



Shaw Environmental, Inc.  
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March 31, 2010

Mr. Binyotti Amungwafor  
Program Assistant  
Wisconsin Department of Natural Resources  
2300 N. Dr. Martin Luther King Jr., Drive  
Milwaukee, Wisconsin 53212-3128

SUBMITTED ELECTRONICALLY

**Re: Redi-Quick Dry Cleaner: Amendment Injection Approval Request & Change Order #1**  
**9508 West Greenfield Avenue**  
**West Allis, Wisconsin**  
**BRRTS No.: 02-41-000676**  
**Shaw Environmental Project No.: 133480**

Dear Mr. Amungwafor:

On December 8, 2009, Shaw Environmental, Inc. submitted the document entitled *Remediation Documentation Report- Baseline Groundwater Monitoring, Amendment Injection & Groundwater Performance Monitoring* for your review and comment. On March 22, 2010, you requested that I provide additional information on the volume of material to be injected. The following sections provide information on amendment injection calculations and recommendations, and a change order for review and approval of costs associated with the recommendations.

### **Amendment Injection Calculations**

I contacted Mr. Bill Newman, proprietor of Newman's Zone®, and Mr. Scott Mullin of Orin Remediation Technologies (Orin), to discuss the results of the pilot test amendment injection, and obtain current pricing for amendment and amendment injection, respectively.

Newman's Zone is the approved electron donor amendment for the project, and Orin was selected as the injection contractor based on their experience on many similar projects, ability to drill and inject in the Redi-Quick Dry Cleaners building and capability to manifold injection lines to inject multiple injection points simultaneously.

The highest concentration of Tetrachloroethene (PCE) near MW-14 (pilot area) within the last 12 months was 3,300 micrograms per Liter (ug/L), TCE at <19.5 ug/L, and (3) cis, 1-2, DCE at 94 ug/L. The most impacted groundwater monitoring well, MW-10, contained PCE at a concentration of 33,000 ug/L and TCE at 580 ug/L on 3/30/2009. The lithology within the vertical treatment zone consists of silty clay with the average depth to groundwater varying between 5 ft. bgs to 14 ft. bgs.

Shaw's design includes the installation of thirty eight (38) locations for full scale injection. The map showing the full scale treatment area with approximate locations for injection points is provided on **Figure 4- Full Scale Injection Point and Monitoring Well Location Map**. Due to the shallow nature of the target injection zone, direct push technology (DPT) will be used for application of the electron donor. A 5-foot radius of influence is expected, with injection wells being spaced in a 10-foot grid pattern. The vertical extent of remediation shall extend from approximately 4 to 16 feet below ground surface (ft. bgs).

The design for full-scale injection includes three separate treatment areas which encompasses the Dauer Driveway/Redi-Quick Interior, Redi-Quick east property line, and the Redi-Quick south parking lot.

### Approach

The proposed remedial approach is the injection of the preferred treatment chemistry (Newman Zone<sup>®</sup> or Neutral Zone<sup>®</sup> provided by RNAS) through a series of 34 DPT borings. The borings would be advanced to the appropriate depth using DPT. The treatment chemistry would be injected into the rods to create minimal positive pressure before commencing injection into the surrounding formation to prevent backflow of formation materials. The rods would then be raised through the vertical contamination zone while simultaneously injecting the treatment chemistry into the formation. The pressure, rate, and total volume of treatment chemistry injected would be monitored by ORIN and amended according to field conditions in order to ensure maximum injection effectiveness.

The preferred treatment chemistry elected by Shaw for in-situ injection is Newman Zone<sup>®</sup> or Neutral Zone<sup>®</sup> provided by RNAS. Chemical properties and reductive equations of the COC using Newman Zone<sup>®</sup> are provided below. Neutral Zone<sup>®</sup> might be used in lieu of Newman Zone due to the rapid reduction in pH observed during the pilot test monitoring period. Bioaugmentation of a microbial consortium may be warranted due to the limited evidence of complete reductive dechlorination of PCE through vinyl chloride to ethenes.

