

January 29, 2008
Job No. 32795.12-C



Ms. Joan Taylor
Rhode Island Department of Environmental Management
Office of Waste Management
235 Promenade Street
Providence, Rhode Island 02908

Re: *Phase II Bedrock Aquifer Evaluation Work Plan*
Phase IV Subsurface Investigation Program
Charbert, Division of NFA Corporate Facility
Alton, Rhode Island

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Dear Ms. Taylor:

GZA GeoEnvironmental, Inc. (GZA) is pleased to submit this *Phase II Bedrock Aquifer Evaluation Work Plan* (Work Plan) for the proposed field studies at the Charbert Facility (Site) to the Rhode Island Department of Environmental Management (RIDEM). We prepared this Work Plan on behalf of our client, Charbert, a Division of NFA Corporation.

BACKGROUND

The subject Site is located off Church Street in Alton, Rhode Island as shown on Figure 1. Based on our November 20, 2007 meeting and discussions with RIDEM, and the data collected to date we have identified the need for several additional field tasks.

The initial bedrock study consisted of the installation of three multi-level wells; each with three depth-specific monitoring zones. The following subsurface profiles were encountered:

LOCATION	DEPTH TO TILL (ft bgs)	DEPTH TO BEDROCK (ft bgs)	TOTAL EXPLORATION DEPTH (ft bgs)
GZ-ML-1	72	117	206
GZ-ML-2	58	83	207.5
GZ-ML-3	39	42	160

Two rounds of groundwater sampling of the multi-level wells was performed. On June 25 and August 09, 2007, GZA personnel sampled the three multilevel wells (ML-1 (A-C), 2 (A-C) and 3 (A-C) according to EPA's low flow sampling protocol. Groundwater samples were analyzed by the following laboratory methods:

- TPH Fingerprint w/Organo-siloxanes (Massachusetts DEP Protocol)
- Volatile Organic Compounds (EPA Method 8260B)
- Semi-volatile organic compounds (EPA Method 8270),
- 13 Priority Pollutant Metals, Iron and Manganese (EPA Method 6010B/7470A).



A hydrogen sulfide odor was noticeable during the August 2009 sampling of ML-2, with odors strongest from zone C. This odor was not observed during the June 25 sampling event.

The laboratory testing results revealed no exceedances of Method 1 GA Groundwater Objectives (as defined in the RIDEM's Rules and Regulations for the Investigation and Remediation of Hazardous Material Releases [Remediation Regulations]) in Wells ML-1 and ML-2 for both sampling events. Results from ML-3 showed exceedances of Tetrachloroethene in Zones A and B, cis-1,2-Dichloroethene in Zone A, and Trichloroethene in Zone A for the August 9 sampling event and similar results for the June 25, 2007 event. As part of the project's QA/QC program, a blind duplicate of ML-3A was run; the results from the two ML-3A samples were comparable.

PROJECT OBJECTIVES

The objective of this Phase II Bedrock Aquifer Evaluation was to further characterize the nature and extent of chemical contaminants within bedrock and elevate the physical condition of bedrock underlying the Site to the contaminant migration.

The purpose of this Work Plan is to outline the proposed technical approach to be utilized for the continued bedrock aquifer evaluation in sufficient detail for RIDEM to review and approve the work. Our proposed studies include:

1. selecting two bedrock aquifer assessment locations (borehole drilling locations);
2. drilling the selected boreholes;
3. assessing in-situ bedrock properties (e.g., degree and orientation of fractures, hydraulic conductivity);
4. selecting appropriate groundwater monitoring zones within the bedrock boreholes and installing multi-level monitoring equipment;
5. evaluating groundwater flow patterns and gradients within the bedrock; and
6. collecting and analyzing representative groundwater samples.

As the investigation has several components that build upon, and are dependent upon, the findings of preceding tasks, the work is described in general terms. Several milestones requiring decisions with regulatory input are included in the project. We propose to address these milestones through the use of our routine monthly progress reports and/or technical memoranda.

