November 9, 2012

Mr. Nathan C. Meadows
West Virginia Department of Environmental Protection
Office of Environmental Remediation
601 57th Street, SE
Charleston, WV 25304

Subject: ***PHASE II ENVIRONMENTAL SITE ASSESSMENT/WETLAND DELINEATION STUDY***
Morgan County Recreational Complex
Morgan County, West Virginia
WVDEP Project No. 12129
Triad Project No. 07-12-0124

Dear Mr. Meadows:

Triad Engineering, Inc. (Triad) has completed the Phase II Environmental Site Assessment/Wetland Delineation Study for the above-referenced Site. A **Site Vicinity Topographic Map** is included as **Figure No. 1** in **Attachment A**. The work performed and findings are discussed herein.

WORK PERFORMED:

Wetland Delineation – Parcels 1 & 2:

Triad delineated the jurisdictional waters of the United States, including wetlands, on **Parcels 1 & 2** at the **Morgan County Recreational Complex (MCRC)**. The work performed and the findings thereof are submitted separately in a report titled ***Report of Routine Wetland/Waterway Delineation Study*** dated November 5, 2012.

Please note that as part of the deed information review for the surveying performed for Wetland Delineation Study, it appears that a small area paralleling U.S. Route 522/Valley Road, just east of Mrs. Kerns' residence and just south of Mr. Golden's residence, which also contains a well described by Mrs. Kerns as Mr. Golden's drinking water well, is part of Parcel 1 as shown on **Sheet No. 1** in **Attachment A**. This well was not sampled or tested as part of this Phase II ESA study.

Phase II Environmental Site Assessment – Parcel 1:

Triad performed a Phase II Environmental Site Assessment (ESA) on Parcel 1 at the MCRC. The work scope generally followed Section 2.0 of the ***Voluntary Remediation and Redevelopment Act Guidance Manual***, Site Assessment. Prior to performing any field work, Triad notified Miss Utility of West Virginia and other local underground utility providers in order to identify utilities on Parcel 1.

Triad utilized a West Virginia certified laboratory (Pace Analytical) to obtain sample containers and perform analytical testing. The collected samples were shipped in the laboratory-provided sample containers (soil, groundwater, and surface water) in a cooler (maintained @ ≤4°C), with proper chain-of-custody documentation.

QA/QC samples were collected as necessary; however, Triad utilized disposable sampling equipment, e.g., liners and bailers, to minimize the need to reuse and decontaminate samplers. In general, field samples and field quality control samples were collected as described in the **Tables 1 - 4** in **Attachment B** listed as follows:

- **Table 1, *Sampling and Analysis Summary*** that summarizes the number of samples per sample media for Contaminants of Concern (COCs).
- **Table 2, *Analytical Methods and Field Sample Container Requirements*** that summarizes the analytical methods, method detection limit requirements, minimum sample volume, container type, preservative, and technical holding time of each media.
- **Table 3, *Field and Matrix QC Samples*** that lists the Quality Control (QC) samples collected.
- **Table 4, *QC Sampling*** that summarizes the sample type, purpose, collection rate, and numbering protocols.

Pace Analytical will also be providing QA/QC data package. Upon receipt, Triad will validate field sampling techniques, sample management, and laboratory analysis methodologies for accuracy, including 100% of the laboratory analytical data per United States Environmental Protection Agency (USEPA) protocols. That data validation report will be submitted under a separate cover.

Geophysical Investigation:

Although a geophysical study was not included in the proposed scope of work, Triad determined that in order to perform an adequate Phase II ESA, a geophysical investigation of the former underground storage tank (UST) basin north of the former on-site structure was needed. As such, a ground penetrating radar (GPR) survey was performed on September 14, 2012 along several lines extending through the northern half of the existing gravel area to identify any imaged anomalies that could aid in detecting existing USTs. The survey lines were conducted with line spacing of approximately 2 feet in order to provide adequate coverage throughout the former UST basin area. Survey lines were oriented in both the general north to south and east to west directions. The approximate test locations were selected by Triad personnel based on the available site information. The general limits of the GPR survey area are illustrated by the shaded area on **Sheet No. 1** in **Attachment A**.