A hot spot treatment option, utilizing nano particle iron during the injection around MW-10 and especially around MW-14 where there have been historically high concentrations of chlorinated solvents in the soil.

### **Proposed Treatment Chemistry**

#### **Newman Zone®**

The ingredients of Newman Zone® combine to provide the advantages of both fast- and slow-release electron donors. Microbial growth begins within hours of injection and rapidly produces anaerobic conditions in the subsurface. Yet a single injection of Newman Zone® can be effective for as long as five years.

The properties of Newman Zone® create a kinetically stable oil-in-water emulsion. Because of the uniform and sub-micron droplet size, the emulsified vegetable oil (EVO) pumps as easily as water when diluted, does not cream, and does not significantly change aquifer permeability.

Newman Zone® contains both fast- and slow-release electron donors. Sodium lactate stimulates microbial growth within hours of injection and rapidly produces anaerobic conditions in the subsurface. However, sodium lactate is quickly depleted by microbes and little if any remains after a period of 60 days or less. Slow fermentation of the vegetable oil provides a continuous supply of hydrogen and volatile fatty acids (VFAs). The hydrogen and VFAs support anaerobic microbial activity for long periods of time, commonly for several years after injection. The vegetable oil is held in suspension as submicron drops by a proprietary mix of additives and stabilizing agents. The emulsified vegetable oil (EVO) remains stable during injection and does not degrade until the stabilizing additives (primarily surfactants) have been consumed by microbes.

Newman Zone® is an oil-in-water emulsion consisting of sub-micron droplets of uniform size. Sophisticated factory processing and proprietary additives consistently produce emulsions with oil droplets between 0.15 and 0.60 microns in size with a median size of 0.30 microns. The sub-micron droplets produce a kinetically stable EVO that prevents the oil from separating from the water. The uniform droplet size means that none of the droplets are large enough to clog aquifer pores. When diluted for injection, Newman Zone® has a viscosity that is essentially the same as water. Hence, it disperses easily in water, pumps as easily as water, and moves through even fine grained materials in a more predictable manner. Newman Zone® is available in different formulations to answer the site-specific needs of individual projects.

## Scope of Services

### Direct Push Injection: Newman's Zone (Full scale)

- Treatment will occur in-situ using DPT.
- Implementation in the field will take approximately 4 days, depending on unforeseen site and matrix conditions.
- Approximately 38 direct injection borings will be advanced within the treatment zone extending from approximately 16 ft. bgs to 4 ft. bgs.
- An average 5-6 foot radius of influence is expected with overlap to ensure complete coverage; each of the 38 injection locations will be spaced approximately 10 feet apart.
- Inject Newman Zone<sup>®</sup> treatment chemistry into each of the 38 direct push locations.
- Concentration and volume will be directed by Shaw, though the goal is to inject approximately 100 gallons of a 10% Newman Zone solution with some Neutral Zone to buffer the influence on pH.
- Concentrations may be adjusted depending on subsurface conditions.
- Collect one (1) soil sample per boring from the Red-Quick building interior, and submit the 14 samples for Volatile Organic Compound laboratory analysis.
- Field notes on the location of the injection points, amount of chemical injected, injection pressure readings and any other injection related field observations will be prepared.

### Direct Push Injection – Nano Scale Iron (Hot Spot Treatment MW-10/MW-14)

- Treatment will occur in-situ using DPT.
- Implementation in the field will take approximately ½ day, depending on unforeseen site and matrix conditions.
- Approximately 4 direct injection borings will be advanced within the treatment zone extending from approximately 16 ft. bgs to 4 ft. bgs.
- An average 4-5 foot radius of influence is expected with overlap to ensure complete coverage; each of the 4 injection locations will be spaced approximately 8 feet apart.
- Inject nano-scale iron treatment chemistry into each of the 4 direct push locations centered around MW-10.
- Approximately 25 lb of nano-scale iron suspended in 100 gallons of

water will be injected into each of the 4 injection points.

