	mg/L mg/L mg/L mg/L	D	04/01/15 15:24 04/01/15 15:24 04/01/15 15:24	04/02/15 15:37 04/02/15 15:37 04/02/15 15:37	Dil Fac

Client: Geosyntec Consultants, Inc. Project/Site: Baseline Characterization

TestAmerica Job ID: 490-75398-1

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Client Sample ID: Baseline GW-DUP

Date Collected: 03/26/15 15:00 Date Received: 03/28/15 08:30 Lab Sample ID: 490-75398-2

Matrix: Water

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Nitrate as N	1.28	H	0.100		mg/L			04/01/15 00:40	1
Sulfate	5.97		1.00		mg/L			04/01/15 00:40	1
Method: 6020 - Metals (ICP/MS)									
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	4.12		0.0200		mg/L		03/31/15 10:17	04/02/15 18:05	10
Chromium	0.0897		0.00200		mg/L		03/31/15 10:17	04/01/15 23:55	1
Copper	0.314		0.00200		mg/L		03/31/15 10:17	04/01/15 23:55	1
Iron	0.920		0.0250		mg/L		03/31/15 10:17	04/01/15 23:55	1
Method: 6020 - Metals (ICP/MS) - Dis	ssolved								
Analyte		Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	3.87		0.00400		mg/L		04/01/15 15:24	04/02/15 15:52	1
Chromium	0.104		0.00400		mg/L		04/01/15 15:24	04/02/15 15:52	1
Copper	0.351		0.00400		mg/L		04/01/15 15:24	04/02/15 15:52	1
lron -	1.19		0.0500		mg/L		04/01/15 15:24	04/02/15 15:52	1
General Chemistry - Dissolved									
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium, hex	0.0300	H	0.0100		mg/L			04/02/15 10:30	1

Client: Geosyntec Consultants, Inc. Project/Site: Baseline Characterization TestAmerica Job ID: 490-75398-1

Client Sample ID: Baseline Soil

Date Collected: 03/26/15 15:15 Date Received: 03/28/15 08:30 Lab Sample ID: 490-75398-3

Matrix: Soil

Method: 6020 - Metals (ICP/MS)							
Analyte	Result Qualifier	RL	MDL Un	nit D	Prepared	Analyzed	Dil Fac
Arsenic	731	2.43	mg	g/Kg	03/31/15 12:00	04/03/15 17:25	5
Chromium	155	2.43	mg	g/Kg	03/31/15 12:00	04/03/15 17:25	5
Copper	1120	2.43	mg	g/Kg	03/31/15 12:00	04/03/15 17:25	5
Iron	4490 B	24.3	mg	g/Kg	03/31/15 12:00	04/03/15 17:25	5

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Client: Geosyntec Consultants, Inc. Project/Site: Baseline Characterization

TestAmerica Job ID: 490-75398-1

Client Sample ID: Baseline Soil-DUP

Date Collected: 03/26/15 15:15 Date Received: 03/28/15 08:30 Lab Sample ID: 490-75398-4

Matrix: Soil

Method: 6020 - Metals (ICP)	MS)						
Analyte	Result Qualifier	RL	MDL Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	624	2.41	mg/Kg		03/31/15 12:00	04/03/15 17:30	5
Chromium	123	2.41	mg/Kg		03/31/15 12:00	04/03/15 17:30	5
Copper	885	2.41	mg/Kg		03/31/15 12:00	04/03/15 17:30	5
Iron	3350 B	24.1	mg/Kg		03/31/15 12:00	04/03/15 17:30	5

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TestAmerica Job ID: 490-75398-1

Client: Geosyntec Consultants, Inc. Project/Site: Baseline Characterization

Method: 9056 - Anions, Ion Chromatography

Lab Sample ID: MB 490-237979/5 Client Sample ID: Method Blank **Matrix: Water** Prep Type: Total/NA

Analysis Batch: 237979

мв мв Result Qualifier RL MDL Unit D Analyzed Dil Fac Analyte Prepared 1.00 03/31/15 16:57 Sulfate ND mg/L

Lab Sample ID: LCS 490-237979/6 Client Sample ID: Lab Control Sample **Matrix: Water** Prep Type: Total/NA

Analysis Batch: 237979

LCS LCS Spike %Rec. Analyte Added Result Qualifier Unit %Rec Limits Sulfate 100 95.55 mg/L 96 80 - 120

Lab Sample ID: LCSD 490-237979/7 Client Sample ID: Lab Control Sample Dup **Matrix: Water** Prep Type: Total/NA

Sulfate

Analysis Batch: 237979 Spike LCSD LCSD %Rec. RPD Analyte Added Result Qualifier Unit D %Rec Limits **RPD** Limit

100

Lab Sample ID: 490-75366-G-4 MS Client Sample ID: Matrix Spike

95.25

mg/L

**Matrix: Water** 

Analysis Batch: 237979

Sample Sample Spike MS MS %Rec. Added Analyte Result Qualifier Result Qualifier Unit %Rec Limits Sulfate 4.94 100 108.4 mg/L 103 80 - 120

Lab Sample ID: 490-75366-G-4 MSD Client Sample ID: Matrix Spike Duplicate Prep Type: Total/NA

**Matrix: Water** 

**Analysis Batch: 237979** 

Sample Sample Spike MSD MSD %Rec. RPD Added Analyte Result Qualifier Result Qualifier Unit D %Rec Limits RPD Limit Sulfate 100 108 80 - 120 4.94 113.0 mg/L 20

Lab Sample ID: MB 490-237980/5 Client Sample ID: Method Blank Prep Type: Total/NA

**Matrix: Water** 

Analysis Batch: 237980

MB MB MDL Unit Analyte RL Result Qualifier D Prepared Analyzed Dil Fac 0.100 Nitrate as N ND mg/L 03/31/15 16:57

Lab Sample ID: LCS 490-237980/6 **Client Sample ID: Lab Control Sample** 

**Matrix: Water** 

Analysis Batch: 237980

LCS LCS Spike %Rec. Analyte Added Result Qualifier Unit %Rec Limits Nitrate as N 10.0 10.27 mg/L 103 80 - 120

Lab Sample ID: LCSD 490-237980/7 Client Sample ID: Lab Control Sample Dup **Matrix: Water** Prep Type: Total/NA

Analysis Batch: 237980

Spike LCSD LCSD %Rec. RPD Analyte Added Result Qualifier Unit %Rec Limits RPD Limit Nitrate as N 10.0 10.22 mg/L 102

TestAmerica Nashville

Prep Type: Total/NA

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Prep Type: Total/NA

Client: Geosyntec Consultants, Inc. Project/Site: Baseline Characterization TestAmerica Job ID: 490-75398-1

Lab Sample ID: 490-75366-G-4 MS

Client Sample ID: Matrix Spike Matrix: Water Prep Type: Total/NA Analysis Batch: 237980

	Sample	Sample	Spike	MS	MS				%Rec.	
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Nitrate as N	1.53		10.0	12.24		mg/L		107	80 - 120	

Lab Sample ID: 490-75366-G-4 MSD Client Sample ID: Matrix Spike Duplicate **Matrix: Water** 

Prep Type: Total/NA

Prep Type: Total/NA

**Prep Batch: 237727** 

**Prep Batch: 237727** 

Prep Batch: 237727

Analysis Batch: 237980

Sample Sample Spike MSD MSD %Rec. RPD Analyte Result Qualifier Added Result Qualifier Unit %Rec Limits RPD Limit D Nitrate as N 1.53 10.0 12.74 mg/L 112 80 - 120

Method: 6020 - Metals (ICP/MS)

Lab Sample ID: MB 490-237727/1-A Client Sample ID: Method Blank

**Matrix: Water** 

Analysis Batch: 238381

	MB	MB							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND		0.00200		mg/L		03/31/15 10:17	04/01/15 22:07	1
Chromium	ND		0.00200		mg/L		03/31/15 10:17	04/01/15 22:07	1
Copper	ND		0.00200		mg/L		03/31/15 10:17	04/01/15 22:07	1
Iron	ND		0.0250		mg/L		03/31/15 10:17	04/01/15 22:07	1

Lab Sample ID: LCS 490-237727/2-A **Client Sample ID: Lab Control Sample** Prep Type: Total/NA

**Matrix: Water** 

Analysis Batch: 238381							Prep E	Batch: 237727
	Spike	LCS	LCS				%Rec.	
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Arsenic	0.100	0.08930		mg/L		89	80 - 120	
Chromium	0.100	0.09565		mg/L		96	80 - 120	
Copper	0.100	0.09297		mg/L		93	80 - 120	
Iron	1.00	0.9753		mg/L		98	80 - 120	

Lab Sample ID: LCSD 490-237727/3-A Client Sample ID: Lab Control Sample Dup Prep Type: Total/NA

**Matrix: Water** 

Analysis Batch: 238381

-	Spike	LCSD	LCSD				%Rec.		RPD	
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits	RPD	Limit	
Arsenic	0.100	0.08521		mg/L		85	80 - 120	5	20	
Chromium	0.100	0.09091		mg/L		91	80 - 120	5	20	
Copper	0.100	0.08813		mg/L		88	80 - 120	5	20	
Iron	1.00	0.9334		mg/L		93	80 - 120	4	20	

Lab Sample ID: 490-75330-A-1-B MS Client Sample ID: Matrix Spike **Matrix: Water** Prep Type: Total/NA

Analysis Batch: 238381

•	Sample	Sample	Spike	MS	MS				%Rec.	
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Arsenic	ND	F2 F1	0.100	ND		mg/L		124	75 _ 125	
Chromium	6.03	F2	0.100	6.965	4	mg/L		938	75 <sub>-</sub> 125	
Copper	ND	F2 F1	0.100	ND	F1	mg/L		157	75 - 125	
Iron	2530		1.00	2734	4	ma/L		20300	75 <sub>-</sub> 125	

TestAmerica Nashville

4/6/2015

TestAmerica Job ID: 490-75398-1

Client: Geosyntec Consultants, Inc. Project/Site: Baseline Characterization

Method: 6020 - Metals (ICP/MS) (Continued)

Lab Sample ID: 490-75330-A-1-C MSD

Lab Sample ID: MB 490-237790/1-A

**Matrix: Water** 

**Matrix: Solid** 

Analysis Batch: 238381

Client Sample ID: Matrix Spike Duplicate

Prep Type: Total/NA Prep Batch: 237727

	Sample	Sample	Spike	MSD	MSD				%Rec.		RPD
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	RPD	Limit
Arsenic	ND	F2 F1	0.100	ND	F1 F2	mg/L		72	75 - 125	30	20
Chromium	6.03	F2	0.100	5.379	4 F2	mg/L		-648	75 - 125	26	20
Copper	ND	F2 F1	0.100	ND	F2	mg/L		104	75 - 125	41	20
Iron	2530		1.00	2255	4	mg/L		-2760	75 - 125	19	20
								0			

Client Sample ID: Method Blank

Prep Type: Total/NA

**Prep Batch: 237790** 

**Prep Batch: 237790** 

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Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND		0.486		mg/Kg		03/31/15 12:00	04/03/15 17:15	1
Chromium	ND		0.486		mg/Kg		03/31/15 12:00	04/03/15 17:15	1
Copper	ND		0.486		mg/Kg		03/31/15 12:00	04/03/15 17:15	1
Iron	10.81		4.86		mg/Kg		03/31/15 12:00	04/03/15 17:15	1

Lab Sample ID: LCS 490-237790/2-A **Client Sample ID: Lab Control Sample** Prep Type: Total/NA

**Matrix: Solid** 

Analysis Batch: 238894

Analysis Batch: 238894

LCS LCS Spike %Rec. Analyte Added Result Qualifier Unit %Rec Limits Arsenic 9.51 10.11 mg/Kg 106 80 - 120 Chromium 38.0 42.05 mg/Kg 111 80 - 120

47.5 50.19 Copper mg/Kg 106 80 - 120 222.2 190 80 - 120 Iron mg/Kg 117

Lab Sample ID: MB 490-238215/1-B

Client Sample ID: Method Blank **Matrix: Water Prep Type: Dissolved** Analysis Batch: 238662 Prep Batch: 238223 MR MR

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND		0.00200		mg/L		04/01/15 15:24	04/02/15 15:21	1
Chromium	ND		0.00200		mg/L		04/01/15 15:24	04/02/15 15:21	1
Copper	ND		0.00200		mg/L		04/01/15 15:24	04/02/15 15:21	1
Iron	ND		0.0250		mg/L		04/01/15 15:24	04/02/15 15:21	1

Lab Sample ID: LCS 490-238215/2-B **Client Sample ID: Lab Control Sample Matrix: Water Prep Type: Dissolved** 

Analysis Batch: 238662 **Prep Batch: 238223** 

	Spike	LCS	LCS				%Rec.	
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Arsenic	0.100	0.09382		mg/L		94	80 - 120	
Chromium	0.100	0.09579		mg/L		96	80 - 120	
Copper	0.100	0.09185		mg/L		92	80 - 120	
Iron	1.00	0.9222		mg/L		92	80 - 120	

TestAmerica Nashville

Client: Geosyntec Consultants, Inc. Project/Site: Baseline Characterization TestAmerica Job ID: 490-75398-1

Method: 6020 - Metals (ICP/MS) (Continued)

Lab Sample ID: LCSD 490-238215/3-B Client Sample ID: Lab Control Sample Dup **Matrix: Water Prep Type: Dissolved** Analysis Batch: 238662 Prep Batch: 238223 Spike LCSD LCSD %Rec Limit babbA Result Qualifier Limits RPD Analyte Unit 2 Arsenic 0.100 0.09530 mg/L 95 80 - 120 20 Chromium 0.100 0.09641 mg/L 96 80 - 120 20

0.09512

0.9654

mg/L

mg/L

95

97

80 - 120

80 - 120

3

20

20

0.100

MR MR

1.00

Method: 7196A - Chromium, Hexavalent

Lab Sample ID: MB 490-238471/9 Client Sample ID: Method Blank **Matrix: Water** Prep Type: Total/NA

Copper

Iron

Analysis Batch: 238471

Analyte Result Qualifier RL MDL Unit Prepared Analyzed Dil Fac Chromium, hex 0.0100 mg/L 04/02/15 10:30 ND

Lab Sample ID: LCS 490-238471/10 Client Sample ID: Lab Control Sample **Matrix: Water** Prep Type: Total/NA

**Analysis Batch: 238471** 

Spike LCS LCS %Rec. Added Result Qualifier Limits Analyte Unit D %Rec 0.100 0.1020 102 85 - 115 Chromium, hex mg/L

Lab Sample ID: 490-75622-H-1 MS Client Sample ID: Matrix Spike Prep Type: Total/NA

**Matrix: Water** 

Analysis Batch: 238471

Sample Sample Spike MS MS %Rec. Result Qualifier Added Result Qualifier Analyte I imits Unit %Rec Chromium, hex ND 0.100 0.1000 mg/L 100 85 - 115

Lab Sample ID: 490-75622-H-1 MSD Client Sample ID: Matrix Spike Duplicate Prep Type: Total/NA

**Matrix: Water** 

Analysis Batch: 238471

Spike MSD MSD RPD Sample Sample %Rec. Analyte Result Qualifier Added Result Qualifier Unit D %Rec Limits RPD Limit Chromium, hex ND 0.100 0.1010 mg/L 101 85 \_ 115

Client Sample ID: Duplicate Lab Sample ID: 490-75622-H-1 DU Prep Type: Total/NA

**Matrix: Water** 

Analysis Batch: 238471

Sample Sample DII DII RPD Analyte Qualifier Qualifier Result Result Unit Limit Chromium, hex ND ND mg/L 20

4/6/2015

# **QC Association Summary**

Client: Geosyntec Consultants, Inc. Project/Site: Baseline Characterization TestAmerica Job ID: 490-75398-1

## HPLC/IC

## Analysis Batch: 237979

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-75366-G-4 MS	Matrix Spike	Total/NA	Water	9056	
490-75366-G-4 MSD	Matrix Spike Duplicate	Total/NA	Water	9056	
490-75398-1	Baseline GW	Total/NA	Water	9056	
490-75398-2	Baseline GW-DUP	Total/NA	Water	9056	
LCS 490-237979/6	Lab Control Sample	Total/NA	Water	9056	
LCSD 490-237979/7	Lab Control Sample Dup	Total/NA	Water	9056	
MB 490-237979/5	Method Blank	Total/NA	Water	9056	

## Analysis Batch: 237980

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-75366-G-4 MS	Matrix Spike	Total/NA	Water	9056	
490-75366-G-4 MSD	Matrix Spike Duplicate	Total/NA	Water	9056	
490-75398-1	Baseline GW	Total/NA	Water	9056	
490-75398-2	Baseline GW-DUP	Total/NA	Water	9056	
LCS 490-237980/6	Lab Control Sample	Total/NA	Water	9056	
LCSD 490-237980/7	Lab Control Sample Dup	Total/NA	Water	9056	
MB 490-237980/5	Method Blank	Total/NA	Water	9056	

## Metals

## Prep Batch: 237727

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-75330-A-1-B MS	Matrix Spike	Total/NA	Water	3010A	
490-75330-A-1-C MSD	Matrix Spike Duplicate	Total/NA	Water	3010A	
490-75398-1	Baseline GW	Total/NA	Water	3010A	
490-75398-2	Baseline GW-DUP	Total/NA	Water	3010A	
LCS 490-237727/2-A	Lab Control Sample	Total/NA	Water	3010A	
LCSD 490-237727/3-A	Lab Control Sample Dup	Total/NA	Water	3010A	
MB 490-237727/1-A	Method Blank	Total/NA	Water	3010A	

## **Prep Batch: 237790**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-75398-3	Baseline Soil	Total/NA	Soil	3051A	
490-75398-4	Baseline Soil-DUP	Total/NA	Soil	3051A	
LCS 490-237790/2-A	Lab Control Sample	Total/NA	Solid	3051A	
MB 490-237790/1-A	Method Blank	Total/NA	Solid	3051A	

#### Filtration Batch: 238215

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-75398-1	Baseline GW	Dissolved	Water	Filtration	
490-75398-2	Baseline GW-DUP	Dissolved	Water	Filtration	
LCS 490-238215/2-B	Lab Control Sample	Dissolved	Water	Filtration	
LCSD 490-238215/3-B	Lab Control Sample Dup	Dissolved	Water	Filtration	
MB 490-238215/1-B	Method Blank	Dissolved	Water	Filtration	

## Prep Batch: 238223

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-75398-1	Baseline GW	Dissolved	Water	3005A	238215
490-75398-2	Baseline GW-DUP	Dissolved	Water	3005A	238215
LCS 490-238215/2-B	Lab Control Sample	Dissolved	Water	3005A	238215

TestAmerica Nashville

4/6/2015

Page 14 of 22

# **QC Association Summary**

Client: Geosyntec Consultants, Inc. Project/Site: Baseline Characterization TestAmerica Job ID: 490-75398-1

2

## **Metals (Continued)**

## Prep Batch: 238223 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
LCSD 490-238215/3-B	Lab Control Sample Dup	Dissolved	Water	3005A	238215
MB 490-238215/1-B	Method Blank	Dissolved	Water	3005A	238215

## Analysis Batch: 238381

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-75330-A-1-B MS	Matrix Spike	Total/NA	Water	6020	237727
490-75330-A-1-C MSD	Matrix Spike Duplicate	Total/NA	Water	6020	237727
490-75398-1	Baseline GW	Total/NA	Water	6020	237727
490-75398-2	Baseline GW-DUP	Total/NA	Water	6020	237727
LCS 490-237727/2-A	Lab Control Sample	Total/NA	Water	6020	237727
LCSD 490-237727/3-A	Lab Control Sample Dup	Total/NA	Water	6020	237727
MB 490-237727/1-A	Method Blank	Total/NA	Water	6020	237727

## Analysis Batch: 238662

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-75398-1	Baseline GW	Dissolved	Water	6020	238223
490-75398-1	Baseline GW	Total/NA	Water	6020	237727
490-75398-2	Baseline GW-DUP	Dissolved	Water	6020	238223
490-75398-2	Baseline GW-DUP	Total/NA	Water	6020	237727
LCS 490-238215/2-B	Lab Control Sample	Dissolved	Water	6020	238223
LCSD 490-238215/3-B	Lab Control Sample Dup	Dissolved	Water	6020	238223
MB 490-238215/1-B	Method Blank	Dissolved	Water	6020	238223

## Analysis Batch: 238894

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-75398-3	Baseline Soil	Total/NA	Soil	6020	237790
490-75398-4	Baseline Soil-DUP	Total/NA	Soil	6020	237790
LCS 490-237790/2-A	Lab Control Sample	Total/NA	Solid	6020	237790
MB 490-237790/1-A	Method Blank	Total/NA	Solid	6020	237790

## **General Chemistry**

## Analysis Batch: 238471

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-75398-1	Baseline GW	Dissolved	Water	7196A	238475
490-75398-2	Baseline GW-DUP	Dissolved	Water	7196A	238475
490-75622-H-1 DU	Duplicate	Total/NA	Water	7196A	
490-75622-H-1 MS	Matrix Spike	Total/NA	Water	7196A	
490-75622-H-1 MSD	Matrix Spike Duplicate	Total/NA	Water	7196A	
LCS 490-238471/10	Lab Control Sample	Total/NA	Water	7196A	
MB 490-238471/9	Method Blank	Total/NA	Water	7196A	

#### Filtration Batch: 238475

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-75398-1	Baseline GW	Dissolved	Water	Filtration	
490-75398-2	Baseline GW-DUP	Dissolved	Water	Filtration	

TestAmerica Nashville

TestAmerica Job ID: 490-75398-1

Client: Geosyntec Consultants, Inc. Project/Site: Baseline Characterization

Client Sample ID: Baseline GW

Date Collected: 03/26/15 15:00 Date Received: 03/28/15 08:30 Lab Sample ID: 490-75398-1

Matrix: Water

	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Analysis	9056		1	10 mL		237979	04/01/15 00:19	CLN	TAL NSH
Total/NA	Analysis	9056		1	10 mL		237980	04/01/15 00:19	CLN	TAL NSH
Dissolved	Prep	3005A			25 mL	50 mL	238223	04/01/15 15:24	TSC	TAL NSH
Dissolved	Filtration	Filtration			25 mL	25 mL	238215	04/01/15 15:24	TSC	TAL NSH
Dissolved	Analysis	6020		1	25 mL	50 mL	238662	04/02/15 15:37	JBD	TAL NSH
Total/NA	Prep	3010A			50 mL	50 mL	237727	03/31/15 10:17	TSC	TAL NSH
Total/NA	Analysis	6020		1	50 mL	50 mL	238381	04/01/15 23:50	JBD	TAL NSH
Total/NA	Prep	3010A			50 mL	50 mL	237727	03/31/15 10:17	TSC	TAL NSH
Total/NA	Analysis	6020		10	50 mL	50 mL	238662	04/02/15 18:00	JBD	TAL NSH
Dissolved	Analysis	7196A		1	10 mL	10 mL	238471	04/02/15 10:30	BMC	TAL NSH
Dissolved	Filtration	Filtration			1.0 mL	1.0 mL	238475	04/02/15 10:30	BMC	TAL NSH

Client Sample ID: Baseline GW-DUP

Date Collected: 03/26/15 15:00

Date Received: 03/28/15 08:30

Lab Sample ID: 490-75398-2

Matrix: Water

	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Analysis	9056		1	10 mL		237979	04/01/15 00:40	CLN	TAL NSF
Total/NA	Analysis	9056		1	10 mL		237980	04/01/15 00:40	CLN	TAL NSH
Dissolved	Prep	3005A			25 mL	50 mL	238223	04/01/15 15:24	TSC	TAL NSH
Dissolved	Filtration	Filtration			25 mL	25 mL	238215	04/01/15 15:24	TSC	TAL NSH
Dissolved	Analysis	6020		1	25 mL	50 mL	238662	04/02/15 15:52	JBD	TAL NSH
Total/NA	Prep	3010A			50 mL	50 mL	237727	03/31/15 10:17	TSC	TAL NSH
Total/NA	Analysis	6020		1	50 mL	50 mL	238381	04/01/15 23:55	JBD	TAL NSH
Total/NA	Prep	3010A			50 mL	50 mL	237727	03/31/15 10:17	TSC	TAL NSH
Total/NA	Analysis	6020		10	50 mL	50 mL	238662	04/02/15 18:05	JBD	TAL NSH
Dissolved	Analysis	7196A		1	10 mL	10 mL	238471	04/02/15 10:30	BMC	TAL NSH
Dissolved	Filtration	Filtration			1.0 mL	1.0 mL	238475	04/02/15 10:30	BMC	TAL NSH

**Client Sample ID: Baseline Soil** 

Date Collected: 03/26/15 15:15

Date Received: 03/28/15 08:30

Lab Sample	ID: 490-75398-3
------------	-----------------

Lab Sample ID: 490-75398-4

Matrix: Soil

**Matrix: Soil** 

	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.515 g	100 mL	237790	03/31/15 12:00	TDP	TAL NSH
Total/NA	Analysis	6020		5	0.515 g	100 mL	238894	04/03/15 17:25	JBD	TAL NSH

Client Sample ID: Baseline Soil-DUP

Date Collected: 03/26/15 15:15

Date Received: 03/28/15 08:30

	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Туре	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.519 g	100 mL	237790	03/31/15 12:00	TDP	TAL NSH

TestAmerica Nashville

Page 16 of 22

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## **Lab Chronicle**

Client: Geosyntec Consultants, Inc. Project/Site: Baseline Characterization TestAmerica Job ID: 490-75398-1

Client Sample ID: Baseline Soil-DUP

Lab Sample ID: 490-75398-4 Date Collected: 03/26/15 15:15

Matrix: Soil

Date Received: 03/28/15 08:30

	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Analysis	6020		5	0.519 g	100 mL	238894	04/03/15 17:30	JBD	TAL NSH

Laboratory References:

TAL NSH = TestAmerica Nashville, 2960 Foster Creighton Drive, Nashville, TN 37204, TEL (615)726-0177

# **Method Summary**

Client: Geosyntec Consultants, Inc. Project/Site: Baseline Characterization

TestAmerica Job ID: 490-75398-1

Method	Method Description	Protocol	Laboratory
9056	Anions, Ion Chromatography	SW846	TAL NSH
6020	Metals (ICP/MS)	SW846	TAL NSH
7196A	Chromium, Hexavalent	SW846	TAL NSH

#### **Protocol References:**

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

#### Laboratory References:

TAL NSH = TestAmerica Nashville, 2960 Foster Creighton Drive, Nashville, TN 37204, TEL (615)726-0177

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TestAmerica Job ID: 490-75398-1

Client: Geosyntec Consultants, Inc. Project/Site: Baseline Characterization

## Laboratory: TestAmerica Nashville

All certifications held by this laboratory are listed. Not all certifications are applicable to this report.

Authority	Program	EPA Region	Certification ID	Expiration Date
A2LA	A2LA		NA: NELAP & A2LA	12-31-15
A2LA	ISO/IEC 17025		0453.07	12-31-15
Alaska (UST)	State Program	10	UST-087	10-31-15
Arizona	State Program	9	AZ0473	05-05-15 *
Arkansas DEQ	State Program	6	88-0737	04-25-15
California	State Program	9	2938	10-31-16
Connecticut	State Program	1	PH-0220	12-31-15
Florida	NELAP	4	E87358	06-30-15
llinois	NELAP	5	200010	12-09-15
owa	State Program	7	131	04-01-16
Kansas	NELAP	7	E-10229	04-30-15 *
Kentucky (UST)	State Program	4	19	06-30-15
Kentucky (WW)	State Program	4	90038	12-31-15
ouisiana	NELAP	6	30613	06-30-15
Maryland	State Program	3	316	03-31-16
Massachusetts	State Program	1	M-TN032	06-30-15
Minnesota	NELAP	5	047-999-345	12-31-15
/lississippi	State Program	4	N/A	06-30-15
Montana (UST)	State Program	8	NA	02-24-20
Nevada	State Program	9	TN00032	07-31-15
New Hampshire	NELAP	1	2963	10-09-15
New Jersey	NELAP	2	TN965	06-30-15
New York	NELAP	2	11342	03-31-16
North Carolina (WW/SW)	State Program	4	387	12-31-15
North Dakota	State Program	8	R-146	06-30-15
Ohio VAP	State Program	5	CL0033	10-16-15
Oklahoma	State Program	6	9412	08-31-15
Dregon	NELAP	10	TN200001	04-27-16
Pennsylvania	NELAP	3	68-00585	06-30-15
Rhode Island	State Program	1	LAO00268	12-30-15
South Carolina	State Program	4	84009 (001)	02-28-15 *
South Carolina (DW)	State Program	4	84009 (002)	02-23-17
Tennessee	State Program	4	2008	02-23-17
Texas	NELAP	6	T104704077	08-31-15
JSDA	Federal		S-48469	10-30-16
Jtah	NELAP	8	TN00032	07-31-15
/irginia	NELAP	3	460152	06-14-15
Vashington	State Program	10	C789	07-19-15
Vest Virginia DEP	State Program	3	219	02-28-16
Visconsin	State Program	5	998020430	08-31-15
Nyoming (UST)	A2LA	8	453.07	12-31-15

TestAmerica Nashville

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<sup>\*</sup> Certification renewal pending - certification considered valid.

THE LEADER IN ENVIRONMENTAL TESTING Nashville, TN



#### COOLER RECEIPT FORM

Cooler Received/Opened On 3/28/2015 @ 0830 1. Tracking # (last 4 digits, FedEx) Courier: FedEx IR Gun ID 18290455 2. Temperature of rep. sample or temp blank when opened: 5 to Degrees Celsius 3. If Item #2 temperature is 0°C or less, was the representative sample or temp blank frozen? YES NO...NA 4. Were custody seals on outside of cooler? If yes, how many and where:\_ FES...NO...NA 5. Were the seals intact, signed, and dated correctly? ĘS...NO...NA 6. Were custody papers inside cooler? I certify that I opened the cooler and answered questions 1-6 (intial) 7. Were custody seals on containers: MO and Intact YES...NO. (ÑA) YES...NO... Were these signed and dated correctly? 8. Packing mat'l used? Bubblewrap) Plastic bag Peanuts Vermiculite Foam Insert Paper Other None 9. Cooling process: (ce) Ice-pack Ice (direct contact) Dry ice Other None 10. Did all containers arrive in good condition (unbroken)? (ES)..NO...NA 11. Were all container labels complete (#, date, signed, pres., etc)? ES2.NO...NA 12. Did all container labels and tags agree with custody papers? YES).NO...NA 13a. Were VOA vials received? YES…NO∷NA YES...NO., NA b. Was there any observable headspace present in any VOA vial? YES...NO.. MA If multiple coolers, sequence #\_ 14. Was there a Trip Blank in this cooler? I certify that I unloaded the cooler and answered questions 7-14 (intial) MIDM 15a. On pres'd bottles, did pH test strips suggest preservation reached the correct pH level? YES..NO.(NA) YES...NO.,MA) b. Did the bottle labels indicate that the correct preservatives were used YES...NO...NA 16. Was residual chlorine present? moun I certify that I checked for chlorine and pH as per SOP and answered questions 15-16 (intial) 17. Were custody papers properly filled out (ink, signed, etc)? ₹£S)..NO...NA YES ... NO...NA 18. Did you sign the custody papers in the appropriate place? 19. Were correct containers used for the analysis requested? 20. Was sufficient amount of sample sent in each container? I certify that I entered this project into LIMS and answered questions 17-20 (intial) MDUM mom I certify that I attached a label with the unique LIMS number to each container (intial) 21. Were there Non-Conformance issues at login? YES (NO) Was a PIPE generated? YES. #5..# trollimitel volume.

Client: Geosyntec Consultants, Inc.

Job Number: 490-75398-1

Login Number: 75398 List Source: TestAmerica Nashville

List Number: 1

Creator: McBride, Mike

Creator: McBride, Mike		
Question	Answer	Comment
Radioactivity wasn't checked or is = background as measured by a survey meter.</td <td>True</td> <td></td>	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	5.6
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time.	False	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	False	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	True	

TestAmerica Nashville

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THE LEADER IN ENVIRONMENTAL TESTING

# **ANALYTICAL REPORT**

TestAmerica Laboratories, Inc.

TestAmerica Nashville 2960 Foster Creighton Drive Nashville, TN 37204 Tel: (615)726-0177

TestAmerica Job ID: 490-77315-1 Client Project/Site: Treatability Study

For:

Geosyntec Consultants, Inc. 10220 Old Columbia Road Suite A Columbia, Maryland 21046

Attn: Amar Wadhawan

Heather Baker

Authorized for release by: 5/12/2015 12:32:48 PM

Heather Baker, Project Manager I (615)301-5043

heather.baker@testamericainc.com

·····LINKS ·······

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**Have a Question?** 



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The test results in this report meet all 2003 NELAC and 2009 TNI requirements for accredited parameters, exceptions are noted in this report. This report may not be reproduced except in full, and with written approval from the laboratory. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-77315-1

# **Table of Contents**

Cover Page	1
Table of Contents	2
Sample Summary	3
Case Narrative	4
Definitions	5
Client Sample Results	6
QC Sample Results	18
QC Association	23
Chronicle	26
Method Summary	30
Certification Summary	31
Chain of Custody	32
Receipt Checklists	35

10

# **Sample Summary**

Matrix

Water

Water

Water

Soil

Soil

Soil

Water Water

Water

Soil

Soil

Soil

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

Client Sample ID

A-1-1

A-1-2

C-1-1

A-1-1

A-1-2

C-1-1

A-2-1

A-2-2

C-2-1

A-2-1

A-2-2

C-2-1

Lab Sample ID

490-77315-1

490-77315-2

490-77315-3

490-77315-4

490-77315-5

490-77315-6

490-77315-7

490-77315-8

490-77315-9

490-77315-10

490-77315-11

490-77315-12

TestAmerica Job ID: 490-77315-1

Collected	Received
04/24/15 15:35	04/28/15 08:50
04/24/15 15:30	04/28/15 08:50
04/24/15 15:25	04/28/15 08:50
04/24/15 15:35	04/28/15 08:50
04/24/15 15:30	04/28/15 08:50
04/24/15 15:25	04/28/15 08:50
04/27/15 16:00	04/28/15 08:50
04/27/15 16:10	04/28/15 08:50
04/27/15 15:30	04/28/15 08:50

04/27/15 16:00 04/28/15 08:50

04/27/15 16:10 04/28/15 08:50 04/27/15 15:30 04/28/15 08:50

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## **Case Narrative**

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-77315-1

Job ID: 490-77315-1

Laboratory: TestAmerica Nashville

**Narrative** 

Job Narrative 490-77315-1

#### Comments

No additional comments.

#### Receipt

The samples were received on 4/28/2015 8:50 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperatures of the 2 coolers at receipt time were 3.6° C and 4.7° C.

#### Except:

Limited sample volume was provided for the following samples: A-1-1 (490-77315-1), A-1-2 (490-77315-2), C-1-1 (490-77315-3), A-2-1 (490-77315-7), A-2-2 (490-77315-8) and C-2-1 (490-77315-9).

#### HPLC/IC

Method 9056: The following samples were diluted due to the nature of the sample matrix: A-1-1 (490-77315-1), A-1-2 (490-77315-2), A-2-1 (490-77315-7) and A-2-2 (490-77315-8). Elevated reporting limits (RLs) are provided.

Method 9056: The following samples were received and analyzed outside of the analytical holding time: A-1-1 (490-77315-1), A-1-2 (490-77315-2), C-1-1 (490-77315-3).

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

#### Metals

Method 6020: The method blank for 244768 contained Iron above the reporting limit (RL). Associated samples were not re-extracted and/or re-analyzed because results were greater than 10X the value found in the method blank.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

#### Field Service / Mobile Lab

No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

#### **General Chemistry**

Method 7196A: The following samples were received outside of holding time: A-1-1 (490-77315-1), A-1-2 (490-77315-2), C-1-1 (490-77315-3), A-2-1 (490-77315-7), A-2-2 (490-77315-8) and C-2-1 (490-77315-9).

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

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## **Definitions/Glossary**

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-77315-1

## **Qualifiers**

#### **HPLC/IC**

Qualifier	Qualifier Description
F1	MS and/or MSD Recovery is outside acceptance limits

**Metals** 

Qualifier **Qualifier Description** MS and/or MSD Recovery is outside acceptance limits.

4 MS, MSD: The analyte present in the original sample is greater than 4 times the matrix spike concentration; therefore, control limits are not

Compound was found in the blank and sample.

**General Chemistry** 

Qualifier **Qualifier Description** 

Sample was prepped or analyzed beyond the specified holding time

**Glossary** 

Abbreviation These commonly used abbreviations may or may not be present in this report.

n Listed under the "D" column to designate that the result is reported on a dry weight basis

%R Percent Recovery **CFL** Contains Free Liquid **CNF** Contains no Free Liquid

DER Duplicate error ratio (normalized absolute difference)

Dil Fac Dilution Factor

DL, RA, RE, IN Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample

DLC Decision level concentration MDA Minimum detectable activity **EDL Estimated Detection Limit** MDC Minimum detectable concentration

MDL Method Detection Limit ML Minimum Level (Dioxin) NC Not Calculated

ND Not detected at the reporting limit (or MDL or EDL if shown)

**PQL Practical Quantitation Limit** 

**Quality Control** QC **RER** Relative error ratio

Reporting Limit or Requested Limit (Radiochemistry) RL

**RPD** Relative Percent Difference, a measure of the relative difference between two points

TEF Toxicity Equivalent Factor (Dioxin) **TEQ** Toxicity Equivalent Quotient (Dioxin)

Page 5 of 35

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-77315-1

Client Sample ID: A-1-1 Lab Sample ID: 490-77315-1 Date Collected: 04/24/15 15:35

**Matrix: Water** 

Date Received: 04/28/15 08:50

Method: 9056 - Anions, Ion Ch		•							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Nitrate as N	2.04		0.100		mg/L			04/28/15 16:39	1
Sulfate	2730		10.0		mg/L			04/29/15 13:39	10
Method: 6020 - Metals (ICP/MS	) - Dissolve	ed							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	0.0258		0.0100		mg/L		04/29/15 15:13	05/01/15 16:02	- 5
Chromium	0.0606		0.0100		mg/L		04/29/15 15:13	05/01/15 16:02	5
Copper	0.0696		0.0100		mg/L		04/29/15 15:13	05/01/15 16:02	5
Iron	788		1.25		mg/L		04/29/15 15:13	05/04/15 12:03	50
General Chemistry - Dissolved									
Analyte		Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium, hex	ND	H	0.0100		mg/L			05/05/15 14:37	1

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-77315-1

Lab Sample ID: 490-77315-2

Analyzed

05/05/15 14:38

Prepared

Matrix: Water

Date Collected: 04/24/15 15:30 Date Received: 04/28/15 08:50

**General Chemistry - Dissolved** 

Analyte

Chromium, hex

Client Sample ID: A-1-2

Analyte	Result Qu	ualifier RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Nitrate as N	2.09	0.100		mg/L			04/28/15 17:19	1
Sulfate	2440	10.0		mg/L			04/29/15 13:59	10
Method: 6020 - Metals	•	ualifior DI	MDI	Unit	n	Propared	Analyzod	Dil Fac
	(ICP/MS) - Dissolved Result Qu		MDL	Unit	D	Prepared	Analyzed	Dil Fac
Analyte	•	ualifier RL 0.0100	MDL	Unit mg/L	<u>D</u>		Analyzed 05/01/15 16:07	Dil Fac
Analyte	Result Qu		MDL		D	04/29/15 15:13		
Analyte Arsenic	Result Qu 0.222	0.0100	MDL	mg/L	<u>D</u>	04/29/15 15:13 04/29/15 15:13	05/01/15 16:07	5

RL

0.0100

MDL Unit

mg/L

Result Qualifier

0.0370 H

Dil Eac

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Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-77315-1

Client Sample ID: C-1-1 Lab Sample ID: 490-77315-3 Date Collected: 04/24/15 15:25

**Matrix: Water** 

Date Received: 04/28/15 08:50

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Nitrate as N	1.57		0.100		mg/L			04/28/15 17:59	1
Sulfate	13.3		1.00		mg/L			04/28/15 17:59	1
Method: 6020 - Metals (ICP/MS) -	Dissolve	ed							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	34.0		0.0833		mg/L		05/01/15 09:45	05/04/15 15:07	25
Chromium	5.18		0.0167		mg/L		05/01/15 09:45	05/04/15 12:54	5
Copper	36.5		0.0833		mg/L		05/01/15 09:45	05/04/15 15:07	25
Iron	135		0.208		mg/L		05/01/15 09:45	05/04/15 12:54	5
General Chemistry - Dissolved									
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium, hex	0.0140	H	0.0100		mg/L			05/05/15 14:40	

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-77315-1

Client Sample ID: A-1-1

Lab Sample ID: 490-77315-4

**Matrix: Soil** 

Date Collected: 04/24/15 15:35 Date Received: 04/28/15 08:50

Method: 6020 - Metals (ICP/MS) Analyte	Result Qualifier	RL	MDL Unit	D Prepared	Analyzed	Dil Fac
Arsenic	361	2.46	mg/Kg	04/29/15 17:51	04/30/15 13:47	5
Chromium	49.0	0.491	mg/Kg	04/29/15 17:51	04/30/15 13:11	1
Copper	468	2.46	mg/Kg	04/29/15 17:51	04/30/15 13:47	5
Iron	2650 B	4.91	mg/Kg	04/29/15 17:51	04/30/15 13:11	1

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Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-77315-1

Client Sample ID: A-1-2

Lab Sample ID: 490-77315-5 Date Collected: 04/24/15 15:30

**Matrix: Soil** 

Date Received: 04/28/15 08:50

Method: 6020 - Metals (ICP/ Analyte	MS)  Result Qualifier	RL	MDL Unit	D Prepared	Analyzed	Dil Fac
Arsenic	270	0.489	mg/Kg	04/29/15 17:5	04/30/15 13:17	1
Chromium	49.3	0.489	mg/Kg	04/29/15 17:5	04/30/15 13:17	1
Copper	390	2.45	mg/Kg	04/29/15 17:5	04/30/15 17:59	5
Iron	3070 B	4.89	mg/Kg	04/29/15 17:5	04/30/15 13:17	1

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-77315-1

Lab Sample ID: 490-77315-6

Matrix: Soil

Date Collected: 04/24/15 15:25 Date Received: 04/28/15 08:50

Client Sample ID: C-1-1

Method: 6020 - Metals (ICP/MS) Analyte	Result Qualit	fier RL	MDL Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	177	0.483	mg/Kg		04/29/15 17:51	04/30/15 13:22	1
Chromium	34.5	0.483	mg/Kg		04/29/15 17:51	04/30/15 13:22	1
Copper	259	0.483	mg/Kg		04/29/15 17:51	04/30/15 13:22	1
Iron	1310 B	4.83	mg/Kg		04/29/15 17:51	04/30/15 13:22	1

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Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-77315-1

Client Sample ID: A-2-1 Lab Sample ID: 490-77315-7

Date Collected: 04/27/15 16:00

Analyte

Chromium, hex

**Matrix: Water** Date Received: 04/28/15 08:50

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Nitrate as N	1.25		0.100		mg/L			04/28/15 18:19	1
Sulfate	2870		10.0		mg/L			04/29/15 14:19	10
- Method: 6020 - Metals	s (ICP/MS) - Dissolve	ed							
	•	Qualifier	DI	MDI	Unit	D	Prepared	Analyzed	Dil Fac
Analyte	Result	Qualifier	RL	MDL	Ullit	ט	riepaieu	Allalyzeu	DII Fac
Arsenic	0.231	Qualifier	0.0100	INIDL	mg/L			05/01/15 16:23	5
		Qualifier		WIDL			04/29/15 15:13		
Arsenic	0.231	Quaimer	0.0100	MIDL	mg/L		04/29/15 15:13 04/29/15 15:13	05/01/15 16:23	5

RL

0.0100

Result Qualifier

0.0490 H

MDL Unit Prepared Analyzed mg/L 05/05/15 14:41

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-77315-1

Client Sample ID: A-2-2 Lab Sample ID: 490-77315-8

0.0360 H

Date Collected: 04/27/15 16:10 Date Received: 04/28/15 08:50

Chromium, hex

**Matrix: Water** 

05/05/15 14:43

Method: 9056 - Anions, Ion	•							
Analyte	Result Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Nitrate as N	1.20	0.100		mg/L			04/28/15 18:59	1
Sulfate	2920	10.0		mg/L			04/29/15 14:40	10
_ Method: 6020 - Metals (ICP	/MS) - Dissolved							
Analyte	Result Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	0.0935	0.0100		mg/L		04/29/15 15:13	05/01/15 16:28	5
Chromium	0.644	0.0100		mg/L		04/29/15 15:13	05/01/15 16:28	5
Copper	7.44	0.0100		mg/L		04/29/15 15:13	05/01/15 16:28	5
_lron _	745	1.25		mg/L		04/29/15 15:13	05/04/15 12:18	50
_ General Chemistry - Disso	lved							
Analyte	Result Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac

0.0100

mg/L

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-77315-1

Client Sample ID: C-2-1 Lab Sample ID: 490-77315-9 **Matrix: Water** 

Date Collected: 04/27/15 15:30 Date Received: 04/28/15 08:50

Method: 9056 - Anions,	lon Chromatography						
Analyte	Result Qualifier	RL	MDL Unit	D	Prepared	Analyzed	Dil Fac
Nitrate as N	1.56	0.100	mg/L			04/28/15 19:40	1
Sulfate	14.9	1.00	mg/L			04/28/15 19:40	1
Method: 6020 - Metals (I	CP/MS) Discolved						

Method: 6020 - Metals (IC	P/MS) - Dissolved							
Analyte	Result Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	22.9	0.0833		mg/L		05/01/15 09:45	05/04/15 15:12	25
Chromium	2.61	0.0167		mg/L		05/01/15 09:45	05/04/15 13:09	5
Copper	18.9	0.0833		mg/L		05/01/15 09:45	05/04/15 15:12	25
Iron	71.0	0.208		mg/L		05/01/15 09:45	05/04/15 13:09	5

iron	71.0		0.206		IIIg/L		05/01/15 09.45	05/04/15 15.09	5
General Chemistry - Dissolved Analyte Chromium, hex	Result ND	Qualifier	RL 0.0100	MDL	Unit mg/L	<u>D</u>	Prepared	Analyzed 05/05/15 14:45	Dil Fac
Onformati, fiex	ND	**	0.0100		mg/L			03/03/13 14.43	Į.

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-77315-1

Lab Sample ID: 490-77315-10

Date Collected: 04/27/15 16:00 Date Received: 04/28/15 08:50

Client Sample ID: A-2-1

Matrix: Soil

Method: 6020 - Metals (ICP/MS) Analyte	Result Qualifier	RL	MDL Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	313	0.488	mg/Kg		04/29/15 17:51	04/30/15 13:27	1
Chromium	54.9	0.488	mg/Kg		04/29/15 17:51	04/30/15 13:27	1
Copper	425	2.44	mg/Kg		04/29/15 17:51	04/30/15 18:04	5
Iron	3010 B	4.88	mg/Kg		04/29/15 17:51	04/30/15 13:27	1

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Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-77315-1

Lab Sample ID: 490-77315-11

Matrix: Soil

Date Collected: 04/27/15 16:10 Date Received: 04/28/15 08:50

Client Sample ID: A-2-2

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Method: 6020 - Metals (ICP/MS) Analyte	Result Qualifier	RL	MDL Unit	D Prepared	Analyzed	Dil Fac
Arsenic	209	0.492	mg/Kg	04/29/15 17:51	04/30/15 13:32	1
Chromium	37.1	0.492	mg/Kg	04/29/15 17:51	04/30/15 13:32	1
Copper	270	0.492	mg/Kg	04/29/15 17:51	04/30/15 13:32	1
Iron	2030 B	4.92	mg/Kg	04/29/15 17:51	04/30/15 13:32	1

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

Client Sample ID: C-2-1

TestAmerica Job ID: 490-77315-1

Lab Sample ID: 490-77315-12

Date Collected: 04/27/15 15:30 **Matrix: Soil** Date Received: 04/28/15 08:50

Method: 6020 - Metals (ICP/ Analyte	MS)  Result Qualifier	RL	MDL Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	113	0.495	mg/Kg		04/29/15 17:51	04/30/15 13:37	1
Chromium	25.4	0.495	mg/Kg		04/29/15 17:51	04/30/15 13:37	1
Copper	194	0.495	mg/Kg		04/29/15 17:51	04/30/15 13:37	1
Iron	1490 B	4.95	mg/Kg		04/29/15 17:51	04/30/15 13:37	1

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

Method: 9056 - Anions, Ion Chromatography

Lab Sample ID: MB 490-244564/6 Client Sample ID: Method Blank Prep Type: Total/NA **Matrix: Water** 

**Analysis Batch: 244564** 

MB MB Analyte Result Qualifier RL **MDL** Unit Analyzed Dil Fac Prepared 1.00 04/28/15 14:45 Sulfate ND mg/L

Lab Sample ID: LCS 490-244564/7 Client Sample ID: Lab Control Sample **Matrix: Water** Prep Type: Total/NA

**Analysis Batch: 244564** 

Spike LCS LCS %Rec. Added Limits Analyte Result Qualifier Unit %Rec Sulfate 100 108.8 mg/L 109 80 - 120

Lab Sample ID: LCSD 490-244564/8 Client Sample ID: Lab Control Sample Dup **Matrix: Water** Prep Type: Total/NA

Analysis Batch: 244564

Spike LCSD LCSD %Rec. **RPD** Added Result Qualifier Limits RPD Limit Analyte Unit D %Rec Sulfate 100 109.3 mg/L 109 80 - 120

Lab Sample ID: 490-77105-B-1 MS **Client Sample ID: Matrix Spike** Prep Type: Total/NA

**Matrix: Water** 

**Analysis Batch: 244564** 

Sample Sample Spike MS MS %Rec. Analyte Result Qualifier Added Result Qualifier Unit %Rec Limits Sulfate 54.6 F1 100 180.6 F1 126 80 - 120 mg/L

Lab Sample ID: 490-77105-B-1 MSD Client Sample ID: Matrix Spike Duplicate **Matrix: Water** Prep Type: Total/NA

**Analysis Batch: 244564** 

Spike MSD MSD %Rec. RPD Sample Sample Added Analyte Result Qualifier Result Qualifier Unit D %Rec Limits RPD Limit Sulfate 54.6 F1 100 179.5 F1 125 80 - 120 mg/L

Lab Sample ID: MB 490-244565/6 **Client Sample ID: Method Blank** Prep Type: Total/NA

**Matrix: Water** 

**Analysis Batch: 244565** 

MB MB Analyte Result Qualifier RL MDL Unit Prepared D Analyzed Dil Fac 0 100 Nitrate as N mg/L 04/28/15 14:45 ND

Lab Sample ID: LCS 490-244565/7 Client Sample ID: Lab Control Sample Prep Type: Total/NA

**Matrix: Water** 

**Analysis Batch: 244565** 

Spike LCS LCS %Rec. Added Result Qualifier Analyte Unit %Rec Limits Nitrate as N 10.0 10.51 105 80 - 120

Lab Sample ID: LCSD 490-244565/8 Client Sample ID: Lab Control Sample Dup **Matrix: Water** Prep Type: Total/NA

**Analysis Batch: 244565** 

LCSD LCSD Spike %Rec. Added Limits Analyte Result Qualifier Unit D %Rec RPD Limit Nitrate as N 10.0 10.40 104 80 - 120 mg/L

TestAmerica Nashville

Page 18 of 35

RPD

**Client Sample ID: Matrix Spike Duplicate** 

**Client Sample ID: Matrix Spike** 

**Client Sample ID: Method Blank** 

**Client Sample ID: Lab Control Sample** 

**Client Sample ID: Lab Control Sample Dup** 

Client Sample ID: Matrix Spike Duplicate

**Prep Type: Total/NA** 

Prep Type: Total/NA

**Client Sample ID: Matrix Spike** 

Lab Sample ID: 490-77105-B-1 MS

**Matrix: Water** 

Analysis Batch: 244565

Sample Sample Spike MS MS %Rec. Analyte Result Qualifier Added Result Qualifier Unit D %Rec Limits Nitrate as N 2.62 F1 10.0 15.77 F1 131 80 - 120 mg/L

Lab Sample ID: 490-77105-B-1 MSD

**Matrix: Water** 

**Analysis Batch: 244565** 

	Sample	Sample	Spike	MSD	MSD				%Rec.		RPD
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	RPD	Limit
Nitrate as N	2.62	F1	10.0	15.81	F1	mg/L		132	80 - 120	0	20

Lab Sample ID: MB 490-244639/6

**Matrix: Water** 

**Analysis Batch: 244639** 

	MB	MR
Analyte	Result	Qua

RL **MDL** Unit ıalifier Prepared Analyzed Dil Fac 04/29/15 12:39 Sulfate 1.00 mg/L

Lab Sample ID: LCS 490-244639/7

**Matrix: Water** 

**Analysis Batch: 244639** 

	<b>Spike</b>	LC2	LUS			%Rec.
Analyte	Added	Result	Qualifier Unit	D	%Rec	Limits
Sulfate	100	105.5	mg/L		106	80 - 120

Lab Sample ID: LCSD 490-244639/8

**Matrix: Water** 

**Analysis Batch: 244639** 

	Spike	LCSD	LCSD				%Rec.		RPD
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits	RPD	Limit
Sulfate	 100	104 8		ma/L		105	80 - 120		20

Lab Sample ID: 490-77399-C-1 MS

**Matrix: Water** 

Analysis Batch: 244639

	Sample	Sample	Spike	MS	MS				%Rec.	
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Sulfate	5.01		100	105.0		ma/l		100	80 120	

Lab Sample ID: 490-77399-C-1 MSD

**Matrix: Water** 

Analysis Ratch: 244639

Alialysis Dalcii. 244033											
-	Sample	Sample	Spike	MSD	MSD				%Rec.		RPD
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	RPD	Limit
Sulfate	5.91		100	106.2		mg/L		100	80 - 120	0	20

TestAmerica Nashville

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

Method: 6020 - Metals (ICP/MS)

Lab Sample ID: MB 490-244768/1-A

**Matrix: Solid** 

**Analysis Batch: 245008** 

**Client Sample ID: Method Blank Prep Type: Total/NA** 

Prep Batch: 244768

Prep Type: Total/NA

_	MB	MB						•	
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND		0.484		mg/Kg		04/29/15 17:51	04/30/15 12:05	1
Chromium	ND		0.484		mg/Kg		04/29/15 17:51	04/30/15 12:05	1
Copper	ND		0.484		mg/Kg		04/29/15 17:51	04/30/15 12:05	1
Iron	6.046		4.84		mg/Kg		04/29/15 17:51	04/30/15 12:05	1

Lab Sample ID: LCS 490-244768/2-A **Client Sample ID: Lab Control Sample** Prep Type: Total/NA

**Matrix: Solid** 

Analyte

**Analysis Batch: 245008** 

	Spike	LCS	LCS				Prep Ba %Rec.	itch: 244768
	Added	Result	Qualifier	Unit	D	%Rec	Limits	
-	19.5	17.69		mg/Kg		91	80 - 120	
	19.5	19.59		mg/Kg		100	80 - 120	

Arsenic Chromium Copper 19.5 18.23 mg/Kg 80 - 120 93 80 - 120 Iron 195 188.1 mg/Kg 96 Lab Sample ID: 490-77268-E-1-C MS **Client Sample ID: Matrix Spike** 

**Matrix: Solid** Analysis Ratch: 245008

	Analysis Batch: 245008	Sample	Sample	Spike	MS	MS				Prep Batch: 244768 %Rec.
	Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits
	Arsenic	5.41		20.1	21.06		mg/Kg		78	75 - 125
	Chromium	22.0		20.1	43.35		mg/Kg		107	75 - 125
l	Copper	14.9	F1	20.1	29.08	F1	mg/Kg		71	75 - 125
	Iron	15700	В	201	16210	4	mg/Kg		236	75 <sub>-</sub> 125

Lab Sample ID: 490-77268-E-1-D MSD **Client Sample ID: Matrix Spike Duplicate Prep Type: Total/NA** 

**Matrix: Solid** 

Analysis Batch: 245008									Prep Ba	tch: 24	4768
•	Sample	Sample	Spike	MSD	MSD				%Rec.		RPD
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	RPD	Limit
Arsenic	5.41		19.5	21.58		mg/Kg		83	75 - 125	2	20
Chromium	22.0		19.5	38.44		mg/Kg		84	75 - 125	12	20
Copper	14.9	F1	19.5	30.68		mg/Kg		81	75 - 125	5	20
Iron	15700	В	195	15300	4	mg/Kg		-224	75 - 125	6	20

Lab Sample ID: MB 490-244711/1-A Client Sample ID: Method Blank **Matrix: Water Prep Type: Total Recoverable** 

MD MD

Analysis Batch: 245540 **Prep Batch: 244711** 

	IVID	IVID							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND		0.00200		mg/L	<del></del>	04/29/15 15:13	05/01/15 15:21	1
Chromium	ND		0.00200		mg/L		04/29/15 15:13	05/01/15 15:21	1
Copper	ND		0.00200		mg/L		04/29/15 15:13	05/01/15 15:21	1
Iron	ND		0.0250		mg/L		04/29/15 15:13	05/01/15 15:21	1

TestAmerica Nashville

5/12/2015

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

Lab Sample ID: LCS 490-244711/2-A

Method: 6020 - Metals (ICP/MS) (Continued)

**Client Sample ID: Lab Control Sample Prep Type: Total Recoverable** 

Analysis Batch: 245540	Spike	LCS	LCS				%Rec.	/1
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Arsenic	0.100	0.09464		mg/L	-	95	80 - 120	
Chromium	0.100	0.09636		mg/L		96	80 - 120	
Copper	0.100	0.09476		mg/L		95	80 - 120	
Iron	1.00	0.9751		mg/L		98	80 - 120	

**Client Sample ID: Matrix Spike Prep Type: Dissolved** 

**Client Sample ID: Matrix Spike Duplicate** 

**Matrix: Water** 

Analysis Batch: 245540

Lab Sample ID: 490-77278-G-11-B MS

h: 245540									Prep Batch: 244	711
	Sample	Sample	Spike	MS	MS				%Rec.	
	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	
	ND		0.100	0.09313		mg/L		92	75 - 125	

Analyte Arsenic Chromium ND 0.100 0.09260 mg/L 75 - 125 0.08796 Copper ND 0.100 88 75 - 125 mg/L 75 - 125 Iron 28.5 1.00 29.49 4 98 mg/L

Lab Sample ID: 490-77278-G-11-C MSD

**Matrix: Water** 

Ma	atrix: Water									Prep Type	e: Diss	olved
Ar	nalysis Batch: 245540									Prep Ba	itch: 24	4711
	_	Sample	Sample	Spike	MSD	MSD				%Rec.		RPD
An	alyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	RPD	Limit
Ars	senic	ND		0.100	0.09389		mg/L		93	75 - 125	1	20
Ch	romium	ND		0.100	0.09436		mg/L		94	75 - 125	2	20
Co	pper	ND		0.100	0.08964		mg/L		90	75 - 125	2	20
Iro	n	28.5		1.00	29.79	4	mg/L		128	75 - 125	1	20

Lab Sample ID: MB 490-245145/1-B Client Sample ID: Method Blank

Lab Cample ID. NID 430-243143/11					Onent Gam	pie ib. Metilo	a Dialik
Matrix: Water					F	rep Type: Di	ssolved
Analysis Batch: 245763						Prep Batch:	245146
•	MB	MB				•	
A a la eta	D14	O!!£!	DI	MDI IInit	 B	A II	D11 E

Analyte	Result Qualifier	RL	MDL Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND	0.00200	mg/L		05/01/15 09:45	05/04/15 12:39	1
Chromium	ND	0.00200	mg/L		05/01/15 09:45	05/04/15 12:39	1
Copper	ND	0.00200	mg/L		05/01/15 09:45	05/04/15 12:39	1
Iron	ND	0.0250	mg/L		05/01/15 09:45	05/04/15 12:39	1

Lab Sample ID: LCS 490-245145/2-B **Client Sample ID: Lab Control Sample** 

Matrix: Water Analysis Batch: 245763							Prep Type: Dissolved Prep Batch: 245146 %Rec. Limits 80 - 120 80 - 120 80 - 120	
- = = = = = = = = = = = = = = = = = =	Spike	LCS	LCS				•	
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Arsenic	0.100	0.1011		mg/L		101	80 - 120	
Chromium	0.100	0.1051		mg/L		105	80 - 120	
Copper	0.100	0.09973		mg/L		100	80 - 120	
Iron	1.00	1.022		mg/L		102	80 - 120	

TestAmerica Nashville

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

Method: 6020 - Metals (ICP/MS) (Continued)

Method: 7196A - Chromium, Hexavalent

Lab Sample ID: 490-77738-F-1 DU

Lab Sample ID: LCSD 490-245145/3-B Matrix: Water Analysis Batch: 245763							D: Lab Control Sam Prep Type: Di Prep Batch:		
	Spike	LCSD	LCSD				%Rec.		RPD
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits	RPD	Limit
Arsenic	0.100	0.1008		mg/L		101	80 - 120	0	20
Chromium	0.100	0.1041		mg/L		104	80 - 120	1	20
Copper	0.100	0.09798		mg/L		98	80 - 120	2	20
Iron	1.00	0.9954		mg/L		100	80 - 120	3	20

#### Lab Sample ID: MB 490-246812/4 **Client Sample ID: Method Blank Matrix: Water Prep Type: Total/NA Analysis Batch: 246812** MB MB Analyte **Result Qualifier** RL **MDL** Unit Prepared Analyzed Chromium, hex $\overline{\mathsf{ND}}$ 0.0100 mg/L 05/05/15 11:10

Lab Sample ID: LCS 490-246812/3 Matrix: Water Analysis Batch: 246812						Clie	ent Sai	mple ID	le ID: Lab Control Sample Prep Type: Total/NA %Rec.				
	•			Spike	LCS	LCS				%Rec.			
	Analyte			Added	Result	Qualifier	Unit	D	%Rec	Limits			
	Chromium, hex			0.100	0.1040		mg/L		104	85 - 115			

Lab Sample ID: 490-77738-F Matrix: Water Analysis Batch: 246812	F-1 MS						CI	ient Sa	•	atrix Spike e: Total/NA
	Sample	Sample	Spike	MS	MS				%Rec.	
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Chromium, hex	ND		0.100	0.1060	-	mg/L		97	85 - 115	
Lab Sample ID: 490-77738-F	-1 MSD					Client	Samp	le ID: N	latrix Spike	Duplicate

Matrix: Water									Prep Ty	ວe: Tot	al/NA
Analysis Batch: 246812											
_	Sample	Sample	Spike	MSD	MSD				%Rec.		RPD
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	RPD	Limit
Chromium, hex	ND		0.100	0.1060		mg/L		97	85 - 115	0	20

Matrix: Water							Prep Type: T	ota	I/NA
Analysis Batch: 246812									
-	Sample	Sample	DU	DU					RPD
Analyte	Result	Qualifier	Result	Qualifier	Unit	D	RP	D	Limit
Chromium, hex	ND		 ND		mg/L		N	c -	20

**Client Sample ID: Duplicate** 

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

## HPLC/IC

### Analysis Batch: 244564

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-77105-B-1 MS	Matrix Spike	Total/NA	Water	9056	
490-77105-B-1 MSD	Matrix Spike Duplicate	Total/NA	Water	9056	
490-77315-3	C-1-1	Total/NA	Water	9056	
490-77315-9	C-2-1	Total/NA	Water	9056	
LCS 490-244564/7	Lab Control Sample	Total/NA	Water	9056	
LCSD 490-244564/8	Lab Control Sample Dup	Total/NA	Water	9056	
MB 490-244564/6	Method Blank	Total/NA	Water	9056	

### **Analysis Batch: 244565**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-77105-B-1 MS	Matrix Spike	Total/NA	Water	9056	_
490-77105-B-1 MSD	Matrix Spike Duplicate	Total/NA	Water	9056	
490-77315-1	A-1-1	Total/NA	Water	9056	
490-77315-2	A-1-2	Total/NA	Water	9056	
490-77315-3	C-1-1	Total/NA	Water	9056	
490-77315-7	A-2-1	Total/NA	Water	9056	
490-77315-8	A-2-2	Total/NA	Water	9056	
490-77315-9	C-2-1	Total/NA	Water	9056	
LCS 490-244565/7	Lab Control Sample	Total/NA	Water	9056	
LCSD 490-244565/8	Lab Control Sample Dup	Total/NA	Water	9056	
MB 490-244565/6	Method Blank	Total/NA	Water	9056	

## **Analysis Batch: 244639**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-77315-1	A-1-1	Total/NA	Water	9056	_
490-77315-2	A-1-2	Total/NA	Water	9056	
490-77315-7	A-2-1	Total/NA	Water	9056	
490-77315-8	A-2-2	Total/NA	Water	9056	
490-77399-C-1 MS	Matrix Spike	Total/NA	Water	9056	
490-77399-C-1 MSD	Matrix Spike Duplicate	Total/NA	Water	9056	
LCS 490-244639/7	Lab Control Sample	Total/NA	Water	9056	
LCSD 490-244639/8	Lab Control Sample Dup	Total/NA	Water	9056	
MB 490-244639/6	Method Blank	Total/NA	Water	9056	

## Metals

## **Prep Batch: 244711**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-77278-G-11-B MS	Matrix Spike	Dissolved	Water	3005A	
490-77278-G-11-C MSD	Matrix Spike Duplicate	Dissolved	Water	3005A	
490-77315-1	A-1-1	Dissolved	Water	3005A	
490-77315-2	A-1-2	Dissolved	Water	3005A	
490-77315-7	A-2-1	Dissolved	Water	3005A	
490-77315-8	A-2-2	Dissolved	Water	3005A	
LCS 490-244711/2-A	Lab Control Sample	Total Recoverable	Water	3005A	
MB 490-244711/1-A	Method Blank	Total Recoverable	Water	3005A	

## Prep Batch: 244768

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-77268-E-1-C MS	Matrix Spike	Total/NA	Solid	3051A	

TestAmerica Nashville

Page 23 of 35

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Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

# **Metals (Continued)**

### Prep Batch: 244768 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-77268-E-1-D MSD	Matrix Spike Duplicate	Total/NA	Solid	3051A	
490-77315-4	A-1-1	Total/NA	Soil	3051A	
490-77315-5	A-1-2	Total/NA	Soil	3051A	
490-77315-6	C-1-1	Total/NA	Soil	3051A	
490-77315-10	A-2-1	Total/NA	Soil	3051A	
490-77315-11	A-2-2	Total/NA	Soil	3051A	
490-77315-12	C-2-1	Total/NA	Soil	3051A	
LCS 490-244768/2-A	Lab Control Sample	Total/NA	Solid	3051A	
MB 490-244768/1-A	Method Blank	Total/NA	Solid	3051A	

### **Analysis Batch: 245008**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-77268-E-1-C MS	Matrix Spike	Total/NA	Solid	6020	244768
490-77268-E-1-D MSD	Matrix Spike Duplicate	Total/NA	Solid	6020	244768
490-77315-4	A-1-1	Total/NA	Soil	6020	244768
490-77315-4	A-1-1	Total/NA	Soil	6020	244768
490-77315-5	A-1-2	Total/NA	Soil	6020	244768
490-77315-6	C-1-1	Total/NA	Soil	6020	244768
490-77315-10	A-2-1	Total/NA	Soil	6020	244768
490-77315-11	A-2-2	Total/NA	Soil	6020	244768
490-77315-12	C-2-1	Total/NA	Soil	6020	244768
LCS 490-244768/2-A	Lab Control Sample	Total/NA	Solid	6020	244768
MB 490-244768/1-A	Method Blank	Total/NA	Solid	6020	244768

## **Analysis Batch: 245086**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-77315-5	A-1-2	Total/NA	Soil	6020	244768
490-77315-10	A-2-1	Total/NA	Soil	6020	244768

### Filtration Batch: 245145

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-77315-3	C-1-1	Dissolved	Water	Filtration	
490-77315-9	C-2-1	Dissolved	Water	Filtration	
LCS 490-245145/2-B	Lab Control Sample	Dissolved	Water	Filtration	
LCSD 490-245145/3-B	Lab Control Sample Dup	Dissolved	Water	Filtration	
MB 490-245145/1-B	Method Blank	Dissolved	Water	Filtration	

### **Prep Batch: 245146**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-77315-3	C-1-1	Dissolved	Water	3005A	245145
490-77315-9	C-2-1	Dissolved	Water	3005A	245145
LCS 490-245145/2-B	Lab Control Sample	Dissolved	Water	3005A	245145
LCSD 490-245145/3-B	Lab Control Sample Dup	Dissolved	Water	3005A	245145
MB 490-245145/1-B	Method Blank	Dissolved	Water	3005A	245145

## **Analysis Batch: 245540**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-77278-G-11-B MS	Matrix Spike	Dissolved	Water	6020	244711
490-77278-G-11-C MSD	Matrix Spike Duplicate	Dissolved	Water	6020	244711
490-77315-1	A-1-1	Dissolved	Water	6020	244711
490-77315-2	A-1-2	Dissolved	Water	6020	244711

TestAmerica Nashville

Page 24 of 35

# **QC Association Summary**

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-77315-1

# **Metals (Continued)**

## **Analysis Batch: 245540 (Continued)**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-77315-7	A-2-1	Dissolved	Water	6020	244711
490-77315-8	A-2-2	Dissolved	Water	6020	244711
LCS 490-244711/2-A	Lab Control Sample	Total Recoverable	Water	6020	244711
MB 490-244711/1-A	Method Blank	Total Recoverable	Water	6020	244711

### Analysis Batch: 245763

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-77315-1	A-1-1	Dissolved	Water	6020	244711
490-77315-2	A-1-2	Dissolved	Water	6020	244711
490-77315-3	C-1-1	Dissolved	Water	6020	245146
490-77315-3	C-1-1	Dissolved	Water	6020	245146
490-77315-7	A-2-1	Dissolved	Water	6020	244711
490-77315-8	A-2-2	Dissolved	Water	6020	244711
490-77315-9	C-2-1	Dissolved	Water	6020	245146
490-77315-9	C-2-1	Dissolved	Water	6020	245146
LCS 490-245145/2-B	Lab Control Sample	Dissolved	Water	6020	245146
LCSD 490-245145/3-B	Lab Control Sample Dup	Dissolved	Water	6020	245146
MB 490-245145/1-B	Method Blank	Dissolved	Water	6020	245146

# **General Chemistry**

### Filtration Batch: 245963

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-77315-1	A-1-1	Dissolved	Water	Filtration	_
490-77315-2	A-1-2	Dissolved	Water	Filtration	
490-77315-3	C-1-1	Dissolved	Water	Filtration	
490-77315-7	A-2-1	Dissolved	Water	Filtration	
490-77315-8	A-2-2	Dissolved	Water	Filtration	
490-77315-9	C-2-1	Dissolved	Water	Filtration	

## Analysis Batch: 246812

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-77315-1	A-1-1	Dissolved	Water	7196A	245963
490-77315-2	A-1-2	Dissolved	Water	7196A	245963
490-77315-3	C-1-1	Dissolved	Water	7196A	245963
490-77315-7	A-2-1	Dissolved	Water	7196A	245963
490-77315-8	A-2-2	Dissolved	Water	7196A	245963
490-77315-9	C-2-1	Dissolved	Water	7196A	245963
490-77738-F-1 DU	Duplicate	Total/NA	Water	7196A	
490-77738-F-1 MS	Matrix Spike	Total/NA	Water	7196A	
490-77738-F-1 MSD	Matrix Spike Duplicate	Total/NA	Water	7196A	
LCS 490-246812/3	Lab Control Sample	Total/NA	Water	7196A	
MB 490-246812/4	Method Blank	Total/NA	Water	7196A	

Page 25 of 35

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

Lab Sample ID: 490-77315-1

**Matrix: Water** 

Client Sample ID: A-1-1

Date Collected: 04/24/15 15:35 Date Received: 04/28/15 08:50

	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Analysis	9056		1	10 mL		244565	04/28/15 16:39	JHS	TAL NSH
Total/NA	Analysis	9056		10	10 mL		244639	04/29/15 13:39	JHS	TAL NSH
Dissolved	Prep	3005A			50 mL	50 mL	244711	04/29/15 15:13	TSC	TAL NSH
Dissolved	Analysis	6020		5	50 mL	50 mL	245540	05/01/15 16:02	JBD	TAL NSH
Dissolved	Prep	3005A			50 mL	50 mL	244711	04/29/15 15:13	TSC	TAL NSH
Dissolved	Analysis	6020		50	50 mL	50 mL	245763	05/04/15 12:03	JBD	TAL NSH
Dissolved	Filtration	Filtration			1.0 mL	1.0 mL	245963	05/05/15 13:30	BLM	TAL NSH
Dissolved	Analysis	7196A		1	10 mL	10 mL	246812	05/05/15 14:37	BLM	TAL NSH

Lab Sample ID: 490-77315-2 Client Sample ID: A-1-2 Date Collected: 04/24/15 15:30

Matrix: Water

Date Received: 04/28/15 08:50

	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Analysis	9056		1	10 mL		244565	04/28/15 17:19	JHS	TAL NSF
Total/NA	Analysis	9056		10	10 mL		244639	04/29/15 13:59	JHS	TAL NSH
Dissolved	Prep	3005A			50 mL	50 mL	244711	04/29/15 15:13	TSC	TAL NSF
Dissolved	Analysis	6020		5	50 mL	50 mL	245540	05/01/15 16:07	JBD	TAL NSF
Dissolved	Prep	3005A			50 mL	50 mL	244711	04/29/15 15:13	TSC	TAL NSF
Dissolved	Analysis	6020		50	50 mL	50 mL	245763	05/04/15 12:08	JBD	TAL NSF
Dissolved	Filtration	Filtration			1.0 mL	1.0 mL	245963	05/05/15 13:30	BLM	TAL NSF
Dissolved	Analysis	7196A		1	10 mL	10 mL	246812	05/05/15 14:38	BLM	TAL NSF

Lab Sample ID: 490-77315-3 **Client Sample ID: C-1-1** Date Collected: 04/24/15 15:25 **Matrix: Water** 

Date Received: 04/28/15 08:50

	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Туре	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Analysis	9056		1	10 mL		244564	04/28/15 17:59	JHS	TAL NSH
Total/NA	Analysis	9056		1	10 mL		244565	04/28/15 17:59	JHS	TAL NSH
Dissolved	Prep	3005A			30 mL	50 mL	245146	05/01/15 09:45	TSC	TAL NSH
Dissolved	Filtration	Filtration			50 mL	50 mL	245145	05/01/15 09:45	TSC	TAL NSH
Dissolved	Analysis	6020		5	30 mL	50 mL	245763	05/04/15 12:54	JBD	TAL NSH
Dissolved	Prep	3005A			30 mL	50 mL	245146	05/01/15 09:45	TSC	TAL NSH
Dissolved	Filtration	Filtration			50 mL	50 mL	245145	05/01/15 09:45	TSC	TAL NSH
Dissolved	Analysis	6020		25	30 mL	50 mL	245763	05/04/15 15:07	JBD	TAL NSH
Dissolved	Filtration	Filtration			1.0 mL	1.0 mL	245963	05/05/15 13:30	BLM	TAL NSH
Dissolved	Analysis	7196A		1	10 mL	10 mL	246812	05/05/15 14:40	BLM	TAL NSH

TestAmerica Nashville

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

Client Sample ID: A-1-1

Lab Sample ID: 490-77315-4

Matrix: Soil

Date Collected: 04/24/15 15:35 Date Received: 04/28/15 08:50

	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.509 g	100 mL	244768	04/29/15 17:51	RDF	TAL NSH
Total/NA	Analysis	6020		1	0.509 g	100 mL	245008	04/30/15 13:11	CME	TAL NSH
Total/NA	Prep	3051A			0.509 g	100 mL	244768	04/29/15 17:51	RDF	TAL NSH
Total/NA	Analysis	6020		5	0.509 g	100 mL	245008	04/30/15 13:47	CME	TAL NSH

Client Sample ID: A-1-2 Lab Sample ID: 490-77315-5

Date Collected: 04/24/15 15:30 Matrix: Soil

Date Received: 04/28/15 08:50

Prep Type Total/NA Total/NA	Batch Type Prep Analysis	<b>Method</b> 3051A 6020	Run	Dil Factor	Initial Amount 0.511 g 0.511 g	Final Amount 100 mL 100 mL	Batch Number 244768 245008	Prepared or Analyzed 04/29/15 17:51 04/30/15 13:17		Lab TAL NSH TAL NSH
Total/NA Total/NA	Prep Analysis	3051A 6020		5	0.511 g 0.511 g	100 mL 100 mL	244768 245086	04/29/15 17:51 04/30/15 17:59	RDF	TAL NSH TAL NSH

Client Sample ID: C-1-1

Date Collected: 04/24/15 15:25

Lab Sample ID: 490-77315-6

Matrix: Soil

Date Collected: 04/24/15 15:25 Date Received: 04/28/15 08:50

	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.518 g	100 mL	244768	04/29/15 17:51	RDF	TAL NSH
Total/NA	Analysis	6020		1	0.518 g	100 mL	245008	04/30/15 13:22	CME	TAL NSH

Client Sample ID: A-2-1

Date Collected: 04/27/15 16:00

Lab Sample ID: 490-77315-7

Matrix: Water

Date Collected: 04/27/15 16:00 Date Received: 04/28/15 08:50

Prep Type Total/NA	Batch Type Analysis	Batch Method 9056	Run	Pactor 1	Initial Amount 10 mL	Final Amount	Batch Number 244565	Prepared or Analyzed 04/28/15 18:19	Analyst JHS	Lab TAL NSH
Total/NA	Analysis	9056		10	10 mL		244639	04/29/15 14:19	JHS	TAL NSH
Dissolved Dissolved	Prep Analysis	3005A 6020		5	50 mL 50 mL	50 mL 50 mL	244711 245540			TAL NSH TAL NSH
Dissolved Dissolved	Prep Analysis	3005A 6020		50	50 mL 50 mL	50 mL 50 mL	244711 245763	04/29/15 15:13 05/04/15 12:13		TAL NSH TAL NSH
Dissolved Dissolved	Filtration Analysis	Filtration 7196A		1	1.0 mL 10 mL	1.0 mL 10 mL	245963 246812	05/05/15 13:30 05/05/15 14:41	BLM BLM	TAL NSH TAL NSH

Client Sample ID: A-2-2 Lab Sample ID: 490-77315-8

Date Collected: 04/27/15 16:10 Date Received: 04/28/15 08:50

_	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Analysis	9056		1	10 mL		244565	04/28/15 18:59	JHS	TAL NSH

TestAmerica Nashville

Page 27 of 35

**Matrix: Water** 

## **Lab Chronicle**

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-77315-1

Batch **Batch** Dil Initial Final Batch Prepared **Prep Type** Туре Method Run Factor Amount Amount Number or Analyzed Analyst Lab Total/NA Analysis 9056 10 10 mL 244639 04/29/15 14:40 JHS TAL NSH Dissolved Prep 3005A 50 mL 244711 04/29/15 15:13 TSC TAL NSH 50 mL Dissolved Analysis 6020 5 50 mL 50 mL 245540 05/01/15 16:28 JBD TAL NSH Dissolved Prep 3005A 50 mL 50 mL 244711 04/29/15 15:13 TSC TAL NSH Dissolved Analysis 6020 50 50 mL 50 mL 245763 05/04/15 12:18 JBD TAL NSH Dissolved Filtration Filtration 1.0 mL 1.0 mL 245963 05/05/15 13:30 BLM TAL NSH Dissolved Analysis 7196A 10 mL 10 mL 246812 05/05/15 14:43 BLM TAL NSH

Client Sample ID: C-2-1

Date Collected: 04/27/15 15:30

Lab Sample ID: 490-77315-9

Matrix: Water

Date Received: 04/28/15 08:50

_	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Analysis	9056		1	10 mL		244564	04/28/15 19:40	JHS	TAL NSH
Total/NA	Analysis	9056		1	10 mL		244565	04/28/15 19:40	JHS	TAL NSH
Dissolved	Prep	3005A			30 mL	50 mL	245146	05/01/15 09:45	TSC	TAL NSH
Dissolved	Filtration	Filtration			50 mL	50 mL	245145	05/01/15 09:45	TSC	TAL NSH
Dissolved	Analysis	6020		5	30 mL	50 mL	245763	05/04/15 13:09	JBD	TAL NSH
Dissolved	Prep	3005A			30 mL	50 mL	245146	05/01/15 09:45	TSC	TAL NSH
Dissolved	Filtration	Filtration			50 mL	50 mL	245145	05/01/15 09:45	TSC	TAL NSH
Dissolved	Analysis	6020		25	30 mL	50 mL	245763	05/04/15 15:12	JBD	TAL NSH
Dissolved	Filtration	Filtration			1.0 mL	1.0 mL	245963	05/05/15 13:30	BLM	TAL NSH
Dissolved	Analysis	7196A		1	10 mL	10 mL	246812	05/05/15 14:45	BLM	TAL NSH

Client Sample ID: A-2-1 Lab Sample ID: 490-77315-10

Date Collected: 04/27/15 16:00 Date Received: 04/28/15 08:50

_	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Туре	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.512 g	100 mL	244768	04/29/15 17:51	RDF	TAL NSH
Total/NA	Analysis	6020		1	0.512 g	100 mL	245008	04/30/15 13:27	CME	TAL NSH
Total/NA	Prep	3051A			0.512 g	100 mL	244768	04/29/15 17:51	RDF	TAL NSH
Total/NA	Analysis	6020		5	0.512 g	100 mL	245086	04/30/15 18:04	JBD	TAL NSH

Client Sample ID: A-2-2 Lab Sample ID: 490-77315-11

Date Collected: 04/27/15 16:10 Date Received: 04/28/15 08:50

_	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.508 g	100 mL	244768	04/29/15 17:51	RDF	TAL NSH
Total/NA	Analysis	6020		1	0.508 g	100 mL	245008	04/30/15 13:32	CME	TAL NSH

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**Matrix: Soil** 

**Matrix: Soil** 

## **Lab Chronicle**

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

**Client Sample ID: C-2-1** 

TestAmerica Job ID: 490-77315-1

Lab Sample ID: 490-77315-12

**Matrix: Soil** 

Date Collected: 04/27/15 15:30 Date Received: 04/28/15 08:50

	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.505 g	100 mL	244768	04/29/15 17:51	RDF	TAL NSH
Total/NA	Analysis	6020		1	0.505 g	100 mL	245008	04/30/15 13:37	CME	TAL NSH

#### **Laboratory References:**

TAL NSH = TestAmerica Nashville, 2960 Foster Creighton Drive, Nashville, TN 37204, TEL (615)726-0177

# **Method Summary**

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-77315-1

Method	Method Description	Protocol	Laboratory
9056	Anions, Ion Chromatography	SW846	TAL NSH
6020	Metals (ICP/MS)	SW846	TAL NSH
7196A	Chromium, Hexavalent	SW846	TAL NSH

#### **Protocol References:**

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

#### Laboratory References:

TAL NSH = TestAmerica Nashville, 2960 Foster Creighton Drive, Nashville, TN 37204, TEL (615)726-0177

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# **Certification Summary**

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-77315-1

# Laboratory: TestAmerica Nashville

All certifications held by this laboratory are listed. Not all certifications are applicable to this report.