GPR testing is a geophysical technique that involves transmitting a radio frequency signal into the ground and receiving any signals that are reflected back. The recorded reflections occur at interfaces where the dielectric constant of the subsurface material changes. In order to image targets within the test area, Triad performed GPR imaging utilizing a Geophysical Survey Systems, Inc. (GSSI) SIR-3000 control unit equipped with a 400 MHz antenna.

When interpreting the results of GPR data the reviewer is most interested in the bright reflections created by contrasting dielectric constants of dissimilar material, such as a metal UST and/or soil backfill. Based on the results of the GPR testing, one suspect abandoned utility line and one identified anomaly interpreted to be suspect buried debris was marked in the field with orange spray paint. The approximate locations thereof are denoted on **Sheet No. 1** in **Attachment A** as **Suspect Abandoned Utility Line** and **Suspect Buried Debris** in the same area as the former UST basin.

It should be noted that target depths can only be accurately determined if a specific dielectric constant for the subsurface materials located at the site can be established. The dielectric constant is a unit-less measure of a material's ability to hold and pass a charge. In order to accurately estimate the dielectric constant for a particular site, an object of known depth must be present and scanned such that the dielectric constant can be calibrated. In this particular case, the global location and an approximate depth of any suspected targets were the primary focus of the GPR survey. Therefore, the calibration of the actual dielectric constant for the on-site soils was not performed. However, an approximate dielectric constant for the on-site soils was utilized for the survey.

There are various factors that can interfere with locating subsurface targets utilizing geophysical methods. Some of these factors include soil types, moisture content, depth, size of the target, subsurface disturbance (e.g. certain types of man-placed backfill), groundwater, and the proximity of other subsurface structures. Small targets (approximately two (2) inches in diameter and smaller) may or may not be detected by GPR testing when utilizing the 400 MHz antenna. Furthermore, pulses emitted by GPR testing may not be able to penetrate moist clayey soils to depths which are sufficient for certain applications. All of these factors have a direct impact on the signal strength of the geophysical device and the ability to accurately detect underground targets.

Soil Sampling:

For purposes of sample acquisition, 17 soil borings (SB-1 through SB-17) were performed on September 27, 2012 at the approximate locations shown on **Sheet No. 1** in **Attachment A**. These soil borings were performed in the manner described in **Attachment C, *Direct-Push Subsurface Soil Collection Standard Operating Procedure***.

Soil samples collected during the sampling activities were visually classified and logged by experienced personnel. **Soil Boring Logs** included in **Attachment D** list sample descriptions, depths, and identification (ID). As shown on the **Soil Boring Logs**, measureable groundwater was not encountered in any of the soil borings.

Soil samples were collected directly from the recovered material using Terra Core™ samplers. The Terra Core™ sample was submitted for volatiles analysis in compliance with the EPA Method 5035 protocol. After sample collection with the Terra Core™ sampler, additional containers were filled with sufficient sample material for analysis of the other COCs.

A portion of the soil sample was placed into a re-sealable sample bag for field screening for the presence of organic vapors using an organic vapor analyzer equipped with a photo-ionization detector (PID). The field screening results, which did not register any detectable readings, are shown on the **Soil Boring Logs** included in **Attachment D**.

The number of samples collected and the COCs tested are listed in Table A.

Table A – Soil Samples[1]

Depth (ft)	Volatiles	Semi-Volatiles	RCRA Metals	Organochlorine Pesticides
0 - 2	17	17	18	17
2 - 6	16	16	16	16
6 - 10	10	10	10	10
10 - 15[2]	0	0	0	0

1 Does not include QA/QC samples which are listed in **Table 3** in **Attachment B**.
2 All soil borings encountered refusal prior to the sampling depth of 10-15'.

The results of the soil sample analyses are listed on the **Pace Analytical Laboratory Analysis Reports** dated October 9 and October 11, 2012 in **Attachment E**. In addition, these results are listed **MCRC Soil Results Table** included in **Attachment F**.

Concentrations for those COCs detected at or above the method detection limit (MDL) were compared to the applicable **Residential Soil De Minimis Standard** as listed in **Table 60-3B** of the ***Voluntary Remediation and Redevelopment Rule - Title 60CRS3,*** and for RCRA metals the **Maximum Natural Background Levels** as listed in ***Voluntary Remediation and Redevelopment Act Guidance Manual*** if higher than the **Residential Soil De Minimis Standard**. These standards and background levels are commonly used as cleanup guidelines by the West Virginia Voluntary Remediation Program (VRP).