- Concentrations may be adjusted depending on subsurface conditions.


**Change Order**

Costs associated with the scope of work presented above are likely eligible for reimbursement under DERF. The estimated cost to execute the proposed scope of work is approximately \$ 33,010.00. In accordance with s. NR 169.21 (3) (a) Wis. Admin. Code, the cost breakdown is presented as **Table 1**.

**Closing**

If there are any questions regarding the information contained herein, or if we can be of additional service, please contact the undersigned at your convenience. As our approval to proceed, please sign below and return to me via fax, mail or [timothy.welch@shawgrp.com](mailto:timothy.welch@shawgrp.com).

Sincerely,  
**SHAW ENVIRONMENTAL, INC.**

  
Timothy P. Welch, P.G.  
Project Manager

cc: Mr. Sam Gruichich

Enclosures

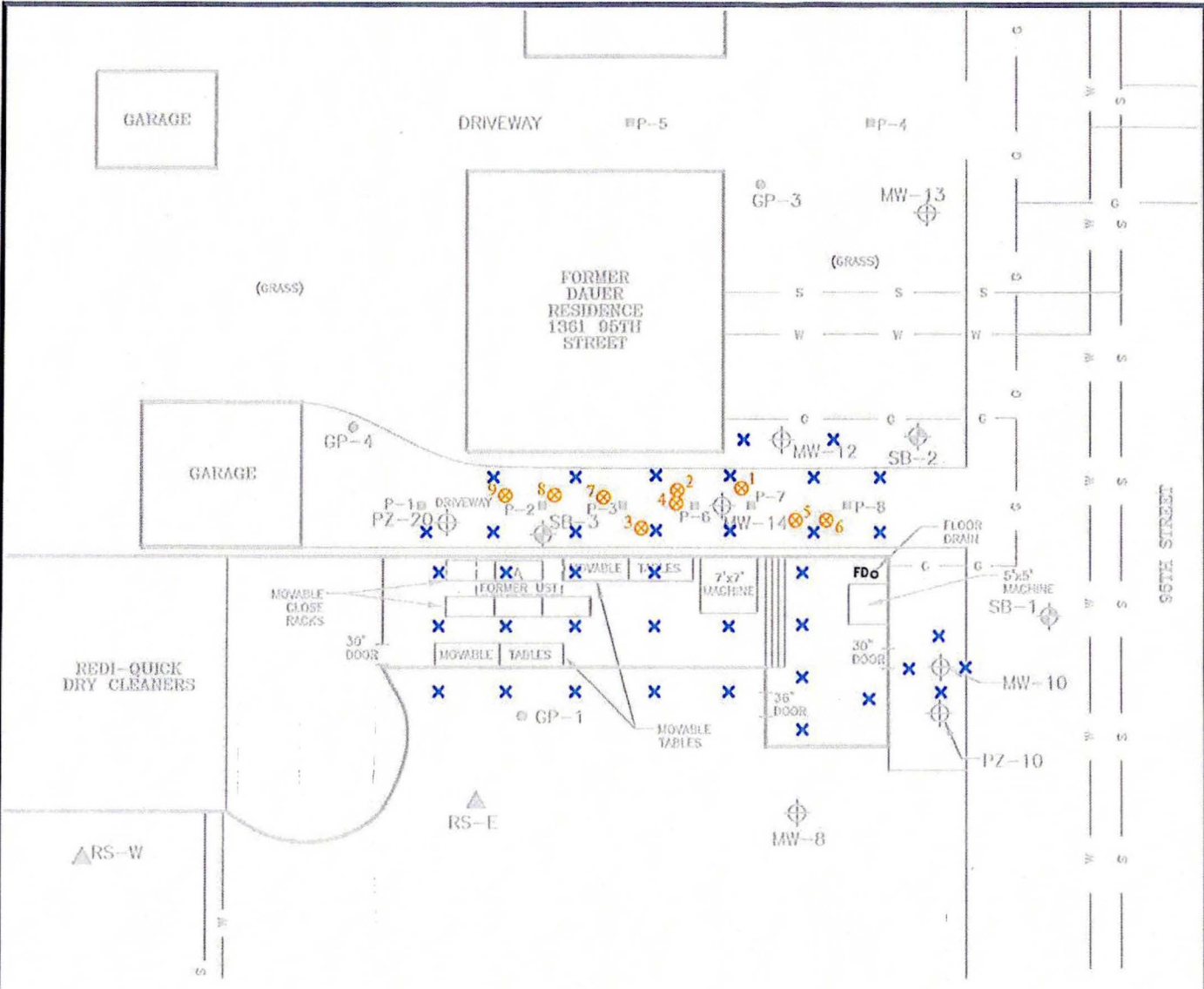
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Mr. Sam Gruichich