Authority	Program	EPA Region	Certification ID	Expiration Date
A2LA	A2LA		NA: NELAP & A2LA	12-31-15
A2LA	ISO/IEC 17025		0453.07	12-31-15
Alaska (UST)	State Program	10	UST-087	10-31-15
Arizona	State Program	9	AZ0473	05-05-16
Arkansas DEQ	State Program	6	88-0737	04-25-16
California	State Program	9	2938	10-31-16
Connecticut	State Program	1	PH-0220	12-31-15
Florida	NELAP	4	E87358	06-30-15
Illinois	NELAP	5	200010	12-09-15
lowa	State Program	7	131	04-01-16
Kansas	NELAP	7	E-10229	05-31-15
Kentucky (UST)	State Program	4	19	06-30-15
Kentucky (WW)	State Program	4	90038	12-31-15
Louisiana	NELAP	6	30613	06-30-15
Maryland	State Program	3	316	03-31-16
Massachusetts	State Program	1	M-TN032	06-30-15
Minnesota	NELAP	5	047-999-345	12-31-15
Mississippi	State Program	4	N/A	06-30-15
Montana (UST)	State Program	8	NA	02-24-20
Nevada	State Program	9	TN00032	07-31-15
New Hampshire	NELAP	1	2963	10-09-15
New Jersey	NELAP	2	TN965	06-30-15
New York	NELAP	2	11342	03-31-16
North Carolina (WW/SW)	State Program	4	387	12-31-15
North Dakota	State Program	8	R-146	06-30-15
Ohio VAP	State Program	5	CL0033	10-16-15
Oklahoma	State Program	6	9412	08-31-15
Oregon	NELAP	10	TN200001	04-27-16
Pennsylvania	NELAP	3	68-00585	06-30-15
Rhode Island	State Program	1	LAO00268	12-30-15
South Carolina	State Program	4	84009 (001)	02-28-16
South Carolina (DW)	State Program	4	84009 (002)	12-16-17
Tennessee	State Program	4	2008	02-23-17
Texas	NELAP	6	T104704077	08-31-15
USDA	Federal		S-48469	10-30-16
Jtah	NELAP	8	TN00032	07-31-15
Virginia	NELAP	3	460152	06-14-15
Washington	State Program	10	C789	07-19-15
West Virginia DEP	State Program	3	219	02-28-16
Wisconsin	State Program	5	998020430	08-31-15
Wyoming (UST)	A2LA	8	453.07	12-31-15

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#### COOLER RECEIPT FORM

THOUSING, IT	
Cooler Received/Opened On 4/28/2015 @ 8:50	
1. Tracking # 452 (last 4 digits, FedEx)	
Courier: FedEx IR Gun ID 17610176	
2. Temperature of rep. sample or temp blank when opened: 47 Degrees Celsius	<b></b>
3. If Item #2 temperature is 0°C or less, was the representative sample or temp blank frozen?	YES NO. (NA
4. Were custody seals on outside of cooler?	ESNONA
If yes, how many and where:	
5. Were the seals intact, signed, and dated correctly?	ESNQNA
6. Were custody papers inside cooler?	MESNO. NA
I certify that I opened the cooler and answered questions 1-6 (intial)	
7. Were custody seals on containers: YES (100) and Intact	YESNO.
Were these signed and dated correctly?	YESNO.MA
8. Packing mat'l used? Bubblewrap Plastic bag Peanuts Vermiculite Foam Insert Papel	Other None
9. Cooling process: (Ice   Ice-pack   Ice (direct contact)   Dry ice	Other None
10. Did all containers arrive in good condition (unbroken)?	(ES).NONA
11. Were all container labels complete (#, date, signed, pres., etc)?	XESNONA
12. Did all container labels and tags agree with custody papers?	YES.).NONA
13a. Were VOA vials received?	YES. NO.NA
b. Was there any observable headspace present in any VOA vial?	YESNO.(NA)
14. Was there a Trip Blank in this cooler? YESNO. (NA) If multiple coolers, sequence	ce #
certify that I unloaded the cooler and answered questions 7-14 (intial)	MOUN
15a. On pres'd bottles, did pH test strips suggest preservation reached the correct pH level?	YESNO.NA
b. Did the bottle labels indicate that the correct preservatives were used	(ES)NONA
16. Was residual chlorine present?	YESNONA
certify that I checked for chlorine and pH as per SOP and answered questions 15-16 (intial)	MDVD
17. Were custody papers properly filled out (ink, signed, etc)?	ÆSNONA
18. Did you sign the custody papers in the appropriate place?	YES.,.NONA
19. Were correct containers used for the analysis requested?	(YES)NONA

I certify that I entered this project into LIMS and answered questions 17-20 (intial)

20. Was sufficient amount of sample sent in each container?

I certify that I attached a label with the unique LIMS number to each container (intial)

21. Were there Non-Conformance issues at login? (FS)..NO Was a NCM generated (FS)..NO...#\_\_\_\_\_

YES...NO...NA



## **COOLER RECEIPT FORM**

Atlanta

	LOC: 490
Cooler Received/Opened On: 4/28/2015 @0850	77315
1. Tracking # <u> 96円 (</u> last 4 digits, FedEx)	
Courier: Fed-Ex IR Gun ID: 14740456	
2. Temperature of rep. sample or temp blank when opened:	
3. If Item #2 temperature is 0°C or less, was the representative sample or temp blank frozen?	YES NO.NA
4. Were custody seals on outside of cooler?	YES).NONA
If yes, how many and where:	
5. Were the seals intact, signed, and dated correctly?	YESNONA
6. Were custody papers inside cooler?	KESNONA
certify that I opened the cooler and answered questions 1-6 (intial)	AF-
7. Were custody seals on containers: YES ( and Intact	YESNO.
Were these signed and dated correctly?	YESNO.
8. Packing mat'l used? Bubblewrap Prastic bag Peanuts Vermiculite Foam Insert Pape	r Other None
9. Cooling process: (Ce ) Ice-pack Ice (direct contact) Dry ice	Other None
10. Did all containers arrive in good condition (unbroken)?	ES)NONA
11. Were all container labels complete (#, date, signed, pres., etc)?	ÆS)NONA
12. Did all container labels and tags agree with custody papers?	ESNONA
13a. Were VOA vials received?	YES(O).NA
b. Was there any observable headspace present in any VOA vial?	YESNO (NA)
14. Was there a Trip Blank in this cooler? YESNO.	ce #
certify that I unloaded the cooler and answered questions 7-14 (intial)	mdug.
15a. On pres'd bottles, did pH test strips suggest preservation reached the correct pH level?	YESNO NA
b. Did the bottle labels indicate that the correct preservatives were used	(ES)NONA
16. Was residual chlorine present?	YESNO.
certify that I checked for chlorine and pH as per SOP and answered questions 15-16 (intial)	<u>mom</u>
17. Were custody papers properly filled out (ink, signed, etc)?	ÆSNONA
18. Did you sign the custody papers in the appropriate place?	ESNONA
19. Were correct containers used for the analysis requested?	ES NO NA
20. Was sufficient amount of sample sent in each container?	(E8)(NO)NA
certify that I entered this project into LIMS and answered questions 17-20 (intial)	MDIN
certify that I attached a label with the unique LIMS number to each container (intial)	MDM
21. Were there Non-Conformance issues at login? (ES)NO Was a NCM generated? (YES).	NO#

# **Chain of Custody Record**

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Custody Seals Intact Custody Seal No.:  A Yes A No	Relinquished by:	Representation of the second o	Relinquished by:	Empty Kit Relinquished by:	Deliverable Requested: I, II, III, IV, Other (specify)	Non-Hezard Flammable Skin Irritent	A-V-2/C-V-	A-2-1	C-2-1	A-22	A-2-1	C-1-1	A-1-2	A-1-1	C-1-1	A-1-2	A-1-1		Sample Identification		Site:	Project Name: Treatability Study	awadhawan@geosyntec.com	ri pire.	State, Zip: MD, 21046	Columbia	Address: 10220 Old Columbia Road Suite A	Company: Geosyntec Consultants, Inc.	Client Contact: Amar Wadhawan	Client Information	TestAmerica Nashville 2960 Foster Creighton Drive Nashville, TN 37204 Phone (615) 726-0177 Fax (615) 726-3404
	Date/Time:		Date/Time:4			Poison B	-	,			412115	51/14/12	454/15	91K2/F	21404	4124/15	3.12411S		Sample Date		SSOW#:	Project #: 49008518	3	Purchase C		(lA) Kequesten (days):	Due Date Requested:		Phone:	Sampler	
		50 4/27/15	12/15/1630	Date:		Unknown Rac	1610/530	1600	1530	16/0	15 1600	1	├	<del>                                     </del>	⊢	<b>├</b>	15 1535		Time	Sample				Purchase Order Requested		ed (days):	questea:		865-370-9	C Chem	Chain of
	Company		Company Check yuter			Radiological	Williams Names XIV	Veater S	Water	Water	Car Water	と書と	Samuel 2	Sales D	Water Water	Cr Water	C Water	reservation Coop	G=grab)   BT=Tissue, /=Air	Sample Matrix Type (W=water, S=solic, C=Comp, O=wasteloil, O=wasteloil								,	03)	F.:	Chain of Custody Record
Cooler Temperature(s) °C and C	Received by:			Time:	Special Instructions/QC Requi	Return To Client	Samuel A			× × ×	×××	7	-2	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	××	× × ×	XXX	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	90 71 60	IBID Filtered erform MS/N 056 - Nitrate, S 196A - Hexava 020 - As, Cr, C	ISD () iulfate lent C	es vi	No.	[No]		29 5 7 2 2 3	Committee State of the State of	Analysis	E-Mail: heather.baker@testamericainc.com	Baker, Heather	Record
°C and Other Remarks:	Date/Time:	Date/i	1 Date/Time:	Method of Shipment	C Requirements:	Disposal By Lab	bo occord if comple											· · · · · · · · · · · · · · · · · · ·										Requested		Carrier Tracking No(s):	
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7	Company	Company				Months	١.		fictored	1-11 ered & thus presented	ed & that preserve				+stered.	) Nitric preserved	d, Nitric preserved		Special Instructions/Note:			VV - pii 4-0 Z - other (specify)	V-MCAA	ā	Q - Na2SO3 R - Na2S2SO3		M - Hexane		<u> </u>	2511.1 //375	12

# **Login Sample Receipt Checklist**

Client: Geosyntec Consultants, Inc.

Job Number: 490-77315-1

Login Number: 77315 List Source: TestAmerica Nashville

List Number: 1

Creator: McBride, Mike

Creator: MCBride, Mike		
Question	Answer	Comment
Radioactivity wasn't checked or is = background as measured by a survey meter.</td <td>True</td> <td></td>	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	3.6/4.7
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	False	Limited volume received.
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

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THE LEADER IN ENVIRONMENTAL TESTING

# ANALYTICAL REPORT

TestAmerica Laboratories, Inc.

TestAmerica Nashville 2960 Foster Creighton Drive Nashville, TN 37204 Tel: (615)726-0177

TestAmerica Job ID: 490-77315-1

Client Project/Site: Treatability Study

Revision: 1

For:

Geosyntec Consultants, Inc. 10220 Old Columbia Road Suite A Columbia, Maryland 21046

Attn: Amar Wadhawan

Heather Baker

Authorized for release by: 5/28/2015 3:17:12 PM

Heather Baker, Project Manager I (615)301-5043

heather.baker@testamericainc.com

·····LINKS ·······

Review your project results through

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**Have a Question?** 



Visit us at: www.testamericainc.com

The test results in this report meet all 2003 NELAC and 2009 TNI requirements for accredited parameters, exceptions are noted in this report. This report may not be reproduced except in full, and with written approval from the laboratory. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

# **Table of Contents**

Cover Page	1
Table of Contents	2
Sample Summary	3
Case Narrative	
Definitions	6
Client Sample Results	7
QC Sample Results	19
QC Association	25
Chronicle	29
Method Summary	33
Certification Summary	34
Chain of Custody	35
Receipt Checklists	38

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# **Sample Summary**

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-77315-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
490-77315-1	A-1-1	Water	04/24/15 15:35	04/28/15 08:50
490-77315-2	A-1-2	Water	04/24/15 15:30	04/28/15 08:50
490-77315-3	C-1-1	Water	04/24/15 15:25	04/28/15 08:50
490-77315-4	A-1-1	Soil	04/24/15 15:35	04/28/15 08:50
490-77315-5	A-1-2	Soil	04/24/15 15:30	04/28/15 08:50
490-77315-6	C-1-1	Soil	04/24/15 15:25	04/28/15 08:50
490-77315-7	A-2-1	Water	04/27/15 16:00	04/28/15 08:50
490-77315-8	A-2-2	Water	04/27/15 16:10	04/28/15 08:50
490-77315-9	C-2-1	Water	04/27/15 15:30	04/28/15 08:50
490-77315-10	A-2-1	Soil	04/27/15 16:00	04/28/15 08:50
490-77315-11	A-2-2	Soil	04/27/15 16:10	04/28/15 08:50
490-77315-12	C-2-1	Soil	04/27/15 15:30	04/28/15 08:50

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### **Case Narrative**

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-77315-1

Job ID: 490-77315-1

Laboratory: TestAmerica Nashville

**Narrative** 

Job Narrative 490-77315-1

This report was revised on 5/28/15 to dry weight correct the solid samples. This report replaces the report generated on 5/12/15 at 12:32.

#### Comments

No additional comments.

#### Receipt

The samples were received on 4/28/2015 8:50 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperatures of the 2 coolers at receipt time were 3.6° C and 4.7° C.

#### Except:

Limited sample volume was provided for the following samples: A-1-1 (490-77315-1), A-1-2 (490-77315-2), C-1-1 (490-77315-3), A-2-1 (490-77315-7), A-2-2 (490-77315-8) and C-2-1 (490-77315-9).

#### HPLC/IC

Method 9056: The following samples were diluted due to the nature of the sample matrix: A-1-1 (490-77315-1), A-1-2 (490-77315-2), A-2-1 (490-77315-7) and A-2-2 (490-77315-8). Elevated reporting limits (RLs) are provided.

Method 9056: The following samples were received and analyzed outside of the analytical holding time: A-1-1 (490-77315-1), A-1-2 (490-77315-2), C-1-1 (490-77315-3).

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

#### Metals

Method 6020: The method blank for 244768 contained Iron above the reporting limit (RL). Associated samples were not re-extracted and/or re-analyzed because results were greater than 10X the value found in the method blank.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

#### Field Service / Mobile Lab

No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

#### General Chemistry

Method 7196A: The following samples were received outside of holding time: A-1-1 (490-77315-1), A-1-2 (490-77315-2), C-1-1 (490-77315-3), A-2-1 (490-77315-7), A-2-2 (490-77315-8) and C-2-1 (490-77315-9).

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Job ID: 490-77315-2

Laboratory: TestAmerica Nashville

**Narrative** 

Job Narrative 490-77315-2

#### Comments

No additional comments.

#### Receipt

The samples were received on 4/28/2015 8:50 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperatures of the 2 coolers at receipt time were 3.6° C and 4.7° C.

TestAmerica Nashville 5/28/2015

Page 4 of 38

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## **Case Narrative**

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-77315-1

**Job ID: 490-77315-2 (Continued)** 

Laboratory: TestAmerica Nashville (Continued)

### **Organic Prep**

No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

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# **Definitions/Glossary**

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-77315-1

## **Qualifiers**

### **HPLC/IC**

Qualifier	Qualifier Description
F1	MS and/or MSD Recovery is outside acceptance limits.

**Metals** 

Qualifier	Qualifier Description
F1	MS and/or MSD Recovery is outside acceptance limits.
4	MS, MSD: The analyte present in the original sample is greater than 4 times the matrix spike concentration; therefore, control limits are not
	applicable.
В	Compound was found in the blank and sample.

### **General Chemistry**

Qualifier	Qualifier Description
Н	Sample was prepped or analyzed beyond the specified holding time

# **Glossary**

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains no Free Liquid
DER	Duplicate error ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision level concentration
MDA	Minimum detectable activity
EDL	Estimated Detection Limit
MDC	Minimum detectable concentration

MDA	Minimum detectable activity
EDL	Estimated Detection Limit
MDC	Minimum detectable concentra
MDL	Method Detection Limit

IVIDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated

ND I	Not detected at the reporting limit (or MDL or EDL if shown)
------	--

PQL	Practical Quantitation Limi
QC	Quality Control
RER	Relative error ratio

RL	Reporting Limit or Requested Limit (Radiochemistry)

RPD	Relative Percent Difference	a measure of the relative	difference between two points

TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

TestAmerica Nashville

Page 6 of 38

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-77315-1

Client Sample ID: A-1-1

Date Collected: 04/24/15 15:35 Date Received: 04/28/15 08:50 Lab Sample ID: 490-77315-1

Matrix: Water

Analyte	Result Qu	alifier RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Nitrate as N	2.04	0.100		mg/L			04/28/15 16:39	1
Sulfate	2730	10.0		mg/L			04/29/15 13:39	10
<del>-</del>								
	•	alifier RI	MDI	Unit	D	Prenared	Analyzed	Dil Fac
Analyte	(ICP/MS) - Dissolved Result Qu 0.0258	alifier RL 0.0100	MDL	Unit mg/L	D	Prepared 04/29/15 15:13	Analyzed 05/01/15 16:02	Dil Fac
Analyte Arsenic	Result Qu		MDL		<u>D</u>	04/29/15 15:13		
Method: 6020 - Metals Analyte Arsenic Chromium Copper	Result Qu 0.0258	0.0100	MDL	mg/L	<u>D</u>	04/29/15 15:13 04/29/15 15:13	05/01/15 16:02	5

**General Chemistry - Dissolved** 

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-77315-1

Client Sample ID: A-1-2 Lab Sample ID: 490-77315-2 **Matrix: Water** 

Date Collected: 04/24/15 15:30 Date Received: 04/28/15 08:50

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Nitrate as N	2.09		0.100		mg/L			04/28/15 17:19	1
Sulfate	2440		10.0		mg/L			04/29/15 13:59	10
Method: 6020 - Metals Analyte		d Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Analyte		Qualifier	RL 0.0100	MDL	Unit mg/L	D	Prepared 04/29/15 15:13		Dil Fac
Analyte Arsenic	Result	Qualifier		MDL		<u>D</u>	04/29/15 15:13		
	Result 0.222	Qualifier	0.0100	MDL	mg/L	<u>D</u>	04/29/15 15:13	05/01/15 16:07 05/01/15 16:07	5

General Chemistry - Dissolved Analyte	Result	Qualifier	RL	MDL (	Jnit	D	Prepared	Analyzed	Dil Fac
Chromium, hex	0.0370	H	0.0100	r	ng/L			05/05/15 14:38	1

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-77315-1

Client Sample ID: C-1-1 Lab Sample ID: 490-77315-3 Date Collected: 04/24/15 15:25

**Matrix: Water** 

Date Received: 04/28/15 08:50

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Nitrate as N	1.57		0.100		mg/L			04/28/15 17:59	1
Sulfate	13.3		1.00		mg/L			04/28/15 17:59	1
Method: 6020 - Metals (ICP/MS) -	Dissolve	ed							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	34.0		0.0833		mg/L		05/01/15 09:45	05/04/15 15:07	25
Chromium	5.18		0.0167		mg/L		05/01/15 09:45	05/04/15 12:54	5
Copper	36.5		0.0833		mg/L		05/01/15 09:45	05/04/15 15:07	25
Iron	135		0.208		mg/L		05/01/15 09:45	05/04/15 12:54	5
General Chemistry - Dissolved									
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium, hex	0.0140	H	0.0100		mg/L			05/05/15 14:40	1

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

Client Sample ID: A-1-1

Date Collected: 04/24/15 15:35

Date Received: 04/28/15 08:50

TestAmerica Job ID: 490-77315-1

Lab Sample ID: 490-77315-4

**Matrix: Soil** 

Percent Solids: 73.1

Method: 6020 - Metals (ICP	P/MS)							
Analyte	Result Qu	ualifier RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	494	3.36		mg/Kg	₩	04/29/15 17:51	04/30/15 13:47	5
Chromium	67.0	0.672		mg/Kg	☼	04/29/15 17:51	04/30/15 13:11	1
Copper	640	3.36		mg/Kg	☼	04/29/15 17:51	04/30/15 13:47	5
Iron	3630 B	6.72		mg/Kg	☼	04/29/15 17:51	04/30/15 13:11	1
General Chemistry								
Analyte	Result Qu	ualifier RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Moisture	27	0.10		%			05/27/15 15:13	1
Percent Solids	73	0.10		%			05/27/15 15:13	1

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

Client Sample ID: A-1-2

TestAmerica Job ID: 490-77315-1

Lab Sample ID: 490-77315-5

Date Collected: 04/24/15 15:30	Matrix: Soil
Date Received: 04/28/15 08:50	Percent Solids: 67.4

Method: 6020 - Metals (ICP/M	IS)								
Analyte	Result Qu	ualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	401		0.726		mg/Kg	<u> </u>	04/29/15 17:51	04/30/15 13:17	1
Chromium	73.1		0.726		mg/Kg	☼	04/29/15 17:51	04/30/15 13:17	1
Copper	579		3.63		mg/Kg	☼	04/29/15 17:51	04/30/15 17:59	5
Iron	4550 B		7.26		mg/Kg	₩	04/29/15 17:51	04/30/15 13:17	1
General Chemistry									
Analyte	Result Qu	ualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Moisture	33		0.10		%			05/27/15 15:13	1
Percent Solids	67		0.10		%			05/27/15 15:13	1

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

Client Sample ID: C-1-1

Date Collected: 04/24/15 15:25

Date Received: 04/28/15 08:50

TestAmerica Job ID: 490-77315-1

Lab Sample ID: 490-77315-6

Matrix: Soil

Percent Solids: 73.1

Method: 6020 - Metals (ICP)	/MS)								
Analyte	Result Qu	ualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	243		0.661		mg/Kg	<u> </u>	04/29/15 17:51	04/30/15 13:22	1
Chromium	47.2		0.661		mg/Kg	₩	04/29/15 17:51	04/30/15 13:22	1
Copper	354		0.661		mg/Kg	₩	04/29/15 17:51	04/30/15 13:22	1
Iron	1790 B		6.61		mg/Kg		04/29/15 17:51	04/30/15 13:22	1
General Chemistry									
Analyte	Result Qu	ualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Moisture	27		0.10		%			05/27/15 15:13	1
Percent Solids	73		0.10		%			05/27/15 15:13	1

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-77315-1

Client Sample ID: A-2-1

Lab Sample ID: 490-77315-7 Date Collected: 04/27/15 16:00

**Matrix: Water** 

Date Received: 04/28/15 08:50

Method: 9056 - Anions, Ion	Chromatography							
Analyte	Result Qualifie	er RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Nitrate as N	1.25	0.100		mg/L			04/28/15 18:19	1
Sulfate	2870	10.0		mg/L			04/29/15 14:19	10
- Method: 6020 - Metals (ICP/I	MS) - Dissolved							
Analyte	Result Qualifie	er RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	0.231	0.0100		mg/L		04/29/15 15:13	05/01/15 16:23	5
Chromium	0.659	0.0100		mg/L		04/29/15 15:13	05/01/15 16:23	5
Copper	9.69	0.0100		mg/L		04/29/15 15:13	05/01/15 16:23	5
Iron	681	1.25		mg/L		04/29/15 15:13	05/04/15 12:13	50
- General Chemistry - Dissolv	/ed							
Analyte	Result Qualifie	er RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium, hex	0.0490 H	0.0100		mg/L			05/05/15 14:41	1

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-77315-1

Client Sample ID: A-2-2

Lab Sample ID: 490-77315-8 Date Collected: 04/27/15 16:10

**Matrix: Water** 

Date Received: 04/28/15 08:50

Method: 9056 - Anions, Ion Chr Analyte	_	<mark>phy</mark> Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Nitrate as N	1.20	Qualifier	0.100		mg/L	=		04/28/15 18:59	1
Sulfate	2920		10.0		mg/L			04/29/15 14:40	10
_ Method: 6020 - Metals (ICP/MS)	- Dissolv	ed							
Analyte		Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	0.0935		0.0100		mg/L		04/29/15 15:13	05/01/15 16:28	5
Chromium	0.644		0.0100		mg/L		04/29/15 15:13	05/01/15 16:28	5
Copper	7.44		0.0100		mg/L		04/29/15 15:13	05/01/15 16:28	5
Iron	745		1.25		mg/L		04/29/15 15:13	05/04/15 12:18	50
- General Chemistry - Dissolved									
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium, hex	0.0360	H	0.0100		mg/L			05/05/15 14:43	1

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-77315-1

Client Sample ID: C-2-1 Lab Sample ID: 490-77315-9 Date Collected: 04/27/15 15:30

**Matrix: Water** 

Date Received: 04/28/15 08:50

Analyte	Result Q	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Nitrate as N	1.56		0.100		mg/L			04/28/15 19:40	1
Sulfate	14.9		1.00		mg/L			04/28/15 19:40	1
Method: 6020 - Metals (ICP/M	IS) - Dissolved	I							
Analyte	Result Q	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	22.9		0.0833		mg/L		05/01/15 09:45	05/04/15 15:12	25
Chromium	2.61		0.0167		mg/L		05/01/15 09:45	05/04/15 13:09	5
Copper	18.9		0.0833		mg/L		05/01/15 09:45	05/04/15 15:12	25
Iron	71.0		0.208		mg/L		05/01/15 09:45	05/04/15 13:09	5
General Chemistry - Dissolve	ed								
Analyte	Result Q	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium, hex	ND H		0.0100		mg/L			05/05/15 14:45	1

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-77315-1

Client Sample ID: A-2-1

Lab Sample ID: 490-77315-10 Date Collected: 04/27/15 16:00

**Matrix: Soil** Percent Solids: 81.0

Date Received: 04/28/15 08:50

Method: 6020 - Metals (ICF Analyte	P/MS) Result Qualifier	RL	MDL Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	387	0.602	mg/Kg	<u></u>	04/29/15 17:51	04/30/15 13:27	1
Chromium	67.7	0.602	mg/Kg	☼	04/29/15 17:51	04/30/15 13:27	1
Copper	525	3.01	mg/Kg	☼	04/29/15 17:51	04/30/15 18:04	5
Iron	3710 B	6.02	mg/Kg	₩.	04/29/15 17:51	04/30/15 13:27	1
Conoral Chamiatry							

General Chemistry Analyte	Result (	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Moisture	19		0.10		%			05/27/15 15:13	1
Percent Solids	81		0.10		%			05/27/15 15:13	1

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

Client Sample ID: A-2-2

Date Collected: 04/27/15 16:10

Date Received: 04/28/15 08:50

TestAmerica Job ID: 490-77315-1

Lab Sample ID: 490-77315-11

Matrix: Soil

Percent Solids: 77.2

Method: 6020 - Metals (ICP/MS	)								
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	271		0.637		mg/Kg	<u> </u>	04/29/15 17:51	04/30/15 13:32	1
Chromium	48.1		0.637		mg/Kg	☼	04/29/15 17:51	04/30/15 13:32	1
Copper	350		0.637		mg/Kg	☼	04/29/15 17:51	04/30/15 13:32	1
lron	2630	В	6.37		mg/Kg	₩	04/29/15 17:51	04/30/15 13:32	1
General Chemistry									
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Moisture	23		0.10		%			05/27/15 15:13	1
Percent Solids	77		0.10		%			05/27/15 15:13	1

7

9

10

11

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

Client Sample ID: C-2-1

Date Collected: 04/27/15 15:30

Date Received: 04/28/15 08:50

**Percent Solids** 

TestAmerica Job ID: 490-77315-1

Lab Sample ID: 490-77315-12

Matrix: Soil

Percent Solids: 81.6

05/27/15 15:13

Method: 6020 - Metals (ICP	/MS)						
Analyte	Result Qualifier	RL	MDL Unit	D	Prepared	Analyzed	Dil Fac
Arsenic		0.606	mg/Kg	₩	04/29/15 17:51	04/30/15 13:37	1
Chromium	31.1	0.606	mg/Kg	₩	04/29/15 17:51	04/30/15 13:37	1
Copper	237	0.606	mg/Kg	₩	04/29/15 17:51	04/30/15 13:37	1
Iron	1820 B	6.06	mg/Kg		04/29/15 17:51	04/30/15 13:37	1
General Chemistry							
Analyte	Result Qualifier	RL	MDL Unit	D	Prepared	Analyzed	Dil Fac
Percent Moisture	18	0.10	%			05/27/15 15:13	1

0.10

**82** 

%

8

9

10

12

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

Method: 9056 - Anions, Ion Chromatography

Lab Sample ID: MB 490-244564/6	Client Sample ID: Method Blank
Matrix: Water	Prep Type: Total/NA

**Analysis Batch: 244564** 

MB MB Analyte Result Qualifier RL **MDL** Unit Dil Fac Prepared Analyzed 1.00 Sulfate ND mg/L 04/28/15 14:45

Lab Sample ID: LCS 490-244564/7 Client Sample ID: Lab Control Sample **Matrix: Water** Prep Type: Total/NA

**Analysis Batch: 244564** 

Spike LCS LCS %Rec. Added Limits Analyte Result Qualifier Unit %Rec Sulfate 100 108.8 mg/L 109 80 - 120

Lab Sample ID: LCSD 490-244564/8 Client Sample ID: Lab Control Sample Dup **Matrix: Water** Prep Type: Total/NA

Analysis Batch: 244564

Spike LCSD LCSD %Rec. **RPD** Added Result Qualifier Limits RPD Limit Analyte Unit D %Rec Sulfate 100 109.3 mg/L 109 80 - 120

Lab Sample ID: 490-77105-B-1 MS **Client Sample ID: Matrix Spike Matrix: Water** Prep Type: Total/NA

**Analysis Batch: 244564** 

Sample Sample Spike MS MS %Rec. Analyte Result Qualifier Added Result Qualifier Unit %Rec Limits Sulfate 54.6 F1 100 180.6 F1 126 80 - 120 mg/L

Lab Sample ID: 490-77105-B-1 MSD Client Sample ID: Matrix Spike Duplicate Prep Type: Total/NA

**Matrix: Water** 

**Analysis Batch: 244564** 

Spike MSD MSD %Rec. RPD Sample Sample Added Analyte Result Qualifier Result Qualifier Unit D %Rec Limits RPD Limit Sulfate 54.6 F1 100 179.5 F1 125 80 - 120 mg/L

Lab Sample ID: MB 490-244565/6 **Client Sample ID: Method Blank Matrix: Water** Prep Type: Total/NA

**Analysis Batch: 244565** 

MB MB Analyte Result Qualifier RL MDL Unit Prepared D Analyzed Dil Fac 0 100 Nitrate as N mg/L 04/28/15 14:45 ND

Lab Sample ID: LCS 490-244565/7 Client Sample ID: Lab Control Sample **Matrix: Water** Prep Type: Total/NA

**Analysis Batch: 244565** 

Spike LCS LCS %Rec. Added Result Qualifier Analyte Unit %Rec Limits Nitrate as N 10.0 10.51 105 80 - 120

Lab Sample ID: LCSD 490-244565/8 Client Sample ID: Lab Control Sample Dup **Matrix: Water** Prep Type: Total/NA

**Analysis Batch: 244565** LCSD LCSD RPD Spike %Rec. Added Limits Analyte Result Qualifier Unit D %Rec RPD Limit Nitrate as N 10.0 10.40 104 80 - 120 mg/L

TestAmerica Nashville

Page 19 of 38

5/28/2015

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

Lab Sample ID: 490-77105-B-1 MS **Client Sample ID: Matrix Spike Matrix: Water Prep Type: Total/NA** 

**Analysis Batch: 244565** 

Sample Sample Spike MS MS %Rec. Analyte Result Qualifier Added Result Qualifier Unit %Rec Limits Nitrate as N 2.62 F1 10.0 15.77 F1 80 - 120 mg/L 131

Lab Sample ID: 490-77105-B-1 MSD **Client Sample ID: Matrix Spike Duplicate Matrix: Water** Prep Type: Total/NA **Analysis Batch: 244565** 

MSD MSD **RPD** Sample Sample Spike %Rec. Result Qualifier Added Result Qualifier Limits RPD Limit Analyte Unit D %Rec 2.62 F1 Nitrate as N 10.0 15.81 F1 mg/L 132 80 - 120 0

Lab Sample ID: MB 490-244639/6 Client Sample ID: Method Blank Prep Type: Total/NA **Matrix: Water** 

**Analysis Batch: 244639** 

MB MB **MDL** Unit RL Dil Fac **Analyte** Result Qualifier Prepared Analyzed Sulfate ND 1.00 mg/L 04/29/15 12:39

Lab Sample ID: LCS 490-244639/7 **Client Sample ID: Lab Control Sample Matrix: Water** Prep Type: Total/NA

**Analysis Batch: 244639** 

Spike LCS LCS %Rec. **Analyte** Added Result Qualifier Unit %Rec Limits Sulfate 100 105.5 mg/L 106 80 - 120

Lab Sample ID: LCSD 490-244639/8 Client Sample ID: Lab Control Sample Dup **Matrix: Water** Prep Type: Total/NA

**Analysis Batch: 244639** 

LCSD LCSD RPD Spike %Rec. Analyte Added Result Qualifier Limits Unit %Rec **RPD** Limit Sulfate 100 104.8 mg/L 105 80 - 120

Lab Sample ID: 490-77399-C-1 MS Client Sample ID: Matrix Spike **Matrix: Water** Prep Type: Total/NA

**Analysis Batch: 244639** 

Sample Sample Spike MS MS %Rec. Added Analyte Result Qualifier Result Qualifier Unit %Rec Limits 100 Sulfate 5.91 105.9 100 80 - 120 mg/L

Lab Sample ID: 490-77399-C-1 MSD Client Sample ID: Matrix Spike Duplicate **Matrix: Water** Prep Type: Total/NA

**Analysis Batch: 244639** 

Sample Sample Spike MSD MSD %Rec. **RPD Analyte** Result Qualifier Added Result Qualifier Limits RPD Limit Unit D %Rec Sulfate 100 100 5.91 106.2 mg/L 80 - 120 0 20

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

Method: 6020 - Metals (ICP/MS)

Lab Sample ID: MB 490-244768/1-A

**Matrix: Solid** 

**Analysis Batch: 245008** 

Client Sample ID: Method Blank Prep Type: Total/NA

Prep Batch: 244768

Prep Type: Total/NA

Prep Batch: 244768

	1410	1410							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND		0.484		mg/Kg		04/29/15 17:51	04/30/15 12:05	1
Chromium	ND		0.484		mg/Kg		04/29/15 17:51	04/30/15 12:05	1
Copper	ND		0.484		mg/Kg		04/29/15 17:51	04/30/15 12:05	1
Iron	6.046		4.84		mg/Kg		04/29/15 17:51	04/30/15 12:05	1
	Arsenic Chromium Copper	Analyte         Result           Arsenic         ND           Chromium         ND           Copper         ND	Arsenic         ND           Chromium         ND           Copper         ND	Analyte         Result Arsenic         Qualifier         RL           Chromium         ND         0.484           Copper         ND         0.484	Analyte         Result Arsenic         Qualifier         RL O.484         MDL O.484           Chromium         ND O.484         0.484           Copper         ND O.484         0.484	Analyte         Result Arsenic         Qualifier         RL ND         MDL Unit Mg/Kg           Chromium         ND         0.484         mg/Kg           Copper         ND         0.484         mg/Kg           0.484         mg/Kg           0.484         mg/Kg	Analyte         Result Arsenic         Qualifier         RL ND         MDL MDL MIT         D MDL MR         MDL M	Analyte         Result Arsenic         Qualifier         RL ND         MDL Unit Unit Unit Mg/Kg         D 04/29/15 17:51           Chromium         ND         0.484         mg/Kg         04/29/15 17:51           Copper         ND         0.484         mg/Kg         04/29/15 17:51           000         0.484         mg/Kg         04/29/15 17:51	Analyte         Result Arsenic         Qualifier         RL OJ.484         MDL MDL Unit MDL

**Client Sample ID: Lab Control Sample** 

**Matrix: Solid** 

**Analysis Batch: 245008** 

Lab Sample ID: LCS 490-244768/2-A

Spike LCS LCS %Rec. Analyte Added Result Qualifier Unit D %Rec Limits Arsenic 19.5 17.69 mg/Kg 91 80 - 120 19.5 mg/Kg Chromium 19.59 100 80 - 120 Copper 19.5 18.23 mg/Kg 93 80 - 120 80 - 120 195 Iron 188.1 mg/Kg 96

Lab Sample ID: 490-77268-E-1-C MS **Client Sample ID: Matrix Spike Matrix: Solid** Prep Type: Total/NA **Analysis Batch: 245008** Prep Batch: 244768

Sample Sample Spike MS MS %Rec. Result Qualifier Analyte Added Result Qualifier %Rec Limits Unit D 77 Arsenic 5.92 22.0 23.08 mg/Kg 78 75 - 125 mg/Kg ☼ Chromium 24.1 22.0 47.50 106 75 - 125 Ö Copper 16.3 F1 22.0 31.86 F1 mg/Kg 71 75 - 125 Iron 17200 B 220 17760 4 mg/Kg ₽ 236 75 - 125

Lab Sample ID: 490-77268-E-1-D MSD Client Sample ID: Matrix Spike Duplicate

MD MD

MR MR

**Matrix: Solid** 

**Analysis Batch: 245540** 

Prep Type: Total/NA **Analysis Batch: 245008** Prep Batch: 244768 MSD MSD Sample Sample Spike %Rec. RPD Analyte Result Qualifier Added Result Qualifier Unit D %Rec Limits RPD Limit Arsenic 5.92 21.4 23.64 ₩ 83 75 - 125 2 mg/Kg 20 Chromium 24.1 21.4 42.11 mg/Kg 77 84 75 - 125 12 20 ₩ 16.3 F1 21.4 33.62 mg/Kg 81 75 - 125 5 20 Copper Iron 17200 B 214 16760 4 mg/Kg -224 75 - 125 20

Lab Sample ID: MB 490-244711/1-A **Client Sample ID: Method Blank Matrix: Water Prep Type: Total Recoverable** 

Prep Batch: 244711

	IVID	IVID							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND		0.00200		mg/L		04/29/15 15:13	05/01/15 15:21	1
Chromium	ND		0.00200		mg/L		04/29/15 15:13	05/01/15 15:21	1
Copper	ND		0.00200		mg/L		04/29/15 15:13	05/01/15 15:21	1
Iron	ND		0.0250		mg/L		04/29/15 15:13	05/01/15 15:21	1

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

Lab Sample ID: LCS 490-244711/2-A

Method: 6020 - Metals (ICP/MS) (Continued)

**Client Sample ID: Lab Control Sample Prep Type: Total Recoverable** 

128

75 - 125

**Prep Batch: 245146** 

20

**Prep Batch: 244711** 

Analysis Batch: 245540				•	Prep B	atch: 24471
	Spike	LCS LCS			%Rec.	
Analyte	Added	Result Qualifier	Unit	D %R	ec Limits	
Arsenic	0.100	0.09464	mg/L		95 80 - 120	
Chromium	0.100	0.09636	mg/L		96 80 - 120	
Copper	0.100	0.09476	mg/L		95 80 - 120	
Iron	1.00	0.9751	mg/L		98 80 - 120	

Lab Sample ID: 490-77278-G-11-B MS **Client Sample ID: Matrix Spike** 

**Matrix: Water** 

**Matrix: Water** 

Analysis Batch: 245540

**Prep Type: Dissolved Prep Batch: 244711** 

	Sample	Sample	Spike	MS	MS				%Rec.	
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Arsenic	ND		0.100	0.09313		mg/L		92	75 - 125	
Chromium	ND		0.100	0.09260		mg/L		93	75 - 125	
Copper	ND		0.100	0.08796		mg/L		88	75 - 125	
Iron	28.5		1.00	29.49	4	mg/L		98	75 - 125	

Lab Sample ID: 490-77278-G-11-C MSD **Client Sample ID: Matrix Spike Duplicate Prep Type: Dissolved** 

**Matrix: Water** 

Analysis Batch: 245540 **Prep Batch: 244711** Sample Sample Spike MSD MSD %Rec. Result Qualifier Analyte Added Result Qualifier Limits RPD Limit Unit D %Rec Arsenic ND 0.100 0.09389 mg/L 93 75 - 125 1 20 Chromium ND 0.100 0.09436 mg/L 94 75 - 125 20 2 Copper ND 0.100 0.08964 mg/L 90 75 - 125 2 20

Lab Sample ID: MB 490-245145/1-B **Client Sample ID: Method Blank Prep Type: Dissolved** 

29.79 4

mg/L

1.00

**Matrix: Water** 

Iron

**Analysis Batch: 245763** 

28.5

	MB	MB							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND		0.00200		mg/L		05/01/15 09:45	05/04/15 12:39	1
Chromium	ND		0.00200		mg/L		05/01/15 09:45	05/04/15 12:39	1
Copper	ND		0.00200		mg/L		05/01/15 09:45	05/04/15 12:39	1
Iron	ND		0.0250		ma/l		05/01/15 09:45	05/04/15 12:39	1

Lab Sample ID: LCS 490-245145/2-B **Client Sample ID: Lab Control Sample Matrix: Water Prep Type: Dissolved** 

Analysis Batch: 245763							<b>Prep Batch: 245146</b>
	Spike	LCS	LCS				%Rec.
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits
Arsenic	0.100	0.1011		mg/L		101	80 - 120
Chromium	0.100	0.1051		mg/L		105	80 - 120
Copper	0.100	0.09973		mg/L		100	80 - 120
Iron	1.00	1.022		mg/L		102	80 - 120

05/05/15 11:10

**Client Sample ID: Matrix Spike** 

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

Method: 6020 - Metals (ICP/MS) (Continued)

Lab Sample ID: LCSD 490-245145/3-B Matrix: Water Analysis Batch: 245763		Client Sample ID: Lab Control Sam Prep Type: D Prep Batch							olved
	Spike	LCSD	LCSD				%Rec.		RPD
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits	RPD	Limit
Arsenic	0.100	0.1008		mg/L		101	80 - 120	0	20
Chromium	0.100	0.1041		mg/L		104	80 - 120	1	20
Copper	0.100	0.09798		mg/L		98	80 - 120	2	20
Iron	1.00	0.9954		mg/L		100	80 - 120	3	20

Method: 7196A - Chromium, Hexavalent

ND

Lab Sample ID: MB 490-246812/4					C	lient Sam	ple ID: Metho	d Blank
Matrix: Water							Prep Type: T	otal/NA
Analysis Batch: 246812								
•	MB	MB						
Analyte	Result	Qualifier	RL	MDL Unit	D	Prepared	Analyzed	Dil Fac

0.0100

mg/L

Lab Sample ID: LCS 490-246812/3 **Client Sample ID: Lab Control Sample Matrix: Water** Prep Type: Total/NA **Analysis Batch: 246812** Spike LCS LCS %Rec. Added Analyte Result Qualifier Unit D %Rec Limits 0.100 0.1040 104 85 - 115 Chromium, hex mg/L

Matrix: Water

Analysis Batch: 246812

Sample Sample Spike MS MS %Rec.

Analyte Result Qualifier Added Result Qualifier Unit D %Rec Limits

Chromium, hex ND 0.100 0.1060 mg/L 97 85 - 115

Lab Sample ID: 490-77738-F-1 MSD

Matrix: Water Prep Type: Total/NA

**Analysis Batch: 246812** MSD MSD Sample Sample Spike %Rec. **RPD** Result Qualifier Added Analyte Result Qualifier Unit D %Rec Limits RPD Limit Chromium, hex ND 0.100 0.1060 mg/L 97 85 - 115

Lab Sample ID: 490-77738-F-1 DU

Matrix: Water

Client Sample ID: Duplicate
Prep Type: Total/NA

**Analysis Batch: 246812** 

Lab Sample ID: 490-77738-F-1 MS

Chromium, hex

	Sample	Sample	DU	DU				RPD
Analyte	Result	Qualifier	Result	Qualifier	Unit	D	RPD	Limit
Chromium, hex	ND		 ND		mg/L		 NC	20

## **QC Sample Results**

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-77315-1

## **Method: Moisture - Percent Moisture**

Lab Sample ID: 490-77315-4 DU Client Sample ID: A-1-1 **Matrix: Soil Prep Type: Total/NA** 

**Analysis Batch: 251326** 

_	Sample	Sample	DU	DU				RPD
Analyte	Result	Qualifier	Result	Qualifier	Unit	D	RPD	Limit
Percent Moisture	27		27		%		 0	20
Percent Solids	73		73		%		0	20

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

#### HPLC/IC

#### Analysis Batch: 244564

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-77105-B-1 MS	Matrix Spike	Total/NA	Water	9056	
490-77105-B-1 MSD	Matrix Spike Duplicate	Total/NA	Water	9056	
490-77315-3	C-1-1	Total/NA	Water	9056	
490-77315-9	C-2-1	Total/NA	Water	9056	
LCS 490-244564/7	Lab Control Sample	Total/NA	Water	9056	
LCSD 490-244564/8	Lab Control Sample Dup	Total/NA	Water	9056	
MB 490-244564/6	Method Blank	Total/NA	Water	9056	

#### **Analysis Batch: 244565**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-77105-B-1 MS	Matrix Spike	Total/NA	Water	9056	_
490-77105-B-1 MSD	Matrix Spike Duplicate	Total/NA	Water	9056	
490-77315-1	A-1-1	Total/NA	Water	9056	
490-77315-2	A-1-2	Total/NA	Water	9056	
490-77315-3	C-1-1	Total/NA	Water	9056	
490-77315-7	A-2-1	Total/NA	Water	9056	
490-77315-8	A-2-2	Total/NA	Water	9056	
490-77315-9	C-2-1	Total/NA	Water	9056	
LCS 490-244565/7	Lab Control Sample	Total/NA	Water	9056	
LCSD 490-244565/8	Lab Control Sample Dup	Total/NA	Water	9056	
MB 490-244565/6	Method Blank	Total/NA	Water	9056	

#### **Analysis Batch: 244639**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-77315-1	A-1-1	Total/NA	Water	9056	_
490-77315-2	A-1-2	Total/NA	Water	9056	
490-77315-7	A-2-1	Total/NA	Water	9056	
490-77315-8	A-2-2	Total/NA	Water	9056	
490-77399-C-1 MS	Matrix Spike	Total/NA	Water	9056	
490-77399-C-1 MSD	Matrix Spike Duplicate	Total/NA	Water	9056	
LCS 490-244639/7	Lab Control Sample	Total/NA	Water	9056	
LCSD 490-244639/8	Lab Control Sample Dup	Total/NA	Water	9056	
MB 490-244639/6	Method Blank	Total/NA	Water	9056	

#### Metals

#### **Prep Batch: 244711**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-77278-G-11-B MS	Matrix Spike	Dissolved	Water	3005A	
490-77278-G-11-C MSD	Matrix Spike Duplicate	Dissolved	Water	3005A	
490-77315-1	A-1-1	Dissolved	Water	3005A	
490-77315-2	A-1-2	Dissolved	Water	3005A	
490-77315-7	A-2-1	Dissolved	Water	3005A	
490-77315-8	A-2-2	Dissolved	Water	3005A	
LCS 490-244711/2-A	Lab Control Sample	Total Recoverable	Water	3005A	
MB 490-244711/1-A	Method Blank	Total Recoverable	Water	3005A	

#### **Prep Batch: 244768**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-77268-E-1-C MS	Matrix Spike	Total/NA	Solid	3051A	

Page 25 of 38

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

## **Metals (Continued)**

#### Prep Batch: 244768 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-77268-E-1-D MSD	Matrix Spike Duplicate	Total/NA	Solid	3051A	
490-77315-4	A-1-1	Total/NA	Soil	3051A	
490-77315-5	A-1-2	Total/NA	Soil	3051A	
490-77315-6	C-1-1	Total/NA	Soil	3051A	
490-77315-10	A-2-1	Total/NA	Soil	3051A	
490-77315-11	A-2-2	Total/NA	Soil	3051A	
490-77315-12	C-2-1	Total/NA	Soil	3051A	
LCS 490-244768/2-A	Lab Control Sample	Total/NA	Solid	3051A	
MB 490-244768/1-A	Method Blank	Total/NA	Solid	3051A	

#### **Analysis Batch: 245008**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-77268-E-1-C MS	Matrix Spike	Total/NA	Solid	6020	244768
490-77268-E-1-D MSD	Matrix Spike Duplicate	Total/NA	Solid	6020	244768
490-77315-4	A-1-1	Total/NA	Soil	6020	244768
490-77315-4	A-1-1	Total/NA	Soil	6020	244768
490-77315-5	A-1-2	Total/NA	Soil	6020	244768
490-77315-6	C-1-1	Total/NA	Soil	6020	244768
490-77315-10	A-2-1	Total/NA	Soil	6020	244768
490-77315-11	A-2-2	Total/NA	Soil	6020	244768
490-77315-12	C-2-1	Total/NA	Soil	6020	244768
LCS 490-244768/2-A	Lab Control Sample	Total/NA	Solid	6020	244768
MB 490-244768/1-A	Method Blank	Total/NA	Solid	6020	244768

#### Analysis Batch: 245086

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-77315-5	A-1-2	Total/NA	Soil	6020	244768
490-77315-10	A-2-1	Total/NA	Soil	6020	244768

#### Filtration Batch: 245145

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-77315-3	C-1-1	Dissolved	Water	Filtration	
490-77315-9	C-2-1	Dissolved	Water	Filtration	
LCS 490-245145/2-B	Lab Control Sample	Dissolved	Water	Filtration	
LCSD 490-245145/3-B	Lab Control Sample Dup	Dissolved	Water	Filtration	
MB 490-245145/1-B	Method Blank	Dissolved	Water	Filtration	

#### **Prep Batch: 245146**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-77315-3	C-1-1	Dissolved	Water	3005A	245145
490-77315-9	C-2-1	Dissolved	Water	3005A	245145
LCS 490-245145/2-B	Lab Control Sample	Dissolved	Water	3005A	245145
LCSD 490-245145/3-B	Lab Control Sample Dup	Dissolved	Water	3005A	245145
MB 490-245145/1-B	Method Blank	Dissolved	Water	3005A	245145

#### **Analysis Batch: 245540**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-77278-G-11-B MS	Matrix Spike	Dissolved	Water	6020	244711
490-77278-G-11-C MSD	Matrix Spike Duplicate	Dissolved	Water	6020	244711
490-77315-1	A-1-1	Dissolved	Water	6020	244711
490-77315-2	A-1-2	Dissolved	Water	6020	244711

TestAmerica Nashville

5/28/2015

Page 26 of 38

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Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

## **Metals (Continued)**

#### **Analysis Batch: 245540 (Continued)**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-77315-7	A-2-1	Dissolved	Water	6020	244711
490-77315-8	A-2-2	Dissolved	Water	6020	244711
LCS 490-244711/2-A	Lab Control Sample	Total Recoverable	Water	6020	244711
MB 490-244711/1-A	Method Blank	Total Recoverable	Water	6020	244711

#### Analysis Batch: 245763

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-77315-1	A-1-1	Dissolved	Water	6020	244711
490-77315-2	A-1-2	Dissolved	Water	6020	244711
490-77315-3	C-1-1	Dissolved	Water	6020	245146
490-77315-3	C-1-1	Dissolved	Water	6020	245146
490-77315-7	A-2-1	Dissolved	Water	6020	244711
490-77315-8	A-2-2	Dissolved	Water	6020	244711
490-77315-9	C-2-1	Dissolved	Water	6020	245146
490-77315-9	C-2-1	Dissolved	Water	6020	245146
LCS 490-245145/2-B	Lab Control Sample	Dissolved	Water	6020	245146
LCSD 490-245145/3-B	Lab Control Sample Dup	Dissolved	Water	6020	245146
MB 490-245145/1-B	Method Blank	Dissolved	Water	6020	245146

## **General Chemistry**

#### Filtration Batch: 245963

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-77315-1	A-1-1	Dissolved	Water	Filtration	
490-77315-2	A-1-2	Dissolved	Water	Filtration	
490-77315-3	C-1-1	Dissolved	Water	Filtration	
490-77315-7	A-2-1	Dissolved	Water	Filtration	
490-77315-8	A-2-2	Dissolved	Water	Filtration	
490-77315-9	C-2-1	Dissolved	Water	Filtration	

#### Analysis Batch: 246812

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-77315-1	A-1-1	Dissolved	Water	7196A	245963
490-77315-2	A-1-2	Dissolved	Water	7196A	245963
490-77315-3	C-1-1	Dissolved	Water	7196A	245963
490-77315-7	A-2-1	Dissolved	Water	7196A	245963
490-77315-8	A-2-2	Dissolved	Water	7196A	245963
490-77315-9	C-2-1	Dissolved	Water	7196A	245963
490-77738-F-1 DU	Duplicate	Total/NA	Water	7196A	
490-77738-F-1 MS	Matrix Spike	Total/NA	Water	7196A	
490-77738-F-1 MSD	Matrix Spike Duplicate	Total/NA	Water	7196A	
LCS 490-246812/3	Lab Control Sample	Total/NA	Water	7196A	
MB 490-246812/4	Method Blank	Total/NA	Water	7196A	

#### **Analysis Batch: 251326**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-77315-4	A-1-1	Total/NA	Soil	Moisture	
490-77315-4 DU	A-1-1	Total/NA	Soil	Moisture	
490-77315-5	A-1-2	Total/NA	Soil	Moisture	
490-77315-6	C-1-1	Total/NA	Soil	Moisture	

Page 27 of 38

## **QC Association Summary**

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-77315-1

## **General Chemistry (Continued)**

#### **Analysis Batch: 251326 (Continued)**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method Prep Batch
490-77315-10	A-2-1	Total/NA	Soil	Moisture
490-77315-11	A-2-2	Total/NA	Soil	Moisture
490-77315-12	C-2-1	Total/NA	Soil	Moisture

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Client: Geosyntec Consultants, Inc.

Project/Site: Treatability Study

Lab Sample ID: 490-77315-1

**Matrix: Water** 

Date Collected: 04/24/15 15:35 Date Received: 04/28/15 08:50

Client Sample ID: A-1-1

	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Analysis	9056		1	10 mL		244565	04/28/15 16:39	JHS	TAL NSH
Total/NA	Analysis	9056		10	10 mL		244639	04/29/15 13:39	JHS	TAL NSH
Dissolved	Prep	3005A			50 mL	50 mL	244711	04/29/15 15:13	TSC	TAL NSH
Dissolved	Analysis	6020		5	50 mL	50 mL	245540	05/01/15 16:02	JBD	TAL NSH
Dissolved	Prep	3005A			50 mL	50 mL	244711	04/29/15 15:13	TSC	TAL NSH
Dissolved	Analysis	6020		50	50 mL	50 mL	245763	05/04/15 12:03	JBD	TAL NSH
Dissolved	Filtration	Filtration			1.0 mL	1.0 mL	245963	05/05/15 13:30	BLM	TAL NSH
Dissolved	Analysis	7196A		1	10 mL	10 mL	246812	05/05/15 14:37	BLM	TAL NSH

Lab Sample ID: 490-77315-2 Client Sample ID: A-1-2

Date Collected: 04/24/15 15:30 **Matrix: Water** 

Date Received: 04/28/15 08:50

Batch **Batch** Dil Initial Final Batch Prepared **Prep Type** Type Method Run **Factor** Amount **Amount** Number or Analyzed **Analyst** Lab Total/NA 04/28/15 17:19 Analysis 9056 10 mL 244565 JHS TAL NSH Total/NA Analysis 9056 10 10 mL 244639 04/29/15 13:59 JHS TAL NSH Dissolved 3005A 50 mL 50 mL 244711 04/29/15 15:13 TSC TAL NSH Prep Dissolved Analysis 6020 5 50 mL 50 mL 245540 05/01/15 16:07 JBD TAL NSH Dissolved Prep 3005A 50 mL 50 mL 244711 04/29/15 15:13 TSC TAL NSH Dissolved Analysis 6020 50 50 mL 50 mL 245763 05/04/15 12:08 JBD TAL NSH Dissolved 1.0 mL 1.0 mL 245963 TAL NSH Filtration Filtration 05/05/15 13:30 BLM 246812 05/05/15 14:38 BLM Dissolved Analysis 7196A 1 10 mL 10 mL TAL NSH

Client Sample ID: C-1-1 Lab Sample ID: 490-77315-3 Date Collected: 04/24/15 15:25 **Matrix: Water** 

Date Received: 04/28/15 08:50

	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Analysis	9056		1	10 mL		244564	04/28/15 17:59	JHS	TAL NSH
Total/NA	Analysis	9056		1	10 mL		244565	04/28/15 17:59	JHS	TAL NSH
Dissolved	Prep	3005A			30 mL	50 mL	245146	05/01/15 09:45	TSC	TAL NSH
Dissolved	Filtration	Filtration			50 mL	50 mL	245145	05/01/15 09:45	TSC	TAL NSH
Dissolved	Analysis	6020		5	30 mL	50 mL	245763	05/04/15 12:54	JBD	TAL NSH
Dissolved	Prep	3005A			30 mL	50 mL	245146	05/01/15 09:45	TSC	TAL NSH
Dissolved	Filtration	Filtration			50 mL	50 mL	245145	05/01/15 09:45	TSC	TAL NSH
Dissolved	Analysis	6020		25	30 mL	50 mL	245763	05/04/15 15:07	JBD	TAL NSH
Dissolved	Filtration	Filtration			1.0 mL	1.0 mL	245963	05/05/15 13:30	BLM	TAL NSH
Dissolved	Analysis	7196A		1	10 mL	10 mL	246812	05/05/15 14:40	BLM	TAL NSH

Lab Sample ID: 490-77315-4

Lab Sample ID: 490-77315-5

Lab Sample ID: 490-77315-6

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

Client Sample ID: A-1-1

Date Collected: 04/24/15 15:35

Matrix: Soil Date Received: 04/28/15 08:50 Percent Solids: 73.1

	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.509 g	100 mL	244768	04/29/15 17:51	RDF	TAL NSH
Total/NA	Analysis	6020		1	0.509 g	100 mL	245008	04/30/15 13:11	CME	TAL NSH
Total/NA	Prep	3051A			0.509 g	100 mL	244768	04/29/15 17:51	RDF	TAL NSH
Total/NA	Analysis	6020		5	0.509 g	100 mL	245008	04/30/15 13:47	CME	TAL NSH
Total/NA	Analysis	Moisture		1			251326	05/27/15 15:13	MAA	TAL NSH

Client Sample ID: A-1-2

Date Collected: 04/24/15 15:30

Date Received: 04/28/15 08:50

_	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Prep	3051A		<del></del>	0.511 g	100 mL	244768	04/29/15 17:51	RDF	TAL NSH
Total/NA	Analysis	6020		1	0.511 g	100 mL	245008	04/30/15 13:17	CME	TAL NSH
Total/NA	Prep	3051A			0.511 g	100 mL	244768	04/29/15 17:51	RDF	TAL NSH
Total/NA	Analysis	6020		5	0.511 g	100 mL	245086	04/30/15 17:59	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			251326	05/27/15 15:13	MAA	TAL NSH

**Client Sample ID: C-1-1** Date Collected: 04/24/15 15:25

Date Received: 04/28/15 08:50

_	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Туре	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.518 g	100 mL	244768	04/29/15 17:51	RDF	TAL NSH
Total/NA	Analysis	6020		1	0.518 g	100 mL	245008	04/30/15 13:22	CME	TAL NSH
Total/NA	Analysis	Moisture		1			251326	05/27/15 15:13	MAA	TAL NSH

Client Sample ID: A-2-1 Date Collected: 04/27/15 16:00

Date Received: 04/28/15 08:50

Dran Time	Batch	Batch	Dum	Dil	Initial	Final	Batch	Prepared	Amaluat	Lab
Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Analysis	9056		1	10 mL		244565	04/28/15 18:19	JHS	TAL NSH
Total/NA	Analysis	9056		10	10 mL		244639	04/29/15 14:19	JHS	TAL NSH
Dissolved	Prep	3005A			50 mL	50 mL	244711	04/29/15 15:13	TSC	TAL NSH
Dissolved	Analysis	6020		5	50 mL	50 mL	245540	05/01/15 16:23	JBD	TAL NSH
Dissolved	Prep	3005A			50 mL	50 mL	244711	04/29/15 15:13	TSC	TAL NSH
Dissolved	Analysis	6020		50	50 mL	50 mL	245763	05/04/15 12:13	JBD	TAL NSH
Dissolved	Filtration	Filtration			1.0 mL	1.0 mL	245963	05/05/15 13:30	BLM	TAL NSH
Dissolved	Analysis	7196A		1	10 mL	10 mL	246812	05/05/15 14:41	BLM	TAL NSH

TestAmerica Nashville

Matrix: Soil

Percent Solids: 73.1

Matrix: Soil

Percent Solids: 67.4

Lab Sample ID: 490-77315-7 **Matrix: Water** 

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

Client Sample ID: A-2-2

Date Collected: 04/27/15 16:10 Date Received: 04/28/15 08:50

Lab Sample ID: 490-77315-8

**Matrix: Water** 

Dil Initial Batch Batch Final Batch Prepared **Prep Type** Type Method Run **Factor** Amount Amount Number or Analyzed Analyst Lab Total/NA Analysis 9056 10 mL 244565 04/28/15 18:59 JHS TAL NSH Total/NA Analysis 9056 10 10 mL 244639 04/29/15 14:40 JHS TAL NSH 50 mL TAL NSH Dissolved Prep 3005A 50 mL 244711 04/29/15 15:13 TSC Dissolved Analysis 6020 5 50 mL 50 mL 245540 05/01/15 16:28 JBD TAL NSH 3005A 50 mL 50 mL TAL NSH Dissolved Prep 244711 04/29/15 15:13 TSC 6020 50 50 mL TAL NSH Dissolved Analysis 50 mL 245763 05/04/15 12:18 JBD Dissolved Filtration Filtration 1.0 mL 1.0 mL 245963 05/05/15 13:30 BLM TAL NSH Dissolved Analysis 7196A 1 10 mL 246812 05/05/15 14:43 BLM TAL NSH 10 mL

Client Sample ID: C-2-1 Lab Sample ID: 490-77315-9

Date Collected: 04/27/15 15:30 **Matrix: Water** Date Received: 04/28/15 08:50

	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Analysis	9056		1	10 mL		244564	04/28/15 19:40	JHS	TAL NSH
Total/NA	Analysis	9056		1	10 mL		244565	04/28/15 19:40	JHS	TAL NSH
Dissolved	Prep	3005A			30 mL	50 mL	245146	05/01/15 09:45	TSC	TAL NSH
Dissolved	Filtration	Filtration			50 mL	50 mL	245145	05/01/15 09:45	TSC	TAL NSH
Dissolved	Analysis	6020		5	30 mL	50 mL	245763	05/04/15 13:09	JBD	TAL NSH
Dissolved	Prep	3005A			30 mL	50 mL	245146	05/01/15 09:45	TSC	TAL NSH
Dissolved	Filtration	Filtration			50 mL	50 mL	245145	05/01/15 09:45	TSC	TAL NSH
Dissolved	Analysis	6020		25	30 mL	50 mL	245763	05/04/15 15:12	JBD	TAL NSH
Dissolved	Filtration	Filtration			1.0 mL	1.0 mL	245963	05/05/15 13:30	BLM	TAL NSH
Dissolved	Analysis	7196A		1	10 mL	10 mL	246812	05/05/15 14:45	BLM	TAL NSH

Lab Sample ID: 490-77315-10 Client Sample ID: A-2-1

Date Collected: 04/27/15 16:00 **Matrix: Soil** Date Received: 04/28/15 08:50 Percent Solids: 81.0

	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.512 g	100 mL	244768	04/29/15 17:51	RDF	TAL NSH
Total/NA	Analysis	6020		1	0.512 g	100 mL	245008	04/30/15 13:27	CME	TAL NSH
Total/NA	Prep	3051A			0.512 g	100 mL	244768	04/29/15 17:51	RDF	TAL NSH
Total/NA	Analysis	6020		5	0.512 g	100 mL	245086	04/30/15 18:04	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			251326	05/27/15 15:13	MAA	TAL NSH

Client Sample ID: A-2-2 Lab Sample ID: 490-77315-11

Date Collected: 04/27/15 16:10 **Matrix: Soil** Date Received: 04/28/15 08:50 Percent Solids: 77.2

	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.508 g	100 mL	244768	04/29/15 17:51	RDF	TAL NSH
Total/NA	Analysis	6020		1	0.508 g	100 mL	245008	04/30/15 13:32	CME	TAL NSH

TestAmerica Nashville

Page 31 of 38

#### **Lab Chronicle**

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-77315-1

Lab Sample ID: 490-77315-11

**Matrix: Soil** 

Date Collected: 04/27/15 16:10 Date Received: 04/28/15 08:50

Client Sample ID: A-2-2

	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Analysis	Moisture		1			251326	05/27/15 15:13	MAA	TAL NSH

Lab Sample ID: 490-77315-12 Client Sample ID: C-2-1

Date Collected: 04/27/15 15:30 **Matrix: Soil** Date Received: 04/28/15 08:50 Percent Solids: 81.6

	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.505 g	100 mL	244768	04/29/15 17:51	RDF	TAL NSH
Total/NA	Analysis	6020		1	0.505 g	100 mL	245008	04/30/15 13:37	CME	TAL NSH
Total/NA	Analysis	Moisture		1			251326	05/27/15 15:13	MAA	TAL NSH

**Laboratory References:** 

TAL NSH = TestAmerica Nashville, 2960 Foster Creighton Drive, Nashville, TN 37204, TEL (615)726-0177

## **Method Summary**

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-77315-1

Method	Method Description	Protocol	Laboratory
9056	Anions, Ion Chromatography	SW846	TAL NSH
6020	Metals (ICP/MS)	SW846	TAL NSH
7196A	Chromium, Hexavalent	SW846	TAL NSH
Moisture	Percent Moisture	EPA	TAL NSH

#### **Protocol References:**

EPA = US Environmental Protection Agency

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

#### Laboratory References:

TAL NSH = TestAmerica Nashville, 2960 Foster Creighton Drive, Nashville, TN 37204, TEL (615)726-0177

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## **Certification Summary**

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-77315-1

## Laboratory: TestAmerica Nashville

All certifications held by this laboratory are listed. Not all certifications are applicable to this report.

Authority	Program	EPA Region	Certification ID	Expiration Dat
A2LA	A2LA		NA: NELAP & A2LA	12-31-15
A2LA	ISO/IEC 17025		0453.07	12-31-15
Alaska (UST)	State Program	10	UST-087	10-31-15
Arizona	State Program	9	AZ0473	05-05-16
Arkansas DEQ	State Program	6	88-0737	04-25-16
California	State Program	9	2938	10-31-16
Connecticut	State Program	1	PH-0220	12-31-15
Florida	NELAP	4	E87358	06-30-15
Illinois	NELAP	5	200010	12-09-15
lowa	State Program	7	131	04-01-16
Kansas	NELAP	7	E-10229	05-31-15
Kentucky (UST)	State Program	4	19	06-30-15
Kentucky (WW)	State Program	4	90038	12-31-15
Louisiana	NELAP	6	30613	06-30-15
Maryland	State Program	3	316	03-31-16
Massachusetts	State Program	1	M-TN032	06-30-15
Minnesota	NELAP	5	047-999-345	12-31-15
Mississippi	State Program	4	N/A	06-30-15
Montana (UST)	State Program	8	NA	02-24-20
Nevada	State Program	9	TN00032	07-31-15
New Hampshire	NELAP	1	2963	10-09-15
New Jersey	NELAP	2	TN965	06-30-15
New York	NELAP	2	11342	03-31-16
North Carolina (WW/SW)	State Program	4	387	12-31-15
North Dakota	State Program	8	R-146	06-30-15
Ohio VAP	State Program	5	CL0033	10-16-15
Oklahoma	State Program	6	9412	08-31-15
Oregon	NELAP	10	TN200001	04-27-16
Pennsylvania	NELAP	3	68-00585	06-30-15
Rhode Island	State Program	1	LAO00268	12-30-15
South Carolina	State Program	4	84009 (001)	02-28-16
South Carolina (DW)	State Program	4	84009 (002)	12-16-17
Tennessee	State Program	4	2008	02-23-17
Texas	NELAP	6	T104704077	08-31-15
USDA	Federal		S-48469	10-30-16
Utah	NELAP	8	TN00032	07-31-15
Virginia	NELAP	3	460152	06-14-15
Washington	State Program	10	C789	07-19-15
West Virginia DEP	State Program	3	219	02-28-16
Wisconsin	State Program	5	998020430	08-31-15
Wyoming (UST)	A2LA	8	453.07	12-31-15

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TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
Nashville, TN



### **COOLER RECEIPT FORM**

Cooler Received/Opened On 4/28/2015 @ 8:50	
1. Tracking # 455 (last 4 digits, FedEx)	
Courier: FedEx IR Gun ID 17610176	
2. Temperature of rep. sample or temp blank when opened: 4.7 Degrees Celsius	<b></b>
3. If Item #2 temperature is 0°C or less, was the representative sample or temp blank frozen?	YES NO. (NA)
4. Were custody seals on outside of cooler?	ESNONA
If yes, how many and where:	
5. Were the seals intact, signed, and dated correctly?	FESNQNA
6. Were custody papers inside cooler?	MES. NO. NA
I certify that I opened the cooler and answered questions 1-6 (intial)	
7. Were custody seals on containers: YES (10) and Intact	YESNO. NA
Were these signed and dated correctly?	YESNO. NA
8. Packing mat'l used? Bubblewrap Plastic bag Peanuts Vermiculite Foam Insert Paper	Other None
9. Cooling process: (Ice   Ice-pack   Ice (direct contact)   Dry ice	Other None
10. Did all containers arrive in good condition (unbroken)?	(ES).NONA
11. Were all container labels complete (#, date, signed, pres., etc)?	YES .NONA
12. Did all container labels and tags agree with custody papers?	YES).NONA
13a. Were VOA vials received?	YES. NO. NA
b. Was there any observable headspace present in any VOA vial?	YESNO.
14. Was there a Trip Blank in this cooler? YESNO. (NA) If multiple coolers, sequence	e #
certify that I unloaded the cooler and answered questions 7-14 (intial)	MDM
15a. On pres'd bottles, did pH test strips suggest preservation reached the correct pH level?	YESNO.NA
b. Did the bottle labels indicate that the correct preservatives were used	(ES)NONA
16. Was residual chlorine present?	YESNO
certify that I checked for chlorine and pH as per SOP and answered questions 15-16 (intial)	MDW
17. Were custody papers properly filled out (ink, signed, etc)?	FESNONA
18. Did you sign the custody papers in the appropriate place?	YES .NONA
19. Were correct containers used for the analysis requested?	(YES)NONA
20. Was sufficient amount of sample sent in each container?	YES. NONA
certify that I entered this project into LIMS and answered questions 17-20 (intial)	
certify that I attached a label with the unique LIMS number to each container (intial)	
21. Were there Non-Conformance issues at login?(YES)NO Was a NCM generated (YES)I	NO#

#### **COOLER RECEIPT FORM**

Atlanta

vasnville, TN	COOLER RECEIFT FORW	Loc: 490
Cooler Received/Opened On: 4/28/2015	5 @0850	77315
1. Tracking #_9641	(last 4 digits, FedEx)	
Courier: <u>Fed-Ex</u> I	IR Gun ID: <u>14740456</u>	
2. Temperature of rep. sample or tem	p blank when opened:	_
	s, was the representative sample or temp blank frozen?	YES NO.NA
I. Were custody seals on outside of co	ooler?	YESNONA
If yes, how many and where:	Itront	
5. Were the seals intact, signed, and d	lated correctly?	(YES)NONA
6. Were custody papers inside cooler?	?	ESNONA
certify that I opened the cooler and ar	nswered questions 1-6 (intial)	<u> </u>
. Were custody seals on containers:	YES ඟ and Intact	YESNO. (NA)
Were these signed and dated correct	ctly?	YESNO.
3. Packing mat'l used? Bubblewrap	Plastic bag Peanuts Vermiculite Foam Insert Pape	r Other None
). Cooling process:	(Ce) Ice-pack Ice (direct contact) Dry ice	e Other None
0. Did all containers arrive in good co	ondition (unbroken)?	ÆS)NONA
1. Were all container labels complete	e (#, date, signed, pres., etc)?	ÆS)NONA
2. Did all container labels and tags a	gree with custody papers?	ES)NONA
3a. Were VOA vials received?		YESNA
b. Was there any observable heads	pace present in any VOA vial?	YESNO (NA)
4. Was there a Trip Blank in this cool	er? YESNO. A If multiple coolers, sequer	ıce #
certify that I unloaded the cooler and	answered questions 7-14 (intial)	mbun
5a. On pres'd bottles, did pH test stri	ps suggest preservation reached the correct pH level?	YESNO.NA
b. Did the bottle labels indicate that	t the correct preservatives were used	(ES)NONA
6. Was residual chlorine present?		YESNO.
certify that I checked for chlorine and	pH as per SOP and answered questions 15-16 (intial)	<u>mom</u>
17. Were custody papers properly fille	ed out (ink, signed, etc)?	ÆS)NONA
18. Did you sign the custody papers in	n the appropriate place?	YESNONA
19. Were correct containers used for t	he analysis requested?	ES NO NA
20. Was sufficient amount of sample s	sent in each container?	(E8)(10)NA
certify that I entered this project into	LIMS and answered questions 17-20 (intial)	MDIN
certify that I attached a label with the	unique LIMS number to each container (intial)	MDM
21. Were there Non-Conformance issu	ues at login? (ES)NO Was a NCM generated? (YES)	.NO#

# **Chain of Custody Record**

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THE LEADER IN FAVI	3
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Custody Seal No.:  Δ Yes Δ No	Relinquished by:	Reithfullished Dr. 1	Relinquished by:	Empty Kit Relinquished by:	V, Q	Non-Hazard	Rossible Hazard Identification	A-7-2/6-7-1	A-2-1	C-2-1	A-VV	A-2-1	C-1-1	A-1-2	A-1-1	C-1-1	A-1-2	A-1-1		Sample Identification	Site:	Project Name: Treatability Study	Email: awadhawan@geosyntec.com	Phone:	State, Zip: MD, 21046	City: Columbia	Address: 10220 Old Columbia Road Suite A	Company: Geosyntec Consultants, Inc.	Client Contect Amar Wadhawan	Client Information	TestAmerica Nashville 2960 Foster Creighton Drive Nashville, TN 37204 Phone (615) 726-0177 Fax (615) 726-3404
	Date Time: 50 4/27/(5	Wilk's	Date/Time: XXXXX	Date:		Poison B Unknown Radiological		1 ( oz.) y a 191 /	1,600	1530	16/0	412115 1600 6	2 JESI 5/11/1/14	4hW115 1530 G	12 SEST STARTE	4 2521 21/1947	12 St51 21/1217	4/24/11S 11535 CT	X	Sample Type Sample (C=comp,	SSOW#	Project # 49008518	WO#	Purchase Order Requested		(A) Kequested (days):	Due Date Requested:	l	O	Chew	
Cooler Temperature(s)		wtec	Company	Time:	Spec		Sample Disp	Water S. W. X	Water S N		Water V X X X	Water	A September 1	WaterS N	Mater S N		Water	Water Y X X X	Preservation Code: XXN N N N	b) BT-Tissue, (-Ahr) Find Filtere  Render MS  9056 - Nitrate  7196A - Hexa  6020 - As, Cr,	MSB ( Sulfate valent C	fes Vi	No.	(a)					う) heather baker@testamericaino	Baker, Heather	Chain of Custody Record
(s) °C and Other Remarks:		Mund to the 27	(1) Datorime	Method of Shipment		it 😾 Disposal By Lab	fee may be assessed if samples																					Analysis Requested	nc.com	Carrier Tracking No(s):	
3.4/42	e 0850	ris 1650 Th	Opposite			Archive For Months	are retained longer than 1 month)	Copyrion The Copyrion		not filtered	21 1-1+ ered & this preserved	21 filtered & that preserve		The state of the s	7 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	net fatera.	21 titlered, Nitric preserval	Elfithered, Nitric preserved		Special Instructions/Note:	Other		J - DI Water	a	U- NITIC AGG	B - NaOH C - Zn Acetate	A - HCL	JOU#	Page 1 of X	490-36874-12511.1 //375	TestAmerica THE EXPERIMENTAL Loc: 490

## **Login Sample Receipt Checklist**

Client: Geosyntec Consultants, Inc.

Job Number: 490-77315-1

Login Number: 77315 List Source: TestAmerica Nashville

List Number: 1

Creator: McBride, Mike

Creator. Michide, Mike		
Question	Answer	Comment
Radioactivity wasn't checked or is = background as measured by a survey meter.</td <td>True</td> <td></td>	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	3.6/4.7
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	False	Limited volume received.
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

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# **ANALYTICAL REPORT**

TestAmerica Laboratories, Inc.

TestAmerica Nashville 2960 Foster Creighton Drive Nashville, TN 37204 Tel: (615)726-0177

TestAmerica Job ID: 490-77930-1 Client Project/Site: Treatability Study

#### For:

Geosyntec Consultants, Inc. 10220 Old Columbia Road Suite A Columbia, Maryland 21046

Attn: Amar Wadhawan



Authorized for release by: 5/28/2015 2:34:59 PM

Heather Baker, Project Manager I (615)301-5043

heather.baker@testamericainc.com

·····LINKS ·······

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The test results in this report meet all 2003 NELAC and 2009 TNI requirements for accredited parameters, exceptions are noted in this report. This report may not be reproduced except in full, and with written approval from the laboratory. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-77930-1

# **Table of Contents**

Cover Page	1
Table of Contents	2
Sample Summary	3
Case Narrative	4
Definitions	5
Client Sample Results	6
QC Sample Results	22
QC Association	27
Chronicle	31
Method Summary	36
Certification Summary	37
Chain of Custody	38
Receipt Checklists	42

4

6

8

9

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12

## **Sample Summary**

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-77930-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
490-77930-1	Biotic_050615	Water	05/06/15 08:50	05/07/15 08:30
490-77930-2	Biotic_050615	Solid	05/06/15 08:50	05/07/15 08:30
490-77930-3	Biotic Dup_050615	Water	05/06/15 10:15	05/07/15 08:30
490-77930-4	Biotic Dup_050615	Solid	05/06/15 10:15	05/07/15 08:30
490-77930-5	Biotic Control_050615	Water	05/06/15 10:25	05/07/15 08:30
490-77930-6	Biotic Control_050615	Solid	05/06/15 10:25	05/07/15 08:30
490-77930-7	Abiotic_4hr_050615	Water	05/06/15 11:40	05/07/15 08:30
490-77930-8	Abiotic_4hr_050615	Solid	05/06/15 11:40	05/07/15 08:30
490-77930-9	Abiotic_4hr_Dup_050615	Water	05/06/15 12:05	05/07/15 08:30
490-77930-10	Abiotic_4hr_Dup_050615	Solid	05/06/15 12:05	05/07/15 08:30
490-77930-11	Abiotic_Control_050615	Water	05/06/15 12:00	05/07/15 08:30
490-77930-12	Abiotic_Control_050615	Solid	05/06/15 12:00	05/07/15 08:30
490-77930-13	Abiotic_8hr_050615	Water	05/06/15 15:30	05/07/15 08:30
490-77930-14	Abiotic_8hr_050615	Solid	05/06/15 15:30	05/07/15 08:30
490-77930-15	Abiotic_8hr_Dup_050615	Water	05/06/15 15:35	05/07/15 08:30
490-77930-16	Abiotic 8hr Dup 050615	Solid	05/06/15 15:35	05/07/15 08:30

#### **Case Narrative**

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-77930-1

Job ID: 490-77930-1

Laboratory: TestAmerica Nashville

**Narrative** 

Job Narrative 490-77930-1

#### Comments

No additional comments.

#### Receipt

The samples were received on 5/7/2015 8:30 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 1.0° C.

#### Except:

Method 7196A: The following samples were received outside of holding time: Biotic\_050615 (490-77930-1), Biotic Dup\_050615 (490-77930-3) and Biotic Control\_050615 (490-77930-5).

#### HPLC/IC

Method 9056: The following samples were diluted due to the nature of the sample matrix: Biotic\_050615 (490-77930-1), Biotic Dup\_050615 (490-77930-3), Abiotic\_4hr\_050615 (490-77930-7), Abiotic\_4hr\_Dup\_050615 (490-77930-15) and Abiotic\_8hr\_Dup\_050615 (490-77930-15). Elevated reporting limits (RLs) are provided.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

#### Metals

Method 6010B: Insufficient sample volume was available to perform a matrix spike/matrix spike duplicate (MS/MSD) associated with 247303.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

#### Field Service / Mobile Lab

No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

#### **General Chemistry**

Method 7196A: The matrix spike / matrix spike duplicate (MS/MSD) recoveries for preparation batch 490-246616 and analytical batch 490-247930 were outside control limits. Sample matrix interference and/or non-homogeneity are suspected because the associated laboratory control sample (LCS) recovery was within acceptance limits.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

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## **Definitions/Glossary**

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-77930-1

#### **Qualifiers**

#### **HPLC/IC**

Qualifier	Qualifier Description
F1	MS and/or MSD Recovery is outside acceptance limits

#### **Metals**

Qualifier	Qualifier Description
F2	MS/MSD RPD exceeds control limits
4	MS, MSD: The analyte present in the original sample is greater than 4 times the matrix spike concentration; therefore, control limits are not applicable.