SCOPE OF WORK

Our field program has been designed to obtain the additional information required to complete the decision process for locating the proposed bedrock exploration locations and to address specific RIDEM comments regarding the bedrock aquifer characterization. The resultant data will augment that previously collected to support a remedy that is in keeping with the Remediation Regulations, which includes the future intended use of the property.

In order to meet the project objectives, the following scope of work is proposed.

TASK 1 – DATA COLLECTION AND EVALUATION

Prior to locating any proposed new bedrock wells, GZA will collect and evaluate the following data:

Cross-Sections and Geophysics

GZA will incorporate the data obtained from the first three bedrock wells into the existing geologic cross-sections developed as part of the overburden Phase II SIR. The Phase II SIR will be used in conjunction with existing bedrock borehole data to refine the bedrock contour map inclusive of any additional bedrock feature information discernable from the surveys. We will utilize this information and existing contaminant release and migration data to assist in the selection of bedrock drilling locations.

Groundwater Quality Evaluation

The results of the ongoing Interim Environmental Monitoring and Compliance groundwater sampling, and the quarterly UIC monitoring results will be evaluated and used in conjunction with previous groundwater analysis to further delineate the extent of contamination in the overburden aquifer. Additionally, Charbert will begin testing the raw well water from 14, 16, and 18 River Street beginning this February and every six months thereafter. Initial testing will consist of VOCs via EPA Method 8260B. In particular, GZA will use the new information in comparison to previous data to detect variations of contaminant concentration and flow direction in the overburden aquifer after the mill stops production in February of 2008. See Figure 1 for monitoring well locations.

Piezometric Monitoring

When the mill ceases its planned production in February of 2008, it will no longer extract production water from the two extraction wells currently in use. Similarly, it will no longer discharge process wastewater to the on-Site lagoons. The anticipated depression of the groundwater associated with the extraction of process water will slowly revert to a “natural” state, the mound created by the lagoons will dissipate, and the direction of groundwater flow adjacent to these areas are expected to recover. To monitor the recovery of the overburden aquifer to a natural state and re-evaluate the groundwater flows both on and around the site GZA proposed the following piezometric monitoring:





1. Install GeoCan automated data collectors on the existing bedrock wells to collect 24-hour groundwater elevations in the bedrock zone on a continuous basis. These are to be installed two weeks prior to mill shut down. The desired data will be collected until at least until June 1, 2008.
2. Install pressure transducers and automated data collectors in production wells EW-3 and EW-4 and in groundwater monitoring wells GZ-3, GZ-7, GZ-19 and GZ-20 to record groundwater elevations continuously. These are to be installed two weeks prior to mill shut down and the data will be collected until at least until June 1, 2008.
3. Record manual groundwater readings at the 52 groundwater monitoring wells and 10 surface water locations shown on Figure 1 on the following schedule:
 - Two weeks prior to shut down;
 - The last day of production;
 - After the mill shuts down; every 2 weeks until June 1, 2008 then monthly through August 31, 2008.

Note manual elevations will also be recorded in the transducer locations during these rounds to confirm the accuracy of the automated readings.

Piezometric monitoring results will be presented in both tabular form and as groundwater contours and reported in monthly progress reports.

Comprehensive Groundwater Sampling and Analysis

To evaluate contamination concentrations in the overburden aquifer after the groundwater table has been restored to a natural or recovered state, GZA proposed to perform a comprehensive sampling and laboratory analytical program including shallow and deep overburden and bedrock groundwater monitoring wells. The number and location of these wells will be determined based on the stabilized groundwater flow directions following the Mill closure and in conjunction with other ongoing monitoring programs. The well selections will be provided to RIDEM in a Technical Memorandum prior to sampling. The samples would be analyzed for volatile organic compounds (VOCs) by EPA Method 8260 only. This work would likely be performed in conjunction with the June 2008 IEMP sampling and analysis program but may be moved based on our evaluation of the piezometric data. .

TASK 2 – SELECT WELL LOCATIONS

Location Selection

At this time, we anticipate conducting two bedrock explorations (designated GZ-ML-4 and GZ-ML-5) to total depths of 200 feet below ground surface, and have tentatively targeted the down-gradient area south of the facility in the vicinity of borehole GZ-21 and GZ-22, and the area to the south of the rear facility yard west of monitoring well PT-2.