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Mr. Binyotti Amungwafor

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Date

File: C:\Projects\100000\133480 (Redi-Quick)\CAD\133480-04.dwg Layout: FIG 4 FS INJ PNT User: bruce.benoit Mar 22, 2010 - 12:48pm



**LEGEND**

- FORMER UNDERGROUND STORAGE TANK (UST)
- MONITORING WELL
- TEST BORING, DRILLED 5/19/99 BY JJS & ASSOCIATES
- PIEZOMETER
- RECOVERY SUMP
- GEOPROBE BORING
- PROBE
- WATER LINE
- SEWER LINE
- GAS LINE
- INJECTION WELL (PILOT TEST)
- PROPOSED INJECTION POINT (FULL SCALE INJECTION)

**TANK KEY**

- 1,000-GALLON DRY CLEANER SOLVENT UST (NO LONGER IN USE)

APPROXIMATE SCALE IN FEET



	Shaw Environmental, Inc. 111 W. Pleasant St. Suite 105 Milwaukee, Wisconsin 53212-3939 (414) 291-2350	<b>TITLE</b> <b>FULL SCALE INJECTION POINT AND MONITORING WELL LOCATION MAP</b>				
	<b>CLIENT</b> Redi-Quick Dry Cleaners	<b>LOCATION</b> Redi-Quick Dry Cleaners Site 9508 West Greenfield Avenue West Allis, Wisconsin	<b>DRWN</b> BEB	<b>CHKD</b> TEW	<b>REVD BY</b> -- <b>REVISION DATE</b> --	<b>APPRVD BY</b> -- <b>DATE</b> 03-22-10

**TABLE 1**  
**Redi-Quick Dry Cleaner**  
**9508 West Greenfield**  
**West Allis, Wisconsin**  
**Change Order #1 Summary**  
**April 12, 2010**

Item	Estimated Price	Actual Price	Explanation
Injection Equipment: Full Scale Injection (Contractor)	\$9,850.00	\$29,250.00	Estimate geoprobe direct push application in February 2007. Current price from ORIN based on pilot test data.
Amendment: Full Scale Injection- (Contractor: Newmans Zone)	\$7,000.00	\$8,320.00	Estimated 1,400 pounds needed, actual is 3,200 pounds
Amendment: Full Scale Injection- (Contractor: Nano Scale Iron)	\$0.00	\$8,950.00	Recommended because of contaminant loading
Amendment: Full Scale Injection (Shaw Labor)	\$3,040.00	\$3,800.00	One additional field day: 10 hrs. @ \$76/hr
Amendment: Project Management (Shaw Labor)	\$1,290.00	\$3,870.00	Work Plan modifications, correspond with Newman & ORIN: 20 HRS @ \$129.00
<b>TOTALS</b>	<b>\$21,180.00</b>	<b>\$54,190.00</b>	
Change Order Request		<b>\$33,010.00</b>	

Contractor                   \$29,670  
Consultant                    3,340  
**\$33,010**

Accepted By: Mr. Binyotti Amungwofer-WDNR Project Manager

Date: \_\_\_\_\_

Accepted By: Mr. Sam Guichich-Redi-Quick Dry Cleaner

Date: \_\_\_\_\_