#### **General Chemistry**

Qualifier	Qualifier Description
F1	MS and/or MSD Recovery is outside acceptance limits.
Н	Sample was prepped or analyzed beyond the specified holding time

## Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
n	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains no Free Liquid
DER	Duplicate error ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision level concentration
MDA	Minimum detectable activity
EDL	Estimated Detection Limit
MDC	Minimum detectable concentration
MDI	Mathed Detection Limit

MDC	Minimum detectable conce
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated

ND Not detected at the reporting limit (or MDL or EDL if shown)

PQL Practical Quantitation Limit

QC Quality Control RER Relative error ratio

RL Reporting Limit or Requested Limit (Radiochemistry)

RPD Relative Percent Difference, a measure of the relative difference between two points

TEF Toxicity Equivalent Factor (Dioxin)
TEQ Toxicity Equivalent Quotient (Dioxin)

TestAmerica Nashville

Page 5 of 42

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Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

Client Sample ID: Biotic 050615

TestAmerica Job ID: 490-77930-1

Lab Sample ID: 490-77930-1

Matrix: Water

Date Collected: 05/06/15 08:50 Date Received: 05/07/15 08:30

**General Chemistry - Dissolved** 

Analyte

Chromium, hex

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Nitrate as N	1.46		0.100		mg/L			05/07/15 13:46	1
Sulfate	2350		5.00		mg/L			05/08/15 18:49	5
Method: 6020 - Metals	,					_			
	,		RI	MDI	Unit	n	Propared	Analyzed	Dil Fac
Analyte	Result	ed Qualifier	RL	MDL		D	Prepared	Analyzed	Dil Fac
Analyte Arsenic	Result 0.0115		0.0100	MDL	mg/L	D	05/11/15 11:25	05/12/15 22:39	5
Analyte	Result			MDL		D	05/11/15 11:25		Dil Fac 5 5
Analyte Arsenic	Result 0.0115		0.0100	MDL	mg/L	<u>D</u>	05/11/15 11:25 05/11/15 11:25	05/12/15 22:39	5

RL

0.0100

MDL Unit

mg/L

Result Qualifier

ND HF1

Analyzed Dil Fac 05/07/15 10:55 1

Prepared

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-77930-1

Client Sample ID: Biotic\_050615

Lab Sample ID: 490-77930-2 Date Collected: 05/06/15 08:50 **Matrix: Solid** 

Date Received: 05/07/15 08:30 Percent Solids: 78.9

Method: 6020 - Metals (ICP/I	MS)								
Analyte	Result Q	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	430 F	2	0.622		mg/Kg	<u> </u>	05/07/15 14:49	05/08/15 19:48	1
Chromium	172		0.622		mg/Kg	☼	05/07/15 14:49	05/08/15 19:48	1
Copper	690		3.11		mg/Kg	☼	05/07/15 14:49	05/12/15 21:38	5
Iron	4100		6.22		mg/Kg	₩	05/07/15 14:49	05/08/15 19:48	1
- General Chemistry									
Analyte	Result Q	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Moisture	21		0.10		%			05/27/15 15:13	1
Percent Solids	79		0.10		%			05/27/15 15:13	1

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

Client Sample ID: Biotic Dup 050615

TestAmerica Job ID: 490-77930-1

Lab Sample ID: 490-77930-3

. Matrix: Water

Date Collected: 05/06/15 10:15 Date Received: 05/07/15 08:30

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Nitrate as N	1.41		0.100		mg/L			05/07/15 14:26	1
Sulfate	2350		5.00		mg/L			05/08/15 19:09	5
Method: 6020 - Metals Analyte	•	e <mark>d</mark> Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Analyte	Result			MDL		D			Dil Fac
Analyte	•		RL 0.0100	MDL	Unit mg/L	<u>D</u>		Analyzed 05/12/15 22:44	Dil Fac
Analyte Arsenic	Result			MDL		D	05/11/15 11:25		Dil Fac 5
	Result ND		0.0100	MDL	mg/L	<u>D</u>	05/11/15 11:25 05/11/15 11:25	05/12/15 22:44	<b>Dil Fac</b> 5 5 5

General Chemistry - Dissolved Analyte	Result	Qualifier	RL	MDL Ur	it	D	Prepared	Analyzed	Dil Fac
Chromium, hex	ND	H	0.0100	mç	J/L	_		05/07/15 10:57	1

12

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

Date Collected: 05/06/15 10:15

Date Received: 05/07/15 08:30

Client Sample ID: Biotic Dup 050615

TestAmerica Job ID: 490-77930-1

Lab Sample ID: 490-77930-4

**Matrix: Solid** 

Percent Solids: 76.9

Method: 6020 - Metals (ICP/	•							
Analyte	Result Qualifie	r RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	725	6.53		mg/Kg	₽	05/07/15 14:49	05/12/15 22:03	10
Chromium	152	0.653		mg/Kg	☼	05/07/15 14:49	05/08/15 20:13	1
Copper	1350	6.53		mg/Kg	☼	05/07/15 14:49	05/12/15 22:03	10
lron -	8240	6.53		mg/Kg	₩	05/07/15 14:49	05/08/15 20:13	1
General Chemistry								
Analyte	Result Qualifie	r RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Moisture	23	0.10		%			05/27/15 15:13	1
Percent Solids	77	0.10		%			05/27/15 15:13	1

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-77930-1

Client Sample ID: Biotic Control 050615

Date Collected: 05/06/15 10:25 Date Received: 05/07/15 08:30

**General Chemistry - Dissolved** 

Analyte

Chromium, hex

Lab Sample ID: 490-77930-5

Analyzed

05/07/15 10:58

Prepared

**Matrix: Water** 

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Nitrate as N	1.53		0.100		mg/L			05/07/15 15:06	1
Sulfate	15.7		1.00		mg/L			05/08/15 19:29	1
=									
Method: 6020 - Metals	(ICP/MS) - Dissolve	d							
<b>Method: 6020 - Metals</b> Analyte	,	<mark>d</mark> Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
	,		RL 0.0100	MDL	Unit mg/L	D		Analyzed 05/12/15 22:49	Dil Fac
Analyte Arsenic	Result			MDL		<u>D</u>	05/11/15 11:25		
Analyte	7.94		0.0100	MDL	mg/L	<u>D</u>	05/11/15 11:25 05/11/15 11:25	05/12/15 22:49	5

RL

0.0100

Result Qualifier

0.0320 H

MDL Unit

mg/L

ໆ,

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

Client Sample ID: Biotic Control\_050615

TestAmerica Job ID: 490-77930-1

Lab Sample ID: 490-77930-6

Date Collected: 05/06/15 10:25	Matrix: Solid
Date Received: 05/07/15 08:30	Percent Solids: 76.9

Method: 6020 - Metals (ICP					_	_		
Analyte	Result Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	254	0.638		mg/Kg	<u>₩</u>	05/07/15 14:49	05/08/15 20:18	1
Chromium	48.4	0.638		mg/Kg	☼	05/07/15 14:49	05/08/15 20:18	1
Copper	324	0.638		mg/Kg	☼	05/07/15 14:49	05/08/15 20:18	1
Iron	1450	6.38		mg/Kg	₩	05/07/15 14:49	05/08/15 20:18	1
General Chemistry								
Analyte	Result Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Moisture	23	0.10		%			05/27/15 15:13	1
Percent Solids	77	0.10		%			05/27/15 15:13	1

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-77930-1

Client Sample ID: Abiotic\_4hr\_050615

Date Collected: 05/06/15 11:40 Date Received: 05/07/15 08:30

Lab Sample ID: 490-77930-7

**Matrix: Water** 

Method: 9056 - Anions, Ion Chr	omatography						
Analyte	Result Qualifie	er RL	MDL Unit	D	Prepared	Analyzed	Dil Fac
Nitrate as N	1.50	0.100	mg/L			05/07/15 15:26	1
Sulfate	3120	10.0	mg/L			05/08/15 20:29	10

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND		0.0200		mg/L		05/11/15 11:25	05/12/15 23:56	10
Chromium	ND		0.0200		mg/L		05/11/15 11:25	05/12/15 23:56	10
Copper	ND		0.0200		mg/L		05/11/15 11:25	05/12/15 23:56	10
Iron	903		2.50		mg/L		05/11/15 11:25	05/12/15 22:54	100

	303		2.00		mg/L		00/11/10	11.20	00/12/10 22:04	100
General Chemistry - Dissolved Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepa	ared	Analyzed	Dil Fac
Chromium, hex	ND		0.0100		mg/L				05/07/15 11:00	1

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-77930-1

ID: 400 77020 9

Client Sample ID: Abiotic\_4hr\_050615

Date Collected: 05/06/15 11:40 Date Received: 05/07/15 08:30

**Percent Solids** 

Lab Sample ID: 490-77930-8 Matrix: Solid

Percent Solids: 75.7

05/27/15 15:13

Method: 6020 - Metals (ICP	/MS)							
Analyte	Result Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	1160	6.38		mg/Kg	<u> </u>	05/07/15 14:49	05/12/15 22:13	10
Chromium	211	0.638		mg/Kg	☼	05/07/15 14:49	05/08/15 20:49	1
Copper	2290	6.38		mg/Kg	☼	05/07/15 14:49	05/12/15 22:13	10
lron	8580	6.38		mg/Kg	☼	05/07/15 14:49	05/08/15 20:49	1
General Chemistry								
Analyte	Result Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Moisture	24	0.10		%			05/27/15 15:13	1

0.10

**76** 

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Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-77930-1

Client Sample ID: Abiotic\_4hr\_Dup\_050615 Lab Sample

ND

Date Collected: 05/06/15 12:05 Date Received: 05/07/15 08:30

Chromium, hex

Lab Sample ID: 490-77930-9

. Matrix: Water

05/07/15 11:03

Method: 9056 - Anions, Ion	• • •	lien. Di	MDI	1114	_	B	A I I	D!! E
Analyte	Result Qua	llifier RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Nitrate as N	1.50	0.100		mg/L			05/07/15 16:06	1
Sulfate	3090	10.0		mg/L			05/08/15 20:49	10
- Method: 6020 - Metals (ICP	P/MS) - Dissolved							
Analyte	Result Qua	lifier RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND ND	0.0200		mg/L		05/11/15 11:25	05/13/15 00:01	10
Chromium	ND	0.0200		mg/L		05/11/15 11:25	05/13/15 00:01	10
Copper	ND	0.0200		mg/L		05/11/15 11:25	05/13/15 00:01	10
Iron	946	2.50		mg/L		05/11/15 11:25	05/12/15 22:59	100
- General Chemistry - Disso	lved							
Analyte	Result Qua	lifier RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac

0.0100

mg/L

3

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Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

Date Collected: 05/06/15 12:05

Client Sample ID: Abiotic\_4hr\_Dup\_050615

TestAmerica Job ID: 490-77930-1

Lab Sample ID: 490-77930-10

. Matrix: Solid

Date Re	ceived: 05/07/15 08:30						Percent Solid	ds: 76.6
Method Analyte	: 6020 - Metals (ICP/MS)	Result Qualifier	RL	MDL Unit	D	Prepared	Analyzed	Dil Fac

Method: 6020 - Metals (ICP/M Analyte	S)  Result Qualif	ier RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	769	6.49		mg/Kg	<u> </u>	05/07/15 14:49	05/12/15 22:19	10
Chromium	120	0.649		mg/Kg	₩	05/07/15 14:49	05/08/15 20:54	1
Copper	1350	6.49		mg/Kg	₩	05/07/15 14:49	05/12/15 22:19	10
lron _	5220	6.49		mg/Kg	☼	05/07/15 14:49	05/08/15 20:54	1
General Chemistry								
Analyte	Result Qualif	ier RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Moisture	23	0.10		%			05/27/15 15:13	1
Percent Solids	77	0.10		%			05/27/15 15:13	1

9

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45

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-77930-1

Lab Sample ID: 490-77930-11

Client Sample ID: Abiotic\_Control\_050615

Date Collected: 05/06/15 12:00 **Matrix: Water** Date Received: 05/07/15 08:30

Method: 9056 - Anions, Ion Chi	omatography						
Analyte	Result Qualifier	RL	MDL Uni	t D	Prepared	Analyzed	Dil Fac
Nitrate as N	1.61 F1	0.100	mg/	L –		05/07/15 16:46	1
Sulfate	12.3	1.00	mg/	L		05/08/15 21:09	1

Analyte Nitrate as N Sulfate	Result 1.61 12.3	Qualifier F1	RL 0.100 1.00	 mg/L mg/L	D	Prepared	Analyzed  05/07/15 16:46  05/08/15 21:09	Dil Fac
Method: 6020 - Metals (ICP/MS	) - Dissolve	ed Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fac

Analyte	Result Qualifie	r RL	MDL Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	3.07	0.0100	mg/L		05/13/15 14:44	05/15/15 14:29	5
Chromium	0.126	0.0100	mg/L		05/13/15 14:44	05/15/15 14:29	5
Copper	0.919	0.0100	mg/L		05/13/15 14:44	05/15/15 14:29	5
Iron	3.39	0.125	mg/L		05/13/15 14:44	05/15/15 14:29	5

General Chemistry - Dissolved									
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium, hex	ND		0.0100		mg/L			05/07/15 11:05	1

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-77930-1

Client Sample ID: Abiotic\_Control\_050615

Date Collected: 05/06/15 12:00 Date Received: 05/07/15 08:30 Lab Sample ID: 490-77930-12

Matrix: Solid Percent Solids: 77.5

Method: 6020 - Metals (ICP/I	MS)							
Analyte	Result Quali	lifier RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	229	0.628		mg/Kg	<u> </u>	05/07/15 14:49	05/08/15 20:24	1
Chromium	51.5	0.628		mg/Kg	☼	05/07/15 14:49	05/08/15 20:24	1
Copper	354	0.628		mg/Kg	☼	05/07/15 14:49	05/08/15 20:24	1
Iron	1960	6.28		mg/Kg	₩	05/07/15 14:49	05/08/15 20:24	1
General Chemistry								
Analyte	Result Quali	lifier RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Moisture	23	0.10		%			05/27/15 15:13	1
Percent Solids	77	0.10		%			05/27/15 15:13	1

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Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-77930-1

Client Sample ID: Abiotic\_8hr\_050615

Date Collected: 05/06/15 15:30 Date Received: 05/07/15 08:30 Lab Sample ID: 490-77930-13

**Matrix: Water** 

Method: 9056 - Anions, Ioi Analyte	n Chromatography Result Qualifier	RL	MDL Unit	D	Prepared	Analyzed	Dil Fac
Nitrate as N	1.77	0.100	mg/L			05/07/15 18:27	1
Sulfate	3040	10.0	mg/L			05/08/15 21:29	10
Method: 6020 - Metals (ICF		10.0	mg/∟			03/06/13 21.29	

Method: 6020 - Metals (ICP/MS) - Dissolved									
Analyte	Result Qualifier	RL	MDL Unit	D Prepared	Analyzed	Dil Fac			
Arsenic	ND ND	0.0200	mg/L	05/11/15 11:25	05/13/15 00:06	10			
Chromium	ND	0.0200	mg/L	05/11/15 11:25	05/13/15 00:06	10			
Copper	ND	0.0200	mg/L	05/11/15 11:25	05/13/15 00:06	10			
Iron	833	2.50	mg/L	05/11/15 11:25	05/12/15 23:05	100			

Iron	833	2.50	mg/L	05/11/15 11:25	05/12/15 23:05	100
General Chemistry - Dissolved Analyte Chromium, hex	Result Qualifier ND	RL	MDL Unit mg/L	D Prepared	Analyzed 05/07/15 11:06	Dil Fac

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Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

Date Collected: 05/06/15 15:30

Date Received: 05/07/15 08:30

Client Sample ID: Abiotic\_8hr\_050615

TestAmerica Job ID: 490-77930-1

Lab Sample ID: 490-77930-14

**Matrix: Solid** 

Percent Solids: 77.9

Method: 6020 - Metals (ICP/MS)									
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	276		0.612		mg/Kg	<u> </u>	05/07/15 14:49	05/08/15 20:39	1
Chromium	48.9		0.612		mg/Kg	₽	05/07/15 14:49	05/08/15 20:39	1
Copper	364		0.612		mg/Kg	☼	05/07/15 14:49	05/08/15 20:39	1
Iron	3110		6.12		mg/Kg	₩	05/07/15 14:49	05/08/15 20:39	1
General Chemistry									
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Moisture	22		0.10		%			05/27/15 15:13	1
Percent Solids	78		0.10		%			05/27/15 15:13	1

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

Client Sample ID: Abiotic 8hr Dup 050615

TestAmerica Job ID: 490-77930-1

Lab Sample ID: 490-77930-15

Matrix: Water

05/07/15 11:08

Date Collected: 05/06/15 15:35 Date Received: 05/07/15 08:30

Chromium, hex

Method: 9056 - Anions Analyte	· .	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Nitrate as N	1.72		0.100		mg/L			05/07/15 19:07	1
Sulfate	3150		10.0		mg/L			05/08/15 21:49	10
Method: 6020 - Metals	,								
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND		0.0200		mg/L		05/11/15 11:25	05/13/15 00:11	10
Chromium	ND		0.0200		mg/L		05/11/15 11:25	05/13/15 00:11	10
Copper	ND		0.0200		mg/L		05/11/15 11:25	05/13/15 00:11	10
Iron	918		2.50		mg/L		05/11/15 11:25	05/12/15 23:10	100
- General Chemistry - D	issolved								
Analyte		Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac

0.0100

mg/L

ND

2

4

6

9

10

11

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

**Percent Moisture** 

**Percent Solids** 

TestAmerica Job ID: 490-77930-1

Client Sample ID: Abiotic\_8hr\_Dup\_050615

**32** 

**68** 

Date Collected: 05/06/15 15:35 Date Received: 05/07/15 08:30 Lab Sample ID: 490-77930-16

Matrix: Solid Percent Solids: 68.5

05/27/15 15:13

05/27/15 15:13

Iron  General Chemistry	8480	7.19		mg/Kg		05/07/15 14:49	05/08/15 20:44	1
Copper	2350	7.19		mg/Kg	≎		05/12/15 22:08	10
Chromium	233	0.719		mg/Kg	≎	05/07/15 14:49	05/08/15 20:44	1
Arsenic	1230	7.19		mg/Kg	<u> </u>	05/07/15 14:49	05/12/15 22:08	10
Method: 6020 - Metals (ICP/N Analyte	S)  Result Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac

0.10

0.10

%

%

8

40

10

12

1:

TestAmerica Job ID: 490-77930-1

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

Method: 9056 - Anions, Ion Chromatography

Lab Sample ID: MB 490-246697/6 Client Sample ID: Method Blank Prep Type: Total/NA **Matrix: Water** 

**Analysis Batch: 246697** 

MB MB Analyte Result Qualifier RL **MDL** Unit Analyzed Dil Fac Prepared 0.100 05/07/15 12:46 Nitrate as N ND mg/L

Lab Sample ID: LCS 490-246697/7 Client Sample ID: Lab Control Sample **Matrix: Water** Prep Type: Total/NA

**Analysis Batch: 246697** 

Spike LCS LCS %Rec. Added Limits Analyte Result Qualifier Unit %Rec Nitrate as N 10.0 10.40 mg/L 104 80 - 120

Lab Sample ID: LCSD 490-246697/8 Client Sample ID: Lab Control Sample Dup **Matrix: Water** Prep Type: Total/NA **Analysis Batch: 246697** 

Spike LCSD LCSD %Rec. **RPD** Added Result Qualifier Limits RPD Limit Analyte Unit D %Rec Nitrate as N 10.0 10.54 mg/L 105 80 - 120

Lab Sample ID: 490-77930-11 MS Client Sample ID: Abiotic\_Control\_050615 **Matrix: Water** Prep Type: Total/NA

**Analysis Batch: 246697** 

Sample Sample Spike MS MS %Rec. Result Qualifier Added Result Qualifier Unit %Rec Limits Nitrate as N 1.61 F1 10.0 13.24 116 80 - 120 mg/L

Lab Sample ID: 490-77930-11 MSD Client Sample ID: Abiotic Control 050615 **Matrix: Water** Prep Type: Total/NA

**Analysis Batch: 246697** 

Spike MSD MSD %Rec. RPD Sample Sample Analyte Result Qualifier Added Result Qualifier Unit D %Rec Limits RPD Limit Nitrate as N 1.61 F1 10.0 14.98 F1 134 mg/L 80 - 120 12

Lab Sample ID: MB 490-247021/6 **Client Sample ID: Method Blank** Prep Type: Total/NA

**Matrix: Water** 

Analysis Batch: 247021

MB MB Result Qualifier RL MDL Unit Prepared Analyte D Analyzed Dil Fac 1 00 Sulfate mg/L 05/08/15 14:03 ND

Lab Sample ID: LCS 490-247021/7 Client Sample ID: Lab Control Sample **Matrix: Water** Prep Type: Total/NA

**Analysis Batch: 247021** 

Spike LCS LCS %Rec. Added Result Qualifier **Analyte** Unit %Rec Limits Sulfate 100 105.4 105 80 - 120

Lab Sample ID: LCSD 490-247021/8 Client Sample ID: Lab Control Sample Dup **Matrix: Water** Prep Type: Total/NA

**Analysis Batch: 247021** 

LCSD LCSD RPD Spike %Rec. Added Limits Analyte Result Qualifier Unit D %Rec RPD Limit Sulfate 100 106.0 106 80 - 120 mg/L

TestAmerica Nashville

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-77930-1

**Client Sample ID: Matrix Spike** 

Client Sample ID: Method Blank

**Client Sample ID: Lab Control Sample** 

Client Sample ID: Biotic\_050615

Client Sample ID: Biotic 050615

**Client Sample ID: Matrix Spike Duplicate** 

Prep Type: Total/NA

Prep Type: Total/NA

Prep Type: Total/NA **Prep Batch: 246589** 

**Prep Type: Total/NA** 

Prep Type: Total/NA

Lab Sample ID: 490-78075-J-4 MS

**Matrix: Water** 

**Analysis Batch: 247021** 

Sample Sample Spike MS MS %Rec. Analyte **Result Qualifier** Added Result Qualifier Unit D %Rec Limits Sulfate 9.23 100 80 - 120 111.8 mg/L 103

Lab Sample ID: 490-78075-J-4 MSD

**Matrix: Water** 

**Analysis Batch: 247021** 

Sample Sample Spike MSD MSD %Rec. **RPD** Result Qualifier Result Qualifier Added Limits Analyte Unit D %Rec RPD Limit Sulfate 9.23 100 109.8 mg/L 101 80 - 120 2

Method: 6020 - Metals (ICP/MS)

Lab Sample ID: MB 490-246589/1-A

**Matrix: Solid** 

**Analysis Batch: 247265** 

	MB	МВ					
/	Analyte Result	Qualifier	RL MDL	Unit D	Prepared	Analyzed	Dil Fac
7	Arsenic ND		0.498	mg/Kg	05/07/15 14:49	05/08/15 19:38	1
(	Chromium ND		0.498	mg/Kg	05/07/15 14:49	05/08/15 19:38	1
(	Copper ND		0.498	mg/Kg	05/07/15 14:49	05/08/15 19:38	1
- 1	ron ND		4.98	mg/Kg	05/07/15 14:49	05/08/15 19:38	1

Lab Sample ID: LCS 490-246589/2-A

**Matrix: Solid** 

Analysis Batch: 24/265	Spike	LCS	LCS				Rec.	246589
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Arsenic	19.8	17.30		mg/Kg		87	80 - 120	
Chromium	19.8	18.13		mg/Kg		91	80 - 120	
Copper	19.8	16.90		mg/Kg		85	80 - 120	
Iron	198	183.0		mg/Kg		92	80 - 120	

Lab Sample ID: 490-77930-2 MS

**Matrix: Solid** 

**Analysis Batch: 247265** Prep Batch: 246589 Sample Sample Spike MS MS %Rec. Analyte Result Qualifier Added Result Qualifier Unit %Rec Limits Arsenic 430 F2 25.5 424.2 4 mg/Kg ☼ -21 75 - 125 Ö Chromium 172 25.5 85.27 4 mg/Kg -340 75 - 125 Iron 4100 255 4835 4 mg/Kg 290 75 - 125

Lab Sample ID: 490-77930-2 MS

Matrix: Solid Analysis Batch: 247865										e: Total/NA tch: 246589
-	Sample	Sample	Spike	MS	MS				%Rec.	
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Copper	690		25.5	746.6	4	mg/Kg	<del></del>	223	75 - 125	

TestAmerica Nashville

TestAmerica Job ID: 490-77930-1

-165

102

102

80 - 120

80 - 120

75 - 125

**Prep Type: Total/NA** 

14

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

Method: 6020 - Metals (ICP/MS) (Continued)

Lab Sample ID: 490-77930-2 MSD Client Sample ID: Biotic\_050615

**Matrix: Solid** 

Copper

Iron

Iron

690

Analysis Batch: 247265									Prep Ba	tch: 24	16589
_	Sample	Sample	Spike	MSD	MSD				%Rec.		RPD
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	RPD	Limit
Arsenic	430	F2	25.0	337.2	4 F2	mg/Kg	<del>\</del>	-370	75 - 125	23	20
Chromium	172		25.0	81.39	4	mg/Kg	₩	-362	75 - 125	5	20
Iron	4100		250	4690	4	mg/Kg	₩	237	75 - 125	3	20

Lab Sample ID: 490-77930-2 MSD Client Sample ID: Biotic\_050615 **Matrix: Solid** Prep Type: Total/NA **Analysis Batch: 247865** Prep Batch: 246589 Sample Sample Spike MSD MSD %Rec. Analyte **Result Qualifier** Added Result Qualifier Limits RPD Limit Unit %Rec

Lab Sample ID: MB 490-247303/1-A **Client Sample ID: Method Blank Matrix: Water Prep Type: Total Recoverable** 

648.6 4

mg/Kg

mg/L

mg/L

25.0

**Analysis Batch: 247656 Prep Batch: 247303** 

	MB MB					
Analyte	Result Qualifier	RL	MDL Unit	D Prepared	Analyzed	Dil Fac
Arsenic	ND ND	0.00200	mg/L	05/11/15 11:25	05/12/15 10:47	1
Chromium	ND	0.00200	mg/L	05/11/15 11:25	05/12/15 10:47	1
Copper	ND	0.00200	mg/L	05/11/15 11:25	05/12/15 10:47	1
Iron	ND	0.0250	mg/L	05/11/15 11:25	05/12/15 10:47	1

Lab Sample ID: LCS 490-247303/2-A **Client Sample ID: Lab Control Sample Matrix: Water Prep Type: Total Recoverable Analysis Batch: 247656** Prep Batch: 247303 LCS LCS Spike %Rec. Added Analyte Result Qualifier Unit D %Rec Limits Arsenic 0.1065 0.100 mg/L 107 80 - 120 Chromium 0.100 0.1078 mg/L 108 80 - 120 0.100 Copper 0.1019 mg/L 102 80 - 120

1.015

1.023

1.00

1.00

Lab Sample ID: LCSD 490-247303/3-A Matrix: Water Analysis Batch: 247656			C	Client Sa			Control Spe: Total F Prep Ba	Recove	verable	
	Spike	LCSD	LCSD				%Rec.		RPD	
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits	RPD	Limit	
Arsenic	0.100	0.1052		mg/L		105	80 - 120	1	20	
Chromium	0.100	0.1064		mg/L		106	80 - 120	1	20	
Copper	0.100	0.1000		mg/L		100	80 - 120	2	20	

Lab Sample ID: MB 490-248030/1-B **Client Sample ID: Method Blank Matrix: Water Prep Type: Dissolved** 

**Analysis Batch: 248708** Prep Batch: 248032 MD MD

	IVID	IAID							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND		0.00200		mg/L		05/13/15 14:44	05/15/15 13:02	1
Chromium	ND		0.00200		mg/L		05/13/15 14:44	05/15/15 13:02	1
Copper	ND		0.00200		mg/L		05/13/15 14:44	05/15/15 13:02	1

TestAmerica Nashville

Page 24 of 42

TestAmerica Job ID: 490-77930-1

**Client Sample ID: Method Blank** 

**Client Sample ID: Lab Control Sample** 

Client: Geosyntec Consultants, Inc.

Project/Site: Treatability Study

Method: 6020 - Metals (ICP/MS) (Continued)

Lab Sample ID: MB 490-248030/1-B

**Matrix: Water** 

**Analysis Batch: 248708** 

**Prep Type: Dissolved** Prep Batch: 248032

MB MB

**MDL** Unit Analyte Result Qualifier RL Prepared Analyzed Dil Fac 05/13/15 14:44 05/15/15 13:02 Iron  $\overline{\mathsf{ND}}$ 0.0250 mg/L

Lab Sample ID: LCS 490-248030/2-B

**Matrix: Water** 

**Analysis Bate** 

er	Prep Type: Dissolved
tch: 248708	Prep Batch: 248032

	Spike	LCS	LCS				%Rec.	
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Arsenic	0.100	0.1015	-	mg/L		102	80 - 120	
Chromium	0.100	0.1007		mg/L		101	80 - 120	
Copper	0.100	0.09814		mg/L		98	80 - 120	
Iron	1.00	1.025		mg/L		103	80 - 120	

Lab Sample ID: 490-78209-G-1-E MS

**Matrix: Water** 

**Analysis Batch: 248708** 

<b>Client Sample</b>	ID:	Matrix	Spike

**Prep Type: Dissolved** Prep Batch: 248032

Sample Sample Spike MS MS %Rec. Analyte Result Qualifier Added Result Qualifier Unit D %Rec Limits Arsenic 0.00293 0.100 0.1040 mg/L 101 75 - 125 Chromium 0.100 ND 0.1014 mg/L 101 75 - 125 Copper ND 0.100 0.1008 mg/L 100 75 - 125 Iron ND 1.00 1.035 mg/L 102 75 - 125

Lab Sample ID: 490-78209-G-1-F MSD

**Matrix: Water** 

Analysis Ratch: 248708

Client Sample	ו :טו	Matrix	Spike	Duplicat	е
		Pren 1	Type: I	Dissolve	d

Prop Ratch: 248032

Alialysis Datcil. 240700									Lieh Da	tC11. Z-	10032
	Sample	Sample	Spike	MSD	MSD				%Rec.		RPD
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	RPD	Limit
Arsenic	0.00293		0.100	0.1045		mg/L		102	75 - 125	0	20
Chromium	ND		0.100	0.1007		mg/L		100	75 - 125	1	20
Copper	ND		0.100	0.1007		mg/L		99	75 - 125	0	20
Iron	ND		1.00	1.035		mg/L		102	75 - 125	0	20
	Analyte Arsenic Chromium Copper	Analyte         Result           Arsenic         0.00293           Chromium         ND           Copper         ND	Analyte         Result         Qualifier           Arsenic         0.00293         Chromium           Copper         ND	Analyte         Result Arsenic         0.00293         0.100           Chromium         ND         0.100           Copper         ND         0.100	Analyte         Result Arsenic         0.00293         0.100         0.1007           Chromium         ND         0.100         0.1007           Copper         ND         0.100         0.1007	Analyte         Result Arsenic         0.00293         0.100         0.1007         Chromium         ND         0.100         0.1007         0.1007           Copper         ND         0.100         0.1007         0.1007	Analyte         Result Arsenic         Qualifier         Added Added Arsenic         MSD Qualifier         Unit MSD Qualifier         Unit MSD Qualifier         Unit MSD Qualifier         Unit MSD Qualifier         MSD Qualifier         MSD Qualifier         MSD Qualifier         MSD Qualifier         MSD Qualifier         Unit MSD Qualifier	Analyte         Result Arsenic         Qualifier         Added Added Arsenic         MSD MSD Qualifier         Unit MSD MSD Qualifier         D MSD Qualifier         MSD MSD Qualifier         Unit MSD Qualifier         D MSD MSD Qualifier         MSD MSD Qualifier         MSD MSD Qualifier         MSD MSD MSD MSD Qualifier         MSD MSD MSD MSD MSD Qualifier         MSD MSD MSD MSD MSD MSD Qualifier         MSD MSD MSD MSD MSD MSD Qualifier         MSD	Analyte         Result Arsenic         Qualifier         Added Added Arsenit         MSD Qualifier         Unit Wing Park         D WRec Park           Chromium         ND         0.100         0.100         0.1007         mg/L         100           Copper         ND         0.100         0.1007         mg/L         99	Analyte         Result Arsenic         0.00293         0.100         0.100         0.1007         mg/L         100         75 - 125           Chromium         ND         0.100         0.1007         0.1007         mg/L         100         75 - 125           Copper         ND         0.100         0.1007         mg/L         100         75 - 125	Analyte         Result Arsenic         Qualifier         Added Arsenic         Result Qualifier         Qualifier Qualifier         MSD Qualifier Qualifier         Unit Qualifier Qualifier         D %Rec Limits RPD           Arsenic         0.00293         0.100         0.1045         mg/L         102         75 - 125         0           Chromium         ND         0.100         0.1007         mg/L         100         75 - 125         1           Copper         ND         0.100         0.1007         mg/L         99         75 - 125         0

Method: 7196A - Chromium, Hexavalent

Lab Sample ID: MB 490-247930/1 **Client Sample ID: Method Blank Prep Type: Total/NA** 

**Matrix: Water** 

Analysis Batch: 247930

MB MB

Analyte	Result Qualifier	RL	MDL Unit	D	Prepared	Analyzed	Dil Fac
Chromium, hex	ND	0.0100	mg/L			05/07/15 10:55	1

Lab Sample ID: LCS 490-247930/2 **Client Sample ID: Lab Control Sample Prep Type: Total/NA** 

**Matrix: Water** 

Analysis Batch: 24/930								
_	Spike	LCS	LCS				%Rec.	
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Chromium, hex	0.100	0.1020	_	ma/L		102	85 - 115	 

TestAmerica Nashville

Page 25 of 42

5/28/2015

#### QC Sample Results

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-77930-1

Client Sample ID: Biotic\_050615

**Client Sample ID: Duplicate** 

**Prep Type: Dissolved** 

#### Method: 7196A - Chromium, Hexavalent (Continued)

Lab Sample ID: 490-77930-1 MS Client Sample ID: Biotic 050615 **Matrix: Water Prep Type: Dissolved** 

Analysis Batch: 247930

Sample Sample Spike MS MS %Rec. Analyte **Result Qualifier** Added Result Qualifier Unit D %Rec Limits 0.100 85 - 115 Chromium, hex ND HF1 0.07600 F1 mg/L 68

Lab Sample ID: 490-77930-1 MSD Client Sample ID: Biotic 050615 **Matrix: Water Prep Type: Dissolved Analysis Batch: 247930** Sample Sample Spike MSD MSD %Rec. **RPD** 

Result Qualifier Added Result Qualifier Limits **RPD** Analyte Unit Limit %Rec 0.100 Chromium, hex ND HF1 0.07500 F1 mg/L 67 85 - 115

Lab Sample ID: 490-77930-1 DU **Matrix: Water** 

Lab Sample ID: 490-77315-A-4 DU

**Analysis Batch: 247930** 

Sample Sample DU DU **RPD** Result Qualifier RPD Analyte Result Qualifier Limit Unit D Chromium, hex ND HF1 ND mg/L NC 20

#### **Method: Moisture - Percent Moisture**

**Matrix: Solid** Prep Type: Total/NA **Analysis Batch: 251326** DU DU RPD Sample Sample Result Qualifier Result Qualifier Unit D RPD Limit Percent Moisture 27 27 % 20 O Percent Solids 73 73 % 0 20

TestAmerica Job ID: 490-77930-1

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

#### HPLC/IC

#### **Analysis Batch: 246697**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-77930-1	Biotic_050615	Total/NA	Water	9056	_
490-77930-3	Biotic Dup_050615	Total/NA	Water	9056	
490-77930-5	Biotic Control_050615	Total/NA	Water	9056	
490-77930-7	Abiotic_4hr_050615	Total/NA	Water	9056	
490-77930-9	Abiotic_4hr_Dup_050615	Total/NA	Water	9056	
490-77930-11	Abiotic_Control_050615	Total/NA	Water	9056	
490-77930-11 MS	Abiotic_Control_050615	Total/NA	Water	9056	
490-77930-11 MSD	Abiotic_Control_050615	Total/NA	Water	9056	
490-77930-13	Abiotic_8hr_050615	Total/NA	Water	9056	
490-77930-15	Abiotic_8hr_Dup_050615	Total/NA	Water	9056	
LCS 490-246697/7	Lab Control Sample	Total/NA	Water	9056	
LCSD 490-246697/8	Lab Control Sample Dup	Total/NA	Water	9056	
MB 490-246697/6	Method Blank	Total/NA	Water	9056	

#### **Analysis Batch: 247021**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-77930-1	Biotic_050615	Total/NA	Water	9056	<del>-</del>
490-77930-3	Biotic Dup_050615	Total/NA	Water	9056	
490-77930-5	Biotic Control_050615	Total/NA	Water	9056	
490-77930-7	Abiotic_4hr_050615	Total/NA	Water	9056	
490-77930-9	Abiotic_4hr_Dup_050615	Total/NA	Water	9056	
490-77930-11	Abiotic_Control_050615	Total/NA	Water	9056	
490-77930-13	Abiotic_8hr_050615	Total/NA	Water	9056	
490-77930-15	Abiotic_8hr_Dup_050615	Total/NA	Water	9056	
490-78075-J-4 MS	Matrix Spike	Total/NA	Water	9056	
490-78075-J-4 MSD	Matrix Spike Duplicate	Total/NA	Water	9056	
LCS 490-247021/7	Lab Control Sample	Total/NA	Water	9056	
LCSD 490-247021/8	Lab Control Sample Dup	Total/NA	Water	9056	
MB 490-247021/6	Method Blank	Total/NA	Water	9056	

#### **Metals**

#### **Prep Batch: 246589**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-77930-2	Biotic_050615	Total/NA	Solid	3051A	<u> </u>
490-77930-2 MS	Biotic_050615	Total/NA	Solid	3051A	
490-77930-2 MSD	Biotic_050615	Total/NA	Solid	3051A	
490-77930-4	Biotic Dup_050615	Total/NA	Solid	3051A	
490-77930-6	Biotic Control_050615	Total/NA	Solid	3051A	
490-77930-8	Abiotic_4hr_050615	Total/NA	Solid	3051A	
490-77930-10	Abiotic_4hr_Dup_050615	Total/NA	Solid	3051A	
490-77930-12	Abiotic_Control_050615	Total/NA	Solid	3051A	
490-77930-14	Abiotic_8hr_050615	Total/NA	Solid	3051A	
490-77930-16	Abiotic_8hr_Dup_050615	Total/NA	Solid	3051A	
LCS 490-246589/2-A	Lab Control Sample	Total/NA	Solid	3051A	
MB 490-246589/1-A	Method Blank	Total/NA	Solid	3051A	

#### **Analysis Batch: 247265**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-77930-2	Biotic_050615	Total/NA	Solid	6020	246589

TestAmerica Nashville

Page 27 of 42

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TestAmerica Job ID: 490-77930-1

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

#### Metals (Continued)

#### **Analysis Batch: 247265 (Continued)**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-77930-2 MS	Biotic_050615	Total/NA	Solid	6020	246589
490-77930-2 MSD	Biotic_050615	Total/NA	Solid	6020	246589
490-77930-4	Biotic Dup_050615	Total/NA	Solid	6020	246589
490-77930-6	Biotic Control_050615	Total/NA	Solid	6020	246589
490-77930-8	Abiotic_4hr_050615	Total/NA	Solid	6020	246589
490-77930-10	Abiotic_4hr_Dup_050615	Total/NA	Solid	6020	246589
490-77930-12	Abiotic_Control_050615	Total/NA	Solid	6020	246589
490-77930-14	Abiotic_8hr_050615	Total/NA	Solid	6020	246589
490-77930-16	Abiotic_8hr_Dup_050615	Total/NA	Solid	6020	246589
LCS 490-246589/2-A	Lab Control Sample	Total/NA	Solid	6020	246589
MB 490-246589/1-A	Method Blank	Total/NA	Solid	6020	246589

#### **Prep Batch: 247303**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-77930-1	Biotic_050615	Dissolved	Water	3005A	
490-77930-3	Biotic Dup_050615	Dissolved	Water	3005A	
490-77930-5	Biotic Control_050615	Dissolved	Water	3005A	
490-77930-7	Abiotic_4hr_050615	Dissolved	Water	3005A	
490-77930-9	Abiotic_4hr_Dup_050615	Dissolved	Water	3005A	
490-77930-13	Abiotic_8hr_050615	Dissolved	Water	3005A	
490-77930-15	Abiotic_8hr_Dup_050615	Dissolved	Water	3005A	
LCS 490-247303/2-A	Lab Control Sample	Total Recoverable	Water	3005A	
LCSD 490-247303/3-A	Lab Control Sample Dup	Total Recoverable	Water	3005A	
MB 490-247303/1-A	Method Blank	Total Recoverable	Water	3005A	

#### **Analysis Batch: 247656**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
LCS 490-247303/2-A	Lab Control Sample	Total Recoverable	Water	6020	247303
LCSD 490-247303/3-A	Lab Control Sample Dup	Total Recoverable	Water	6020	247303
MB 490-247303/1-A	Method Blank	Total Recoverable	Water	6020	247303

#### **Analysis Batch: 247865**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-77930-1	Biotic_050615	Dissolved	Water	6020	247303
490-77930-2	Biotic_050615	Total/NA	Solid	6020	246589
490-77930-2 MS	Biotic_050615	Total/NA	Solid	6020	246589
490-77930-2 MSD	Biotic_050615	Total/NA	Solid	6020	246589
490-77930-3	Biotic Dup_050615	Dissolved	Water	6020	247303
490-77930-4	Biotic Dup_050615	Total/NA	Solid	6020	246589
490-77930-5	Biotic Control_050615	Dissolved	Water	6020	247303
490-77930-7	Abiotic_4hr_050615	Dissolved	Water	6020	247303
490-77930-7	Abiotic_4hr_050615	Dissolved	Water	6020	247303
490-77930-8	Abiotic_4hr_050615	Total/NA	Solid	6020	246589
490-77930-9	Abiotic_4hr_Dup_050615	Dissolved	Water	6020	247303
490-77930-9	Abiotic_4hr_Dup_050615	Dissolved	Water	6020	247303
490-77930-10	Abiotic_4hr_Dup_050615	Total/NA	Solid	6020	246589
490-77930-13	Abiotic_8hr_050615	Dissolved	Water	6020	247303
490-77930-13	Abiotic_8hr_050615	Dissolved	Water	6020	247303
490-77930-15	Abiotic_8hr_Dup_050615	Dissolved	Water	6020	247303
490-77930-15	Abiotic_8hr_Dup_050615	Dissolved	Water	6020	247303
490-77930-16	Abiotic_8hr_Dup_050615	Total/NA	Solid	6020	246589

TestAmerica Nashville

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#### **QC Association Summary**

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-77930-1

#### Filtration Batch: 248030

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method Prep Batch
490-77930-11	Abiotic_Control_050615	Dissolved	Water	Filtration
490-78209-G-1-E MS	Matrix Spike	Dissolved	Water	Filtration
490-78209-G-1-F MSD	Matrix Spike Duplicate	Dissolved	Water	Filtration
LCS 490-248030/2-B	Lab Control Sample	Dissolved	Water	Filtration
MB 490-248030/1-B	Method Blank	Dissolved	Water	Filtration

#### Prep Batch: 248032

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-77930-11	Abiotic_Control_050615	Dissolved	Water	3005A	248030
490-78209-G-1-E MS	Matrix Spike	Dissolved	Water	3005A	248030
490-78209-G-1-F MSD	Matrix Spike Duplicate	Dissolved	Water	3005A	248030
LCS 490-248030/2-B	Lab Control Sample	Dissolved	Water	3005A	248030
MB 490-248030/1-B	Method Blank	Dissolved	Water	3005A	248030

#### **Analysis Batch: 248708**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-77930-11	Abiotic_Control_050615	Dissolved	Water	6020	248032
490-78209-G-1-E MS	Matrix Spike	Dissolved	Water	6020	248032
490-78209-G-1-F MSD	Matrix Spike Duplicate	Dissolved	Water	6020	248032
LCS 490-248030/2-B	Lab Control Sample	Dissolved	Water	6020	248032
MB 490-248030/1-B	Method Blank	Dissolved	Water	6020	248032

#### **General Chemistry**

#### Filtration Batch: 246616

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-77930-1	Biotic_050615	Dissolved	Water	Filtration	
490-77930-1 DU	Biotic_050615	Dissolved	Water	Filtration	
490-77930-1 MS	Biotic_050615	Dissolved	Water	Filtration	
490-77930-1 MSD	Biotic_050615	Dissolved	Water	Filtration	
490-77930-3	Biotic Dup_050615	Dissolved	Water	Filtration	
490-77930-5	Biotic Control_050615	Dissolved	Water	Filtration	
490-77930-7	Abiotic_4hr_050615	Dissolved	Water	Filtration	
490-77930-9	Abiotic_4hr_Dup_050615	Dissolved	Water	Filtration	
490-77930-11	Abiotic_Control_050615	Dissolved	Water	Filtration	
490-77930-13	Abiotic_8hr_050615	Dissolved	Water	Filtration	
490-77930-15	Abiotic_8hr_Dup_050615	Dissolved	Water	Filtration	

#### **Analysis Batch: 247930**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-77930-1	Biotic_050615	Dissolved	Water	7196A	246616
490-77930-1 DU	Biotic_050615	Dissolved	Water	7196A	246616
490-77930-1 MS	Biotic_050615	Dissolved	Water	7196A	246616
490-77930-1 MSD	Biotic_050615	Dissolved	Water	7196A	246616
490-77930-3	Biotic Dup_050615	Dissolved	Water	7196A	246616
490-77930-5	Biotic Control_050615	Dissolved	Water	7196A	246616
490-77930-7	Abiotic_4hr_050615	Dissolved	Water	7196A	246616
490-77930-9	Abiotic_4hr_Dup_050615	Dissolved	Water	7196A	246616
490-77930-11	Abiotic_Control_050615	Dissolved	Water	7196A	246616
490-77930-13	Abiotic_8hr_050615	Dissolved	Water	7196A	246616
490-77930-15	Abiotic_8hr_Dup_050615	Dissolved	Water	7196A	246616
LCS 490-247930/2	Lab Control Sample	Total/NA	Water	7196A	
MB 490-247930/1	Method Blank	Total/NA	Water	7196A	

Page 29 of 42

TestAmerica Nashville

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#### **QC Association Summary**

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-77930-1

#### Analysis Batch: 251326

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-77315-A-4 DU	Duplicate	Total/NA	Solid	Moisture	_
490-77930-2	Biotic_050615	Total/NA	Solid	Moisture	
490-77930-4	Biotic Dup_050615	Total/NA	Solid	Moisture	
490-77930-6	Biotic Control_050615	Total/NA	Solid	Moisture	
490-77930-8	Abiotic_4hr_050615	Total/NA	Solid	Moisture	
490-77930-10	Abiotic_4hr_Dup_050615	Total/NA	Solid	Moisture	
490-77930-12	Abiotic_Control_050615	Total/NA	Solid	Moisture	
490-77930-14	Abiotic_8hr_050615	Total/NA	Solid	Moisture	
490-77930-16	Abiotic_8hr_Dup_050615	Total/NA	Solid	Moisture	

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Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

Lab Sample ID: 490-77930-1

Lab Sample ID: 490-77930-2

05/12/15 21:38 CME

05/27/15 15:13 MAA

**Matrix: Water** 

**Matrix: Solid** 

TAL NSH

TAL NSH

Client Sample ID: Biotic 050615

Date Collected: 05/06/15 08:50 Date Received: 05/07/15 08:30

	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Analysis	9056		1	10 mL		246697	05/07/15 13:46	JHS	TAL NSH
Total/NA	Analysis	9056		5	10 mL		247021	05/08/15 18:49	JHS	TAL NSH
Dissolved	Prep	3005A			50 mL	50 mL	247303	05/11/15 11:25	TSC	TAL NSH
Dissolved	Analysis	6020		5	50 mL	50 mL	247865	05/12/15 22:39	CME	TAL NSH
Dissolved	Analysis	7196A		1	10 mL	10 mL	247930	05/07/15 10:55	BLM	TAL NSH
Dissolved	Filtration	Filtration			1.0 mL	1.0 mL	246616	05/07/15 16:38	BLM	TAL NSH

Client Sample ID: Biotic\_050615

Analysis

Analysis

6020

Moisture

Date Collected: 05/06/15 08:50

Total/NA

Total/NA

<b>Date Receive</b>	d: 05/07/15	P	ercent S	olids: 78.9						
Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.510 g	100 mL	246589	05/07/15 14:49	ZLN	TAL NSH
Total/NA	Analysis	6020		1	0.510 g	100 mL	247265	05/08/15 19:48	CME	TAL NSH
Total/NA	Prep	3051A			0.510 g	100 mL	246589	05/07/15 14:49	ZLN	TAL NSH

0.510 g

100 mL

247865

251326

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Client Sample ID: Biotic Dup\_050615

Lab Sample ID: 490-77930-3 Date Collected: 05/06/15 10:15 **Matrix: Water** Date Received: 05/07/15 08:30

	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Analysis	9056		1	10 mL		246697	05/07/15 14:26	JHS	TAL NSH
Total/NA	Analysis	9056		5	10 mL		247021	05/08/15 19:09	JHS	TAL NSH
Dissolved	Prep	3005A			50 mL	50 mL	247303	05/11/15 11:25	TSC	TAL NSH
Dissolved	Analysis	6020		5	50 mL	50 mL	247865	05/12/15 22:44	CME	TAL NSH
Dissolved	Analysis	7196A		1	10 mL	10 mL	247930	05/07/15 10:57	BLM	TAL NSH
Dissolved	Filtration	Filtration			1.0 mL	1.0 mL	246616	05/07/15 16:38	BLM	TAL NSH

Client Sample ID: Biotic Dup_050615	Lab Sample ID: 490-77930-4
Date Collected: 05/06/15 10:15	Matrix: Solid
Date Received: 05/07/15 08:30	Percent Solids: 76.9

	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.498 g	100 mL	246589	05/07/15 14:49	ZLN	TAL NSH
Total/NA	Analysis	6020		1	0.498 g	100 mL	247265	05/08/15 20:13	CME	TAL NSH
Total/NA	Prep	3051A			0.498 g	100 mL	246589	05/07/15 14:49	ZLN	TAL NSH
Total/NA	Analysis	6020		10	0.498 g	100 mL	247865	05/12/15 22:03	CME	TAL NSH
Total/NA	Analysis	Moisture		1			251326	05/27/15 15:13	MAA	TAL NSH

TestAmerica Nashville

TestAmerica Job ID: 490-77930-1

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

Client Sample ID: Biotic Control\_050615

Date Collected: 05/06/15 10:25 Date Received: 05/07/15 08:30 Lab Sample ID: 490-77930-5

. Matrix: Water

	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Analysis	9056		1	10 mL		246697	05/07/15 15:06	JHS	TAL NSH
Total/NA	Analysis	9056		1	10 mL		247021	05/08/15 19:29	JHS	TAL NSH
Dissolved	Prep	3005A			50 mL	50 mL	247303	05/11/15 11:25	TSC	TAL NSH
Dissolved	Analysis	6020		5	50 mL	50 mL	247865	05/12/15 22:49	CME	TAL NSH
Dissolved	Analysis	7196A		1	10 mL	10 mL	247930	05/07/15 10:58	BLM	TAL NSH
Dissolved	Filtration	Filtration			1.0 mL	1.0 mL	246616	05/07/15 16:38	BLM	TAL NSH

Client Sample ID: Biotic Control\_050615 Lab Sample ID: 490-77930-6

Date Collected: 05/06/15 10:25

Date Received: 05/07/15 08:30

Matrix: Solid
Percent Solids: 76.9

Γ	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.509 g	100 mL	246589	05/07/15 14:49	ZLN	TAL NSH
Total/NA	Analysis	6020		1	0.509 g	100 mL	247265	05/08/15 20:18	CME	TAL NSH
Total/NA	Analysis	Moisture		1			251326	05/27/15 15:13	MAA	TAL NSH

Client Sample ID: Abiotic\_4hr\_050615 Lab Sample ID: 490-77930-7

Date Collected: 05/06/15 11:40
Date Received: 05/07/15 08:30

	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Analysis	9056		1	10 mL		246697	05/07/15 15:26	JHS	TAL NSH
Total/NA	Analysis	9056		10	10 mL		247021	05/08/15 20:29	JHS	TAL NSH
Dissolved	Prep	3005A			50 mL	50 mL	247303	05/11/15 11:25	TSC	TAL NSH
Dissolved	Analysis	6020		100	50 mL	50 mL	247865	05/12/15 22:54	CME	TAL NSH
Dissolved	Prep	3005A			50 mL	50 mL	247303	05/11/15 11:25	TSC	TAL NSH
Dissolved	Analysis	6020		10	50 mL	50 mL	247865	05/12/15 23:56	CME	TAL NSH
Dissolved	Analysis	7196A		1	10 mL	10 mL	247930	05/07/15 11:00	BLM	TAL NSH
Dissolved	Filtration	Filtration			1.0 mL	1.0 mL	246616	05/07/15 16:38	BLM	TAL NSH

Client Sample ID: Abiotic\_4hr\_050615 Lab Sample ID: 490-77930-8

Date Collected: 05/06/15 11:40

Date Received: 05/07/15 08:30

Matrix: Solid
Percent Solids: 75.7

	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.518 g	100 mL	246589	05/07/15 14:49	ZLN	TAL NSH
Total/NA	Analysis	6020		1	0.518 g	100 mL	247265	05/08/15 20:49	CME	TAL NSH
Total/NA	Prep	3051A			0.518 g	100 mL	246589	05/07/15 14:49	ZLN	TAL NSH
Total/NA	Analysis	6020		10	0.518 g	100 mL	247865	05/12/15 22:13	CME	TAL NSH
Total/NA	Analysis	Moisture		1			251326	05/27/15 15:13	MAA	TAL NSH

TestAmerica Nashville

Page 32 of 42

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190-77930-8 Matrix: Solid

**Matrix: Water** 

Lab Sample ID: 490-77930-10

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

Client Sample ID: Abiotic\_4hr\_Dup\_050615

Lab Sample ID: 490-77930-9 Date Collected: 05/06/15 12:05 **Matrix: Water** 

Date Received: 05/07/15 08:30

_	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Analysis	9056		1	10 mL		246697	05/07/15 16:06	JHS	TAL NSH
Total/NA	Analysis	9056		10	10 mL		247021	05/08/15 20:49	JHS	TAL NSH
Dissolved	Prep	3005A			50 mL	50 mL	247303	05/11/15 11:25	TSC	TAL NSH
Dissolved	Analysis	6020		100	50 mL	50 mL	247865	05/12/15 22:59	CME	TAL NSH
Dissolved	Prep	3005A			50 mL	50 mL	247303	05/11/15 11:25	TSC	TAL NSH
Dissolved	Analysis	6020		10	50 mL	50 mL	247865	05/13/15 00:01	CME	TAL NSH
Dissolved	Analysis	7196A		1	10 mL	10 mL	247930	05/07/15 11:03	BLM	TAL NSH
Dissolved	Filtration	Filtration			1.0 mL	1.0 mL	246616	05/07/15 16:38	BLM	TAL NSH

Client Sample ID: Abiotic 4hr Dup 050615

Date Collected: 05/06/15 12:05

**Matrix: Solid** Date Received: 05/07/15 08:30 Percent Solids: 76.6

	Batch	Batch		ווט	initiai	Finai	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.503 g	100 mL	246589	05/07/15 14:49	ZLN	TAL NSH
Total/NA	Analysis	6020		1	0.503 g	100 mL	247265	05/08/15 20:54	CME	TAL NSH
Total/NA	Prep	3051A			0.503 g	100 mL	246589	05/07/15 14:49	ZLN	TAL NSH
Total/NA	Analysis	6020		10	0.503 g	100 mL	247865	05/12/15 22:19	CME	TAL NSH
Total/NA	Analysis	Moisture		1			251326	05/27/15 15:13	MAA	TAL NSH

Client Sample ID: Abiotic\_Control\_050615

Lab Sample ID: 490-77930-11 Date Collected: 05/06/15 12:00 **Matrix: Water** 

Date Received: 05/07/15 08:30

_	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Analysis	9056		1	10 mL		246697	05/07/15 16:46	JHS	TAL NSH
Total/NA	Analysis	9056		1	10 mL		247021	05/08/15 21:09	JHS	TAL NSH
Dissolved	Prep	3005A			25 mL	25 mL	248032	05/13/15 14:44	TSC	TAL NSH
Dissolved	Filtration	Filtration			25 mL	25 mL	248030	05/13/15 14:44	TSC	TAL NSH
Dissolved	Analysis	6020		5	25 mL	25 mL	248708	05/15/15 14:29	CME	TAL NSH
Dissolved	Analysis	7196A		1	10 mL	10 mL	247930	05/07/15 11:05	BLM	TAL NSH
Dissolved	Filtration	Filtration			1.0 mL	1.0 mL	246616	05/07/15 16:38	BLM	TAL NSH

Client Sample ID: Abiotic\_Control\_050615 Lab Sample ID: 490-77930-12

Date Collected: 05/06/15 12:00

Date Received: 05/07/15 08:30 Percent Solids: 77.5

	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.514 g	100 mL	246589	05/07/15 14:49	ZLN	TAL NSH
Total/NA	Analysis	6020		1	0.514 g	100 mL	247265	05/08/15 20:24	CME	TAL NSH
Total/NA	Analysis	Moisture		1			251326	05/27/15 15:13	MAA	TAL NSH

TestAmerica Nashville

Page 33 of 42

**Matrix: Solid** 

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

Lab Sample ID: 490-77930-13

Lab Sample ID: 490-77930-14

Lab Sample ID: 490-77930-15

**Matrix: Water** 

Client Sample ID: Abiotic\_8hr\_050615 Date Collected: 05/06/15 15:30

Date Received: 05/07/15 08:30

	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Analysis	9056		1	10 mL		246697	05/07/15 18:27	JHS	TAL NSH
Total/NA	Analysis	9056		10	10 mL		247021	05/08/15 21:29	JHS	TAL NSH
Dissolved	Prep	3005A			50 mL	50 mL	247303	05/11/15 11:25	TSC	TAL NSH
Dissolved	Analysis	6020		100	50 mL	50 mL	247865	05/12/15 23:05	CME	TAL NSH
Dissolved	Prep	3005A			50 mL	50 mL	247303	05/11/15 11:25	TSC	TAL NSH
Dissolved	Analysis	6020		10	50 mL	50 mL	247865	05/13/15 00:06	CME	TAL NSH
Dissolved	Analysis	7196A		1	10 mL	10 mL	247930	05/07/15 11:06	BLM	TAL NSH
Dissolved	Filtration	Filtration			1.0 mL	1.0 mL	246616	05/07/15 16:38	BLM	TAL NSH

Client Sample ID: Abiotic\_8hr\_050615

Date Collected: 05/06/15 15:30

Date Received: 05/07/15 08:30

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.524 g	100 mL	246589	05/07/15 14:49		TAL NSH
Total/NA	Analysis	6020		1	0.524 g	100 mL	247265	05/08/15 20:39	CME	TAL NSH
Total/NA	Analysis	Moisture		1			251326	05/27/15 15:13	MAA	TAL NSH

Client Sample ID: Abiotic\_8hr\_Dup\_050615

Date Collected: 05/06/15 15:35 Date Received: 05/07/15 08:30

	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Analysis	9056		1	10 mL		246697	05/07/15 19:07	JHS	TAL NSH
Total/NA	Analysis	9056		10	10 mL		247021	05/08/15 21:49	JHS	TAL NSH
Dissolved	Prep	3005A			50 mL	50 mL	247303	05/11/15 11:25	TSC	TAL NSH
Dissolved	Analysis	6020		100	50 mL	50 mL	247865	05/12/15 23:10	CME	TAL NSH
Dissolved	Prep	3005A			50 mL	50 mL	247303	05/11/15 11:25	TSC	TAL NSH
Dissolved	Analysis	6020		10	50 mL	50 mL	247865	05/13/15 00:11	CME	TAL NSH
Dissolved	Analysis	7196A		1	10 mL	10 mL	247930	05/07/15 11:08	BLM	TAL NSH
Dissolved	Filtration	Filtration			1.0 mL	1.0 mL	246616	05/07/15 16:38	BLM	TAL NSH

<b>Date Receive</b>	Date Received: 05/07/15 08:30					Percent Solids: 68.				
Date Collecte	ed: 05/06/15 <sup>*</sup>	15:35						N	/latrix: Solid	
<b>Client Sam</b>	ple ID: Abi	iotic_8hr_Dup_(	050615			La	ab Sample II	D: 490	-77930-16	
Bioconvou	rittation	· maddii			1.0 1112	210010	00/01/10 10:00	DE.W.	17.12.11011	
Dissolved	Filtration	Filtration		1.0 mL	1.0 mL	246616	05/07/15 16:38	BI M	TAL NSH	
Dissolved	Analysis	7196A	1	10 mL	10 mL	247930	05/07/15 11:08	BLM	TAL NSH	
Dissolved	Analysis	6020	10	50 mL	50 mL	247865	05/13/15 00:11	CME	TAL NSH	

	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Туре	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.508 g	100 mL	246589	05/07/15 14:49	ZLN	TAL NSH
Total/NA	Analysis	6020		1	0.508 g	100 mL	247265	05/08/15 20:44	CME	TAL NSH
Total/NA	Prep	3051A			0.508 g	100 mL	246589	05/07/15 14:49	ZLN	TAL NSH
Total/NA	Analysis	6020		10	0.508 g	100 mL	247865	05/12/15 22:08	CME	TAL NSH
Total/NA	Analysis	Moisture		1			251326	05/27/15 15:13	MAA	TAL NSH

TestAmerica Nashville

Page 34 of 42

**Matrix: Solid** 

**Matrix: Water** 

Percent Solids: 77.9

#### **Lab Chronicle**

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-77930-1

#### **Laboratory References:**

TAL NSH = TestAmerica Nashville, 2960 Foster Creighton Drive, Nashville, TN 37204, TEL (615)726-0177

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#### **Method Summary**

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-77930-1

Method	Method Description	Protocol	Laboratory
9056	Anions, Ion Chromatography	SW846	TAL NSH
6020	Metals (ICP/MS)	SW846	TAL NSH
7196A	Chromium, Hexavalent	SW846	TAL NSH
Moisture	Percent Moisture	EPA	TAL NSH

#### **Protocol References:**

EPA = US Environmental Protection Agency

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

#### Laboratory References:

TAL NSH = TestAmerica Nashville, 2960 Foster Creighton Drive, Nashville, TN 37204, TEL (615)726-0177

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#### **Certification Summary**

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-77930-1

#### Laboratory: TestAmerica Nashville

All certifications held by this laboratory are listed. Not all certifications are applicable to this report.

Authority	Program	EPA Region	Certification ID	Expiration Date
A2LA	A2LA		NA: NELAP & A2LA	12-31-15
A2LA	ISO/IEC 17025		0453.07	12-31-15
Alaska (UST)	State Program	10	UST-087	10-31-15
Arizona	State Program	9	AZ0473	05-05-16
Arkansas DEQ	State Program	6	88-0737	04-25-16
California	State Program	9	2938	10-31-16
Connecticut	State Program	1	PH-0220	12-31-15
Florida	NELAP	4	E87358	06-30-15
Illinois	NELAP	5	200010	12-09-15
lowa	State Program	7	131	04-01-16
Kansas	NELAP	7	E-10229	05-31-15
Kentucky (UST)	State Program	4	19	06-30-15
Kentucky (WW)	State Program	4	90038	12-31-15
Louisiana	NELAP	6	30613	06-30-15
Maryland	State Program	3	316	03-31-16
Massachusetts	State Program	1	M-TN032	06-30-15
Minnesota	NELAP	5	047-999-345	12-31-15
Mississippi	State Program	4	N/A	06-30-15
Montana (UST)	State Program	8	NA	02-24-20
Nevada	State Program	9	TN00032	07-31-15
New Hampshire	NELAP	1	2963	10-09-15
New Jersey	NELAP	2	TN965	06-30-15
New York	NELAP	2	11342	03-31-16
North Carolina (WW/SW)	State Program	4	387	12-31-15
North Dakota	State Program	8	R-146	06-30-15
Ohio VAP	State Program	5	CL0033	10-16-15
Oklahoma	State Program	6	9412	08-31-15
Oregon	NELAP	10	TN200001	04-27-16
Pennsylvania	NELAP	3	68-00585	06-30-15
Rhode Island	State Program	1	LAO00268	12-30-15
South Carolina	State Program	4	84009 (001)	02-28-16
South Carolina (DW)	State Program	4	84009 (002)	12-16-17
Tennessee	State Program	4	2008	02-23-17
Texas	NELAP	6	T104704077	08-31-15
USDA	Federal	·	S-48469	10-30-16
Jtah	NELAP	8	TN00032	07-31-15
Virginia	NELAP	3	460152	06-14-15
Washington	State Program	10	C789	07-19-15
West Virginia DEP	State Program	3	219	02-28-16
Wisconsin	State Program	5	998020430	08-31-15
Wyoming (UST)	A2LA	8	453.07	12-31-15

TestAmerica Nashville





#### **COOLER RECEIPT FORM**

490-77930	Chain of	Custod

Cooler Received/Opened On 5/7/2015 @ 8:30	
1. Tracking #(last 4 digits, FedEx)	
Courier: FedEx IR Gun ID 17610176	
2. Temperature of rep. sample or temp blank when opened: \_\mathcal{O}Degrees Celsius	
3. If Item #2 temperature is $0^{\circ}$ C or less, was the representative sample or temp blank frozen?	YES NO
4. Were custody seals on outside of cooler?	ESNONA
If yes, how many and where:	
5. Were the seals intact, signed, and dated correctly?	(YES NONA
6. Were custody papers inside cooler?	ESNONA
I certify that I opened the cooler and answered questions 1-6 (intial)	
7. Were custody seals on containers: YES 🔞 and Intact	YESNO.
Were these signed and dated correctly?	YESNO. (NA)
8. Packing mat'l used? Bubblewrap Plastic bag Peanuts Vermiculite Foam Insert Paper	Other None
9. Cooling process: (dee lce-pack lce (direct contact) Dry ice	Other None
10. Did all containers arrive in good condition (unbroken)?	ÆSNONA
11. Were all container labels complete (#, date, signed, pres., etc)?	ES)NONA
12. Did all container labels and tags agree with custody papers?	(ESNONA
13a. Were VOA vials received?	YES, NONA
b. Was there any observable headspace present in any VOA vial?	YESNO.
14. Was there a Trip Blank in this cooler? YESNO.(.NA) If multiple coolers, sequence	ce #
certify that I unloaded the cooler and answered questions 7-14 (intial)	MDM
15a. On pres'd bottles, did pH test strips suggest preservation reached the correct pH level?	YESNO.ANA
b. Did the bottle labels indicate that the correct preservatives were used	ESNONA
16. Was residual chlorine present?	YESNO:(A)
certify that I checked for chlorine and pH as per SOP and answered questions 15-16 (intial)	Mom
17. Were custody papers properly filled out (ink, signed, etc)?	(ES)NONA
18. Did you sign the custody papers in the appropriate place?	ESNONA
19. Were correct containers used for the analysis requested?	ESNONA
20. Was sufficient amount of sample sent in each container?	25. NONA
certify that I entered this project into LIMS and answered questions 17-20 (intial)	man
certify that I attached a label with the unique LIMS number to each container (intial)	wow.
21. Were there Non-Conformance issues at login? (ES) (Was a NCM generated?)	6.#

TestAmerica Nashville 2960 Foster Creighton Drive Nashville, TN 37204 Phone (615) 726-0177 Fax (615) 726-3404	Chain of Custody Record	dy Record	Loc: 490 <b>77930</b>	Testamenco
Client Information	Sampler:	Lab PM: Baker, Heather	Carri	COC No: 490-36874-12511.1
Client Contact Amar Wadhawan	Phone: 865-330 -0037	E-Mail: heather.baker@testamericainc.com		Page 4-647 1 0+ 3
Company: Geosyntec Consultants, Inc.		Analysis Requested	uested	Job #:
Address:	Due Date Requested:		79	Broconvation Codes:

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Custody Seals Infact: Custody Seal No.:  ∆ Yes ∆ No	Relinquished by:	reinquismed by:	Relinquished by:	Empty Kit Relinquished by:	Deliverable Requested: I, II, III, IV, Other (specity)	tant 🗌	Abjetic - 8 HR Dub - 0506()	Abjetic-8HQ-Dup-05 6615	-8HR-05	- SH2		Abjetic control oxobis	Abjetic - Control 050615	Apietic - 440 - Dup -050615	Abietic-AIR-DAT-OTOBUS	Abiotic-4HR- DWD 050615	Abjotic-4HR-050615		Sample Identification		Site:	Project Name: Treatability Study	Email: awadhawan@geosyntec.com	Phone:	State, Zip: MD, 21046	City: Columbia	Address: 10220 Old Columbia Road Suite A	Company: Geosyntec Consultants, Inc.	Client Contact Amar Wadhawan	Client Information	TestAmerica Nashville 2960 Foster Creighton Drive Nashville, TN 37204 Phone (615) 726-0177 Fax (615) 726-3404
	Date/Time:	Date/IIme:	01/06/15			Poison B	4	_				-					05/06/15		Sample Date	)	SSOW#:	Project #: 49008518	WO#	ase		TAT Requested (days):	Due Date Requested:		Phone:	Sampler: Link	
				Date:		Unknown 🗀	157	1735	e	  -	1230	700	1200	•	+	705	15/10	\(\frac{1}{2}\)	X IIIIe	<b>(</b> 0				Order Requested		ed (days):	uested:		865-330	no chen	Chair
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Cop	Rec		Rec	Time:	Specia			<u> </u>	Z	Z - X	X	Z	×	2	Z	7	Z		X	(e)d Filtered eriorin MS/N 056 - Nitrate, S	169 n		6 Or NO	loj .					E-Mail: heather.baker@testamericainc.com	Lab PM: Baker, Heather	lecord
Cooler Temperature(s) °C and Other Remarks:	Received by:	Received by:	eived by	<b>)</b>	Special Instructions/QC Requirements:	Return To Cli	Disposal	×	×		×	×	×	×		×	×	200	6	196A - Hexava 020 - As, Cr, C		hromi	ım						testameric		
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#### **Login Sample Receipt Checklist**

Client: Geosyntec Consultants, Inc.

Job Number: 490-77930-1

Login Number: 77930 List Source: TestAmerica Nashville

List Number: 1

Creator: McBride, Mike

oreator. McDride, Mine		
Question	Answer	Comment
Radioactivity wasn't checked or is = background as measured by a survey meter.</td <td>True</td> <td></td>	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	1.0
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	False	Limited volume received.
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

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THE LEADER IN ENVIRONMENTAL TESTING

## **ANALYTICAL REPORT**

TestAmerica Laboratories, Inc.

TestAmerica Nashville 2960 Foster Creighton Drive Nashville, TN 37204 Tel: (615)726-0177

TestAmerica Job ID: 490-78056-1 Client Project/Site: Treatability Study

#### For:

Geosyntec Consultants, Inc. 10220 Old Columbia Road Suite A Columbia, Maryland 21046

Attn: Amar Wadhawan

# Heather Baker

Authorized for release by: 5/28/2015 2:53:35 PM

Heather Baker, Project Manager I (615)301-5043

heather.baker@testamericainc.com

·····LINKS ·······

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Total Access

**Have a Question?** 



Visit us at: www.testamericainc.com

The test results in this report meet all 2003 NELAC and 2009 TNI requirements for accredited parameters, exceptions are noted in this report. This report may not be reproduced except in full, and with written approval from the laboratory. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

# **Table of Contents**

Cover Page	1
Table of Contents	2
Sample Summary	3
Case Narrative	
Definitions	5
Client Sample Results	6
QC Sample Results	10
QC Association	14
Chronicle	16
Method Summary	17
Certification Summary	18
Chain of Custody	19
Pacaint Chacklists	21

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#### **Sample Summary**

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-78056-1

Lab Sample ID	Client Sample ID	Matrix	Collected Received
490-78056-1	Abiotic_24HR_05072015	Water	05/07/15 08:00 05/08/15 09:00
490-78056-2	Abiotic_24HR_05072015	Solid	05/07/15 08:00 05/08/15 09:00
490-78056-3	Abiotic_24HR_DUP_05072015	Water	05/07/15 08:05 05/08/15 09:00
490-78056-4	Abiotic_24HR_DUP_05072015	Solid	05/07/15 08:05 05/08/15 09:00

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### **Case Narrative**

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-78056-1

Job ID: 490-78056-1

Laboratory: TestAmerica Nashville

Narrative

Job Narrative 490-78056-1

### Comments

No additional comments.

### Receipt

The samples were received on 5/8/2015 9:00 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 1.5° C.

Except:

Method 7196A: The following samples were received outside of holding time: Abiotic\_24HR\_05072015 (490-78056-1) and Abiotic\_24HR\_DUP\_05072015 (490-78056-3).

### HPLC/IC

No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

#### Metals

Method 6020: Insufficient sample volume was available to perform a matrix spike/matrix spike duplicate (MS/MSD) associated with batch 247303.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

### Field Service / Mobile Lab

No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

### **General Chemistry**

No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

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## **Definitions/Glossary**

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-78056-1

## **Qualifiers**

### **HPLC/IC**

Qualifier	Qualifier Description
4	MS, MSD: The analyte present in the original sample is greater than 4 times the matrix spike concentration; therefore, control limits are not
	applicable.
E	Result exceeded calibration range.

### **Metals**

Qualifier	Qualifier Description
4	MS, MSD: The analyte present in the original sample is greater than 4 times the matrix spike concentration; therefore, control limits are not
	applicable.
F1	MS and/or MSD Recovery is outside acceptance limits.