However, the findings of the work described in Task 1 above will be evaluated to assess the most suitable locations for the proposed wells. Our goal is to bound the southwestern extent of bedrock aquifer contaminant with these explorations. The piezometric monitoring results and analytical laboratory results, bedrock cross-section plan and recommended drilling locations will be submitted to RIDEM in the form of a Technical Memorandum; drilling will not proceed until RIDEM has approved of the proposed locations and depths.

Field Exploration Program

The drilling and contingency plan, the in-situ testing program and the monitoring well installation procedures will be performed in accordance with the field program in Task 2, 3 and 4 of the March 15, 2006 *Bedrock Aquifer Evaluation Work Plan*, which was previously approved by RIDEM.

Drilling Procedures

The following subsections briefly describe the proposed drilling methods. To minimize the potential that the proposed exploration program will affect the distribution of DNAPL and/or dissolved phase contamination, if present within the aquifer, we will not drill directly within known or suspected chlorinated compound release areas. A DNAPL identification and contingency action plan was developed for the previous drilling program, and is attached as Appendix A. As noted in the plan, all drilling activities will be suspended and RIDEM will be notified in the event of the suspected detection of DNAPL.

A GZA geologist/engineer will be present during the field program to observe the investigation process, collect and screen soil samples, and prepare boring/well logs describing subsurface conditions. Soil and water generated as part of the exploration program will be managed in accordance with the procedures provided in RIDEM's Guidelines for the Management of Investigation Derived Waste (Policy Memo 95-01).

Boreholes will be advanced approximately 200 feet below ground surface, which should result in penetrations between approximately 110 and 170 into bedrock. The borings will be drilled by a truck mounted drill rig using air-rotary drilling techniques and steel drill casing to support soils. Once bedrock is encountered, the drill casing will advanced a minimum of 5 feet into rock, or until the rock is stable and self-supporting. A permanent steel well casing will then be installed to the base of the borehole and grouted in place, using a non-shrink cement-bentonite grout (SikaGrout or equivalent) tremied in place. The drill casing will be removed during the grouting process and the grout will be allowed to cure overnight before bedrock drilling commences.

Soil Sampling

Soil samples will be collected at a minimum of 5-foot intervals beginning at ground surface with a 24-inch, steel split-spoon sampler in accordance with ASTM D1586-67. The primary objectives of the soil sampling program are to identify any potential aquitard materials above the bedrock surface and to evaluate the levels of contamination within the soils to minimize the potential for DNAPL migration into the bedrock. The split-spoon samples will be opened and evaluated on site for visual and olfactory evidence of contamination. Samples will be field screened for volatile organic compounds (VOCs) with a Foxboro Model TVA 1000 combination flame and photoionization detector device (FID/PID).

If field screening suggests that there is a potential for elevated total VOC contamination (i.e., PID readings above 100 parts per million – ppm), samples of suspect soils will be taken for laboratory analysis of VOC by EPA Method 8260B. Each sample will be collected in a 40-ml methanol preserved VOA vial and an 8-ounce jar with a Teflon-lined lid will be collected, labeled and placed in an ice filled cooler and transported to the laboratory under chain-of-custody.

TASK 3 BEDROCKGROUNDWATER SAMPLING AND ANALYTICAL METHODS

We propose to sample and analyze groundwater from the two proposed new locations (likely representing 4 to 6 discrete sampling zones) and select existing groundwater monitoring wells, as needed. Groundwater samples will be collected utilizing the permanently installed, nitrogen driven double valve pumps. Ultra-high purity nitrogen will be used for purging and sample collection.

A comprehensive round of water levels will be recorded at the Site prior to sampling the multi-level wells. Samples will be field screened for stabilization prior to sample collection using a Horiba Model U22 multi-meter. Electrical conductivity, pH, turbidity, dissolved oxygen, and temperature measurements will be recorded periodically until readings from two successive rounds have less than a 10 percent difference.