As summarized on the **MCRC Soil Results Table** included in **Attachment F**, nine of the 44 soil samples tested for RCRA metals exhibited elevated **Arsenic (As)** concentrations that exceeded the **Maximum Natural Background Level** of **13 milligrams per kilogram (mg/kg).** In addition, one of the 43 soil samples tested for **Organochlorine Pesticides** exhibited an elevated concentration of **DDE** in comparison to the **Residential Soil De Minimis Standard** of **1.4 mg/kg**. These specific samples with the respective sample depths and laboratory results are summarized in the following table. The elevated arsenic concentrations are also summarized on **Sheet No. 2** in **Attachment A**.

Table B – Elevated Soil Sample Concentrations

Sample Location	Sample Depth (ft)[1]	COC	Result (mg/kg)
SB-1	2 - 6	As	13.2
SB-1	6 - 7.3	As	13.8
SB-5	0 - 2	As	15.4
SB-7	0 - 2	As	15.5
SB-7	2 - 6	As	33.4
SB-8	0 - 2	As	14.7
SB-8	6 - 10	As	21.5
SB-15	0 - 2	As	20.8
SB-16	0 - 2	As	36.0
SB-16	0 - 2	DDE	1.97

1 All depths are approximate.

Groundwater Sampling:

As shown on the **Soil Boring Logs** included in **Attachment D**, measurable groundwater was not encountered in any of the soil borings. As such, groundwater samples could not be collected using temporary groundwater sampling points.

The two existing water wells located near the on-site trailer and labeled Well No. 1 and Well No. 2 on **Sheet No. 1** in **Attachment A** were gauged and sampled on October 9, 2012. The groundwater samples were collected in the manner described in **Attachment C, *Hand Bailing Groundwater Collection Standard Operating Procedure and Dissolved Metals in Groundwater Collection Standard Operating Procedure***.

The results of the water well gauging are listed in Table C.

Table C – Water Well Gauging[1]

Well ID	Free Product (ft)	Well Casing Stickup (ft)	Groundwater Depth from Top of Casing (ft)	Groundwater Depth from Surface (ft)
Well No. 1	--	1.3	29.20	27.9
Well No. 2	--	1.8	26.37	24.57

1 All measurements are approximate.

The number of samples collected and the COCs tested are listed in Table D.

Table D – Groundwater Samples[1]

	Volatiles	Semi-Volatiles	RCRA Metals (dissolved)	Organochlorine Pesticides
# of samples	2	2	2	2

1 Does not include QA/QC samples which are listed in **Table 3** in **Attachment B**.

The results of the groundwater sample analyses are listed on the **Pace Analytical Laboratory Analysis Report** dated October 23, 2012 in **Attachment E**. In addition, these results are listed **MCRC Water Results Table** included in **Attachment F**. Concentrations for those COCs detected at or above the method detection limit (MDL) were compared to the applicable **Groundwater De Minimis Standards** as listed in **Table 60-3B** of the ***Voluntary Remediation and Redevelopment Rule - Title 60CRS3***. These standards are commonly used as cleanup guidelines by the West Virginia VRP.

As summarized on the **MCRC Water Results Table** included in **Attachment F**, the groundwater sample collected from Well No. 2 exhibited elevated **Polynuclear Aromatic Hydrocarbons (PAHs)** in comparison to the **Groundwater De Minimis Standards.** These specific PAH exceedances with the respective laboratory results and standards are listed in the following table.

Table E – Elevated Groundwater Sample Concentrations

Sample Location	PAH COC	Result (ug/L)	Groundwater De Minimis Standard (ug/L)
Well No. 2	Benzo(a)pyrene	1.10J	0.20
Well No. 2	Benzo(b)fluoranthene	1.10J	0.029
Well No. 2	Benzo(k)fluoranthene	1.1J	0.29

ug/L – micrograms per liter
J – Estimated concentration above the adjusted method detection limit (MDL) and below the adjusted reporting limit (RL).