### **General Chemistry**

Qualifier	Qualifier Description
Н	Sample was prepped or analyzed beyond the specified holding time

## Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains no Free Liquid
DER	Duplicate error ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision level concentration
MDA	Minimum detectable activity
EDL	Estimated Detection Limit

MDA	Minimum detectable activity
EDL	Estimated Detection Limit
MDC	Minimum detectable concentration
MDL	Method Detection Limit
	Minimum I amel (Discript)

MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated

ND Not detected at the reporting limit (or M	OL or EDL if shown)
--	---------------------

PQL Practical Quantitation Limit	PQL	Practical Quantitation Limit
----------------------------------	-----	------------------------------

QC	Quality Control
RER	Relative error ratio

RI	Reporting Limit or Requested Limit	(Radiochemistry)
NL .	Reporting Limit of Requested Limit	(Naulochiellistry)

TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Page 5 of 21

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-78056-1

Lab Sample ID: 490-78056-1

Analyzed

05/08/15 15:31

Prepared

Client Sample ID: Abiotic\_24HR\_05072015

Date Collected: 05/07/15 08:00

Result Qualifier

ND H

**Matrix: Water** 

Date Received: 05/08/15 09:00

Analyte

Chromium, hex

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Nitrate as N	1.62		0.100		mg/L			05/08/15 15:48	1
Sulfate	3070		10.0		mg/L			05/09/15 15:24	10
- Method: 6020 - Metals	s (ICP/MS) - Dissolve	ed							
	•			ME	Unit		Duamanad	A	Dil Foo
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	0.210	Qualitier	0.0200 —	MDL	mg/L	— –		05/13/15 00:16	10
		Qualifier		MIDL		— –	05/11/15 11:25		
Arsenic	0.210	Qualifier	0.0200	MIDL	mg/L		05/11/15 11:25 05/11/15 11:25	05/13/15 00:16	10

RL

0.0100

MDL Unit

mg/L

10

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Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-78056-1

Client Sample ID: Abiotic\_24HR\_05072015 Lab Sample ID: 490-78056-2

Date Collected: 05/07/15 08:00 Matrix: Solid

Date Received: 05/08/15 09:00 Percent Solids: 79.6

Method: 6020 - Metals (ICP)	/MS)							
Analyte	Result Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	344	3.12		mg/Kg	₩	05/12/15 13:51	05/13/15 01:33	5
Chromium	62.5	3.12		mg/Kg	₩	05/12/15 13:51	05/13/15 01:33	5
Copper	634	3.12		mg/Kg	≎	05/12/15 13:51	05/13/15 01:33	5
Iron	3960	31.2		mg/Kg	☆	05/12/15 13:51	05/13/15 01:33	5
- General Chemistry								
Analyte	Result Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Moisture	20	0.10		%			05/27/15 15:13	1
Percent Solids	80	0.10		%			05/27/15 15:13	1

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

Client Sample ID: Abiotic\_24HR\_DUP\_05072015

TestAmerica Job ID: 490-78056-1

Lab Sample ID: 490-78056-3

Matrix: Water

Date Collected: 05/07/15 08:05 Date Received: 05/08/15 09:00

Method: 9056 - Anions, Ion Analyte	Result Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Nitrate as N	1.73	0.100	i	mg/L		-	05/08/15 16:28	1
Sulfate	3240	10.0	1	mg/L			05/09/15 15:44	10

Sulfate	3240	10.0	mg/L			05/09/15 15:44	10
Method: 6020 - Metals (IC	•	D.	MDI II		Dunnanad	Anahmad	Dil 5
Analyte	Result Qualifier	RL	MDL Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND ND	0.0200	mg/L		05/11/15 11:25	05/13/15 00:21	10
Chromium	ND	0.0200	mg/L		05/11/15 11:25	05/13/15 00:21	10
Copper	ND	0.0200	mg/L		05/11/15 11:25	05/13/15 00:21	10
Iron	921	2.50	mg/L		05/11/15 11:25	05/12/15 23:20	100
_ 							

_									
General Chemistry - Dissolved									
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium, hex	ND	H	0.0100		mg/L			05/08/15 15:33	1

TestAmerica Nashville

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

Date Collected: 05/07/15 08:05 Date Received: 05/08/15 09:00

Client Sample ID: Abiotic\_24HR\_DUP\_05072015

TestAmerica Job ID: 490-78056-1

Lab Sample ID: 490-78056-4

Matrix	: Solid
Percent Solid	s: 78.0

Method: 6020 - Metals (ICP Analyte	/MS) Result Q	Jualifior	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	<del>786</del>		3.22	IVIDE	mg/Kg	— <del>=</del>	05/12/15 13:51	05/13/15 01:38	5
Chromium	574		3.22		mg/Kg	₩	05/12/15 13:51		5
Copper	747		3.22		mg/Kg	₩	05/12/15 13:51	05/13/15 01:38	5
Iron	4070		32.2		mg/Kg	₽	05/12/15 13:51	05/13/15 01:38	5
General Chemistry									
Analyte	Result Q	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Moisture	22		0.10		%			05/27/15 15:13	1
Percent Solids	78		0.10		%			05/27/15 15:13	1

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

Method: 9056 - Anions, Ion Chromatography

Lab Sample ID: MB 490-247022/6 Client Sample ID: Method Blank Prep Type: Total/NA **Matrix: Water** 

**Analysis Batch: 247022** 

MB MB

Analyte Result Qualifier RL **MDL** Unit Analyzed Dil Fac Prepared 0.100 05/08/15 14:03 Nitrate as N ND mg/L

Lab Sample ID: LCS 490-247022/7 Client Sample ID: Lab Control Sample **Matrix: Water** Prep Type: Total/NA

**Analysis Batch: 247022** 

Spike LCS LCS %Rec. Added Limits Analyte Result Qualifier Unit %Rec Nitrate as N 10.0 10.25 mg/L 102 80 - 120

Lab Sample ID: LCSD 490-247022/8 Client Sample ID: Lab Control Sample Dup **Matrix: Water** Prep Type: Total/NA

**Analysis Batch: 247022** 

Spike LCSD LCSD %Rec. **RPD** Result Qualifier Added Limits RPD Limit Analyte Unit D %Rec Nitrate as N 10.0 10.20 mg/L 102 80 - 120

Lab Sample ID: 490-78075-J-4 MS **Client Sample ID: Matrix Spike** Prep Type: Total/NA

**Matrix: Water** 

**Analysis Batch: 247022** 

Sample Sample Spike MS MS %Rec. Analyte Result Qualifier Added Result Qualifier Unit %Rec Limits Nitrate as N ND 10.0 9.970 100 80 - 120 mg/L

Lab Sample ID: 490-78075-J-4 MSD Client Sample ID: Matrix Spike Duplicate Prep Type: Total/NA

**Matrix: Water** 

**Analysis Batch: 247022** 

Spike MSD MSD %Rec. RPD Sample Sample Analyte Result Qualifier Added Result Qualifier Unit D %Rec Limits RPD Limit Nitrate as N ND 10.0 9.989 mg/L 100 80 - 120

Lab Sample ID: MB 490-247094/6 **Client Sample ID: Method Blank** Prep Type: Total/NA

**Matrix: Water** 

Analysis Batch: 247094

MB MB Result Qualifier RL MDL Unit Prepared Analyte D Analyzed Dil Fac 1 00 Sulfate mg/L 05/09/15 11:32 ND

Lab Sample ID: LCS 490-247094/7 Client Sample ID: Lab Control Sample Prep Type: Total/NA

**Matrix: Water** 

Analysis Batch: 247094

Spike LCS LCS %Rec. Added **Analyte** Result Qualifier Unit %Rec Limits Sulfate 100 108.4 108 80 - 120

Lab Sample ID: LCSD 490-247094/8 Client Sample ID: Lab Control Sample Dup **Matrix: Water** Prep Type: Total/NA

**Analysis Batch: 247094** 

LCSD LCSD RPD Spike %Rec. Added Limits Analyte Result Qualifier Unit D %Rec RPD Limit Sulfate 100 106.7 107 80 - 120 mg/L

TestAmerica Nashville

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-78056-1

**Client Sample ID: Matrix Spike** 

**Client Sample ID: Method Blank** 

**Client Sample ID: Lab Control Sample** 

80 - 120

106

**Client Sample ID: Matrix Spike Duplicate** 

**Prep Type: Total/NA** 

Prep Type: Total/NA

Lab Sample ID: 490-78158-A-1 MS

**Matrix: Water** 

**Analysis Batch: 247094** 

Sample Sample Spike MS MS %Rec. Analyte Result Qualifier Added Result Qualifier Unit %Rec Limits Sulfate 2290 E 100 1965 E 4 80 - 120 mg/L -330

Lab Sample ID: 490-78158-A-1 MSD

**Matrix: Water** 

**Analysis Batch: 247094** 

**RPD** Sample Sample Spike MSD MSD %Rec. Result Qualifier Added Result Qualifier Limits RPD Limit Analyte Unit D %Rec 2290 E 1984 E 4 Sulfate 100 mg/L -311 80 - 120

Method: 6020 - Metals (ICP/MS)

Lab Sample ID: MB 490-247657/1-A

**Matrix: Solid** 

**Prep Type: Total/NA** Analysis Batch: 247865 Prep Batch: 247657 MB MB

**MDL** Unit Prepared Analyte Result Qualifier RL Analyzed Dil Fac Arsenic  $\overline{\mathsf{ND}}$ 0.500 05/12/15 13:51 05/13/15 00:52 mg/Kg Chromium ND 0.500 mg/Kg 05/12/15 13:51 05/13/15 00:52 ND 0.500 mg/Kg 05/12/15 13:51 05/13/15 00:52 Copper ND 05/12/15 13:51 05/13/15 00:52 Iron 5.00 mg/Kg

Lab Sample ID: LCS 490-247657/2-A

**Matrix: Solid** 

Analysis Batch: 247865 Prep Batch: 247657 Spike LCS LCS %Rec. Analyte Added Result Qualifier Unit D %Rec Limits 19.5 Arsenic 18.21 mg/Kg 93 80 - 120 Chromium 19.5 19.71 mg/Kg 101 80 - 120 Copper 19.5 19.57 mg/Kg 100 80 - 120

195

Lab Sample ID: 490-78158-A-2-B MS

Iron

**Matrix: Solid** Prep Type: Total/NA **Analysis Batch: 247865** Prep Batch: 247657

205.7

mg/Kg

	Sample	Sample	Spike	MS	MS				%Rec.	
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Arsenic	334		25.2	443.8	4	mg/Kg	<u>₩</u>	436	75 - 125	
Chromium	62.2	F1	25.2	104.1	F1	mg/Kg	☼	167	75 - 125	
Copper	403		25.2	717.3	4	mg/Kg	☼	1251	75 - 125	
Iron	3550		252	4718	4	ma/Ka	₩.	466	75 - 125	

Lab Sample ID: 490-78158-A-2-C MSD

Matrix: Solid Analysis Batch: 247865									Prep Typ		
	Sample	Sample	Spike	MSD	MSD				%Rec.		RPD
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	RPD	Limit
Arsenic	334		25.7	456.9	4	mg/Kg	₩	478	75 - 125	3	20
Chromium	62.2	F1	25.7	110.9	F1	mg/Kg	₩	190	75 - 125	6	20
Copper	403		25.7	634.9	4	mg/Kg	₩	905	75 - 125	12	20
Iron	3550		257	4473	4	mg/Kg	₩.	361	75 <sub>-</sub> 125	5	20

TestAmerica Nashville

5/28/2015

Page 11 of 21

Client Sample ID: Matrix Spike

Prep Type: Total/NA

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

## Method: 6020 - Metals (ICP/MS) (Continued)

Lab Sample ID: MB 490-247303/1-A Client Sample ID: Method Blank **Matrix: Water Prep Type: Total Recoverable Analysis Batch: 247656 Prep Batch: 247303** 

MB MB Analyte Result Qualifier RL **MDL** Unit D Prepared Analyzed Dil Fac Arsenic  $\overline{\mathsf{ND}}$ 0.00200 mg/L 05/11/15 11:25 05/12/15 10:47 ND Chromium 0.00200 mg/L 05/11/15 11:25 05/12/15 10:47 ND Copper 0.00200 mg/L 05/11/15 11:25 05/12/15 10:47 ND 0.0250 05/11/15 11:25 05/12/15 10:47 Iron mg/L

Lab Sample ID: LCS 490-247303/2-A **Client Sample ID: Lab Control Sample Matrix: Water Prep Type: Total Recoverable** Analysis Batch: 247656 **Prep Batch: 247303** Spike LCS LCS %Rec. Analyte Added Result Qualifier Unit D %Rec Limits Arsenic 0.100 0.1065 mg/L 107 80 - 120 0.100 Chromium 0.1078 mg/L 108 80 - 120 0.100 0.1019 mg/L 102 80 - 120 Copper 1.00 1.015 mg/L 102 80 - 120 Iron

Lab Sample ID: LCSD 490-247303/3-A Client Sample ID: Lab Control Sample Dup **Matrix: Water Prep Type: Total Recoverable Analysis Batch: 247656** Prep Batch: 247303 Spike LCSD LCSD %Rec. **RPD** Unit Analyte Added Result Qualifier Limits RPD Limit D %Rec Arsenic 0.100 0.1052 mg/L 105 80 - 120 20 Chromium 0.100 0.1064 106 80 - 120 20 mg/L Copper 0.100 0.1000 mg/L 100 80 - 120 20 Iron 1.00 1.023 102 80 - 120 20 mg/L

### Method: 7196A - Chromium, Hexavalent

Lab Sample ID: MB 490-247899/1 Client Sample ID: Method Blank **Matrix: Water** Prep Type: Total/NA

**Analysis Batch: 247899** 

MB MB Analyte Result Qualifier RL MDL Unit D Prepared Analyzed Dil Fac Chromium, hex  $\overline{\mathsf{ND}}$ 0.0100 mg/L 05/08/15 11:20

Lab Sample ID: LCS 490-247899/2 **Client Sample ID: Lab Control Sample Matrix: Water** Prep Type: Total/NA

**Analysis Batch: 247899** 

Spike LCS LCS %Rec. Added Result Qualifier Analyte Unit D %Rec Limits Chromium, hex 0.100 0.1070 107 85 - 115 mg/L

Lab Sample ID: 490-78056-1 MS Client Sample ID: Abiotic 24HR 05072015 **Matrix: Water Prep Type: Dissolved** 

**Analysis Batch: 247899** 

Sample Sample Spike MS MS %Rec. Analyte Result Qualifier Added Result Qualifier Unit D %Rec Limits Chromium, hex ND H 0.100 0.09900 mg/L 90 85 - 115

5/28/2015

Page 12 of 21

## **QC Sample Results**

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-78056-1

### Method: 7196A - Chromium, Hexavalent (Continued)

Lab Sample ID: 490-78056-1 MSD Client Sample ID: Abiotic\_24HR\_05072015 **Matrix: Water Prep Type: Dissolved** 

Analysis Batch: 247899

	Sample	Sample	Spike	MSD	MSD				%Rec.		RPD	
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	RPD	Limit	
Chromium, hex	ND	H	0.100	0.09900		mg/L		90	85 - 115	0	20	

Lab Sample ID: 490-78056-1 DU Client Sample ID: Abiotic\_24HR\_05072015 **Matrix: Water Prep Type: Dissolved** 

**Analysis Batch: 247899** 

DU DU Sample Sample **RPD** Result Qualifier Analyte Result Qualifier Unit RPD Limit Chromium, hex  $\overline{\mathsf{ND}}$   $\overline{\mathsf{H}}$ ND mg/L NC 20

### **Method: Moisture - Percent Moisture**

Lab Sample ID: 490-77315-A-4 DU **Client Sample ID: Duplicate** Matrix: Solid **Prep Type: Total/NA** 

**Analysis Batch: 251326** 

	Sample	Sample	DU	DU				RPD	
Analyte	Result	Qualifier	Result	Qualifier	Unit	D	RPD	Limit	
Percent Moisture	27		27		%		 0	20	
Percent Solids	73		73		%		0	20	

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

### HPLC/IC

### **Analysis Batch: 247022**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-78056-1	Abiotic_24HR_05072015	Total/NA	Water	9056	
490-78056-3	Abiotic_24HR_DUP_05072015	Total/NA	Water	9056	
490-78075-J-4 MS	Matrix Spike	Total/NA	Water	9056	
490-78075-J-4 MSD	Matrix Spike Duplicate	Total/NA	Water	9056	
LCS 490-247022/7	Lab Control Sample	Total/NA	Water	9056	
LCSD 490-247022/8	Lab Control Sample Dup	Total/NA	Water	9056	
MB 490-247022/6	Method Blank	Total/NA	Water	9056	

### Analysis Batch: 247094

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-78056-1	Abiotic_24HR_05072015	Total/NA	Water	9056	
490-78056-3	Abiotic_24HR_DUP_05072015	Total/NA	Water	9056	
490-78158-A-1 MS	Matrix Spike	Total/NA	Water	9056	
490-78158-A-1 MSD	Matrix Spike Duplicate	Total/NA	Water	9056	
LCS 490-247094/7	Lab Control Sample	Total/NA	Water	9056	
LCSD 490-247094/8	Lab Control Sample Dup	Total/NA	Water	9056	
MB 490-247094/6	Method Blank	Total/NA	Water	9056	

### Metals

### Prep Batch: 247303

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-78056-1	Abiotic_24HR_05072015	Dissolved	Water	3005A	
490-78056-3	Abiotic_24HR_DUP_05072015	Dissolved	Water	3005A	
LCS 490-247303/2-A	Lab Control Sample	Total Recoverable	Water	3005A	
LCSD 490-247303/3-A	Lab Control Sample Dup	Total Recoverable	Water	3005A	
MB 490-247303/1-A	Method Blank	Total Recoverable	Water	3005A	

### **Analysis Batch: 247656**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
LCS 490-247303/2-A	Lab Control Sample	Total Recoverable	Water	6020	247303
LCSD 490-247303/3-A	Lab Control Sample Dup	Total Recoverable	Water	6020	247303
MB 490-247303/1-A	Method Blank	Total Recoverable	Water	6020	247303

### Prep Batch: 247657

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-78056-2	Abiotic_24HR_05072015	Total/NA	Solid	3051A	<del>-</del>
490-78056-4	Abiotic_24HR_DUP_05072015	Total/NA	Solid	3051A	
490-78158-A-2-B MS	Matrix Spike	Total/NA	Solid	3051A	
490-78158-A-2-C MSD	Matrix Spike Duplicate	Total/NA	Solid	3051A	
LCS 490-247657/2-A	Lab Control Sample	Total/NA	Solid	3051A	
MB 490-247657/1-A	Method Blank	Total/NA	Solid	3051A	

## **Analysis Batch: 247865**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-78056-1	Abiotic_24HR_05072015	Dissolved	Water	6020	247303
490-78056-1	Abiotic_24HR_05072015	Dissolved	Water	6020	247303
490-78056-2	Abiotic_24HR_05072015	Total/NA	Solid	6020	247657
490-78056-3	Abiotic_24HR_DUP_05072015	Dissolved	Water	6020	247303
490-78056-3	Abiotic_24HR_DUP_05072015	Dissolved	Water	6020	247303

TestAmerica Nashville

5/28/2015

Page 14 of 21

2

3

4

6

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12

## **QC Association Summary**

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-78056-1

## Metals (Continued)

### **Analysis Batch: 247865 (Continued)**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-78056-4	Abiotic_24HR_DUP_05072015	Total/NA	Solid	6020	247657
490-78158-A-2-B MS	Matrix Spike	Total/NA	Solid	6020	247657
490-78158-A-2-C MSD	Matrix Spike Duplicate	Total/NA	Solid	6020	247657
LCS 490-247657/2-A	Lab Control Sample	Total/NA	Solid	6020	247657
MB 490-247657/1-A	Method Blank	Total/NA	Solid	6020	247657

## **General Chemistry**

### **Analysis Batch: 247899**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-78056-1	Abiotic_24HR_05072015	Dissolved	Water	7196A	_
490-78056-1 DU	Abiotic_24HR_05072015	Dissolved	Water	7196A	
490-78056-1 MS	Abiotic_24HR_05072015	Dissolved	Water	7196A	
490-78056-1 MSD	Abiotic_24HR_05072015	Dissolved	Water	7196A	
490-78056-3	Abiotic_24HR_DUP_05072015	Dissolved	Water	7196A	
LCS 490-247899/2	Lab Control Sample	Total/NA	Water	7196A	
MB 490-247899/1	Method Blank	Total/NA	Water	7196A	

### **Analysis Batch: 251326**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-77315-A-4 DU	Duplicate	Total/NA	Solid	Moisture	
490-78056-2	Abiotic_24HR_05072015	Total/NA	Solid	Moisture	
490-78056-4	Abiotic 24HR DUP 05072015	Total/NA	Solid	Moisture	

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Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

Client Sample ID: Abiotic 24HR 05072015

Date Collected: 05/07/15 08:00 Date Received: 05/08/15 09:00

Lab Sample ID: 490-78056-1

**Matrix: Water** 

	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Analysis	9056		1	10 mL		247022	05/08/15 15:48	JHS	TAL NSH
Total/NA	Analysis	9056		10	10 mL		247094	05/09/15 15:24	CLN	TAL NSH
Dissolved	Prep	3005A			50 mL	50 mL	247303	05/11/15 11:25	TSC	TAL NSH
Dissolved	Analysis	6020		100	50 mL	50 mL	247865	05/12/15 23:15	CME	TAL NSH
Dissolved	Prep	3005A			50 mL	50 mL	247303	05/11/15 11:25	TSC	TAL NSH
Dissolved	Analysis	6020		10	50 mL	50 mL	247865	05/13/15 00:16	CME	TAL NSH
Dissolved	Analysis	7196A		1	10 mL	10 mL	247899	05/08/15 15:31	BLM	TAL NSH

Client Sample ID: Abiotic\_24HR\_05072015 Lab Sample ID: 490-78056-2

Date Collected: 05/07/15 08:00

Matrix: Solid Percent Solids: 79.6

Date Received: 05/08/15 09:00

	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.504 g	100 mL	247657	05/12/15 13:51	ZLN	TAL NSH
Total/NA	Analysis	6020		5	0.504 g	100 mL	247865	05/13/15 01:33	CME	TAL NSH
Total/NA	Analysis	Moisture		1			251326	05/27/15 15:13	MAA	TAL NSH

Client Sample ID: Abiotic\_24HR\_DUP\_05072015 Lab Sample ID: 490-78056-3 **Matrix: Water** 

Date Collected: 05/07/15 08:05 Date Received: 05/08/15 09:00

	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Analysis	9056		1	10 mL		247022	05/08/15 16:28	JHS	TAL NSH
Total/NA	Analysis	9056		10	10 mL		247094	05/09/15 15:44	CLN	TAL NSH
Dissolved	Prep	3005A			50 mL	50 mL	247303	05/11/15 11:25	TSC	TAL NSH
Dissolved	Analysis	6020		100	50 mL	50 mL	247865	05/12/15 23:20	CME	TAL NSH
Dissolved	Prep	3005A			50 mL	50 mL	247303	05/11/15 11:25	TSC	TAL NSH
Dissolved	Analysis	6020		10	50 mL	50 mL	247865	05/13/15 00:21	CME	TAL NSH
Dissolved	Analysis	7196A		1	10 mL	10 mL	247899	05/08/15 15:33	BLM	TAL NSH

Client Sample ID: Abiotic\_24HR\_DUP\_05072015 Lab Sample ID: 490-78056-4

Date Collected: 05/07/15 08:05 **Matrix: Solid** Date Received: 05/08/15 09:00 Percent Solids: 78.0

Duan Tana	Batch	Batch	Desa	Dil	Initial	Final	Batch	Prepared	Amalust	Lab
Prep Type Total/NA	Type Prep	Method 3051A	Run	Factor	0.498 a	Amount 100 mL	Number 247657	or Analyzed 05/12/15 13:51	Analyst ZLN	- <b>Lab</b> TAL NSH
Total/NA	Analysis	6020		5	0.498 g	100 mL	247865	05/13/15 01:38		TAL NSH
Total/NA	Analysis	Moisture		1			251326	05/27/15 15:13	MAA	TAL NSH

**Laboratory References:** 

TAL NSH = TestAmerica Nashville, 2960 Foster Creighton Drive, Nashville, TN 37204, TEL (615)726-0177

TestAmerica Nashville

## **Method Summary**

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-78056-1

Method	Method Description	Protocol	Laboratory
9056	Anions, Ion Chromatography	SW846	TAL NSH
6020	Metals (ICP/MS)	SW846	TAL NSH
7196A	Chromium, Hexavalent	SW846	TAL NSH
Moisture	Percent Moisture	EPA	TAL NSH

### **Protocol References:**

EPA = US Environmental Protection Agency

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

### Laboratory References:

TAL NSH = TestAmerica Nashville, 2960 Foster Creighton Drive, Nashville, TN 37204, TEL (615)726-0177

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## **Certification Summary**

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-78056-1

## Laboratory: TestAmerica Nashville

All certifications held by this laboratory are listed. Not all certifications are applicable to this report.

Authority	Program	EPA Region	Certification ID	Expiration Date
A2LA	A2LA		NA: NELAP & A2LA	12-31-15
A2LA	ISO/IEC 17025		0453.07	12-31-15
Alaska (UST)	State Program	10	UST-087	10-31-15
Arizona	State Program	9	AZ0473	05-05-16
Arkansas DEQ	State Program	6	88-0737	04-25-16
California	State Program	9	2938	10-31-16
Connecticut	State Program	1	PH-0220	12-31-15
Florida	NELAP	4	E87358	06-30-15
Illinois	NELAP	5	200010	12-09-15
lowa	State Program	7	131	04-01-16
Kansas	NELAP	7	E-10229	05-31-15
Kentucky (UST)	State Program	4	19	06-30-15
Kentucky (WW)	State Program	4	90038	12-31-15
Louisiana	NELAP	6	30613	06-30-15
Maryland	State Program	3	316	03-31-16
Massachusetts	State Program	1	M-TN032	06-30-15
Minnesota	NELAP	5	047-999-345	12-31-15
Mississippi	State Program	4	N/A	06-30-15
Montana (UST)	State Program	8	NA	02-24-20
Nevada	State Program	9	TN00032	07-31-15
New Hampshire	NELAP	1	2963	10-09-15
New Jersey	NELAP	2	TN965	06-30-15
New York	NELAP	2	11342	03-31-16
North Carolina (WW/SW)	State Program	4	387	12-31-15
North Dakota	State Program	8	R-146	06-30-15
Ohio VAP	State Program	5	CL0033	10-16-15
Oklahoma	State Program	6	9412	08-31-15
Oregon	NELAP	10	TN200001	04-27-16
Pennsylvania	NELAP	3	68-00585	06-30-15
Rhode Island	State Program	1	LAO00268	12-30-15
South Carolina	State Program	4	84009 (001)	02-28-16
South Carolina (DW)	State Program	4	84009 (002)	12-16-17
Tennessee	State Program	4	2008	02-23-17
Texas	NELAP	6	T104704077	08-31-15
USDA	Federal		S-48469	10-30-16
Jtah	NELAP	8	TN00032	07-31-15
Virginia	NELAP	3	460152	06-14-15
Washington	State Program	10	C789	07-19-15
West Virginia DEP	State Program	3	219	02-28-16
Wisconsin	State Program	5	998020430	08-31-15
Wyoming (UST)	A2LA	8	453.07	12-31-15



Nashville, TN

### **COOLER RECEIPT FORM**



Cooler Received/Opened On 5/8/2015 @ 900	
1. Tracking #(last 4 digits, FedEx)	
Courier: Fed-ex IR Gun ID 17960358	
2. Temperature of rep. sample or temp blank when opened: 115 Degrees Celsius	
3. If Item #2 temperature is 0°C or less, was the representative sample or temp blank frozen?	YES NO. NA
4. Were custody seals on outside of cooler?	YESNONA
If yes, how many and where:	
5. Were the seals intact, signed, and dated correctly?	(YES)NONA
6. Were custody papers inside cooler?	ES.NONA
certify that I opened the cooler and answered questions 1-6 (intial)	
7. Were custody seals on containers: YES NO and Intact	YESNONA
Were these signed and dated correctly?	YESNOVA
8. Packing mat'l used? Bubblewrap Plastic bag Peanuts Vermiculite Foam Insert Paper	Other None
9. Cooling process: (Ice) Ice-pack Ice (direct contact) Dry ice	Other None
10. Did all containers arrive in good condition (unbroken)?	(YESNONA
11. Were all container labels complete (#, date, signed, pres., etc)?	YES NONA
12. Did all container labels and tags agree with custody papers?	(FES)NONA
13a. Were VOA vials received?	YESNA
b. Was there any observable headspace present in any VOA vial?	YESNO.
14. Was there a Trip Blank in this cooler? YES.(NoNA If multiple coolers, sequence	ce #
certify that I unloaded the cooler and answered questions 7-14 (intial)	· 
15a. On pres'd bottles, did pH test strips suggest preservation reached the correct pH level?	YESNQ.NA
b. Did the bottle labels indicate that the correct preservatives were used	YESNO. NA
16. Was residual chlorine present?	YESNO(NA
certify that I checked for chlorine and pH as per SOP and answered questions 15-16 (intial)	ADIT
17. Were custody papers properly filled out (ink, signed, etc)?	(ES)NONA
18. Did you sign the custody papers in the appropriate place?	ESNONA
19. Were correct containers used for the analysis requested?	(YES)NONA
20. Was sufficient amount of sample sent in each container?	YESNONA
certify that I entered this project into LIMS and answered questions 17-20 (intial)	DIT
certify that I attached a label with the unique LIMS number to each container (intial)	Q/1_
21. Were there Non-Conformance issues at login? (YES). No Was a PIPE generated? (FES.)	¥#
30H	014
5/8/14	(11117)

Cooler Temperature(s) °C and Other Remarks:

Received by:

Company

Date/Time:

Custody Seal No.

Custody Seals Intact:

### Abiotic - JUHR - DUP - 050715 Abiotic - 24HR - DWD - OFFOTIS Abirtin- 24 HR - Dup- 050715 ZYHR OFO719 Abiotic - 244R- 050715 050715 Phone (615) 726-0177 Fax (615) 726-3404 0220 Old Columbia Road Suite A **TestAmerica Nashville** Possible Hazard Identification awadhawan@geosyntec.com 2960 Foster Creighton Drive 24 HR Geosyntec Consultants, Inc. Client Information Sample Identification Nashville, TN 37204 Abiotic -Slient Contact: Amar Wadhawan Freatability Study 一だり Abiotic State, Zip: MD, 21046 Columbia ompany:

0 - AsNaO2
P. Na2O45
Q. Na2SO3
R. Na2S2SO3
S. H2SO4
T. TSP Dodecahydrate
U - Acetone
W - InCAA
W - ph 4.5
Z - other (specify)

78056

Po#: Purchase Order Requested

Project #: 49008518 SSOW#:

FAT Requested (days): Due Date Requested:

Loc: 490

C - Zn Acetate
D Nitric Acid F - MeOH

G - Amchior H - Ascorbic Acid I - loe J - DI Water K - EDTA L - EDA

Special Instructions/Note:

Total Number of containers

9050 - As, Cr, Cu, Fe

(W=water, S=solid, O=waste/olf,

Sample Type (C≃comp, G=grab)

Sample

Sample Date

Matrix

Tybe - Frexavalent Unromium

HMB, proserved

HNO2 proce med

×

Water

W/ater

Water Water

Water

X

X

Preservation Gode

Water Water

b

0800

05/01/15

Maker

0300 0880

2000

Water Water < Water

TestAmerica

Page 1-of-7 i of-COC No: 490-36874-12511.1

**Analysis Requested** 

Lab PM: Baker, Heather E-Mail: heather baker@testamericainc.com

1500

Phone: 865-330

Ches

, NX

Chain of Custody Record

Possible Hazard Identification	l	[		Sample Disposal ( A fee may be assessed if samples are retained longer than 1 month)	be assessed if samples	are retained longer than	month)
Non-Hazard Flammable Skin Irritant Poison E	~ 1	Unknown Radiological		Return To Client	Disposal By Lab	Archive For	Month
Deliverable Requested: I, II, III, IV, Other (specify)			0,	Special Instructions/QC Requirements:	ements:		
Empty Kit Relinquished by:		Date:	Time:	Č	Method of Shipment:		
Retinquished by:	Date/Time: <b>5/1/1</b>	effine.	Company	Received by:	4	Date Chris. 0350	Company
Relinquished by:	Date/Time:	, see "	Company	My Mid by Mills	Healing Datem	05/08/15 90)	Company

rquished by:

## **Login Sample Receipt Checklist**

Client: Geosyntec Consultants, Inc.

Job Number: 490-78056-1

Login Number: 78056 List Source: TestAmerica Nashville

List Number: 1

Creator: Huskey, Adam

Creator. Huskey, Adam		
Question	Answer	Comment
Radioactivity wasn't checked or is = background as measured by a survey meter.</td <td>True</td> <td></td>	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time.	False	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	False	Limited volume received.
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

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THE LEADER IN ENVIRONMENTAL TESTING

## **ANALYTICAL REPORT**

TestAmerica Laboratories, Inc.

TestAmerica Nashville 2960 Foster Creighton Drive Nashville, TN 37204 Tel: (615)726-0177

TestAmerica Job ID: 490-78158-1 Client Project/Site: Treatability Study

### For:

Geosyntec Consultants, Inc. 10220 Old Columbia Road Suite A Columbia, Maryland 21046

Attn: Amar Wadhawan

# Heather Baker

Authorized for release by: 5/28/2015 2:59:48 PM

Heather Baker, Project Manager I (615)301-5043

heather.baker@testamericainc.com

·····LINKS ·······

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Total Access

**Have a Question?** 



Visit us at: www.testamericainc.com

The test results in this report meet all 2003 NELAC and 2009 TNI requirements for accredited parameters, exceptions are noted in this report. This report may not be reproduced except in full, and with written approval from the laboratory. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

## **Table of Contents**

Cover Page	1
Table of Contents	2
Sample Summary	3
Case Narrative	
Definitions	5
Client Sample Results	6
QC Sample Results	10
QC Association	14
Chronicle	16
Method Summary	17
Certification Summary	18
Chain of Custody	19
Pagaint Chacklists	21

3

4

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## **Sample Summary**

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-78158-1

Lab Sample ID	Client Sample ID	Matrix	Collected Received
490-78158-1	Abiotic_48HR_050815	Water	05/08/15 08:15 05/09/15 08:30
490-78158-2	Abiotic_48HR_050815	Solid	05/08/15 08:15 05/09/15 08:30
490-78158-3	Abiotic_48HR_DUP_050815	Water	05/08/15 08:25 05/09/15 08:30
490-78158-4	Abiotic_48HR_DUP_050815	Solid	05/08/15 08:25 05/09/15 08:30

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### **Case Narrative**

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-78158-1

Job ID: 490-78158-1

Laboratory: TestAmerica Nashville

Narrative

Job Narrative 490-78158-1

### Comments

No additional comments.

### Receipt

The samples were received on 5/9/2015 8:30 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 2.6° C.

Except:

Method 7196A: The following samples were received outside of holding time: Abiotic\_48HR\_050815 (490-78158-1) and Abiotic\_48HR\_DUP\_050815 (490-78158-3).

### HPLC/IC

No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

#### Metals

Method 6020: Insufficient sample volume was available to perform a matrix spike/matrix spike duplicate (MS/MSD) associated with 247303.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

### Field Service / Mobile Lab

No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

### **General Chemistry**

No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

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## **Definitions/Glossary**

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-78158-1

## **Qualifiers**

### **HPLC/IC**

Qualifier	Qualifier Description
4	MS, MSD: The analyte present in the original sample is greater than 4 times the matrix spike concentration; therefore, control limits are not
	applicable.
E	Result exceeded calibration range.

### **Metals**

Qualifier	Qualifier Description
F1	MS and/or MSD Recovery is outside acceptance limits.
4	MS, MSD: The analyte present in the original sample is greater than 4 times the matrix spike concentration; therefore, control limits are not
	applicable.

### **General Chemistry**

Qualifier	Qualifier Description
Н	Sample was prepped or analyzed beyond the specified holding time

## Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains no Free Liquid
DER	Duplicate error ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision level concentration
MDA	Minimum detectable activity

DLO	Boololoff lovel contoontration
MDA	Minimum detectable activity
EDL	Estimated Detection Limit
MDC	Minimum detectable concentration
MDL	Method Detection Limit
	Minimum Laurel (Diamin)

MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated

ND Not detected at the reporting limit (or M	OL or EDL if shown)
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PQL	Practical Quantitation Limit

QC	Quality Control
RER	Relative error ratio

RI	Reporting Limit or Requested Limit	(Radiochemistry)
NL .	Reporting Limit of Requested Limit	(Naulochiellistry)

TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Page 5 of 21

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-78158-1

Lab Sample ID: 490-78158-1 **Matrix: Water** 

Client Sample ID: Abiotic 48HR 050815 Date Collected: 05/08/15 08:15

Date Received: 05/09/15 08:30

Method: 9056 - Anions, Ion Chromatography Analyte Result Qualifier RL **MDL** Unit D Prepared Analyzed Dil Fac 0.100 05/09/15 13:24 Nitrate as N 1.36 mg/L 05/09/15 14:24 **Sulfate** 3170 10.0 mg/L 10

Method: 6020 - Metals	(ICP/MS) - Dissolved						
Analyte	Result Qualifier	RL	MDL Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	0.148	0.0200	mg/L		05/11/15 11:25	05/13/15 00:26	10
Chromium	ND	0.0200	mg/L		05/11/15 11:25	05/13/15 00:26	10
Copper	ND	0.0200	mg/L		05/11/15 11:25	05/13/15 00:26	10
Iron	882	2.50	mg/L		05/11/15 11:25	05/12/15 23:25	100

General Chemistry - Dissolved Analyte	Result	Qualifier	RL	MDL U	nit D	Prepared	Analvzed	Dil Fac
Allulyto	itosuit	Qualifici		IIIDE O		rioparca	Analyzou	Diriac
Chromium, hex	ND	H	0.0100	m	ng/L		05/09/15 11:45	1

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

Date Collected: 05/08/15 08:15

Date Received: 05/09/15 08:30

**Percent Solids** 

Client Sample ID: Abiotic\_48HR\_050815

TestAmerica Job ID: 490-78158-1

Lab Sample ID: 490-78158-2

**Matrix: Solid** 

05/27/15 15:13

Percent Solids: 78.3

Method: 6020 - Metals (ICP	/MS)						
Analyte	Result Qualifier	RL	MDL Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	334	3.22	mg/Kg	<u> </u>	05/12/15 13:51	05/13/15 01:02	- 5
Chromium	62.2 F1	3.22	mg/Kg	₩	05/12/15 13:51	05/13/15 01:02	5
Copper	403	3.22	mg/Kg	☼	05/12/15 13:51	05/13/15 01:02	5
lron	3550	32.2	mg/Kg	☼	05/12/15 13:51	05/13/15 01:02	5
General Chemistry							
Analyte	Result Qualifier	RL	MDL Unit	D	Prepared	Analyzed	Dil Fac
Percent Moisture		0.10	<del></del> %			05/27/15 15:13	1

0.10

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

Client Sample ID: Abiotic 48HR DUP 050815

TestAmerica Job ID: 490-78158-1

Lab Sample ID: 490-78158-3

Prepared

Matrix: Water

Analyzed

05/09/15 11:47

Date Collected: 05/08/15 08:25 Date Received: 05/09/15 08:30

Analyte

Chromium, hex

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Nitrate as N	1.43		0.100		mg/L			05/09/15 14:44	1
Sulfate	3140		10.0		mg/L			05/09/15 15:04	10
Method: 6020 - Metals	(ICP/MS) - Dissolve	ed							
Analyte	,	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
	,		RL 0.0200	MDL	Unit mg/L	D		Analyzed 05/13/15 00:31	Dil Fac
Analyte Arsenic	Result			MDL		D		05/13/15 00:31	
Analyte	Result ND		0.0200	MDL	mg/L	<u>D</u>	05/11/15 11:25	05/13/15 00:31 05/13/15 00:31	10

RL

0.0100

MDL Unit

mg/L

Result Qualifier

ND H

TestAmerica Nashville

Page 8 of 21

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Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

Date Collected: 05/08/15 08:25

Date Received: 05/09/15 08:30

Client Sample ID: Abiotic\_48HR\_DUP\_050815

TestAmerica Job ID: 490-78158-1

Lab Sample ID: 490-78158-4

-ab Sample ID: 490-78158-4
Matrix: Solid

Percent Solids: 78.1

Analyte	Result Qualifier	RL	MDL Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	746	3.09	mg/Kg	<u> </u>	05/12/15 13:51	05/13/15 01:28	5
Chromium	194	3.09	mg/Kg	☼	05/12/15 13:51	05/13/15 01:28	5
Copper	1280	3.09	mg/Kg	☼	05/12/15 13:51	05/13/15 01:28	5
Iron	5910	30.9	mg/Kg	₩.	05/12/15 13:51	05/13/15 01:28	5

General Chemistry									
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Moisture	22		0.10		%			05/27/15 15:13	1
Percent Solids	78		0.10		%			05/27/15 15:13	1

5/28/2015

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Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

Method: 9056 - Anions, Ion Chromatography

Lab Sample ID: MB 490-247094/6 Client Sample ID: Method Blank Prep Type: Total/NA **Matrix: Water** 

Analysis Batch: 247094

MB MB Analyte Result Qualifier RL **MDL** Unit Analyzed Dil Fac Prepared 1.00 05/09/15 11:32 Sulfate ND mg/L

Lab Sample ID: LCS 490-247094/7 Client Sample ID: Lab Control Sample **Matrix: Water** Prep Type: Total/NA

**Analysis Batch: 247094** 

Spike LCS LCS %Rec. Added Limits Analyte Result Qualifier Unit %Rec Sulfate 100 108.4 mg/L 108 80 - 120

Lab Sample ID: LCSD 490-247094/8 Client Sample ID: Lab Control Sample Dup **Matrix: Water** Prep Type: Total/NA

Analysis Batch: 247094

Spike LCSD LCSD %Rec. **RPD** Added Result Qualifier Limits RPD Limit Analyte Unit D %Rec Sulfate 100 106.7 mg/L 107 80 - 120

Client Sample ID: 490-78158-A-1 MS Lab Sample ID: 490-78158-A-1 MS Prep Type: Total/NA

**Matrix: Water** 

**Analysis Batch: 247094** 

Sample Sample Spike MS MS %Rec. Analyte Result Qualifier Added Result Qualifier Unit %Rec Limits Sulfate 2290 E 100 1965 E 4 -330 80 - 120 mg/L

Lab Sample ID: 490-78158-A-1 MSD Client Sample ID: 490-78158-A-1 MSD **Matrix: Water** Prep Type: Total/NA

**Analysis Batch: 247094** 

Spike MSD MSD %Rec. RPD Sample Sample Analyte Result Qualifier Added Result Qualifier Unit D %Rec Limits RPD Limit Sulfate 100 1984 E 4 2290 E mg/L -311 80 - 120

Lab Sample ID: MB 490-247095/6 **Client Sample ID: Method Blank** Prep Type: Total/NA

**Matrix: Water** 

**Analysis Batch: 247095** 

MB MB Analyte Result Qualifier RL MDL Unit Prepared D Analyzed Dil Fac 0 100 Nitrate as N mg/L 05/09/15 11:32 ND

Lab Sample ID: LCS 490-247095/7 Client Sample ID: Lab Control Sample **Matrix: Water** Prep Type: Total/NA

Analysis Batch: 247095

Spike LCS LCS %Rec. Added Result Qualifier Analyte Unit %Rec Limits Nitrate as N 10.0 10.51 105 80 - 120

Lab Sample ID: LCSD 490-247095/8 Client Sample ID: Lab Control Sample Dup **Matrix: Water** Prep Type: Total/NA

**Analysis Batch: 247095** 

LCSD LCSD RPD Spike %Rec. Added Limits Analyte Result Qualifier Unit D %Rec RPD Limit Nitrate as N 10.0 10.37 104 80 - 120 mg/L

TestAmerica Nashville

Prep Type: Total/NA

Prep Type: Total/NA

**Prep Type: Total/NA** 

Prep Batch: 247657

**Prep Type: Total/NA** 

**Prep Type: Total/NA** 

Client Sample ID: Abiotic\_48HR\_050815

Client Sample ID: Abiotic\_48HR\_050815

**Client Sample ID: Method Blank** 

**Client Sample ID: Lab Control Sample** 

Client Sample ID: Abiotic\_48HR\_050815

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

Lab Sample ID: 490-78158-A-1 MS

**Matrix: Water** 

Analysis Batch: 247095

Sample Sample Spike MS MS %Rec. Analyte Result Qualifier Added Result Qualifier Unit D %Rec Limits Nitrate as N 1.36 10.0 11.94 106 80 - 120 mg/L

Lab Sample ID: 490-78158-A-1 MSD

**Matrix: Water** 

**Analysis Batch: 247095** 

, , , , , , , , , , , , , , , , , , , ,	Sample	Sample	Spike	MSD	MSD				%Rec.		RPD
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	RPD	Limit
Nitrate as N	1.36		10.0	11.90		mg/L		105	80 - 120	0	20

Method: 6020 - Metals (ICP/MS)

Lab Sample ID: MB 490-247657/1-A

**Matrix: Solid** 

**Analysis Batch: 247865** 

_	MB	MB						•	
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND		0.500		mg/Kg		05/12/15 13:51	05/13/15 00:52	1
Chromium	ND		0.500		mg/Kg		05/12/15 13:51	05/13/15 00:52	1
Copper	ND		0.500		mg/Kg		05/12/15 13:51	05/13/15 00:52	1
Iron	ND		5.00		mg/Kg		05/12/15 13:51	05/13/15 00:52	1

Lab Sample ID: LCS 490-247657/2-A

**Matrix: Solid** 

Analysis Batch: 247865							Prep Batch: 2476	557
	Spike	LCS	LCS				%Rec.	
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Arsenic	19.5	18.21		mg/Kg		93	80 - 120	
Chromium	19.5	19.71		mg/Kg		101	80 - 120	
Copper	19.5	19.57		mg/Kg		100	80 - 120	
Iron	195	205.7		ma/Ka		106	80 - 120	

Lab Sample ID: 490-78158-2 MS

**Matrix: Solid** 

Analysis Batch: 247865									Prep Ba	tch: 247657
	Sample	Sample	Spike	MS	MS				%Rec.	
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Arsenic	334		25.2	443.8	4	mg/Kg	<u> </u>	436	75 - 125	
Chromium	62.2	F1	25.2	104.1	F1	mg/Kg	₩	167	75 - 125	
Copper	403		25.2	717.3	4	mg/Kg	₩	1251	75 - 125	
Iron	3550		252	4718	4	mg/Kg	₩.	466	75 - 125	

Lab Sample ID: 490-78158-2 MSD

Matrix: Solid

matrix. Odila									I ICP I Y	oc. Tot	anita
Analysis Batch: 247865									Prep Ba	itch: 24	<del>1</del> 7657
	Sample	Sample	Spike	MSD	MSD				%Rec.		RPD
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	RPD	Limit
Arsenic	334		25.7	456.9	4	mg/Kg	₩	478	75 - 125	3	20
Chromium	62.2	F1	25.7	110.9	F1	mg/Kg	₩	190	75 - 125	6	20
Copper	403		25.7	634.9	4	mg/Kg	☼	905	75 - 125	12	20
Iron	3550		257	4473	4	mg/Kg	₩.	361	75 - 125	5	20

TestAmerica Nashville

Page 11 of 21

Client Sample ID: Abiotic\_48HR\_050815 Prep Type: Total/NA

5/28/2015

Client: Geosyntec Consultants, Inc.

Project/Site: Treatability Study

Method: 6020 - Metals (ICP/MS) (Continued)

MR MR

Lab Sample ID: MB 490-247303/1-A

**Matrix: Water** 

**Analysis Batch: 247656** 

Client Sample ID: Method Blank **Prep Type: Total Recoverable** 

Prep Batch: 247303

Analyte	Result (	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND		0.00200		mg/L		05/11/15 11:25	05/12/15 10:47	1
Chromium	ND	0	.00200		mg/L		05/11/15 11:25	05/12/15 10:47	1
Copper	ND	0	.00200		mg/L		05/11/15 11:25	05/12/15 10:47	1
Iron	ND		0.0250		mg/L		05/11/15 11:25	05/12/15 10:47	1

Lab Sample ID: LCS 490-247303/2-A **Client Sample ID: Lab Control Sample Prep Type: Total Recoverable Matrix: Water Analysis Batch: 247656 Prep Batch: 247303** Spike LCS LCS %Rec.

Analyte Added Result Qualifier Unit D %Rec Limits Arsenic 0.100 0.1065 mg/L 107 80 - 120 0.100 Chromium 0.1078 mg/L 108 80 - 120 Copper 0.100 0.1019 mg/L 102 80 - 120 Iron 1.00 1.015 mg/L 102 80 - 120

Lab Sample ID: LCSD 490-247303/3-A Client Sample ID: Lab Control Sample Dup **Matrix: Water Prep Type: Total Recoverable** Analysis Batch: 247656 Prep Batch: 247303 Spike LCSD LCSD %Rec. **RPD** Analyte Added Result Qualifier Unit Limits RPD Limit D %Rec Arsenic 0.100 0.1052 mg/L 105 80 - 120 20 Chromium 0.100 0.1064 106 80 - 120 20 mg/L 1 Copper 0.100 0.1000 mg/L 100 80 - 120 20

Method: 7196A - Chromium, Hexavalent

Lab Sample ID: 490-78156-A-3 MS **Client Sample ID: Matrix Spike Matrix: Water** Prep Type: Total/NA

1.023

mg/L

102

80 - 120

1.00

Iron

Analysis Batch: 247958

7 many one Datom 2 m occ										
	Sample	Sample	Spike	MS	MS				%Rec.	
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Chromium hex	ND		0.100	0.09100		ma/l		91	85 - 115	

Lab Sample ID: 490-78156-A-3 MSD Client Sample ID: Matrix Spike Duplicate Prep Type: Total/NA

**Matrix: Water** 

Analysis Batch: 247958

7 mar <b>y</b> 515 Zatom 2 11 555	Sample	Sample	Spike	MSD	MSD				%Rec.		RPD
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	RPD	Limit
Chromium, hex	ND		0.100	0.09100		mg/L		91	85 - 115	0	20

Lab Sample ID: 490-78156-A-3 DU **Client Sample ID: Duplicate** Prep Type: Total/NA

**Matrix: Water** 

Analysis Batch: 247958

Alialysis Dalcii. 247 300									
	Sample	Sample	DU	DU					RPD
Analyte	Result	Qualifier	Result	Qualifier	Unit	D		RPD	Limit
Chromium, hex	ND		 ND		mg/L			NC	20

TestAmerica Nashville

5/28/2015

## **QC Sample Results**

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-78158-1

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Method: 7196A - Chromium, Hexavalent (Continued)

Lab Sample ID: MB 490-247950/1-A

Client Sample ID: Method Blank

Matrix: Water

Prep Type: Dissolved

**Analysis Batch: 247958** 

 Analyte
 Result Chromium, hex
 Qualifier ND
 RL ND
 MDL Will Unit Wight
 D Wight
 Prepared Wight
 Analyzed Analyzed Will Fac Wight
 Dil Fac Wight

Lab Sample ID: LCS 490-247950/2-A

Matrix: Water

Prep Type: Dissolved

Analysis Batch: 247958

**Method: Moisture - Percent Moisture** 

Lab Sample ID: 490-77315-A-4 DU

Matrix: Solid

Client Sample ID: Duplicate
Prep Type: Total/NA

**Analysis Batch: 251326** 

DU DU Sample Sample **RPD** Analyte Result Qualifier Result Qualifier Unit RPD Limit Percent Moisture 27 27 % 0 20 Percent Solids 73 73 % 0 20

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Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

### HPLC/IC

### Analysis Batch: 247094

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-78158-1	Abiotic_48HR_050815	Total/NA	Water	9056	
490-78158-3	Abiotic_48HR_DUP_050815	Total/NA	Water	9056	
490-78158-A-1 MS	490-78158-A-1 MS	Total/NA	Water	9056	
490-78158-A-1 MSD	490-78158-A-1 MSD	Total/NA	Water	9056	
LCS 490-247094/7	Lab Control Sample	Total/NA	Water	9056	
LCSD 490-247094/8	Lab Control Sample Dup	Total/NA	Water	9056	
MB 490-247094/6	Method Blank	Total/NA	Water	9056	

### **Analysis Batch: 247095**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-78158-1	Abiotic_48HR_050815	Total/NA	Water	9056	
490-78158-3	Abiotic_48HR_DUP_050815	Total/NA	Water	9056	
490-78158-A-1 MS	Abiotic_48HR_050815	Total/NA	Water	9056	
490-78158-A-1 MSD	Abiotic_48HR_050815	Total/NA	Water	9056	
LCS 490-247095/7	Lab Control Sample	Total/NA	Water	9056	
LCSD 490-247095/8	Lab Control Sample Dup	Total/NA	Water	9056	
MB 490-247095/6	Method Blank	Total/NA	Water	9056	

### Metals

### Prep Batch: 247303

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-78158-1	Abiotic_48HR_050815	Dissolved	Water	3005A	
490-78158-3	Abiotic_48HR_DUP_050815	Dissolved	Water	3005A	
LCS 490-247303/2-A	Lab Control Sample	Total Recoverable	Water	3005A	
LCSD 490-247303/3-A	Lab Control Sample Dup	Total Recoverable	Water	3005A	
MB 490-247303/1-A	Method Blank	Total Recoverable	Water	3005A	

## **Analysis Batch: 247656**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
LCS 490-247303/2-A	Lab Control Sample	Total Recoverable	Water	6020	247303
LCSD 490-247303/3-A	Lab Control Sample Dup	Total Recoverable	Water	6020	247303
MB 490-247303/1-A	Method Blank	Total Recoverable	Water	6020	247303

### Prep Batch: 247657

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-78158-2	Abiotic_48HR_050815	Total/NA	Solid	3051A	<del>-</del>
490-78158-2 MS	Abiotic_48HR_050815	Total/NA	Solid	3051A	
490-78158-2 MSD	Abiotic_48HR_050815	Total/NA	Solid	3051A	
490-78158-4	Abiotic_48HR_DUP_050815	Total/NA	Solid	3051A	
LCS 490-247657/2-A	Lab Control Sample	Total/NA	Solid	3051A	
MB 490-247657/1-A	Method Blank	Total/NA	Solid	3051A	

## Analysis Batch: 247865

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-78158-1	Abiotic_48HR_050815	Dissolved	Water	6020	247303
490-78158-1	Abiotic_48HR_050815	Dissolved	Water	6020	247303
490-78158-2	Abiotic_48HR_050815	Total/NA	Solid	6020	247657
490-78158-2 MS	Abiotic_48HR_050815	Total/NA	Solid	6020	247657
490-78158-2 MSD	Abiotic_48HR_050815	Total/NA	Solid	6020	247657

TestAmerica Nashville

Page 14 of 21

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## **QC Association Summary**

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-78158-1

## Metals (Continued)

### **Analysis Batch: 247865 (Continued)**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-78158-3	Abiotic_48HR_DUP_050815	Dissolved	Water	6020	247303
490-78158-3	Abiotic_48HR_DUP_050815	Dissolved	Water	6020	247303
490-78158-4	Abiotic_48HR_DUP_050815	Total/NA	Solid	6020	247657
LCS 490-247657/2-A	Lab Control Sample	Total/NA	Solid	6020	247657
MB 490-247657/1-A	Method Blank	Total/NA	Solid	6020	247657

## **General Chemistry**

### Filtration Batch: 247950

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-78158-1	Abiotic_48HR_050815	Dissolved	Water	Filtration	
490-78158-3	Abiotic_48HR_DUP_050815	Dissolved	Water	Filtration	
LCS 490-247950/2-A	Lab Control Sample	Dissolved	Water	Filtration	
MB 490-247950/1-A	Method Blank	Dissolved	Water	Filtration	

### **Analysis Batch: 247958**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-78156-A-3 DU	Duplicate	Total/NA	Water	7196A	
490-78156-A-3 MS	Matrix Spike	Total/NA	Water	7196A	
490-78156-A-3 MSD	Matrix Spike Duplicate	Total/NA	Water	7196A	
490-78158-1	Abiotic_48HR_050815	Dissolved	Water	7196A	247950
490-78158-3	Abiotic_48HR_DUP_050815	Dissolved	Water	7196A	247950
LCS 490-247950/2-A	Lab Control Sample	Dissolved	Water	7196A	247950
MB 490-247950/1-A	Method Blank	Dissolved	Water	7196A	247950

### **Analysis Batch: 251326**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-77315-A-4 DU	Duplicate	Total/NA	Solid	Moisture	
490-78158-2	Abiotic_48HR_050815	Total/NA	Solid	Moisture	
490-78158-4	Abiotic 48HR DUP 050815	Total/NA	Solid	Moisture	

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Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

Lab Sample ID: 490-78158-1

**Matrix: Water** 

Client Sample ID: Abiotic 48HR 050815 Date Collected: 05/08/15 08:15

Date Received: 05/09/15 08:30

_	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Analysis	9056		1	10 mL		247095	05/09/15 13:24	CLN	TAL NSH
Total/NA	Analysis	9056		10	10 mL		247094	05/09/15 14:24	CLN	TAL NSH
Dissolved	Prep	3005A			50 mL	50 mL	247303	05/11/15 11:25	TSC	TAL NSH
Dissolved	Analysis	6020		100	50 mL	50 mL	247865	05/12/15 23:25	CME	TAL NSH
Dissolved	Prep	3005A			50 mL	50 mL	247303	05/11/15 11:25	TSC	TAL NSH
Dissolved	Analysis	6020		10	50 mL	50 mL	247865	05/13/15 00:26	CME	TAL NSH
Dissolved	Analysis	7196A		1	10 mL	10 mL	247958	05/09/15 11:45	BLM	TAL NSH
Dissolved	Filtration	Filtration			1.0 mL	1.0 mL	247950	05/09/15 11:45	BLM	TAL NSH

Client Sample ID: Abiotic\_48HR\_050815 Lab Sample ID: 490-78158-2

Date Collected: 05/08/15 08:15 **Matrix: Solid** Date Received: 05/09/15 08:30 Percent Solids: 78.3

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.496 g	100 mL	247657	05/12/15 13:51	ZLN	TAL NSH
Total/NA	Analysis	6020		5	0.496 g	100 mL	247865	05/13/15 01:02	CME	TAL NSH
Total/NA	Analysis	Moisture		1			251326	05/27/15 15:13	MAA	TAL NSH

Client Sample ID: Abiotic\_48HR\_DUP\_050815 Lab Sample ID: 490-78158-3 **Matrix: Water** 

Date Collected: 05/08/15 08:25 Date Received: 05/09/15 08:30

_	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Analysis	9056		1	10 mL		247095	05/09/15 14:44	CLN	TAL NSH
Total/NA	Analysis	9056		10	10 mL		247094	05/09/15 15:04	CLN	TAL NSH
Dissolved	Prep	3005A			50 mL	50 mL	247303	05/11/15 11:25	TSC	TAL NSH
Dissolved	Analysis	6020		100	50 mL	50 mL	247865	05/12/15 23:40	CME	TAL NSH
Dissolved	Prep	3005A			50 mL	50 mL	247303	05/11/15 11:25	TSC	TAL NSH
Dissolved	Analysis	6020		10	50 mL	50 mL	247865	05/13/15 00:31	CME	TAL NSH
Dissolved	Analysis	7196A		1	10 mL	10 mL	247958	05/09/15 11:47	BLM	TAL NSH
Dissolved	Filtration	Filtration			1.0 mL	1.0 mL	247950	05/09/15 11:47	BLM	TAL NSH

Client Sample ID: Abiotic\_48HR\_DUP\_050815 Lab Sample ID: 490-78158-4

Date Collected: 05/08/15 08:25 **Matrix: Solid** Date Received: 05/09/15 08:30 Percent Solids: 78.1

	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.518 g	100 mL	247657	05/12/15 13:51	ZLN	TAL NSH
Total/NA	Analysis	6020		5	0.518 g	100 mL	247865	05/13/15 01:28	CME	TAL NSH
Total/NA	Analysis	Moisture		1			251326	05/27/15 15:13	MAA	TAL NSH

**Laboratory References:** 

TAL NSH = TestAmerica Nashville, 2960 Foster Creighton Drive, Nashville, TN 37204, TEL (615)726-0177

TestAmerica Nashville

Page 16 of 21

5/28/2015

## **Method Summary**

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-78158-1

Method	Method Description	Protocol	Laboratory
9056	Anions, Ion Chromatography	SW846	TAL NSH
6020	Metals (ICP/MS)	SW846	TAL NSH
7196A	Chromium, Hexavalent	SW846	TAL NSH
Moisture	Percent Moisture	EPA	TAL NSH

### **Protocol References:**

EPA = US Environmental Protection Agency

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

### Laboratory References:

TAL NSH = TestAmerica Nashville, 2960 Foster Creighton Drive, Nashville, TN 37204, TEL (615)726-0177

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## **Certification Summary**

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-78158-1

## Laboratory: TestAmerica Nashville

All certifications held by this laboratory are listed. Not all certifications are applicable to this report.

Authority	Program	EPA Region	Certification ID	Expiration Dat
A2LA	A2LA		NA: NELAP & A2LA	12-31-15
A2LA	ISO/IEC 17025		0453.07	12-31-15
Alaska (UST)	State Program	10	UST-087	10-31-15
Arizona	State Program	9	AZ0473	05-05-16
Arkansas DEQ	State Program	6	88-0737	04-25-16
California	State Program	9	2938	10-31-16
Connecticut	State Program	1	PH-0220	12-31-15
Florida	NELAP	4	E87358	06-30-15
Illinois	NELAP	5	200010	12-09-15
lowa	State Program	7	131	04-01-16
Kansas	NELAP	7	E-10229	05-31-15
Kentucky (UST)	State Program	4	19	06-30-15
Kentucky (WW)	State Program	4	90038	12-31-15
Louisiana	NELAP	6	30613	06-30-15
Maryland	State Program	3	316	03-31-16
Massachusetts	State Program	1	M-TN032	06-30-15
Minnesota	NELAP	5	047-999-345	12-31-15
Mississippi	State Program	4	N/A	06-30-15
Montana (UST)	State Program	8	NA	02-24-20
Nevada	State Program	9	TN00032	07-31-15
New Hampshire	NELAP	1	2963	10-09-15
New Jersey	NELAP	2	TN965	06-30-15
New York	NELAP	2	11342	03-31-16
North Carolina (WW/SW)	State Program	4	387	12-31-15
North Dakota	State Program	8	R-146	06-30-15
Ohio VAP	State Program	5	CL0033	10-16-15
Oklahoma	State Program	6	9412	08-31-15
Oregon	NELAP	10	TN200001	04-27-16
Pennsylvania	NELAP	3	68-00585	06-30-15
Rhode Island	State Program	1	LAO00268	12-30-15
South Carolina	State Program	4	84009 (001)	02-28-16
South Carolina (DW)	State Program	4	84009 (002)	12-16-17
Tennessee	State Program	4	2008	02-23-17
Texas	NELAP	6	T104704077	08-31-15
USDA	Federal		S-48469	10-30-16
Jtah	NELAP	8	TN00032	07-31-15
Virginia	NELAP	3	460152	06-14-15
Washington	State Program	10	C789	07-19-15
West Virginia DEP	State Program	3	219	02-28-16
Wisconsin	State Program	5	998020430	08-31-15
Wyoming (UST)	A2LA	8	453.07	12-31-15

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### **COOLER RECEIPT FORM**

Cooler Received/Opened On 5/9/2015 @ 0830	
1. Tracking #(last 4 digits, FedEx)	•
Courier: Fed-ex IR Gun ID 97310166	
2. Temperature of rep. sample or temp blank when opened:	_
3. If Item #2 temperature is $0^{\circ}\text{C}$ or less, was the representative sample or temp blank frozen?	YES NO(NA)
4. Were custody seals on outside of cooler?	YESNONA
If yes, how many and where:	
5. Were the seals intact, signed, and dated correctly?	YESNONA
6. Were custody papers inside cooler?	YESNONA
I certify that I opened the cooler and answered questions 1-6 (intial)	6
7. Were custody seals on containers: YES YES and Intact	YESNO.
Were these signed and dated correctly?	YESNO
8. Packing mat'l used? Pubblewrap Plastic bag Peanuts Vermiculite Foam Insert Paper	Other None
9. Cooling process: (ce   Ice-pack   Ice (direct contact)   Dry ice	Other None
10. Did all containers arrive in good condition (unbroken)?	ESNONA
11. Were all container labels complete (#, date, signed, pres., etc)?	XES)NONA
12. Did all container labels and tags agree with custody papers?	ÆS)NONA
13a. Were VOA vials received?	YES., NO.).NA
b. Was there any observable headspace present in any VOA vial?	YESNO.
14. Was there a Trip Blank in this cooler? YESNO(A) If multiple coolers, sequence	ce #
I certify that I unloaded the cooler and answered questions 7-14 (intial)	MLM
15a. On pres'd bottles, did pH test strips suggest preservation reached the correct pH level?	YESNO.(NA)
b. Did the bottle labels indicate that the correct preservatives were used	ÆS)NONA
16. Was residual chlorine present?	YESNO(NA)
I certify that I checked for chlorine and pH as per SOP and answered questions 15-16 (intial)	mom
17. Were custody papers properly filled out (ink, signed, etc)?	(ES).NONA
18. Did you sign the custody papers in the appropriate place?	ESNONA
19. Were correct containers used for the analysis requested?	ESNONA
20. Was sufficient amount of sample sent in each container?	25 .NONA
I certify that I entered this project into LIMS and answered questions 17-20 (intial)	mam
I certify that I attached a label with the unique LIMS number to each container (intial)	Mam
21. Were there Non-Conformance issues at login? YES.(NO) Was a NCM generated? YES.(	NO#

m -	오	Chain of Custody Record	stody R	ecord	Loc: 490 <b>781 አ</b> ጾ	TestAmerica
Phone (615) 726-0177 Fax (615) 726-3404						THE LEADER IN FORIRCHMENTAL TESTING
Client Information	1. "  }.	Ches	Baker,	Baker, Heather	Came	490-36874-12511.1
		30 - 00 <del>8</del> 7	E-Mail: heath	E-Mail: heather.baker@testamericainc.com		Page ( of )
Company: Geosyntec Consultants, Inc.		,		/sis	Requested	Job #:
Address: 10220 Old Columbia Road Suite A	Due Date Requested:					읤
Cily. Columbia	TAT Requested (days):					B - NaOH C - Zn Acetate
State, Zip: MD, 21046			. 8		of the second	D - Nitric Acid P - Na2O4S E - NaHSO4 Q - Na2SO3
Phone:	PO# Purchase Order Requested	quested			an a	G - Amchlor H - Ascorbic Acid
Email: awadhawan@geosyntec.com	WO#:			Ne)		I - Ice J - DI Water
Project Name: Treatability Study	Project #. 49008518			es, or	ifaina	L-EDA Z-other (specify)
Site: TEL	SSOW#:			iSD (y iulfate ient Cl	area	Other:
		Sample Type	Matrix (w=water,	Filtered Trans N Nitrate, S - Hexava As, Cr, C	Number	
Sample Identification	Sample Date	Sample (C=comp, Time G=grab)	O=wasteloil, BT=Tissue, A=Air)	<b>Perio</b> 9056 - 7196A	Total	Special Instructions/Note:
	V		allon Code			
Abietic - 48HR - or es/15	05/05/15 00	2 9180	Water	× ×	Sarrei (	HND Dreserved
ar HR			Water	× .		
- 48 HR-		-	Swater	×	U.87	
Ľ.	30	0825	Water	× ×	20 - 10 - 10 - 10 - 10 - 10 - 10 - 10 -	HNOS preserved
48 HR			Water	×		
1 张松 1 以	~	<b>↓</b>   <b>♥</b>	Syntate:	X		
-			Water		18.00 m	
			Water			
			Water			
			Water		2	To grand
			Water			
Possible Hazard Identification  Non-Hazard Flammable Skin Irritant Poison B	on B Unknown	n Radiological	ical	Sample Disposal (A fee may be Return To Client	may be assessed if samples are retain Moisposal By Lab	are retained longer than 1 month)  Archive For Months
ested: I, II, III, IV, Ot				刃	ents:	
Empty Kit Relinquished by:	Date:	te:		Time: /	Method of Shipment:	
Relinquished by:	05/08//5	0630	Geos where	Received by To To	03-08-	15 1200 Company
	Date/Time:		Company *			OB30 Company
Relinquished by:	Date/Time:		Company	Received by:	- 1	0
Custody Seals Intact: Custody Seal No.:  ∆ Yes ∆ No				Cooler Temperature(s) °C and Other Remarks:	Remarks:	
△ Tes △ NO					X	

# **Login Sample Receipt Checklist**

Client: Geosyntec Consultants, Inc.

Job Number: 490-78158-1

Login Number: 78158 List Source: TestAmerica Nashville

List Number: 1

Creator: McBride, Mike

Answer	Comment
True	
True	
N/A	
True	
True	
True	
True	2.6
True	
False	Refer to Job Narrative for details.
True	
True	
True	
True	
False	Limited volume received.
N/A	
True	
True	
True	
True	
N/A	
	True N/A True True True True True True True True

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THE LEADER IN ENVIRONMENTAL TESTING

# **ANALYTICAL REPORT**

TestAmerica Laboratories, Inc.

TestAmerica Nashville 2960 Foster Creighton Drive Nashville, TN 37204 Tel: (615)726-0177

TestAmerica Job ID: 490-78405-1 Client Project/Site: Treatability Study

### For:

Geosyntec Consultants, Inc. 10220 Old Columbia Road Suite A Columbia, Maryland 21046

Attn: Amar Wadhawan

# Heather Baker

Authorized for release by: 5/29/2015 11:15:57 AM

Heather Baker, Project Manager I (615)301-5043

heather.baker@testamericainc.com

·····LINKS ······

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**Have a Question?** 



Visit us at: www.testamericainc.com

The test results in this report meet all 2003 NELAC and 2009 TNI requirements for accredited parameters, exceptions are noted in this report. This report may not be reproduced except in full, and with written approval from the laboratory. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

# **Table of Contents**

Cover Page	1
Table of Contents	2
Sample Summary	3
Case Narrative	4
Definitions	5
Client Sample Results	6
QC Sample Results	16
QC Association	21
Chronicle	24
Method Summary	27
Certification Summary	28
Chain of Custody	29
Racaint Chacklists	32

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# **Sample Summary**

Matrix

Water

Solid

Water

Solid

Water

Solid

Water

Solid

Water

Solid

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

**Client Sample ID** 

Abiotic\_Day 7\_051315

Abiotic\_Day 7\_051315

Abiotic Control\_051315

Abiotic Control\_051315

Biotic\_051315

Biotic\_051315

Biotic\_Dup\_051315

Biotic\_Dup\_051315

Abiotic\_Day 7\_Dup\_051315

Abiotic\_Day 7\_Dup\_051315

Lab Sample ID

490-78405-1

490-78405-2

490-78405-3

490-78405-4

490-78405-5

490-78405-6

490-78405-7

490-78405-8

490-78405-9

490-78405-10

TestAmerica Job ID: 490-78405-1

0-1141	D
Collected	Received
05/13/15 08:35	05/14/15 08:30
05/13/15 08:35	05/14/15 08:30
05/13/15 08:45	05/14/15 08:30
05/13/15 08:45	05/14/15 08:30
05/13/15 12:00	05/14/15 08:30
05/13/15 12:00	05/14/15 08:30
05/13/15 12:15	05/14/15 08:30
05/13/15 12:15	05/14/15 08:30

05/13/15 12:25 05/14/15 08:30 05/13/15 12:25 05/14/15 08:30

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### **Case Narrative**

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-78405-1

Job ID: 490-78405-1

Laboratory: TestAmerica Nashville

**Narrative** 

Job Narrative 490-78405-1

### Comments

No additional comments.

### Receipt

The samples were received on 5/14/2015 8:30 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 3.6° C.

### Receipt Exceptions

Method 7196A: The following samples were received outside of holding time: Abiotic\_Day 7\_051315 (490-78405-1) and Abiotic\_Day 7\_Dup\_051315 (490-78405-3).

### HPLC/IC

No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

### Metals

Method 6020: Insufficient sample volume was available to perform a matrix spike/matrix spike duplicate (MS/MSD) associated with batch 249411.

Method 6020: The solid samples were not homgeneous based on field duplicate and matrix spike/matrix spike duplicate (MS/MSD) results.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

### Field Service / Mobile Lab

No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

### **General Chemistry**

Method 7196A: The matrix spike / matrix spike duplicate (MS/MSD) recoveries for preparation batch 490-248611 and analytical batch 490-248616 were outside control limits. Sample matrix interference and/or non-homogeneity are suspected because the associated laboratory control sample (LCS) recovery was within acceptance limits.

Method 7196A: The following sample was received with insufficient holding time remaining to analyze the sample within the 24 hour holding time: Abiotic Control 051315 (490-78405-5).

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

### **Organic Prep**

No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

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# **Definitions/Glossary**

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-78405-1

### **Qualifiers**

### **Metals**

Qualifier	Qualifier Description
F2	MS/MSD RPD exceeds control limits
F1	MS and/or MSD Recovery is outside acceptance limits.
4	MS, MSD: The analyte present in the original sample is greater than 4 times the matrix spike concentration; therefore, control limits are not applicable.

### **General Chemistry**

Qualifier	Qualifier Description
F1	MS and/or MSD Recovery is outside acceptance limits.
Н	Sample was prepped or analyzed beyond the specified holding time

# Glossary

PQL

QC RER

RL RPD

TEF

TEQ

Practical Quantitation Limit

Toxicity Equivalent Factor (Dioxin)

Toxicity Equivalent Quotient (Dioxin)

Reporting Limit or Requested Limit (Radiochemistry)

Relative Percent Difference, a measure of the relative difference between two points

**Quality Control** 

Relative error ratio

Abbreviation	These commonly used abbreviations may or may not be present in this report.
<del>a</del>	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains no Free Liquid
DER	Duplicate error ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision level concentration
MDA	Minimum detectable activity
EDL	Estimated Detection Limit
MDC	Minimum detectable concentration
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not detected at the reporting limit (or MDL or EDL if shown)

T - - ( A - - - - 2 - - - N | - - | - | - | 1 | -

Page 5 of 32

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Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-78405-1

Client Sample ID: Abiotic\_Day 7\_051315

Date Collected: 05/13/15 08:35 Date Received: 05/14/15 08:30 Lab Sample ID: 490-78405-1

Matrix: Water

Method: 9056 - Anions, Ion Chi	romatogra	phy							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Nitrate as N	1.09		0.100		mg/L			05/14/15 13:48	1
Sulfate	3130		10.0		mg/L			05/14/15 14:07	10
- Method: 6020 - Metals (ICP/MS	) - Dissolv	ed							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	0.0271		0.00200		mg/L		05/14/15 16:06	05/22/15 12:51	1
Chromium	ND		0.00200		mg/L		05/14/15 16:06	05/22/15 12:51	1
Copper	0.00835		0.00200		mg/L		05/14/15 16:06	05/22/15 12:51	1
Iron	828		0.250		mg/L		05/14/15 16:06	05/22/15 12:20	10
– General Chemistry - Dissolved									
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium, hex	ND	H F1	10.0		mg/L			05/14/15 10:58	1000

TestAmerica Nashville

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Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-78405-1

1405.0

Client Sample ID: Abiotic\_Day 7\_051315

Date Collected: 05/13/15 08:35 Date Received: 05/14/15 08:30

**Percent Solids** 

Lab Sample ID: 490-78405-2 Matrix: Solid

Percent Solids: 79.3

05/27/15 15:13

Method: 6020 - Metals (ICP/M	•								
Analyte	Result C	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	311 F	2	0.605		mg/Kg	₩	05/14/15 11:13	05/18/15 21:23	1
Chromium	62.6 F	-1 F2	0.605		mg/Kg	₩	05/14/15 11:13	05/18/15 21:23	1
Copper	459 F	2	0.605		mg/Kg	☼	05/14/15 11:13	05/18/15 21:23	1
Iron	3110		6.05		mg/Kg	☆	05/14/15 11:13	05/18/15 21:23	1
General Chemistry									
Analyte	Result C	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Moisture	21		0.10		%			05/27/15 15:13	1

0.10

**79** 

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Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-78405-1

Lab Sample ID: 490-78405-3

**Matrix: Water** 

Client Sample ID: Abiotic Day 7 Dup 051315 Date Collected: 05/13/15 08:45

Date Received: 05/14/15 08:30

Analyte	Result Qualif	er RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Nitrate as N	1.14	0.100		mg/L			05/14/15 14:26	1
Sulfate	3150	10.0		mg/L			05/14/15 14:45	10
	(ICP/MS) - Dissolved	lan Di	MDI	11m:4		Drawarad	Analyzad	Dil Foo
Method: 6020 - Metals Analyte	(ICP/MS) - Dissolved Result Qualif	er RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
		RL 0.0100	MDL	Unit mg/L	D		Analyzed 05/22/15 12:10	Dil Fac
Analyte	Result Qualif		MDL		D	05/14/15 16:06		

Iron	739		1.25		mg/L		05/14/15 16:0	6 05/22/15 12:15	50
General Chemistry - Dissolved Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium, hex	ND	H	0.0100		mg/L			05/14/15 11:00	1

TestAmerica Nashville

Page 8 of 32

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

Date Collected: 05/13/15 08:45

Date Received: 05/14/15 08:30

Client Sample ID: Abiotic\_Day 7\_Dup\_051315

TestAmerica Job ID: 490-78405-1

Lab Sample ID: 490-78405-4

Matrix: Solid

Percent Solids: 78.6

Method: 6020 - Metals (ICP/MS) Analyte	Result Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	400	0.624		mg/Kg	<u></u>	05/14/15 11:13	05/18/15 21:51	1
Chromium	73.3	0.624		mg/Kg	₽	05/14/15 11:13	05/18/15 21:51	1
Copper	451	0.624		mg/Kg	☼	05/14/15 11:13	05/18/15 21:51	1
Iron	3690	6.24		mg/Kg	₩	05/14/15 11:13	05/18/15 21:51	1

General Chemistry Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Moisture	21		0.10		%			05/27/15 15:13	1
Percent Solids	79		0.10		%			05/27/15 15:13	1

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Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-78405-1

Client Sample ID: Abiotic Control\_051315

Date Collected: 05/13/15 12:00 Date Received: 05/14/15 08:30 Lab Sample ID: 490-78405-5

Matrix: Water

Analyte	Result (	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Nitrate as N	1.16		0.100		mg/L			05/14/15 15:04	1
Sulfate	9.05		1.00		mg/L			05/14/15 15:04	1
	(100(110) 01 1								
Method: 6020 - Metals	,								
Analyte	Result		RL	MDL		D	Prepared	Analyzed	
Analyte	,		RL 0.0100	MDL	Unit mg/L	D		Analyzed 05/22/15 11:04	Dil Fac
Analyte	Result			MDL		D	05/19/15 10:45		
Arsenic	Result 0		0.0100	MDL	mg/L	D_	05/19/15 10:45 05/19/15 10:45	05/22/15 11:04	5

General Chemistry - Dissolved<br/>AnalyteAnalyteResult<br/>Chromium, hexQualifierRLMDLUnitDPreparedAnalyzedDil FaChromium, hexNDH0.0100mg/L0.01000.0101

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

Date Collected: 05/13/15 12:00

Date Received: 05/14/15 08:30

**Percent Moisture** 

**Percent Solids** 

Client Sample ID: Abiotic Control 051315

TestAmerica Job ID: 490-78405-1

Lab Sample ID: 490-78405-6

Matrix: Solid

05/27/15 15:13

05/27/15 15:13

Percent Solids: 77.8

General Chemistry Analyte	Result Qualifier	RL	MDL Unit	D	Prepared	Analyzed	Dil Fac
lron -	1620	6.46	mg/Kg	₽	05/14/15 11:13	05/18/15 21:57	1
Copper	293	0.646	mg/Kg	₩	05/14/15 11:13	05/18/15 21:57	1
Chromium	46.0	0.646	mg/Kg	₩	05/14/15 11:13	05/18/15 21:57	1
Arsenic	221	0.646	mg/Kg	<u>₩</u>	05/14/15 11:13	05/18/15 21:57	1
Method: 6020 - Metals (ICP/N Analyte	(IS) Result Qualifier	RL	MDL Unit	D	Prepared	Analyzed	Dil Fac

0.10

0.10

%

22

**78** 

9

10

11

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-78405-1

Client Sample ID: Biotic\_051315

Date Collected: 05/13/15 12:15 Date Received: 05/14/15 08:30

Chromium, hex

Lab Sample ID: 490-78405-7

Matrix: Water

05/14/15 11:02

Method: 9056 - Anions, Ion Ch Analyte	• •	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Nitrate as N	1.23		0.100		mg/L			05/14/15 16:01	1
Sulfate	2810		10.0		mg/L			05/14/15 16:20	10
Method: 6020 - Metals (ICP/MS	) - Dissolve	ed							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	0.00493		0.00200		mg/L		05/14/15 16:06	05/22/15 12:05	1
Chromium	ND		0.00200		mg/L		05/14/15 16:06	05/22/15 12:05	1
Copper	0.694		0.00200		mg/L		05/14/15 16:06	05/22/15 12:05	1
Iron	98.8		0.0250		mg/L		05/14/15 16:06	05/22/15 12:05	1
- General Chemistry - Dissolved									
Analyte		Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac

0.0100

mg/L

ND

TestAmerica Nashville

3

5

7

8

9

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11

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

Date Collected: 05/13/15 12:15

Date Received: 05/14/15 08:30

Analyte

**Percent Moisture** 

**Percent Solids** 

Client Sample ID: Biotic 051315

TestAmerica Job ID: 490-78405-1

Lab Sample ID: 490-78405-8

Matrix: Solid

Percent Solids: 77.9

Analyzed

05/27/15 15:13

05/27/15 15:13

Analyte	Result Qualifier	RL	MDL Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	249	0.612	mg/Kg	<u> </u>	05/14/15 11:13	05/18/15 22:02	1
Chromium	45.6	0.612	mg/Kg	☼	05/14/15 11:13	05/18/15 22:02	1
Copper	305	0.612	mg/Kg	☼	05/14/15 11:13	05/18/15 22:02	1
Iron	5020	6.12	mg/Kg	₽	05/14/15 11:13	05/18/15 22:02	1

RL

0.10

0.10

MDL Unit

%

%

D

Prepared

Result Qualifier

22

**78** 

Dil Fac

9

10

12

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-78405-1

Client Sample ID: Biotic\_Dup\_051315

Date Collected: 05/13/15 12:25 Date Received: 05/14/15 08:30

Lab Sample ID: 490-78405-9

**Matrix: Water** 

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Nitrate as N	1.14		0.100		mg/L			05/14/15 16:39	1
Sulfate	2820		10.0		mg/L			05/14/15 16:59	10
Method: 6020 - Metals (ICP/MS)	- Dissolv	ed							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND		0.0100		mg/L		05/14/15 16:06	05/22/15 12:00	5
Chromium	ND		0.0100		mg/L		05/14/15 16:06	05/22/15 12:00	5
Copper	0.273		0.0100		mg/L		05/14/15 16:06	05/22/15 12:00	5
Iron	204		0.125		mg/L		05/14/15 16:06	05/22/15 12:00	5
General Chemistry - Dissolved									
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium, hex	ND		0.0100		mg/L			05/14/15 11:03	

TestAmerica Nashville

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

Date Collected: 05/13/15 12:25

Date Received: 05/14/15 08:30

Client Sample ID: Biotic\_Dup\_051315

TestAmerica Job ID: 490-78405-1

Lab Sample ID: 490-78405-10

Percent Solids: 79.3

**Matrix: Solid** 

Method: 6020 - Metals (ICP/MS) Analyte	Result Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	1400	6.20		mg/Kg	<u></u>	05/14/15 11:13	05/19/15 10:36	10
Chromium	88.9	0.620		mg/Kg	☆	05/14/15 11:13	05/18/15 22:19	1
Copper	1700	6.20		mg/Kg	₩	05/14/15 11:13	05/19/15 10:36	10
Iron	12600	6.20		mg/Kg	\$	05/14/15 11:13	05/18/15 22:19	1

General Chemistry Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Moisture	21		0.10		%			05/27/15 15:13	1
Percent Solids	79		0.10		%			05/27/15 15:13	1

TestAmerica Job ID: 490-78405-1

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

Method: 9056 - Anions, Ion Chromatography

Lab Sample ID: MB 490-248546/6 Client Sample ID: Method Blank Prep Type: Total/NA **Matrix: Water** 

**Analysis Batch: 248546** 

MB MB Analyte Result Qualifier RL **MDL** Unit Analyzed Dil Fac D Prepared 1.00 05/14/15 12:50 Sulfate ND mg/L

Lab Sample ID: LCS 490-248546/7 Client Sample ID: Lab Control Sample **Matrix: Water** Prep Type: Total/NA

**Analysis Batch: 248546** 

Spike LCS LCS %Rec. Added Limits Analyte Result Qualifier Unit %Rec Sulfate 100 94.67 mg/L 95 80 - 120

Lab Sample ID: LCSD 490-248546/8 Client Sample ID: Lab Control Sample Dup **Matrix: Water** Prep Type: Total/NA

Analysis Batch: 248546

Spike LCSD LCSD %Rec. **RPD** Added Result Qualifier Limits RPD Limit Analyte Unit D %Rec Sulfate 100 95.07 mg/L 95 80 - 120

Client Sample ID: Abiotic Control\_051315 Lab Sample ID: 490-78405-5 MS Prep Type: Total/NA

**Matrix: Water** 

**Analysis Batch: 248546** 

Sample Sample Spike MS MS %Rec. Analyte Result Qualifier Added Result Qualifier Unit %Rec Limits Sulfate 9.05 100 100.9 92 80 - 120 mg/L

Lab Sample ID: 490-78405-5 MSD Client Sample ID: Abiotic Control 051315 **Matrix: Water** Prep Type: Total/NA

**Analysis Batch: 248546** 

Spike MSD MSD %Rec. RPD Sample Sample Analyte Result Qualifier Added Result Qualifier Unit %Rec Limits RPD Limit Sulfate 9.05 100 92 100.6 mg/L 80 - 120

Lab Sample ID: MB 490-248547/6 **Client Sample ID: Method Blank** Prep Type: Total/NA

**Matrix: Water** 

**Analysis Batch: 248547** 

Analyte Result Qualifier RL MDL Unit Prepared D Analyzed Dil Fac 0 100 Nitrate as N mg/L 05/14/15 12:50 ND

MB MB

Lab Sample ID: LCS 490-248547/7 Client Sample ID: Lab Control Sample **Matrix: Water** Prep Type: Total/NA

Analysis Batch: 248547

Spike LCS LCS %Rec. Added Result Qualifier Analyte Unit %Rec Limits Nitrate as N 10.0 9.110 91 80 - 120

Lab Sample ID: LCSD 490-248547/8 Client Sample ID: Lab Control Sample Dup **Matrix: Water** Prep Type: Total/NA

**Analysis Batch: 248547** 

LCSD LCSD RPD Spike %Rec. Added Limits Analyte Result Qualifier Unit D %Rec RPD Limit Nitrate as N 10.0 9.099 91 80 - 120 mg/L

TestAmerica Nashville

TestAmerica Job ID: 490-78405-1

Client Sample ID: Abiotic Control\_051315

**Client Sample ID: Method Blank** 

05/14/15 11:13 05/18/15 21:12

**Client Sample ID: Lab Control Sample** 

Prep Type: Total/NA

**Prep Type: Total/NA** 

Prep Batch: 248268

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

Lab Sample ID: 490-78405-5 MS

**Matrix: Water** 

**Analysis Batch: 248547** 

Client Sample ID: Abiotic Control\_051315 **Prep Type: Total/NA** 

Sample Sample Spike MS MS %Rec. Analyte Result Qualifier Added Result Qualifier Unit D %Rec Limits Nitrate as N 10.0 9.947 88 80 - 120 1 16 mg/L

Lab Sample ID: 490-78405-5 MSD

**Matrix: Water** 

**Analysis Batch: 248547** 

**RPD** Sample Sample Spike MSD MSD %Rec. Limit Result Qualifier Added Result Qualifier Limits RPD Analyte Unit D %Rec Nitrate as N 1.16 10.0 9.994 mg/L 88 80 - 120 n

Method: 6020 - Metals (ICP/MS)

Lab Sample ID: MB 490-248268/1-A

**Matrix: Solid** 

Analysis Batch: 249316

MB MB **MDL** Unit Prepared Analyte Result Qualifier RL D Analyzed Dil Fac Arsenic  $\overline{\mathsf{ND}}$ 0.487 05/14/15 11:13 05/18/15 21:12 mg/Kg Chromium ND 0.487 mg/Kg 05/14/15 11:13 05/18/15 21:12 ND 0.487 mg/Kg 05/14/15 11:13 05/18/15 21:12 Copper

4.87

mg/Kg

Lab Sample ID: LCS 490-248268/2-A

**Matrix: Solid** 

Iron

**Analysis Batch: 249316** 

Spike

ND

LCS LCS %Rec. Analyte Added Result Qualifier Unit D %Rec Limits 19.7 Arsenic 17.09 mg/Kg 87 80 - 120 Chromium 19.7 18.27 mg/Kg 93 80 - 120 Copper 19.7 17.56 mg/Kg 89 80 - 120 Iron 197 194.9 mg/Kg 99 80 - 120

Lab Sample ID: 490-78405-2 MS

**Matrix: Solid** 

**Analysis Batch: 249316** 

Sample Sample Spike MS MS %Rec. Analyte Result Qualifier Added Result Qualifier Unit %Rec Limits Arsenic 311 F2 24.7 565.9 4 mg/Kg ☼ 1032 75 - 125 Ö Chromium 24.7 428.4 F1 1482 62.6 F1 F2 mg/Kg 75 - 125₩ Copper 459 24.7 651.7 4 mg/Kg 781 75 - 125 F2 3919 4 75 - 125 Iron 247 mg/Kg 330 3110

Lab Sample ID: 490-78405-2 MSD

Matrix: Solid

Analysis Batch: 249316									Prep Ba		
	Sample	Sample	Spike	MSD	MSD				%Rec.		RPD
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	RPD	Limit
Arsenic	311	F2	25.3	395.2	4 F2	mg/Kg	<u> </u>	332	75 - 125	36	20
Chromium	62.6	F1 F2	25.3	119.0	F1 F2	mg/Kg	₩	223	75 - 125	113	20
Copper	459	F2	25.3	385.4	4 F2	mg/Kg	₩	-291	75 - 125	51	20
Iron	3110		253	3492	4	mg/Kg	₩	153	75 - 125	12	20

TestAmerica Nashville

Page 17 of 32

Client Sample ID: Abiotic\_Day 7\_051315

Prep Type: Total/NA

Prep Batch: 248268

Prep Type: Total/NA Prep Batch: 248268

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

### Method: 6020 - Metals (ICP/MS) (Continued)

Lab Sample ID: MB 490-248409/1-A

**Matrix: Water** 

Analysis Batch: 249687

**Client Sample ID: Method Blank Prep Type: Total Recoverable** 

**Client Sample ID: Lab Control Sample** 

**Prep Batch: 248409** 

_	MB MB						
Analyte	Result Qua	lifier RL	MDL Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND	0.00200	mg/L		05/14/15 16:06	05/19/15 17:34	1
Chromium	ND	0.00200	mg/L		05/14/15 16:06	05/19/15 17:34	1
Copper	ND	0.00200	mg/L		05/14/15 16:06	05/19/15 17:34	1
Iron	ND	0.0250	mg/L		05/14/15 16:06	05/19/15 17:34	1

Lab Sample ID: LCS 490-248409/2-A

**Matrix: Water** 

**Analysis Batch: 249687** 

**Prep Type: Total Recoverable Prep Batch: 248409** 

	<b>Бріке</b>	LCS	LCS			%Rec.	
Analyte	Added	Result	Qualifier	Unit [	%Rec	Limits	
Arsenic	0.100	0.1003		mg/L	100	80 - 120	
Chromium	0.100	0.1024		mg/L	102	80 - 120	
Copper	0.100	0.09527		mg/L	95	80 - 120	
Iron	1.00	1.092		mg/L	109	80 - 120	

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Lab Sample ID: 490-78368-A-1-B MS

**Matrix: Water** 

Analysis Batch: 249687

**Client Sample ID: Matrix Spike Prep Type: Dissolved** 

Prep Batch: 248409

Sample Sample Spike MS MS %Rec. Analyte Result Qualifier Added Result Qualifier Unit Limits D %Rec Arsenic ND 0.100 0.1009 mg/L 101 75 - 125 Chromium ND 0.100 0.1029 mg/L 103 75 - 125 Copper ND 0.100 0.09580 mg/L 95 75 - 125 Iron ND 1.00 1.095 mg/L 108 75 - 125