Groundwater samples will be analyzed by the following methods:

- TPH Fingerprint w/Organo-siloxanes (Massachusetts DEP Protocol)
- Volatile Organic Compounds (EPA Method 8260B)
- Semi-volatile organic compounds (EPA Method 8270),
- 13 Priority Pollutant Metals, Iron and Manganese (EPA Method 6010B/7470A).

The resultant data will be used to evaluate the Site's compliance status with respect to the GA Groundwater Objectives and the potential for the occurrence of DNAPL within bedrock at the Site and the lateral and vertical extent of groundwater confirmation.

Quality Assurance/Quality Control





To assess potential laboratory induced contamination, the project laboratory will prepare and analyze Trip Blanks and Method Blanks. Trip Blanks follow the sample containers, and subsequently the collected samples, through the monitoring process and can be used to assess the presence of non-site related contaminants that may be introduced from the environment during the sampling and transportation process (e.g., benzene, toluene, or xylene from automobile exhaust fumes). Method Blanks are used to ensure that no contamination is introduced to the samples during the preparation and analytical process (e.g., methylene chloride and acetone that are commonly used laboratory reagents).

There is no need to prepare equipment blanks, which represent rinsates from non-dedicated field sampling equipment, as all field sampling equipment used for the Solinst system is dedicated to the individual wells. One blind duplicate will be prepared. The blind duplicate provides an indication as to the reproducibility of the sampling and laboratory analytical procedures.

TASK 4 WOOD RIVER PROPERTY EVALUATION

Based on the recent sampling and analysis conducted by RIDEM, there is no evidence of residential drinking water well contamination on the western side of the Wood River related to releases of the Charbert facility. GZA will evaluate the potential for further residential development in areas adjacent to the Site. This evaluation will include a review the Hopkinton Tax Assessors Maps and available bedrock and soil maps to evaluate if there are areas that are planned to be developed. If so, precautions will be developed for RIDEM review and approval.

TASK 5 BEDROCK AQUIFER SITE INVESTIGATION REPORT

At the completion of the bedrock investigation, GZA will prepare a final *Bedrock Site Investigation Report* (SIR) that addresses applicable sections of the Remediation Regulations. This SIR will focus on the findings of the bedrock evaluation and will serve to supplement the existing June 2, 2005 SIR.

SCHEDULE

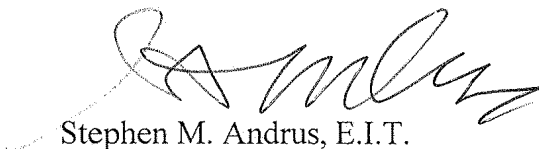
This proposal schedule is based on our current assessment of the progressions of the work and availability of subcontractors. It is subject to change due to a number of factors beyond our control. We will provide an updated project schedule with each monthly progress report.

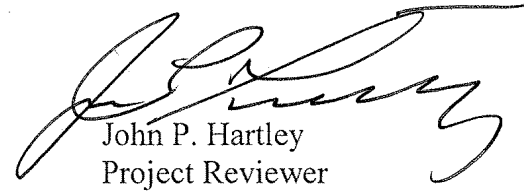
We look forward to your approval of this work plan. Please feel free to call Ed or Steve at (401) 421-4140 (or via email at esummerly@gza.com or stephen.andrus@gza.com) with any questions or comments.

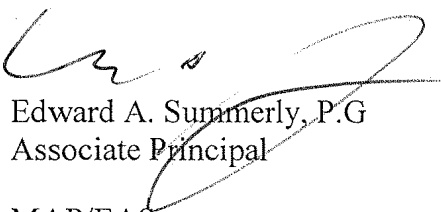
Very truly yours,



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Attachments: Figure E-1 – *Proposed Exploration Location Plan*
Appendix A – DNAPL Contingency Plan
Appendix B – Packer Testing Procedures

cc: Cynthia Gianfrancesco, RIDEM (2 copies)
Mary Morgan, Town of Richmond Clerk
Clark Memorial Library, Charbert Document/Repository