Surface Water Sampling:

Surface water samples were collected from the existing farm pond. The surface water samples were collected in the manner described in **Attachment C, *Shallow Surface Water Collection Standard Operating Procedure***. There was no discharge from the pond draining to the unnamed tributary of Sleepy Creek.

The number of samples collected and the COCs tested are listed in Table F.

Table F – Surface Water Samples[1]

	Volatiles	Semi-Volatiles	RCRA Metals	Organochlorine Pesticides
# of samples	1	1	1	1

1 Does not include QA/QC samples which are listed in **Table 3** in **Attachment B**.

The results of the surface water sample analyses are listed on the **Pace Analytical Laboratory Analysis Report** dated October 23, 2012 in **Attachment E**. In addition, these results are listed **MCRC Water Results Table** included in **Attachment F**. Concentrations for those COCs detected at or above the method detection limit (MDL) were compared to the values listed in the ***Requirements Governing Water Quality Standards Rule - Title 47CRS2.***

The surface water sample from the farm pond exhibited an elevated **Iron** level of **2,780 ug/L** compared to the **West Virginia Surface Water Quality Standard** of **1,500 ug/L** established for **Aquatic Life (Chronic) in Warm Water Fishery Streams/Wetlands**. The elevated Iron level is in all likelihood due to surface water runoff from the barren shale bedrock located on the topographic highs up slope of the pond on site.

FINDINGS:

The findings of the Phase II Environmental Site Assessment/Wetland Delineation Study are summarized as follows:

- The southeastern corner of **Parcel 1** contains a small, isolated pond, which in the opinion of Triad, would not be considered jurisdictional waters of the U.S. subject to regulation by the U.S Army Corps of Engineers (Corps) under Section 404 of the Clean Water Act (CWA). For further details, please refer to the separate report titled ***Report of Routine Wetland/Waterway Delineation Study***.

- The northeastern corner of **Parcel 2** contains an area of mixed forested scrub-shrub and emergent wetlands, which in the opinion of Triad, would be considered jurisdictional waters of the U.S. and waters of the State of West Virginia. For further details, please refer to the separate report titled ***Report of Routine Wetland/Waterway Delineation Study***.

- The small area paralleling U.S. Route 522/Valley Road, just east of Mrs. Kerns' residence and just south of Mr. Golden's residence, which also contains a well described by Mrs. Kerns as Mr. Golden's drinking water well, appears to be part of **Parcel 1** as shown on **Sheet No. 1** in **Attachment A** based on a review of available deed information. This well was not sampled or tested as part of this Phase II ESA study.

- The GPR testing identified one suspect abandoned utility line and one anomaly interpreted to be suspect buried debris denoted on **Sheet No. 1** in **Attachment A** as **Suspect Abandoned Utility Line** and **Suspect Buried Debris** in the same area as the former UST basin.

- Nine of the 44 soil samples tested for RCRA metals exhibited **As** concentrations that exceed the **Maximum Natural Background Level** of **13 mg/kg** as shown on **Sheet No. 2** in **Attachment A**.

- One of the 43 soil samples tested for **Organochlorine Pesticides** (SB-16 at 0 - 2') exhibited a **DDE** concentration of **1.97 mg/kg** that exceeds the **Residential Soil De Minimis Standard** of **1.4 mg/kg**.

- Well No. 2 exhibited estimated levels of **PAHs** that exceed **Groundwater De Minimis Standards**.

- The surface water in the farm pond exhibited an elevated **Iron** level of **2,780 ug/L** that exceeds the **West Virginia Surface Water Quality Standard** of **1,500 ug/L** established for **Aquatic Life (Chronic) in Warm Water Fishery Streams/Wetlands**.

If you should have any questions concerning the information provided herein, please feel free to contact the undersigned at 540-667-9300, ext. 107 or at jmitchell@triadeng.com.

Sincerely,

TRIAD ENGINEERING, INC.

Jeffrey H. Mitchell, CPG, LRS
Environmental Services Manager – Eastern Region

Attachments

Attachment A – Illustrations (Figure No. 1 and Sheets No. 1 & No. 2)
Attachment B – Sampling Summary Tables (Tables 1 - 4)
Attachment C – Sample Collection Standard Operating Procedures
Attachment D – Soil Boring Logs
Attachment E – Laboratory Analysis Reports
Attachment F – Soil & Water Results Tables