Lab Sample ID: 490-78368-A-1-C MSD

**Matrix: Water** 

**Analysis Batch: 249687** 

**Client Sample ID: Matrix Spike Duplicate** 

**Prep Type: Dissolved** Prep Batch: 248409

-	Sample	Sample	Spike	MSD	MSD				%Rec.		RPD
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	RPD	Limit
Arsenic	ND		0.100	0.09822		mg/L		98	75 - 125	3	20
Chromium	ND		0.100	0.1005		mg/L		101	75 - 125	2	20
Copper	ND		0.100	0.09528		mg/L		94	75 - 125	1	20
Iron	ND		1.00	1.066		mg/L		105	75 - 125	3	20

Lab Sample ID: MB 490-249403/1-B

**Matrix: Water** 

**Analysis Batch: 250589** 

**Client Sample ID: Method Blank Prep Type: Dissolved** 

Prep Batch: 249411

	MB	MB							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND		0.00200		mg/L	<del></del> _	05/19/15 10:45	05/22/15 10:49	1
Chromium	ND		0.00200		mg/L		05/19/15 10:45	05/22/15 10:49	1
Copper	ND		0.00200		mg/L		05/19/15 10:45	05/22/15 10:49	1
Iron	ND		0.0250		mg/L		05/19/15 10:45	05/22/15 10:49	1

TestAmerica Nashville

5/29/2015

TestAmerica Job ID: 490-78405-1

Client Sample ID: Method Blank

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

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Method: 6020 - Metals (ICP/MS) (Continued)

Lab Sample ID: LCS 490-249403/2-B				Clie	Sample			
Matrix: Water							Prep Type: [	Dissolved
Analysis Batch: 250589							Prep Batcl	n: <b>249411</b>
	Spike	LCS	LCS				%Rec.	
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Arsenic	0.100	0.1015		mg/L		102	80 - 120	
Chromium	0.100	0.1020		mg/L		102	80 - 120	
Copper	0.100	0.09980		mg/L		100	80 - 120	
Iron	1.00	1.077		ma/L		108	80 - 120	

Lab Sample ID: LCSD 490-249403/3-B Matrix: Water Analysis Batch: 250589							ample ID: Lab Control \$ Prep Type Prep Ba				
	Spike	LCSD	LCSD				%Rec.		RPD		
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits	RPD	Limit		
Arsenic	0.100	0.09757		mg/L		98	80 - 120	4	20		
Chromium	0.100	0.09796		mg/L		98	80 - 120	4	20		
Copper	0.100	0.09913		mg/L		99	80 - 120	1	20		
Iron	1.00	1.058		mg/L		106	80 - 120	2	20		

# Method: 7196A - Chromium, Hexavalent

Lab Sample ID: MB 490-248616/1

Matrix: Water							Pre	ep Type: To	
Analysis Batch: 248616									
	MB	MB							
Analyto E	Poeult	Qualifier	DI	MDI	Unit	D	Propared	Analyzod	Dil Fac

Analyte	Result Qualifier	RL	MDL Unit	D	Prepared	Analyzed	Dil Fac
Chromium, hex	ND	0.0100	mg/L			05/14/15 10:52	1

Lab Sample ID: LCS 490-248616/2	Client Sample ID: Lab Control Sample
Matrix: Water	Prep Type: Total/NA
Analysis Batch: 248616	

	Spike	LCS	LCS				%Rec.	
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Chromium, hex	0.100	0.1030		mg/L	_	103	85 - 115	

Lab Sample ID: 490-78405-1 MS	Client Sample ID: Abiotic_Day 7_051315
Matrix: Water	Prep Type: Dissolved
Analysis Batch: 248616	

	Sample	Sample	Spike	MS	MS				%Rec.	
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Chromium, hex	ND	H F1	100	79.00	F1	mg/L		79	85 - 115	

Lab Sample ID: 490-78405-1 MSD Matrix: Water Analysis Batch: 248616						Client Sa	amp		Abiotic_D Prep Typ	-	
	Sample	Sample	Spike	MSD	MSD				%Rec.		RPD
A a l4 a	D 14	O	A alala al	Danula	O	11	_	0/ D	1 !!4	DDD	1 !!4

Sample Sample Sample Sample SpikeMSD MSD%Rec.RPDAnalyteResult Chromium, hexQualifier NDAdded HF1Result NDQualifier TP1Qualifier TP2Unit TP2D MSD%Rec.Limit TP2

TestAmerica Nashville

# **QC Sample Results**

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-78405-1

## Method: 7196A - Chromium, Hexavalent (Continued)

Lab Sample ID: 490-78405-1 DU

Client Sample ID: Abiotic\_Day 7\_051315

Matrix: Water

Prep Type: Dissolved

**Analysis Batch: 248616** 

ı		Sample	Sample	DU	DU				RPD	
	Analyte	Result	Qualifier	Result	Qualifier	Unit	D	RPD	Limit	
	Chromium, hex	ND	H F1	 ND		mg/L		NC	20	

### **Method: Moisture - Percent Moisture**

Lab Sample ID: 490-77315-A-4 DU

Matrix: Solid

Client Sample ID: Duplicate
Prep Type: Total/NA

Analysis Batch: 251326

, , , , , , , , , , , , , , , , , , , ,	Sample	Sample	DU	DU					RPD
Analyte	Result	Qualifier	Result	Qualifier	Unit	D		RPD	Limit
Percent Moisture	27		27		%			0	20
Percent Solids	73		73		%			0	20

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TestAmerica Job ID: 490-78405-1

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

### HPLC/IC

# Analysis Batch: 248546

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-78405-1	Abiotic_Day 7_051315	Total/NA	Water	9056	
490-78405-3	Abiotic_Day 7_Dup_051315	Total/NA	Water	9056	
490-78405-5	Abiotic Control_051315	Total/NA	Water	9056	
490-78405-5 MS	Abiotic Control_051315	Total/NA	Water	9056	
490-78405-5 MSD	Abiotic Control_051315	Total/NA	Water	9056	
490-78405-7	Biotic_051315	Total/NA	Water	9056	
490-78405-9	Biotic_Dup_051315	Total/NA	Water	9056	
LCS 490-248546/7	Lab Control Sample	Total/NA	Water	9056	
LCSD 490-248546/8	Lab Control Sample Dup	Total/NA	Water	9056	
MB 490-248546/6	Method Blank	Total/NA	Water	9056	

### **Analysis Batch: 248547**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-78405-1	Abiotic_Day 7_051315	Total/NA	Water	9056	
490-78405-3	Abiotic_Day 7_Dup_051315	Total/NA	Water	9056	
490-78405-5	Abiotic Control_051315	Total/NA	Water	9056	
490-78405-5 MS	Abiotic Control_051315	Total/NA	Water	9056	
490-78405-5 MSD	Abiotic Control_051315	Total/NA	Water	9056	
490-78405-7	Biotic_051315	Total/NA	Water	9056	
490-78405-9	Biotic_Dup_051315	Total/NA	Water	9056	
LCS 490-248547/7	Lab Control Sample	Total/NA	Water	9056	
LCSD 490-248547/8	Lab Control Sample Dup	Total/NA	Water	9056	
MB 490-248547/6	Method Blank	Total/NA	Water	9056	

### **Metals**

### **Prep Batch: 248268**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-78405-2	Abiotic_Day 7_051315	Total/NA	Solid	3051A	
490-78405-2 MS	Abiotic_Day 7_051315	Total/NA	Solid	3051A	
490-78405-2 MSD	Abiotic_Day 7_051315	Total/NA	Solid	3051A	
490-78405-4	Abiotic_Day 7_Dup_051315	Total/NA	Solid	3051A	
490-78405-6	Abiotic Control_051315	Total/NA	Solid	3051A	
490-78405-8	Biotic_051315	Total/NA	Solid	3051A	
490-78405-10	Biotic_Dup_051315	Total/NA	Solid	3051A	
LCS 490-248268/2-A	Lab Control Sample	Total/NA	Solid	3051A	
MB 490-248268/1-A	Method Blank	Total/NA	Solid	3051A	

# **Prep Batch: 248409**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-78368-A-1-B MS	Matrix Spike	Dissolved	Water	3005A	_
490-78368-A-1-C MSD	Matrix Spike Duplicate	Dissolved	Water	3005A	
490-78405-1	Abiotic_Day 7_051315	Dissolved	Water	3005A	
490-78405-3	Abiotic_Day 7_Dup_051315	Dissolved	Water	3005A	
490-78405-7	Biotic_051315	Dissolved	Water	3005A	
490-78405-9	Biotic_Dup_051315	Dissolved	Water	3005A	
LCS 490-248409/2-A	Lab Control Sample	Total Recoverable	Water	3005A	
MB 490-248409/1-A	Method Blank	Total Recoverable	Water	3005A	

TestAmerica Nashville

Page 21 of 32

# **QC Association Summary**

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-78405-1

# **Metals (Continued)**

### Analysis Batch: 249316

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-78405-2	Abiotic_Day 7_051315	Total/NA	Solid	6020	248268
490-78405-2 MS	Abiotic_Day 7_051315	Total/NA	Solid	6020	248268
490-78405-2 MSD	Abiotic_Day 7_051315	Total/NA	Solid	6020	248268
490-78405-4	Abiotic_Day 7_Dup_051315	Total/NA	Solid	6020	248268
490-78405-6	Abiotic Control_051315	Total/NA	Solid	6020	248268
490-78405-8	Biotic_051315	Total/NA	Solid	6020	248268
490-78405-10	Biotic_Dup_051315	Total/NA	Solid	6020	248268
LCS 490-248268/2-A	Lab Control Sample	Total/NA	Solid	6020	248268
MB 490-248268/1-A	Method Blank	Total/NA	Solid	6020	248268

### Filtration Batch: 249403

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-78405-5	Abiotic Control_051315	Dissolved	Water	Filtration	
LCS 490-249403/2-B	Lab Control Sample	Dissolved	Water	Filtration	
LCSD 490-249403/3-B	Lab Control Sample Dup	Dissolved	Water	Filtration	
MB 490-249403/1-B	Method Blank	Dissolved	Water	Filtration	

### **Prep Batch: 249411**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-78405-5	Abiotic Control_051315	Dissolved	Water	3005A	249403
LCS 490-249403/2-B	Lab Control Sample	Dissolved	Water	3005A	249403
LCSD 490-249403/3-B	Lab Control Sample Dup	Dissolved	Water	3005A	249403
MB 490-249403/1-B	Method Blank	Dissolved	Water	3005A	249403

### **Analysis Batch: 249440**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-78405-10	Biotic_Dup_051315	Total/NA	Solid	6020	248268

### **Analysis Batch: 249687**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-78368-A-1-B MS	Matrix Spike	Dissolved	Water	6020	248409
490-78368-A-1-C MSD	Matrix Spike Duplicate	Dissolved	Water	6020	248409
LCS 490-248409/2-A	Lab Control Sample	Total Recoverable	Water	6020	248409
MB 490-248409/1-A	Method Blank	Total Recoverable	Water	6020	248409

### **Analysis Batch: 250589**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-78405-1	Abiotic_Day 7_051315	Dissolved	Water	6020	248409
490-78405-1	Abiotic_Day 7_051315	Dissolved	Water	6020	248409
490-78405-3	Abiotic_Day 7_Dup_051315	Dissolved	Water	6020	248409
490-78405-3	Abiotic_Day 7_Dup_051315	Dissolved	Water	6020	248409
490-78405-5	Abiotic Control_051315	Dissolved	Water	6020	249411
490-78405-7	Biotic_051315	Dissolved	Water	6020	248409
490-78405-9	Biotic_Dup_051315	Dissolved	Water	6020	248409
LCS 490-249403/2-B	Lab Control Sample	Dissolved	Water	6020	249411
LCSD 490-249403/3-B	Lab Control Sample Dup	Dissolved	Water	6020	249411
MB 490-249403/1-B	Method Blank	Dissolved	Water	6020	249411

Page 22 of 32

# **QC Association Summary**

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-78405-1

# **General Chemistry**

### Filtration Batch: 248611

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-78405-1	Abiotic_Day 7_051315	Dissolved	Water	Filtration	
490-78405-1 DU	Abiotic_Day 7_051315	Dissolved	Water	Filtration	
490-78405-1 MS	Abiotic_Day 7_051315	Dissolved	Water	Filtration	
490-78405-1 MSD	Abiotic_Day 7_051315	Dissolved	Water	Filtration	
490-78405-3	Abiotic_Day 7_Dup_051315	Dissolved	Water	Filtration	
490-78405-5	Abiotic Control_051315	Dissolved	Water	Filtration	
490-78405-7	Biotic_051315	Dissolved	Water	Filtration	
490-78405-9	Biotic_Dup_051315	Dissolved	Water	Filtration	

### **Analysis Batch: 248616**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-78405-1	Abiotic_Day 7_051315	Dissolved	Water	7196A	248611
490-78405-1 DU	Abiotic_Day 7_051315	Dissolved	Water	7196A	248611
490-78405-1 MS	Abiotic_Day 7_051315	Dissolved	Water	7196A	248611
490-78405-1 MSD	Abiotic_Day 7_051315	Dissolved	Water	7196A	248611
490-78405-3	Abiotic_Day 7_Dup_051315	Dissolved	Water	7196A	248611
490-78405-5	Abiotic Control_051315	Dissolved	Water	7196A	248611
490-78405-7	Biotic_051315	Dissolved	Water	7196A	248611
490-78405-9	Biotic_Dup_051315	Dissolved	Water	7196A	248611
LCS 490-248616/2	Lab Control Sample	Total/NA	Water	7196A	
MB 490-248616/1	Method Blank	Total/NA	Water	7196A	

### **Analysis Batch: 251326**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-77315-A-4 DU	Duplicate	Total/NA	Solid	Moisture	
490-78405-2	Abiotic_Day 7_051315	Total/NA	Solid	Moisture	
490-78405-4	Abiotic_Day 7_Dup_051315	Total/NA	Solid	Moisture	
490-78405-6	Abiotic Control_051315	Total/NA	Solid	Moisture	
490-78405-8	Biotic_051315	Total/NA	Solid	Moisture	
490-78405-10	Biotic_Dup_051315	Total/NA	Solid	Moisture	

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1:

Client: Geosyntec Consultants, Inc.

Project/Site: Treatability Study

Lab Sample ID: 490-78405-1

**Matrix: Water** 

Client Sample ID: Abiotic Day 7 051315 Date Collected: 05/13/15 08:35

Date Received: 05/14/15 08:30

	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Analysis	9056		1	10 mL		248547	05/14/15 13:48	CLN	TAL NSH
Total/NA	Analysis	9056		10	10 mL		248546	05/14/15 14:07	CLN	TAL NSH
Dissolved	Prep	3005A			50 mL	50 mL	248409	05/14/15 16:06	RDF	TAL NSH
Dissolved	Analysis	6020		10	50 mL	50 mL	250589	05/22/15 12:20	JBD	TAL NSH
Dissolved	Prep	3005A			50 mL	50 mL	248409	05/14/15 16:06	RDF	TAL NSH
Dissolved	Analysis	6020		1	50 mL	50 mL	250589	05/22/15 12:51	JBD	TAL NSH
Dissolved	Filtration	Filtration			1.0 mL	1.0 mL	248611	05/14/15 10:41	BLM	TAL NSH
Dissolved	Analysis	7196A		1000	10 mL	10 mL	248616	05/14/15 10:58	BLM	TAL NSH

Client Sample ID: Abiotic\_Day 7\_051315

Date Collected: 05/13/15 08:35

Date Received: 05/14/15 08:30

Lab Sample ID: 490-78405-2 **Matrix: Solid** 

Percent Solids: 79.3

	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.521 g	100 mL	248268	05/14/15 11:13	ZLN	TAL NSH
Total/NA	Analysis	6020		1	0.521 g	100 mL	249316	05/18/15 21:23	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			251326	05/27/15 15:13	MAA	TAL NSH

Client Sample ID: Abiotic\_Day 7\_Dup\_051315

Date Collected: 05/13/15 08:45

Date Received: 05/14/15 08:30

Lab Sample ID: 490-78405-3

**Matrix: Water** 

Prep Type Total/NA	Batch Type Analysis	Batch Method 9056	Run	Factor 1	Initial Amount 10 mL	Final Amount	Batch Number 248547	Prepared or Analyzed 05/14/15 14:26	Analyst CLN	Lab TAL NSH
Total/NA	Analysis	9056		10	10 mL		248546	05/14/15 14:45	CLN	TAL NSH
Dissolved Dissolved	Prep Analysis	3005A 6020		5	50 mL 50 mL	50 mL 50 mL	248409 250589	05/14/15 16:06 05/22/15 12:10		TAL NSH TAL NSH
Dissolved Dissolved	Prep Analysis	3005A 6020		50	50 mL 50 mL	50 mL 50 mL	248409 250589	05/14/15 16:06 05/22/15 12:15		TAL NSH TAL NSH
Dissolved Dissolved	Filtration Analysis	Filtration 7196A		1	1.0 mL 10 mL	1.0 mL 10 mL	248611 248616	05/14/15 10:41 05/14/15 11:00	BLM BLM	TAL NSH TAL NSH

Client Sample ID: Abiotic\_Day 7\_Dup\_051315

Date Collected: 05/13/15 08:45

Date Received: 05/14/15 08:30

Lab Sample	ID: 490-78405-4
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**Matrix: Solid** 

Percent Solids: 78.6

		Batch	Batch		Dil	Initial	Final	Batch	Prepared		
ı	Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
=	Total/NA	Prep	3051A			0.510 g	100 mL	248268	05/14/15 11:13	ZLN	TAL NSH
-	Total/NA	Analysis	6020		1	0.510 g	100 mL	249316	05/18/15 21:51	JBD	TAL NSH
-	Total/NA	Analysis	Moisture		1			251326	05/27/15 15:13	MAA	TAL NSH

TestAmerica Nashville

5/29/2015

Page 24 of 32

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

Client Sample ID: Abiotic Control\_051315

Date Collected: 05/13/15 12:00 Date Received: 05/14/15 08:30

Lab Sample ID: 490-78405-5

**Matrix: Water** 

	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Analysis	9056		1	10 mL		248546	05/14/15 15:04	CLN	TAL NSH
Total/NA	Analysis	9056		1	10 mL		248547	05/14/15 15:04	CLN	TAL NSH
Dissolved	Prep	3005A			50 mL	50 mL	249411	05/19/15 10:45	TSC	TAL NSH
Dissolved	Filtration	Filtration			50 mL	50 mL	249403	05/19/15 10:45	TSC	TAL NSH
Dissolved	Analysis	6020		5	50 mL	50 mL	250589	05/22/15 11:04	JBD	TAL NSH
Dissolved	Filtration	Filtration			1.0 mL	1.0 mL	248611	05/14/15 10:41	BLM	TAL NSH
Dissolved	Analysis	7196A		1	10 mL	10 mL	248616	05/14/15 11:08	BLM	TAL NSH

Client Sample ID: Abiotic Control\_051315

Date Collected: 05/13/15 12:00

Date Received: 05/14/15 08:30

Lab Sample ID: 490-78405-6

Lab Sample ID: 490-78405-7

**Matrix: Solid** Percent Solids: 77.8

Prep Type Total/NA	Batch Type Prep	Batch Method 3051A	Run	Dil Factor	Initial Amount 0.497 q	Final Amount 100 mL	Batch Number 248268	Prepared or Analyzed 05/14/15 11:13	Analyst	Lab TAL NSH
Total/NA	Analysis	6020		1	0.497 g 0.497 g	100 mL	246266 249316	05/14/15 11.13		TAL NSH
Total/NA	Analysis	Moisture		1			251326	05/27/15 15:13	MAA	TAL NSH

Client Sample ID: Biotic\_051315

Date Collected: 05/13/15 12:15

Date Received: 05/14/15 08:30

	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Analysis	9056		1	10 mL		248547	05/14/15 16:01	CLN	TAL NSF
Total/NA	Analysis	9056		10	10 mL		248546	05/14/15 16:20	CLN	TAL NSH
Dissolved	Prep	3005A			50 mL	50 mL	248409	05/14/15 16:06	RDF	TAL NSF
Dissolved	Analysis	6020		1	50 mL	50 mL	250589	05/22/15 12:05	JBD	TAL NSF
Dissolved	Filtration	Filtration			1.0 mL	1.0 mL	248611	05/14/15 10:41	BLM	TAL NSF
Dissolved	Analysis	7196A		1	10 mL	10 mL	248616	05/14/15 11:02	BLM	TAL NSH

Client Sample ID: Biotic\_051315

Date Collected: 05/13/15 12:15

Date Received: 05/14/15 08:30

Lab Sample ID: 490-78405-8

**Matrix: Solid** 

**Matrix: Water** 

Percent Solids: 77.9

	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.524 g	100 mL	248268	05/14/15 11:13	ZLN	TAL NSH
Total/NA	Analysis	6020		1	0.524 g	100 mL	249316	05/18/15 22:02	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			251326	05/27/15 15:13	MAA	TAL NSH

TestAmerica Nashville

### **Lab Chronicle**

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

Client Sample ID: Biotic\_Dup\_051315

TestAmerica Job ID: 490-78405-1

Lab Sample ID: 490-78405-9

**Matrix: Water** 

Date Collected: 05/13/15 12:25 Date Received: 05/14/15 08:30

	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Analysis	9056		1	10 mL		248547	05/14/15 16:39	CLN	TAL NSH
Total/NA	Analysis	9056		10	10 mL		248546	05/14/15 16:59	CLN	TAL NSH
Dissolved	Prep	3005A			50 mL	50 mL	248409	05/14/15 16:06	RDF	TAL NSH
Dissolved	Analysis	6020		5	50 mL	50 mL	250589	05/22/15 12:00	JBD	TAL NSH
Dissolved	Filtration	Filtration			1.0 mL	1.0 mL	248611	05/14/15 10:41	BLM	TAL NSH
Dissolved	Analysis	7196A		1	10 mL	10 mL	248616	05/14/15 11:03	BLM	TAL NSH

Lab Sample ID: 490-78405-10 Client Sample ID: Biotic\_Dup\_051315

Date Collected: 05/13/15 12:25 **Matrix: Solid** Date Received: 05/14/15 08:30 Percent Solids: 79.3

_	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.508 g	100 mL	248268	05/14/15 11:13	ZLN	TAL NSH
Total/NA	Analysis	6020		1	0.508 g	100 mL	249316	05/18/15 22:19	JBD	TAL NSH
Total/NA	Prep	3051A			0.508 g	100 mL	248268	05/14/15 11:13	ZLN	TAL NSH
Total/NA	Analysis	6020		10	0.508 g	100 mL	249440	05/19/15 10:36	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			251326	05/27/15 15:13	MAA	TAL NSH

### **Laboratory References:**

TAL NSH = TestAmerica Nashville, 2960 Foster Creighton Drive, Nashville, TN 37204, TEL (615)726-0177

# **Method Summary**

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-78405-1

Method	Method Description	Protocol	Laboratory
9056	Anions, Ion Chromatography	SW846	TAL NSH
6020	Metals (ICP/MS)	SW846	TAL NSH
7196A	Chromium, Hexavalent	SW846	TAL NSH
Moisture	Percent Moisture	EPA	TAL NSH

### **Protocol References:**

EPA = US Environmental Protection Agency

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

### **Laboratory References:**

TAL NSH = TestAmerica Nashville, 2960 Foster Creighton Drive, Nashville, TN 37204, TEL (615)726-0177

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# **Certification Summary**

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-78405-1

# Laboratory: TestAmerica Nashville

All certifications held by this laboratory are listed. Not all certifications are applicable to this report.

Authority	Program	EPA Region	Certification ID	Expiration Date
A2LA	A2LA		NA: NELAP & A2LA	12-31-15
A2LA	ISO/IEC 17025		0453.07	12-31-15
Alaska (UST)	State Program	10	UST-087	10-31-15
Arizona	State Program	9	AZ0473	05-05-16
Arkansas DEQ	State Program	6	88-0737	04-25-16
California	State Program	9	2938	10-31-16
Connecticut	State Program	1	PH-0220	12-31-15
Florida	NELAP	4	E87358	06-30-15
Illinois	NELAP	5	200010	12-09-15
lowa	State Program	7	131	04-01-16
Kansas	NELAP	7	E-10229	05-31-15
Kentucky (UST)	State Program	4	19	06-30-15
Kentucky (WW)	State Program	4	90038	12-31-15
Louisiana	NELAP	6	30613	06-30-15
Maryland	State Program	3	316	03-31-16
Massachusetts	State Program	1	M-TN032	06-30-15
Minnesota	NELAP	5	047-999-345	12-31-15
Mississippi	State Program	4	N/A	06-30-15
Montana (UST)	State Program	8	NA	02-24-20
Nevada	State Program	9	TN00032	07-31-15
New Hampshire	NELAP	1	2963	10-09-15
New Jersey	NELAP	2	TN965	06-30-15
New York	NELAP	2	11342	03-31-16
North Carolina (WW/SW)	State Program	4	387	12-31-15
North Dakota	State Program	8	R-146	06-30-15
Ohio VAP	State Program	5	CL0033	10-16-15
Oklahoma	State Program	6	9412	08-31-15
Oregon	NELAP	10	TN200001	04-27-16
Pennsylvania	NELAP	3	68-00585	06-30-15
Rhode Island	State Program	1	LAO00268	12-30-15
South Carolina	State Program	4	84009 (001)	02-28-16
South Carolina (DW)	State Program	4	84009 (002)	12-16-17
Tennessee	State Program	4	2008	02-23-17
Texas	NELAP	6	T104704077	08-31-15
USDA	Federal		S-48469	10-30-16
Utah	NELAP	8	TN00032	07-31-15
Virginia	NELAP	3	460152	06-14-15
Washington	State Program	10	C789	07-19-15
West Virginia DEP	State Program	3	219	02-28-16
Wisconsin	State Program	5	998020430	08-31-15
Wyoming (UST)	A2LA	8	453.07	12-31-15





# **COOLER RECEIPT FORM**

Cooler Received/Opened On 5/14/2015 @ 0830	
1. Tracking #(last 4 digits, FedEx)	
Courier: Fed-ex IR Gun ID 17960357	
2. Temperature of rep. sample or temp blank when opened:	
3. If Item #2 temperature is $0^{\circ}\text{C}$ or less, was the representative sample or temp blank frozen?	YES NO. NA
4. Were custody seals on outside of cooler?	YES)NONA
If yes, how many and where:	
5. Were the seals intact, signed, and dated correctly?	YESNONA
6. Were custody papers inside cooler?	YES)NONA
certify that I opened the cooler and answered questions 1-6 (intial)	W
7. Were custody seals on containers: YES 🐞 and Intact	YESNO., NA
Were these signed and dated correctly?	YESNO.
3. Packing mat'l used? (Bubblewra) (Plastic bag) Peanuts Vermiculite Foam Insert Paper	Other None
O. Cooling process: dee lce-pack lce (direct contact) Dry ice	Other None
10. Did all containers arrive in good condition (unbroken)?	YESNONA
11. Were all container labels complete (#, date, signed, pres., etc)?	(ES)NONA
2. Did all container labels and tags agree with custody papers?	ESNONA
3a. Were VOA vials received?	YES(O)NA
b. Was there any observable headspace present in any VOA vial?	YESNO.
14. Was there a Trip Blank in this cooler? YESNO. (MA) If multiple coolers, sequence	e #
certify that I unloaded the cooler and answered questions 7-14 (intial)	Mary
5a. On pres'd bottles, did pH test strips suggest preservation reached the correct pH level?	YESNO:
b. Did the bottle labels indicate that the correct preservatives were used	ESNONA
6. Was residual chlorine present?	YESNO
certify that I checked for chlorine and pH as per SOP and answered questions 15-16 (intial)	Morn
7. Were custody papers properly filled out (ink, signed, etc)?	ÆŠ)NONA
8. Did you sign the custody papers in the appropriate place?	YES NONA
9. Were correct containers used for the analysis requested?	NONA
20. Was sufficient amount of sample sent in each container?	YESNA
certify that I entered this project into LIMS and answered questions 17-20 (intial)	193.n
certify that I attached a label with the unique LIMS number to each container (intial)	M>M
المن المنظمة ا 1. Were there Non-Conformance issues at login? (1987) Was a NCM generated? (1987) المنظمة	NO#

Total   Tota	TestAmerica Nashville								l oc: 490	90	7	<b>(+&gt;</b>	3
Committee   Comm	2960 Foster Creighton Drive Nashville, TN 37204 Phono (645) 726 0477 Env (645) 726 3404	C	hain of C	ustody R	ecord				784	05	# 1.7	LEADER WEN	PINOMENTAL TESTING
Second   Computation   From   Set   320 - 502   Computation   Computat	Client Information	_	1	Lab PI Bake	v: r, Heather			Carrier Tr			00C	No: 36874-1251	
Subst A   Analysis Requested	Client Contact: Amar Wadhawan	865-	330-003)	E-Mail heath	er.baker@te	estamericain	c.com				Page:		042
Camping   Contents   Camping   Contents   Camping   Ca	Company: Geosyntec Consultants, Inc.					A	sis	equested	_		Job #		
Companies Com   Companies Control Regulated (days);   Companies Cont	Suite	Due Date Requested	<del></del>							سىدى: ئۇلۇ	Pres	8	les:
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Sample   Marix   Sample	Email: awadhawan@geosyntec.com	#O#			100000000000000000000000000000000000000	m				oscilla " r			U - Acetone V - MCAA
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Water	1		212	<u> </u>							ュ	)	served
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Sample Disposal (A fee may be assessed if samples are retained longer than 1 mo   Skin Irritant   Poison B   Unknown   Radiological   Seturn To Client   Disposal By Lab   Archive For	Biotic_ 051315	<	@ 	<u> </u>	_	×					ija		
ed: I, II, III, IV, Other (specify)    Custody Seal No.:   Date/firme:   Date:   Date/firme:   Date/firme:   Date/firme:   Date/firme:   Date/firme:   Company   Received by:   Date/firme:   Date/firme:	le Skin Irritant			ogical	Sample I	Disposal ( A turn To Clier	fee may bo	e assessed Disposal	l <b>if sample</b> Bv Lab	s are retai ⊟ Ar	<b>ned lo</b> s chive F	nger than 1 or	month)
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TestAmerica Nashville 2960 Foster Creighton Drive Nashville, TN 37204 Phone (615) 726-0177 Fax (615) 726

# **Chain of Custody Record**

Loc: 490 **78405** 

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△ Yes △ No	Custody Seals Intact:   Custody Seal No.	Relinquished by:	elinquished by:	Chen L	Empty Kit Relinquished by:	Deliverable Requested: I, II, III, IV, Other (specify)	Non-Hazard Flammable Skin Irritant	Possible Hazard Identification									Biotic - Dup - 051315	Biotic_Pup_ objais	Biotic_ Dup_ 051315		Sample Identification		Project Name: Treatability Study	Email: awadhawan@geosyntec.com	Phone:	State, Zip: MD, 21046	City: Columbia	Address: 10220 Old Columbia Road Suite A	Company: Geosyntec Consultants, Inc.	Client Contact: Amar Wadhawan	Client Information	Phone (615) 726-0177 Fax (615) 726-3404
		Date/Time:	Time:	Date/Time: 5/13/15 1300	Date:		□ Poison B □ Unknown □ Rad										<		05/3/15 1225		Sample Date Time G=	SSOW#:	Project #: 49008518	WO#	Po#: Purchase Order Requested		TAT Requested (days):	Due Date Requested:			Sampler: Linki Chek	Constitution
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# **Login Sample Receipt Checklist**

Client: Geosyntec Consultants, Inc.

Job Number: 490-78405-1

SDG Number:

Login Number: 78405 List Source: TestAmerica Nashville

List Number: 1

Creator: McBride, Mike

Creator. MCDride, Mike		
Question	Answer	Comment
Radioactivity wasn't checked or is = background as measured by a survey meter.</td <td>True</td> <td></td>	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	3.6
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	False	Limited volume received.
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	True	

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THE LEADER IN ENVIRONMENTAL TESTING

# **ANALYTICAL REPORT**

TestAmerica Laboratories, Inc.

TestAmerica Nashville 2960 Foster Creighton Drive Nashville, TN 37204 Tel: (615)726-0177

TestAmerica Job ID: 490-78877-1

TestAmerica Sample Delivery Group: TEL Client Project/Site: CCA Treatability

### For:

Geosyntec Consultants, Inc. 10220 Old Columbia Road Suite A Columbia, Maryland 21046

Attn: Amar Wadhawan

# Heather Bafer

Authorized for release by: 6/9/2015 3:59:57 PM

Heather Baker, Project Manager I (615)301-5043

heather.baker@testamericainc.com

·····LINKS ·······

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**Have a Question?** 



Visit us at: www.testamericainc.com

The test results in this report meet all 2003 NELAC and 2009 TNI requirements for accredited parameters, exceptions are noted in this report. This report may not be reproduced except in full, and with written approval from the laboratory. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

TestAmerica Job ID: 490-78877-1 SDG: TEL

# **Table of Contents**

Cover Page	1
Table of Contents	2
Sample Summary	3
Case Narrative	4
Definitions	5
Client Sample Results	6
QC Sample Results	10
QC Association	16
Chronicle	19
Method Summary	21
Certification Summary	
Chain of Custody	23
Receipt Checklists	25

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# **Sample Summary**

Client: Geosyntec Consultants, Inc. Project/Site: CCA Treatability

Lab Sample ID 490-78877-1 490-78877-2 490-78877-3 490-78877-4 TestAmerica Job ID: 490-78877-1 SDG: TEL

Client Sample ID	Matrix	Collected Re	ceived
Abiotic_Day 14_052015	Water	05/20/15 10:30 05/21	/15 08:30
Abiotic_Day 14_052015	Solid	05/20/15 10:30 05/21	/15 08:30
Abiotic_Day 14_Dup_052015	Water	05/20/15 10:40 05/21	/15 08:30
Abiotic_Day 14_Dup_052015	Solid	05/20/15 10:40 05/21	/15 08:30

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### Case Narrative

Client: Geosyntec Consultants, Inc. Project/Site: CCA Treatability

TestAmerica Job ID: 490-78877-1

SDG: TEL

Job ID: 490-78877-1

Laboratory: TestAmerica Nashville

**Narrative** 

Job Narrative 490-78877-1

### Comments

No additional comments.

### Receipt

The samples were received on 5/21/2015 8:30 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 4.1° C.

### HPLC/IC

Method 9056: The following sample was diluted due to the nature of the sample matrix: Abiotic Day 14 052015 (490-78877-1). Elevated reporting limits (RL) are provided.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

### Metals

Method 6020: The following samples were diluted due to the abundance of non-target analytes: Abiotic Day 14 052015 (490-78877-1) and Abiotic Day 14 Dup 052015 (490-78877-3). Elevated reporting limits (RLs) are provided.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

### Field Service / Mobile Lab

No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

### **General Chemistry**

Method 7196A: The following sample was diluted due to the nature of the sample matrix: Abiotic Day 14 052015 (490-78877-1). Elevated reporting limits (RLs) are provided.

Method 7196A: The following samples were received with less than one shift (8 hours) remaining on a test with a holding time of 48 hours or less. As such, the laboratory had insufficient time remaining to perform the analysis within holding time: Abiotic Day 14 052015 (490-78877-1) and Abiotic Day 14 Dup 052015 (490-78877-3).

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

### Organic Prep

No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

# **Definitions/Glossary**

Client: Geosyntec Consultants, Inc. Project/Site: CCA Treatability

TestAmerica Job ID: 490-78877-1

SDG: TEL

### **Qualifiers**

### **HPLC/IC**

Qualifier	Qualifier Description
Н	Sample was prepped or analyzed beyond the specified holding time

F1 MS and/or MSD Recovery is outside acceptance limits.

**Metals** 

Qualifier **Qualifier Description** 

MS, MSD: The analyte present in the original sample is greater than 4 times the matrix spike concentration; therefore, control limits are not

applicable.

**General Chemistry** 

Qualifier **Qualifier Description** 

Sample was prepped or analyzed beyond the specified holding time

## **Glossary**

Abbreviation These commonly used abbreviations may or may not be present in this report.

Listed under the "D" column to designate that the result is reported on a dry weight basis

%R Percent Recovery **CFL** Contains Free Liquid **CNF** Contains no Free Liquid

DER Duplicate error ratio (normalized absolute difference)

Dil Fac **Dilution Factor** 

DL, RA, RE, IN Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample

DLC Decision level concentration MDA Minimum detectable activity **EDL Estimated Detection Limit** MDC Minimum detectable concentration

MDI Method Detection Limit MLMinimum Level (Dioxin)

NC Not Calculated

ND Not detected at the reporting limit (or MDL or EDL if shown)

**PQL Practical Quantitation Limit** 

QC **Quality Control RER** Relative error ratio

Reporting Limit or Requested Limit (Radiochemistry) RL

**RPD** Relative Percent Difference, a measure of the relative difference between two points

**TEF** Toxicity Equivalent Factor (Dioxin) **TEQ** Toxicity Equivalent Quotient (Dioxin)

TestAmerica Nashville

Client: Geosyntec Consultants, Inc. Project/Site: CCA Treatability

TestAmerica Job ID: 490-78877-1

Lab Sample ID: 490-78877-1

Analyzed

05/21/15 10:35

Prepared

SDG: TEL

Client Sample ID: Abiotic Day 14 052015

Date Collected: 05/20/15 10:30

Result Qualifier

ND H

Matrix: Water

	Date	Received:	05/21/15	08:30
--	------	-----------	----------	-------

Analyte

Chromium, hex

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Nitrate as N	1.87		0.100		mg/L			05/21/15 22:56	1
Nitrate as N	1.65	Н	0.100		mg/L			06/05/15 12:51	1
Sulfate	3180		10.0		mg/L			05/26/15 18:18	10
Method: 6020 - Metals Analyte	•	ed Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mathadi CO20 - Matala	(ICD/MC) Discolu	. d							
Analyte	Result			MDL		D			
Analyte Arsenic	•		0.0200	MDL	mg/L	<u>D</u>	05/28/15 09:55	05/28/15 18:57	10
Analyte	Result 0.0274			MDL		<u>D</u>	05/28/15 09:55	05/28/15 18:57 05/28/15 18:57	

RL

10.0

MDL Unit

mg/L

Dil Fac

Client: Geosyntec Consultants, Inc. Project/Site: CCA Treatability

TestAmerica Job ID: 490-78877-1

SDG: TEL

Client Sample ID: Abiotic\_Day 14\_052015

Date Collected: 05/20/15 10:30 Date Received: 05/21/15 08:30 Lab Sample ID: 490-78877-2 Matrix: Solid

Matrix: Solid Percent Solids: 81.2

Method: 6020 - Metals (ICP	/MS)							
Analyte	Result Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	887	3.07		mg/Kg	<u></u>	05/22/15 13:05	05/26/15 13:57	- 5
Chromium	340	0.613		mg/Kg	☆	05/22/15 13:05	05/22/15 19:27	1
Copper	1000	3.07		mg/Kg	≎	05/22/15 13:05	05/26/15 13:57	5
Iron	6000	6.13		mg/Kg	₩	05/22/15 13:05	05/22/15 19:27	1
General Chemistry								
Analyte	Result Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Moisture	19	0.10		%			05/27/15 15:13	1
Percent Solids	81	0.10		%			05/27/15 15:13	1

TestAmerica Nashville

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Client: Geosyntec Consultants, Inc. Project/Site: CCA Treatability

TestAmerica Job ID: 490-78877-1

SDG: TEL

Client Sample ID: Abiotic\_Day 14\_Dup\_052015

Date Collected: 05/20/15 10:40 Date Received: 05/21/15 08:30

Lab Sample ID: 490-78877-3

Matrix: Water

Method: 9056 - Anions, Ion Chro Analyte	_	<mark>phy</mark> Qualifier	RL	MDI	Unit	D	Prepared	Analyzed	Dil Fac
Nitrate as N	0.609	Qualifier	0.100	INDL	mg/L		Trepared	05/21/15 23:56	1
Nitrate as N	0.973	н	0.100		mg/L			06/05/15 13:11	1
Sulfate	3150		10.0		mg/L			05/22/15 00:36	10
_ Method: 6020 - Metals (ICP/MS) -	Dissolv	ed							
Analyte		Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	0.0287	·	0.0200		mg/L		05/28/15 09:55	05/28/15 19:14	10
Chromium	ND		0.0200		mg/L		05/28/15 09:55	05/28/15 19:14	10
Copper	0.0277		0.0200		mg/L		05/28/15 09:55	05/28/15 19:14	10
Iron	851		0.250		mg/L		05/28/15 09:55	05/28/15 19:14	10
General Chemistry - Dissolved									
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium, hex	ND	Н	0.0100		mg/L			05/21/15 10:38	1

Client: Geosyntec Consultants, Inc. Project/Site: CCA Treatability

TestAmerica Job ID: 490-78877-1

SDG: TEL

Client Sample ID: Abiotic\_Day 14\_Dup\_052015

**79** 

Date Collected: 05/20/15 10:40 Date Received: 05/21/15 08:30

**Percent Solids** 

Lab Sample ID: 490-78877-4 **Matrix: Solid** 

Percent Solids: 79.2

05/27/15 15:13

Method: 6020 - Metals (ICP	P/MS)							
Analyte	Result Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	362	0.621		mg/Kg	<u> </u>	05/22/15 13:05	05/22/15 19:33	1
Chromium	121	0.621		mg/Kg	☼	05/22/15 13:05	05/22/15 19:33	1
Copper	402	0.621		mg/Kg	☼	05/22/15 13:05	05/22/15 19:33	1
Iron	3380	6.21		mg/Kg		05/22/15 13:05	05/22/15 19:33	1
General Chemistry								
Analyte	Result Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Moisture	<u>21</u>	0.10		%			05/27/15 15:13	1

0.10

%

TestAmerica Job ID: 490-78877-1

SDG: TEL

# Method: 9056 - Anions, Ion Chromatography

Lab Sample ID: MB 490-250584/3 Client Sample ID: Method Blank Prep Type: Total/NA **Matrix: Water** 

Analysis Batch: 250584

MB MB Analyte Result Qualifier RL **MDL** Unit Analyzed Dil Fac D Prepared 1.00 Sulfate ND mg/L 05/21/15 21:56

Lab Sample ID: LCS 490-250584/4 Client Sample ID: Lab Control Sample **Matrix: Water** Prep Type: Total/NA

Analysis Batch: 250584

Spike LCS LCS %Rec. Added Limits Analyte Result Qualifier Unit %Rec Sulfate 100 104.6 mg/L 105 80 - 120

Lab Sample ID: LCSD 490-250584/5 Client Sample ID: Lab Control Sample Dup **Matrix: Water** Prep Type: Total/NA

Analysis Batch: 250584

Spike LCSD LCSD %Rec. **RPD** Added Result Qualifier Limits RPD Limit Analyte Unit D %Rec Sulfate 100 104.9 mg/L 105 80 - 120

Client Sample ID: Matrix Spike Lab Sample ID: 490-78888-H-17 MS Prep Type: Total/NA

**Matrix: Water** 

**Analysis Batch: 250584** 

Sample Sample Spike MS MS %Rec. Analyte Result Qualifier Added Result Qualifier Unit %Rec Limits Sulfate 3.96 100 105.9 102 80 - 120 mg/L

Lab Sample ID: 490-78888-H-17 MSD Client Sample ID: Matrix Spike Duplicate **Matrix: Water** Prep Type: Total/NA

**Analysis Batch: 250584** 

Spike MSD MSD %Rec. RPD Sample Sample Analyte Result Qualifier Added Result Qualifier Unit %Rec Limits RPD Limit Sulfate 100 104 80 - 120 3.96 107 6 mg/L

Lab Sample ID: MB 490-250585/3 **Client Sample ID: Method Blank** Prep Type: Total/NA

**Matrix: Water** 

Analysis Batch: 250585

MB MB Analyte Result Qualifier RL MDL Unit Prepared D Analyzed Dil Fac 0 100 Nitrate as N mg/L 05/21/15 21:56 ND

Lab Sample ID: LCS 490-250585/4 Client Sample ID: Lab Control Sample **Matrix: Water** Prep Type: Total/NA

Analysis Batch: 250585

Spike LCS LCS %Rec. Added Result Qualifier Analyte Unit %Rec Limits Nitrate as N 10.0 10.26 103 80 - 120

Lab Sample ID: LCSD 490-250585/5 Client Sample ID: Lab Control Sample Dup **Matrix: Water** Prep Type: Total/NA

**Analysis Batch: 250585** 

LCSD LCSD RPD Spike %Rec. Added Limits Analyte Result Qualifier Unit D %Rec RPD Limit Nitrate as N 10.0 10.24 102 80 - 120 mg/L

TestAmerica Nashville

TestAmerica Job ID: 490-78877-1

**Client Sample ID: Matrix Spike** 

Client Sample ID: Method Blank

**Client Sample ID: Lab Control Sample** 

Client Sample ID: Lab Control Sample Dup

Client Sample ID: Matrix Spike Duplicate

**Client Sample ID: Matrix Spike Duplicate** 

Prep Type: Total/NA

Client Sample ID: Matrix Spike

Client Sample ID: Method Blank

SDG: TEL

Lab Sample ID: 490-78888-H-17 MS

**Matrix: Water** 

**Analysis Batch: 250585** 

Sample Sample Spike MS MS %Rec. Analyte Result Qualifier Added Result Qualifier Unit %Rec Limits Nitrate as N 10.0 9.880 99 80 - 120 ND mg/L

Lab Sample ID: 490-78888-H-17 MSD

**Matrix: Water** 

**Analysis Batch: 250585** 

**RPD** Sample Sample Spike MSD MSD %Rec. Result Qualifier Added Result Qualifier Limits RPD Analyte Unit D %Rec Limit 80 - 120 Nitrate as N ND 10.0 9.883 mg/L 99 0

Lab Sample ID: MB 490-251275/6

**Matrix: Water** 

**Analysis Batch: 251275** 

MB MB RL **MDL** Unit **Analyte** Result Qualifier Dil Fac Prepared Analyzed Sulfate ND 1.00 mg/L 05/26/15 15:08

Lab Sample ID: LCS 490-251275/7

**Matrix: Water** 

**Analysis Batch: 251275** 

Spike LCS LCS %Rec. **Analyte** Added Result Qualifier Unit %Rec Limits Sulfate 100 93.22 mg/L 80 - 120

Lab Sample ID: LCSD 490-251275/8

**Matrix: Water** 

**Analysis Batch: 251275** 

LCSD LCSD RPD Spike %Rec. Added Result Qualifier Limits Analyte Unit %Rec **RPD** Limit Sulfate 100 92.67 mg/L 93 80 - 120

Lab Sample ID: 490-79111-F-6 MS

**Matrix: Water** 

**Analysis Batch: 251275** 

Sample Sample Spike MS MS %Rec. Added Analyte Result Qualifier Result Qualifier Unit %Rec Limits Sulfate 100 ND 95.58 96 80 - 120 mg/L

Lab Sample ID: 490-79111-F-6 MSD

**Matrix: Water** 

**Analysis Batch: 251275** 

Sample Sample Spike MSD MSD %Rec. **RPD** Result Qualifier Added Result Qualifier RPD Analyte Unit %Rec Limits Limit Sulfate ND 100 108 108.2 mg/L 80 - 120 12

Lab Sample ID: MB 490-253938/12

**Matrix: Water** 

**Analysis Batch: 253938** 

MB MB

Analyte Result Qualifier RL MDL Unit Prepared Analyzed Dil Fac Nitrate as N  $\overline{\mathsf{ND}}$ 0.100 mg/L 06/05/15 13:51

TestAmerica Nashville

TestAmerica Job ID: 490-78877-1

SDG: TEL

## Method: 9056 - Anions, Ion Chromatography (Continued)

Lab Sample ID: LCS 490-253938/13 **Client Sample ID: Lab Control Sample Matrix: Water Prep Type: Total/NA** 

**Analysis Batch: 253938** 

Spike LCS LCS %Rec. Analyte Added Result Qualifier Unit D %Rec Limits Nitrate as N 10.0 10.55 mg/L 105 80 - 120

Lab Sample ID: LCSD 490-253938/14 Client Sample ID: Lab Control Sample Dup **Matrix: Water** Prep Type: Total/NA **Analysis Batch: 253938 RPD** 

Spike LCSD LCSD %Rec. Added Result Qualifier Limits Analyte Unit **RPD** D %Rec Nitrate as N 10.0 10.47 mg/L 105 80 - 120

Lab Sample ID: 490-79747-K-2 MS **Client Sample ID: Matrix Spike Matrix: Water Prep Type: Total/NA** 

**Analysis Batch: 253938** 

Sample Sample Spike MS MS %Rec. Result Qualifier Added Result Qualifier Limits Analyte Unit D %Rec Nitrate as N ND F1 10.0 12.21 F1 mg/L 122 80 - 120

Lab Sample ID: 490-79747-K-2 MSD Client Sample ID: Matrix Spike Duplicate **Matrix: Water** Prep Type: Total/NA

**Analysis Batch: 253938** 

RPD Sample Sample Spike MSD MSD %Rec. Analyte Result Qualifier Added Result Qualifier Unit %Rec Limits **RPD** Limit Nitrate as N ND F1 10.0 12.10 F1 121 80 - 120 20 mg/L

Method: 6020 - Metals (ICP/MS)

Lab Sample ID: MB 490-250579/1-A Client Sample ID: Method Blank Prep Type: Total/NA

**Matrix: Solid** 

Analysis Batch: 250980 **Prep Batch: 250579** MR MR

	IVID	IVID								
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac	
Arsenic	ND		0.501		mg/Kg		05/22/15 13:05	05/22/15 18:15	1	
Chromium	ND		0.501		mg/Kg		05/22/15 13:05	05/22/15 18:15	1	
Copper	ND		0.501		mg/Kg		05/22/15 13:05	05/22/15 18:15	1	
Iron	ND		5.01		mg/Kg		05/22/15 13:05	05/22/15 18:15	1	

Lab Sample ID: LCS 490-250579/2-A **Client Sample ID: Lab Control Sample Matrix: Solid** Prep Type: Total/NA

**Analysis Batch: 250980 Prep Batch: 250579** 

	Spike	LCS	LCS				%Rec.	
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Arsenic	19.0	16.00		mg/Kg		84	80 - 120	
Chromium	19.0	18.34		mg/Kg		96	80 - 120	
Copper	19.0	17.02		mg/Kg		89	80 - 120	
Iron	190	188.4		ma/Ka		99	80 - 120	

TestAmerica Nashville

Limit

TestAmerica Job ID: 490-78877-1

Client: Geosyntec Consultants, Inc. Project/Site: CCA Treatability

Iron

SDG: TEL

# Method: 6020 - Metals (ICP/MS) (Continued)

Lab Sample ID: LCSD 490-250579/3-A Client Sample ID: Lab Control Sample Dup **Matrix: Solid** Prep Type: Total/NA Analysis Batch: 250980 **Prep Batch: 250579** Spike LCSD LCSD %Rec. **RPD** Analyte Added Result Qualifier Unit D %Rec Limits RPD Limit 19.8 2 Arsenic 16.39 mg/Kg 83 80 - 120 20 Chromium 19.8 18.88 95 80 - 120 20 mg/Kg 3 19.8 88 20 Copper 17.48 mg/Kg 80 - 1203 198 190.9 96 80 - 120 20 Iron mg/Kg

Lab Sample ID: 490-78597-B-1-B MS **Client Sample ID: Matrix Spike** Prep Type: Total/NA **Matrix: Solid** Analysis Batch: 250980 **Prep Batch: 250579** Sample Sample Spike MS MS %Rec. Analyte Result Qualifier Added Result Qualifier Unit D %Rec Limits Arsenic ND 19.8 ND mg/Kg NC 75 - 125 268.8 4 Chromium 239 19.8 mg/Kg 149 75 - 125ND 19.8 ND mg/Kg NC 75 - 125 Copper 198 75 - 125 64500 65510 4 mg/Kg 493 Iron

Lab Sample ID: 490-78597-B-1-C MSD **Client Sample ID: Matrix Spike Duplicate Matrix: Solid** Prep Type: Total/NA **Analysis Batch: 250980** Prep Batch: 250579 Sample Sample Spike MSD MSD %Rec. **RPD** Unit Analyte Result Qualifier Added Result Qualifier %Rec l imits RPD Limit D Arsenic ND 20.0 ND mg/Kg 105 75 - 125 NC 20 Chromium 239 20.0 262.6 4 mg/Kg 116 75 - 125 2 20 Copper ND 20.0 ND mg/Kg 118 75 - 1256 20 Iron 64500 200 63360 4 mg/Kg -590 75 - 125 20

Lab Sample ID: MB 490-251658/1-A Client Sample ID: Method Blank **Matrix: Water Prep Type: Total Recoverable Analysis Batch: 251984 Prep Batch: 251658** 

MR MR Analyte Result Qualifier RL **MDL** Unit D Prepared Analyzed Dil Fac Arsenic  $\overline{\mathsf{ND}}$ 05/28/15 09:55 05/28/15 18:13 0.00200 mg/L Chromium ND 0.00200 mg/L 05/28/15 09:55 05/28/15 18:13 ND 0.00200 mg/L 05/28/15 09:55 05/28/15 18:13 Copper ND Iron 0.0250 mg/L 05/28/15 09:55 05/28/15 18:13

Lab Sample ID: LCS 490-251658/2-A **Client Sample ID: Lab Control Sample Matrix: Water Prep Type: Total Recoverable Analysis Batch: 251984 Prep Batch: 251658** LCS LCS Spike %Rec. **Analyte** Added Result Qualifier Unit %Rec I imits Arsenic 0.100 0.09901 mg/L 99 80 - 120 Chromium 0.100 0.1016 102 80 - 120 mg/L Copper 0.100 0.09932 mg/L 99 80 - 120 1.00 1.022 102 80 - 120

mg/L

TestAmerica Nashville

TestAmerica Job ID: 490-78877-1 SDG: TEL

Project/Site: CCA Treatability

Client: Geosyntec Consultants, Inc.

Method: 6020 - Metals (ICP/MS) (Continued)

Lab Sample ID: 490-79125-I	D-13-B MS						C	lient Sa	mple ID: Matrix Spike
Matrix: Water									Prep Type: Dissolved
Analysis Batch: 251984									<b>Prep Batch: 251658</b>
-	Sample	Sample	Spike	MS	MS				%Rec.
Analyte .	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	l imits

Analysis Batch. 201004	Sample	Sample	Spike	MS	MS				%Rec.
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits
Arsenic	0.00698		0.100	0.1009		mg/L		94	75 - 125
Chromium	ND		0.100	0.1036		mg/L		104	75 - 125
Copper	ND		0.100	0.09670		mg/L		97	75 - 125
Iron	15.0		1.00	15.99	4	mg/L		96	75 - 125

Lab Sample ID: 490-79125-D-13-C MSD Client Sample ID: Matrix Spike Duplicate **Matrix: Water Prep Type: Dissolved** Analysis Batch: 251984 **Prep Batch: 251658** MSD MSD Sample Sample Spike %Rec. **RPD** Analyte Result Qualifier Added Result Qualifier Unit D %Rec Limits RPD Limit 0.00698 Arsenic 0.100 0.1009 mg/L 94 75 - 125 0 20 Chromium 20 ND 0.100 0.1032 mg/L 103 75 - 125 0 ND 0.100 0.09625 mg/L 96 75 - 125 0 20 Copper 75 - 125 15.0 Iron 1.00 15.84 4 mg/L 81 20

Method: 7196A - Chromium, Hexavalent

Lab Sample ID: MB 490-251724/1 **Client Sample ID: Method Blank Matrix: Water** Prep Type: Total/NA

**Analysis Batch: 251724** 

MB MB Analyte Result Qualifier RL **MDL** Unit Prepared Analyzed Dil Fac Chromium, hex ND 0.0100 mg/L 05/21/15 10:35

Lab Sample ID: LCS 490-251724/2 **Client Sample ID: Lab Control Sample Matrix: Water** Prep Type: Total/NA

**Analysis Batch: 251724** 

LCS LCS Spike %Rec. **Analyte** Added Result Qualifier Unit %Rec Limits Chromium, hex 0.100 0.1050 105 85 - 115

Lab Sample ID: 490-78877-1 MS Client Sample ID: Abiotic Day 14 052015 **Matrix: Water Prep Type: Dissolved** 

**Analysis Batch: 251724** 

	Sample	Sample	Spike	MS	MS			%Rec.	
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	%Rec	Limits	
Chromium, hex	ND	Н	200	178.0		ma/L	 89	85 - 115	 

Lab Sample ID: 490-78877-1 MSD Client Sample ID: Abiotic\_Day 14\_052015 **Prep Type: Dissolved Matrix: Water** 

Analysis Batch: 251724

Analysis Dalcii. 231124												
	Sample	Sample	Spike	MSD	MSD				%Rec.		RPD	
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	RPD	Limit	
Chromium, hex	ND	Н	200	174.0		mg/L		87	85 - 115	2	20	

TestAmerica Nashville

# **QC Sample Results**

Client: Geosyntec Consultants, Inc. Project/Site: CCA Treatability

TestAmerica Job ID: 490-78877-1

SDG: TEL

Method: 7196A - Chromium, Hexavalent (Continued)

Lab Sample ID: 490-78877-1 DU Client Sample ID: Abiotic\_Day 14\_052015 **Matrix: Water Prep Type: Dissolved** 

Analysis Batch: 251724

Sample Sample DU DU RPD Analyte Result Qualifier Result Qualifier Unit D RPD Limit Chromium, hex ND H ND NC mg/L 20

**Method: Moisture - Percent Moisture** 

Lab Sample ID: 490-77315-A-4 DU **Client Sample ID: Duplicate Matrix: Solid** Prep Type: Total/NA

**Analysis Batch: 251326** 

_	Sample	Sample	DU	DU				RPD
Analyte	Result	Qualifier	Result	Qualifier	Unit	D	RPD	Limit
Percent Moisture	27		27		%		 0	20
Percent Solids	73		73		%		0	20

# **QC Association Summary**

Client: Geosyntec Consultants, Inc. Project/Site: CCA Treatability

TestAmerica Job ID: 490-78877-1 SDG: TEL

HPLC/IC

Analysis Batch: 250584

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-78877-3	Abiotic_Day 14_Dup_052015	Total/NA	Water	9056	
490-78888-H-17 MS	Matrix Spike	Total/NA	Water	9056	
490-78888-H-17 MSD	Matrix Spike Duplicate	Total/NA	Water	9056	
LCS 490-250584/4	Lab Control Sample	Total/NA	Water	9056	
LCSD 490-250584/5	Lab Control Sample Dup	Total/NA	Water	9056	
MB 490-250584/3	Method Blank	Total/NA	Water	9056	

Analysis Batch: 250585

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-78877-1	Abiotic_Day 14_052015	Total/NA	Water	9056	
490-78877-3	Abiotic_Day 14_Dup_052015	Total/NA	Water	9056	
490-78888-H-17 MS	Matrix Spike	Total/NA	Water	9056	
490-78888-H-17 MSD	Matrix Spike Duplicate	Total/NA	Water	9056	
LCS 490-250585/4	Lab Control Sample	Total/NA	Water	9056	
LCSD 490-250585/5	Lab Control Sample Dup	Total/NA	Water	9056	
MB 490-250585/3	Method Blank	Total/NA	Water	9056	

**Analysis Batch: 251275** 

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-78877-1	Abiotic_Day 14_052015	Total/NA	Water	9056	
490-79111-F-6 MS	Matrix Spike	Total/NA	Water	9056	
490-79111-F-6 MSD	Matrix Spike Duplicate	Total/NA	Water	9056	
LCS 490-251275/7	Lab Control Sample	Total/NA	Water	9056	
LCSD 490-251275/8	Lab Control Sample Dup	Total/NA	Water	9056	
MB 490-251275/6	Method Blank	Total/NA	Water	9056	

**Analysis Batch: 253938** 

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-78877-1	Abiotic_Day 14_052015	Total/NA	Water	9056	_
490-78877-3	Abiotic_Day 14_Dup_052015	Total/NA	Water	9056	
490-79747-K-2 MS	Matrix Spike	Total/NA	Water	9056	
490-79747-K-2 MSD	Matrix Spike Duplicate	Total/NA	Water	9056	
LCS 490-253938/13	Lab Control Sample	Total/NA	Water	9056	
LCSD 490-253938/14	Lab Control Sample Dup	Total/NA	Water	9056	
MB 490-253938/12	Method Blank	Total/NA	Water	9056	

**Metals** 

**Prep Batch: 250579** 

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-78597-B-1-B MS	Matrix Spike	Total/NA	Solid	3051A	_
490-78597-B-1-C MSD	Matrix Spike Duplicate	Total/NA	Solid	3051A	
490-78877-2	Abiotic_Day 14_052015	Total/NA	Solid	3051A	
490-78877-4	Abiotic_Day 14_Dup_052015	Total/NA	Solid	3051A	
LCS 490-250579/2-A	Lab Control Sample	Total/NA	Solid	3051A	
LCSD 490-250579/3-A	Lab Control Sample Dup	Total/NA	Solid	3051A	
MB 490-250579/1-A	Method Blank	Total/NA	Solid	3051A	

TestAmerica Nashville

6/9/2015

Page 16 of 25

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# **QC Association Summary**

Client: Geosyntec Consultants, Inc. Project/Site: CCA Treatability

TestAmerica Job ID: 490-78877-1

SDG: TEL

# **Metals (Continued)**

### Analysis Batch: 250980

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-78597-B-1-B MS	Matrix Spike	Total/NA	Solid	6020	250579
490-78597-B-1-C MSD	Matrix Spike Duplicate	Total/NA	Solid	6020	250579
490-78877-2	Abiotic_Day 14_052015	Total/NA	Solid	6020	250579
490-78877-4	Abiotic_Day 14_Dup_052015	Total/NA	Solid	6020	250579
LCS 490-250579/2-A	Lab Control Sample	Total/NA	Solid	6020	250579
LCSD 490-250579/3-A	Lab Control Sample Dup	Total/NA	Solid	6020	250579
MB 490-250579/1-A	Method Blank	Total/NA	Solid	6020	250579

### **Analysis Batch: 251264**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-78877-2	Abiotic_Day 14_052015	Total/NA	Solid	6020	250579

### **Prep Batch: 251658**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-78877-1	Abiotic_Day 14_052015	Dissolved	Water	3005A	
490-78877-3	Abiotic_Day 14_Dup_052015	Dissolved	Water	3005A	
490-79125-D-13-B MS	Matrix Spike	Dissolved	Water	3005A	
490-79125-D-13-C MSD	Matrix Spike Duplicate	Dissolved	Water	3005A	
LCS 490-251658/2-A	Lab Control Sample	Total Recoverable	Water	3005A	
MB 490-251658/1-A	Method Blank	Total Recoverable	Water	3005A	

### **Analysis Batch: 251984**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-78877-1	Abiotic_Day 14_052015	Dissolved	Water	6020	251658
490-78877-3	Abiotic_Day 14_Dup_052015	Dissolved	Water	6020	251658
490-79125-D-13-B MS	Matrix Spike	Dissolved	Water	6020	251658
490-79125-D-13-C MSD	Matrix Spike Duplicate	Dissolved	Water	6020	251658
LCS 490-251658/2-A	Lab Control Sample	Total Recoverable	Water	6020	251658
MB 490-251658/1-A	Method Blank	Total Recoverable	Water	6020	251658

# **General Chemistry**

### **Analysis Batch: 251326**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-77315-A-4 DU	Duplicate	Total/NA	Solid	Moisture	
490-78877-2	Abiotic_Day 14_052015	Total/NA	Solid	Moisture	
490-78877-4	Abiotic_Day 14_Dup_052015	Total/NA	Solid	Moisture	

### **Analysis Batch: 251724**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-78877-1	Abiotic_Day 14_052015	Dissolved	Water	7196A	251733
490-78877-1 DU	Abiotic_Day 14_052015	Dissolved	Water	7196A	251733
490-78877-1 MS	Abiotic_Day 14_052015	Dissolved	Water	7196A	251733
490-78877-1 MSD	Abiotic_Day 14_052015	Dissolved	Water	7196A	251733
490-78877-3	Abiotic_Day 14_Dup_052015	Dissolved	Water	7196A	251733
LCS 490-251724/2	Lab Control Sample	Total/NA	Water	7196A	
MB 490-251724/1	Method Blank	Total/NA	Water	7196A	

Page 17 of 25

# **QC Association Summary**

Client: Geosyntec Consultants, Inc. Project/Site: CCA Treatability

TestAmerica Job ID: 490-78877-1

SDG: TEL

# **General Chemistry (Continued)**

### Filtration Batch: 251733

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-78877-1	Abiotic_Day 14_052015	Dissolved	Water	Filtration	
490-78877-1 DU	Abiotic_Day 14_052015	Dissolved	Water	Filtration	
490-78877-1 MS	Abiotic_Day 14_052015	Dissolved	Water	Filtration	
490-78877-1 MSD	Abiotic_Day 14_052015	Dissolved	Water	Filtration	
490-78877-3	Abiotic_Day 14_Dup_052015	Dissolved	Water	Filtration	

TestAmerica Job ID: 490-78877-1 SDG: TEL

Client Sample ID: Abiotic\_Day 14\_052015

Date Collected: 05/20/15 10:30 Date Received: 05/21/15 08:30

Lab Sample ID: 490-78877-1

**Matrix: Water** 

	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Analysis	9056		10	10 mL		251275	05/26/15 18:18	JHS	TAL NSH
Total/NA	Analysis	9056		1	10 mL		250585	05/21/15 22:56	JHS	TAL NSH
Total/NA	Analysis	9056		1	10 mL		253938	06/05/15 12:51	JHS	TAL NSH
Dissolved	Prep	3005A			50 mL	50 mL	251658	05/28/15 09:55	TSC	TAL NSH
Dissolved	Analysis	6020		10	50 mL	50 mL	251984	05/28/15 18:57	JBD	TAL NSH
Dissolved	Filtration	Filtration			1.0 mL	1.0 mL	251733	05/21/15 10:31	BLM	TAL NSH
Dissolved	Analysis	7196A		1000	10 mL	10 mL	251724	05/21/15 10:35	BLM	TAL NSH

Client Sample ID: Abiotic\_Day 14\_052015 Lab Sample ID: 490-78877-2

Date Collected: 05/20/15 10:30 Date Received: 05/21/15 08:30

**Matrix: Solid** Percent Solids: 81.2

**Matrix: Water** 

Batch Batch Dil Initial Final Batch Prepared **Prep Type** Type Method Run **Factor** Amount Amount Number or Analyzed Analyst Lab Total/NA Prep 3051A 0.502 g 100 mL 250579 05/22/15 13:05 ZLN TAL NSH Total/NA Analysis 6020 0.502 g 100 mL 250980 05/22/15 19:27 JBD TAL NSH 1 Total/NA Prep 3051A 0.502 g 100 mL 250579 05/22/15 13:05 ZLN TAL NSH Total/NA Analysis 6020 5 0.502 g 100 mL 251264 05/26/15 13:57 JBD TAL NSH 05/27/15 15:13 MAA Total/NA Analysis 1 251326 TAL NSH Moisture

Client Sample ID: Abiotic Day 14 Dup 052015 Lab Sample ID: 490-78877-3

Date Collected: 05/20/15 10:40 Date Received: 05/21/15 08:30

_	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Analysis	9056		1	10 mL		250585	05/21/15 23:56	JHS	TAL NSH
Total/NA	Analysis	9056		10	10 mL		250584	05/22/15 00:36	JHS	TAL NSH
Total/NA	Analysis	9056		1	10 mL		253938	06/05/15 13:11	JHS	TAL NSH
Dissolved	Prep	3005A			50 mL	50 mL	251658	05/28/15 09:55	TSC	TAL NSH
Dissolved	Analysis	6020		10	50 mL	50 mL	251984	05/28/15 19:14	JBD	TAL NSH
Dissolved	Filtration	Filtration			1.0 mL	1.0 mL	251733	05/21/15 10:31	BLM	TAL NSH
Dissolved	Analysis	7196A		1	10 mL	10 mL	251724	05/21/15 10:38	BLM	TAL NSH

Client Sample ID: Abiotic Day 14 Dup 052015 Lab Sample ID: 490-78877-4

Date Collected: 05/20/15 10:40 **Matrix: Solid** Date Received: 05/21/15 08:30 Percent Solids: 79.2

_	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.508 g	100 mL	250579	05/22/15 13:05	ZLN	TAL NSH
Total/NA	Analysis	6020		1	0.508 g	100 mL	250980	05/22/15 19:33	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			251326	05/27/15 15:13	MAA	TAL NSH

TestAmerica Nashville

# **Lab Chronicle**

Client: Geosyntec Consultants, Inc. Project/Site: CCA Treatability

TestAmerica Job ID: 490-78877-1 SDG: TEL

### **Laboratory References:**

TAL NSH = TestAmerica Nashville, 2960 Foster Creighton Drive, Nashville, TN 37204, TEL (615)726-0177

# **Method Summary**

Client: Geosyntec Consultants, Inc. Project/Site: CCA Treatability

TestAmerica Job ID: 490-78877-1

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Method	Method Description	Protocol	Laboratory
9056	Anions, Ion Chromatography	SW846	TAL NSH
6020	Metals (ICP/MS)	SW846	TAL NSH
7196A	Chromium, Hexavalent	SW846	TAL NSH
Moisture	Percent Moisture	EPA	TAL NSH

### **Protocol References:**

EPA = US Environmental Protection Agency

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

### Laboratory References:

TAL NSH = TestAmerica Nashville, 2960 Foster Creighton Drive, Nashville, TN 37204, TEL (615)726-0177

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TestAmerica Job ID: 490-78877-1 SDG: TEL

Client: Geosyntec Consultants, Inc. Project/Site: CCA Treatability

# **Laboratory: TestAmerica Nashville**

All certifications held by this laboratory are listed. Not all certifications are applicable to this report.

Authority	Program	EPA Region	Certification ID	Expiration Date
A2LA	A2LA		NA: NELAP & A2LA	12-31-15
A2LA	ISO/IEC 17025		0453.07	12-31-15
Alaska (UST)	State Program	10	UST-087	10-31-15
Arizona	State Program	9	AZ0473	05-05-16
Arkansas DEQ	State Program	6	88-0737	04-25-16
California	State Program	9	2938	10-31-16
Connecticut	State Program	1	PH-0220	12-31-15
Florida	NELAP	4	E87358	06-30-15 *
Illinois	NELAP	5	200010	12-09-15
lowa	State Program	7	131	04-01-16
Kansas	NELAP	7	E-10229	05-31-15 *
Kentucky (UST)	State Program	4	19	06-30-15 *
Kentucky (WW)	State Program	4	90038	12-31-15
Louisiana	NELAP	6	30613	06-30-15 *
Maryland	State Program	3	316	03-31-16
Massachusetts	State Program	1	M-TN032	06-30-15 *
Minnesota	NELAP	5	047-999-345	12-31-15
Mississippi	State Program	4	N/A	06-30-15 *
Montana (UST)	State Program	8	NA	02-24-20
Nevada	State Program	9	TN00032	07-31-15
New Hampshire	NELAP	1	2963	10-09-15
New Jersey	NELAP	2	TN965	06-30-15 *
New York	NELAP	2	11342	03-31-16
North Carolina (WW/SW)	State Program	4	387	12-31-15
North Dakota	State Program	8	R-146	06-30-15 *
Ohio VAP	State Program	5	CL0033	10-16-15
Oklahoma	State Program	6	9412	08-31-15
Oregon	NELAP	10	TN200001	04-27-16
Pennsylvania	NELAP	3	68-00585	06-30-15 *
Rhode Island	State Program	1	LAO00268	12-30-15
South Carolina	State Program	4	84009 (001)	02-28-16
South Carolina (DW)	State Program	4	84009 (002)	12-16-17
Tennessee	State Program	4	2008	02-23-17
Texas	NELAP	6	T104704077	08-31-15
USDA	Federal		S-48469	10-30-16
Utah	NELAP	8	TN00032	07-31-15
Virginia	NELAP	3	460152	06-14-15 *
Washington	State Program	10	C789	07-19-15
West Virginia DEP	State Program	3	219	02-28-16
Wisconsin	State Program	5	998020430	08-31-15
Wyoming (UST)	A2LA	8	453.07	12-31-15

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<sup>\*</sup> Certification renewal pending - certification considered valid.





# **COOLER RECEIPT FORM**

Cooler Received/Opened On 5/21/2015 @ 0830	
1. Tracking #(last 4 digits, FedEx)	
Courier: FedEx IR Gun ID 94660220	
2. Temperature of rep. sample or temp blank when opened: 4.1Degrees Celsius	
3. If Item #2 temperature is 0°C or less, was the representative sample or temp blank frozen?	YES NO. (NA)
4. Were custody seals on outside of cooler?	(YES)NONA
If yes, how many and where:(i) front	
5. Were the seals intact, signed, and dated correctly?	(YES)NONA
6. Were custody papers inside cooler?	ŒSNONA
I certify that I opened the cooler and answered questions 1-6 (intial)	moun
7. Were custody seals on containers:  YES and Intact	YESNO
Were these signed and dated correctly?	YESNONA
8. Packing mat'l used? Rubblewrap Plastic bag Peanuts Vermiculite Foam Insert Paper	Other None
9. Cooling process: Ice-pack Ice (direct contact) Dry ice	Other None
10. Did all containers arrive in good condition (unbroken)?	XES).NONA
11. Were all container labels complete (#, date, signed, pres., etc)?	ESNONA
12. Did all container labels and tags agree with custody papers?	ESNONA
13a. Were VOA vials received?	YES(O)NA
b. Was there any observable headspace present in any VOA vial?	YESNO. NA
14. Was there a Trip Blank in this cooler? YESNO If multiple coolers, sequence	e #
I certify that I unloaded the cooler and answered questions 7-14 (intial)	MAN
15a. On pres'd bottles, did pH test strips suggest preservation reached the correct pH level?	YESNO.(NA)
b. Did the bottle labels indicate that the correct preservatives were used	ÆS)NONA
16. Was residual chlorine present?	YESNO
Lertify that I checked for chlorine and pH as per SOP and answered questions 15-16 (intial)	MDN
17. Were custody papers properly filled out (ink, signed, etc)?	(ES).NONA
18. Did you sign the custody papers in the appropriate place?	VES NONA
19. Were correct containers used for the analysis requested?	ESNONA
20. Was sufficient amount of sample sent in each container?	KES)NONA
certify that I entered this project into LIMS and answered questions 17-20 (intial)	MOM
certify that I attached a label with the unique LIMS number to each container (intial)	MIM
21. Were there Non-Conformance issues at login? YES NO Was a NCM generated? YES	₹55.#

TestAmerica Knowile NASHVIUE
5815 Middlebrook Pike
Knoxville, TN 37921
Phone 865 291-3000 (Main)
Phone 865-291-3031 (Receiving)

# Chain of Custody Recorc 78877

Relinquished by:	Relinquished by:	Cher C:	Relinquished by:	Special Instructions/QC Requirements & Comments:	Non-Hazard	Possible Hazard Identification	Preservation Used: 1= lce, 2= HCl; 3= H <sub>2</sub> SO <sub>4</sub> ; 4=HNO <sub>3</sub> ; 5=NaOH; 6= Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub>		•		Abiotic - Day 14 - Dup-052015	<b>~</b>	_	Abiotic Day 14 052015	Sample Identification	Sampled by: Linki Chen	P O #	TEL	Project Name/Number CA Treatribility	Phone 513-503-0658	City/State/Zip Known We / TN /37919	Address 2140 Sutherland Am, Stelo)	Company Name (TEOSYNTEC Consultants	Client Contact	Phone 865 291-3000 (Main) Phone 865-291-3031 (Receiving)	815 Middlebrook Pike Knoxville, TN 37921
Company:	Company:	Creecymaec	Company:		Skin Irritant Poison B		-HNO <sub>3</sub> ; 5=NaOH; 6= Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> Other4		*		05/20/15 1040 G	e		05/00/15 1030 CT	Sample Date Time Type	1 day	2 days	1 week	2 weeks	TAT if different from Below	Calendar ( C) or Work Days (W)	Analysis Turnaround Time	Tel/Mobile:	Project Manager: AMA MAN		Chair
Date/Time: Received by:	Date/Time: Received by:	SW1 3	Date/Time: Received by		Unknown Return To Client Disposal By Lab	Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)	$\phi_{}$		У - Z	> Z	× × ×	\( \times \)	X	× ×	Matrix Cont. Field		νi - (	tra	te, 6)				Lab Contact:   Cather Date Carrier: FedeX	Madhausam Site Contact: Linki Chen		Chain of Custody Recorc 78877
	Date/lime: 4.1c	05-26-15 /420			Archive For Months	es are retained longer than 1 month)			-4:	-	throz preserved 3	24	10	HND3 preserved -1	Sample Specific Notes:	Recorded by: Date:	Tracking Number:	Shipper:FedExUPSOther:	Temperature: deg C	Number of Packages:	Custody Seals Intact? Y N NA	Lab Use Only:	coc No: 04963	COC Record of	THE LEADER IN ENVIRONMENTAL TESTING	IESTAMETICO 2015

# **Login Sample Receipt Checklist**

Client: Geosyntec Consultants, Inc.

Job Number: 490-78877-1

SDG Number: TEL

Login Number: 78877 List Source: TestAmerica Nashville

List Number: 1

Creator: McBride, Mike

Creator: McBride, Mike		
Question	Answer	Comment
Radioactivity wasn't checked or is = background as measured by a survey meter.</td <td>True</td> <td></td>	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	4.1
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

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THE LEADER IN ENVIRONMENTAL TESTING

# **ANALYTICAL REPORT**

TestAmerica Laboratories, Inc.

TestAmerica Nashville 2960 Foster Creighton Drive Nashville, TN 37204 Tel: (615)726-0177

TestAmerica Job ID: 490-82623-1

TestAmerica Sample Delivery Group: TEL Client Project/Site: Treatability Study

## For:

Geosyntec Consultants, Inc. 10220 Old Columbia Road Suite A Columbia, Maryland 21046

Attn: Amar Wadhawan

# Boxanne L Connor

Authorized for release by: 7/24/2015 12:29:04 PM
Roxanne Connor, Senior Project Manager (615)301-5761
roxanne.connor@testamericainc.com

Designee for

Heather Baker, Project Manager I (615)301-5043

heather.baker@testamericainc.com

Review your project

results through
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The test results in this report meet all 2003 NELAC and 2009 TNI requirements for accredited parameters, exceptions are noted in this report. This report may not be reproduced except in full, and with written approval from the laboratory. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

TestAmerica Job ID: 490-82623-1 SDG: TEL

# **Table of Contents**

Cover Page	1
Table of Contents	2
Sample Summary	3
Case Narrative	4
Definitions	5
Client Sample Results	6
QC Sample Results	12
QC Association	17
Chronicle	19
Method Summary	21
Certification Summary	22
Chain of Custody	23
Receipt Checklists	25

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# **Sample Summary**

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-82623-1 SDG: TEL

ΓEL

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
490-82623-1	Biotic_071315	Water	07/13/15 14:00	07/14/15 09:30
490-82623-2	Biotic_071315	Solid	07/13/15 14:00	07/14/15 09:30
490-82623-3	Biotic Dup_071315	Water	07/13/15 14:15	07/14/15 09:30
490-82623-4	Biotic Dup 071315	Solid	07/13/15 14:15	07/14/15 09:30

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### **Case Narrative**

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-82623-1

SDG: TEL

Job ID: 490-82623-1

Laboratory: TestAmerica Nashville

**Narrative** 

Job Narrative 490-82623-1

### Comments

No additional comments.

### Receipt

The samples were received on 7/14/2015 9:30 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 2.6° C.

No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

### Metals

Method(s) 6020: The method blank for 265025 contained copper above the reporting limit (RL). Associated sample(s) were not re-extracted and/or re-analyzed because results were greater than 10X the value found in the method blank.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

### Field Service / Mobile Lab

No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

### **General Chemistry**

Method(s) 7196A: The matrix spike / matrix spike duplicate (MS/MSD) recoveries for preparation batch 490-264921 and analytical batch 490-264922 were outside control limits. Sample matrix interference and/or non-homogeneity are suspected because the associated laboratory control sample (LCS) recovery was within acceptance limits.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

### **Organic Prep**

No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

# **Definitions/Glossary**

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-82623-1

SDG: TEL

# **Qualifiers**

### **HPLC/IC**

Qualifier	Qualifier Description
4	MS, MSD: The analyte present in the original sample is greater than 4 times the matrix spike concentration; therefore, control limits are not
	applicable.
E	Result exceeded calibration range.

### **Metals**

Qualifier	Qualifier Description
В	Compound was found in the blank and sample.
4	MS, MSD: The analyte present in the original sample is greater than 4 times the matrix spike concentration; therefore, control limits are not
	applicable.

### **General Chemistry**

Qualifier	Qualifier Description
F1	MS and/or MSD Recovery is outside acceptance limits.

# Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains no Free Liquid
DER	Duplicate error ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision level concentration
MDA	Minimum detectable activity

MDA	Minimum detectable activity
EDL	Estimated Detection Limit
MDC	Minimum detectable concentration
MDL	Method Detection Limit
MI	Minimum Level (Dioxin)

MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated

ND Not detected at the reporting limit (or MDL or EDL if shown)
---

PQL	Practical Quantitation Limit

QC	Quality Control
RER	Relative error ratio

RI	Reporting Limit or Requested Limit	(Radiochemistry)
NL .	Reporting Limit of Requested Limit	(Naulochiellistry)

TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

TestAmerica Nashville

Page 5 of 25

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-82623-1

SDG: TEL

Client Sample ID: Biotic\_071315

Date Collected: 07/13/15 14:00 Date Received: 07/14/15 09:30

Lab Sample ID: 490-82623-1

**Matrix: Water** 

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Nitrate as N	ND		0.100		mg/L			07/14/15 14:50	1
Sulfate	2370		10.0		mg/L			07/14/15 15:48	10
Method: 6020 - Metals (ICP/MS) -	Dissolve	ed							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	19.0		0.100		mg/L		07/15/15 13:54	07/23/15 15:27	50
Chromium	0.0565		0.00200		mg/L		07/15/15 13:54	07/21/15 17:23	1
Copper	2.55		0.00200		mg/L		07/15/15 13:54	07/21/15 17:23	1
Iron	4.68		0.250		mg/L		07/15/15 13:54	07/23/15 15:21	10
General Chemistry - Dissolved									
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium, hex	ND	F1	0.0100		mg/L			07/14/15 12:12	

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-82623-1

SDG: TEL

Client Sample ID: Biotic\_071315

Lab Sample ID: 490-82623-2

Date Collected: 07/13/15 14:00 Date Received: 07/14/15 09:30

Matrix: Solid

General Chemistry Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Moisture	23		0.10		%			07/14/15 11:58	1
Percent Solids	77		0.10		%			07/14/15 11:58	1

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Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-82623-1

SDG: TEL

Client Sample ID: Biotic\_071315

Date Collected: 07/13/15 14:00 Date Received: 07/14/15 09:30

Lab Sample ID: 490-82623-2 Matrix: Solid

Percent Solids: 77.2

Method: 6020 - Metals (ICP/MS)							
Analyte	Result Qualifier	RL	MDL Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	256	0.640	mg/Kg	<u> </u>	07/15/15 13:41	07/16/15 19:15	1
Chromium	47.0	0.640	mg/Kg	₩	07/15/15 13:41	07/16/15 19:15	1
Copper	392 B	0.640	mg/Kg	₩	07/15/15 13:41	07/16/15 19:15	1
Iron	3180	6.40	mg/Kg		07/15/15 13:41	07/16/15 19:15	1

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-82623-1

07/14/15 12:15

SDG: TEL

Client Sample ID: Biotic Dup 071315

Date Collected: 07/13/15 14:15 Date Received: 07/14/15 09:30

Chromium, hex

Lab Sample ID: 490-82623-3

**Matrix: Water** 

Method: 9056 - Anions, Ion Chro	•	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Nitrate as N	ND		0.100		mg/L			07/14/15 16:07	1
Sulfate	2250		10.0		mg/L			07/14/15 16:26	10
Method: 6020 - Metals (ICP/MS)	- Dissolve	ed							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	15.4		0.100		mg/L		07/15/15 13:54	07/23/15 15:04	50
Chromium	0.0127		0.00200		mg/L		07/15/15 13:54	07/21/15 17:17	1
Copper	1.68		0.00200		mg/L		07/15/15 13:54	07/21/15 17:17	1
Iron	0.269		0.250		mg/L		07/15/15 13:54	07/23/15 14:59	10
General Chemistry - Dissolved									
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac

0.0100

mg/L

ND

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Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-82623-1

SDG: TEL

Client Sample ID: Biotic Dup\_071315

Lab Sample ID: 490-82623-4 Date Collected: 07/13/15 14:15

**Matrix: Solid** 

Date Received: 07/14/15 09:30

General Chemistry Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Moisture	21		0.10		%			07/14/15 11:58	1
Percent Solids	79		0.10		%			07/14/15 11:58	1

Client: Geosyntec Consultants, Inc.

Project/Site: Treatability Study

TestAmerica Job ID: 490-82623-1

SDG: TEL

Client Sample ID: Biotic Dup\_071315 Lab Sample ID: 490-82623-4

 Date Collected: 07/13/15 14:15
 Matrix: Solid

 Date Received: 07/14/15 09:30
 Percent Solids: 79.2

Method: 6020 - Metals (ICP/MS Analyte	S) Result Qualifier	RL	MDL Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	166	0.614	mg/Kg	<u> </u>	07/15/15 13:41	07/16/15 19:40	1
Chromium	30.6	0.614	mg/Kg	₩	07/15/15 13:41	07/16/15 19:40	1
Copper	233 B	0.614	mg/Kg	₩	07/15/15 13:41	07/16/15 19:40	1
Iron	2130	6.14	mg/Kg		07/15/15 13:41	07/16/15 19:40	1

TestAmerica Job ID: 490-82623-1 SDG: TEL

# Method: 9056 - Anions, Ion Chromatography

Lab Sample ID: MB 490-264815/6 Client Sample ID: Method Blank Prep Type: Total/NA **Matrix: Water** 

**Analysis Batch: 264815** 

MB MB Analyte Result Qualifier RL **MDL** Unit Analyzed Dil Fac Prepared 1.00 07/14/15 13:53 Sulfate ND mg/L

Lab Sample ID: LCS 490-264815/7 Client Sample ID: Lab Control Sample **Matrix: Water** Prep Type: Total/NA **Analysis Batch: 264815** 

Spike LCS LCS %Rec. Added Limits Analyte Result Qualifier Unit %Rec Sulfate 100 91.46 mg/L 91 80 - 120

Lab Sample ID: LCSD 490-264815/8 Client Sample ID: Lab Control Sample Dup **Matrix: Water** Prep Type: Total/NA

**Analysis Batch: 264815** 

Spike LCSD LCSD %Rec. **RPD** Added Result Qualifier Limits RPD Limit Analyte Unit D %Rec Sulfate 100 91.79 mg/L 92 80 - 120

Client Sample ID: 490-82623-A-1 MS Lab Sample ID: 490-82623-A-1 MS Prep Type: Total/NA

**Matrix: Water** 

**Analysis Batch: 264815** 

Sample Sample Spike MS MS %Rec. Analyte Result Qualifier Added Result Qualifier Unit %Rec Limits Sulfate 2950 E 100 2469 E 4 -478 80 - 120 mg/L

Lab Sample ID: 490-82623-A-1 MSD Client Sample ID: 490-82623-A-1 MSD **Matrix: Water** Prep Type: Total/NA

**Analysis Batch: 264815** 

Spike MSD MSD %Rec. RPD Sample Sample Analyte Result Qualifier Added Result Qualifier Unit D %Rec Limits RPD Limit Sulfate 100 2470 E 4 -477 80 - 120 2950 E mg/L

Lab Sample ID: MB 490-264816/6 **Client Sample ID: Method Blank** Prep Type: Total/NA

**Matrix: Water** 

**Analysis Batch: 264816** 

MB MB Analyte Result Qualifier RL MDL Unit Prepared D Analyzed Dil Fac 0 100 Nitrate as N mg/L 07/14/15 13:53 ND

Lab Sample ID: LCS 490-264816/7 Client Sample ID: Lab Control Sample **Matrix: Water** Prep Type: Total/NA

Analysis Batch: 264816

Spike LCS LCS %Rec. Added Result Qualifier Analyte Unit %Rec Limits Nitrate as N 10.0 9.708 97 80 - 120

Lab Sample ID: LCSD 490-264816/8 Client Sample ID: Lab Control Sample Dup **Matrix: Water** Prep Type: Total/NA

**Analysis Batch: 264816** 

LCSD LCSD RPD Spike %Rec. Added Limits Analyte Result Qualifier Unit D %Rec RPD Limit Nitrate as N 10.0 9.760 98 80 - 120 mg/L

TestAmerica Nashville

TestAmerica Job ID: 490-82623-1

Client Sample ID: Biotic\_071315

**Client Sample ID: Method Blank** 

**Client Sample ID: Lab Control Sample** 

**Prep Type: Total/NA** 

Prep Batch: 265025

Prep Type: Total/NA

Prep Type: Total/NA

SDG: TEL

Lab Sample ID: 490-82623-1 MS

**Matrix: Water** 

**Analysis Batch: 264816** 

Sample Sample Spike MS MS %Rec. Analyte Result Qualifier Added Result Qualifier Unit %Rec Limits Nitrate as N ND 10.0 87 80 - 120 8.681 mg/L

Lab Sample ID: 490-82623-1 MSD Client Sample ID: Biotic\_071315

**Matrix: Water** Prep Type: Total/NA

**Analysis Batch: 264816** 

**RPD** Sample Sample Spike MSD MSD %Rec. Result Qualifier Added Result Qualifier Limits RPD Analyte Unit D %Rec

Limit Nitrate as N ND 10.0 8.577 mg/L 86 80 - 120

Method: 6020 - Metals (ICP/MS)

Lab Sample ID: MB 490-265025/1-A

**Matrix: Solid** 

**Analysis Batch: 265706** 

MB MB **MDL** Unit Prepared Analyte Result Qualifier RL D Analyzed Dil Fac Arsenic  $\overline{\mathsf{ND}}$ 0.504 07/15/15 13:41 07/16/15 19:04 mg/Kg Chromium ND 0.504 mg/Kg 07/15/15 13:41 07/16/15 19:04 1.277 0.504 mg/Kg 07/15/15 13:41 07/16/15 19:04 Copper 07/15/15 13:41 07/16/15 19:04 Iron ND 5.04 mg/Kg

Lab Sample ID: LCS 490-265025/2-A

**Matrix: Solid** 

**Analysis Batch: 265706 Prep Batch: 265025** Spike LCS LCS %Rec. Analyte Added Result Qualifier Unit D %Rec Limits Arsenic 19.8 17.25 mg/Kg 87 80 - 120 Chromium 19.8 20.24 mg/Kg 102 80 - 120 100 Copper 19.8 19.82 mg/Kg 80 - 120 Iron 198 205.7 mg/Kg 104 80 - 120

Lab Sample ID: 490-82623-2 MS

**Matrix: Solid** 

**Analysis Batch: 265706** 

Sample Sample Spike MS MS %Rec. Analyte Result Qualifier Added Result Qualifier Unit D %Rec Limits Arsenic 256 25.7 262.6 4 mg/Kg ☼ 27 75 - 125 ₩ Chromium 47.0 25.7 72.69 mg/Kg 100 75 - 125₿ Copper 392 25.7 394.6 4 mg/Kg 10 75 - 125 В Ö 23 257 3236 4 75 - 125 Iron 3180 mg/Kg

Lab Sample ID: 490-82623-2 MSD

Matrix: Solid

Analysis Batch: 265706									Prep Ba		
	Sample	Sample	Spike	MSD	MSD				%Rec.		RPD
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	RPD	Limit
Arsenic	256		25.4	284.6	4	mg/Kg	<u> </u>	114	75 - 125	8	20
Chromium	47.0		25.4	72.98		mg/Kg	₩	102	75 - 125	0	20
Copper	392	В	25.4	423.8	4	mg/Kg	₩	125	75 - 125	7	20
Iron	3180		254	3554	4	mg/Kg	₩.	149	75 <sub>-</sub> 125	9	20

TestAmerica Nashville

Page 13 of 25

7/24/2015

Client Sample ID: Biotic\_071315 Prep Type: Total/NA

Prep Batch: 265025

Client Sample ID: Biotic 071315 Prep Type: Total/NA

TestAmerica Job ID: 490-82623-1

SDG: TEL

### Method: 6020 - Metals (ICP/MS) (Continued)

Lab Sample ID: MB 490-265030/1-A	Client Sample ID: Method Blank
Matrix: Water	Prep Type: Total Recoverable
Analysis Batch: 266935	Prep Batch: 265030
MB MB	

Analyte	Result Qualifier	RL	MDL Unit	D	Prepared	Analyzed	Dil Fac
Chromium	ND	0.00200	mg/L		07/15/15 13:54	07/21/15 16:32	1
Copper	ND	0.00200	mg/L		07/15/15 13:54	07/21/15 16:32	1

Lab Sample ID: MB 490-265030/1-A	Client Sample ID: Method Blank
Matrix: Water	Prep Type: Total Recoverable
Analysis Batch: 267599	Prep Batch: 265030

	MR	MR						
Analyte	Result	Qualifier	RL	MDL	Unit	Prepared	Analyzed	Dil Fac
Arsenic	ND		0.00200		mg/L	07/15/15 13:54	07/23/15 14:15	1
Iron	ND		0.0250		mg/L	07/15/15 13:54	07/23/15 14:15	1

Lab Sample ID: LCS 490-265030/2-A Matrix: Water				Clie		•	): Lab Control Samplo pe: Total Recoverablo		
Analysis Batch: 266935								Prep Batch: 265030	)
		Spike	LCS	LCS				%Rec.	
Analyte		Added	Result	Qualifier	Unit	D	%Rec	Limits	
Chromium		0.100	0.09454		mg/L		95	80 - 120	_
Copper		0.100	0.08993		mg/L		90	80 - 120	

Lab Sample ID: LCS 490-265030/2-A		Client Sample ID: Lab Control S								
Matrix: Water				P	rep Typ	e: Total Recoverat	ole			
Analysis Batch: 267599							Prep Batch: 2650	30		
-	Spike	LCS	LCS				%Rec.			
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits			
Arsenic	 0.100	0.09876		mg/L		99	80 - 120	_		
Iron	1.00	1.062		mg/L		106	80 - 120			

Lab Sample ID: LCSD 490-265030/3-A	Client Sample ID: Lab Control Sample Dup								
Matrix: Water				P	rep Typ	oe: Total F	Recove	rable	
Analysis Batch: 266935							Prep Ba	tch: 20	<b>55030</b>
	Spike	LCSD	LCSD				%Rec.		RPD
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits	RPD	Limit
Chromium	0.100	0.09591		mg/L		96	80 - 120	1	20
Copper	0.100	0.09099		mg/L		91	80 - 120	1	20

Lab Sample ID: LCSD 490-265030/3-A Matrix: Water		C	Client S			Control Spe: Total F			
Analysis Batch: 267599							Prep Ba		
	Spike	LCSD	LCSD				%Rec.		RPD
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits	RPD	Limit
Arsenic	0.100	0.09940		mg/L		99	80 - 120	1	20
Iron	1.00	1.082		mg/L		108	80 - 120	2	20

Lab Sample ID: 490-82699-A-2-B MS									ample ID: Matrix Spike	
Matrix: Water									<b>Prep Type: Dissolved</b>	
Analysis Batch: 266935									<b>Prep Batch: 265030</b>	
	Sample	Sample	Spike	MS	MS				%Rec.	
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Chromium	ND		0.100	0.08930		mg/L		89	75 - 125	

TestAmerica Nashville

TestAmerica Job ID: 490-82623-1 SDG: TEL

### Method: 6020 - Metals (ICP/MS) (Continued)

Lab Sample ID: 490-82699-A-2-B MS										mple ID: I	Matrix Spike
	Matrix: Water									<b>Prep Type</b>	e: Dissolved
	Analysis Batch: 266935									Prep Ba	atch: 265030
	-	Sample	Sample	Spike	MS	MS				%Rec.	
	Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	
	Copper	ND		0.100	0.09335		mg/L		93	75 - 125	

Lab Sample ID: 490-82699-A-2-B MS									Client Sample ID: Matrix Spike					
	Matrix: Water									<b>Prep Type</b>	e: Dissolved			
	Analysis Batch: 267599									Prep Ba	atch: 265030			
	-	Sample	Sample	Spike	MS	MS				%Rec.				
	Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits				
	Arsenic	0.0588	-	0.100	0.1507		mg/L		92	75 - 125				
	Iron	9.61		1.00	10.66	4	ma/L		105	75 - 125				

Lab Sample ID: 490-82699- Matrix: Water Analysis Batch: 266935	A-2-C MSD	)				Client	Samp		Matrix Spil Prep Type Prep Ba	e: Diss	olved
	Sample	Sample	Spike	MSD	MSD				%Rec.		RPD
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	RPD	Limit
Chromium	ND		0.100	0.08705		mg/L		87	75 - 125	3	20
Copper	ND		0.100	0.09354		mg/L		94	75 - 125	0	20

Lab Sample ID: 490-82699-	A-2-C MSD					Client	Samp	le ID: N	latrix Spil	ce Dup	licate
Matrix: Water									<b>Prep Type</b>	e: Diss	olved
Analysis Batch: 267599									Prep Ba	tch: 26	55030
_	Sample	Sample	Spike	MSD	MSD				%Rec.		RPD
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	RPD	Limit
Arsenic	0.0588		0.100	0.1507		mg/L		92	75 - 125	0	20
Iron	9.61		1.00	10.64	4	mg/L		103	75 <sub>-</sub> 125	0	20

### Method: 7196A - Chromium, Hexavalent

Lab Sample ID: MB 490-264922/1	Client Sample ID: Method Blank
Matrix: Water	Prep Type: Total/NA
Analysis Batch, 264022	

Analysis Batch: 264922

Analyte

Chromium, hex

Lab Sample ID: LCS 490-264922/2

	MB	MB							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium, hex	ND		0.0100		mg/L			07/14/15 12:12	1

Matrix: Water Analysis Batch: 264922							Prep Type: To	tal/NA
	Spike	LCS	LCS				%Rec.	
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Chromium, hex	0.100	0.09500		mg/L		95	85 - 115	
Lab Sample ID: 490-82623-1 MS Matrix: Water Analysis Batch: 264922					Clie		nple ID: Biotic_0 Prep Type: Dis	

MS MS

0.03700 F1

Result Qualifier

Unit

mg/L

Spike

Added

0.100

Sample Sample

ND F1

Result Qualifier

TestAmerica Nashville

**Client Sample ID: Lab Control Sample** 

%Rec.

Limits

85 - 115

D %Rec

### **QC Sample Results**

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-82623-1

SDG: TEL

### Method: 7196A - Chromium, Hexavalent (Continued)

Client Sample ID: Biotic\_071315 Lab Sample ID: 490-82623-1 MSD **Matrix: Water Prep Type: Dissolved Analysis Batch: 264922** 

	Sample	Sample	<b>Бріке</b>	เพอบ	M2D				%Rec.		RPD	
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	RPD	Limit	
Chromium, hex	ND	F1	0.100	0.03700	F1	mg/L		28	85 - 115	0	20	

Lab Sample ID: 490-82623-1 DU Client Sample ID: Biotic\_071315 **Matrix: Water Prep Type: Dissolved** 

**Analysis Batch: 264922** 

	Sample	Sample	DU	DU					RPD
Analyte	Result	Qualifier	Result	Qualifier	Unit	D		RPD	Limit
Chromium, hex	ND	F1	 ND		mg/L	_		NC	20

#### **Method: Moisture - Percent Moisture**

Lab Sample ID: 490-82537-A-1 DU **Client Sample ID: Duplicate** Matrix: Solid **Prep Type: Total/NA** 

Analysis Batch: 264594

	Sample	Sample	DU	DU				RPD
Analyte	Result	Qualifier	Result	Qualifier	Unit	D	RPD	Limit
Percent Moisture	9.5		8.5		%		 11	20
Percent Solids	91		91		%		1	20

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-82623-1

SDG: TEL

### HPLC/IC

### **Analysis Batch: 264815**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-82623-1	Biotic_071315	Total/NA	Water	9056	
490-82623-3	Biotic Dup_071315	Total/NA	Water	9056	
490-82623-A-1 MS	490-82623-A-1 MS	Total/NA	Water	9056	
490-82623-A-1 MSD	490-82623-A-1 MSD	Total/NA	Water	9056	
LCS 490-264815/7	Lab Control Sample	Total/NA	Water	9056	
LCSD 490-264815/8	Lab Control Sample Dup	Total/NA	Water	9056	
MB 490-264815/6	Method Blank	Total/NA	Water	9056	

### **Analysis Batch: 264816**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-82623-1	Biotic_071315	Total/NA	Water	9056	
490-82623-1 MS	Biotic_071315	Total/NA	Water	9056	
490-82623-1 MSD	Biotic_071315	Total/NA	Water	9056	
490-82623-3	Biotic Dup_071315	Total/NA	Water	9056	
LCS 490-264816/7	Lab Control Sample	Total/NA	Water	9056	
LCSD 490-264816/8	Lab Control Sample Dup	Total/NA	Water	9056	
MB 490-264816/6	Method Blank	Total/NA	Water	9056	

### Metals

### **Prep Batch: 265025**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-82623-2	Biotic_071315	Total/NA	Solid	3051A	
490-82623-2 MS	Biotic_071315	Total/NA	Solid	3051A	
490-82623-2 MSD	Biotic_071315	Total/NA	Solid	3051A	
490-82623-4	Biotic Dup_071315	Total/NA	Solid	3051A	
LCS 490-265025/2-A	Lab Control Sample	Total/NA	Solid	3051A	
MB 490-265025/1-A	Method Blank	Total/NA	Solid	3051A	

### **Prep Batch: 265030**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-82623-1	Biotic_071315	Dissolved	Water	3005A	<del>-</del>
490-82623-3	Biotic Dup_071315	Dissolved	Water	3005A	
490-82699-A-2-B MS	Matrix Spike	Dissolved	Water	3005A	
490-82699-A-2-C MSD	Matrix Spike Duplicate	Dissolved	Water	3005A	
LCS 490-265030/2-A	Lab Control Sample	Total Recoverable	Water	3005A	
LCSD 490-265030/3-A	Lab Control Sample Dup	Total Recoverable	Water	3005A	
MB 490-265030/1-A	Method Blank	Total Recoverable	Water	3005A	

### **Analysis Batch: 265706**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-82623-2	Biotic_071315	Total/NA	Solid	6020	265025
490-82623-2 MS	Biotic_071315	Total/NA	Solid	6020	265025
490-82623-2 MSD	Biotic_071315	Total/NA	Solid	6020	265025
490-82623-4	Biotic Dup_071315	Total/NA	Solid	6020	265025
LCS 490-265025/2-A	Lab Control Sample	Total/NA	Solid	6020	265025
MB 490-265025/1-A	Method Blank	Total/NA	Solid	6020	265025

Page 17 of 25

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-82623-1

SDG: TEL

### **Metals (Continued)**

### **Analysis Batch: 266935**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-82623-1	Biotic_071315	Dissolved	Water	6020	265030
490-82623-3	Biotic Dup_071315	Dissolved	Water	6020	265030
490-82699-A-2-B MS	Matrix Spike	Dissolved	Water	6020	265030
490-82699-A-2-C MSD	Matrix Spike Duplicate	Dissolved	Water	6020	265030
LCS 490-265030/2-A	Lab Control Sample	Total Recoverable	Water	6020	265030
LCSD 490-265030/3-A	Lab Control Sample Dup	Total Recoverable	Water	6020	265030
MB 490-265030/1-A	Method Blank	Total Recoverable	Water	6020	265030

### **Analysis Batch: 267599**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-82623-1	Biotic_071315	Dissolved	Water	6020	265030
490-82623-1	Biotic_071315	Dissolved	Water	6020	265030
490-82623-3	Biotic Dup_071315	Dissolved	Water	6020	265030
490-82623-3	Biotic Dup_071315	Dissolved	Water	6020	265030
490-82699-A-2-B MS	Matrix Spike	Dissolved	Water	6020	265030
490-82699-A-2-C MSD	Matrix Spike Duplicate	Dissolved	Water	6020	265030
LCS 490-265030/2-A	Lab Control Sample	Total Recoverable	Water	6020	265030
LCSD 490-265030/3-A	Lab Control Sample Dup	Total Recoverable	Water	6020	265030
MB 490-265030/1-A	Method Blank	Total Recoverable	Water	6020	265030

### **General Chemistry**

### Analysis Batch: 264594

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-82537-A-1 DU	Duplicate	Total/NA	Solid	Moisture	
490-82623-2	Biotic_071315	Total/NA	Solid	Moisture	
490-82623-4	Biotic Dup_071315	Total/NA	Solid	Moisture	

#### Filtration Batch: 264921

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-82623-1	Biotic_071315	Dissolved	Water	Filtration	
490-82623-1 DU	Biotic_071315	Dissolved	Water	Filtration	
490-82623-1 MS	Biotic_071315	Dissolved	Water	Filtration	
490-82623-1 MSD	Biotic_071315	Dissolved	Water	Filtration	
490-82623-3	Biotic Dup 071315	Dissolved	Water	Filtration	

### **Analysis Batch: 264922**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-82623-1	Biotic_071315	Dissolved	Water	7196A	264921
490-82623-1 DU	Biotic_071315	Dissolved	Water	7196A	264921
490-82623-1 MS	Biotic_071315	Dissolved	Water	7196A	264921
490-82623-1 MSD	Biotic_071315	Dissolved	Water	7196A	264921
490-82623-3	Biotic Dup_071315	Dissolved	Water	7196A	264921
LCS 490-264922/2	Lab Control Sample	Total/NA	Water	7196A	
MB 490-264922/1	Method Blank	Total/NA	Water	7196A	

TestAmerica Job ID: 490-82623-1

SDG: TEL

Client Sample ID: Biotic 071315

Date Collected: 07/13/15 14:00 Date Received: 07/14/15 09:30

Lab Sample ID: 490-82623-1

**Matrix: Water** 

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9056		1	10 mL		264816	07/14/15 14:50	JHS	TAL NSH
Total/NA	Analysis	9056		10	10 mL		264815	07/14/15 15:48	JHS	TAL NSH
Dissolved	Prep	3005A			50 mL	50 mL	265030	07/15/15 13:54	ZLN	TAL NSH
Dissolved	Analysis	6020		1	50 mL	50 mL	266935	07/21/15 17:23	CME	TAL NSH
Dissolved	Prep	3005A			50 mL	50 mL	265030	07/15/15 13:54	ZLN	TAL NSH
Dissolved	Analysis	6020		10	50 mL	50 mL	267599	07/23/15 15:21	CME	TAL NSH
Dissolved	Prep	3005A			50 mL	50 mL	265030	07/15/15 13:54	ZLN	TAL NSH
Dissolved	Analysis	6020		50	50 mL	50 mL	267599	07/23/15 15:27	CME	TAL NSH
Dissolved	Filtration	Filtration			10 mL	1.0 mL	264921	07/14/15 11:09	BLM	TAL NSH
Dissolved	Analysis	7196A		1	10 mL	10 mL	264922	07/14/15 12:12	BLM	TAL NSH

Client Sample ID: Biotic 071315

Date Collected: 07/13/15 14:00

Date Received: 07/14/15 09:30

Lab Sample ID: 490-82623-2

**Matrix: Solid** 

**Matrix: Water** 

	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Analysis	Moisture		1			264594	07/14/15 11:58	MAA	TAL NSH

Client Sample ID: Biotic\_071315

Date Collected: 07/13/15 14:00

Date Received: 07/14/15 09:30

Lab Sample ID: 490-82623-2 **Matrix: Solid** Percent Solids: 77.2

Lab Sample ID: 490-82623-3

	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.506 g	100 mL	265025	07/15/15 13:41	KMS	TAL NSH
Total/NA	Analysis	6020		1	0.506 g	100 mL	265706	07/16/15 19:15	CME	TAL NSH

Client Sample ID: Biotic Dup\_071315

Date Collected: 07/13/15 14:15

Date Received: 07/14/15 09:30

	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Analysis	9056		1	10 mL		264816	07/14/15 16:07	JHS	TAL NSH
Total/NA	Analysis	9056		10	10 mL		264815	07/14/15 16:26	JHS	TAL NSH
Dissolved	Prep	3005A			50 mL	50 mL	265030	07/15/15 13:54	ZLN	TAL NSH
Dissolved	Analysis	6020		1	50 mL	50 mL	266935	07/21/15 17:17	CME	TAL NSH
Dissolved	Prep	3005A			50 mL	50 mL	265030	07/15/15 13:54	ZLN	TAL NSH
Dissolved	Analysis	6020		10	50 mL	50 mL	267599	07/23/15 14:59	CME	TAL NSH
Dissolved	Prep	3005A			50 mL	50 mL	265030	07/15/15 13:54	ZLN	TAL NSH
Dissolved	Analysis	6020		50	50 mL	50 mL	267599	07/23/15 15:04	CME	TAL NSH
Dissolved	Analysis	7196A		1	10 mL	10 mL	264922	07/14/15 12:15	BLM	TAL NSH
Dissolved	Filtration	Filtration			10 mL	1.0 mL	264921	07/15/15 11:33	BLM	TAL NSH

TestAmerica Nashville

### **Lab Chronicle**

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-82623-1

SDG: TEL

Client Sample ID: Biotic Dup\_071315

Lab Sample ID: 490-82623-4 Date Collected: 07/13/15 14:15

**Matrix: Solid** 

Date Received: 07/14/15 09:30

	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Analysis	Moisture		1			264594	07/14/15 11:58	MAA	TAL NSH

Client Sample ID: Biotic Dup\_071315 Lab Sample ID: 490-82623-4

Date Collected: 07/13/15 14:15

**Matrix: Solid** 

Date Received: 07/14/15 09:30 Percent Solids: 79.2

	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.514 g	100 mL	265025	07/15/15 13:41	KMS	TAL NSH
Total/NA	Analysis	6020		1	0.514 g	100 mL	265706	07/16/15 19:40	CME	TAL NSH

**Laboratory References:** 

TAL NSH = TestAmerica Nashville, 2960 Foster Creighton Drive, Nashville, TN 37204, TEL (615)726-0177

### **Method Summary**

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-82623-1

SDG:	IEL

Method	Method Description	Protocol	Laboratory
9056	Anions, Ion Chromatography	SW846	TAL NSH
6020	Metals (ICP/MS)	SW846	TAL NSH
7196A	Chromium, Hexavalent	SW846	TAL NSH
Moisture	Percent Moisture	EPA	TAL NSH

#### **Protocol References:**

EPA = US Environmental Protection Agency

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

#### Laboratory References:

TAL NSH = TestAmerica Nashville, 2960 Foster Creighton Drive, Nashville, TN 37204, TEL (615)726-0177

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TestAmerica Job ID: 490-82623-1 SDG: TEL

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

### **Laboratory: TestAmerica Nashville**

All certifications held by this laboratory are listed. Not all certifications are applicable to this report.

Authority	Program	EPA Region	Certification ID	Expiration Date
A2LA	A2LA		NA: NELAP & A2LA	12-31-15
A2LA	ISO/IEC 17025		0453.07	12-31-15
Alaska (UST)	State Program	10	UST-087	07-24-16
Arizona	State Program	9	AZ0473	05-05-16
Arkansas DEQ	State Program	6	88-0737	04-25-16
California	State Program	9	2938	10-31-16
Connecticut	State Program	1	PH-0220	12-31-15
Florida	NELAP	4	E87358	06-30-16
Georgia	State Program	4	N/A	06-30-16
Illinois	NELAP	5	200010	12-09-15
lowa	State Program	7	131	04-01-16
Kansas	NELAP	7	E-10229	10-31-15
Kentucky (UST)	State Program	4	19	06-30-16
Kentucky (WW)	State Program	4	90038	12-31-15
Louisiana	NELAP	6	30613	06-30-16
Maryland	State Program	3	316	03-31-16
Massachusetts	State Program	1	M-TN032	06-30-16
Minnesota	NELAP	5	047-999-345	12-31-15
Mississippi	State Program	4	N/A	06-30-16
Montana (UST)	State Program	8	NA	02-24-20
Nevada	State Program	9	TN00032	07-31-15 *
New Hampshire	NELAP	1	2963	10-09-15
New Jersey	NELAP	2	TN965	09-30-15
New York	NELAP	2	11342	03-31-16
North Carolina (WW/SW)	State Program	4	387	12-31-15
North Dakota	State Program	8	R-146	06-30-15 *
Ohio VAP	State Program	5	CL0033	07-10-17
Oklahoma	State Program	6	9412	08-31-15
Oregon	NELAP	10	TN200001	04-27-16
Pennsylvania	NELAP	3	68-00585	06-30-16
Rhode Island	State Program	1	LAO00268	12-30-15
South Carolina	State Program	4	84009 (001)	02-28-16
South Carolina (DW)	State Program	4	84009 (002)	12-16-17
Tennessee	State Program	4	2008	02-23-17
Texas	NELAP	6	T104704077	08-31-15
USDA	Federal		S-48469	10-30-16
Utah	NELAP	8	TN00032	07-31-15 *
Virginia	NELAP	3	460152	06-14-16
Washington	State Program	10	C789	07-19-15 *
West Virginia DEP	State Program	3	219	02-28-16
Wisconsin	State Program	5	998020430	08-31-15
Wyoming (UST)	A2LA	8	453.07	12-31-15

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<sup>\*</sup> Certification renewal pending - certification considered valid.





### COOLER RECEIPT FORM

Cooler Received/Opened On 7/14/2015 @ 0930	
1. Tracking #(last 4 digits, FedEx)	
Courier: Fed-ex IR Gun ID 17960357	
2. Temperature of rep. sample or temp blank when opened: \(\frac{\int_0}{D}\) Degrees Celsius	_
3. If Item #2 temperature is 0°C or less, was the representative sample or temp blank frozen?	YES NO. NA
4. Were custody seals on outside of cooler?	VES. NONA
If yes, how many and where:	
5. Were the seals intact, signed, and dated correctly?	YESNONA
6. Were custody papers inside cooler?	YESNONA
I certify that I opened the cooler and answered questions 1-6 (intial)	to
7. Were custody seals on containers: YES (10) and Intact	YESNO(NA)
Were these signed and dated correctly?	YESNONA
8. Packing mat'l used? Bubblewrap Plastic bag Peanuts Vermiculite Foam Insert Paper	Other None
9. Cooling process:	Other None
10. Did all containers arrive in good condition (unbroken)?	(ES)NONA
11. Were all container labels complete (#, date, signed, pres., etc)?	ÆS)NONA
12. Did all container labels and tags agree with custody papers?	(ES)NONA
13a. Were VOA vials received?	YES. NONA
b. Was there any observable headspace present in any VOA vial?	YESNO.
14. Was there a Trip Blank in this cooler? YESNO. (NA) If multiple coolers, sequence	ce #
certify that I unloaded the cooler and answered questions 7-14 (intial)	m>m_
15a. On pres'd bottles, did pH test strips suggest preservation reached the correct pH level?	YESNO.
b. Did the bottle labels indicate that the correct preservatives were used	(ES).NONA
16. Was residual chlorine present?	YESNO. 03
certify that I checked for chlorine and pH as per SOP and answered questions 15-16 (intial)	<u> wom</u>
17. Were custody papers properly filled out (ink, signed, etc)?	(FES)NONA
18. Did you sign the custody papers in the appropriate place?	(ES)NONA
19. Were correct containers used for the analysis requested?	ESNONA
20. Was sufficient amount of sample sent in each container?	ESNONA
certify that I entered this project into LIMS and answered questions 17-20 (intial)	MDn
certify that I attached a label with the unique LIMS number to each container (intial)	MDM
21. Were there Non-Conformance issues at login? YES NO Was a NCM generated? YES	NO.).#

TestAmerica Nashville 2960 Foster Creighton Drive

**Chain of Custody Record** 

Loc: 490 **82623** 

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2960 Foster Creighton Drive							į		201
lashville, TN 37204 hone 615 726 0177 fax	Regulatory Program:							Tota notice I about the lessing 4	3 /24/
Client Contact	Project Manager: Baker, Heather	r: Baker, Hea	ı		위	Date: 7/13/15	3/15	COC No: 1	
Amar Wadhawan	Email: heather.baker@testamerica.com	baker@testar	nerica.com	Lab C	Lab Contact: Linxi Chen	Carrier: Fedex	Fedex	_1of1_COCs	ડેક
eosyntec Consultants	Analys	Analysis Turnaround Time	d Time						
0220 Old Columbia Road Suite A	☐ CALENDAR DAYS		WORKING DAYS	<u> </u>	um			For Lab Use Only:	
Columbia Phone (410) 910-7619		nt from Belov		) ' N '	omit			Walk-in Client:	
MD, 21046 FAX		2 weeks						Lab Sampling:	
Project Name: Treatability Study		1 week		D (	nt C				
Site:TEL		2 days		MS	aleı			Job / SDG No.:	
00#		1 day		/IS /	exav				
	Sample Sample			ered S	6-Nitra 6A -He 0 - As,				
Sample Identification	<u> </u>	le G=Grab)	Matrix	Filt Per	719			Sample Specific Notes:	S:
Biotic_071315	07/2/15 1400	90 G	₩.	1	×			HNO3 preserved	_
Biotic_071315	-	G	w .	1 N	×				+
Biotic_071315	_	G	s,	z	×				2
Biotic Dup_071315	21415	, G	₩ .	1 Y	×			HNO3 preserved	-3 5
Biotic Dup_071315		G	€	z	×				
Biotic Dup_071315	<	G	S 1	z	×				<u>۔</u> 24 (
	2								age
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		/							
'ossible Hazard Identification:	=NaOH; 6= Other			2			医子宫 医物质试验	(五年) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1)	
Are any samples from a listed EPA Hazardous Waste? Please comments Section if the lab is to dispose of the sample.	Please List any EPA Waste Codes for the sample in the	ste Codes for	the sample in		ii pie Disposai ( A ree m	ray be assesse	d it samples are n	Sample Disposal ( A ree may be assessed it samples are retained longer than 1 month)	
☑ Non-Hazard ☐ Flammable ☐ Skin Irritant	Poison B	Unknown	nwor		Return to Client	☑ Disposal by Lab	Archive for	e for Months	
special Instructions/QC Requirements & Comments:						ļ			
Custody Seals Intact:   Yes   No	Custody Seal No.:				ဂျငooler Temp. (°C): Obs'd:	); Obs'd:	Corr'd:	Therm ID No.:	
Chan L. 1520	Company:		Date/Time:	1520 Rec	Received by:	-0	Company: JA KNO大	Date/Time:	
telinguished by	Company:		Date/Time:	7. 200 - R	Received by:	0	Company:	333	26,
Relinquished by:	Company:		Date/Time:		Received in Laboratory by:	0	Company:	Date/Time:	,

### **Login Sample Receipt Checklist**

Client: Geosyntec Consultants, Inc.

Job Number: 490-82623-1

SDG Number: TEL

Login Number: 82623 List Source: TestAmerica Nashville

List Number: 1

Creator: McBride, Mike

Creator: McBride, Mike		
Question	Answer	Comment
Radioactivity wasn't checked or is = background as measured by a survey meter.</td <td>True</td> <td></td>	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	2.6
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	True	

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THE LEADER IN ENVIRONMENTAL TESTING

# **ANALYTICAL REPORT**

TestAmerica Laboratories, Inc.

TestAmerica Nashville 2960 Foster Creighton Drive Nashville, TN 37204 Tel: (615)726-0177

TestAmerica Job ID: 490-83497-1 Client Project/Site: Treatability Study

#### For:

Geosyntec Consultants, Inc. 10220 Old Columbia Road Suite A Columbia, Maryland 21046

Attn: Amar Wadhawan

# Heather Baker

Authorized for release by: 8/9/2015 10:36:18 PM

Heather Baker, Project Manager I (615)301-5043

heather.baker@testamericainc.com

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The test results in this report meet all 2003 NELAC and 2009 TNI requirements for accredited parameters, exceptions are noted in this report. This report may not be reproduced except in full, and with written approval from the laboratory. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

# **Table of Contents**

Cover Page	1
Table of Contents	2
Sample Summary	3
Case Narrative	4
Definitions	5
Client Sample Results	6
QC Sample Results	12
QC Association	20
Chronicle	24
Method Summary	26
Certification Summary	27
Chain of Custody	28
Racaint Chacklists	32

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### **Sample Summary**

Matrix

Water

Solid

Water

Solid

Solid

Water

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

**Client Sample ID** 

Biotic Dup\_072315

Biotic Dup\_072315

Control\_072315

Control\_073015

Biotic\_072315

Biotic\_072315

Lab Sample ID

490-83497-1

490-83497-2

490-83497-3

490-83497-4

490-83497-6

490-83988-1

TestAmerica Job ID: 490-83497-1

07/23/15 12:25 07/24/15 08:40

07/30/15 14:45 07/31/15 08:30

Collected	Received
07/23/15 12:35	07/24/15 08:40
07/23/15 12:35	07/24/15 08:40
07/23/15 12:45	07/24/15 08:40
07/23/15 12:45	07/24/15 08:40

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### **Case Narrative**

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-83497-1

Job ID: 490-83497-1

Laboratory: TestAmerica Nashville

**Narrative** 

Job Narrative 490-83497-1

#### Comments

No additional comments.

#### Receipt

The samples were received on 7/24/2015 8:40 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 3.1° C.

No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

#### Metals

No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

#### Field Service / Mobile Lab

No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

#### **General Chemistry**

No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

#### **Organic Prep**

No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Job ID: 490-83988-1

**Laboratory: TestAmerica Nashville** 

Narrative

Job Narrative 490-83988-1

#### Comments

No additional comments.

#### Receipt

The samples were received on 7/31/2015 8:30 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 3.1° C.

#### HPLC/IC

Method 9056: The following sample was analyzed outside of the analytical holding time: Control 073015 (490-83988-1).

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

#### Metals

No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

#### **General Chemistry**

No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

TestAmerica Nashville 8/9/2015

### **Definitions/Glossary**

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-83497-1

### **Qualifiers**

### **HPLC/IC**

Qualifier	Qualifier Description
4	MS, MSD: The analyte present in the original sample is greater than 4 times the matrix spike concentration; therefore, control limits are not
	applicable.
E	Result exceeded calibration range.
Н	Sample was prepped or analyzed beyond the specified holding time
Metals	
• ""	

Qualifier	Qualifier Description
4	MS, MSD: The analyte present in the original sample is greater than 4 times the matrix spike concentration; therefore, control limits are not
	applicable.
F2	MS/MSD RPD exceeds control limits

### **Glossary**

Abbreviation	These commonly used abbreviations may or may not be present in this report.
a	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains no Free Liquid
DER	Duplicate error ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision level concentration
MDA	Minimum detectable activity
EDL	Estimated Detection Limit
MDC	Minimum detectable concentration
MDL	Method Detection Limit

ML Minimum Level (Dioxin) NC Not Calculated

Not detected at the reporting limit (or MDL or EDL if shown) ND

PQL **Practical Quantitation Limit** 

**Quality Control** QC RER Relative error ratio

RL Reporting Limit or Requested Limit (Radiochemistry)

RPD Relative Percent Difference, a measure of the relative difference between two points

TEF Toxicity Equivalent Factor (Dioxin) TEQ Toxicity Equivalent Quotient (Dioxin)

TestAmerica Nashville

Page 5 of 32

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-83497-1

Client Sample ID: Biotic\_072315

Date Collected: 07/23/15 12:35 Date Received: 07/24/15 08:40 Lab Sample ID: 490-83497-1

Matrix: Water

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Nitrate as N	ND		0.100		mg/L			07/25/15 01:29	1
Sulfate	2200		5.00		mg/L			07/25/15 02:29	5
Method: 6020 - Metals (ICP/MS) -	Dissolve	ed							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	24.6		0.200		mg/L		07/24/15 14:43	07/29/15 15:41	100
Chromium	0.0231		0.0100		mg/L		07/24/15 14:43	07/29/15 15:31	5
Copper	2.61		0.200		mg/L		07/24/15 14:43	07/30/15 16:30	100
Iron	0.281		0.0250		mg/L		07/24/15 14:43	07/29/15 13:46	1
General Chemistry - Dissolved									
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium, hex	ND		0.0100		mg/L			07/24/15 10:44	1

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-83497-1

Client Sample ID: Biotic\_072315

Date Collected: 07/23/15 12:35

**78** 

Lab Sample ID: 490-83497-2 Matrix: Solid

07/24/15 10:20

Date Received: 07/24/15 08:40

**Percent Solids** 

Method: 6020 - Metals (ICP/M	<b>S</b> )								
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	198	F2	0.625		mg/Kg	<u> </u>	07/27/15 10:20	07/29/15 17:57	1
Chromium	45.7		0.625		mg/Kg	₩	07/27/15 10:20	07/29/15 17:57	1
Copper	233		0.625		mg/Kg	₩	07/27/15 10:20	07/31/15 16:57	1
Iron	3210	F2	6.25		mg/Kg	\$	07/27/15 10:20	07/30/15 17:20	1
General Chemistry									
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Moisture	22		0.10		%			07/24/15 10:20	1

0.10

%

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Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-83497-1

Client Sample ID: Biotic Dup 072315

Date Collected: 07/23/15 12:45 Date Received: 07/24/15 08:40

Chromium, hex

Lab Sample ID: 490-83497-3

**Matrix: Water** 

07/24/15 10:46

Method: 9056 - Anions, Ion Chr Analyte	•	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Nitrate as N	ND		0.100		mg/L			07/25/15 02:49	1
Sulfate	2280		5.00		mg/L			07/25/15 03:09	5
Method: 6020 - Metals (ICP/MS) Analyte		ed Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	21.5		0.200		mg/L		07/24/15 14:43	07/29/15 15:46	100
Chromium	0.0203		0.0100		mg/L		07/24/15 14:43	07/29/15 15:36	5
Copper	2.20		0.200		mg/L		07/24/15 14:43	07/30/15 16:36	100
Iron	0.233		0.0250		mg/L		07/24/15 14:43	07/29/15 13:51	1
- General Chemistry - Dissolved									
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac

0.0100

mg/L

ND

TestAmerica Nashville

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

Client Sample ID: Biotic Dup\_072315

TestAmerica Job ID: 490-83497-1

Lab Sample ID: 490-83497-4

. Matrix: Solid

Date Collected: 07/23/15 12:45 Date Received: 07/24/15 08:40

Analyte	Result Qualifier	RL	MDL Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	327	0.611	mg/Kg	<u> </u>	07/27/15 10:20	07/29/15 18:23	1
Chromium	65.6	0.611	mg/Kg	☼	07/27/15 10:20	07/29/15 18:23	1
Copper	462	3.05	mg/Kg	☼	07/27/15 10:20	07/31/15 17:25	5
Iron	4470	6.11	mg/Kg	₽	07/27/15 10:20	07/30/15 17:48	1

General Chemistry Analyte	Result Qualit	fier RL	MDL Un	it D	Prepared	Analyzed	Dil Fac
Percent Moisture	22	0.10	<u></u> %			07/24/15 10:20	1
Percent Solids	78	0.10	%			07/24/15 10:20	1

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Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-83497-1

Client Sample ID: Control\_072315

Date Collected: 07/23/15 12:25 Date Received: 07/24/15 08:40 Lab Sample ID: 490-83497-6

Matrix: Solid

Method: 6020 - Metals ( Analyte	ICP/MS)  Result Qualifie	r RL	MDL Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	142	0.608	mg/Kg	<u></u>	07/27/15 10:20	07/29/15 18:28	1
Chromium	36.2	0.608	mg/Kg	☼	07/27/15 10:20	07/29/15 18:28	1
Copper	314	0.608	mg/Kg	₩	07/27/15 10:20	07/31/15 17:30	1
Iron	1020	6.08	mg/Kg	₽	07/27/15 10:20	07/30/15 17:59	1

General Chemistry Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Moisture	18		0.10		%			07/24/15 10:20	1
Percent Solids	82		0.10		%			07/24/15 10:20	1

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Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-83497-1

Client Sample ID: Control\_073015

Date Collected: 07/30/15 14:45 Date Received: 07/31/15 08:30 Lab Sample ID: 490-83988-1

Matrix: Water

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Nitrate as N	1.66	H	0.100		mg/L			08/06/15 20:55	1
Sulfate	30.8		5.00		mg/L			08/06/15 21:55	5
- Method: 6020 - Metals (ICP/M	S) - Dissolve	ed							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	88.0		0.200		mg/L		08/05/15 09:09	08/07/15 10:45	100
Chromium	10.6		0.200		mg/L		08/05/15 09:09	08/07/15 10:45	100
Copper	93.6		0.200		mg/L		08/05/15 09:09	08/07/15 10:45	100
Iron	218		0.125		mg/L		08/05/15 09:09	08/06/15 00:28	5
- General Chemistry - Dissolve	ed								
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium, hex	0.0140		0.0100		mg/L			07/31/15 10:15	1

TestAmerica Nashville

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Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

Method: 9056 - Anions, Ion Chromatography

Lab Sample ID: MB 490-267866/3 Client Sample ID: Method Blank **Prep Type: Total/NA Matrix: Water** 

**Analysis Batch: 267866** 

MB MB Analyte Result Qualifier RL **MDL** Unit Analyzed Dil Fac Prepared 1.00 07/25/15 00:49 Sulfate ND mg/L

Lab Sample ID: LCS 490-267866/4 **Client Sample ID: Lab Control Sample Matrix: Water** Prep Type: Total/NA

**Analysis Batch: 267866** 

Spike LCS LCS %Rec. Added Limits Analyte Result Qualifier Unit %Rec Sulfate 100 98.41 mg/L 98 80 - 120

Lab Sample ID: 490-83497-B-1 MS Client Sample ID: 490-83497-B-1 MS Prep Type: Total/NA

**Matrix: Water** 

Analysis Batch: 267866

Sample Sample Spike MS MS %Rec. Result Qualifier Added Result Qualifier Limits Analyte Unit D %Rec Sulfate 1270 E 100 2089 E 4 mg/L 821 80 - 120

Client Sample ID: 490-83497-B-1 MSD Lab Sample ID: 490-83497-B-1 MSD Prep Type: Total/NA

**Matrix: Water** 

**Analysis Batch: 267866** 

Sample Sample Spike MSD MSD %Rec. RPD Analyte Result Qualifier Added Result Qualifier Unit %Rec Limits **RPD** Limit Sulfate 1270 E 100 2097 E 4 mg/L 829 80 - 120

Lab Sample ID: MB 490-267867/3 Client Sample ID: Method Blank **Matrix: Water** Prep Type: Total/NA

**Analysis Batch: 267867** 

MR MR

Analyte Result Qualifier RL **MDL** Unit Analyzed Dil Fac Prepared Nitrate as N ND 0.100 07/25/15 00:49 mg/L

Lab Sample ID: LCS 490-267867/4 **Client Sample ID: Lab Control Sample Matrix: Water** Prep Type: Total/NA

**Analysis Batch: 267867** 

Spike LCS LCS %Rec. Analyte Added Result Qualifier Unit D %Rec Limits 96 Nitrate as N 10.0 9.597 80 - 120 mg/L

Lab Sample ID: 490-83497-B-1 MS Client Sample ID: Biotic\_072315 Prep Type: Total/NA

**Matrix: Water** 

**Analysis Batch: 267867** 

Sample Sample Spike MS MS %Rec. Result Qualifier Added Analyte Result Qualifier Unit %Rec Limits Nitrate as N ND 10.0 9.561 mg/L 95 80 - 120

Lab Sample ID: 490-83497-B-1 MSD Client Sample ID: Biotic 072315 Prep Type: Total/NA

**Matrix: Water** 

**Analysis Batch: 267867** 

Sample Sample Spike MSD MSD %Rec. **RPD** Result Qualifier Added Limits Analyte Result Qualifier Unit D %Rec RPD Limit Nitrate as N ND 10.0 9.860 98 80 - 120 mg/L

TestAmerica Nashville

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

**Client Sample ID: Method Blank** 

Lab Sample ID: MB 490-271466/6 **Matrix: Water** 

**Analysis Batch: 271466** MB MB

**Prep Type: Total/NA** 

Analyte Result Qualifier RL **MDL** Unit Prepared Analyzed Dil Fac Sulfate 1.00 mg/L 08/06/15 19:55 ND

Lab Sample ID: LCS 490-271466/7 **Client Sample ID: Lab Control Sample Matrix: Water** Prep Type: Total/NA

**Analysis Batch: 271466** 

LCS LCS Spike %Rec. Added Result Qualifier Limits Analyte Unit D %Rec Sulfate 100 103.6 mg/L 104 80 - 120

Lab Sample ID: LCSD 490-271466/8 Client Sample ID: Lab Control Sample Dup **Matrix: Water** Prep Type: Total/NA **Analysis Batch: 271466** LCSD LCSD RPD Spike %Rec.

Limits Added Result Qualifier **Analyte** Unit %Rec **RPD** Limit Sulfate 100 103.7 mg/L 104 80 - 120

Lab Sample ID: 490-83988-A-1 MS Client Sample ID: 490-83988-A-1 MS Prep Type: Total/NA

**Matrix: Water** 

**Analysis Batch: 271466** 

Spike MS MS Sample Sample %Rec. Analyte Result Qualifier Added Result Qualifier Unit %Rec Limits Sulfate 17.4 100 115.3 mg/L 80 - 120

Lab Sample ID: 490-83988-A-1 MSD Client Sample ID: 490-83988-A-1 MSD **Matrix: Water** Prep Type: Total/NA

**Analysis Batch: 271466** 

MSD MSD Sample Sample Spike %Rec. RPD Result Qualifier Added Result Qualifier Limits Analyte Unit %Rec **RPD** Limit Sulfate 17.4 100 114.8 mg/L 80 - 120

Lab Sample ID: MB 490-271467/6 **Client Sample ID: Method Blank** Prep Type: Total/NA

**Matrix: Water** 

**Analysis Batch: 271467** 

MB MB Analyte Result Qualifier RL MDL Unit Prepared Analyzed Dil Fac mg/L Nitrate as N  $\overline{\mathsf{ND}}$ 0.100 08/06/15 19:55

Lab Sample ID: LCS 490-271467/7 **Client Sample ID: Lab Control Sample Matrix: Water** Prep Type: Total/NA

**Analysis Batch: 271467** 

Spike LCS LCS %Rec. Added Result Qualifier Analyte Unit %Rec Limits 10.0 9.983 100 Nitrate as N mg/L 80 - 120

Client Sample ID: Lab Control Sample Dup Lab Sample ID: LCSD 490-271467/8 **Matrix: Water** Prep Type: Total/NA

**Analysis Batch: 271467** 

LCSD LCSD %Rec. **RPD** Spike Analyte Added Result Qualifier Unit D %Rec Limits **RPD** Limit Nitrate as N 10.0 10.33 mg/L 103 80 - 120 20

TestAmerica Nashville

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

Method: 9056 - Anions, Ion Chromatography (Continued)

Lab Sample ID: 490-83988-1 MS Client Sample ID: Control 073015 **Matrix: Water** Prep Type: Total/NA

**Analysis Batch: 271467** 

Sample Sample Spike MS MS %Rec. Analyte Result Qualifier Added Result Qualifier %Rec Limits Unit D 10.0 Nitrate as N 1.66 H 11.49 98 80 - 120 mg/L

Lab Sample ID: 490-83988-1 MSD Client Sample ID: Control 073015 Prep Type: Total/NA

**Matrix: Water** 

Analysis Batch: 271467

	Sample	Sample	Spike	MSD	MSD				%Rec.		RPD
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	RPD	Limit
Nitrate as N	1.66	Н	10.0	11.17		mg/L		95	80 - 120	3	20

Method: 6020 - Metals (ICP/MS)

Lab Sample ID: MB 490-268315/1-A Client Sample ID: Method Blank **Matrix: Solid** Prep Type: Total/NA **Prep Batch: 268315** 

**Analysis Batch: 269296** 

MB MB Analyte Result Qualifier RL **MDL** Unit Prepared Analyzed Dil Fac Arsenic 0.500 07/27/15 10:20 07/29/15 17:47  $\overline{\mathsf{ND}}$ mg/Kg Chromium ND 0.500 mg/Kg 07/27/15 10:20 07/29/15 17:47

Lab Sample ID: MB 490-268315/1-A Client Sample ID: Method Blank **Matrix: Solid** Prep Type: Total/NA

**Analysis Batch: 269578** 

MB MB RL **Analyte** Result Qualifier **MDL** Unit Prepared Analyzed Dil Fac 5.00 07/27/15 10:20 07/30/15 17:09 Iron  $\overline{\mathsf{ND}}$ mg/Kg

Lab Sample ID: MB 490-268315/1-A **Client Sample ID: Method Blank** Prep Type: Total/NA

**Matrix: Solid** 

Iron

**Analysis Batch: 270256** 

MB MB Analyte RL **MDL** Unit Result Qualifier Prepared Analyzed Dil Fac ND 0.500 mg/Kg 07/27/15 10:20 07/31/15 16:46

Copper Lab Sample ID: LCS 490-268315/2-A **Client Sample ID: Lab Control Sample** 

**Matrix: Solid** Prep Type: Total/NA **Analysis Batch: 269296 Prep Batch: 268315** Spike LCS LCS %Rec. Analyte Added Result Qualifier Unit %Rec Limits Arsenic 19.9 18.35 mg/Kg 92 80 - 120

Chromium 199 17.71 mg/Kg 89 80 - 120 Lab Sample ID: LCS 490-268315/2-A **Client Sample ID: Lab Control Sample** 

199

**Matrix: Solid** Prep Type: Total/NA **Analysis Batch: 269578 Prep Batch: 268315** Spike LCS LCS %Rec. Added Limits **Analyte** Result Qualifier Unit D %Rec

212.2

mg/Kg

106

80 - 120

TestAmerica Nashville

8/9/2015

**Prep Batch: 268315** 

Prep Batch: 268315

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

Method: 6020 - Metals (ICP/MS) (Continued)

Lab Sample ID: LCS 490-268315/2-A				Client	Samp	le ID	: Lab Control Sample
Matrix: Solid							Prep Type: Total/NA
Analysis Batch: 270256							<b>Prep Batch: 268315</b>
	Spike	LCS	LCS				%Rec.
Analyte	Added	Result	Qualifier	Unit	D %	Rec	Limits
Copper	19.9	19.16		mg/Kg		96	80 - 120

Lab Sample ID: 490-83497 Matrix: Solid Analysis Batch: 269296	'-2 MS						Clie	nt Sam	ple ID: Biotic_072315 Prep Type: Total/NA Prep Batch: 268315
_	Sample	Sample	Spike	MS	MS				%Rec.
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits
Arsenic	198	F2	25.0	221.8	4	mg/Kg	<u> </u>	95	75 - 125
Chromium	45.7		25.0	69.87		mg/Kg	≎	97	75 <sub>-</sub> 125

M	ab Sample ID: 490-83497-2 latrix: Solid analysis Batch: 269578	MS						Client Sample ID: Biotic_ Prep Type: T Prep Batch:			e: Total/NA
	, , , , , , , , , , , , , , , , , , , ,	Sample	Sample	Spike	MS	MS				%Rec.	
A	nalyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Iro	on	3210	F2	250	3595	4	mg/Kg	₩	152	75 - 125	

Lab Sample ID: 490-83497-2	I IVI S						Cile	ent Sam	ipie iD: Biotic_0/2315
Matrix: Solid									Prep Type: Total/NA
Analysis Batch: 270256									<b>Prep Batch: 268315</b>
_	Sample	Sample	Spike	MS	MS				%Rec.
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits
Copper	233		25.0	284.1	4	mg/Kg	₽	203	75 - 125

Lab Sample ID: 490-83497	-2 MSD						Clie	nt Sam	ple ID: Bi	otic_07	72315
Matrix: Solid									Prep Ty	e: Tot	al/NA
Analysis Batch: 269296									Prep Ba	itch: 26	88315
	Sample	Sample	Spike	MSD	MSD				%Rec.		RPD
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	RPD	Limit
Arsenic	198	F2	24.8	275.7	4 F2	mg/Kg	<u>₩</u>	313	75 - 125	22	20
Chromium	45.7		24.8	73.86		mg/Kg	☼	113	75 - 125	6	20

Lab Sample ID: 490-83497 Matrix: Solid Analysis Batch: 270256	-2 MSD						Clien	ıt Sam	nple ID: Bi Prep Typ Prep Ba	pe: Tot	al/NA	
_	Sample	Sample	Spike	MSD	MSD				%Rec.		RPD	
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D '	%Rec	Limits	RPD	Limit	
Connor	222		24.0	227.0	1	ma/Ka	- 75 -	417	75 125	17	20	

Соррог	200	21.0	007:0	1119/119		70-120	• • •	
Lab Sample ID: MB 490-26	7805/1-A				Client San	iple ID: Me	thod B	lank
Matrix: Water					Prep Ty	oe: Total R	ecover	able
Analysis Batch: 269196						Pren Bat		

, midigolo Datolli 200 loc									
•	MB	MB						•	
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND		0.00200		mg/L		07/24/15 14:43	07/29/15 12:39	1
Chromium	ND		0.00200		mg/L		07/24/15 14:43	07/29/15 12:39	1
Copper	ND		0.00200		mg/L		07/24/15 14:43	07/29/15 12:39	1
Iron	ND		0.0250		mg/L		07/24/15 14:43	07/29/15 12:39	1
	Analyte Arsenic Chromium Copper	Analyte         Result           Arsenic         ND           Chromium         ND           Copper         ND	AnalyteResult QualifierArsenicNDChromiumNDCopperND	Analyte         Result         Qualifier         RL           Arsenic         ND         0.00200           Chromium         ND         0.00200           Copper         ND         0.00200	Analyte         Result         Qualifier         RL         MDL           Arsenic         ND         0.00200         Chromium         ND         0.00200           Copper         ND         0.00200         Copper	MB Analyte         Result Arsenic         Qualifier         RL O.00200         MDL mg/L           Chromium         ND         0.00200         mg/L           Copper         ND         0.00200         mg/L	MB Analyte         Result Arsenic         Qualifier         RL O.00200         MDL mg/L         D	MB         MB           Analyte         Result         Qualifier         RL         MDL         Unit         D         Prepared           Arsenic         ND         0.00200         mg/L         07/24/15 14:43           Chromium         ND         0.00200         mg/L         07/24/15 14:43           Copper         ND         0.00200         mg/L         07/24/15 14:43	Analyte         Result         Qualifier         RL         MDL         Unit         D         Prepared         Analyzed           Arsenic         ND         0.00200         mg/L         07/24/15 14:43         07/29/15 12:39           Chromium         ND         0.00200         mg/L         07/24/15 14:43         07/29/15 12:39           Copper         ND         0.00200         mg/L         07/24/15 14:43         07/29/15 12:39

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Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

Method: 6020 - Metals (ICP/MS) (Continued)

Lab Sample ID: MB 490-267805/1-A

**Matrix: Water** 

**Analysis Batch: 269578** 

Client Sample ID: Method Blank **Prep Type: Total Recoverable Prep Batch: 267805** 

MB MB

Analyte Result Qualifier RL **MDL** Unit Analyzed Dil Fac Prepared 0.00200 07/24/15 14:43 07/30/15 15:46 ND mg/L Copper

Lab Sample ID: LCS 490-267805/2-A Client Sample ID: Lab Control Sample **Matrix: Water Prep Type: Total Recoverable** 

**Analysis Batch: 269196 Prep Batch: 267805** Spike LCS LCS %Rec. Added Limits **Analyte** Result Qualifier Unit D %Rec Arsenic 0.100 0.1079 mg/L 108 80 - 120 Chromium 0.100 0.09275 mg/L 93 80 - 120

Copper 0.100 0.09437 mg/L 94 80 - 120 Iron 1.00 0.9999 mg/L 100 80 - 120

Lab Sample ID: LCS 490-267805/2-A **Client Sample ID: Lab Control Sample Matrix: Water Prep Type: Total Recoverable** 

**Prep Batch: 267805 Analysis Batch: 269578** Spike LCS LCS %Rec.

Added Analyte Result Qualifier Unit %Rec Limits 0.100 0.09592 80 - 120 Copper mg/L 96

Lab Sample ID: MB 490-270526/1-A **Client Sample ID: Method Blank Prep Type: Total Recoverable Matrix: Water** 

**Analysis Batch: 271145 Prep Batch: 270526** 

MB MB Analyte Result Qualifier RL **MDL** Unit D Prepared Analyzed Dil Fac Arsenic  $\overline{\mathsf{ND}}$ 0.00200 mg/L 08/04/15 10:51 08/05/15 23:02 Chromium ND 08/04/15 10:51 08/05/15 23:02 0.00200 mg/L ND Copper 0.00200 mg/L 08/04/15 10:51 08/05/15 23:02 Iron ND 0.0250 mg/L 08/04/15 10:51 08/05/15 23:02

Lab Sample ID: LCS 490-270526/2-A **Client Sample ID: Lab Control Sample** 

**Matrix: Water** 

**Prep Type: Total Recoverable Analysis Batch: 271145** Prep Batch: 270526

	Spike	LCS	LCS				%Rec.	
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Arsenic	0.100	0.09438		mg/L		94	80 - 120	
Chromium	0.100	0.09583		mg/L		96	80 - 120	
Copper	0.100	0.09148		mg/L		91	80 - 120	
Iron	1.00	0.9768		mg/L		98	80 - 120	

Lab Sample ID: 490-83431-A-5-B MS **Client Sample ID: Matrix Spike Matrix: Water Prep Type: Dissolved** 

**Analysis Batch: 269196 Prep Batch: 267805** 

	Sample	Sample	Spike	MS	MS				%Rec.	
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Arsenic	ND		0.100	0.1021		mg/L		101	75 - 125	
Chromium	ND		0.100	0.09032		mg/L		90	75 <sub>-</sub> 125	
Copper	ND		0.100	0.08896		mg/L		89	75 <sub>-</sub> 125	
Iron	9.91		1.00	10.04	4	mg/L		13	75 <sub>-</sub> 125	

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8/9/2015

Client Sample ID: Matrix Spike Duplicate

Client: Geosyntec Consultants, Inc.

Project/Site: Treatability Study

Method: 6020 - Metals (ICP/MS) (Continued)

Lab Sample ID: 490-83431-	A-5-B MS			Client Sample ID: Matrix Spike
Matrix: Water				Prep Type: Dissolved
Analysis Batch: 269578				<b>Prep Batch: 267805</b>
•	Sample Sample	Spike	MS MS	%Rec.

Analyte Result Qualifier Added Result Qualifier Unit D %Rec Limits 0.100 Copper ND 0.08986 89 75 - 125 mg/L

Lab Sample ID: 490-83431-A-5-C MSD

Matrix: Water Analysis Batch: 269196									Prep Type Prep Ba		
	Sample	Sample	Spike	MSD	MSD				%Rec.		RPD
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	RPD	Limit
Arsenic	ND		0.100	0.1037		mg/L		103	75 - 125	2	20
Chromium	ND		0.100	0.09120		mg/L		91	75 - 125	1	20
Copper	ND		0.100	0.08646		mg/L		86	75 - 125	3	20
Iron	9.91		1.00	10.20	4	mg/L		29	75 - 125	2	20

Lab Sample ID: 490-83431-A-5-C MSD **Client Sample ID: Matrix Spike Duplicate Matrix: Water Prep Type: Dissolved** 

Analysis Batch: 269578									Prep Ba	atch: 20	<b>67805</b>
-	Sample	Sample	Spike	MSD	MSD				%Rec.		RPD
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	RPD	Limit
Copper	ND		0.100	0.08769		mg/L		87	75 - 125	2	20

Lab Sample ID: 490-84150-A-6-B MS **Client Sample ID: Matrix Spike Matrix: Water Prep Type: Dissolved** Prep Batch: 270526

**Analysis Batch: 271145** 

	Sample	Sample	Spike	MS	MS				%Rec.	
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Arsenic	0.152		0.100	0.2591		mg/L		107	75 - 125	 
Chromium	ND		0.100	0.09622		mg/L		95	75 - 125	
Copper	ND		0.100	0.08747		mg/L		87	75 - 125	
Iron	ND		1.00	0.9817		mg/L		98	75 - 125	

Lab Sample ID: 490-84150-A-6-C MSD Client Sample ID: Matrix Spike Duplicate

**Matrix: Water** 

Analysis Batch: 271145									Prep Ba	itch: 27	70526
	Sample	Sample	Spike	MSD	MSD				%Rec.		RPD
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	RPD	Limit
Arsenic	0.152		0.100	0.2507		mg/L		98	75 - 125	3	20
Chromium	ND		0.100	0.09294		mg/L		92	75 - 125	3	20
Copper	ND		0.100	0.08631		mg/L		86	75 - 125	1	20
Iron	ND		1.00	0.9438		mg/L		94	75 - 125	4	20

Method: 7196A - Chromium, Hexavalent

Lab Sample ID: MB 490-270945/1 **Client Sample ID: Method Blank** Prep Type: Total/NA

**Matrix: Water** 

Analysis Patch: 270045

Analysis Batch: 270945	МВ	MB							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium, hex	ND		0.0100		mg/L			07/31/15 10:15	1

TestAmerica Nashville

8/9/2015

Page 17 of 32

**Prep Type: Dissolved** 

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

### Method: 7196A - Chromium, Hexavalent (Continued)

Lab Sample ID: LCS 490-270945/2	Client Sample ID: Lab Control Sample
Matrix: Water	Prep Type: Total/NA
Analysis Batch: 270945	

Spike LCS LCS %Rec. Analyte Added Result Qualifier D %Rec Limits Unit 0.100 Chromium, hex 0.1040 104 85 - 115 mg/L

Lab Sample ID: MB 490-270949/1 Client Sample ID: Method Blank **Matrix: Water** Prep Type: Total/NA

**Analysis Batch: 270949** 

MB MB Dil Fac Analyte Result Qualifier RL MDL Unit Prepared Analyzed Chromium, hex  $\overline{\mathsf{ND}}$ 0.0100 mg/L 07/24/15 10:44

Lab Sample ID: LCS 490-270949/2 **Client Sample ID: Lab Control Sample Matrix: Water** Prep Type: Total/NA

Analysis Batch: 270949

Spike LCS LCS %Rec. Added Result Qualifier Limits Analyte Unit D %Rec Chromium, hex 0.100 0.1000 mg/L 100 85 - 115

Lab Sample ID: 490-83538-B-1 MS **Client Sample ID: Matrix Spike Matrix: Water** Prep Type: Total/NA

**Analysis Batch: 270949** 

Sample Sample Spike MS MS %Rec. Result Qualifier Added Result Qualifier Unit %Rec Limits Chromium, hex ND 1000 1000 100 85 - 115 mg/L

Lab Sample ID: 490-83538-B-1 MSD Client Sample ID: Matrix Spike Duplicate **Matrix: Water** Prep Type: Total/NA

**Analysis Batch: 270949** 

Spike MSD MSD %Rec. RPD Sample Sample Analyte Result Qualifier Added Result Qualifier Unit %Rec Limits RPD Limit Chromium, hex ND 1000 1000 mg/L 100 85 - 115 20

Lab Sample ID: 490-83538-A-1 DU **Client Sample ID: Duplicate Matrix: Water** Prep Type: Total/NA

**Analysis Batch: 270949** 

DU DU Sample Sample **RPD** Result Qualifier Result Qualifier Analyte Unit **RPD** Limit Chromium, hex ND ND mg/L

Lab Sample ID: 490-83988-1 MS Client Sample ID: Control\_073015 **Matrix: Water Prep Type: Dissolved** 

Analysis Batch: 270945

Sample Sample Spike MS MS %Rec. Result Qualifier Added Analyte Result Qualifier Unit %Rec Limits Chromium, hex 0.0140 0.100 0.1100 mg/L 96 85 - 115

Lab Sample ID: 490-83988-1 MSD Client Sample ID: Control 073015 **Matrix: Water Prep Type: Dissolved** 

**Analysis Batch: 270945** 

Sample Sample Spike MSD MSD %Rec. **RPD** Result Qualifier Added Analyte Result Qualifier Unit D %Rec Limits RPD Limit Chromium, hex 0.0140 0.100 0.1100 96 mg/L

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### **QC Sample Results**

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

Lab Sample ID: 490-83988-1 DU

**Matrix: Water** 

TestAmerica Job ID: 490-83497-1

Client Sample ID: Control\_073015

**Prep Type: Dissolved** 

DU DU RPD Sample Sample Analyte Result Qualifier Result Qualifier Unit D RPD Limit Chromium, hex 0.0140 0.01400 mg/L 0 20

**Method: Moisture - Percent Moisture** 

Lab Sample ID: 490-83468-E-1 DU **Client Sample ID: Duplicate Matrix: Solid** Prep Type: Total/NA

**Analysis Batch: 267648** 

Analysis Batch: 270945

	Sample	Sample	DU	DU					RPD
Analyte	Result	Qualifier	Result	Qualifier	Unit	D		RPD	Limit
Percent Moisture	6.1		6.2		%			2	20
Percent Solids	94		94		%			0.1	20

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

### HPLC/IC

### Analysis Batch: 267866

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-83497-1	Biotic_072315	Total/NA	Water	9056	
490-83497-3	Biotic Dup_072315	Total/NA	Water	9056	
490-83497-B-1 MS	490-83497-B-1 MS	Total/NA	Water	9056	
490-83497-B-1 MSD	490-83497-B-1 MSD	Total/NA	Water	9056	
LCS 490-267866/4	Lab Control Sample	Total/NA	Water	9056	
MB 490-267866/3	Method Blank	Total/NA	Water	9056	

### **Analysis Batch: 267867**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-83497-1	Biotic_072315	Total/NA	Water	9056	
490-83497-3	Biotic Dup_072315	Total/NA	Water	9056	
490-83497-B-1 MS	Biotic_072315	Total/NA	Water	9056	
490-83497-B-1 MSD	Biotic_072315	Total/NA	Water	9056	
LCS 490-267867/4	Lab Control Sample	Total/NA	Water	9056	
MB 490-267867/3	Method Blank	Total/NA	Water	9056	

### **Analysis Batch: 271466**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-83988-1	Control_073015	Total/NA	Water	9056	_
490-83988-A-1 MS	490-83988-A-1 MS	Total/NA	Water	9056	
490-83988-A-1 MSD	490-83988-A-1 MSD	Total/NA	Water	9056	
LCS 490-271466/7	Lab Control Sample	Total/NA	Water	9056	
LCSD 490-271466/8	Lab Control Sample Dup	Total/NA	Water	9056	
MB 490-271466/6	Method Blank	Total/NA	Water	9056	

### **Analysis Batch: 271467**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-83988-1	Control_073015	Total/NA	Water	9056	
490-83988-1 MS	Control_073015	Total/NA	Water	9056	
490-83988-1 MSD	Control_073015	Total/NA	Water	9056	
LCS 490-271467/7	Lab Control Sample	Total/NA	Water	9056	
LCSD 490-271467/8	Lab Control Sample Dup	Total/NA	Water	9056	
MB 490-271467/6	Method Blank	Total/NA	Water	9056	

### Metals

### Prep Batch: 267805

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-83431-A-5-B MS	Matrix Spike	Dissolved	Water	3005A	_
490-83431-A-5-C MSD	Matrix Spike Duplicate	Dissolved	Water	3005A	
490-83497-1	Biotic_072315	Dissolved	Water	3005A	
490-83497-3	Biotic Dup_072315	Dissolved	Water	3005A	
LCS 490-267805/2-A	Lab Control Sample	Total Recoverable	Water	3005A	
MB 490-267805/1-A	Method Blank	Total Recoverable	Water	3005A	

### **Prep Batch: 268315**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-83497-2	Biotic_072315	Total/NA	Solid	3051A	
490-83497-2 MS	Biotic_072315	Total/NA	Solid	3051A	
490-83497-2 MSD	Biotic_072315	Total/NA	Solid	3051A	

TestAmerica Nashville

8/9/2015

Page 20 of 32

9

6

8

46

11

12

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-83497-1

### **Metals (Continued)**

### Prep Batch: 268315 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method Prep Batch
490-83497-4	Biotic Dup_072315	Total/NA	Solid	3051A
490-83497-6	Control_072315	Total/NA	Solid	3051A
LCS 490-268315/2-A	Lab Control Sample	Total/NA	Solid	3051A
MB 490-268315/1-A	Method Blank	Total/NA	Solid	3051A

### Analysis Batch: 269196

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-83431-A-5-B MS	Matrix Spike	Dissolved	Water	6020	267805
490-83431-A-5-C MSD	Matrix Spike Duplicate	Dissolved	Water	6020	267805
490-83497-1	Biotic_072315	Dissolved	Water	6020	267805
490-83497-1	Biotic_072315	Dissolved	Water	6020	267805
490-83497-1	Biotic_072315	Dissolved	Water	6020	267805
490-83497-3	Biotic Dup_072315	Dissolved	Water	6020	267805
490-83497-3	Biotic Dup_072315	Dissolved	Water	6020	267805
490-83497-3	Biotic Dup_072315	Dissolved	Water	6020	267805
LCS 490-267805/2-A	Lab Control Sample	Total Recoverable	Water	6020	267805
MB 490-267805/1-A	Method Blank	Total Recoverable	Water	6020	267805

### **Analysis Batch: 269296**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-83497-2	Biotic_072315	Total/NA	Solid	6020	268315
490-83497-2 MS	Biotic_072315	Total/NA	Solid	6020	268315
490-83497-2 MSD	Biotic_072315	Total/NA	Solid	6020	268315
490-83497-4	Biotic Dup_072315	Total/NA	Solid	6020	268315
490-83497-6	Control_072315	Total/NA	Solid	6020	268315
LCS 490-268315/2-A	Lab Control Sample	Total/NA	Solid	6020	268315
MB 490-268315/1-A	Method Blank	Total/NA	Solid	6020	268315

### **Analysis Batch: 269578**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-83431-A-5-B MS	Matrix Spike	Dissolved	Water	6020	267805
490-83431-A-5-C MSD	Matrix Spike Duplicate	Dissolved	Water	6020	267805
490-83497-1	Biotic_072315	Dissolved	Water	6020	267805
490-83497-2	Biotic_072315	Total/NA	Solid	6020	268315
490-83497-2 MS	Biotic_072315	Total/NA	Solid	6020	268315
490-83497-3	Biotic Dup_072315	Dissolved	Water	6020	267805
490-83497-4	Biotic Dup_072315	Total/NA	Solid	6020	268315
490-83497-6	Control_072315	Total/NA	Solid	6020	268315
LCS 490-267805/2-A	Lab Control Sample	Total Recoverable	Water	6020	267805
LCS 490-268315/2-A	Lab Control Sample	Total/NA	Solid	6020	268315
MB 490-267805/1-A	Method Blank	Total Recoverable	Water	6020	267805
MB 490-268315/1-A	Method Blank	Total/NA	Solid	6020	268315

### **Analysis Batch: 270256**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-83497-2	Biotic_072315	Total/NA	Solid	6020	268315
490-83497-2 MS	Biotic_072315	Total/NA	Solid	6020	268315
490-83497-2 MSD	Biotic_072315	Total/NA	Solid	6020	268315
490-83497-4	Biotic Dup_072315	Total/NA	Solid	6020	268315
490-83497-6	Control_072315	Total/NA	Solid	6020	268315
LCS 490-268315/2-A	Lab Control Sample	Total/NA	Solid	6020	268315

TestAmerica Nashville

8/9/2015

9

4

6

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9

12

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-83497-1

**Metals (Continued)** 

<b>Analysis</b>	Batch: 270256	(Continued)
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Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
MB 490-268315/1-A	Method Blank	Total/NA	Solid	6020	268315

### Prep Batch: 270526

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-83988-1	Control_073015	Dissolved	Water	3005A	270785
490-84150-A-6-B MS	Matrix Spike	Dissolved	Water	3005A	
490-84150-A-6-C MSD	Matrix Spike Duplicate	Dissolved	Water	3005A	
LCS 490-270526/2-A	Lab Control Sample	Total Recoverable	Water	3005A	
MB 490-270526/1-A	Method Blank	Total Recoverable	Water	3005A	

#### Filtration Batch: 270785

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-83988-1	Control_073015	Dissolved	Water	Filtration	

### **Analysis Batch: 271145**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-83988-1	Control_073015	Dissolved	Water	6020	270526
490-84150-A-6-B MS	Matrix Spike	Dissolved	Water	6020	270526
490-84150-A-6-C MSD	Matrix Spike Duplicate	Dissolved	Water	6020	270526
LCS 490-270526/2-A	Lab Control Sample	Total Recoverable	Water	6020	270526
MB 490-270526/1-A	Method Blank	Total Recoverable	Water	6020	270526

### **Analysis Batch: 271729**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-83988-1	Control_073015	Dissolved	Water	6020	270526

### **General Chemistry**

### **Analysis Batch: 267648**

	Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
	490-83468-E-1 DU	Duplicate	Total/NA	Solid	Moisture	
	490-83497-2	Biotic_072315	Total/NA	Solid	Moisture	
	490-83497-4	Biotic Dup_072315	Total/NA	Solid	Moisture	
١	490-83497-6	Control_072315	Total/NA	Solid	Moisture	

### **Analysis Batch: 270945**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-83988-1	Control_073015	Dissolved	Water	7196A	270946
490-83988-1 DU	Control_073015	Dissolved	Water	7196A	270946
490-83988-1 MS	Control_073015	Dissolved	Water	7196A	270946
490-83988-1 MSD	Control_073015	Dissolved	Water	7196A	270946
LCS 490-270945/2	Lab Control Sample	Total/NA	Water	7196A	
MB 490-270945/1	Method Blank	Total/NA	Water	7196A	

#### Filtration Batch: 270946

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-83988-1	Control_073015	Dissolved	Water	Filtration	
490-83988-1 DU	Control_073015	Dissolved	Water	Filtration	
490-83988-1 MS	Control_073015	Dissolved	Water	Filtration	
490-83988-1 MSD	Control 073015	Dissolved	Water	Filtration	

TestAmerica Nashville

Page 22 of 32

8/9/2015

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-83497-1

### 3

### **General Chemistry (Continued)**

### Analysis Batch: 270949

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-83497-1	Biotic_072315	Dissolved	Water	7196A	270950
490-83497-3	Biotic Dup_072315	Dissolved	Water	7196A	270950
490-83538-A-1 DU	Duplicate	Total/NA	Water	7196A	
490-83538-B-1 MS	Matrix Spike	Total/NA	Water	7196A	
490-83538-B-1 MSD	Matrix Spike Duplicate	Total/NA	Water	7196A	
LCS 490-270949/2	Lab Control Sample	Total/NA	Water	7196A	
MB 490-270949/1	Method Blank	Total/NA	Water	7196A	

### Filtration Batch: 270950

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-83497-1	Biotic_072315	Dissolved	Water	Filtration	
490-83497-3	Biotic Dup_072315	Dissolved	Water	Filtration	

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TestAmerica Job ID: 490-83497-1

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

Client Sample ID: Biotic 072315

Date Collected: 07/23/15 12:35 Date Received: 07/24/15 08:40

Lab Sample ID: 490-83497-1

**Matrix: Water** 

	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Analysis	9056		1	10 mL		267867	07/25/15 01:29	CLN	TAL NSH
Total/NA	Analysis	9056		5	10 mL		267866	07/25/15 02:29	CLN	TAL NSH
Dissolved	Prep	3005A			50 mL	50 mL	267805	07/24/15 14:43	ZLN	TAL NSH
Dissolved	Analysis	6020		100	50 mL	50 mL	269578	07/30/15 16:30	CME	TAL NSH
Dissolved	Prep	3005A			50 mL	50 mL	267805	07/24/15 14:43	ZLN	TAL NSH
Dissolved	Analysis	6020		1	50 mL	50 mL	269196	07/29/15 13:46	CME	TAL NSH
Dissolved	Prep	3005A			50 mL	50 mL	267805	07/24/15 14:43	ZLN	TAL NSH
Dissolved	Analysis	6020		5	50 mL	50 mL	269196	07/29/15 15:31	CME	TAL NSH
Dissolved	Prep	3005A			50 mL	50 mL	267805	07/24/15 14:43	ZLN	TAL NSH
Dissolved	Analysis	6020		100	50 mL	50 mL	269196	07/29/15 15:41	CME	TAL NSH
Dissolved	Analysis	7196A		1	10 mL	10 mL	270949	07/24/15 10:44	BLM	TAL NSH
Dissolved	Filtration	Filtration			10 mL	1.0 mL	270950	08/05/15 13:42	BLM	TAL NSH

Client Sample ID: Biotic\_072315

Date Collected: 07/23/15 12:35

Date Received: 07/24/15 08:40

Lab Sample ID: 490-83497-2 **Matrix: Solid** 

Lab Sample ID: 490-83497-3

**Matrix: Water** 

	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.511 g	100 mL	268315	07/27/15 10:20	KMS	TAL NSH
Total/NA	Analysis	6020		1	0.511 g	100 mL	269578	07/30/15 17:20	CME	TAL NSH
Total/NA	Prep	3051A			0.511 g	100 mL	268315	07/27/15 10:20	KMS	TAL NSH
Total/NA	Analysis	6020		1	0.511 g	100 mL	270256	07/31/15 16:57	CME	TAL NSH
Total/NA	Prep	3051A			0.511 g	100 mL	268315	07/27/15 10:20	KMS	TAL NSH
Total/NA	Analysis	6020		1	0.511 g	100 mL	269296	07/29/15 17:57	CME	TAL NSH
Total/NA	Analysis	Moisture		1			267648	07/24/15 10:20	MAA	TAL NSH

Client Sample ID: Biotic Dup\_072315

Date Collected: 07/23/15 12:45

Date Received: 07/24/15 08:40

_	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Analysis	9056		1	10 mL		267867	07/25/15 02:49	CLN	TAL NSH
Total/NA	Analysis	9056		5	10 mL		267866	07/25/15 03:09	CLN	TAL NSH
Dissolved	Prep	3005A			50 mL	50 mL	267805	07/24/15 14:43	ZLN	TAL NSH
Dissolved	Analysis	6020		100	50 mL	50 mL	269578	07/30/15 16:36	CME	TAL NSH
Dissolved	Prep	3005A			50 mL	50 mL	267805	07/24/15 14:43	ZLN	TAL NSH
Dissolved	Analysis	6020		1	50 mL	50 mL	269196	07/29/15 13:51	CME	TAL NSH
Dissolved	Prep	3005A			50 mL	50 mL	267805	07/24/15 14:43	ZLN	TAL NSH
Dissolved	Analysis	6020		5	50 mL	50 mL	269196	07/29/15 15:36	CME	TAL NSH
Dissolved	Prep	3005A			50 mL	50 mL	267805	07/24/15 14:43	ZLN	TAL NSH
Dissolved	Analysis	6020		100	50 mL	50 mL	269196	07/29/15 15:46	CME	TAL NSH
Dissolved	Analysis	7196A		1	10 mL	10 mL	270949	07/24/15 10:46	BLM	TAL NSH
Dissolved	Filtration	Filtration			10 mL	1.0 mL	270950	08/05/15 13:42	BLM	TAL NSH

TestAmerica Nashville

Page 24 of 32

TestAmerica Job ID: 490-83497-1

Client: Geosyntec Consultants, Inc.

Client Sample ID: Biotic Dup 072315

Project/Site: Treatability Study

Lab Sample ID: 490-83497-4

**Matrix: Solid** 

Date Collected: 07/23/15 12:45 Date Received: 07/24/15 08:40

	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.523 g	100 mL	268315	07/27/15 10:20	KMS	TAL NSH
Total/NA	Analysis	6020		1	0.523 g	100 mL	269578	07/30/15 17:48	CME	TAL NSH
Total/NA	Prep	3051A			0.523 g	100 mL	268315	07/27/15 10:20	KMS	TAL NSH
Total/NA	Analysis	6020		5	0.523 g	100 mL	270256	07/31/15 17:25	CME	TAL NSH
Total/NA	Prep	3051A			0.523 g	100 mL	268315	07/27/15 10:20	KMS	TAL NSH
Total/NA	Analysis	6020		1	0.523 g	100 mL	269296	07/29/15 18:23	CME	TAL NSH
Total/NA	Analysis	Moisture		1			267648	07/24/15 10:20	MAA	TAL NSH

Client Sample ID: Control\_072315 Lab Sample ID: 490-83497-6

Date Collected: 07/23/15 12:25 Date Received: 07/24/15 08:40

**Matrix: Solid** 

**Matrix: Water** 

	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Prep	3051A	<del></del>		0.502 g	100 mL	268315	07/27/15 10:20	KMS	TAL NSH
Total/NA	Analysis	6020		1	0.502 g	100 mL	269578	07/30/15 17:59	CME	TAL NSH
Total/NA	Prep	3051A			0.502 g	100 mL	268315	07/27/15 10:20	KMS	TAL NSH
Total/NA	Analysis	6020		1	0.502 g	100 mL	270256	07/31/15 17:30	CME	TAL NSH
Total/NA	Prep	3051A			0.502 g	100 mL	268315	07/27/15 10:20	KMS	TAL NSH
Total/NA	Analysis	6020		1	0.502 g	100 mL	269296	07/29/15 18:28	CME	TAL NSH
Total/NA	Analysis	Moisture		1			267648	07/24/15 10:20	MAA	TAL NSH

Client Sample ID: Control\_073015 Lab Sample ID: 490-83988-1

Date Collected: 07/30/15 14:45 Date Received: 07/31/15 08:30

	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Analysis	9056		1	10 mL		271467	08/06/15 20:55	JHS	TAL NSH
Total/NA	Analysis	9056		5	10 mL		271466	08/06/15 21:55	JHS	TAL NSH
Dissolved	Filtration	Filtration			50 mL	50 mL	270785	08/05/15 09:06	ZLN	TAL NSH
Dissolved	Prep	3005A			50 mL	50 mL	270526	08/05/15 09:09	ZLN	TAL NSH
Dissolved	Analysis	6020		5	50 mL	50 mL	271145	08/06/15 00:28	CME	TAL NSH
Dissolved	Filtration	Filtration			50 mL	50 mL	270785	08/05/15 09:06	ZLN	TAL NSH
Dissolved	Prep	3005A			50 mL	50 mL	270526	08/05/15 09:09	ZLN	TAL NSH
Dissolved	Analysis	6020		100	50 mL	50 mL	271729	08/07/15 10:45	CME	TAL NSH
Dissolved	Filtration	Filtration			1.0 mL	1.0 mL	270946	07/31/15 10:04	BLM	TAL NSH
Dissolved	Analysis	7196A		1	10 mL	10 mL	270945	07/31/15 10:15	BLM	TAL NSH

**Laboratory References:** 

TAL NSH = TestAmerica Nashville, 2960 Foster Creighton Drive, Nashville, TN 37204, TEL (615)726-0177

# **Method Summary**

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-83497-1

Method	Method Description	Protocol	Laboratory
9056	Anions, Ion Chromatography	SW846	TAL NSH
6020	Metals (ICP/MS)	SW846	TAL NSH
7196A	Chromium, Hexavalent	SW846	TAL NSH
Moisture	Percent Moisture	EPA	TAL NSH

#### **Protocol References:**

EPA = US Environmental Protection Agency

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

#### Laboratory References:

TAL NSH = TestAmerica Nashville, 2960 Foster Creighton Drive, Nashville, TN 37204, TEL (615)726-0177

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TestAmerica Job ID: 490-83497-1

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

## **Laboratory: TestAmerica Nashville**

All certifications held by this laboratory are listed. Not all certifications are applicable to this report.

Authority	Program	EPA Region	Certification ID	Expiration Date				
A2LA	A2LA		NA: NELAP & A2LA	12-31-15				
A2LA	ISO/IEC 17025		0453.07	12-31-15				
Alaska (UST)	State Program	10	UST-087	07-24-16				
Arizona	State Program	9	AZ0473	05-05-16				
Arkansas DEQ	State Program	6	88-0737	04-25-16				
California	State Program	9	2938	10-31-16				
Connecticut	State Program	1	PH-0220	12-31-15				
Florida	NELAP	4	E87358	06-30-16				
Georgia	State Program	4	N/A	06-30-16				
Illinois	NELAP	5	200010	12-09-15				
lowa	State Program	7	131	04-01-16				
Kansas	NELAP	7	E-10229	10-31-15				
Kentucky (UST)	State Program	4	19	06-30-16				
Kentucky (WW)	State Program	4	90038	12-31-15				
Louisiana	NELAP	6	30613	06-30-16				
Maryland	State Program	3	316	03-31-16				
Massachusetts	State Program	1	M-TN032	06-30-16				
Minnesota	NELAP	5	047-999-345	12-31-15				
Mississippi	State Program	4	N/A	06-30-16				
Montana (UST)	State Program	8	NA	02-24-20				
Nevada	State Program	9	TN00032	07-31-16				
New Hampshire	NELAP	1	2963	10-09-15				
New Jersey	NELAP	2	TN965	09-30-15				
New York	NELAP	2	11342	03-31-16				
North Carolina (WW/SW)	State Program	4	387	12-31-15				
North Dakota	State Program	8	R-146	06-30-15 *				
Ohio VAP	State Program	5	CL0033	07-10-17				
Oklahoma	State Program	6	9412	08-31-15 *				
Oregon	NELAP	10	TN200001	04-27-16				
Pennsylvania	NELAP	3	68-00585	06-30-16				
Rhode Island	State Program	1	LAO00268	12-30-15				
South Carolina	State Program	4	84009 (001)	02-28-16				
South Carolina (DW)	State Program	4	84009 (002)	12-16-17				
Tennessee	State Program	4	2008	02-23-17				
Texas	NELAP	6	T104704077	08-31-15 *				
USDA	Federal		S-48469	10-30-16				
Utah	NELAP	8	TN00032	07-31-15 *				
Virginia	NELAP	3	460152	06-14-16				
Washington	State Program	10	C789	07-19-15 *				
West Virginia DEP	State Program	3	219	02-28-16				
Wisconsin	State Program	5	998020430	08-31-15 *				
Wyoming (UST)	A2LA	8	453.07	12-31-15				

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 $<sup>\</sup>ensuremath{^{*}}$  Certification renewal pending - certification considered valid.



#### COOLER RECEIPT FORM



Cooler Received/Opened On 7/24/2015 @ 0840 2599 1. Tracking # (last 4 digits, FedEx) Courier: FedEx IR Gun ID 12080142 Degrees Celsius 2. Temperature of rep. sample or temp blank when opened: 3. If Item #2 temperature is 0°C or less, was the representative sample or temp blank frozen? YES NO..(NA NO...NA 4. Were custody seals on outside of cooler? If yes, how many and where: 5. Were the seals intact, signed, and dated correctly? 6. Were custody papers inside cooler? .NO...NA I certify that I opened the cooler and answered questions 1-6 (intial) 7. Were custody seals on containers: YES NO, and Intact Were these signed and dated correctly? 8. Packing mat'l used? Subblewrap Plastic bag Peanuts Vermiculite Foam Insert Paper Other None (Ice Dice-pack) Ice (direct contact) 9. Cooling process: Dry ice Other None YES.).NO...NA 10. Did all containers arrive in good condition (unbroken)? .NO...NA 11. Were all container labels complete (#, date, signed, pres., etc)? 12. Did all container labels and tags agree with custody papers? .NO...NA 13a. Were VOA vials received? b. Was there any observable headspace present in any VOA vial? YES. NO. NA If multiple coolers, sequence # 14. Was there a Trip Blank in this cooler? I certify that I unloaded the cooler and answered questions 7-14 (intial) 15a. On pres'd bottles, did pH test strips suggest preservation reached the correct pH level? YES..NO(NA (YES) b. Did the bottle labels indicate that the correct preservatives were used YES...NO. NA 16. Was residual chlorine present? I certify that I checked for chlorine and pH as per SOP and answered questions 15-16 (intial) .NO...NA 17. Were custody papers properly filled out (ink, signed, etc)? .NO...NA 18. Did you sign the custody papers in the appropriate place? YES ... NO... NA 19. Were correct containers used for the analysis requested? (YES.).NO...NA 20. Was sufficient amount of sample sent in each container? I certify that I entered this project into LIMS and answered questions 17-20 (intial) I certify that I attached a label with the unique LIMS number to each container (intial)

21. Were there Non-Conformance issues at login? YES...(NO) Was a NCM generated? YES...(NO).#

2960 Foster Creighton Drive TestAmerica Nashville

Loc: 490 **83497** 

# **Chain of Custody Record**

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THE LEADER IN ENVIRONMENTAL TESTING ON THE LEADER IN ENVIRONMENTAL TESTING ON TESTAMERICA Laboratories, Inc. 80	America
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Relinquished by:	Relinquished by:	Relinquished by: Linxi Chen		Special Instructions/QC Requirements & Comments:	☑ Non-Hazard ☐ Flammable ☐ Skin Irritant	Are any samples from a listed EPA Hazardous Waste? Plea Comments Section if the lab is to dispose of the sample.	Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3;			Control_072315	Control_072315	Control_072315	Biotic Dup_072315	Biotic Dup_072315	Biotic Dup_072315	Biotic_072315	Biotic_072315	Biotic_072315	Sample Identification	PO#	Site: TEL	Project Name: Treatability Study	6	Columbia Phone (410) 910-7619	10220 Old Columbia Road Suite A	Geosyntec Consultants	Amar Wadhawan	Client Contact	Nashville, TN 37204 phone 615.726.0177 fax
Company:	Company:	Company: Geosyntec Consultants	Custody Seal No.:		☐ Poison B ☐ U	Please List any EPA Waste Codes for the sample in the	5=NaOH; 6= Other	B 1		7/23/2015 1225 <b>G</b>	7/23/2015 1225 . <b>G</b>	7/23/2015 1225 <b>G</b>	7/23/2015 1245 <b>G</b>	7/23/2015 1245 <b>G</b>	7/23/2015 1245 <b>G</b>	7/23/2015 1235 <b>G</b>	7/23/2015 1235 <b>G</b>	7/23/2015 1235 <b>G</b>	Sample Sample Type Sample Time G=Grab)	1 day				TAT if different from Below	☐ CALENDAR DAYS ☐	Analysis Turnaround Time	Email:AWadhawan@Geosyntec.com	Project Manager: Amar Wadhawan	Regulatory Program:
Date/Time:	Date/Time:	Date/Time: 7/23/15 1315			Unknown	the sample in the				σ 1	W 1	W 1	σ ¬	× 1	W 1 Y	σ -	W 1	W 1	b) Matrix Cont.		ole (	₹/	N)		WORKING DAYS				□ DW □ NPDES
Received in Laboratory by:	Received by:	Received by:	Cooler Temp. (°C): Obs'd:		☐ Return to Client ☑ Dispo	Sample Disposal ( A fee may be assessed if samples are retained longer than 1 month)				×	×	×	×	×	×	X	×	×	Perform N 9056-Nitra 7196A -He 6020 - As,	te, xav	Sulf aler	ate	hro				ker	Site Contact: Linxi Chen D:	□ RCRA □ Other:
Company:	Company: TH N	Company	l:Corr'd:		☑ Disposal by Lab ☐ Archive for	ssessed if samples are retained			-						-												Carrier: Fedex	Date: 7/23/15	
Date/Time:	Date/Time: 7-24-15 0740	Date/Time: 67-25-15 1455	Therm ID No.:		Months .	l longer than 1 month)					P	HNO3 preserved	29 (	of 3:	HNO3 preserved			HNO3 preserved	Sample Specific Notes:		Job / SDG No.:		Lab Sampling:	Walk in Client	For Lab Use Only:		1 of 1 COCs	COC No: 1	TestAmerica Laboratories, Inc.

Temp. 3.1

Form No. CA-C-WI-002, Rev. 4.3, dated 12/05/2013



# **TestAmerica** THE LEADER IN ENVIRONMENTAL TESTING Nashville, TN

#### **COOLER RECEIPT FORM**

Cooler Received/Opened On 7/31/2015 @ 0830	
1. Tracking #(last 4 digits, FedEx)	
Courier: Fed-ex IR Gun ID 17960357	
2. Temperature of rep. sample or temp blank when opened:	
3. If Item #2 temperature is 0°C or less, was the representative sample or temp blank frozen?	YES NONA
4. Were custody seals on outside of cooler?  If yes, how many and where:    Fant / Back	YES. NONA
If yes, how many and where: / fon // 13 act	
5. Were the seals intact, signed, and dated correctly?	YES. NONA
6. Were custody papers inside cooler?	YES.).NONA
I certify that I opened the cooler and answered questions 1-6 (intial)	1
7. Were custody seals on containers: YES (NO) and Intact	YESNO.
Were these signed and dated correctly?	YESNONA
8. Packing mat'l used? Bubblewrap Plastic bag Peanuts Vermiculite Foam Insert Paper	Other None
9. Cooling process: (ce) Ice-pack Ice (direct contact) Dry ice	Other None
10. Did all containers arrive in good condition (unbroken)?	YES NONA
11. Were all container labels complete (#, date, signed, pres., etc)?	XESNONA
12. Did all container labels and tags agree with custody papers?	ESNONA
13a. Were VOA vials received?	YESNA
b. Was there any observable headspace present in any VOA vial?	YESNO.
14. Was there a Trip Blank in this cooler? YESNO.	e #
I certify that I unloaded the cooler and answered questions 7-14 (intial)	mam
15a. On pres'd bottles, did pH test strips suggest preservation reached the correct pH level?	YESNO NA
b. Did the bottle labels indicate that the correct preservatives were used	YESNO, NA
16. Was residual chlorine present?	YESNO
Lertify that I checked for chlorine and pH as per SOP and answered questions 15-16 (intial)	mom
17. Were custody papers properly filled out (ink, signed, etc)?	ESNONA
18. Did you sign the custody papers in the appropriate place?	ESNONA
19. Were correct containers used for the analysis requested?	(ES).NONA
20. Was sufficient amount of sample sent in each container?	(ES).NONA
Lertify that Lentered this project into LIMS and answered questions 17-20 (intial)	Man
certify that I attached a label with the unique LIMS number to each container (intial)	MDM
21. Were there Non-Conformance issues at login? YES NO Was a NCM generated? YES	vo).#

TestAmerica Nashville 2960 Foster Creighton Drive

# **Chain of Custody Record**

Loc: 490 **83988** 

TestAmerica.

Relinquished by:	Relinquished by:	Relinquished by: - tinxi Cherr Multi-Murray	Custody Seals Intact: ☐ Yes ☐ No	Special Instructions/QC Requirements & Comments:	☑ Non-Hazard ☐ Flammable ☐ Skin Irritant	Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample.	Preservation Used: 1= lce, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other,						Control_073015	Control_073015	Sample Identification	PO#	Site:TEL	Project Name: Treatability Study	6	Columbia Phone (410) 910-7619	10220 Old Columbia Road Suite A	Geosyntec Consultants	Amar Wadhawan	Client Contact	Nashville, TN 37204 phone 615.726.0177 fax
Companý: '	Company: A	Company: Geosyntec Consultants	Custody Seal No.:		☐ Poison B ☐ Un	e List any EPA Waste Codes for t	5=NaOH; 6= Other						7/30/2015 1445 <b>G</b>	7/30/2015 1445 <b>G</b>	Sample Sample (c-comp. Date Time G=Crab)	1 day	☐ 2 days	1 week		TAT if different from Below	☐ CALENDAR DAYS ☐ W	Analysis Turnaround Time	Email:AWadhawan@Geosyntec.com	Project Manager: Amar Wadhawan	Regulatory Program: 🔲 DW
Date/Time: Rece	re: 164	Date/Time: Reod			Unknown								S Z	W 1	Matrix Comt. Filtered S Perform I	am //S /	MS	D	( Y /		DAYS				☐ DW ☐ NPDES ☐ RCRA
Received in Laboratory by:	Received by:	Received by:	Cooler Temp. (°C): Obs'd:		Return to Client	pie Disposai ( A iee iliay							×	×	7196A -Hi 6020 - As	exa	vale	nt (	Chr	omi	um		Lab Contact: Heather Baker	Site Contact: Linxi Chen	RA Other:
Company:	Company:	Company:	)bs'd:Corr'd:		☑ Disposal by Lab ☐ Archive for	Sampie Disposar ( A ree may be assessed it sampies are retained tonger main i month)																	Carrier: Fedex	Date: 7/30/15	
Date/Time:	Dáte/Time: 5	Date/Time:	Therm ID No.:		r Months	med longer diali i montil)	というというを変われるというなどを発生								Sample Specific Notes:		Job / SDG No.:		Lab Sampling:	Walk-in Client:	For Lab Use Only:		1 of 1 COCs	COC No: 1	TestAmerica Laboratories, Inc.

# **Login Sample Receipt Checklist**

Client: Geosyntec Consultants, Inc.

Job Number: 490-83497-1

Login Number: 83497 List Source: TestAmerica Nashville

List Number: 1

Creator: Armstrong, Daniel

Creator. Armstrong, Damer		
Question	Answer	Comment
Radioactivity wasn't checked or is = background as measured by a survey meter.</td <td>True</td> <td></td>	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	3.1C
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

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THE LEADER IN ENVIRONMENTAL TESTING

# **ANALYTICAL REPORT**

TestAmerica Laboratories, Inc.

TestAmerica Nashville 2960 Foster Creighton Drive Nashville, TN 37204 Tel: (615)726-0177

TestAmerica Job ID: 490-84899-1

TestAmerica Sample Delivery Group: TEL Client Project/Site: Treatability Study

For:

Geosyntec Consultants, Inc. 10220 Old Columbia Road Suite A Columbia, Maryland 21046

Attn: Amar Wadhawan

Heather Baker

Authorized for release by: 8/26/2015 2:28:41 PM

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The test results in this report meet all 2003 NELAC and 2009 TNI requirements for accredited parameters, exceptions are noted in this report. This report may not be reproduced except in full, and with written approval from the laboratory. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-84899-1 SDG: TEL

# **Table of Contents**

Cover Page	1
Table of Contents	2
Sample Summary	3
Case Narrative	4
Definitions	5
Client Sample Results	6
QC Sample Results	10
QC Association	15
Chronicle	17
Method Summary	19
Certification Summary	20
Chain of Custody	21
Receipt Checklists	23

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# **Sample Summary**

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-84899-1

SDG: TEL

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
490-84899-1	Biotic_081115	Water	08/11/15 11:30	08/12/15 09:45
490-84899-2	Biotic_081115	Solid	08/11/15 11:30	08/12/15 09:45
490-84899-3	Biotic Dup_081115	Water	08/11/15 11:45	08/12/15 09:45
490-84899-4	Biotic Dup_081115	Solid	08/11/15 11:45	08/12/15 09:45

#### **Case Narrative**

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-84899-1

SDG: TEL

Job ID: 490-84899-1

Laboratory: TestAmerica Nashville

**Narrative** 

Job Narrative 490-84899-1

#### Comments

No additional comments.

#### Receipt

The samples were received on 8/12/2015 9:45 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 1.5° C.

#### HPLC/IC

Method 9056: The following samples were diluted due to the nature of the sample matrix: Biotic 081115 (490-84899-1) and Biotic Dup 081115 (490-84899-3). Elevated reporting limits (RLs) are provided.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

#### Metals

No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

#### Field Service / Mobile Lab

No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

#### **General Chemistry**

Method 7196A: The following samples with a holding time of 24 hours, were received with less than one 8 hour shift remaining of holding time: Biotic 081115 (490-84899-1) and Biotic Dup 081115 (490-84899-3). Because of this, the samples were unable to be analyzed within holding time.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

# **Definitions/Glossary**

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-84899-1

SDG: TEL

#### **Qualifiers**

#### **HPLC/IC**

Qualifier	Qualifier Description
4	MS, MSD: The analyte present in the original sample is greater than 4 times the matrix spike concentration; therefore, control limits are not
	applicable.
E	Result exceeded calibration range.

#### **Metals**

Qualifier	Qualifier Description
F1	MS and/or MSD Recovery is outside acceptance limits.
4	MS, MSD: The analyte present in the original sample is greater than 4 times the matrix spike concentration; therefore, control limits are not
	applicable.

#### **General Chemistry**

Qualifier	Qualifier Description
Н	Sample was prepped or analyzed beyond the specified holding time

# Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains no Free Liquid
DER	Duplicate error ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision level concentration
MDA	Minimum detectable activity

DLC	Decision level concentration
MDA	Minimum detectable activity
EDL	Estimated Detection Limit
MDC	Minimum detectable concentration
MDL	Method Detection Limit

MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated

ND Not detected at the reporting limit (or MDL or EDL if shown
--

PQL	Practical Quantitation Limit
i QL	i radioai Quarititation Ellilit

QC	Quality Control
RER	Relative error ratio

Reporting Limit or Requested Limit (Radiochemistry) RL

RPD Relative Percent Difference, a measure of the relative difference between two points

TEF Toxicity Equivalent Factor (Dioxin) Toxicity Equivalent Quotient (Dioxin) TEQ

TestAmerica Nashville

Page 5 of 23

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-84899-1

SDG: TEL

Client Sample ID: Biotic\_081115

Date Collected: 08/11/15 11:30 Date Received: 08/12/15 09:45

Lab Sample ID: 490-84899-1

Matrix: Water

Method: 9056 - Anion	s, Ion Chromatogra	phy							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Nitrate as N	ND		0.100		mg/L			08/12/15 13:57	1
Sulfate	2410		5.00		mg/L			08/12/15 14:55	5
– Method: 6020 - Metals	s (ICP/MS) - Dissolve	ed							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	32.7		0.100		mg/L		08/17/15 09:46	08/19/15 22:26	50
Chromium	ND		0.100		mg/L		08/17/15 09:46	08/19/15 22:26	50

Method: 6020 - Metals Analyte	(ICP/MS) - DISSOIVED  Result Qualifier	RL	MDL Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	32.7	0.100	mg/L		08/17/15 09:46	08/19/15 22:26	50
Chromium	ND	0.100	mg/L		08/17/15 09:46	08/19/15 22:26	50
Copper	2.59	0.0100	mg/L		08/17/15 09:46	08/19/15 00:40	5
Iron	ND	1.25	mg/L		08/17/15 09:46	08/19/15 22:26	50
_							

General Chemistry - Dissolved		Qualifier	RL	MDL	Unit	D	Prepared	Analvzed	Dil Fac
Chromium, hex	ND		0.100		mg/L			08/12/15 12:52	10

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-84899-1

SDG: TEL

Client Sample ID: Biotic\_081115

Date Collected: 08/11/15 11:30 Date Received: 08/12/15 09:45

Lab Sample ID: 490-84899-2

**Matrix: Solid** 

Percent Solids: 77.9

Method: 6020 - Metals (ICP/MS	<b>S</b> )								
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	150		0.641		mg/Kg	<u> </u>	08/13/15 08:51	08/13/15 13:42	1
Chromium	30.3		0.641		mg/Kg	☼	08/13/15 08:51	08/13/15 13:42	1
Copper	171		0.641		mg/Kg	☼	08/13/15 08:51	08/13/15 13:42	1
Iron	1950		6.41		mg/Kg	☼	08/13/15 08:51	08/13/15 13:42	1
General Chemistry									
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Moisture	22		0.10		%			08/12/15 08:59	1
Percent Solids	78		0.10		%			08/12/15 08:59	1

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-84899-1

SDG: TEL

Client Sample ID: Biotic Dup\_081115

Date Collected: 08/11/15 11:45 Date Received: 08/12/15 09:45

Lab Sample ID: 490-84899-3

Matrix: Water

Method: 9056 - Anions	s, Ion Chromatogra	phy							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Nitrate as N	ND		0.100		mg/L			08/12/15 15:33	1
Sulfate	2440		5.00		mg/L			08/12/15 15:52	5
Method: 6020 - Metals	(ICD/MC) Discolve	a al							
Analyte	,	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
	,		RL 0.100	MDL	Unit mg/L	D		Analyzed 08/19/15 22:32	Dil Fac

Analyte	Result Qualifier	RL	MDL Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	27.6	0.100	mg/L		08/17/15 09:46	08/19/15 22:32	50
Chromium	ND	0.100	mg/L		08/17/15 09:46	08/19/15 22:32	50
Copper	3.39	0.0100	mg/L		08/17/15 09:46	08/19/15 00:46	5
Iron	ND	1.25	mg/L		08/17/15 09:46	08/19/15 22:32	50

General Chemistry - Dissolved Analyte	Result	Qualifier	RL	MDL (	Unit	D	Prepared	Analyzed	Dil Fac
Chromium, hex	ND	H	0.0100	i	mg/L			08/12/15 12:54	1

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-84899-1

SDG: TEL

Client Sample ID: Biotic Dup 081115

Date Collected: 08/11/15 11:45 Date Received: 08/12/15 09:45 Lab Sample ID: 490-84899-4

Matrix: Solid

Percent Solids: 80.5

Method: 6020 - Metals (ICP/MS)									
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	136		0.625		mg/Kg	<u> </u>	08/13/15 08:51	08/13/15 13:59	1
Chromium	31.2		0.625		mg/Kg	☼	08/13/15 08:51	08/13/15 13:59	1
Copper	163		0.625		mg/Kg	☼	08/13/15 08:51	08/13/15 13:59	1
_Iron	1990		6.25		mg/Kg	₩	08/13/15 08:51	08/13/15 13:59	1
General Chemistry									
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Moisture	20		0.10		%			08/12/15 08:59	1
Percent Solids	80		0.10		%			08/12/15 08:59	1

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## Method: 9056 - Anions, Ion Chromatography

Lab Sample ID: MB 490-272759/3 Client Sample ID: Method Blank Prep Type: Total/NA **Matrix: Water** 

**Analysis Batch: 272759** 

MB MB Analyte Result Qualifier RL **MDL** Unit Analyzed Dil Fac D Prepared 1.00 08/12/15 13:00 Sulfate ND mg/L

Lab Sample ID: LCS 490-272759/4 Client Sample ID: Lab Control Sample **Matrix: Water** Prep Type: Total/NA **Analysis Batch: 272759** 

Spike LCS LCS %Rec. Added Limits Analyte Result Qualifier Unit %Rec Sulfate 100 91.28 mg/L 91 80 - 120

Lab Sample ID: LCSD 490-272759/5 Client Sample ID: Lab Control Sample Dup **Matrix: Water** Prep Type: Total/NA

**Analysis Batch: 272759** 

Spike LCSD LCSD %Rec. **RPD** Added Result Qualifier Limits RPD Limit Analyte Unit D %Rec Sulfate 100 91.69 mg/L 92 80 - 120

Client Sample ID: 490-84899-B-1 MS Lab Sample ID: 490-84899-B-1 MS Prep Type: Total/NA

**Matrix: Water** 

**Analysis Batch: 272759** 

Sample Sample Spike MS MS %Rec. Analyte Result Qualifier Added Result Qualifier Unit %Rec Limits Sulfate 2790 E 100 2376 E 4 -415 80 - 120 mg/L

Lab Sample ID: 490-84899-B-1 MSD Client Sample ID: 490-84899-B-1 MSD **Matrix: Water** Prep Type: Total/NA

**Analysis Batch: 272759** 

Spike MSD MSD %Rec. RPD Sample Sample Analyte Result Qualifier Added Result Qualifier Unit %Rec Limits RPD Limit Sulfate 100 2366 E 4 -425 2790 E mg/L 80 - 120

Lab Sample ID: MB 490-272760/3 **Client Sample ID: Method Blank** Prep Type: Total/NA

**Matrix: Water** 

**Analysis Batch: 272760** 

MB MB Analyte Result Qualifier RL MDL Unit Prepared D Analyzed Dil Fac 0 100 Nitrate as N mg/L 08/12/15 13:00 ND

Lab Sample ID: LCS 490-272760/4 Client Sample ID: Lab Control Sample **Matrix: Water** Prep Type: Total/NA

**Analysis Batch: 272760** 

Spike LCS LCS %Rec. Added Analyte Result Qualifier Unit %Rec Limits Nitrate as N 10.0 9.669 97 80 - 120

Lab Sample ID: LCSD 490-272760/5 Client Sample ID: Lab Control Sample Dup **Matrix: Water** Prep Type: Total/NA

**Analysis Batch: 272760** 

LCSD LCSD RPD Spike %Rec. Added Limits Analyte Result Qualifier Unit D %Rec RPD Limit Nitrate as N 10.0 9.671 97 80 - 120 mg/L

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-84899-1

Client Sample ID: Biotic\_081115

**Client Sample ID: Method Blank** 

**Client Sample ID: Lab Control Sample** 

Prep Type: Total/NA

**Prep Batch: 272842** 

Prep Type: Total/NA

Prep Type: Total/NA

SDG: TEL

Lab Sample ID: 490-84899-1 MS

**Matrix: Water** 

Analysis Batch: 272760

Sample Sample Spike MS MS %Rec. Analyte Result Qualifier Added Result Qualifier Unit D %Rec Limits Nitrate as N ND 10.0 8.961 90 80 - 120 mg/L

Lab Sample ID: 490-84899-1 MSD Client Sample ID: Biotic\_081115 Prep Type: Total/NA

**Matrix: Water** 

**Analysis Batch: 272760** 

**RPD** Sample Sample Spike MSD MSD %Rec. Result Qualifier Added Result Qualifier Unit Limits RPD Limit Analyte D %Rec Nitrate as N ND 10.0 10.17 mg/L 102 80 - 120 13

Method: 6020 - Metals (ICP/MS)

Lab Sample ID: MB 490-272842/1-A

**Matrix: Solid** 

Analysis Batch: 273149

	MB	MB							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND		0.498		mg/Kg		08/13/15 08:51	08/13/15 12:56	1
Chromium	ND		0.498		mg/Kg		08/13/15 08:51	08/13/15 12:56	1
Copper	ND		0.498		mg/Kg		08/13/15 08:51	08/13/15 12:56	1
Iron	ND		4.98		mg/Kg		08/13/15 08:51	08/13/15 12:56	1

Lab Sample ID: LCS 490-272842/2-A

**Matrix: Solid** 

Analysis Batch: 273149							<b>Prep Batch: 272842</b>
	Spike	LCS	LCS				%Rec.
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits
Arsenic	19.8	19.52		mg/Kg		99	80 - 120
Chromium	19.8	20.55		mg/Kg		104	80 - 120
Copper	19.8	19.19		mg/Kg		97	80 - 120
Iron	198	199.8		ma/Ka		101	80 - 120

Lab Sample ID: 490-84794-L-1-C MS **Client Sample ID: Matrix Spike** Prep Type: Total/NA

**Matrix: Solid** 

Analysis Batch: 273149	Sample	Sample	Spike	MS	MS				Prep Bat %Rec.	ch: 272842
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Arsenic	1.12	F1	24.1	17.79	F1	mg/Kg	<u> </u>	69	75 - 125	
Chromium	10.3		24.1	35.08		mg/Kg	☼	103	75 <sub>-</sub> 125	
Copper	21.0		24.1	41.96		mg/Kg	☼	87	75 - 125	
Iron	7510		241	9020	4	ma/Ka	₩.	627	75 - 125	

Lab Sample ID: 490-84794-L-1-D MSD **Client Sample ID: Matrix Spike Duplicate** 

Matrix: Solid

Analysis Batch: 273149									Prep Ba		
-	Sample	Sample	Spike	MSD	MSD				%Rec.		RPD
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	RPD	Limit
Arsenic	1.12	F1	23.5	17.83	F1	mg/Kg	₩	71	75 - 125		20
Chromium	10.3		23.5	34.09		mg/Kg	₩	101	75 - 125	3	20
Copper	21.0		23.5	39.87		mg/Kg	≎	80	75 - 125	5	20
Iron	7510		235	8500	4	mg/Kg	₽	421	75 - 125	6	20

TestAmerica Nashville

Prep Type: Total/NA

TestAmerica Job ID: 490-84899-1 SDG: TEL

104

108

mg/L

mg/L

80 - 120

80 - 120

TEL

### Method: 6020 - Metals (ICP/MS) (Continued)

Client: Geosyntec Consultants, Inc.

Project/Site: Treatability Study

Copper

Iron

Lab Sample ID: MB 490-273688/1-A

Matrix: Water

Analysis Batch: 274373

MB MB

MB MB

Client Sample ID: Method Blank
Prep Type: Total Recoverable
Prep Batch: 273688

	1410	IVID							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND		0.00200		mg/L		08/17/15 09:46	08/18/15 23:31	1
Copper	ND		0.00200		mg/L		08/17/15 09:46	08/18/15 23:31	1

Lab Sample ID: MB 490-273688/1-A

Matrix: Water

Analysis Batch: 274758

Client Sample ID: Method Blank
Prep Type: Total Recoverable
Prep Batch: 273688

MB MB Analyte Result Qualifier RL **MDL** Unit D Prepared Analyzed Dil Fac mg/L Chromium  $\overline{\mathsf{ND}}$ 0.00200 08/17/15 09:46 08/19/15 21:46 ND 0.0250 mg/L 08/17/15 09:46 08/19/15 21:46 Iron

Lab Sample ID: LCS 490-273688/2-A **Client Sample ID: Lab Control Sample Matrix: Water Prep Type: Total Recoverable Analysis Batch: 274373** Prep Batch: 273688 LCS LCS Spike %Rec. Analyte Added Result Qualifier %Rec Limits Unit Arsenic 0.100 0.09431 mg/L 94 80 - 120

0 1041

1.083

0.100

1.00

Lab Sample ID: LCS 490-273688/2-A Client Sample ID: Lab Control Sample **Prep Type: Total Recoverable Matrix: Water Analysis Batch: 274758** Prep Batch: 273688 Spike LCS LCS %Rec. Analyte Added Result Qualifier Unit D %Rec Limits 0.100 Chromium 0.1008 mg/L 80 - 120 101

Lab Sample ID: 490-84907-A-1-D MS

Matrix: Water

Analysis Batch: 274373

Sample Sample Spike MS MS

Sample Sample Spike MS MS

Analyte Result Qualifier Added Result Qualifier Unit D %Rec. Limits

	Sample	Sample	Spike	MS	MS				%Rec.	
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Arsenic	ND		0.100	0.09608		mg/L		96	75 - 125	
Copper	ND		0.100	0.1064		mg/L		106	75 - 125	

Lab Sample ID: 490-84907-A-1-D MS **Client Sample ID: Matrix Spike Matrix: Water Prep Type: Dissolved Analysis Batch: 274758** Prep Batch: 273688 Sample Sample Spike MS MS %Rec. Result Qualifier Added **Analyte** Result Qualifier %Rec Limits Unit Chromium ND 0.100 0.1022 mg/L 102 75 - 125 ND 1.00 75 - 125 Iron 1 113 mg/L 111

Lab Sample ID: 490-84907-A-1-E MSD **Client Sample ID: Matrix Spike Duplicate Matrix: Water Prep Type: Dissolved Analysis Batch: 274373 Prep Batch: 273688** Sample Sample Spike MSD MSD %Rec. **RPD** Analyte Result Qualifier Added Result Qualifier Unit D %Rec Limits RPD Limit 0.100 75 <sub>-</sub> 125 Arsenic ND 0.09665 mg/L 97

TestAmerica Job ID: 490-84899-1 SDG: TEL

Method: 6020 - Metals (ICP/MS) (Continued)

Client: Geosyntec Consultants, Inc.

Project/Site: Treatability Study

Lab Sample ID: 490-84907-	A-1-E MSD	)				Client	Samp	le ID: N	latrix Spik	ce Dup	licate
Matrix: Water									<b>Prep Type</b>	e: Diss	olved
Analysis Batch: 274373									Prep Ba	tch: 27	73688
	Sample	Sample	Spike	MSD	MSD				%Rec.		RPD
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	RPD	Limit
Copper	ND		0.100	0.1057		mg/L		106	75 - 125	1	20

Lab Sample ID: 490-84907-A-1-E MSD **Client Sample ID: Matrix Spike Duplicate Matrix: Water Prep Type: Dissolved Analysis Batch: 274758** Prep Batch: 273688 Sample Sample Spike MSD MSD %Rec. **RPD** Analyte Result Qualifier Added Result Qualifier Unit %Rec Limits RPD Limit 20 Chromium ND 0.100 0.1035 104 75 - 125 mg/L ND 1.00 1.120 75 - 125 20 Iron mg/L 112

Method: 7196A - Chromium, Hexavalent

Lab Sample ID: MB 490-272893/11 **Client Sample ID: Method Blank Matrix: Water** Prep Type: Total/NA **Analysis Batch: 272893** MB MB

Analyte Result Qualifier **MDL** Unit Dil Fac Prepared Analyzed Chromium, hex ND 0.0100 mg/L 08/12/15 10:13

Lab Sample ID: LCS 490-272893/12 **Client Sample ID: Lab Control Sample Matrix: Water** Prep Type: Total/NA **Analysis Batch: 272893** Spike LCS LCS %Rec.

Analyte Added Result Qualifier Unit D %Rec Limits 0.100 98 Chromium, hex 0.09800 mg/L 85 - 115

Lab Sample ID: 490-84899-1 MS Client Sample ID: Biotic\_081115 **Matrix: Water Prep Type: Dissolved** 

**Analysis Batch: 272893** 

Sample Sample Spike MS MS %Rec. Result Qualifier Added Limits Analyte Result Qualifier Unit %Rec Chromium, hex ND H 1.00 92 85 - 115 0.9200 mg/L

Lab Sample ID: 490-84899-1 MSD Client Sample ID: Biotic\_081115 **Matrix: Water Prep Type: Dissolved** 

**Analysis Batch: 272893** 

Sample Sample Spike MSD MSD %Rec. **RPD** Result Qualifier Added Analyte Result Qualifier Unit D %Rec Limits RPD Limit Chromium, hex ND H 1.00 0.9200 mg/L 92 85 - 115

Lab Sample ID: 490-84899-1 DU Client Sample ID: Biotic\_081115 **Matrix: Water Prep Type: Dissolved** 

**Analysis Batch: 272893** 

Sample Sample DU DU **RPD** Result Qualifier Result Qualifier Unit **RPD** Limit ND H mg/L Chromium, hex  $\overline{\mathsf{ND}}$ NC 20

# **QC Sample Results**

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-84899-1

SDG: TEL

## **Method: Moisture - Percent Moisture**

Lab Sample ID: 490-84899-2 DU **Matrix: Solid** 

Client Sample ID: Biotic_081115	
Prep Type: Total/NA	

Analysis Batch: 272556								
_	Sample	Sample	DU	DU				RPD
Analyte	Result	Qualifier	Result	Qualifier	Unit	D	RPD	Limit
Percent Moisture	22		21		%		 7	20
Percent Solids	78		79		%		2	20

TestAmerica Job ID: 490-84899-1 SDG: TEL

HPLC/IC

**Analysis Batch: 272759** 

Client: Geosyntec Consultants, Inc.

Project/Site: Treatability Study

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-84899-1	Biotic_081115	Total/NA	Water	9056	
490-84899-3	Biotic Dup_081115	Total/NA	Water	9056	
490-84899-B-1 MS	490-84899-B-1 MS	Total/NA	Water	9056	
490-84899-B-1 MSD	490-84899-B-1 MSD	Total/NA	Water	9056	
LCS 490-272759/4	Lab Control Sample	Total/NA	Water	9056	
LCSD 490-272759/5	Lab Control Sample Dup	Total/NA	Water	9056	
MB 490-272759/3	Method Blank	Total/NA	Water	9056	

#### **Analysis Batch: 272760**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-84899-1	Biotic_081115	Total/NA	Water	9056	
490-84899-1 MS	Biotic_081115	Total/NA	Water	9056	
490-84899-1 MSD	Biotic_081115	Total/NA	Water	9056	
490-84899-3	Biotic Dup_081115	Total/NA	Water	9056	
LCS 490-272760/4	Lab Control Sample	Total/NA	Water	9056	
LCSD 490-272760/5	Lab Control Sample Dup	Total/NA	Water	9056	
MB 490-272760/3	Method Blank	Total/NA	Water	9056	

#### Metals

#### Prep Batch: 272842

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-84794-L-1-C MS	Matrix Spike	Total/NA	Solid	3051A	
490-84794-L-1-D MSD	Matrix Spike Duplicate	Total/NA	Solid	3051A	
490-84899-2	Biotic_081115	Total/NA	Solid	3051A	
490-84899-4	Biotic Dup_081115	Total/NA	Solid	3051A	
LCS 490-272842/2-A	Lab Control Sample	Total/NA	Solid	3051A	
MB 490-272842/1-A	Method Blank	Total/NA	Solid	3051A	

#### **Analysis Batch: 273149**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-84794-L-1-C MS	Matrix Spike	Total/NA	Solid	6020	272842
490-84794-L-1-D MSD	Matrix Spike Duplicate	Total/NA	Solid	6020	272842
490-84899-2	Biotic_081115	Total/NA	Solid	6020	272842
490-84899-4	Biotic Dup_081115	Total/NA	Solid	6020	272842
LCS 490-272842/2-A	Lab Control Sample	Total/NA	Solid	6020	272842
MB 490-272842/1-A	Method Blank	Total/NA	Solid	6020	272842

#### **Prep Batch: 273688**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-84899-1	Biotic_081115	Dissolved	Water	3005A	_
490-84899-3	Biotic Dup_081115	Dissolved	Water	3005A	
490-84907-A-1-D MS	Matrix Spike	Dissolved	Water	3005A	
490-84907-A-1-E MSD	Matrix Spike Duplicate	Dissolved	Water	3005A	
LCS 490-273688/2-A	Lab Control Sample	Total Recoverable	Water	3005A	
MB 490-273688/1-A	Method Blank	Total Recoverable	Water	3005A	

#### **Analysis Batch: 274373**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-84899-1	Biotic_081115	Dissolved	Water	6020	273688

TestAmerica Nashville

Page 15 of 23

# **QC Association Summary**

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-84899-1

SDG: TEL

## **Metals (Continued)**

### **Analysis Batch: 274373 (Continued)**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-84899-3	Biotic Dup_081115	Dissolved	Water	6020	273688
490-84907-A-1-D MS	Matrix Spike	Dissolved	Water	6020	273688
490-84907-A-1-E MSD	Matrix Spike Duplicate	Dissolved	Water	6020	273688
LCS 490-273688/2-A	Lab Control Sample	Total Recoverable	Water	6020	273688
MB 490-273688/1-A	Method Blank	Total Recoverable	Water	6020	273688

#### **Analysis Batch: 274758**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-84899-1	Biotic_081115	Dissolved	Water	6020	273688
490-84899-3	Biotic Dup_081115	Dissolved	Water	6020	273688
490-84907-A-1-D MS	Matrix Spike	Dissolved	Water	6020	273688
490-84907-A-1-E MSD	Matrix Spike Duplicate	Dissolved	Water	6020	273688
LCS 490-273688/2-A	Lab Control Sample	Total Recoverable	Water	6020	273688
MB 490-273688/1-A	Method Blank	Total Recoverable	Water	6020	273688

## **General Chemistry**

#### **Analysis Batch: 272556**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-84899-2	Biotic_081115	Total/NA	Solid	Moisture	
490-84899-2 DU	Biotic_081115	Total/NA	Solid	Moisture	
490-84899-4	Biotic Dup_081115	Total/NA	Solid	Moisture	

#### **Analysis Batch: 272893**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-84899-1	Biotic_081115	Dissolved	Water	7196A	272905
490-84899-1 DU	Biotic_081115	Dissolved	Water	7196A	272905
490-84899-1 MS	Biotic_081115	Dissolved	Water	7196A	272905
490-84899-1 MSD	Biotic_081115	Dissolved	Water	7196A	272905
490-84899-3	Biotic Dup_081115	Dissolved	Water	7196A	272905
LCS 490-272893/12	Lab Control Sample	Total/NA	Water	7196A	
MB 490-272893/11	Method Blank	Total/NA	Water	7196A	

#### Filtration Batch: 272905

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-84899-1	Biotic_081115	Dissolved	Water	Filtration	
490-84899-1 DU	Biotic_081115	Dissolved	Water	Filtration	
490-84899-1 MS	Biotic_081115	Dissolved	Water	Filtration	
490-84899-1 MSD	Biotic_081115	Dissolved	Water	Filtration	
490-84899-3	Biotic Dup_081115	Dissolved	Water	Filtration	

TestAmerica Job ID: 490-84899-1

SDG: TEL

Client Sample ID: Biotic 081115

Date Collected: 08/11/15 11:30 Date Received: 08/12/15 09:45

Client: Geosyntec Consultants, Inc.

Project/Site: Treatability Study

Lab Sample ID: 490-84899-1

**Matrix: Water** 

**Matrix: Solid** 

**Matrix: Solid** 

**Matrix: Water** 

Percent Solids: 77.9

	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Analysis	9056		1	10 mL		272760	08/12/15 13:57	JHS	TAL NSH
Total/NA	Analysis	9056		5	10 mL		272759	08/12/15 14:55	JHS	TAL NSH
Dissolved	Prep	3005A			50 mL	50 mL	273688	08/17/15 09:46	ZLN	TAL NSH
Dissolved	Analysis	6020		5	50 mL	50 mL	274373	08/19/15 00:40	CME	TAL NSH
Dissolved	Prep	3005A			50 mL	50 mL	273688	08/17/15 09:46	ZLN	TAL NSH
Dissolved	Analysis	6020		50	50 mL	50 mL	274758	08/19/15 22:26	KKK	TAL NSH
Dissolved	Filtration	Filtration			1.0 mL	1.0 mL	272905	08/12/15 12:30	BLM	TAL NSH
Dissolved	Analysis	7196A		10	10 mL	10 mL	272893	08/12/15 12:52	BLM	TAL NSH

Lab Sample ID: 490-84899-2 Client Sample ID: Biotic\_081115

Date Collected: 08/11/15 11:30

Date Received: 08/12/15 09:45

Batch Batch Dil Initial Final Batch Prepared **Prep Type** Type Method Run **Factor** Amount **Amount** Number or Analyzed Analyst Lab Total/NA Analysis Moisture 272556 08/12/15 08:59 MAA TAL NSH

Client Sample ID: Biotic 081115 Lab Sample ID: 490-84899-2

Date Collected: 08/11/15 11:30

Date Received: 08/12/15 09:45

_										
	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.501 g	100 mL	272842	08/13/15 08:51	KMS	TAL NSH
Total/NA	Analysis	6020		1	0.501 g	100 mL	273149	08/13/15 13:42	LEG	TAL NSH

Client Sample ID: Biotic Dup\_081115 Lab Sample ID: 490-84899-3

Date Collected: 08/11/15 11:45

Date Received: 08/12/15 09:45

	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Туре	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Analysis	9056		1	10 mL		272760	08/12/15 15:33	JHS	TAL NSH
Total/NA	Analysis	9056		5	10 mL		272759	08/12/15 15:52	JHS	TAL NSH
Dissolved	Prep	3005A			50 mL	50 mL	273688	08/17/15 09:46	ZLN	TAL NSH
Dissolved	Analysis	6020		5	50 mL	50 mL	274373	08/19/15 00:46	CME	TAL NSH
Dissolved	Prep	3005A			50 mL	50 mL	273688	08/17/15 09:46	ZLN	TAL NSH
Dissolved	Analysis	6020		50	50 mL	50 mL	274758	08/19/15 22:32	KKK	TAL NSH
Dissolved	Filtration	Filtration			1.0 mL	1.0 mL	272905	08/12/15 12:30	BLM	TAL NSH
Dissolved	Analysis	7196A		1	10 mL	10 mL	272893	08/12/15 12:54	BLM	TAL NSH

#### **Lab Chronicle**

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-84899-1

SDG: TEL

Client Sample ID: Biotic Dup\_081115

Lab Sample ID: 490-84899-4 Date Collected: 08/11/15 11:45

**Matrix: Solid** 

Date Received: 08/12/15 09:45

Batch Batch Dil Initial Final Batch Prepared **Prep Type** Type Method Run **Factor** Amount Amount Number or Analyzed Analyst Total/NA Analysis Moisture 272556 08/12/15 08:59 MAA TAL NSH

Client Sample ID: Biotic Dup\_081115 Lab Sample ID: 490-84899-4

Date Collected: 08/11/15 11:45

Matrix: Solid

Date Received: 08/12/15 09:45 Percent Solids: 80.5

	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.497 g	100 mL	272842	08/13/15 08:51	KMS	TAL NSH
Total/NA	Analysis	6020		1	0.497 g	100 mL	273149	08/13/15 13:59	LEG	TAL NSH

**Laboratory References:** 

TAL NSH = TestAmerica Nashville, 2960 Foster Creighton Drive, Nashville, TN 37204, TEL (615)726-0177

# **Method Summary**

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-84899-1

	0-1000 1	
S	DG: TFI	

Method	Method Description	Protocol	Laboratory
9056	Anions, Ion Chromatography	SW846	TAL NSH
6020	Metals (ICP/MS)	SW846	TAL NSH
7196A	Chromium, Hexavalent	SW846	TAL NSH
Moisture	Percent Moisture	EPA	TAL NSH

#### **Protocol References:**

EPA = US Environmental Protection Agency

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

#### Laboratory References:

TAL NSH = TestAmerica Nashville, 2960 Foster Creighton Drive, Nashville, TN 37204, TEL (615)726-0177

TestAmerica Job ID: 490-84899-1 SDG: TEL

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

## **Laboratory: TestAmerica Nashville**

All certifications held by this laboratory are listed. Not all certifications are applicable to this report.

Authority	Program	EPA Region	Certification ID	Expiration Date
A2LA	A2LA		NA: NELAP & A2LA	12-31-15
A2LA	ISO/IEC 17025		0453.07	12-31-15
Alaska (UST)	State Program	10	UST-087	07-24-16
Arizona	State Program	9	AZ0473	05-05-16
Arkansas DEQ	State Program	6	88-0737	04-25-16
California	State Program	9	2938	10-31-16
Connecticut	State Program	1	PH-0220	12-31-15
Florida	NELAP	4	E87358	06-30-16
Georgia	State Program	4	N/A	06-30-16
Illinois	NELAP	5	200010	12-09-15
lowa	State Program	7	131	04-01-16
Kansas	NELAP	7	E-10229	10-31-15
Kentucky (UST)	State Program	4	19	06-30-16
Kentucky (WW)	State Program	4	90038	12-31-15
Louisiana	NELAP	6	30613	06-30-16
Maryland	State Program	3	316	03-31-16
Massachusetts	State Program	1	M-TN032	06-30-16
Minnesota	NELAP	5	047-999-345	12-31-15
Mississippi	State Program	4	N/A	06-30-16
Montana (UST)	State Program	8	NA	02-24-20
Nevada	State Program	9	TN00032	07-31-16
New Hampshire	NELAP	1	2963	10-09-15
New Jersey	NELAP	2	TN965	09-30-15
New York	NELAP	2	11342	03-31-16
North Carolina (WW/SW)	State Program	4	387	12-31-15
North Dakota	State Program	8	R-146	06-30-15 *
Ohio VAP	State Program	5	CL0033	07-10-17
Oklahoma	State Program	6	9412	08-31-15 *
Oregon	NELAP	10	TN200001	04-27-16
Pennsylvania	NELAP	3	68-00585	06-30-16
Rhode Island	State Program	1	LAO00268	12-30-15
South Carolina	State Program	4	84009 (001)	02-28-16
South Carolina (Do Not Use - DW)	State Program	4	84009 (002)	12-16-17
Tennessee	State Program	4	2008	02-23-17
Texas	NELAP	6	T104704077	08-31-16
USDA	Federal		S-48469	10-30-16
Utah	NELAP	8	TN00032	07-31-16
Virginia	NELAP	3	460152	06-14-16
Washington	State Program	10	C789	07-19-16
West Virginia DEP	State Program	3	219	02-28-16
Wisconsin	State Program	5	998020430	08-31-16
Wyoming (UST)	A2LA	8	453.07	12-31-15

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<sup>\*</sup> Certification renewal pending - certification considered valid.



## **COOLER RECEIPT FORM**



Cooler Received/Opened On 8/12/2015 @ 9:45	
1. Tracking #(last 4 digits, FedEx)	
Courier: FedEx IR Gun ID 17610176	
2. Temperature of rep. sample or temp blank when opened:Degrees Celsius	<i>t.</i>
3. If Item #2 temperature is $0^{\circ}$ C or less, was the representative sample or temp blank frozen?	YES NO(NA)
4. Were custody seals on outside of cooler?  If yes, how many and where:	YESNONA
If yes, how many and where:	
5. Were the seals intact, signed, and dated correctly?	(res)nona
6. Were custody papers inside cooler?	resnona
I certify that I opened the cooler and answered questions 1-6 (intial)	
7. Were custody seals on containers:  YES  NO  and Intact	YESNO(NA
Were these signed and dated correctly?	YESNONA
8. Packing mat'l used? Bubblewrap Plastic bag Peanuts Vermiculite Foam Insert Paper	Other None
9. Cooling process: lce lce-pack lce (direct contact) Dry ice	Other None
10. Did all containers arrive in good condition (unbroken)?	YES)NONA
11. Were all container labels complete (#, date, signed, pres., etc)?	YES).NONA
12. Did all container labels and tags agree with custody papers?	YES .NONA
13a. Were VOA vials received?	YESNO.NA
b. Was there any observable headspace present in any VOA vial?	YESNO.(NA)
14. Was there a Trip Blank in this cooler? YESNA If multiple coolers, sequence	e #
I certify that I unloaded the cooler and answered questions 7-14 (intial)	
15a. On pres'd bottles, did pH test strips suggest preservation reached the correct pH level?	YESNO(NA)
b. Did the bottle labels indicate that the correct preservatives were used	YES NO NA
16. Was residual chlorine present?	YESNONA
I certify that I checked for chlorine and pH as per SOP and answered questions 15-16 (intial)	DA
17. Were custody papers properly filled out (ink, signed, etc)?	YES)NONA
18. Did you sign the custody papers in the appropriate place?	YES)NONA
19. Were correct containers used for the analysis requested?	YESNONA
20. Was sufficient amount of sample sent in each container?	ESNONA
I certify that I entered this project into LIMS and answered questions 17-20 (intial)	
I certify that I attached a label with the unique LIMS number to each container (intial)	- 100 100100
21. Were there Non-Conformance issues at login? (YES. NO) Was a NCM generated? (YES.)	6.)#490-173488
DA8-12-15	

Φ.	Loc: 490 <b>84899</b>	Chain	Chain of Custody Record	<u>o.</u>	Testamerica 15 THE LEADER IN ENVIRONMENTAL TESTING (20)
					THE LEADER IN ENVIRONMENTAL TESTING (
		Regulatory Program:   Dw  NPDES  RCRA  Other:	☐ RCRA ☐ Other:		TestAmerica Laboratories, Inc. 8
ontact	3	Project Manager: Amar Wadhawan	Site Contact: Linxi Chen	Date: 8/11/15	COC No: 1
		Email:AWadhawan@Geosyntec.com	Lab Contact: Heather Baker	Carrier: Fedex	1 of1_ COCs
		Analysis Turnaround Time			Sampler: LC
A		☐ CALENDAR DAYS ☐ WORKING DAYS	) ium		For Lab Use Only:
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Date/Time: 1530		Çom /	117_	Received by	Recei	1900	Date/Time: 8/11/15 1300		Geosyntec	Company: Geosyntec Consultants		ä	Relinquished by: Linxi Chen	Relinquishe
herm ID No.:	Corr'd: The	Obs'd:	em <b>g</b> ) (°C):	Cooler	_			٠	al No.:	Custody Seal No.:	No	□ Yes □	Custody Seals Intact:	Custody
	·			,	)						iomments:	Special Instructions/QC Requirements & Comments:	structions/QC R	Special Ins
Months	Archive for	Disposal by Lab	<u>S</u>	Return to Client			nwn	Unknown		Poison B	Skin Irritant	☐ Flammable	rard	☑ Non-Hazard
nger than 1 month)	Sample Disposal ( A fee may be assessed if samples are retained longer than 1 month)	e assessed if	( A fee may b	e Disposal	Samp	ple in	r the sam	te Codes fo	EPA Was	ıse List any	is Waste? Plea of the sample.	Possible Hazard Identification: Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample.	Possible Hazard Identification: Are any samples from a listed EF the Comments Section if the lab	Are any sai
计多字字 化邻苯酚 计多数操作 化邻苯酚 化二氯甲酚						1			6= Other	5=NaOH;	SO4; 4=HNO3	Preservation Used: 1=1ce, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other	on Used: 1= lcc	reservati
						_								
HNO3 preserved														
				×	-		ဟ	G	1145	8/11/2015		Biotic Dup_081115	Biotic [	
					×	7	8	G	1145	8/11/2015		Biotic Dup_081115	Biotic I	
HNO3 preserved				×		1	٤	G	1145	8/11/2015		Biotic Dup_081115	Biotic [	
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HNO3 preserved				×		<b>1</b>	8	G	1130	8/11/2015		Biotic_081115	Bioti	
Sample Specific Notes:				7196A -He	Perform N	C # 의 의 Filtered S	Matrix	Type (C=Comp, G=Grab)	Sample Time	Sample Date		Sample Identification	Sample	
					IS/			1 day	1					P0#
Job / SDG No.:					MSI	do /		2 days	2 -			3		Site:TEL
					) (Y	V/1		2 weeks	<u> </u>	<b>]</b> [		Shidy	ne: Treatability Study	Project Name:
Walk-in Client:	- <			rom	_			om Below	TAT if different from Below			Phone (410) 910-7619	Phone	Columbia
For Lab Use Only:				ilum	l )		WORKING DAYS	☐ WOR	R DAYS	☐ CALENDAR DAYS		Suite A	10220 Old Columbia Road Suite A	0220 Old (
Sampler: LC	I (0			1			Time	Analysis Turnaround Time	nalysis T	A			Geosyntec Consultants	Seosyntec
_1 of1COCs	X	Carrier: Fedex	r Baker	Lab Contact: Heather Baker	ab Cont	_	.com	Email:AWadhawan@Geosyntec.com	dhawan@	Email:AWa			awan	Amar Wadhawan
COC No: 1		Date: 8/11/15	hen	Site Contact: Linxi Chen	ite Cont	S	van	Project Manager: Amar Wadhawan	nager: An	Project Ma	7	Client Contact	Clien	
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Form No. CA-C-WI-002, Rev. 4.3, dated 12/05/2013

# **Login Sample Receipt Checklist**

Client: Geosyntec Consultants, Inc.

Job Number: 490-84899-1

SDG Number: TEL

Login Number: 84899 List Source: TestAmerica Nashville

List Number: 1

Creator: Armstrong, Daniel

Creator. Armstrong, Damei		
Question	Answer	Comment
Radioactivity wasn't checked or is = background as measured by meter.</td <td>a survey True</td> <td></td>	a survey True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised o tampered with.	r True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	1.5C
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the	ne COC. True	
Samples are received within Holding Time.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	ed True	
Containers requiring zero headspace have no headspace or bubble <6mm (1/4").	e is N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

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THE LEADER IN ENVIRONMENTAL TESTING

# **ANALYTICAL REPORT**

TestAmerica Laboratories, Inc.

TestAmerica Nashville 2960 Foster Creighton Drive Nashville, TN 37204 Tel: (615)726-0177

TestAmerica Job ID: 490-87569-1 Client Project/Site: Treatability Study

#### For:

Geosyntec Consultants, Inc. 10220 Old Columbia Road Suite A Columbia, Maryland 21046

Attn: Amar Wadhawan

# Heather Baker

Authorized for release by: 10/8/2015 3:54:06 PM

Heather Baker, Project Manager I (615)301-5043

heather.baker@testamericainc.com

·····LINKS ·······

Review your project results through

Total Access

**Have a Question?** 



Visit us at: www.testamericainc.com

The test results in this report meet all 2003 NELAC and 2009 TNI requirements for accredited parameters, exceptions are noted in this report. This report may not be reproduced except in full, and with written approval from the laboratory. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

# **Table of Contents**

Cover Page	1
Table of Contents	2
Sample Summary	3
Case Narrative	4
Definitions	5
Client Sample Results	6
QC Sample Results	12
QC Association	16
Chronicle	18
Method Summary	21
Certification Summary	22
Chain of Custody	23
Racaint Chacklists	25

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# **Sample Summary**

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-87569-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
490-87569-1	Biotic_091715	Water	09/17/15 14:30	09/18/15 09:10
490-87569-2	Biotic_091715	Solid	09/17/15 14:30 (	09/18/15 09:10
490-87569-3	Biotic Dup_091715	Water	09/17/15 15:00 (	09/18/15 09:10
490-87569-4	Biotic Dup_091715	Solid	09/17/15 15:00 (	09/18/15 09:10
490-87569-5	Control_091715	Water	09/17/15 14:00 (	09/18/15 09:10
490-87569-6	Control_091715	Solid	09/17/15 14:00 (	09/18/15 09:10

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#### **Case Narrative**

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-87569-1

Job ID: 490-87569-1

Laboratory: TestAmerica Nashville

Narrative

Job Narrative 490-87569-1

#### Comments

No additional comments.

#### Receipt

The samples were received on 9/18/2015 9:10 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 3.2° C.

#### HPLC/IC

Method 9056: The following samples were diluted due to the nature of the sample matrix: Biotic\_091715 (490-87569-1) and Biotic Dup\_091715 (490-87569-3). Elevated reporting limits (RLs) are provided.

Method 9056: Reanalysis of the following samples was performed outside of the analytical holding time due to a clogged auto sampler line: Biotic\_091715 (490-87569-1), Biotic Dup\_091715 (490-87569-3) and Control\_091715 (490-87569-5). Due to this circumstance, the initial data was not usable.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

#### Metals

Method 6020: The method blank for preparation batch 490-283984 and analytical batch 490-284290 contained Iron above the reporting limit (RL). There was insufficient sample to perform a re-extraction and/or re-analysis; therefore, the data have been reported.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

#### Field Service / Mobile Lab

No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

#### General Chemistry

No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

#### **Organic Prep**

No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

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# **Definitions/Glossary**

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-87569-1

# **Qualifiers**

## **HPLC/IC**

Qualifier	Qualifier Description
Н	Sample was prepared or analyzed beyond the specified holding time

Metals	
Qualifier	Qualifier Description
В	Compound was found in the blank and sample.
F2	MS/MSD RPD exceeds control limits
F1	MS and/or MSD Recovery is outside acceptance limits.
4	MS, MSD: The analyte present in the original sample is greater than 4 times the matrix spike concentration; therefore, control limits are not applicable.

# **Glossary**

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains no Free Liquid
DER	Duplicate error ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision level concentration
MDA	Minimum detectable activity
EDL	Estimated Detection Limit
MDC	Minimum detectable concentration
MDL	Method Detection Limit

MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NO	Not Coloulated

NC

ND Not detected at the reporting limit (or MDL or EDL if shown)

PQL Practical Quantitation Limit

QC **Quality Control** Relative error ratio RER

Reporting Limit or Requested Limit (Radiochemistry) RL

Relative Percent Difference, a measure of the relative difference between two points RPD

TEF Toxicity Equivalent Factor (Dioxin) TEQ Toxicity Equivalent Quotient (Dioxin)

TestAmerica Nashville

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-87569-1

Client Sample ID: Biotic\_091715

Date Collected: 09/17/15 14:30 Date Received: 09/18/15 09:10

Chromium, hex

Lab Sample ID: 490-87569-1

. Matrix: Water

09/18/15 12:52

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Nitrate as N	0.118	H	0.100		mg/L			09/19/15 18:59	1
Sulfate	1750		5.00		mg/L			09/19/15 19:19	5
Method: 6020 - Metals (ICP/MS)	· Dissolve	ed							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	22.9		0.0400		mg/L		09/24/15 08:37	09/25/15 12:45	20
Chromium	0.0665		0.00200		mg/L		09/24/15 08:37	09/24/15 18:40	1
Copper	0.440		0.0100		mg/L		09/24/15 08:37	09/25/15 12:40	5
lron	2.52	В	0.0250		mg/L		09/24/15 08:37	09/24/15 18:40	1
General Chemistry - Dissolved									
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac

0.0100

mg/L

ND

TestAmerica Nashville

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Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

Date Collected: 09/17/15 14:30

Date Received: 09/18/15 09:10

Client Sample ID: Biotic\_091715

TestAmerica Job ID: 490-87569-1

Lab Sample ID: 490-87569-2

**Matrix: Solid** 

Percent Solids: 85.4

Analyte	Result Qu	ualifier RL	MDL Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	156 F2	0.576	mg/Kg	<u></u>	09/18/15 13:21	09/18/15 23:13	1
Chromium	28.2 F1	l <b>F2</b> 0.576	mg/Kg	₩	09/18/15 13:21	09/18/15 23:13	1
Copper	163	0.576	mg/Kg	☆	09/18/15 13:21	09/18/15 23:13	1
Iron	2160	5.76	mg/Kg	☆	09/18/15 13:21	09/18/15 23:13	1

General Chemistry									
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Moisture	15		0.10		%			09/18/15 11:35	1
Percent Solids	85		0.10		%			09/18/15 11:35	1

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-87569-1

Client Sample ID: Biotic Dup\_091715

Date Collected: 09/17/15 15:00 Date Received: 09/18/15 09:10 Lab Sample ID: 490-87569-3

Matrix: Water

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Nitrate as N	0.117	H	0.100		mg/L			09/19/15 19:39	1
Sulfate	1950		5.00		mg/L			09/19/15 19:59	5
Method: 6020 - Metals (ICP/MS)	- Dissolve	ed							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	16.1		0.0400		mg/L		09/24/15 08:37	09/25/15 12:55	20
Chromium	0.0244		0.00200		mg/L		09/24/15 08:37	09/24/15 18:45	1
Copper	0.0591		0.00200		mg/L		09/24/15 08:37	09/24/15 18:45	1
Iron	0.333	В	0.0250		mg/L		09/24/15 08:37	09/24/15 18:45	1
General Chemistry - Dissolved									
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium, hex	ND		0.0100		mg/L		-	09/18/15 12:52	

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Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

Date Collected: 09/17/15 15:00

Date Received: 09/18/15 09:10

**Percent Solids** 

Client Sample ID: Biotic Dup 091715

TestAmerica Job ID: 490-87569-1

Lab Sample ID: 490-87569-4

. Matrix: Solid

Percent Solids: 80.7

09/18/15 11:35

Method: 6020 - Metals (ICP	/MS)						
Analyte	Result Qualifier	RL	MDL Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	371	0.596	mg/Kg	<del>\</del>	09/18/15 13:21	09/18/15 23:38	1
Chromium	45.6	0.596	mg/Kg	₩	09/18/15 13:21	09/18/15 23:38	1
Copper	326	0.596	mg/Kg	☼	09/18/15 13:21	09/18/15 23:38	1
lron_	3240	5.96	mg/Kg		09/18/15 13:21	09/18/15 23:38	1
- General Chemistry							
Analyte	Result Qualifier	RL	MDL Unit	D	Prepared	Analyzed	Dil Fac
Percent Moisture	19	0.10	%			09/18/15 11:35	1

0.10

81

%

10

10

1:

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-87569-1

Client Sample ID: Control\_091715

Date Collected: 09/17/15 14:00 Date Received: 09/18/15 09:10

Lab Sample ID: 490-87569-5

Matrix: Water

Method: 9056 - Anions, Ion Chro	_		DI	MDI	l lmi4	ь.	Duamawad	Amalumad	Dil Foo
Analyte		Qualifier	RL	MDL		D	Prepared	Analyzed	Dil Fac
Nitrate as N	1.44	Н	0.100		mg/L			09/19/15 20:20	1
Sulfate	20.5		1.00		mg/L			09/19/15 20:20	1
Method: 6020 - Metals (ICP/MS) -	Dissolv	ed							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	13.3		0.0400		mg/L		09/24/15 08:37	09/25/15 13:06	20
Chromium	0.158		0.00200		mg/L		09/24/15 08:37	09/24/15 18:50	1
Copper	1.58		0.0100		mg/L		09/24/15 08:37	09/25/15 13:01	5
Iron	2.72	В	0.0250		mg/L		09/24/15 08:37	09/24/15 18:50	1
General Chemistry - Dissolved									
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium, hex	0.0140		0.0100		mg/L			09/18/15 12:52	1

TestAmerica Nashville

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

Date Collected: 09/17/15 14:00

Client Sample ID: Control\_091715

TestAmerica Job ID: 490-87569-1

Lab Sample ID: 490-87569-6

**Matrix: Solid** Percent Solids: 81.4

Date Received: 09/18/15 09:10								Percent Solid	ls: 81.4
Method: 6020 - Metals (ICP/MS)		0	D.	MDI	1124	_	<b>D</b>	A a la a .d	D'! E
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	214		0.607		mg/Kg	<del></del>	09/18/15 13:21	09/18/15 23:43	1

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	214		0.607		mg/Kg	<u> </u>	09/18/15 13:21	09/18/15 23:43	1
Chromium	85.9		0.607		mg/Kg	₩	09/18/15 13:21	09/18/15 23:43	1
Copper	347		0.607		mg/Kg	₩	09/18/15 13:21	09/18/15 23:43	1
Iron	1650		6.07		mg/Kg	₽	09/18/15 13:21	09/18/15 23:43	1

General Chemistry Analyte	Result Q	)ualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Moisture	19		0.10		%			09/18/15 11:35	1
Percent Solids	81		0.10		%			09/18/15 11:35	1

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

Method: 9056 - Anions, Ion Chromatography

Lab Sample ID: MB 490-283015/6 Client Sample ID: Method Blank Prep Type: Total/NA **Matrix: Water** 

**Analysis Batch: 283015** 

MB MB Analyte Result Qualifier RL **MDL** Unit Analyzed Dil Fac Prepared 1.00 09/19/15 17:59 Sulfate ND mg/L

Lab Sample ID: LCS 490-283015/7 **Client Sample ID: Lab Control Sample Matrix: Water** Prep Type: Total/NA

Analysis Batch: 283015

Spike LCS LCS %Rec. Added Limits Analyte Result Qualifier Unit %Rec Sulfate 100 102.6 mg/L 103 80 - 120

Lab Sample ID: LCSD 490-283015/8 Client Sample ID: Lab Control Sample Dup **Matrix: Water** Prep Type: Total/NA

**Analysis Batch: 283015** 

Spike LCSD LCSD %Rec. **RPD** Added Result Qualifier Limits RPD Limit Analyte Unit D %Rec Sulfate 100 102.5 mg/L 102 80 - 120

Lab Sample ID: 490-87601-F-1 MS **Client Sample ID: Matrix Spike Matrix: Water** Prep Type: Total/NA

**Analysis Batch: 283015** 

Sample Sample Spike MS MS %Rec. Analyte Result Qualifier Added Result Qualifier Unit %Rec Limits Sulfate 11.7 100 97.83 86 80 - 120 mg/L

Lab Sample ID: 490-87601-F-1 MSD Client Sample ID: Matrix Spike Duplicate **Matrix: Water** Prep Type: Total/NA

**Analysis Batch: 283015** 

Spike MSD MSD %Rec. RPD Sample Sample Analyte Result Qualifier Added Result Qualifier Unit D %Rec Limits RPD Limit Sulfate 100 117 92.88 mg/L 81 80 - 120

Lab Sample ID: MB 490-283016/6 Client Sample ID: Method Blank Prep Type: Total/NA

**Matrix: Water** 

Analysis Batch: 283016

MB MB Analyte Result Qualifier RL MDL Unit Prepared D Analyzed Dil Fac 0 100 Nitrate as N mg/L 09/19/15 17:59 ND

Lab Sample ID: LCS 490-283016/7 Client Sample ID: Lab Control Sample Prep Type: Total/NA

**Matrix: Water** 

Analysis Batch: 283016

Spike LCS LCS %Rec. Added Analyte Result Qualifier Unit %Rec Limits Nitrate as N 10.0 9.862 99 80 - 120

Lab Sample ID: LCSD 490-283016/8 Client Sample ID: Lab Control Sample Dup **Matrix: Water** Prep Type: Total/NA

**Analysis Batch: 283016** 

LCSD LCSD RPD Spike %Rec. Added Limits Analyte Result Qualifier Unit D %Rec RPD Limit Nitrate as N 10.0 9.877 99 80 - 120 mg/L

TestAmerica Nashville

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

**Client Sample ID: Matrix Spike** 

**Client Sample ID: Matrix Spike Duplicate** 

**Client Sample ID: Method Blank** 

09/18/15 13:21 09/18/15 23:02

**Client Sample ID: Lab Control Sample** 

Client Sample ID: Biotic\_091715

Client Sample ID: Biotic\_091715

**Prep Type: Total/NA** 

Prep Type: Total/NA

**Prep Type: Total/NA** 

Lab Sample ID: 490-87601-F-1 MS

**Matrix: Water** 

Analysis Batch: 283016

Sample Sample Spike MS MS %Rec. Analyte Result Qualifier Added Result Qualifier Unit D %Rec Limits Nitrate as N 0.242 10.0 9.329 91 80 - 120 mg/L

Lab Sample ID: 490-87601-F-1 MSD

**Matrix: Water** 

Analysis Batch: 283016

	Sample	Sample	Spike	MSD	MSD				%Rec.		RPD
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	RPD	Limit
Nitrate as N	0.242		10.0	8.834		mg/L		86	80 - 120	5	20

Method: 6020 - Metals (ICP/MS)

Lab Sample ID: MB 490-282741/1-A

**Matrix: Solid** 

Analysis Batch: 283108								Prep Batch:	282741
•	MB	MB							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND		0.494		mg/Kg		09/18/15 13:21	09/18/15 23:02	1
Chromium	ND		0.494		mg/Kg		09/18/15 13:21	09/18/15 23:02	1
Copper	ND		0.494		mg/Kg		09/18/15 13:21	09/18/15 23:02	1

4.94

mg/Kg

ND

Lab Sample ID: LCS 490-282741/2-A

Iron

Matrix: Solid Analysis Batch: 283108	Spike	LCS	LCS				Prep Type: T Prep Batch: %Rec.	
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Arsenic	20.0	19.45		mg/Kg		97	80 - 120	
Chromium	20.0	19.93		mg/Kg		100	80 - 120	
Copper	20.0	18.85		mg/Kg		94	80 - 120	
Iron	200	197 4		ma/Ka		99	80 - 120	

Lab Sample ID: 490-87569-2 MS

Matrix: Solid

Analysis Batch: 283108									Prep Batch: 282741
	Sample	Sample	Spike	MS	MS				%Rec.
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits
Arsenic	156	F2	23.1	254.1	4	mg/Kg	₽	423	75 - 125
Chromium	28.2	F1 F2	23.1	68.78	F1	mg/Kg	☼	176	75 <sub>-</sub> 125
Copper	163		23.1	196.4	4	mg/Kg	☼	147	75 - 125
Iron	2160		231	2158	4	ma/Ka	₩.	-0.4	75 <sub>-</sub> 125

Lab Sample ID: 490-87569-2 MSD

Matrix: Solid Analysis Batch: 283108									Prep Typ		
	Sample	Sample	Spike	MSD	MSD				%Rec.		RPD
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	RPD	Limit
Arsenic	156	F2	23.2	183.1	4 F2	mg/Kg	<u> </u>	115	75 - 125	32	20
Chromium	28.2	F1 F2	23.2	54.87	F2	mg/Kg	₩	115	75 - 125	22	20
Copper	163		23.2	203.5	4	mg/Kg	₩	176	75 - 125	4	20
Iron	2160		232	2394	4	mg/Kg	<del>\</del>	101	75 - 125	10	20

TestAmerica Nashville

Page 13 of 25

Client: Geosyntec Consultants, Inc.

Project/Site: Treatability Study

Method: 6020 - Metals (ICP/MS) (Continued)

Lab Sample ID: MB 490-283984/1-A

**Matrix: Water** 

Analysis Batch: 284290

**Client Sample ID: Method Blank Prep Type: Total Recoverable** 

Prep Batch: 283984

	MB MB					
Analyte	Result Qualifier	RL	MDL Unit	D Prepared	Analyzed	Dil Fac
Arsenic	ND	0.00200	mg/L	09/23/15 17:40	09/24/15 14:12	1
Chromium	ND	0.00200	mg/L	09/23/15 17:40	09/24/15 14:12	1
Copper	ND	0.00200	mg/L	09/23/15 17:40	09/24/15 14:12	1
Iron	0.03968	0.0250	mg/L	09/23/15 17:40	09/24/15 14:12	1

LCS LCS

0.09964

0.1001

0.09085

1.025

Result Qualifier

Unit

mg/L

mg/L

mg/L

mg/L

Spike

Added

0.100

0.100

0.100

1.00

Lab Sample ID: LCS 490-283984/2-A

**Matrix: Water** 

Analyte

Arsenic

Copper

Iron

Chromium

**Analysis Batch: 284290** 

**Client Sample ID: Lab Control Sample Prep Type: Total Recoverable** Prep Batch: 283984

%Rec. D %Rec Limits 100 80 - 120 100 80 - 120 91 80 - 120

80 - 120

103

Lab Sample ID: 490-84862-D-17-C MS

**Matrix: Water** 

**Analysis Batch: 284290** 

**Client Sample ID: Matrix Spike Prep Type: Dissolved** 

Prep Batch: 283984

	Sample	Sample	Spike	MS	MS				%Rec.	
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Arsenic	ND		0.100	0.1038		mg/L		104	75 - 125	
Chromium	ND		0.100	0.1043		mg/L		104	75 - 125	
Copper	ND		0.100	0.09579		mg/L		96	75 - 125	
Iron	ND		1.00	1.066		mg/L		107	75 - 125	

Lab Sample ID: 490-84862-D-17-D MSD

**Matrix: Water** 

**Client Sample ID: Matrix Spike Duplicate** 

**Prep Type: Dissolved** 

Analysis Batch: 284290									Prep Ba	itcn: 28	33984
-	Sample	Sample	Spike	MSD	MSD				%Rec.		RPD
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	RPD	Limit
Arsenic	ND		0.100	0.1071		mg/L		107	75 - 125	3	20
Chromium	ND		0.100	0.1088		mg/L		109	75 - 125	4	20
Copper	ND		0.100	0.09912		mg/L		99	75 - 125	3	20
Iron	ND		1.00	1.116		mg/L		112	75 - 125	5	20

Method: 7196A - Chromium, Hexavalent

Lab Sample ID: MB 490-283492/1

**Matrix: Water** 

**Analysis Batch: 283492** 

**Client Sample ID: Method Blank** 

Prep Type: Total/NA

MB MB Analyte Result Qualifier RL **MDL** Unit Prepared Analyzed Dil Fac Chromium, hex ND 0.0100 09/18/15 12:52 mg/L

TestAmerica Nashville

Client: Geosyntec Consultants, Inc.

Project/Site: Treatability Study

Method: 7196A - Chromium, Hexavalent (Continued)

Lab Sample ID: LCS 490-283492/2 **Client Sample ID: Lab Control Sample Matrix: Water** Prep Type: Total/NA

Analysis Batch: 283492

Spike LCS LCS %Rec. Analyte Added Result Qualifier Unit D %Rec Limits 0.100 95 85 - 115 Chromium, hex 0.09500 mg/L

Lab Sample ID: 490-87569-1 MS Client Sample ID: Biotic 091715 **Matrix: Water Prep Type: Dissolved** 

Analysis Batch: 283492

Sample Sample Spike MS MS %Rec. Result Qualifier Added Limits Analyte Result Qualifier Unit %Rec Chromium, hex  $\overline{\mathsf{ND}}$ 0.100 0.1000 mg/L 100 85 - 115

Lab Sample ID: 490-87569-1 MSD Client Sample ID: Biotic\_091715 **Prep Type: Dissolved** 

**Matrix: Water** 

Analysis Batch: 283492

Sample Sample Spike MSD MSD %Rec. **RPD** Result Qualifier Added Result Qualifier Limits RPD Limit Analyte Unit D %Rec Chromium, hex ND 0.100 0.09900 mg/L 99

Lab Sample ID: 490-87569-1 DU Client Sample ID: Biotic\_091715 **Prep Type: Dissolved** 

**Matrix: Water** 

**Analysis Batch: 283492** 

DU DU RPD Sample Sample Analyte Result Qualifier Result Qualifier Unit **RPD** Limit Chromium, hex ND ND NC 20 mg/L

**Method: Moisture - Percent Moisture** 

Lab Sample ID: 490-87544-B-3 DU **Client Sample ID: Duplicate Matrix: Solid** Prep Type: Total/NA

**Analysis Batch: 282704** 

**RPD** Sample Sample DU DU Analyte Result Qualifier Result Qualifier Unit D RPD Limit Percent Moisture 18 15 % 20 Percent Solids 82 85 % 3 20

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

# HPLC/IC

# Analysis Batch: 283015

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-87569-1	Biotic_091715	Total/NA	Water	9056	
490-87569-3	Biotic Dup_091715	Total/NA	Water	9056	
490-87569-5	Control_091715	Total/NA	Water	9056	
490-87601-F-1 MS	Matrix Spike	Total/NA	Water	9056	
490-87601-F-1 MSD	Matrix Spike Duplicate	Total/NA	Water	9056	
LCS 490-283015/7	Lab Control Sample	Total/NA	Water	9056	
LCSD 490-283015/8	Lab Control Sample Dup	Total/NA	Water	9056	
MB 490-283015/6	Method Blank	Total/NA	Water	9056	

# **Analysis Batch: 283016**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-87569-1	Biotic_091715	Total/NA	Water	9056	
490-87569-3	Biotic Dup_091715	Total/NA	Water	9056	
490-87569-5	Control_091715	Total/NA	Water	9056	
490-87601-F-1 MS	Matrix Spike	Total/NA	Water	9056	
490-87601-F-1 MSD	Matrix Spike Duplicate	Total/NA	Water	9056	
LCS 490-283016/7	Lab Control Sample	Total/NA	Water	9056	
LCSD 490-283016/8	Lab Control Sample Dup	Total/NA	Water	9056	
MB 490-283016/6	Method Blank	Total/NA	Water	9056	

# Metals

## **Prep Batch: 282741**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-87569-2	Biotic_091715	Total/NA	Solid	3051A	<del>_</del>
490-87569-2 MS	Biotic_091715	Total/NA	Solid	3051A	
490-87569-2 MSD	Biotic_091715	Total/NA	Solid	3051A	
490-87569-4	Biotic Dup_091715	Total/NA	Solid	3051A	
490-87569-6	Control_091715	Total/NA	Solid	3051A	
LCS 490-282741/2-A	Lab Control Sample	Total/NA	Solid	3051A	
MB 490-282741/1-A	Method Blank	Total/NA	Solid	3051A	

# **Analysis Batch: 283108**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-87569-2	Biotic_091715	Total/NA	Solid	6020	282741
490-87569-2 MS	Biotic_091715	Total/NA	Solid	6020	282741
490-87569-2 MSD	Biotic_091715	Total/NA	Solid	6020	282741
490-87569-4	Biotic Dup_091715	Total/NA	Solid	6020	282741
490-87569-6	Control_091715	Total/NA	Solid	6020	282741
LCS 490-282741/2-A	Lab Control Sample	Total/NA	Solid	6020	282741
MB 490-282741/1-A	Method Blank	Total/NA	Solid	6020	282741

# Prep Batch: 283984

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-84862-D-17-C MS	Matrix Spike	Dissolved	Water	3005A	
490-84862-D-17-D MSD	Matrix Spike Duplicate	Dissolved	Water	3005A	
490-87569-1	Biotic_091715	Dissolved	Water	3005A	284035
490-87569-3	Biotic Dup_091715	Dissolved	Water	3005A	284035
490-87569-5	Control_091715	Dissolved	Water	3005A	284035
LCS 490-283984/2-A	Lab Control Sample	Total Recoverable	Water	3005A	

TestAmerica Nashville

Page 16 of 25

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10/8/2015

# **QC Association Summary**

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-87569-1

# **Metals (Continued)**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
MB 490-283984/1-A	Method Blank	Total Recoverable	Water	3005A	

## Filtration Batch: 284035

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-87569-1	Biotic_091715	Dissolved	Water	Filtration	<u> </u>
490-87569-3	Biotic Dup_091715	Dissolved	Water	Filtration	
490-87569-5	Control_091715	Dissolved	Water	Filtration	

# **Analysis Batch: 284290**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-84862-D-17-C MS	Matrix Spike	Dissolved	Water	6020	283984
490-84862-D-17-D MSD	Matrix Spike Duplicate	Dissolved	Water	6020	283984
LCS 490-283984/2-A	Lab Control Sample	Total Recoverable	Water	6020	283984
MB 490-283984/1-A	Method Blank	Total Recoverable	Water	6020	283984

# **Analysis Batch: 284468**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-87569-1	Biotic_091715	Dissolved	Water	6020	283984
490-87569-3	Biotic Dup_091715	Dissolved	Water	6020	283984
490-87569-5	Control_091715	Dissolved	Water	6020	283984

## **Analysis Batch: 284943**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-87569-1	Biotic_091715	Dissolved	Water	6020	283984
490-87569-1	Biotic_091715	Dissolved	Water	6020	283984
490-87569-3	Biotic Dup_091715	Dissolved	Water	6020	283984
490-87569-5	Control_091715	Dissolved	Water	6020	283984
490-87569-5	Control_091715	Dissolved	Water	6020	283984

# **General Chemistry**

## Analysis Batch: 282704

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-87544-B-3 DU	Duplicate	Total/NA	Solid	Moisture	
490-87569-2	Biotic_091715	Total/NA	Solid	Moisture	
490-87569-4	Biotic Dup_091715	Total/NA	Solid	Moisture	
490-87569-6	Control_091715	Total/NA	Solid	Moisture	

# Analysis Batch: 283492

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-87569-1	Biotic_091715	Dissolved	Water	7196A	_
490-87569-1 DU	Biotic_091715	Dissolved	Water	7196A	
490-87569-1 MS	Biotic_091715	Dissolved	Water	7196A	
490-87569-1 MSD	Biotic_091715	Dissolved	Water	7196A	
490-87569-3	Biotic Dup_091715	Dissolved	Water	7196A	
490-87569-5	Control_091715	Dissolved	Water	7196A	
LCS 490-283492/2	Lab Control Sample	Total/NA	Water	7196A	
MB 490-283492/1	Method Blank	Total/NA	Water	7196A	

TestAmerica Nashville

Page 17 of 25

Date Collected: 09/17/15 14:30 Date Received: 09/18/15 09:10

Client Sample ID: Biotic 091715

Lab Sample ID: 490-87569-1

Matrix:	Water
Matrix:	Water

	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Analysis	9056		1	10 mL		283016	09/19/15 18:59	JHS	TAL NSH
Total/NA	Analysis	9056		5	10 mL		283015	09/19/15 19:19	JHS	TAL NSH
Dissolved	Filtration	Filtration			30 mL	30 mL	284035	09/24/15 08:35	ZLN	TAL NSH
Dissolved	Prep	3005A			30 mL	30 mL	283984	09/24/15 08:37	RDF	TAL NSH
Dissolved	Analysis	6020		1	30 mL	30 mL	284468	09/24/15 18:40	KKK	TAL NSH
Dissolved	Filtration	Filtration			30 mL	30 mL	284035	09/24/15 08:35	ZLN	TAL NSH
Dissolved	Prep	3005A			30 mL	30 mL	283984	09/24/15 08:37	RDF	TAL NSH
Dissolved	Analysis	6020		5	30 mL	30 mL	284943	09/25/15 12:40	KKK	TAL NSH
Dissolved	Filtration	Filtration			30 mL	30 mL	284035	09/24/15 08:35	ZLN	TAL NSH
Dissolved	Prep	3005A			30 mL	30 mL	283984	09/24/15 08:37	RDF	TAL NSH
Dissolved	Analysis	6020		20	30 mL	30 mL	284943	09/25/15 12:45	KKK	TAL NSH
Dissolved	Analysis	7196A		1	10 mL	10 mL	283492	09/18/15 12:52	BLM	TAL NSH

Client Sample ID: Biotic\_091715

Date Collected: 09/17/15 14:30

Date Received: 09/18/15 09:10

Lab Sample ID: 490-87569-2

Matrix: Solid

_	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Analysis	Moisture		1			282704	09/18/15 11:35	MNM	TAL NSH

Client Sample ID: Biotic\_091715

Date Collected: 09/17/15 14:30 Date Received: 09/18/15 09:10

Lab Sample	ID:	490-87569-2
		Matrix: Solid

Percent Solids: 85.4

_	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.508 g	100 mL	282741	09/18/15 13:21	KMS	TAL NSH
Total/NA	Analysis	6020		1	0.508 g	100 mL	283108	09/18/15 23:13	CME	TAL NSH

Client Sample ID: Biotic Dup\_091715

Date Collected: 09/17/15 15:00

Date Received: 09/18/15 09:10

	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Analysis	9056		1	10 mL		283016	09/19/15 19:39	JHS	TAL NSH
Total/NA	Analysis	9056		5	10 mL		283015	09/19/15 19:59	JHS	TAL NSH
Dissolved	Filtration	Filtration			45 mL	45 mL	284035	09/24/15 08:35	ZLN	TAL NSH
Dissolved	Prep	3005A			45 mL	45 mL	283984	09/24/15 08:37	RDF	TAL NSH
Dissolved	Analysis	6020		1	45 mL	45 mL	284468	09/24/15 18:45	KKK	TAL NSH
Dissolved	Filtration	Filtration			45 mL	45 mL	284035	09/24/15 08:35	ZLN	TAL NSH
Dissolved	Prep	3005A			45 mL	45 mL	283984	09/24/15 08:37	RDF	TAL NSH
Dissolved	Analysis	6020		20	45 mL	45 mL	284943	09/25/15 12:55	KKK	TAL NSH
Dissolved	Analysis	7196A		1	10 mL	10 mL	283492	09/18/15 12:52	BLM	TAL NSH

TestAmerica Nashville

Page 18 of 25

10/8/2015

Lab Sample ID: 490-87569-3 **Matrix: Water** 

Client: Geosyntec Consultants, Inc.

Project/Site: Treatability Study

Client Sample ID: Biotic Dup\_091715 Lab Sample ID: 490-87569-4

Date Collected: 09/17/15 15:00 **Matrix: Solid** 

Date Received: 09/18/15 09:10

Batch Dil Initial Final Batch Batch Prepared **Prep Type** Type Method Run **Factor** Amount Amount Number or Analyzed Analyst Total/NA Analysis Moisture 282704 09/18/15 11:35 MNM TAL NSH

Client Sample ID: Biotic Dup\_091715 Lab Sample ID: 490-87569-4

Date Collected: 09/17/15 15:00 Matrix: Solid Date Received: 09/18/15 09:10 Percent Solids: 80.7

_	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.520 g	100 mL	282741	09/18/15 13:21	KMS	TAL NSH
Total/NA	Analysis	6020		1	0.520 g	100 mL	283108	09/18/15 23:38	CME	TAL NSH

Client Sample ID: Control\_091715 Lab Sample ID: 490-87569-5 **Matrix: Water** 

Date Collected: 09/17/15 14:00

Date Received: 09/18/15 09:10

	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Analysis	9056		1	10 mL		283015	09/19/15 20:20	JHS	TAL NS
Total/NA	Analysis	9056		1	10 mL		283016	09/19/15 20:20	JHS	TAL NS
Dissolved	Filtration	Filtration			50 mL	50 mL	284035	09/24/15 08:35	ZLN	TAL NS
Dissolved	Prep	3005A			50 mL	50 mL	283984	09/24/15 08:37	RDF	TAL NS
Dissolved	Analysis	6020		1	50 mL	50 mL	284468	09/24/15 18:50	KKK	TAL NS
Dissolved	Filtration	Filtration			50 mL	50 mL	284035	09/24/15 08:35	ZLN	TAL NS
Dissolved	Prep	3005A			50 mL	50 mL	283984	09/24/15 08:37	RDF	TAL NS
Dissolved	Analysis	6020		5	50 mL	50 mL	284943	09/25/15 13:01	KKK	TAL NS
Dissolved	Filtration	Filtration			50 mL	50 mL	284035	09/24/15 08:35	ZLN	TAL NS
Dissolved	Prep	3005A			50 mL	50 mL	283984	09/24/15 08:37	RDF	TAL NS
Dissolved	Analysis	6020		20	50 mL	50 mL	284943	09/25/15 13:06	KKK	TAL NS
Dissolved	Analysis	7196A		1	10 mL	10 mL	283492	09/18/15 12:52	BLM	TAL NS

Lab Sample ID: 490-87569-6 Client Sample ID: Control 091715

Date Collected: 09/17/15 14:00 Date Received: 09/18/15 09:10

	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Analysis	Moisture		1			282704	09/18/15 11:35	MNM	TAL NSH

Client Sample ID: Control\_091715 Lab Sample ID: 490-87569-6

Date Collected: 09/17/15 14:00 Date Received: 09/18/15 09:10

	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.506 g	100 mL	282741	09/18/15 13:21	KMS	TAL NSH
Total/NA	Analysis	6020		1	0.506 q	100 mL	283108	09/18/15 23:43	CME	TAL NSH

TestAmerica Nashville

Percent Solids: 81.4

Page 19 of 25

10/8/2015

Matrix: Solid

**Matrix: Solid** 

# **Lab Chronicle**

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-87569-1

## **Laboratory References:**

TAL NSH = TestAmerica Nashville, 2960 Foster Creighton Drive, Nashville, TN 37204, TEL (615)726-0177

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# **Method Summary**

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-87569-1

Method	Method Description	Protocol	Laboratory
9056	Anions, Ion Chromatography	SW846	TAL NSH
6020	Metals (ICP/MS)	SW846	TAL NSH
7196A	Chromium, Hexavalent	SW846	TAL NSH
Moisture	Percent Moisture	EPA	TAL NSH

## **Protocol References:**

EPA = US Environmental Protection Agency

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

## Laboratory References:

TAL NSH = TestAmerica Nashville, 2960 Foster Creighton Drive, Nashville, TN 37204, TEL (615)726-0177

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Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

# **Laboratory: TestAmerica Nashville**

All certifications held by this laboratory are listed. Not all certifications are applicable to this report.

Authority	Program	EPA Region	Certification ID	<b>Expiration Date</b>
A2LA	A2LA		NA: NELAP & A2LA	12-31-15
A2LA	ISO/IEC 17025		0453.07	12-31-15
Alaska (UST)	State Program	10	UST-087	07-24-16
Arizona	State Program	9	AZ0473	05-05-16
Arkansas DEQ	State Program	6	88-0737	04-25-16
California	State Program	9	2938	10-31-16
Connecticut	State Program	1	PH-0220	12-31-15
Florida	NELAP	4	E87358	06-30-16
Georgia	State Program	4	N/A	06-30-16
Illinois	NELAP	5	200010	12-09-15 *
Iowa	State Program	7	131	04-01-16
Kansas	NELAP	7	E-10229	10-31-15 *
Kentucky (UST)	State Program	4	19	06-30-16
Kentucky (WW)	State Program	4	90038	12-31-15
Louisiana	NELAP	6	30613	06-30-16
Maryland	State Program	3	316	03-31-16
Massachusetts	State Program	1	M-TN032	06-30-16
Minnesota	NELAP	5	047-999-345	12-31-15
Mississippi	State Program	4	N/A	06-30-16
Montana (UST)	State Program	8	NA	02-24-20
Nevada	State Program	9	TN00032	07-31-16
New Hampshire	NELAP	1	2963	10-09-16
New Jersey	NELAP	2	TN965	10-30-15 *
New York	NELAP	2	11342	03-31-16
North Carolina (WW/SW)	State Program	4	387	12-31-15
North Dakota	State Program	8	R-146	06-30-15 *
Ohio VAP	State Program	5	CL0033	07-10-17
Oklahoma	State Program	6	9412	08-31-16
Oregon	NELAP	10	TN200001	04-27-16
Pennsylvania	NELAP	3	68-00585	06-30-16
Rhode Island	State Program	1	LAO00268	12-30-15
South Carolina	State Program	4	84009 (001)	02-28-16
South Carolina (Do Not Use - DW)	State Program	4	84009 (002)	12-16-17
Tennessee	State Program	4	2008	02-23-17
Texas	NELAP	6	T104704077	08-31-16
USDA	Federal		S-48469	10-30-16
Utah	NELAP	8	TN00032	07-31-16
Virginia	NELAP	3	460152	06-14-16
Washington	State Program	10	C789	07-19-16
West Virginia DEP	State Program	3	219	02-28-16
Wisconsin	State Program	5	998020430	08-31-16
Wyoming (UST)	A2LA	8	453.07	12-31-15

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<sup>\*</sup> Certification renewal pending - certification considered valid.

## **COOLER RECEIPT**

	490-87569 Chain et 0
Γ FORM	490-87569 Chain of Custody

Cooler Received/Opened On: 9/18/2015	5 @0910			
1. Tracking #	(last 4 digits, FedEx)			
Courier: Fed-Ex	R Gun ID: <u>14740456</u>	77		
2. Temperature of rep. sample or temp	o blank when opened:	<u>5 , C</u> Degr	ees Celsius	_
3. If Item #2 temperature is 0°C or less,	, was the representative	sample or temp	blank frozen?	YES NO NA
4. Were custody seals on outside of co	ooler?	<b>1</b>	1-	ESNONA
If yes, how many and where:		Itro	nt	<del></del>
5. Were the seals intact, signed, and da	ated correctly?			ESNONA
6. Were custody papers inside cooler?	•		6	YESNONA
I certify that I opened the cooler and an	iswered questions 1-6 (ii	ntial)		<del></del>
7. Were custody seals on containers:	YES	(NO) an	d Intact	YESNONA
Were these signed and dated correc	tly?			YESNO(NA)
8. Packing mat'l used? Bubblewrap	astic bag Peanuts Ve	ermiculite Foar	n Insert Paper	Other None
9. Cooling process:	lce lce-pack	Ice (direct cor	tact) Dry ice	Other None
10. Did all containers arrive in good co	endition (unbroken)?		(	YES NONA
11. Were all container labels complete	(#, date, signed, pres., e	tc)?	7	YES)NONA
12. Did all container labels and tags ag	ree with custody papers	?	7	YESNONA
13a. Were VOA vials received?				YESNONA
b. Was there any observable headsp	pace present in any VOA	vial?		YESNONA
14. Was there a Trip Blank in this coole	er? YESNO.(.NA	) If multiple co	oolers, sequence	#
I certify that I unloaded the cooler and a	answered questions 7-14	l (intial)	·	W
15a. On pres'd bottles, did pH test strip	os suggest preservation	reached the co	rect pH level?	ESNO(.NA)
b. Did the bottle labels indicate that	the correct preservative	s were used	C	YESNONA
16. Was residual chlorine present?			,	YES.(.NO.)NA
I certify that I checked for chlorine and	pH as per SOP and ansv	vered questions	15-16 (intial)	-CV
17. Were custody papers properly filled	d out (ink, signed, etc)?		(	YESNONA
18. Did you sign the custody papers in	the appropriate place?		Ć.	YESNONA
19. Were correct containers used for the	ne analysis requested?		Ć	YES NONA
20. Was sufficient amount of sample se	ent in each container?		,	YES NO NA
I certify that I entered this project into L	.IMS and answered ques	tions 17-20 (inti	al)	1
I certify that I attached a label with the u	unique LIMS number to e	each container (	intial)	~~
21. Were there Non-Conformance issue	es at login? YES.).NO \	Was a NCM gen	erated (YES) No	o# <u>/9988</u> 2
				199883

**TestAmerica** 

THE LEADER IN ENVIRONMENTAL TESTING

Nashville, TN

# TestAmerica Nashville 2960 Foster Creighton Drive

**Chain of Custody Record** 

TestAmerica Nashville				Cha	Chain of Custody Record	T C	Ĕ	춙	Š V	ᅏ	င္ပ	3									•	Toct > morice	<b>4</b> 15
2960 Foster Creighton Drive																						THE LEADER IN ENVIRONMENTAL TESTING 8/20	າ <b>ສ ∑</b> ໃຊ/ <b>ງ</b> ∩∶
Nashville, TN 37204 phone 615.726.0177 fax	Reguli	Regulatory Program:		☐ DW ☐ NPDES	PDES	□ RCRA	₽ P	М	□ Other:													TestAmerica Laboratories, Inc.	ያ ( 10/
Client Contact	Project Manager: Amar Wadhawan	าager: Am	ar Wadhav	van	Sit	e Co	nta	Ë	Site Contact: Linxi Chen	Ten			Dat	Date: 9/17/15	17/1	۳.						COC No: 1	Ш
Amar Wadhawan	Email:AWadhawan@Geosyntec.com	dhawan@	Geosyntec	.com	la la	-8		┨╬	Lab Contact: Heather Baker	Bak	┨╸	1	Car	Carrier: Fedex	12	۱×۱	┨╵	-	-	┨╵	+	1 of1 COCs	
decayment Collections	CALCAN	ildiyələ il	Allalysis i dillalodilo i ille	ביווים											_	_	_				al c	Sample: LC	L
Columbia	L CALENDAR DAYS	RUAYS	,	WORKING DAYS	<u></u>	N)		III						Loc: 490	: 49	0						For Lab Use Only:	
MD, 21046 FAX		2 weeks	2 weeks		N)	Υ/								$\infty$	87569	9					<del></del> -	Lab Sampling:	丄
Project Name: Treatability Study		1 4	1 week		(Y/				,,,														
EL		20	2 days																		ᆮ	Job / SDG No.:	Ш
PO#		1 day	lay															_					Ш
	0 1 1 1	S and a	sampie Type		red S	orm N	-Nitra A -He	- As,	7.0,														
Sample Identification	Date	Time	(C=Comp, G=Grab)	Matrix Co		†	₩		0020		ļ ļ	ļ				<u> </u>	ļ	<u> </u>	ļ	<u> </u>		Sample Specific Notes:	l
Biotic_091715	9/17/2015	1430	G	٧	1 Y		×	×								10					7	HNO3 preserved	İ
Biotic_091715	9/17/2015	1430	G	٤		×		-								1	Ľ						<u> </u>
Biotic_091715	9/17/2015	1430	G	S				×								3							<u> </u>
Biotic Dup_091715	9/17/2015	1500	G	\$	1		×	×								$\mathcal{S}$	_				<u> </u>	HNO3 preserved	25
Biotic Dup_091715	9/17/2015	1500	G	٤	Z	×	<u> </u>	<del> </del>			-				1	1	<u> </u>	<u> </u>	ļ	ļ	<u> </u>		1 4 of
Biotic Dup_091715	9/17/2015	1500	G	s	z			×								Ş							P 2
Control_091715	9/17/2015	1400	G	٤	Z	×	×	×								3							Pan
Control_091715	9/17/2015	1400	G	v	Z			×		_						2							L
								_			+-							_			_		L.
Preservation.Used _1=lice_2=HC;_3=H2SO4: 4=HNO3:_5=NaOH;6=Other.	03; 5=NaOH;	6= Other	熱性變			を を を を を を を を を を を を を を を を を を を	ंदर्भ करोत	\$ 100 S	能加 麗麗		***		汗 数据	多	额			機制					海影
Possible Hazard Identification:  Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in	⊃lease List any	EPA Was	te Codes fo	r the sampl	e in	Sam	ıple	Disp	Sample Disposal ( A		m a	y be	ass	esse	d Ħ	sam	ples	are	ret:	ine	ᅙ	fee may be assessed if samples are retained longer than 1 month)	
☑ Non-Hazard ☐ Flammable ☐ Skin Irritant	Poison B		☐ Unknown	m	,	П	] Reti	ā	Return to Client			<u>⊆</u>	Disposal by Lab	l by L	ö			□	☐ Archive for	for		Months	
Special Instructions/QC Requirements & Comments:								l															
Custody Seats Intact: Ses Seat No.	custody seat No.:	ai No.:					П	g	ogici i c		3	пр. ( с). свъ	١			Ġ	_ Con a					יפווו ום ועס	Ц
Relinquished by: Linxi Chen	Company: Geosyntec	Seosyntec		Date/Time: 9/17/15 1600	00	Received by:	5 6 E	d by:	<u>}</u>	28/28/ 28/28/	<b>S</b>				Company:	Pan	ξ×.	Ž				Date/Time: 9-17-15 16: 2년	L
	Company:	Ŧ		Date/Time:		Rec	Received by	/ <u>`</u> §	47	TZ.	2	₩,	~		Company:	<b>1</b> pa	7 }					Date/Time:	
Relinquished by:	Company:	\$		Date/Time:		Rec	eive	ij	Received in Laboratory by:	tory k	Ϋ́				Company:	pan	~	3	ł			Date/Time:	

# **Login Sample Receipt Checklist**

Client: Geosyntec Consultants, Inc.

Job Number: 490-87569-1

Login Number: 87569 List Source: TestAmerica Nashville

List Number: 1

Creator: Gambill, Shane

oreator. Gambin, oriane		
Question	Answer	Comment
Radioactivity wasn't checked or is = background as measured by a survey meter.</td <td>True</td> <td></td>	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	3.2
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	False	Insufficient volume received for requested analysis.
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	True	

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THE LEADER IN ENVIRONMENTAL TESTING

# **ANALYTICAL REPORT**

TestAmerica Laboratories, Inc.

TestAmerica Nashville 2960 Foster Creighton Drive Nashville, TN 37204 Tel: (615)726-0177

TestAmerica Job ID: 490-89123-1

TestAmerica Sample Delivery Group: TEL Client Project/Site: Treatability Study

For:

Geosyntec Consultants, Inc. 10220 Old Columbia Road Suite A Columbia, Maryland 21046

Attn: Amar Wadhawan

Heather Baker

Authorized for release by: 10/29/2015 4:17:13 PM

Heather Baker, Project Manager I (615)301-5043

heather.baker@testamericainc.com

.....LINKS .....

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**Have a Question?** 



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The test results in this report meet all 2003 NELAC and 2009 TNI requirements for accredited parameters, exceptions are noted in this report. This report may not be reproduced except in full, and with written approval from the laboratory. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

TestAmerica Job ID: 490-89123-1 SDG: TEL

# **Table of Contents**

Cover Page	1
Table of Contents	2
Sample Summary	3
Case Narrative	4
Definitions	5
Client Sample Results	6
QC Sample Results	10
QC Association	14
Chronicle	16
Method Summary	18
Certification Summary	19
Chain of Custody	20
Receipt Checklists	22

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1:

# **Sample Summary**

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-89123-1

SDG: TEL

Lab Sample ID	Client Sample ID	Matrix	Collected Received	
490-89123-1	Biotic_100815	Water	10/08/15 14:00 10/09/15 09:5	0
490-89123-2	Biotic_100815	Soil	10/08/15 14:00 10/09/15 09:5	0
490-89123-3	Biotic Dup_100815	Water	10/08/15 14:30 10/09/15 09:5	0
490-89123-4	Biotic Dup 100815	Soil	10/08/15 14:30 10/09/15 09:5	0

## **Case Narrative**

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-89123-1

SDG: TEL

Job ID: 490-89123-1

Laboratory: TestAmerica Nashville

**Narrative** 

Job Narrative 490-89123-1

#### Comments

No additional comments.

## Receipt

The samples were received on 10/9/2015 9:50 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 3.0° C.

#### HPLC/IC

Method 9056: The following samples were diluted due to the nature of the sample matrix: Biotic 100815 (490-89123-1) and Biotic Dup 100815 (490-89123-3). Elevated reporting limits (RLs) are provided.

Method 9056: Reanalysis of the following samples was performed outside of the analytical holding time due to a failing continuing calibration verification (CCV) as well as a failing laboratory control sample duplicate (LCSD): Biotic 100815 (490-89123-1) and Biotic Dup 100815 (490-89123-3). See batch 490-288498.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

#### Metals

No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

## **General Chemistry**

Method 7196A, SM 3500 CR D: The following sample was received with less than one shift (8 hours) remaining on a test with a holding time of 48 hours or less. As such, the laboratory had insufficient time remaining to perform the analysis within holding time: Biotic 100815 (490-89123-1).

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

### Organic Prep

No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

# **Definitions/Glossary**

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-89123-1

SDG: TEL

## **Qualifiers**

## **HPLC/IC**

Н Sample was prepped or analyzed beyond the specified holding time

**Metals** 

Qualifier **Qualifier Description** 

MS, MSD: The analyte present in the original sample is greater than 4 times the matrix spike concentration; therefore, control limits are not

**General Chemistry** 

Qualifier **Qualifier Description** 

Sample was prepped or analyzed beyond the specified holding time

# **Glossary**

Abbreviation	These commonly used abbreviations may or may not be present in this report.
--------------	---

¤ Listed under the "D" column to designate that the result is reported on a dry weight basis

%R Percent Recovery **CFL** Contains Free Liquid **CNF** Contains no Free Liquid

**DER** Duplicate error ratio (normalized absolute difference)

Dil Fac Dilution Factor

Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample DL, RA, RE, IN

DLC Decision level concentration MDA Minimum detectable activity **EDL Estimated Detection Limit** MDC Minimum detectable concentration

MDL Method Detection Limit ML Minimum Level (Dioxin)

Not Calculated NC

ND Not detected at the reporting limit (or MDL or EDL if shown)

**PQL Practical Quantitation Limit** 

QC **Quality Control RER** Relative error ratio

Reporting Limit or Requested Limit (Radiochemistry) RL

**RPD** Relative Percent Difference, a measure of the relative difference between two points

TEF Toxicity Equivalent Factor (Dioxin) **TEQ** Toxicity Equivalent Quotient (Dioxin)

TestAmerica Nashville

10/29/2015

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-89123-1

SDG: TEL

Client Sample ID: Biotic\_100815

Date Collected: 10/08/15 14:00 Date Received: 10/09/15 09:50

Lab Sample ID: 490-89123-1

Matrix: Water

Method: 9056 - Anions, Ion Chro	_								
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Nitrate as N	0.194	H	0.100		mg/L			10/11/15 04:01	1
Sulfate	1970		10.0		mg/L			10/11/15 04:19	10
Method: 6020 - Metals (ICP/MS) -	Dissolv	ed							
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	46.8		0.100		mg/L		10/13/15 09:15	10/16/15 15:53	50
Chromium	4.28		0.0100		mg/L		10/13/15 09:15	10/15/15 23:08	5
Copper	35.4		0.100		mg/L		10/13/15 09:15	10/16/15 15:53	50
Iron	322		0.125		mg/L		10/13/15 09:15	10/15/15 23:08	5
General Chemistry - Dissolved									
Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium, hex	ND	H	0.0100		mg/L			10/09/15 13:15	1

TestAmerica Nashville

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-89123-1

SDG: TEL

Client Sample ID: Biotic\_100815

Date Collected: 10/08/15 14:00 Date Received: 10/09/15 09:50

**Percent Solids** 

Lab Sample ID: 490-89123-2 Matrix: Soil

Percent Solids: 79.9

10/09/15 13:05

Method: 6020 - Metals (ICP	/MS)							
Analyte	Result Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	330	3.14		mg/Kg	<u> </u>	10/19/15 14:00	10/23/15 19:42	5
Chromium	182	3.14		mg/Kg	₩	10/19/15 14:00	10/23/15 19:42	5
Copper	1100	3.14		mg/Kg	☼	10/19/15 14:00	10/23/15 19:42	5
Iron	3380	6.29		mg/Kg		10/19/15 14:00	10/24/15 16:59	1
General Chemistry								
Analyte	Result Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Moisture	<u> </u>	0.10		%			10/09/15 13:05	1

0.10

80

%

5

7

8

9

10

12

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-89123-1

SDG: TEL

Client Sample ID: Biotic Dup 100815

Date Collected: 10/08/15 14:30 Date Received: 10/09/15 09:50

Chromium, hex

Lab Sample ID: 490-89123-3

10/09/15 13:20

Matrix: Water

Method: 9056 - Anions,	Ion Chromatography							
Analyte	Result Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Nitrate as N	ND H	1.00		mg/L			10/11/15 04:37	10
Sulfate	1670	10.0		mg/L			10/11/15 04:37	10
- Method: 6020 - Metals (I	ICP/MS) - Dissolved							
Analyte	Result Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	13.8	0.100		mg/L		10/13/15 09:15	10/16/15 16:09	50
Chromium	0.825	0.0100		mg/L		10/13/15 09:15	10/15/15 23:24	5
Copper	6.43	0.100		mg/L		10/13/15 09:15	10/16/15 18:55	50
lron	52.7	0.125		mg/L		10/13/15 09:15	10/15/15 23:24	5
- General Chemistry - Dis	ssolved							
Analyte	Result Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac

0.0100

mg/L

ND

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-89123-1

SDG: TEL

Client Sample ID: Biotic Dup 100815

Date Collected: 10/08/15 14:30 Date Received: 10/09/15 09:50

**Percent Solids** 

Lab Sample ID: 490-89123-4

**Matrix: Soil** 

Percent Solids: 81.3

10/09/15 13:05

Method: 6020 - Metals (ICP	/MS)							
Analyte	Result Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	400	2.99		mg/Kg	<u> </u>	10/19/15 14:00	10/23/15 19:47	- 5
Chromium	53.1	2.99		mg/Kg	₩	10/19/15 14:00	10/23/15 19:47	5
Copper	202	2.99		mg/Kg	₩	10/19/15 14:00	10/23/15 19:47	5
Iron	2310	5.97		mg/Kg	₽	10/19/15 14:00	10/24/15 17:04	1
General Chemistry								
Analyte	Result Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Moisture		0.10		%			10/09/15 13:05	1

0.10

81

%

TestAmerica Job ID: 490-89123-1 SDG: TEL

# Method: 9056 - Anions, Ion Chromatography

Lab Sample ID: MB 490-288867/3 Client Sample ID: Method Blank Prep Type: Total/NA **Matrix: Water** 

**Analysis Batch: 288867** 

MB MB Analyte Result Qualifier RL **MDL** Unit Analyzed Dil Fac Prepared 1.00 Sulfate ND mg/L 10/11/15 03:07

Lab Sample ID: LCS 490-288867/4 **Client Sample ID: Lab Control Sample Matrix: Water** Prep Type: Total/NA

**Analysis Batch: 288867** 

Spike LCS LCS %Rec. Added Limits Analyte Result Qualifier Unit %Rec Sulfate 100 98.64 mg/L 99 80 - 120

Lab Sample ID: LCSD 490-288867/5 Client Sample ID: Lab Control Sample Dup **Matrix: Water** Prep Type: Total/NA

**Analysis Batch: 288867** 

Spike LCSD LCSD %Rec. **RPD** Added Result Qualifier Limits RPD Limit Analyte Unit D %Rec Sulfate 100 98.90 mg/L 99 80 - 120

Lab Sample ID: 490-89148-E-10 MS **Client Sample ID: Matrix Spike Matrix: Water** Prep Type: Total/NA

**Analysis Batch: 288867** 

Sample Sample Spike MS MS %Rec. Analyte Result Qualifier Added Result Qualifier Unit %Rec Limits Sulfate 4.24 100 92.26 88 80 - 120 mg/L

Lab Sample ID: 490-89148-E-10 MSD Client Sample ID: Matrix Spike Duplicate **Matrix: Water** Prep Type: Total/NA

**Analysis Batch: 288867** 

Spike MSD MSD %Rec. RPD Sample Sample Analyte Result Qualifier Added Result Qualifier Unit %Rec Limits RPD Limit Sulfate 100 97 80 - 120 4.24 100.8 mg/L

Lab Sample ID: MB 490-288868/3 **Client Sample ID: Method Blank** Prep Type: Total/NA

**Matrix: Water** 

**Analysis Batch: 288868** 

MB MB Analyte Result Qualifier RL MDL Unit Prepared D Analyzed Dil Fac 0 100 Nitrate as N mg/L 10/11/15 03:07 ND

Lab Sample ID: LCS 490-288868/4 Client Sample ID: Lab Control Sample Prep Type: Total/NA

**Matrix: Water** 

**Analysis Batch: 288868** 

Spike LCS LCS %Rec. Added Analyte Result Qualifier Unit %Rec Limits Nitrate as N 10.0 9.734 97 80 - 120

Lab Sample ID: LCSD 490-288868/5 Client Sample ID: Lab Control Sample Dup **Matrix: Water** Prep Type: Total/NA

**Analysis Batch: 288868** 

LCSD LCSD RPD Spike %Rec. Added Limits Analyte Result Qualifier Unit D %Rec RPD

Limit Nitrate as N 10.0 9.732 97 80 - 120 mg/L

TestAmerica Nashville

TestAmerica Job ID: 490-89123-1

**Client Sample ID: Matrix Spike** 

Prep Type: Total/NA

SDG: TEL

Lab Sample ID: 490-89148-E-10 MS

**Matrix: Water** 

Analysis Batch: 288868

Sample Sample Spike MS MS %Rec. Analyte Result Qualifier Added Result Qualifier Unit %Rec Limits Nitrate as N 10.0 8.506 ND

MD MD

85 80 - 120 mg/L

Lab Sample ID: 490-89148-E-10 MSD

**Matrix: Water** 

**Analysis Batch: 288868** 

**Client Sample ID: Matrix Spike Duplicate** Prep Type: Total/NA

	Sample	Sample	Spike	MSD	MSD				%Rec.		RPD
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	RPD	Limit
Nitrate as N	ND		10.0	9.444		mg/L		94	80 - 120	10	20

Method: 6020 - Metals (ICP/MS)

Lab Sample ID: MB 490-291020/1-A

**Matrix: Solid** 

**Analysis Batch: 292575** 

**Client Sample ID: Method Blank Prep Type: Total/NA Prep Batch: 291020** 

	IVID	IVID					
Analyte	Result (	Qualifier RL	MDL	Unit D	Prepared	Analyzed	Dil Fac
Arsenic	ND	0.498		mg/Kg	10/19/15 14:00	10/23/15 18:39	1
Chromium	ND	0.498	1	mg/Kg	10/19/15 14:00	10/23/15 18:39	1
Copper	ND	0.498	;	mg/Kg	10/19/15 14:00	10/23/15 18:39	1
Iron	ND	4.98		mg/Kg	10/19/15 14:00	10/23/15 18:39	1

Lab Sample ID: LCS 490-291020/2-A

**Matrix: Solid** 

**Analysis Batch: 292575** 

**Client Sample ID: Lab Control Sample** Prep Type: Total/NA Prep Batch: 291020

Spike LCS LCS %Rec. Analyte Added Result Qualifier Unit D %Rec Limits Arsenic 19.8 17.16 mg/Kg 86 80 - 120 Chromium 19.8 18.73 mg/Kg 94 80 - 120 Copper 19.8 18.43 mg/Kg 93 80 - 120 Iron 198 184.4 mg/Kg 93 80 - 120

Lab Sample ID: 490-89919-A-1-B MS

**Matrix: Solid** 

**Analysis Batch: 292575** 

**Client Sample ID: Matrix Spike** Prep Type: Total/NA Prep Batch: 291020

Sample Sample Spike MS MS %Rec. Analyte Result Qualifier Added Result Qualifier Unit D %Rec Limits Arsenic ND 19.1 21.21 mg/Kg 111 75 - 125 Chromium 19.1 110 193.5 4 mg/Kg 436 75 - 125 Copper ND 19.1 21.15 mg/Kg 111 75 - 125 75 - 125 Iron 31400 191 48820 4 mg/Kg 9121

Lab Sample ID: 490-89919-A-1-C MSD

**Matrix: Solid** 

**Client Sample ID: Matrix Spike Duplicate** Prep Type: Total/NA

Analysis Batch: 292575									Prep Ba	itch: 29	1020
_	Sample	Sample	Spike	MSD	MSD				%Rec.		RPD
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	RPD	Limit
Arsenic	ND		19.4	18.79		mg/Kg		97	75 - 125	12	20
Chromium	110		19.4	165.3	4	mg/Kg		285	75 - 125	16	20
Copper	ND		19.4	21.10		mg/Kg		109	75 - 125	0	20
Iron	31400		194	42360	4	mg/Kg		5652	75 <sub>-</sub> 125	14	20

TestAmerica Nashville

Page 11 of 22

10/29/2015

TestAmerica Job ID: 490-89123-1 SDG: TEL

# Method: 6020 - Metals (ICP/MS) (Continued)

MR MR

Lab Sample ID: MB 490-289188/1-A

**Matrix: Water** 

Analysis Batch: 290398

**Client Sample ID: Method Blank Prep Type: Total Recoverable** 

Client Sample ID: Lab Control Sample

**Prep Batch: 289188** 

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND		0.00200		mg/L		10/13/15 09:15	10/15/15 22:18	1
Chromium	ND		0.00200		mg/L		10/13/15 09:15	10/15/15 22:18	1
Copper	ND		0.00200		mg/L		10/13/15 09:15	10/15/15 22:18	1
Iron	ND		0.0250		mg/L		10/13/15 09:15	10/15/15 22:18	1

Lab Sample ID: LCS 490-289188/2-A

**Matrix: Water** 

Analysis Batch: 290398

		Prep Type: Total Recoverable
		Prep Batch: 289188
0	100 100	0/ Dag

-	Spike	LCS	LCS				%Rec.	
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Arsenic	0.100	0.08878		mg/L		89	80 - 120	
Chromium	0.100	0.09495		mg/L		95	80 - 120	
Copper	0.100	0.08881		mg/L		89	80 - 120	
Iron	1.00	0.9421		mg/L		94	80 - 120	

Lab Sample ID: 490-89354-A-3-C MS

**Matrix: Water** 

Analysis Batch: 290398

Client Sample ID: Matrix Spike
Prep Type: Dissolved
D D. ( . ) . 000400

Prep Batch: 289188

	Sample	Sample	Spike	MS	MS				%Rec.	
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Arsenic	ND		0.100	0.08971		mg/L		88	75 - 125	
Chromium	ND		0.100	0.09396		mg/L		94	75 - 125	
Copper	ND		0.100	0.08447		mg/L		84	75 - 125	
Iron	1.66		1.00	2.546		mg/L		89	75 - 125	

Lab Sample ID: 490-89354-A-3-D MSD

**Matrix: Water** 

Client Sample	ID:	Matrix S	3pike	Dupl	icate
---------------	-----	----------	-------	------	-------

**Prep Type: Dissolved** 

Analysis Batch: 290398									Prep Ba	itcn: 20	59100
-	Sample	Sample	Spike	MSD	MSD				%Rec.		RPD
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	RPD	Limit
Arsenic	ND		0.100	0.09298		mg/L		92	75 - 125	4	20
Chromium	ND		0.100	0.09641		mg/L		96	75 - 125	3	20
Copper	ND		0.100	0.08684		mg/L		87	75 - 125	3	20
Iron	1.66		1.00	2.630		mg/L		98	75 - 125	3	20

# Method: 7196A - Chromium, Hexavalent

Lab Sample ID: MB 490-289612/12 **Client Sample ID: Method Blank Matrix: Water** Prep Type: Total/NA

Analysis Batch: 289612

MB MB	

Analyte	Result Qualifier	RL	MDL Unit	D	Prepared	Analyzed	Dil Fac
Chromium, hex	ND	0.0100	mg/l			10/09/15 11:40	1

TestAmerica Nashville

TestAmerica Job ID: 490-89123-1 SDG: TEL

RPD

# **Method: 7196A - Chromium, Hexavalent (Continued)**

Sample Sample

Lab Sample ID: LCS 490-2 Matrix: Water	289612/13					Clie	nt Sa	mple ID	: Lab Cor		_
									Prep Ty	be. Tot	ai/NA
Analysis Batch: 289612			Spike	LCS	LCS				%Rec.		
Analyte			Added		Qualifier	Unit	D	%Rec	Limits		
Chromium, hex			0.100	0.1030		mg/L		103	85 - 115		
Lab Sample ID: 490-89118	8-G-5 MS						C	lient Sa	mple ID: I	<b>Matrix</b>	Spike
Matrix: Water									Prep Ty		
Analysis Batch: 289612											
	Sample	Sample	Spike	MS	MS				%Rec.		
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits		
Chromium, hex	ND		0.100	0.1030		mg/L		103	85 - 115		
Lab Sample ID: 490-89118	-G-5 MSD					Client	Samp	le ID: N	Matrix Spil	ce Dup	licate
Matrix: Water									Prep Ty	pe: Tot	al/NA
Analysis Batch: 289612											
	Sample	Sample	Spike	MSD	MSD				%Rec.		RPD
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	RPD	Limit
Chromium, hex	ND		0.100	0.1030		mg/L		103	85 - 115	0	20
Lab Sample ID: 490-89118	8-G-5 DU							Client	Sample I	D: Dup	licate
Matrix: Water Analysis Batch: 289612									Prep Ty		

Analyte	Result	Qualifier	Result	Qualifier	Unit	D			RPD	Limit
Chromium, hex	ND		ND		mg/L				NC	20
L ah Sample ID: 490-89118	-B-6 MS					C	lient Sa	ample ID: N	latrix 9	Snike

DU DU

Matrix: Water									Prep Type	e: Dissolv	ved
Analysis Batch: 289612											
	Sample	Sample	Spike	MS	MS				%Rec.		
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits		
Chromium, hex	ND		0.100	0.1010		mg/L		101	85 - 115		

Lab Sample ID: 490-89118-B-6 MSD	Client Sample ID: Matrix Spike Duplicate
Matrix: Water	Prep Type: Dissolved
Analysis Batch: 289612	

-	Sample	Sample	Spike	MSD	MSD				%Rec.		RPD
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	RPD	Limit
Chromium, hex	ND		0.100	0.1000		mg/L	_	100	85 - 115	1	20

# **Method: Moisture - Percent Moisture**

Lab Sample ID: 490-89120-B-4 DU

Matrix: Solid							Prep Ty	/pe: Tot	al/NA	
Analysis Batch: 288374										
	Sample	Sample	DU	DU					RPD	
Analyte	Result	Qualifier	Result	Qualifier	Unit	D		RPD	Limit	
Percent Moisture	21		22		%			0.9	20	
Percent Solids	79		78		%			0.2	20	

TestAmerica Nashville

**Client Sample ID: Duplicate** 

# **QC Association Summary**

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-89123-1

SDG: TEL

# HPLC/IC

# Analysis Batch: 288867

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-89123-1	Biotic_100815	Total/NA	Water	9056	
490-89123-3	Biotic Dup_100815	Total/NA	Water	9056	
490-89148-E-10 MS	Matrix Spike	Total/NA	Water	9056	
490-89148-E-10 MSD	Matrix Spike Duplicate	Total/NA	Water	9056	
LCS 490-288867/4	Lab Control Sample	Total/NA	Water	9056	
LCSD 490-288867/5	Lab Control Sample Dup	Total/NA	Water	9056	
MB 490-288867/3	Method Blank	Total/NA	Water	9056	

## **Analysis Batch: 288868**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-89123-1	Biotic_100815	Total/NA	Water	9056	_
490-89123-3	Biotic Dup_100815	Total/NA	Water	9056	
490-89148-E-10 MS	Matrix Spike	Total/NA	Water	9056	
490-89148-E-10 MSD	Matrix Spike Duplicate	Total/NA	Water	9056	
LCS 490-288868/4	Lab Control Sample	Total/NA	Water	9056	
LCSD 490-288868/5	Lab Control Sample Dup	Total/NA	Water	9056	
MB 490-288868/3	Method Blank	Total/NA	Water	9056	

## Metals

## Filtration Batch: 289186

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-89123-1	Biotic_100815	Dissolved	Water	Filtration	
490-89123-3	Biotic Dup_100815	Dissolved	Water	Filtration	

# **Prep Batch: 289188**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-89123-1	Biotic_100815	Dissolved	Water	3005A	289186
490-89123-3	Biotic Dup_100815	Dissolved	Water	3005A	289186
490-89354-A-3-C MS	Matrix Spike	Dissolved	Water	3005A	
490-89354-A-3-D MSD	Matrix Spike Duplicate	Dissolved	Water	3005A	
LCS 490-289188/2-A	Lab Control Sample	Total Recoverable	Water	3005A	
MB 490-289188/1-A	Method Blank	Total Recoverable	Water	3005A	

# **Analysis Batch: 290398**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-89123-1	Biotic_100815	Dissolved	Water	6020	289188
490-89123-3	Biotic Dup_100815	Dissolved	Water	6020	289188
490-89354-A-3-C MS	Matrix Spike	Dissolved	Water	6020	289188
490-89354-A-3-D MSD	Matrix Spike Duplicate	Dissolved	Water	6020	289188
LCS 490-289188/2-A	Lab Control Sample	Total Recoverable	Water	6020	289188
MB 490-289188/1-A	Method Blank	Total Recoverable	Water	6020	289188

# **Analysis Batch: 290561**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-89123-1	Biotic_100815	Dissolved	Water	6020	289188
490-89123-3	Biotic Dup_100815	Dissolved	Water	6020	289188

Page 14 of 22

# **QC Association Summary**

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-89123-1

SDG: TEL

# **Metals (Continued)**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-89123-3	Biotic Dup_100815	Dissolved	Water	6020	289188

# **Prep Batch: 291020**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-89123-2	Biotic_100815	Total/NA	Soil	3051A	
490-89123-4	Biotic Dup_100815	Total/NA	Soil	3051A	
490-89919-A-1-B MS	Matrix Spike	Total/NA	Solid	3051A	
490-89919-A-1-C MSD	Matrix Spike Duplicate	Total/NA	Solid	3051A	
LCS 490-291020/2-A	Lab Control Sample	Total/NA	Solid	3051A	
MB 490-291020/1-A	Method Blank	Total/NA	Solid	3051A	

# **Analysis Batch: 292575**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-89123-2	Biotic_100815	Total/NA	Soil	6020	291020
490-89123-4	Biotic Dup_100815	Total/NA	Soil	6020	291020
490-89919-A-1-B MS	Matrix Spike	Total/NA	Solid	6020	291020
490-89919-A-1-C MSD	Matrix Spike Duplicate	Total/NA	Solid	6020	291020
LCS 490-291020/2-A	Lab Control Sample	Total/NA	Solid	6020	291020
MB 490-291020/1-A	Method Blank	Total/NA	Solid	6020	291020

# **Analysis Batch: 292807**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-89123-2	Biotic_100815	Total/NA	Soil	6020	291020
490-89123-4	Biotic Dup_100815	Total/NA	Soil	6020	291020

# **General Chemistry**

## **Analysis Batch: 288374**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-89120-B-4 DU	Duplicate	Total/NA	Solid	Moisture	
490-89123-2	Biotic_100815	Total/NA	Soil	Moisture	
490-89123-4	Biotic Dup_100815	Total/NA	Soil	Moisture	

## **Analysis Batch: 289612**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-89118-B-6 MS	Matrix Spike	Dissolved	Water	7196A	
490-89118-B-6 MSD	Matrix Spike Duplicate	Dissolved	Water	7196A	
490-89118-G-5 DU	Duplicate	Total/NA	Water	7196A	
490-89118-G-5 MS	Matrix Spike	Total/NA	Water	7196A	
490-89118-G-5 MSD	Matrix Spike Duplicate	Total/NA	Water	7196A	
490-89123-1	Biotic_100815	Dissolved	Water	7196A	289613
490-89123-3	Biotic Dup_100815	Dissolved	Water	7196A	289613
LCS 490-289612/13	Lab Control Sample	Total/NA	Water	7196A	
MB 490-289612/12	Method Blank	Total/NA	Water	7196A	

## Filtration Batch: 289613

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-89123-1	Biotic_100815	Dissolved	Water	Filtration	
490-89123-3	Biotic Dup_100815	Dissolved	Water	Filtration	

TestAmerica Nashville

10/29/2015

Page 15 of 22

TestAmerica Job ID: 490-89123-1

SDG: TEL

Client Sample ID: Biotic 100815

Date Collected: 10/08/15 14:00 Date Received: 10/09/15 09:50

Client: Geosyntec Consultants, Inc.

Project/Site: Treatability Study

Lab Sample ID: 490-89123-1

**Matrix: Water** 

Prep Type Total/NA	Batch Type Analysis	Batch Method 9056	Run	Dil Factor	Initial Amount 10 mL	Final Amount	Batch Number 288868	Prepared or Analyzed 10/11/15 04:01	Analyst JHS	Lab TAL NSH
Total/NA	Analysis	9056		10	10 mL		288867	10/11/15 04:19	JHS	TAL NSH
Dissolved	Filtration	Filtration			50 mL	50 mL	289186	10/13/15 09:08	ZLN	TAL NSH
Dissolved	Prep	3005A			50 mL	50 mL	289188	10/13/15 09:15	ZLN	TAL NSH
Dissolved	Analysis	6020		5	50 mL	50 mL	290398	10/15/15 23:08	KKK	TAL NSH
Dissolved	Filtration	Filtration			50 mL	50 mL	289186	10/13/15 09:08	ZLN	TAL NSH
Dissolved	Prep	3005A			50 mL	50 mL	289188	10/13/15 09:15	ZLN	TAL NSH
Dissolved	Analysis	6020		50	50 mL	50 mL	290561	10/16/15 15:53	KKK	TAL NSH
Dissolved	Filtration	Filtration			1.0 mL	1.0 mL	289613	10/09/15 12:58	BLM	TAL NSH
Dissolved	Analysis	7196A		1	10 mL	10 mL	289612	10/09/15 13:15	BLM	TAL NSH

Client Sample ID: Biotic\_100815 Lab Sample ID: 490-89123-2 **Matrix: Soil** 

Date Collected: 10/08/15 14:00

Date Received: 10/09/15 09:50

Batch Dil Initial Final Batch Batch Prepared **Prep Type** Type Method Amount Number or Analyzed Run **Factor** Amount Analyst Lab Total/NA Analysis Moisture 288374 10/09/15 13:05 MNM TAL NSH

Client Sample ID: Biotic\_100815 Lab Sample ID: 490-89123-2 **Matrix: Soil** 

Date Collected: 10/08/15 14:00

Date Received: 10/09/15 09:50

	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.498 g	100 mL	291020	10/19/15 14:00	KMS	TAL NSH
Total/NA	Analysis	6020		5	0.498 g	100 mL	292575	10/23/15 19:42	KKK	TAL NSH
Total/NA	Prep	3051A			0.498 g	100 mL	291020	10/19/15 14:00	KMS	TAL NSH
Total/NA	Analysis	6020		1	0.498 g	100 mL	292807	10/24/15 16:59	KKK	TAL NSH

Lab Sample ID: 490-89123-3 Client Sample ID: Biotic Dup 100815

Date Collected: 10/08/15 14:30 Date Received: 10/09/15 09:50

	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Analysis	9056		10	10 mL		288867	10/11/15 04:37	JHS	TAL NSH
Total/NA	Analysis	9056		10	10 mL		288868	10/11/15 04:37	JHS	TAL NSH
Dissolved	Filtration	Filtration			50 mL	50 mL	289186	10/13/15 09:08	ZLN	TAL NSH
Dissolved	Prep	3005A			50 mL	50 mL	289188	10/13/15 09:15	ZLN	TAL NSH
Dissolved	Analysis	6020		5	50 mL	50 mL	290398	10/15/15 23:24	KKK	TAL NSH
Dissolved	Filtration	Filtration			50 mL	50 mL	289186	10/13/15 09:08	ZLN	TAL NSH
Dissolved	Prep	3005A			50 mL	50 mL	289188	10/13/15 09:15	ZLN	TAL NSH
Dissolved	Analysis	6020		50	50 mL	50 mL	290561	10/16/15 16:09	KKK	TAL NSH
Dissolved	Filtration	Filtration			50 mL	50 mL	289186	10/13/15 09:08	ZLN	TAL NSH
Dissolved	Prep	3005A			50 mL	50 mL	289188	10/13/15 09:15	ZLN	TAL NSH

TestAmerica Nashville

Percent Solids: 79.9

**Matrix: Water** 

Page 16 of 22

10/29/2015

## **Lab Chronicle**

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-89123-1

SDG: TEL

Client Sample ID: Biotic Dup\_100815

Date Collected: 10/08/15 14:30 Date Received: 10/09/15 09:50

Lab Sample ID: 490-89123-3

**Matrix: Water** 

**Matrix: Soil** 

	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Dissolved	Analysis	6020		50	50 mL	50 mL	290972	10/16/15 18:55	KKK	TAL NSH
Dissolved	Filtration	Filtration			1.0 mL	1.0 mL	289613	10/09/15 12:58	BLM	TAL NSH
Dissolved	Analysis	7196A		1	10 mL	10 mL	289612	10/09/15 13:20	BLM	TAL NSH

Client Sample ID: Biotic Dup\_100815 Lab Sample ID: 490-89123-4

Date Collected: 10/08/15 14:30

Date Received: 10/09/15 09:50

_	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Analysis	Moisture		1			288374	10/09/15 13:05	MNM	TAL NSH

Client Sample ID: Biotic Dup\_100815 Lab Sample ID: 490-89123-4

Date Collected: 10/08/15 14:30

**Matrix: Soil** Date Received: 10/09/15 09:50 Percent Solids: 81.3

	Batch	Batch		Dil	Initial	Final	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Amount	Amount	Number	or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.515 g	100 mL	291020	10/19/15 14:00	KMS	TAL NSH
Total/NA	Analysis	6020		5	0.515 g	100 mL	292575	10/23/15 19:47	KKK	TAL NSH
Total/NA	Prep	3051A			0.515 g	100 mL	291020	10/19/15 14:00	KMS	TAL NSH
Total/NA	Analysis	6020		1	0.515 g	100 mL	292807	10/24/15 17:04	KKK	TAL NSH

#### **Laboratory References:**

TAL NSH = TestAmerica Nashville, 2960 Foster Creighton Drive, Nashville, TN 37204, TEL (615)726-0177

TestAmerica Nashville

# **Method Summary**

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

TestAmerica Job ID: 490-89123-1

SDG:	IEL	

Method	Method Description	Protocol	Laboratory
9056	Anions, Ion Chromatography	SW846	TAL NSH
6020	Metals (ICP/MS)	SW846	TAL NSH
7196A	Chromium, Hexavalent	SW846	TAL NSH
Moisture	Percent Moisture	EPA	TAL NSH

#### **Protocol References:**

EPA = US Environmental Protection Agency

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

#### Laboratory References:

TAL NSH = TestAmerica Nashville, 2960 Foster Creighton Drive, Nashville, TN 37204, TEL (615)726-0177

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TestAmerica Job ID: 490-89123-1 SDG: TEL

Client: Geosyntec Consultants, Inc. Project/Site: Treatability Study

# **Laboratory: TestAmerica Nashville**

All certifications held by this laboratory are listed. Not all certifications are applicable to this report.

Authority	Program	EPA Region	Certification ID	Expiration Date
A2LA	A2LA		NA: NELAP & A2LA	12-31-15
A2LA	ISO/IEC 17025		0453.07	12-31-15
Alaska (UST)	State Program	10	UST-087	07-24-16
Arizona	State Program	9	AZ0473	05-05-16
Arkansas DEQ	State Program	6	88-0737	04-25-16
California	State Program	9	2938	10-31-16
Connecticut	State Program	1	PH-0220	12-31-15
Florida	NELAP	4	E87358	06-30-16
Georgia	State Program	4	N/A	06-30-16
Illinois	NELAP	5	200010	12-09-15 *
lowa	State Program	7	131	04-01-16
Kansas	NELAP	7	E-10229	10-31-15 *
Kentucky (UST)	State Program	4	19	06-30-16
Kentucky (WW)	State Program	4	90038	12-31-15
Louisiana	NELAP	6	30613	06-30-16
Maryland	State Program	3	316	03-31-16
Massachusetts	State Program	1	M-TN032	06-30-16
Minnesota	NELAP	5	047-999-345	12-31-16
Mississippi	State Program	4	N/A	06-30-16
Montana (UST)	State Program	8	NA	02-24-20
Nevada	State Program	9	TN00032	07-31-16
New Hampshire	NELAP	1	2963	10-09-16
New Jersey	NELAP	2	TN965	10-30-15 *
New York	NELAP	2	11342	03-31-16
North Carolina (WW/SW)	State Program	4	387	12-31-15
North Dakota	State Program	8	R-146	06-30-15 *
Ohio VAP	State Program	5	CL0033	07-10-17
Oklahoma	State Program	6	9412	08-31-16
Oregon	NELAP	10	TN200001	04-27-16
Pennsylvania	NELAP	3	68-00585	06-30-16
Rhode Island	State Program	1	LAO00268	12-30-15
South Carolina	State Program	4	84009 (001)	02-28-16
South Carolina (Do Not Use - DW)	State Program	4	84009 (002)	12-16-17
Tennessee	State Program	4	2008	02-23-17
Texas	NELAP	6	T104704077	08-31-16
USDA	Federal		S-48469	10-30-16
Utah	NELAP	8	TN00032	07-31-16
Virginia	NELAP	3	460152	06-14-16
Washington	State Program	10	C789	07-19-16
West Virginia DEP	State Program	3	219	02-28-16
Wisconsin	State Program	5	998020430	08-31-16
Wyoming (UST)	A2LA	8	453.07	12-31-15

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<sup>\*</sup> Certification renewal pending - certification considered valid.





## **COOLER RECEIPT FORM**

490-89123 Chain of Custody	

Cooler Received/Opened On 10/9/2015 @ 0950	
1. Tracking #(last 4 digits, FedEx)	
Courier: FedEx IR Gun ID 17960353	
2. Temperature of rep. sample or temp blank when opened: <u>3</u> Degrees Celsius	
3. If Item #2 temperature is 0°C or less, was the representative sample or temp blank frozen?	YES NO NA
4. Were custody seals on outside of cooler?	YESNONA
If yes, how many and where:	
5. Were the seals intact, signed, and dated correctly?	YESNONA
6. Were custody papers inside cooler?	YESNONA
I certify that I opened the cooler and answered questions 1-6 (intial)	
7. Were custody seals on containers: YES 🔞 and Intact	YESNO. NA
Were these signed and dated correctly?	YESNO (NA)
8. Packing mat'l used? Bubblewrap Plastic bag Peanuts Vermiculite Foam Insert Pape	r Other None
9. Cooling process: (direct contact) Dry ice	Other None
10. Did all containers arrive in good condition (unbroken)?	ESNONA
11. Were all container labels complete (#, date, signed, pres., etc)?	ESNONA
12. Did all container labels and tags agree with custody papers?	ESNONA
13a. Were VOA vials received?	YES(100.).NA
b. Was there any observable headspace present in any VOA vial?	YESNO(A
14. Was there a Trip Blank in this cooler? YESNO NA If multiple coolers, sequen	ce #
I certify that I unloaded the cooler and answered questions 7-14 (intial)	mey.
15a. On pres'd bottles, did pH test strips suggest preservation reached the correct pH level?	YESNO.NA
b. Did the bottle labels indicate that the correct preservatives were used	YESNO
16. Was residual chlorine present?	YESNO.
I certify that I checked for chlorine and pH as per SOP and answered guestions 15-16 (intial)	
17. Were custody papers properly filled out (ink, signed, etc)?	ESNONA
18. Did you sign the custody papers in the appropriate place?	ESNONA
19. Were correct containers used for the analysis requested?	XES).NONA
20. Was sufficient amount of sample sent in each container?	XES .NONA
certify that I entered this project into LIMS and answered guestions 17-20 (intial)	Mary_
certify that I attached a label with the unique LIMS number to each container (intial)	Mam
21. Were there Non-Conformance issues at login? YES. (NO) Was a NCM generated? YES.	NO.)#

TestAmerica Nashville

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Amar Wadhawan	Email:AWadhawan@Geosyntec.com	dhawan@	Geosyntec.	com	La	Lab Contact: Heather Baker	ntac	#   :	ath	ᆲ	ake	٦		្ឋា	7. E	Carrier: Fedex	ğ i	^	-				١ -			잌		_		200s	1	丄	1
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Sample Identification	Date	Time	(C=Comp, G=Grab)	Matrix Cont.	Filte	1	<del> </del>	<b>-</b>	<del> </del>							İ				<u> </u>	<b></b>				Sar	nple	Sp	Sign	S.	Sample Specific Notes:		L	
Biotic_100815	10/8/2015	1400	G	W 1	z	×	×	×															-										
Biotic_100815	10/8/2015	1400	6	S	z			×																									
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Possible Hazard Identification: Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample.	ease List any I	≣PA Wast	e Codes for	the sample i		Sample Disposal ( A	ple	Disp	osal	Â	fee	ma)	be	ass	ess	ed i	sa	힐	ຮັ	9	etaii	per	lon	fee may be assessed if samples are retained longer than 1 month)	than	1	1001	Ę					
☑ Non-Hazard ☐ Flammable ☐ Skin Irritant	☐ Poison B		Unknown	n			Return to Client	to Ti	⊃lient				Disposal by Lab	spos	by	ab				Archive for	ive fo	٦			Months	ths							
Special Instructions/QC Requirements & Comments:														-									1	1									
Custody Seals Intact:	Custody Seal No.: Company: Geosyntec	No.: eosyntec		Date/Time:		Received by:	jiyed	_ <u>}</u>	Cooler Temp.	en		(°C):	Obs'd	ä		ठ	Company:	Corr'd:	Þ,   i <sub>⊥</sub>		-		희회	herm ID No.:			ŝ		<b>∟∥</b>	ا ٔ ا ڔ	<sup>7</sup>		
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# **Login Sample Receipt Checklist**

Client: Geosyntec Consultants, Inc.

Job Number: 490-89123-1

SDG Number: TEL

10/29/2015

Login Number: 89123 List Source: TestAmerica Nashville

List Number: 1

Creator: McBride, Mike

Question	Answer	Comment
Radioactivity wasn't checked or is = background as measured by a survey neter.</td <td>True</td> <td></td>	True	
he cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	N/A	
he cooler or samples do not appear to have been compromised or ampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	3.0
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
s the Field Sampler's name present on COC?	True	
here are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
here is sufficient vol. for all requested analyses, incl. any requested //S/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is 6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

TestAmerica Nashville



Client: Geosyntec Consultants

SiREM File Reference: S-3581

Client Project Number:

Date Samples Received: May 14, 2015 Date Samples Analyzed: May 27, 2015

	SiREM Reference	Client	Sample	Lactate	Acetate	Propionate	Formate	Butyrate	Pyruvate
Client Sample ID	ID ID	Sample Date	dilution factor	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Biotic-050615	15-0529	6-May-15	50	< 0.39	2.6	<0.31	4.2	<0.41	<0.69
Biotic-Dup-050615	15-0530	6-May-15	50	< 0.39	2.4	<0.31	9.1	<0.41	< 0.69
Biotic Control-050615	15-0531	6-May-15	50	< 0.39	<0.54	<0.31	<0.22	<0.41	< 0.69
Biotic-051315	15-0532	13-May-15	50	< 0.39	2.5	<0.31	11	<0.41	< 0.69
Biotic-Dup-051315	15-0533	13-May-15	50	< 0.39	2.8	<0.31	8.0	<0.41	<0.69
			QL	0.39	0.54	0.31	0.22	0.41	0.69

#### Comments:

Method: Ion Chromatography

QL = Quantitation limit

J = associated value is estimated; compound positively detected at concentration below the QL

< = compound analysed for but not detected, associated value is QL. Sample QL is corrected for dilution.</p>

Analyst:

Results approved:

Date:

Analyst:

Michael Healey, B.Sc.
Laboratory Technician

Date:

28-May-15

0.69

SiREM File Reference: S-3662

0.41



Analytical Results

Client: Geosyntec

Client Project Number: CCA Treatability Date Samples Received: August 11, 2015

Date Samples Analyzed: August 13, 2015 and August 17, 2015

	SiREM Reference	Client	Sample	Lactate	Acetate	Propionate	Formate	Butyrate	Pyruvate
Client Sample ID	ID ID	Sample Date	dilution factor	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Biotic_072315	15-0909	23-Jul-15	1000	105	1912	<6.2	9.4	<8.2	<14
Biotic_Dup_072315	15-0910	23-Jul-15	1000	95	1913	<6.2	9.9	<8.2	<14
Control_073015	15-0911	30-Jul-15	1000	1450	<11	<6.2	7.7	<8.2	<14
Biotic_081115	15-0912	11-Aug-15	1000	93	2072	<6.2	31	<8.2	<14
Biotic_Dup_081115	15-0913	11-Aug-15	1000	85	2476	20	14	<8.2	<14

QL

Laboratory Manager

0.39

0.54

0.31

0.22

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Method: Ion Chromatography

QL = Quantitation limit

Laboratory Technician

J = associated value is estimated; compound positively detected at concentration below the QL

< = compound analysed for but not detected, associated value is QL. Sample QL is corrected for dilution.</p>



Client: Geosyntec

Client Project Number: MEM1223.01.02 Date Samples Received: September 23, 2015 Date Samples Analyzed: September 24, 2015

SiREM File Reference: S-3701

		Client	Sample	Lactate	Acetate	Propionate	Formate	Butyrate	Pyruvate
Client Sample ID	SiREM Reference ID	Sample Date	dilution factor	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Biotic_091715	15-1120	17-Sep-15	1000	162	815	<6.2	<4.4	<8.2	<14
Biotic Dup_091715	15-1121	17-Sep-15	1000	<7.8	1483	438	<4.4	<8.2	<14
Control_091715	15-1122	17-Sep-15	1000	<7.8	<11	<6.2	<4.4	<8.2	<14
			QL	7.8	11	6.2	4.4	8.2	14

## Comments:

Method: Ion Chromatography

QL = Quantitation limit

J = associated value is estimated; compound positively detected at concentration below the QL

< = compound analysed for but not detected, associated value is QL. Sample QL is corrected for dilution.</p>

Analyst:	Results approved:	Date:
Alica untendless	Sandia O wordyed	28-Sep-15
Alicia Quintanilla, M.Env.Sc.	Sandra Dworatzek , M.Sc.	
Laboratory Assistant	Senior Laboratory Manager	



# **APPENDIX C**



engineers | scientists | innovators

# Collstrup CCA Bench-Scale Treatability Study Work Plan

# Prepared for:

Capital Region of Denmank Kongens Vænge 2 3400 Hillerød

Prepared by:

Geosyntec Consultants, Inc. 10220 Old Columbia Road, Suite A Columbia, Maryland 21046

January 2015



# Collstrup CCA Bench-Scale Treatability Study Work Plan

## **TABLE OF CONTENT**

1	INT	FRODUCTION	1
2	PR	OJECT BACKGROUND	1
3	IN S	SITU BIOSEQUESTRATION TECHNOLOGY	1
4	BE	NCH-SCALE BIOTREATBILITY TESTS	2
	4.1	Field Sampling	2
	4.2	Experimental Design	3
	4.3	Sampling and Analysis	3
5	DA	TA ANALYSIS AND REPORTING	3
6	PR	OJECT SCHEDULE AND BUDGET	4

## **LIST OF FIGURES**

Figure 1. Site map with information about contamination and groundwater flow

**Figure 2.** Schematic showing potential application of in situ biosequestration for remediation of CCA contaminated sites

## **LIST OF TABLES**

**Table 1**. Design of CCA bench-scale treatability study



#### 1 INTRODUCTION

The Capital Region of Denmark (Capital Region) and Geosyntec Consultants, Inc. (Geosyntec) are collaborating to conduct a bench-scale treatability study to assess the efficacy of biosequestration as remedial approach for treatment of soil and groundwater contaminated with Chromated Copper Arsenate (CCA). The technology represents a state-of-the-practice method for in situ treatment of CCA metals (arsenic, chromium, and copper) and other heavy metals. The technology has already been demonstrated in published bench- and field-scale studies at sites in the United States, and therefore is sufficiently mature for testing by the Capital Region. The overall goal of this bench-scale study is to test the technology under site-specific conditions and aid in the pilot-scale test design for treatment of CCA in soil and groundwater at the former Collstrup wood treatment facility in Hillerød, Denmark (Site). The Capital Region intends that the technology implemented in the pilot-scale tests will be suitable for full-scale remediation not only at the Site but also at other Collstrup wood treatment facilities elsewhere in Denmark. This work plan provides a brief description of the Site background, scientific and technical merits of biosequestration technology, the treatability study design, sampling and analysis, data analysis and reporting, and project schedule and budget.

## 2 PROJECT BACKGROUND

The Site is located in Hillerød, Denmark, adjacent to Esrum Lake. The Site is owned by the Danish EPA (Forest and Nature Agency) and it is not currently in use. The property covers a 73,000 m<sup>2</sup> (7 ha) area, is fenced to prevent public access, and is largely overgrown with vegetation and trees (see **Figure 1**). From 1936 to 1976, the Site was used as a facility for processing and treatment of wood lumber. During certain points in its operational history, wood was pressure-treated with CCA. The abundant use of CCA at the Site resulted in extensive impacts of Arsenic (As), Chromium (Cr), and Copper (Cu) in soils and groundwater. As is the primary metal of concern, and an estimated 35 to 44 tons of As remain within waste bark/mulch on the ground surface, soil, and groundwater at the Site. The majority of As mass occurs in the soils above the water table, within 0.5 meters below ground surface (m bgs).

The shallow geology at the Site mainly consists of fluvial sediments with some clay inter-layering occurring from 0 to 5 m bgs. Rainwater infiltration has mobilized vertical spreading of CCA contamination, with significant concentrations of As occurring down to 4 m bgs. A perched water table occurs between 3 to 5 m bgs. A clay till layer that occurs between 5 to 20 m bgs is believed to serve as a partial barrier to limit vertical migration of CCA contamination. A secondary aquifer (upper sand layer) occurs beneath the clay till at depths ranging from 20 to 40 m bgs; contamination in that layer is relatively low.

## 3 IN SITU BIOSEQUESTRATION TECHNOLOGY

In this treatability study, the biosequestration technology is being tested for in situ remediation of CCA metals at wood treatment facilities in the Capital Region. Microorganisms are known to directly or indirectly cause transformation of metal species through redox reactions. In situ biosequestration consists of amending the subsurface environment with organic electron donors (lactate, methanol, etc.) and sulfate to stimulate microbial activity and create sulfate-reducing conditions leading to the formation of sulfide and polysulfide species (**Figure 2**). The sulfate-reducing bacteria utilize sulfate as the electron acceptor leading to the formation of sulfide species.



Scientific studies have shown that under these conditions Cr(VI) and As(V) reductively precipitate to Cr(III) and  $As_2S_3(s)$  respectively while Cu precipitates as CuS(s).

Many remedial approaches exist to individually treat As, Cr, and Cu, but only a limited number are applicable to treat all three simultaneously. Moreover, the selection of any such in situ remedial technology depends on several factors such as site-specific hydrogeology and biogeochemical conditions, contamination matrix and area, remediation time-frame and objectives, performance goals, technology maturity, and costs. Based on these criteria, an evaluation of several technologies for consideration for in situ remediation of CCA metals suggested that in situ biosequestration using electron donors and sulfate was the most efficient, cost-effective, and environmentally sustainable remedial approach. Increasingly, in situ redox manipulation is being used to treat Cr and As contamination problems in soil and groundwater. Although this approach does not remove Cr and As from the target treatment zone, it does immobilize and sequester these metals under anaerobic conditions, for indefinite timeframes, even after conditions have transitioned to aerobic. In situ biosequestration, therefore, presents an innovative and cost-effective alternative to conventional approaches such as solidification/stabilization or electrokinetic extraction for remediating CCA contaminated sites.

#### 4 BENCH-SCALE BIOTREATBILITY TESTS

Bench-scale tests will be performed to test and optimize the site-specific performance of two different types of reducing agents/treatment processes: 1) biological reduction using lactate and ferrous sulfate, and for comparison, 2) chemical reduction using calcium polysulfide and ferrous sulfate. The bench-scale tests will measure the rates at which CCA metals are treated and reagents are consumed, and the results will be used to (1) identify the most effective treatment agents for potential future pilot-scale test, and (2) support the pilot-scale test design (e.g., treatment rates, residence time, etc.).

#### 4.1 Field Sampling

COWI will perform collection of geologic material and groundwater at the Site, under subcontract to Geosyntec. Composite samples of shallow subsurface geologic material will be collected using a hand auger or other standard shallow soil sampling technique from either hotspot 1 or hotspot 2 (Figure 1) up to depth of 0.5 m bgs. The samples will be homogenized in the field and will be stored in clean plastic or glass jars (or equivalent) on ice. The Site groundwater will be collected at a depth of 3 - 5 m bgs from existing onsite wells nearby the sampling location(s) of geologic material. The groundwater will be retrieved following the standard groundwater sampling procedures such as bailers or submersible pumps and will be collected in clean and sterile 4-L plastic carboys (or equivalent) and stored on ice. Geosyntec understands that subsurface characterization of Site geologic material and groundwater has been recently conducted as part of ongoing pilot test evaluations. The exact sampling depths for collection of Site materials for this treatability study will be determined upon review of the characterization data so as to target zones of maximum contamination. Upon collection, the Site materials will be express-shipped under chain-of-custody to Geosyntec's Knoxville Laboratory in Tennessee.



### 4.2 Experimental Design

**Table 1** provides a summary of the treatments, sampling frequency, and analytical parameters for this bench-scale treatability study. An initial baseline characterization of the Site geologic material and groundwater will be conducted to establish background geochemical conditions and concentrations of CCA metals. All controls and treatments will be performed in duplicates. The untreated control will not receive any amendments and will serve as the experimental control against which the effects of the biotreatment and chemical treatments will be measured. In the biotreatment test, the reactors will be amended with lactate and ferrous sulfate to stimulate the activity of the sulfate reducing bacteria and cause precipitation metal sulfide species. In the chemical treatment test, the reactors will be amended with calcium polysulfide and ferrous sulfate to cause metal sulfide formation due to abiotic processes. The dosing concentration of the amendments for the different treatments will be determined based on the background concentration of the CCA metals determined during the baseline characterization. The dosing concentrations will incorporate the stoichiometric requirements along with a safety factor for demand by non-target constituents in the Site materials.

Identical batch reactors will be constructed prior to initiation of the tests and used for the treatments as per **Table 1**. Each reactor will comprise of 25-50 g of Site geologic material with 200 - 250 ml of Site groundwater. After addition of amendments to start the tests, the reactors will be sealed and incubated under anaerobic conditions on a rotary shaker at room temperature ( $\sim$ 22°C) for a period of 3 – 5 months. The experimental design is not final and may be optimized in light of additional information obtained from recent Site characterization studies or during baseline characterization.

#### 4.3 Sampling and Analysis

The frequency of sample collection and analysis is summarized in **Table 1**. During sampling events, two reactors from each treatment and two controls (as needed) will be opened and sacrificed to collect geologic material and groundwater. The solids will be analyzed for total metals whereas the groundwater will be analyzed for dissolved metals, volatile fatty acids, anions, and geochemical parameters (temperature, pH, oxidation reduction potential, and dissolved oxygen). While this list of analytical parameters is fairly extensive, analysis of additional parameters such as acid volatile sulfides (AVS), simultaneously extracted metals (SEM) and Cr, As speciation may be performed on select samples to gain additional information. Also, the sampling frequency and analysis may be optimized as needed during the study to gain required information while saving costs. The sample analysis will be performed by a certified commercial laboratory using USEPA accepted standard analytical methods.

#### 5 DATA ANALYSIS AND REPORTING

During the course of the treatability tests, periodic samples will be collected and analyzed for temporal trends in CCA metal concentrations together with other appropriate test-specific parameters, such as volatile fatty acids, anions, pH, ORP, temperature, and dissolved oxygen. Data will be tabulated and visualized in time-series scatter plots. These graphs will be used to evaluate: (i) changes in concentrations of total and dissolved metals; (ii) rates of metal sulfide precipitation; and (iii) requirements for treatment specific amendments. In addition, data analysis will be performed to assess potential inhibitory factors, if observed. The treatability study data will also be MEM1223/Collstrup CCA Treatability Study Workplan\_Final 3



evaluated to identify potential technical challenges that may be associated with field applications of the tested treatments. Upon completion of the treatability study, Geosyntec will prepare a report that will present the study methodology, all data generated during the study, necessary tables and graphs, and an assessment of the performance of each treatment.

## 6 PROJECT SCHEDULE AND BUDGET

The bench-scale tests are expected to take between 3 and 5 months from the date the Site materials are received by Geosyntec. The total cost of the project is \$35,000, of which \$20,000 will be funded from the Capital Region (Geosyntec will fund \$15,000 of the budget using company resources). Majority of the project budget pertains to experimental set-up, sampling, and analyses associated with the bench-scale tests. Geosyntec will be responsible for project management, data interpretation, and report preparation.



# **FIGURES**



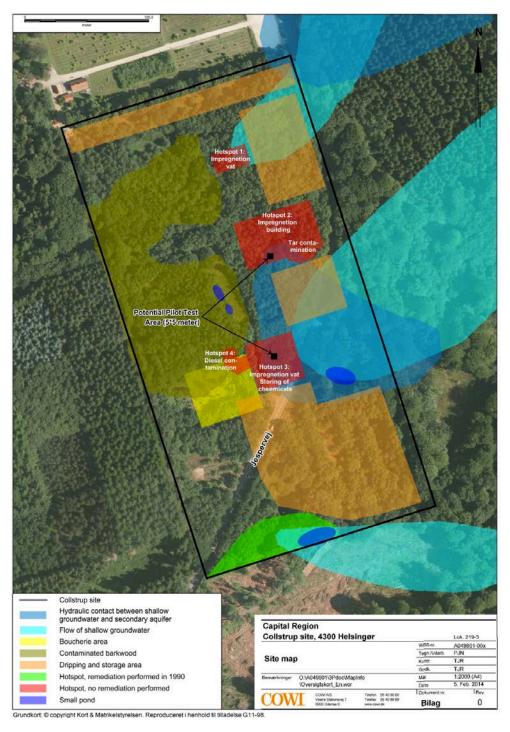
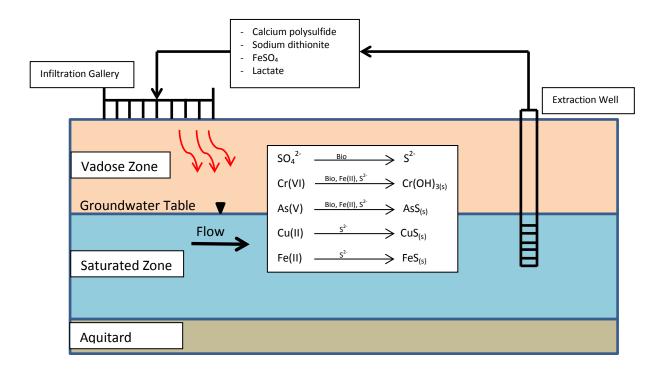


Figure 1. Site map with information about contamination and groundwater flow





**Figure 2**. Schematic showing potential application of in situ biosequestration for remediation of CCA contaminated sites.



# **TABLES**

# TABLE 1 DESIGN OF CCA BENCH-SCALE TREATABILITY STUDY Capital Region Of Denmark

	# of Reactors		Complina	# of	Pa	rameters (# S	amples per	Parameter)	
Phase	per Sampling Event	Matrix	Sampling Frequency	Samples	Total Metals <sup>(1)</sup>	Dissolved Metals <sup>(1)</sup>	NVFAs <sup>(2)</sup>	Anions (3)	Geochemical analysis <sup>(4)</sup>
Baseline Characterization	0	Soil	One time	2	2	0	0	0	0
		Groundwater		2	2	2	0	2	2
Untreated Control	2	Soil	Three times	6	6	0	0	0	0
Chirettea Control	2	Groundwater	Timee times	6	0	6	6	6	6
Biotreatment (Lactate + Sulfate)	2.	Soil	Seven Times	14	14	0	0	0	0
Bion cument (Enclude   Sugare)	2	Groundwater	Seven Times	14	0	14	14	14	14
Chemical Treatment (Calcium Polysulfide + Ferrous Sulfate)	2	Soil	Seven Times	14	14	0	0	0	0
Chemicai Treatment (Catcium Folysuifiae + Ferrous Suifiae)	2	Groundwater	Seven Times	14	0	14	0	14	14
Total (Nos. of React	tor = 34)			72	38	36	20	36	36

#### **Notes:**

NVFAs: Non-Volatile Fatty Acid

- (1) Arsenic, Chromium, Copper, and Iron.
- (2) Lactate, Acetate, Propionate, Formate, Butyrate, and Pyruvate.
- (3) Nitrate and Sulfate.
- (4) Temperature, Redox, pH, and Dissolved Oxygen.